Maldives Civil Aviation Authority
Republic of Maldives

Civil Aviation Advisory Publication

CAAP-Aircrew

Issue 3.00, 01 June 2025

Foreword

Maldives Civil Aviation Authority, in exercise of the powers conferred on it under Articles 5 and 6 of the Maldives Civil Aviation Authority Act 2/2012 has adopted this Advisory Publication.

This Regulation shall be cited as CAAP-Aircrew and shall come in to force on 01 June 2025.

CAAP-Aircrew dated 31 March 2016 will be repealed as from 01 June 2025.

Definitions of the terms and abbreviations used in this regulation, unless the context requires otherwise, are in MCAR-1 Definitions and Abbreviations and MCAR-Aircrew.

'Acceptable Means of Compliance' (AMC) illustrate a means, or several alternative means, but not necessarily the only possible means by which a requirement can be met.

'Guidance Material' (GM) helps to illustrate the meaning of a requirement.

For the Civil Aviation Authority
Hussain Jaleel
Chief Executive

List of Amendments

Rev #	Date	Remarks
Issue 1 Amendment 0	2015-03-01	Initial issue.
Issue 2 Amendment 0	2016-03-31	Published on CAA website.
Issue 3 Amendment 0	2025-06-01	Published on CAA website.

List of Effective Pages

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ANNEX VII (PART-ORA)

SUBPART GEN – GENERAL REQUIREMENTS

SECTION I – GENERAL

AMC1 ORA.GEN.120(a) Means of compliance

DEMONSTRATION OF COMPLIANCE

In order to demonstrate that the Implementing Rules are met, a risk assessment should be completed and documented. The result of this risk assessment should demonstrate that an equivalent level of safety to that established by the Acceptable Means of Compliance (AMC) adopted by the Agency is reached.

AMC1 ORA.GEN.125 Terms of approval and privileges of an organisation

MANAGEMENT SYSTEM DOCUMENTATION

The management system documentation should contain the privileges and detailed scope of activities for which the organisation is certified, as relevant to the applicable requirements. The scope of activities defined in the management system documentation should be consistent with the terms of approval.

AMC1 ORA.GEN.130 Changes to organisations

APPLICATION TIME FRAMES

(a) The application for the amendment of an organisation certificate should be submitted at least 30 days before the date of the intended changes.

(b) In the case of a planned change of a nominated person, the organisation should inform the competent authority at least 10 days before the date of the proposed change.

(c) Unforeseen changes should be notified at the earliest opportunity, in order to enable the competent authority to determine continued compliance with the applicable requirements and to amend, if necessary, the organisation certificate and related terms of approval.

GM1 ORA.GEN.130(a) Changes to organisations

GENERAL

(a) Typical examples of changes requiring prior approval which may affect the certificate or the terms of approval are listed below:

(1) the name of the organisation;

(2) the organisation's principal place of business;

(3) the organisation's scope of activities;

(4) additional locations of the organisation;

(5) the accountable manager;

(6) any of the persons referred to in ORA.GEN.210(a) and (b);

(7) the organisation's documentation as required by this Part, safety policy and procedures;

(8) the facilities.

(b) Prior approval by the competent authority is required for any changes to the organisation's procedure describing how changes not requiring prior approval will be managed and notified to the competent authority.

(c) Changes requiring prior approval may only be implemented upon receipt of formal approval by the competent authority.

GM2 ORA.GEN.130(a) Changes to organisations

CHANGE OF NAME OF THE ORGANISATION

A change of name requires the organisation to submit a new application as a matter of urgency.

Where this is the only change to report, the new application can be accompanied by a copy of the documentation previously submitted to the competent authority under the previous name, as a means of demonstrating how the organisation complies with the applicable requirements.

GM1 ORA.GEN.130(c) Changes to organisations

GENERAL

Typical examples of changes not requiring prior approval are to the following items:

(a) medical equipment (e.g. electrocardiograph (ECG), ophthalmoscope);

(b) flight simulation training device (FSTD) operator's technical personnel;

(c) change in schedule of preventive maintenance; and

(d) list of instructors.

It is recommended that all information on changes not requiring prior approval be included as annexes to the approved training organisation (ATO)'s, FSTD operator's, as well as aeromedical centre's documentation

AMC1 ORA.GEN.150(b) Findings

GENERAL

The corrective action plan defined by the organisation should address the effects of the non-conformity, as well as its root-cause.

GM1 ORA.GEN.150 Findings

GENERAL

(a) Corrective action is the action to eliminate or mitigate the root cause(s) and prevent recurrence of an existing detected non-compliance or other undesirable condition or situation.

(b) Proper determination of the root cause is crucial for defining effective corrective actions.

SECTION II – MANAGEMENT

AMC1 ORA.GEN.200(a)(1);(2);(3);(5) Management system

NON-COMPLEX ORGANISATIONS - GENERAL

(a) Safety risk management may be performed using hazard checklists or similar risk management tools or processes, which are integrated into the activities of the organisation.

(b) The organisation should manage safety risks related to a change. The management of change should be a documented process to identify external and internal change that may have an adverse effect on safety. It should make use of the organisation's existing hazard identification, risk assessment and mitigation processes.

(c) The organisation should identify a person who fulfils the role of safety manager and who is responsible for coordinating the safety management system. This person may be the accountable manager or a person with an operational role in the organisation.

(d) Within the organisation, responsibilities should be identified for hazard identification, risk assessment and mitigation.

(e) The safety policy should include a commitment to improve towards the highest safety standards, comply with all applicable legal requirements, meet all applicable standards, consider best practices and provide appropriate resources.

(f) The organisation should, in cooperation with other stakeholders, develop, coordinate and maintain an emergency response plan (ERP) that ensures orderly and safe transition from normal to emergency operations and return to normal operations. The ERP should provide the actions to be taken by the organisation or specified individuals in an emergency and reflect the size, nature and complexity of the activities performed by the organisation.

AMC1 ORA.GEN.200(a)(1) Management system

COMPLEX ORGANISATIONS - ORGANISATION AND ACCOUNTABILITIES

The management system of an organisation should encompass safety by including a safety manager and a safety review board in the organisational structure.

(a) Safety manager

(1) The safety manager should act as the focal point and be responsible for the development, administration and maintenance of an effective safety management system.

(2) The functions of the safety manager should be to:

(i) facilitate hazard identification, risk analysis and management;

(ii) monitor the implementation of actions taken to mitigate risks, as listed in the safety action plan;

(iii) provide periodic reports on safety performance;

(iv) ensure maintenance of safety management documentation;

(v) ensure that there is safety management training available and that it meets acceptable standards;

(vi) provide advice on safety matters; and

(vii) ensure initiation and follow-up of internal occurrence / accident investigations.

(b) Safety review board

(1) The Safety review board should be a high level committee that considers matters of strategic safety in support of the accountable manager's safety accountability.

(2) The board should be chaired by the accountable manager and be composed of heads of functional areas.

(3) The safety review board should monitor:

(i) safety performance against the safety policy and objectives;

(ii) that any safety action is taken in a timely manner; and

(iii) the effectiveness of the organisation's safety management processes.

(c) The safety review board should ensure that appropriate resources are allocated to achieve the established safety performance.

(d) The safety manager or any other relevant person may attend, as appropriate, safety review board meetings. He/she may communicate to the accountable manager all information, as necessary, to allow decision making based on safety data.

GM1 ORA.GEN.200(a)(1) Management system

SAFETY MANAGER

(a) Depending on the size of the organisation and the nature and complexity of its activities, the safety manager may be assisted by additional safety personnel for the performance of all safety management related tasks.

(b) Regardless of the organisational set-up it is important that the safety manager remains the unique focal point as regards the development, administration and maintenance of the organisation's safety management system.

GM2 ORA.GEN.200(a)(1) Management system

COMPLEX ORGANISATIONS - SAFETY ACTION GROUP

(a) A safety action group may be established as a standing group or as an ad-hoc group to assist or act on behalf of the safety review board.

(b) More than one safety action group may be established depending on the scope of the task and specific expertise required.

(c) The safety action group should report to and take strategic direction from the safety review board and should be comprised of managers, supervisors and personnel from operational areas.

(d) The safety action group should:

  (1) monitor operational safety;

  (2) resolve identified risks;

  (3) assess the impact on safety of operational changes; and

  (4) ensure that safety actions are implemented within agreed timescales.

(e) The safety action group should review the effectiveness of previous safety recommendations and safety promotion.

AMC1 ORA.GEN.200(a)(2) Management system

COMPLEX ORGANISATIONS - SAFETY POLICY

(a) The safety policy should:

  (1) be endorsed by the accountable manager;

  (2) reflect organisational commitments regarding safety and its proactive and systematic management;

  (3) be communicated, with visible endorsement, throughout the organisation; and

  (4) include safety reporting principles.

(b) The safety policy should include a commitment:

(1) to improve towards the highest safety standards;

(2) to comply with all applicable legislation, meet all applicable standards and consider best practices;

(3) to provide appropriate resources;

(4) to enforce safety as one primary responsibility of all managers; and

(5) not to blame someone for reporting something which would not have been otherwise detected.

(c) Senior management should:

(1) continually promote the safety policy to all personnel and demonstrate their commitment to it;

(2) provide necessary human and financial resources for its implementation; and

(3) establish safety objectives and performance standards.

GM1 ORA.GEN.200(a)(2) Management system

SAFETY POLICY

The safety policy is the means whereby the organisation states its intention to maintain and, where practicable, improve safety levels in all its activities and to minimise its contribution to the risk of an aircraft accident as far as is reasonably practicable.

The safety policy should state that the purpose of safety reporting and internal investigations is to improve safety, not to apportion blame to individuals.

AMC1 ORA.GEN.200(a)(3) Management system

COMPLEX ORGANISATIONS - SAFETY RISK MANAGEMENT

(a) Hazard identification processes

(1) Reactive and proactive schemes for hazard identification should be the formal means of collecting, recording, analysing, acting on and generating feedback about hazards and the associated risks that affect the safety of the operational activities of the organisation.

(2) All reporting systems, including confidential reporting schemes, should include an effective feedback process.

(b) Risk assessment and mitigation processes

(1) A formal risk management process should be developed and maintained that ensures analysis (in terms of likelihood and severity of occurrence), assessment (in terms of tolerability) and control (in terms of mitigation) of risks to an acceptable level.

(2) The levels of management who have the authority to make decisions regarding the tolerability of safety risks, in accordance with (b)(1), should be specified.

(c) Internal safety investigation

(1) The scope of internal safety investigations should extend beyond the scope of occurrences required to be reported to the competent authority.

(d) Safety performance monitoring and measurement

(1) Safety performance monitoring and measurement should be the process by which the safety performance of the organisation is verified in comparison to the safety policy and objectives.

(2) This process should include:

(i) safety reporting;

(ii) safety studies, that is, rather large analyses encompassing broad safety concerns;

(iii) safety reviews including trends reviews, which would be conducted during introduction and deployment of new technologies, change or implementation of procedures, or in situations of structural change in operations;

(iv) safety audits focussing on the integrity of the organisation’s management system, and periodically assessing the status of safety risk controls; and

(v) safety surveys, examining particular elements or procedures of a specific operation, such as problem areas or bottlenecks in daily operations, perceptions and opinions of operational personnel and areas of dissent or confusion.

(e) The management of change

The organisation should manage safety risks related to a change. The management of change should be a documented process to identify external and internal change that may have an adverse effect on safety. It should make use of the organisation’s existing hazard identification, risk assessment and mitigation processes.

(f) Continuous improvement

The organisation should continuously seek to improve its safety performance. Continuous improvement should be achieved through:

(1) proactive and reactive evaluations of facilities, equipment, documentation and procedures through safety audits and surveys;

(2) proactive evaluation of individuals’ performance to verify the fulfilment of their safety responsibilities; and

(3) reactive evaluations in order to verify the effectiveness of the system for control and mitigation of risk.

(g) The emergency response plan (ERP)

(1) An ERP should be established that provides the actions to be taken by the organisation or specified individuals in an emergency. The ERP should reflect the size, nature and complexity of the activities performed by the organisation.

(2) The ERP should ensure:

(i) an orderly and safe transition from normal to emergency operations;

(ii) safe continuation of operations or return to normal operations as soon as practicable; and

(iii) coordination with the emergency response plans of other organisations, where appropriate.

GM1 ORA.GEN.200(a)(3) Management system

INTERNAL OCCURRENCE REPORTING SCHEME

(a) The overall purpose of the scheme is to use reported information to improve the level of safety performance of the organisation and not to attribute blame.

(b) The objectives of the scheme are to:

(1) enable an assessment to be made of the safety implications of each relevant incident and accident, including previous similar occurrences, so that any necessary action can be initiated; and

(2) ensure that knowledge of relevant incidents and accidents is disseminated, so that other persons and organisations may learn from them.

(c) The scheme is an essential part of the overall monitoring function and it is complementary to the normal day-to-day procedures and ‘control’ systems and is not intended to duplicate or supersede any of them. The scheme is a tool to identify those instances where routine procedures have failed.

(d) All occurrence reports judged reportable by the person submitting the report should be retained as the significance of such reports may only become obvious at a later date.

GM3 ORA.GEN.200(a)(3) Management system

APPROVED TRAINING ORGANISATIONS - RISK MANAGEMENT OF FLIGHT OPERATIONS WITH KNOWN OR FORECAST VOLCANIC ASH CONTAMINATION

(a) Responsibilities

The ATO is responsible for the safety of its operations, including within an area with known or forecast volcanic ash contamination.

The ATO should complete this assessment of safety risks related to known or forecast volcanic ash contamination as part of its management system before initiating operations into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash.

This process is intended to ensure the ATO takes into account the likely accuracy and quality of the information sources it uses in its management system and to demonstrate its own competence and capability to interpret data from different sources in order to achieve the necessary level of data integrity reliably and correctly resolve any conflicts among data sources that may arise.

In order to decide whether or not to operate into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, the ATO should make use of the safety risk assessment within its management system as required by ORA.GEN.200.

The ATO's safety risk assessment should take into account all relevant data including data from the type certificate holders (TCHs) regarding the susceptibility of the aircraft they operate to volcanic cloud-related airworthiness effects, the nature and severity of these effects and the related pre-flight, in-flight and post-flight precautions to be observed by the ATO.

The ATO should ensure that personnel required to be familiar with the details of the safety risk assessments receives all relevant information (both pre-flight and in-flight) in order to be in a position to apply appropriate mitigation measures as specified by the safety risk assessments.

(b) Procedures

The ATO should have documented procedures for the management of operations into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash.

These procedures should ensure that, at all times, flight operations remain within the accepted safety boundaries as established through the management system allowing for any variations in information sources, equipment, operational experience or organisation. Procedures should include those for flight crew and any other relevant personnel such that they are in a position to evaluate correctly the risk of flights into airspace forecast to be contaminated by volcanic ash and to plan accordingly.

Continuing airworthiness personnel should be provided with procedures allowing them to correctly assess the need for and to execute relevant maintenance or continuing airworthiness interventions.

The ATO should retain sufficient qualified and competent staff to generate well supported operational risk management decisions and ensure that its staff are appropriately trained and current. It is recommended that the ATO make the necessary arrangements for its relevant staff to take up opportunities to be involved in volcanic ash exercises conducted in their areas of operation.

(c) Volcanic activity information and the ATO's potential response

Before and during operations, information valuable to the ATO is generated by various volcano agencies worldwide. The ATO's risk assessment and mitigating actions need to take account of and respond appropriately to the information likely to be available during each phase of the eruptive sequence from pre-eruption through to end of eruptive activity. It is nevertheless noted that eruptions rarely follow a deterministic pattern of behaviour. A typical ATO's response may consist of the following:

(1) Pre-eruption

The ATO should have in place a robust mechanism for ensuring that it is constantly vigilant for any alerts of pre-eruption volcanic activity relevant to its operations. The staff involved need to understand the threat to safe operations that such alerts represent.

An ATO whose areas of activity include large, active volcanic areas for which immediate International Airways Volcano Watch (IAVW) alerts may not be available, should define its strategy for capturing information about increased volcanic activity before pre-eruption alerts are generated. For example, an ATO may combine elevated activity information with information concerning the profile and history of the volcano to determine an operating policy, which could include re-routing or restrictions at night. This would be useful when dealing with the 60% of volcanoes which are unmonitored.

Such an ATO should also ensure that its crews are aware that they may be the first to observe an eruption and so need to be vigilant and ready to ensure that this information is made available for wider dissemination as quickly as possible.

(2) Start of an eruption

Given the likely uncertainty regarding the status of the eruption during the early stages of an event and regarding the associated volcanic cloud, the ATO's procedures should include a requirement for crews to initiate re-routes to avoid the affected airspace.

The ATO should ensure that flights are planned to remain clear of the affected areas and that consideration is given to available aerodromes/operating sites and fuel requirements.

It is expected that the following initial actions will be taken by the ATO:

(i) determine if any aircraft in flight could be affected, alert the crew and provide advice on re-routing as required;

(ii) alert management;

(iii) for flight departures, brief flight crew and revise flight and fuel planning in accordance with the safety risk assessment;

(iv) alert flight crew to the need for increased monitoring of information (e.g. special air report (AIREP), volcanic activity report (VAR), significant weather information (SIGMET), NOTAMs and company messages);

(v) initiate the gathering of all data relevant to determining the risk; and

(vi) apply mitigations identified in the safety risk assessment.

(3) On-going eruption

As the eruptive event develops, the ATO can expect the responsible Volcanic Ash Advisory Centre (VAAC) to provide volcanic ash advisory messages (VAA/VAGs) defining, as accurately as possible, the vertical and horizontal extent of areas and layers of volcanic clouds. As a minimum, the ATO should monitor, and take account of, this VAAC information as well as of relevant SIGMETs and NOTAMs.

Other sources of information are likely to be available such as VAR/AIREPs, satellite imagery and a range of other information from State and commercial organisations. The ATO should plan its operations in accordance with its safety risk assessment taking into account the information that it considers accurate and relevant from these additional sources.

The ATO should carefully consider and resolve differences or conflicts among the information sources, notably between published information and observations (pilot reports, airborne measurements, etc.).

Given the dynamic nature of the volcanic hazards, the ATO should ensure that the situation is monitored closely and operations adjusted to suit changing conditions.

The ATO should be aware that, depending on the State concerned the affected or danger areas may be established and presented in a different way than described in EUR Doc 019-NAT Doc 006.

The ATO should require reports from its crews concerning any encounters with volcanic emissions. These reports should be passed immediately to the appropriate air traffic services (ATS) unit and to the ATO’s competent authority.

For the purpose of flight planning, the ATO should treat the horizontal and vertical limits of the temporary danger area (TDA) or airspace forecast to be contaminated by volcanic ash as applicable, to be over-flown as it would mountainous terrain, modified in accordance with its safety risk assessment. The ATO should take account of the risk of cabin depressurisation or engine failure resulting in the inability to maintain level flight above a volcanic cloud. Additional minimum Equipment List (MEL) provisions, if applicable, should be considered in consultation with the TCHs.

Flying below a volcanic ash contaminated airspace should be considered on a case by case basis. It should only be planned to reach or leave an aerodrome/operating site close to the boundary of this airspace or where the ash contamination is very high and stable. The establishment of Minimum Sector Altitude (MSA) and the availability of aerodromes/operating sites should be considered.

(d) Safety risk assessment

When directed specifically at the issue of intended flight into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, the process should involve the following:

(1) Identifying the hazards

The generic hazard, in the context of this document, is airspace forecast to beor aerodromes/operating sites known to be contaminated with volcanic ash, and whose characteristics are harmful to the airworthiness and operation of the aircraft.

This GM is referring to volcanic ash contamination since it is the most significant hazard for flight operations in the context of a volcanic eruption. Nevertheless, it might not be the only hazard and therefore the operator should consider additional hazards which could have an adverse effect on aircraft structure or passengers safety such as gases.

Within this generic hazard, the ATO should develop its own list of specific hazards taking into account its specific aircraft, experience, knowledge and type of operation, and any other relevant data stemming from previous eruptions.

(2) Considering the severity and consequences of the hazard occurring (i.e. the nature and actual level of damage expected to be inflicted on the particular aircraft from exposure to that volcanic ash cloud).

(3) Evaluating the likelihood of encountering volcanic ash clouds with characteristics harmful to the safe operation of the aircraft.

For each specific hazard within the generic hazard, the likelihood of adverse consequences should be assessed, either qualitatively or quantitatively.

(4) Determining whether the consequent risk is acceptable and within the ATO's risk performance criteria.

At this stage of the process, the safety risks should be classified as acceptable or unacceptable. The assessment of tolerability will be subjective, based on qualitative data and expert judgement, until specific quantitative data are available in respect of a range of parameters.

(5) Taking action to reduce the safety risk to a level that is acceptable to the ATO's management.

Appropriate mitigation for each unacceptable risk identified should then be considered in order to reduce the risk to a level acceptable to the ATO's management.

(e) Procedures to be considered when identifying possible mitigations actions

When conducting a volcanic ash safety risk assessment, the ATO should consider the following non-exhaustive list of procedures and processes as mitigation:

(1) Type certificate holders

Obtaining advice from the TCHs and other engineering sources concerning operations in potentially contaminated airspace and/or aerodromes/operating sites contaminated by volcanic ash.

This advice should set out:

(i) the features of the aircraft that are susceptible to airworthiness effects related to volcanic ash;

(ii) the nature and severity of these effects;

(iii) the effect of volcanic ash on operations to/from contaminated aerodromes/ operating sites, including the effect on take-off and landing aircraft performance;

(iv) the related pre-flight, in-flight and post-flight precautions to be observed by the ATO including any necessary amendments to aircraft operating manuals, aircraft maintenance manuals, master minimum equipment list/dispatch deviation or equivalents required to support the ATO; and

(v) the recommended inspections associated with inadvertent operations in volcanic ash contaminated airspace and operations to/from volcanic ash contaminated aerodromes/operating sites; this may take the form of instructions for continuing airworthiness or other advice.

(2) ATO/contracted organisations’ personnel

Definition of procedures for flight planning and operations ensuring that:

(i) flight crews are in a position to evaluate correctly the risk of encountering volcanic ash contaminated airspace, or aerodromes/operating sites, and can plan accordingly;

(ii) flight planning and operational procedures enable crews to avoid areas and aerodromes/operating sites with unacceptable volcanic ash contamination;

(iii) flight crew are aware of the possible signs of entry into a volcanic ash cloud and execute the associated procedures;

(iv) continuing airworthiness personnel are able to assess the need for, and to execute, any necessary maintenance or other required interventions; and

(v) crews are provided with appropriate aircraft performance data when operating to/from aerodromes/operating sites contaminated with volcanic ash.

(3) Provision of enhanced flight watch

This should ensure:

(i) close and continuous monitoring of VAA, VAR/AIREP, SIGMET, NOTAM and ASHTAM and other relevant information, and information from crews, concerning the volcanic ash cloud hazard;

(ii) access to plots of the affected areas from SIGMETs, NOTAMs and other relevant information for crews; and

(iii) communication of the latest information to crews in a timely fashion.

(4) Flight planning

Flexibility of the process to allow re-planning at short notice should conditions change.

(5) Departure, destination and alternate aerodromes

For the airspace to be traversed, or the aerodromes/operating sites in use, parameters to evaluate and take account of:

(i) the probability of contamination;

(ii) any additional aircraft performance requirements;

(iii) required maintenance considerations;

(iv) fuel requirements for re-routeing and extended holding.

(6) Routing policy

Parameters to evaluate and take account of:

(i) the shortest period in and over the forecast contaminated area;

(ii) the hazards associated with flying over the contaminated area;

(iii) drift down and emergency descent considerations;

(iv) the policy for flying below the contaminated airspace and the associated hazards.

(7) Diversion policy

Parameters to evaluate and take account of:

(i) maximum allowed distance from a suitable aerodrome/operating site;

(ii) availability of aerodromes/operating sites outside the forecast contaminated area;

(iii) diversion policy after an volcanic ash encounter.

(8) Minimum equipment list

Additional provisions in the MEL, if applicable, for dispatching aircraft with unserviceabilities that might affect the following non-exhaustive list of systems:

(i) air conditioning packs;

(ii) engine bleeds;

(iii) pressurisation system;

(iv) electrical power distribution system;

(v) air data system;

(vi) standby instruments;

(vii) navigation systems;

(viii) de-icing systems;

(ix) engine driven generators;

(x) auxiliary power unit (APU);

(xi) airborne collision avoidance system (ACAS);

(xii) terrain awareness warning system (TAWS);

(xiii) autoland systems;

(xiv) provision of crew oxygen;

(xv) supplemental oxygen for passengers.

(9) Standard operating procedures

Crew training to ensure they are familiar with normal and abnormal operating procedures and particularly any changes regarding but not limited to:

(i) pre-flight planning;

(ii) in-flight monitoring of volcanic ash cloud affected areas and avoidance procedures;

(iii) diversion;

(iv) communications with ATC;

(v) in-flight monitoring of engine and systems potentially affected by volcanic ash cloud contamination;

(vi) recognition and detection of volcanic ash clouds and reporting procedures;

(vii) in-flight indications of a volcanic ash cloud encounter;

(viii) procedures to be followed if a volcanic ash cloud is encountered;

(ix) unreliable or erroneous airspeed;

(x) non-normal procedures for engines and systems potentially affected by volcanic ash cloud contamination;

(xi) engine-out and engine relight;

(xii) escape routes; and

(xiii) operations to/from aerodromes/operating sites contaminated with volcanic ash.

(10) Provision for aircraft technical log

This should ensure:

(i) Systematic entry in the aircraft continuing airworthiness records or aircraft log if available related to any actual or suspected volcanic ash encounter whether in-flight or at an aerodrome/operating site; and

(ii) Checking, prior to flight, of the completion of maintenance actions related to an entry in the continuing airworthiness records or aircraft log if available for a volcanic ash cloud encounter on a previous flight.

(11) Incident reporting

Crew requirements for:

(i) reporting an airborne volcanic ash cloud encounter (VAR);

(ii) post-flight volcanic ash cloud reporting (VAR);

(iii) reporting non encounters in airspace forecast to be contaminated; and

(iv) filing a mandatory occurrence report in accordance with ORA.GEN.160.

(12) Continuing airworthiness procedures

Procedures when operating in or near areas of volcanic ash cloud contamination:

(i) enhancement of vigilance during inspections and regular maintenance and appropriate adjustments to maintenance practices;

(ii) definition of a follow-up procedure when a volcanic ash cloud encounter has been reported or suspected;

(iii) thorough investigation for any sign of unusual or accelerated abrasions or corrosion or of volcanic ash accumulation;

(iv) reporting to TCHs and the relevant authorities observations and experiences from operations in areas of volcanic ash cloud contamination;

(v) completion of any additional maintenance recommended by the TCH or by the competent authority.

(f) Reporting

The ATO should ensure that reports are immediately submitted to the nearest ATS unit using the VAR/AIREP procedures followed up by a more detailed VAR on landing together with, as applicable, a report as defined in MCAR 13-B, and an aircraft technical log entry for:

(1) any incident related to volcanic clouds;

(2) any observation of volcanic ash activity and

(3) anytime that volcanic ash is not encountered in an area where it was forecast to be.

(g) Additional guidance

Further guidance on volcanic ash safety risk assessment is given in ICAO Doc. 9974 (Flight safety and volcanic ash – Risk management of flight operations with known or forecast volcanic ash contamination).

GM4 ORA.GEN.200(a)(3) Management system

SAFETY RISK ASSESSMENT – RISK REGISTER

The results of the assessment of the potential adverse consequences or outcome of each hazard may be recorded by the ATO in a risk register, an example of which is provided below.

Hazard		Incident Sequence Description	Existing Controls	Outcome (Pre-Mitigation)			Additional Mitigation required	Outcome (Post-Mitigation)			Actions and Owners	Monitoring and Review Requirements
No	Description			Severity	Likelihood	Risk		Severity	Likelihood	Risk		

AMC1 ORA.GEN.200(a)(4) Management system

TRAINING AND COMMUNICATION ON SAFETY

(a) Training

(1) All personnel should receive safety training as appropriate for their safety responsibilities.

(2) Adequate records of all safety training provided should be kept.

(b) Communication

(1) The organisation should establish communication about safety matters that:

(i) ensures that all personnel are aware of the safety management activities as appropriate for their safety responsibilities;

(ii) conveys safety critical information, especially relating to assessed risks and analysed hazards;

(iii) explains why particular actions are taken; and

(iv) explains why safety procedures are introduced or changed.

(2) Regular meetings with personnel where information, actions and procedures are discussed may be used to communicate safety matters.

GM1 ORA.GEN.200(a)(4) Management system

TRAINING AND COMMUNICATION ON SAFETY

The safety training programme may consist of self-instruction via a media (newsletters, flight safety magazines), class-room training, e-learning or similar training provided by training service providers.

AMC1 ORA.GEN.200(a)(5) Management system

ORGANISATION'S MANAGEMENT SYSTEM DOCUMENTATION

(a) The organisation's management system documentation should at least include the following information:

(1) a statement signed by the accountable manager to confirm that the organisation will continuously work in accordance with the applicable requirements and the organisation's documentation as required by this Part;

(2) the organisation's scope of activities;

(3) the titles and names of persons referred to in ORA.GEN.210(a) and (b);

(4) an organisation chart showing the lines of responsibility between the persons referred to in ORA.GEN.210;

(5) a general description and location of the facilities referred to in ORA.GEN.215;

(6) procedures specifying how the organisation ensures compliance with the applicable requirements;

(7) the amendment procedure for the organisation's management system documentation.

(b) The organisation's management system documentation may be included in a separate manual or in (one of) the manual(s) as required by the applicable Subpart(s). A cross reference should be included.

GM1 ORA.GEN.200(a)(5) Management system

ORGANISATION'S MANAGEMENT SYSTEM DOCUMENTATION

(a) It is not required to duplicate information in several manuals. The information may be contained in any of the organisation manuals (e.g. operations manual, training manual), which may also be combined.

(b) The organisation may also choose to document some of the information required to be documented in separate documents (e.g. procedures). In this case, it should ensure that manuals contain adequate references to any document kept separately. Any such documents are then to be considered an integral part of the organisation's management system documentation.

AMC1 ORA.GEN.200(a)(5) Management system

COMPLEX ORGANISATIONS – ORGANISATION'S SAFETY MANAGEMENT MANUAL

(a) The safety management manual (SMM) should be the key instrument for communicating the approach to safety for the whole of the organisation. The SMM should document all aspects of safety management, including the safety policy, objectives, procedures and individual safety responsibilities.

(b) The contents of the safety management manual should include all of the following:

(1) scope of the safety management system;

(2) safety policy and objectives;

(3) safety accountability of the accountable manager;

(4) safety responsibilities of key safety personnel;

(5) documentation control procedures;

(6) hazard identification and risk management schemes;

(7) safety action planning;

(8) safety performance monitoring;

(9) incident investigation and reporting;

(10) emergency response planning;

(11) management of change (including organisational changes with regard to safety responsibilities);

(12) safety promotion.

(c) The SMM may be contained in (one of) the manual(s) of the organisation.

AMC1 ORA.GEN.200(a)(6) Management system

COMPLIANCE MONITORING - GENERAL

(1) Compliance monitoring

The implementation and use of a compliance monitoring function should enable the organisation to monitor compliance with the relevant requirements of this Part and other applicable Parts.

(1) The organisation should specify the basic structure of the compliance monitoring function applicable to the activities conducted.

(2) The compliance monitoring function should be structured according to the size of the organisation and the complexity of the activities to be monitored.

(2) Organisations should monitor compliance with the procedures they have designed to ensure safe activities. In doing so, they should as a minimum, and where appropriate, monitor:

(1) privileges of the organisation;

(2) manuals, logs, and records;

(3) training standards;

(4) management system procedures and manuals.

(3) Organisational set up

(1) To ensure that the organisation continues to meet the requirements of this Part and other applicable Parts, the accountable manager should designate a compliance monitoring manager. The role of the compliance monitoring manager is to ensure that the activities of the organisation are monitored for compliance with the applicable regulatory requirements , and any additional requirements as established by the organisation, and that these activities are being carried out properly under the supervision of the relevant head of functional area.

(2) The compliance monitoring manager should be responsible for ensuring that the compliance monitoring programme is properly implemented, maintained and continually reviewed and improved.

(3) The compliance monitoring manager should:

(i) have direct access to the accountable manager;

(ii) not be one of the other persons referred to in ORA.GEN.210(b);

(iii) be able to demonstrate relevant knowledge, background and appropriate experience related to the activities of the organisation; including knowledge and experience in compliance monitoring; and

(iv) have access to all parts of the organisation, and as necessary, any contracted organisation.

(4) In the case of a non-complex organisation, this task may be exercised by the accountable manager provided he/she has demonstrated having the related competence as defined in (c)(3)(iii).

(5) In the case the same person acts as compliance monitoring manager and as safety manager, the accountable manager, with regards to his/her direct accountability for safety, should ensure that sufficient resources are allocated to both functions, taking into account the size of the organisation and the nature and complexity of its activities.

(6) The independence of the compliance monitoring function should be established by ensuring that audits and inspections are carried out by personnel not responsible for the function, procedure or products being audited.

(4) Compliance monitoring documentation

(1) Relevant documentation should include the relevant part(s) of the organisation's management system documentation.

(2) In addition, relevant documentation should also include the following:

(i) terminology;

(ii) specified activity standards;

(iii) a description of the organisation;

(iv) the allocation of duties and responsibilities;

(v) procedures to ensure regulatory compliance;

(vi) the compliance monitoring programme, reflecting:

(A) schedule of the monitoring programme;

(B) audit procedures;

(C) reporting procedures;

(D) follow-up and corrective action procedures; and

(E) recording system.

(vii) the training syllabus referred to in (e)(2);

(viii) document control.

(5) Training

(1) Correct and thorough training is essential to optimise compliance in every organisation. In order to achieve significant outcomes of such training, the

organisation should ensure that all personnel understand the objectives as laid down in the organisation's management system documentation.

(2) Those responsible for managing the compliance monitoring function should receive training on this task. Such training should cover the requirements of compliance monitoring, manuals and procedures related to the task, audit techniques, reporting and recording.

(3) Time should be provided to train all personnel involved in compliance management and for briefing the remainder of the personnel.

(4) The allocation of time and resources should be governed by the volume and complexity of the activities concerned.

GM1 ORA.GEN.200(a)(6) Management system

COMPLIANCE MONITORING - GENERAL

(a) The organisational set-up of the compliance monitoring function should reflect the size of the organisation and the nature and complexity of its activities. The compliance monitoring manager may perform all audits and inspections himself/herself or appoint one or more auditors by choosing personnel having the related competence as defined in AMC1 ORA.GEN.200(a)(6) point (c)(3)(iii), either from within or outside the organisation.

(b) Regardless of the option chosen it must be ensured that the independence of the audit function is not affected, in particular in cases where those performing the audit or inspection are also responsible for other functions within the organisation.

(c) In case external personnel are used to perform compliance audits or inspections:

(1) any such audits or inspections are performed under the responsibility of the compliance monitoring manager; and

(2) the organisation remains responsible to ensure that the external personnel has relevant knowledge, background and experience as appropriate to the activities being audited or inspected; including knowledge and experience in compliance monitoring.

(d) The organisation retains the ultimate responsibility for the effectiveness of the compliance monitoring function in particular for the effective implementation and follow-up of all corrective actions.

GM2 ORA.GEN.200(a)(6) Management system

COMPLEX ORGANISATIONS - COMPLIANCE MONITORING PROGRAMME FOR ATOs

(a) Typical subject areas for compliance monitoring audits and inspections for approved training organisations (ATOs) should be the following:

(1) facilities;

(2) actual flight and ground training;

(3) technical standards.

(b) ATOs should monitor compliance with the training and operations manuals they have designed to ensure safe and efficient training. In doing so, they should, where appropriate, additionally monitor the following:

(1) training procedures;

(2) flight safety;

(3) flight and duty time limitations, rest requirements and scheduling;

(4) aircraft maintenance/operations interface.

GM3 ORA.GEN.200(a)(6) Management system

AUDIT AND INSPECTION

(a) 'Audit' means a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which requirements are complied with.

(b) 'Inspection' means an independent documented conformity evaluation by observation and judgement accompanied as appropriate by measurement, testing or gauging, in order to verify compliance with applicable requirements.

AMC1 ORA.GEN.200(b) Management system

SIZE, NATURE AND COMPLEXITY OF THE ACTIVITY

(a) An organisation should be considered as complex when it has a workforce of more than 20 full time equivalents (FTEs) involved in the activity subject to Regulation MCAR Aircrew.

(b) Organisations with up to 20 full time equivalents (FTEs) involved in the activity, may also be considered complex based on an assessment of the following factors:

(1) in terms of complexity, the extent and scope of contracted activities subject to the approval;

(2) in terms of risk criteria, whether any of the following are present:

(i) operations requiring the following specific approvals: performance based navigation (PBN), low visibility operation (LVO), extended range operations with two-engined aeroplanes (ETOPS), helicopter hoist operation (HHO), helicopter emergency medical service (HEMS), night vision imaging system (NVIS) and dangerous goods (DG);

(ii) different types of aircraft used;

(iii) the environment (offshore, mountainous area etc.);

(c) Regardless of the criteria mentioned in (a) and (b), the following organisations should always be considered as non-complex:

(1) Approved Training Organisations (ATOs) only providing training for the light aircraft pilot licence (LAPL), private pilot licence (PPL), sailplane pilot licence (SPL) or balloon pilot licence (BPL) and the associated ratings and certificates;

(2) Aero-Medical Centres (AeMCs).

(d) Regardless of the criteria mentioned in (a) and (b), the organisations that provide training in the following areas should always be considered as complex:

(1) full flight simulators (FFSs); or

(2) multi-pilot (MP) type rating; or

(3) zero-flight-time training (ZFTT); or

(4) complex aircraft; or

(5) different categories of aircraft; or

(6) instructor certificates for point (2) and (4) aircraft; or

(7) two or more aerodromes/operating sites.

AMC1 ORA.GEN.200(c) Management system

ATOs PROVIDING TRAINING ONLY FOR THE LAPL, PPL, SPL AND BPL AND THE ASSOCIATED RATINGS OR CERTIFICATES – ORGANISATIONAL REVIEW

(a) The primary objective of the organisational review is to enable the organisation to ensure that its management system remains effective by verifying that it:

(1) has continually identified its aviation safety hazards;

(2) has effectively mitigated the associated risks; and

(3) monitors compliance with the applicable requirements.

(b) Safety risk management should:

(1) be performed using internal safety or occurrence reports, hazard checklists, risk registers or similar risk management tools or processes, integrated into the activities of the organisation;

(2) in particular address safety risks related to a change; making use of the existing hazard identification, risk assessment and mitigation tools or processes; and

(3) include provisions for emergency response or a formal Emergency Response Plan (ERP).

(c) As part of the management system documentation required by ORA.GEN.200(a)(5), the organisation should describe the organisational review programme and related responsibilities. Persons responsible for the organisational review should have a thorough knowledge of the applicable requirements and of the organisation's procedures.

(d) The status of all corrective and risk mitigation actions should be monitored by the person responsible for the organisational review programme and implemented within a specified time frame. Action closure should be recorded by the person responsible for the organisational review programme, along with a summary of the action taken.

(e) The results of the organisational review, including all non-compliance findings and new risks identified during the review, should be presented to the accountable manager and the person or group of persons nominated in accordance with ORA.GEN.210(b) prior to notification to the competent authority. All level 1 findings in the sense of ARA.GEN.350 should be immediately notified to the competent authority and all necessary actions immediately taken.

(f) Based on the results of the organisational review, the accountable manager should determine the need for and initiate, as appropriate, further actions to address deficiencies in or further improve the organisation's management system.

GM1 ORA.GEN.200(c) Management system

ATOs PROVIDING TRAINING ONLY FOR THE LAPL, PPL, SPL OR BPL AND THE ASSOCIATED RATINGS OR CERTIFICATES – ORGANISATIONAL REVIEW PROGRAMME

(a) The organisational review programme may consist of:

(1) checklist(s) covering all items necessary to be addressed in order to ensure that the organisation identified its aviation safety hazards, effectively mitigates the associated risks and ensures effective compliance with the applicable requirements. These should address all procedures described in the management system documentation and training manual; and

(2) a schedule for the accomplishment of the different checklist items, with each item being checked at least once within any 12-month period. The organisation may choose to conduct one full review annually or to conduct several partial reviews.

(b) Performance of organisational reviews:

Each review item may be addressed using an appropriate combination of:

(1) review of training records, training documentation;

(2) review of internal safety reports (e.g. notified difficulties in using current procedures and training material, etc.);

(3) review of the risk register and hazard checklists, as applicable;

(4) sample check of training courses;

(5) witnessing of examinations, as appropriate;

(6) interview of the personnel involved; and

(7) review of the feedback provided by students and customers.

(c) It is recommended that internal safety reports and occurrence reports be reviewed on a continual basis with the aim of identifying possible corrective and risk mitigation actions.

GM2 ORA.GEN.200(c) Management system

ATOs PROVIDING TRAINING ONLY FOR THE LAPL, PPL, SPL OR BPL AND THE ASSOCIATED RATINGS OR CERTIFICATES – ORGANISATIONAL REVIEW ITEMS

The following provides a list of typical items for an organisational review checklist, to be adapted as necessary to cover all relevant procedures described in the management system documentation and training manual:

(a) Terms of approval

Check that:

(1) no training has been performed outside the terms of approval;

(2) changes not requiring prior approval have been properly managed.

(b) Training syllabi and course material

Check that:

(1) training syllabi and course materials are in compliance with the applicable requirements, as last amended;

(2) training practices are in compliance with the documentation; and

(3) instructor training practices are standardised.

(c) Training equipment and tools

Check that all equipment and tools other than aircraft and FSTDs are present and meet the criteria defined in the training manual.

(d) Facilities

Check that the facilities meet the criteria defined in the training manual.

(e) Training aircraft and FSTDs

Check that the training aircraft and FSTDs meet the criteria defined in the training manual.

(f) Personnel
Check that:

(1) the current accountable manager and other nominated persons are correctly identified;

(2) the organisation chart accurately indicates lines of responsibility and accountability throughout the organisation;

(3) the organisation remains in compliance with the applicable requirements, in case the number of personnel has decreased or if the activity has increased;

(4) the qualification of all new personnel (or personnel with new functions) has been appropriately assessed;

(5) staff involved in any safety management-related processes and tasks has been properly trained; and

(6) staff has been trained, as necessary, to cover changes in regulations, in competent authority publications, in the organisation, its management system documentation and in associated procedures, etc.

(g) Contracted activities (In case the organisation has contracted activities):

(1) Check that new providers have been assessed prior to the establishment of any contract;

(2) For existing providers approved for such activities: check the authorisation and approval status of the contracted organisation; and

(3) For existing providers not approved for such activities: check that the service provided conforms to the applicable requirements of this Part.

(h) Training and communication on safety

Check that:

(1) all personnel are aware of safety management policies, processes and tasks;

(2) safety-related documentations and publications are available; and

(3) safety-critical information derived from internal safety or occurrence reporting and hazard identification have been timely communicated to all staff concerned.

(i) Management system documentation

Check that:

(1) the documentation is adequate and updated;

(2) staff are aware of the safety policy; and

(3) staff can easily access such documentation when needed.

(j) Record-keeping

Check that:

(1) the records cover all the training activities and management system processes; and

(2) minimum record-keeping periods (random checks) are complied with.

(k) Emergency response provisions or ERP

Check that:

(1) emergency response information is up to date and readily available; and

(2) all staff are aware of emergency response information or the ERP, as applicable (random checks).

(l) Internal safety or occurrence reporting procedures

(1) Check the number of reports received since the last review;

(2) Check that:

(i) internal reporting and external occurrence reporting are performed in accordance with reporting procedures;

(ii) the safety or occurrence reports are analysed; and

(iii) feedback is provided to reporters.

(m) Other risk management tools or processes implemented

(1) As applicable, check that:

(i) records of hazards and risks are assessed; in particular following analysis of safety or occurrence reports and when significant changes occur (regulations, personnel, training aircraft, training courses, etc.);

(ii) the risks are assessed and the risk mitigation actions followed up and recorded;

(iii) any risk that has been found acceptable is duly justified; and

(iv) the assumptions made for the risk assessment remain valid;

(2) Verify the effectiveness of all risk mitigation actions initiated since the last organisational review.

AMC1 ORA.GEN.205 Contracted activities

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) The organisation may decide to contract certain activities to external organisations.

(b) A written agreement should exist between the organisation and the contracted organisation clearly defining the contracted activities and the applicable requirements.

(c) The contracted safety related activities relevant to the agreement should be included in the organisation's safety management and compliance monitoring programmes.

(d) The organisation should ensure that the contracted organisation has the necessary authorisation or approval when required, and commands the resources and competence to undertake the task.

GM1 ORA.GEN.205 Contracted activities

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) Regardless of the approval status of the contracted organisation, the contracting organisation is responsible to ensure that all contracted activities are subject to hazard identification and risk management as required by ORA.GEN.200(a)(3) and to compliance monitoring as required by ORA.GEN.200(a)(6).

(b) When the contracted organisation is itself certified to carry out the contracted activities, the organisation's compliance monitoring should at least check that the approval effectively covers the contracted activities and that it is still valid.

(c) If the organisation requires the contracted organisation to conduct an activity which exceeds the contracted organisation's terms of approval, this will be considered as the contracted organisation working under the approval of the contracting organisation.

AMC1 ORA.GEN.215 Facility requirements

ATOs PROVIDING TRAINING FOR the CPL, MPL AND ATPL AND THE ASSOCIATED RATINGS AND CERTIFICATES

(a) For ATOs providing flight training, the following flight operations accommodation should be available:

   (1) an operations room with facilities to control flying operations;

   (2) a flight planning room with the following facilities:

      (i) appropriate current maps and charts;

      (ii) current aeronautical information service (AIS) information;

      (iii) current meteorological information;

      (iv) communications to air traffic control (ATC) and the operations room;

      (v) any other flight safety related material.

   (3) adequate briefing rooms/cubicles of sufficient size and number;

   (4) suitable offices for the supervisory personnel and room(s) to allow flight instructors to write reports on students, complete records and other related documentation;

   (5) furnished crew-room(s) for instructors and students.

(b) For ATOs providing theoretical knowledge training, the following facilities for theoretical knowledge instruction should be available:

   (1) adequate classroom accommodation for the current student population;

   (2) suitable demonstration equipment to support the theoretical knowledge instruction;

   (3) a radiotelephony training and testing facility;

   (4) a reference library containing publications giving coverage of the syllabus;

   (5) offices for the instructional personnel.

AMC2 ORA.GEN.215 Facility requirements

ATOs PROVIDING TRAINING FOR THE LAPL, PPL, SPL OR BPL AND THE ASSOCIATED RATINGS AND CERTIFICATES

(a) The following flight operations accommodation should be available:

(1) a flight planning room with the following facilities:

(i) appropriate current aviation maps and charts;

(ii) current AIS information;

(iii) current meteorological information;

(iv) communications to ATC (if applicable);

(v) any other flight safety related material.

(2) adequate briefing room(s)/cubicles of sufficient size and number;

(3) suitable office(s) to allow flight instructors to write reports on students, complete records and other related documentation;

(4) suitable rest areas for instructors and students, where appropriate to the training task;

(5) in the case of ATOs providing training for the BPL or LAPL(B) only, the flight operations accommodation listed in (a)(1) to (a)(4) may be replaced by other suitable facilities when operating outside aerodromes.

(b) The following facilities for theoretical knowledge instruction should be available:

(1) adequate classroom accommodation for the current student population;

(2) suitable demonstration equipment to support the theoretical knowledge instruction;

(3) suitable office(s) for the instructional personnel.

(c) A single room may be sufficient to provide the functions listed in (a) and (b).

AMC1 ORA.GEN.220(b) Record-keeping

GENERAL

(a) The record-keeping system should ensure that all records are accessible whenever needed within a reasonable time. These records should be organised in a way that ensures traceability and retrievability throughout the required retention period.

(b) Records should be kept in paper form or in electronic format or a combination of both. Records stored on microfilm or optical disc format are also acceptable. The records should remain legible throughout the required retention period. The retention period starts when the record has been created or last amended.

(c) Paper systems should use robust material which can withstand normal handling and filing. Computer systems should have at least one backup system which should be updated within 24 hours of any new entry. Computer systems should include safeguards against the ability of unauthorised personnel to alter the data.

(d) All computer hardware used to ensure data backup should be stored in a different location from that containing the working data and in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data continues to be accessible at least through the full period specified in the relevant Subpart. In the absence of such indication, all records should be kept for a minimum period of 5 years.

GM1 ORA.GEN.220(b) Record-keeping

RECORDS

Microfilming or optical storage of records may be carried out at any time. The records should be as legible as the original record and remain so for the required retention period.

SUBPART ATO – APPROVED TRAINING ORGANISATIONS

SECTION I – GENERAL

GM1 ORA.ATO.100 Scope

The content of this Section contains the requirements applicable to all ATOs providing training for pilot licences and the associated ratings and certificates.

It is applicable to ATOs providing training for:

(a) the LAPL, PPL, SPL and BPL and the associated ratings and certificates; and

(b) the commercial pilot licence (CPL), multi-crew pilot licence (MPL) and airline transport pilot licence (ATPL) and the associated ratings and certificates.

AMC1 ORA.ATO.105 Application

APPLICATION FORM

APPLICATION FORM FOR AN ATO CERTIFICATE		
N°	Question	Supplementary information
1.	Name of training organisation under which the activity is to take place	address, fax number, e-mail, URL
2.	Training courses offered	theory and/or flight training
3.	Name of head of training	type and number of licence full/part-time
4.	Name of chief flight instructor	as (3)
5.	Name of chief theoretical knowledge instructor	as (3)
6.	Name of flight instructor(s), where applicable	as (3)
7.	Aerodrome(s) / operating site(s) to be used	IFR approaches, if applicable night flying, if applicable air traffic control flight testing facilities, if applicable data reply facilities, if applicable
8.	Flight operations accommodation	location, number and size of rooms
9.	Theoretical instruction facilities	location, number and size of rooms
10.	Description of training devices (as applicable)	FFS, FNPT I, II and III, FTD 1, 2 and 3, and 3, and BITD

11.	Description of aircraft	Class/type(s) of aircraft registration of aircraft IFR equipped, if applicable Flight test instrumentation, if applicable
12.	Proposed administration and manuals: (submit with application if required)	(a) course programmes (b) training records (c) operations manual (d) training manual
13.	Details of proposed compliance monitoring system	

Note 1: If answers to any of the above questions are incomplete, the applicant should provide full details of alternative arrangements separately.
Note 2: instrument flight rules (IFR), full flight simulator (FFS), flight and navigation procedures trainer (FNPT), flight training device (FTD), basic instrument training device (BITD)

I, (name), on behalf of (name of training organisation) certify that all the above named persons are in compliance with the applicable requirements and that all the above information given is complete and correct. (Date) (Signature)

AMC1 ORA.ATO.110(b) Personnel requirements

HEAD OF TRAINING

The nominated head of training (HT) should have the overall responsibility to ensure that the training is in compliance with the appropriate requirements. In an ATO providing training courses for different aircraft categories, the HT shall be assisted by one or more nominated deputy HT(s) for certain flight training courses.

AMC1 ORA.ATO.110(c) Personnel requirements

THEORETICAL KNOWLEDGE INSTRUCTORS

Theoretical knowledge instructors should, before appointment, prove their competency by giving a test lecture based on material they have developed for the subjects they are to teach.

AMC1 ORA.ATO.120(a);(b) Record-keeping

ATOs PROVIDING TRAINING ONLY FOR THE LAPL, PPL, SPL OR BPL AND THE ASSOCIATED RATINGS AND CERTIFICATES

The details of ground, flight and flight instruction by using FSTD given to a specific individual student and the detailed progress reports from instructors may be kept also in a student’s progress card. This progress card should contain all the exercises of the training syllabus. The instructor should sign this card if a certain exercise has been completed or a specific assessment has been conducted.

AMC1 ORA.ATO.125 Training programme

GENERAL

Flight training in an FSTD and theoretical knowledge instruction should be phased in such a manner as to ensure that students are able to apply to flight exercises the knowledge gained on the ground. Arrangements should be made so that problems encountered during instruction can be resolved during subsequent training.

AMC2 ORA.ATO.125 Training programme

TYPE RATING COURSES – AEROPLANES

(a) Introduction

(1) When developing the training programme for a type rating course, in addition to complying with the standards included in the operational suitability data (OSD), as established in accordance with Regulation (EC) 1702/2003[1] for the applicable type, the ATO should also follow any further recommendations contained therein.

(2) The type rating course should, as far as possible, provide for a continual process of ground, FSTD and flight training to enable the student to assimilate the knowledge and skills required to operate a specific aircraft type safely and efficiently. The student's ability to do this should be determined by the demonstration of a satisfactory level of theoretical knowledge of the aircraft determined by progressive checking of knowledge and examination, progressive assessment by the ATO during flight training and the successful completion of a practical skill test with an examiner.

(3) The type rating course should normally be conducted as a single, fulltime course of study and training. However, in the situation where the course is intended to enable a pilot to fly a further aircraft type while continuing to fly a current type, such as to enable mixed fleet flying with the same operator, some elements of the theoretical knowledge course conducted by self-study may be undertaken while the student continues to fly the current type.

(b) Variants

(1) Familiarisation training: Where an aeroplane type rating also includes variants of the same aircraft type requiring familiarisation training, the additional familiarisation training may be included in the theoretical knowledge training of the initial type rating course. Flight training should be conducted on a single variant within the type.

(2) Differences training: Where an aeroplane type rating also includes variants of the same aircraft type for which difference training is required, the initial training course should be directed towards a single variant. Additional training

to operate other variants within the same type rating should be completed after successful completion of the initial type rating course. However, elements of this differences training may be undertaken at appropriate stages of the initial course, with the agreement of the competent authority.

(c) Programme of theoretical knowledge and flight training

(1) The training programme should specify the time allocated to theoretical knowledge training, FSTD training and, if not approved for zero flighttime training (ZFTT), the aeroplane. The initial type rating course should be programmed on the basis that the student has the minimum licensing and experience requirements for entry to the course. For a first type rating on a multi-pilot aeroplane (MPA), the course should also provide for consolidation and type-specific training in those elements of basic multi-crew cooperation (MCC) training relevant to the type or variant.

(2) If the ATO wishes to provide a training course that includes credit for previous experience on similar types of aircraft, such as those with common systems or operating procedures with the new type, the entry requirements to such courses should be specified by the ATO and should define the minimum level of experience and qualification required of the flight crew member.

(3) The ATO is permitted to contract elements of training to a third party training provider. In such cases the contracted organisation should normally be approved to conduct such training. When the contracted organisation is not an ATO, the competent authority should, within the approval process of the ATO, include the contracted organisation and be satisfied that the standard of training intended to be given meets the requirements. The other obligations of the ATO, such as student progress monitoring and an adequate management system, can be exercised by the ATO seeking approval and which retains responsibility for the whole course.

GROUND TRAINING

(d) Syllabus

The ground training syllabus should provide for the student to gain a thorough understanding of the operation, function and, if appropriate, abnormal and emergency operation of all aircraft systems. This training should also include those systems essential to the operation of the aircraft, such as 'fly-by-wire' flight control systems, even if the flight crew have little or no control of their normal or abnormal operation.

(e) Theoretical knowledge instruction

The theoretical knowledge instruction training should meet the general objectives of (but not be limited to) giving the student:

(1) a thorough knowledge of the aircraft structure, powerplant and systems, and their associated limitations, including mass and balance, aircraft performance and flight planning considerations;

(2) a knowledge of the positioning and operation of the cockpit controls and indicators for the aircraft and its systems;

(3) an understanding of system malfunctions, their effect on aircraft operations and interaction with other systems; and

(4) the understanding of normal, abnormal and emergency procedures.

(f) Facilities and training aids

The ATO should provide adequate facilities for classroom instruction and have available appropriately qualified and experienced instructors. Training aids should enable students to gain practical experience of the operation of systems covered by the theoretical knowledge syllabus and, in the case of multi-pilot aeroplanes, enable such practical application of the knowledge to be carried out in a multi-crew environment. Facilities should be made available for student self-study outside the formal training programme.

(g) Computer-based training (CBT)

CBT provides a valuable source of theoretical instruction, enabling the students to progress at their own pace within specified time limits. Many such systems ensure that syllabus subjects are fully covered and progress can be denied until a satisfactory assimilation of knowledge has been demonstrated. Such systems may allow self-study or distance learning, if they incorporate adequate knowledge testing procedures. When CBT is used as part of the theoretical knowledge instruction phase, the student should also have access to a suitably qualified instructor able to assist with areas of difficulty for the student.

(h) Self-study and distance learning

Elements of the theoretical knowledge syllabus may be adequately addressed by distance learning, if approved, or self-study, particularly when utilising CBT. Progress testing, either by self-assessed or instructor-evaluated means should be included in any self-study programme. If self-study or distance learning is included in the theoretical knowledge training, the course should also provide for an adequate period of supervised consolidation and knowledge testing.

(i) Progress tests and final theoretical knowledge examination

(1) The theoretical knowledge training programme should provide for progressive testing of the assimilation of the required knowledge. This testing process should also provide for retesting of syllabus items so that a thorough understanding of the required knowledge is assured. This should be achieved by intervention by a qualified instructor or, if using CBT with a self-testing facility, and by further testing during the supervised consolidation phase of the ground course.

(2) The final theoretical knowledge examination should cover all areas of the theoretical knowledge syllabus. The final examination should be conducted as a supervised written (including computer-based) knowledge test without reference to course material. The pass mark of 75% assumes the achievement of satisfactory levels of knowledge during the progressive phase tests of the

course. The student should be advised of any areas of lack of knowledge displayed during the examination and, if necessary, given remedial instruction. A successful pass of the theoretical knowledge course and final examination should be a pre-requisite for progression to the flight training phase of the type rating course, unless otherwise determined in the OSD established in accordance with Regulation (EC) 1702/2003.

FLIGHT TRAINING

(j) Flight simulation training devices (FSTDs)

A type rating course for a multi-pilot aeroplane should include FSTD training.

The amount of training required when using FSTDs will depend on the complexity of the aeroplane concerned, and to some extent on the previous experience of the pilot. Except for those courses giving credit for previous experience (c.2.), a minimum of 32 hours of FSTD training should be programmed for a crew of a multipilot aeroplane, of which at least 16 hours should be in an FFS operating as a crew. FFS time may be reduced if other qualified FSTDs used during the flight training programme accurately replicate the cockpit environment, operation and aeroplane response. Such FSTDs may typically include flight management computer (FMC) training devices using hardware and computer programmes identical to those of the aeroplane.

(k) Aeroplane training with FFS

(1) with the exception of courses approved for ZFTT, certain training exercises normally involving take-off and landing in various configurations should be completed in the aeroplane rather than in an FFS. Unless otherwise specified in the OSD established this take-off and landing training should include:

(A) at least four landings in the case of MPAs (or single-pilot high performance complex aeroplanes (SP HPAs)) where the student pilot has more than 500 hours of MPA experience (or SPA experience) in aeroplanes of similar size and performance or, in all other cases, at least six landings;

(B) at least one full-stop landing; and

(C) one go-around with all engines operating.

This aeroplane training may be completed after the student pilot has completed the FSTD training and has successfully undertaken the type rating skill test, provided it does not exceed 2 hours of the flight training course.

(2) courses approved for ZFTT

(i) During the specific simulator session before line flying under supervision (LIFUS), consideration should be given to varying conditions, for example:

(A) runway surface conditions;

(B) runway length;

(C) flap setting;

(D) power setting;

(E) crosswind and turbulence conditions; and

(F) maximum take-off mass (MTOM) and maximum landing mass (MLM).

(ii) At least one landing should be conducted as full-stop landing. The session should be flown in normal operation. Special attention should be given to the taxiing technique.

(iii) A training methodology should be agreed with the competent authority that ensures the trainee is fully competent with the exterior inspection of the aeroplane before conducting such an inspection un-supervised.

(iv) The LIFUS should be performed as soon as possible after the specific FFS session.

(v) The licence endorsement should be entered on the licence after the skill test, but before the first four take-offs and landings in the aeroplane. At the discretion of the competent authority, provisional or temporary endorsement and any restriction should be entered on the licence.

(vi) Where a specific arrangement exists between the ATO and the commercial air transport operator, the operator proficiency check (OPC) and the ZFTT specific details should be conducted using the operator's standard operating procedures (SOPs).

(3) All training exercises should be designed to remain within the training envelope as determined by the ATO (Note: Further guidance regarding the training envelope can be found in GM1 ORA.ATO.125 point (f)).

(l) Aeroplane without FFS

(1) Flight training conducted solely in an aeroplane without the use of FSTDs cannot cover the crew resource management (CRM) and multicrew cockpit (MCC) aspects of MPA flight training, and for safety reasons cannot cover all emergency and abnormal aircraft operation required for the training and skill test. In such cases, the ATO should demonstrate to the competent authority that adequate training in these aspects can be achieved by other means. For training conducted solely on an MPA where two pilots are trained together without the use of an FSTD, a minimum of 8 hours of flight training as pilot flying (PF) for each pilot should normally be required. For training on a single-pilot aeroplane, 10 hours of flight training should normally be required. It is accepted that for some relatively simple single or multi-engine aircraft without systems such as pressurisation, flight management system (FMS) or electronic cockpit displays, this minimum may be reduced.

(2) Aeroplane training normally involves an inherent delay in achieving an acceptable flight situation and configuration for training to be carried out in accordance with the agreed syllabus. These could include ATC or other traffic

delay on the ground prior to take-off, the necessity to climb to height or transit to suitable training areas and the unavoidable need to physically reposition the aircraft for subsequent or repeat manoeuvres or instrument approaches. In such cases it should be ensured that the training syllabus provides adequate flexibility to enable the minimum amount of required flight training to be carried out.

(la) Additional UPRT training as per point FCL.725.A(c) UPRT as per point FCL.725.A(c) should include the elements and components in table 1.

Table 1: Elements and respective components of upset prevention training

Elements and components		TK instruction	FSTD/ Aeroplane training
A.	**Aerodynamics**		
1.	General aerodynamic characteristics	•	
2.	Aeroplane certification and limitations	•	
3.	Aerodynamics (high and low altitudes)	•	•
4.	Aeroplane performance (high and low altitudes)	•	•
5.	AoA and stall awareness	•	•
6.	Stick shaker or other stall-warning device activation (as applicable)	•	•
7.	Stick pusher (as applicable)	•	•
8.	Mach effects (if applicable to the aeroplane type)	•	•
9.	Aeroplane stability	•	•
10.	Control surface fundamentals	•	•
11.	Use of trims	•	•
12.	Icing and contamination effects	•	•
13.	Propeller slipstream (as applicable)	•	•
B.	**Causes of and contributing factors to upsets**		
1.	Environmental	•	
2.	Pilot-induced	•	
3.	Mechanical (aeroplane systems)	•	
C.	**Safety review of accidents and incidents relating to aeroplane upsets**		
1.	Safety review of accidents and incidents relating to aeroplane upsets	•	
D.	**G-load awareness and management**		
1.	Positive/negative/increasing/decreasing G-loads	•	•
2.	Lateral G awareness (sideslip)	•	•
3.	G-load management	•	•
E.	**Energy management**		
1.	Kinetic energy vs potential energy vs effect of thrust-drag ratio on the total energy	•	•
F.	**Flight path management**		
1.	Relationship between pitch, power and performance	•	•

Elements and components		TK instruction	FSTD/ Aeroplane training
2.	Performance and effects of differing power plants (if applicable)	•	•
3.	Manual and automation inputs for guidance and control	•	•
4.	Type-specific characteristics	•	•
5.	Management of go-arounds from various stages during the approach	•	•
6.	Automation management	•	•
7.	Proper use of rudder	•	•
G.	**Recognition**		
1.	Type-specific examples of physiological, visual and instrument clues during developing and developed upsets	•	•
2.	Pitch/power/roll/yaw	•	•
3.	Effective scanning (effective monitoring)	•	•
4.	Type-specific stall protection systems and cues	•	•
5.	Criteria for identifying stalls and upsets	•	•
H.	**System malfunction** (including immediate handling and subsequent operational considerations, as applicable)		
1.	Flight control defects	•	•
2.	Engine failure (partial or full)	•	•
3.	Instrument failures	•	•
4.	Loss of reliable airspeed (see also point (lb) of this AMC)	•	•
5.	Automation failures	•	•
6.	Fly-by-wire (FBW) protection degradations	•	•
7.	Stall protection system failures including icing alerting systems	•	•

(lb) Flight path management (manual or automatic, as appropriate) during unreliable airspeed indication and other failures at high altitude in aeroplanes with a maximum cruising altitude above FL300

The following training elements should be integrated into type rating training courses for aeroplanes with a maximum cruising altitude above FL300:

Element	TK instruction	FSTD / Aeroplane training
Basic flight physics principles concerning flight at high altitude, with a particular emphasis on the relative proximity of the critical Mach number and the stall, pitch behaviour, and an understanding of the reduced stall angle of attack when compared with low altitude flight.	•	•

Element	TK instruction	FSTD / Aeroplane training
Interaction of the automation (autopilot, flight director, auto-throttle/auto-thrust) and the consequences of failures inducing disconnection of the automation.	•	•
Consequences of an unreliable airspeed and other failures indication at high altitude and the need for the flight crew to promptly identify the failure and react with appropriate (minimal) control inputs to keep the aircraft in a safe envelope.	•	•
Degradation of FBW flight control laws/modes and its consequence on aircraft stability and flight envelope protections, including stall warnings.	•	•
Practical training, using appropriate simulators, on manual handling at high altitude in normal and in non-normal flight control laws/modes, with particular emphasis on pre-stall buffet, the reduced stall angle of attack when compared with low altitude flight, and the effect of pitch inputs on the aircraft trajectory and energy state.		•
The requirement to promptly and accurately apply the stall recovery procedure, as provided by the aircraft manufacturer, at the first indication of an impending stall. Differences between high-altitude and low-altitude stalls must be addressed.	•	•
Procedures for taking over and transferring manual control of the aircraft, especially for FBW aeroplanes with independent side-sticks.	•	•
Task sharing and crew coordination in high workload/stress conditions with appropriate call-out and acknowledgement to confirm changes to the aircraft flight control law/mode.	•	•

SKILL TEST

(m) Upon completion of the flight training, the pilot will be required to undergo a skill test with an examiner to demonstrate adequate competency of aircraft operation for issue of the type rating. The skill test should be separate from the flight training syllabus, and provision for it cannot be included in the minimum requirements or training hours of the agreed flight training programme. The skill test may be conducted in an FFS, the aeroplane or, in exceptional circumstances, a combination of both.

COURSE COMPLETION CERTIFICATE

(n) The HT, or a nominated representative, should certify that all training has been carried out before an applicant undertakes a skill test for the type rating to be included in the pilot’s licence. If an ATO is unable to provide certain elements of the training that is required to be carried out on an aircraft the ATO may issue such a certificate confirming the completion of the ground training or the training in an FSTD.

AMC3 ORA.ATO.125 Training programme

TYPE RATING COURSES – HELICOPTERS

(a) Introduction

(1) when developing the training programme for a type rating course, in addition to complying with the standards included in the OSD as established in accordance with Regulation (EC) 1702/2003 for the applicable type, the ATO should also follow any further recommendations contained therein.

(2) the course should, as far as possible, provide for integrated ground, FSTD and flight training designated to enable the student to operate safely and qualify for the grant of a type rating. The course should be directed towards a helicopter type, but where variants exist, all flying and ground training forming the basis of the course should relate to a single variant.

(b) Variants

(1) Familiarisation training: where a helicopter type rating also includes variants of the same aircraft type requiring familiarisation training, the additional familiarisation training may be included in the theoretical knowledge training of the initial type rating course.

(2) Differences training: where a helicopter type rating also includes variants of the same aircraft type for which difference training is required, the initial training course should be directed towards a single variant. Additional training to operate other variants within the same type rating should be completed after successful completion of the initial type rating course, although elements of this differences training may be undertaken at appropriate stages of the initial course, with the agreement of the competent authority.

(c) Training in helicopter and FSTDs

The training programme should specify the amounts of flight training in the helicopter type and in FSTDs (FFSs, flight training devices (FTDs), or other training devices (OTDs)). Where a suitable FFS is geographically remote from the normal training base, the competent authority may agree to some additional training being included in the programme at a remote facility.

(d) Skill test

The content of the flight training programme should be directed towards the skill test for that type. The practical training given in Part-FCL should be modified as necessary.

The skill test may be completed in a helicopter, in an FFS or partially in a helicopter and in an FSTD. The use of an FSTD for skill tests is governed by the level of approval of the flight simulator and the previous experience of the candidate. Where an FSTD is not available, abnormal operations of systems should not be practised in a helicopter other than as allowed for in the skill test form for the type.

(e) Phase progress tests and final theoretical knowledge examination

Prior to the final theoretical knowledge examination covering the whole syllabus, the training programme should provide for phase progress tests associated with each phase of theoretical knowledge instruction. The phase progress tests should assess the candidate’s knowledge on completion of each phase of the training programme.

(f) Facilities: ground school equipment, training facilities and aids

The ATO should provide, as a minimum, facilities for classroom instruction. Additional classroom training aids and equipment including, where appropriate, computers, should reflect the content of the course and the complexity of the helicopter. For multi-engine and multi-pilot helicopters, the minimum level of ground training aids should include equipment that provides a realistic cockpit working environment. Task analysis and the latest state-of–the-art training technology is encouraged and should be fully incorporated into the training facilities wherever possible. Facilities for self and supervised testing should be available to the student.

(g) Training devices

An FTD or OTD may be provided to supplement classroom training in order to enable students to practice and consolidate theoretical instruction. Where suitable equipment is not available, or is not appropriate, a helicopter or flight simulator of the relevant variant should be available. If an FTD represents a different variant of the same helicopter type for which the student is being trained, then differences or familiarisation training is required.

(h) Computer-based training (CBT)

Where CBT aids are used as a training tool, the ATO should ensure that a fully qualified ground instructor is available at all times when such equipment is being used by course students. Other than for revision periods, CBT lessons should be briefed and debriefed by a qualified ground instructor.

(i) Theoretical knowledge instruction

The theoretical knowledge instruction training should meet the general objectives of giving the student:

(1) a thorough knowledge of the helicopter structure, transmissions, rotors and equipment, powerplant and systems, and their associated limitations;

(2) a knowledge of the positioning and operation of the cockpit controls and indicators for the helicopter and its systems;

(3) a knowledge of performance, flight planning and monitoring, mass and balance, servicing and optional equipment items;

(4) an understanding of system malfunctions, their effect on helicopter operations and interaction with other systems; and

(5) the understanding of normal, abnormal and emergency procedures and giving the student the understanding of potential control problems near the edge of the handling envelope. In particular, the phenomenon of ‘servo

transparency' (also known as 'jack stall') should be covered for those helicopter types where it is a known problem.

The amount of time and the contents of the theoretical instruction will depend on the complexity of the helicopter type involved and, to some extent, on the previous experience of the student.

(j) Flight training

(1) FSTDs

The level of qualification and the complexity of the type will determine the amount of practical training that may be accomplished in an FSTD, including completion of the skill test. Prior to undertaking the skill test, a student should demonstrate competency in the skill test items during the practical training.

(2) Helicopter (with FSTD)

With the exception of courses approved for ZFTT, the amount of flight time in a helicopter should be adequate for completion of the skill test.

(3) Helicopters (without FSTD)

Whenever a helicopter is used for training, the amount of flight time practical training should be adequate for the completion of the skill test. The amount of flight training will depend on the complexity of the helicopter type involved and, to some extent, on the previous experience of the applicant.

AMC4 ORA.ATO.125 Training programme

FLIGHT TEST TRAINING COURSES – AEROPLANES AND HELICOPTERS

(a) Introduction

(1) The flight test training course should, as far as possible, provide for a continuous process of ground and flight training to enable the student to assimilate the knowledge and skills required to conduct flight testing safely and efficiently. The student's ability to do this should be determined by the demonstration of a satisfactory level of theoretical knowledge of flight testing determined by progressive checking of knowledge and examination and progressive assessment by the ATO during flying training. There should be no difference in the level of knowledge or competency required of the student, irrespective of the intended role of the student as test pilot or other flight test personnel (for example, flight test engineer) within the flight crew.

(2) The flight test training course should normally be conducted as a single, full-time course of study and training.

(b) Programme of theoretical knowledge and flight training

(1) The training programme should specify the time allocated to theoretical knowledge training and flying training.

(2) If the ATO wishes to provide a flight test training course that includes credit for previous experience on flight testing activity, the entry requirements to such courses should be specified by the ATO and should define the minimum level of experience and qualification required of the flight test crew member.

GROUND TRAINING

(c) Syllabus

(1) The ground training syllabus should provide for the student to gain a thorough understanding of flight testing techniques.

(d) Theoretical knowledge instruction

(1) The theoretical knowledge instruction training should give the student a thorough knowledge of the academic requirements of flight testing.

(e) Facilities and training aids

(1) The ATO should provide adequate facilities for classroom instruction and have available appropriately qualified and experienced instructors. Training aids should enable students to gain practical experience of flight testing covered by the theoretical knowledge syllabus and enable such practical application of the knowledge to be carried out in a multicrew environment. Facilities should be made available for student selfstudy outside the formal training programme.

(f) Computer-based training (CBT)

(1) CBT provides a valuable source of theoretical instruction, enabling the student to progress at his/her own pace within specified time limits. Many such systems ensure that syllabus subjects are fully covered and progress can be denied until a satisfactory assimilation of knowledge has been demonstrated. Such systems may allow self-study or distance learning, if they incorporate adequate knowledge testing procedures. When CBT is used as part of the theoretical knowledge instruction phase, the student should also have access to a suitably qualified instructor able to assist with areas of difficulty for the student.

(g) Self-study and distance learning

(1) Elements of the theoretical knowledge syllabus may be adequately addressed by distance learning, if approved, or self-study, particularly when utilising CBT. Progress testing, either by self-assessed or instructor-evaluated means, should be included in any self-study programme. If self-study or distance learning is included in the theoretical knowledge training, the course should also provide for an adequate period of supervised consolidation and knowledge testing prior to the commencement of flight training.

(h) Progress tests and final theoretical knowledge examination

(1) The theoretical knowledge training programme should provide for progressive testing of the assimilation of the required knowledge. This testing process should also provide for retesting of syllabus items so that a thorough

understanding of the required knowledge is assured. This should be achieved by intervention by a qualified instructor or, if using CBT with a self-testing facility, and by further testing during the supervised consolidation phase of the ground course.

(2) The theoretical knowledge examinations should cover all areas of the theoretical knowledge syllabus. The examinations should be conducted as supervised written or oral knowledge tests without reference to course material. The pass mark (as defined by the ATO) assumes the achievement of satisfactory levels of knowledge during the progressive phase tests of the course. The student should be advised of any areas of lack of knowledge displayed during the examination and, if necessary, given remedial instruction.

FLIGHT TRAINING

(i) Aeroplane and helicopter training

(1) It is widely accepted that flying training normally involves inherent delay in achieving an acceptable flight situation and configuration for training to be carried out in accordance with the agreed syllabus. These could include ATC or other traffic delay on the ground prior to take off, the necessity to climb to height or transit to suitable training areas and the unavoidable need to physically reposition the aircraft for subsequent or repeat manoeuvres or instrument approaches. In such cases it should be ensured that the training syllabus provides adequate flexibility to enable the minimum amount of required flight training to be carried out.

FINAL IN-FLIGHT EXERCISE

(j) Upon completion of the flight test training, the test pilot or flight test engineer will be required to undergo in-flight exercise with a flight test instructor (FTI) to demonstrate adequate competency of flight testing for issue of the flight test rating. The final in-flight exercise must be conducted in an appropriate aeroplane or helicopter (as applicable).

COURSE COMPLETION CERTIFICATE

(k) The HT is required to certify that the applicant has successfully completed the training course.

GM1 ORA.ATO.125 Training programme

UPSET PREVENTION AND RECOVERY TRAINING (UPRT)

(a) General

The objective of the UPRT is to ensure that pilots are competent to prevent or recover from a developing or developed aeroplane upset. Prevention training prepares pilots to avoid upsets whereas recovery training prepares pilots to prevent an accident once an upset condition has developed.

(b) Human factors

Threat and Error Management (TEM) and Crew Resource Management (CRM) principles should be integrated into the UPRT. In particular, the surprise and startle effect as well as the importance of resilience development should be emphasised.

Training should also emphasise that an actual upset condition may expose pilots to significant physiological and psychological challenges, such as visual illusions, spatial disorientation and unusual G-forces, with the objective of developing strategies to deal with such challenges.

(c) Development of training scenarios

During the development of training scenarios, the ATO should ensure that all of the following is avoided:

(a) negative training and negative transfer of training; and

(b) training utilising predictive scenarios.

Please refer to Revision 2 of the Airplane Upset Recovery Training Aid (AURTA) for further guidance on the development of training scenarios.

(d) Additional guidance

Specific guidance to the UPRT elements and exercises is available in:

(1) the latest revision of the ICAO Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training';

(2) Revision 3 of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA); and

(3) the Flight Safety Foundation publication 'A Practical Guide for Improving Flight Path Monitoring', November 2014.

(e) Training platform

(1) When designing a training course, ATOs should select aeroplanes that are suitable for all the required training exercises. Where certain exercises require particular capabilities, then an ATO may consider the use of different aeroplanes for different exercises. Examples include basic UPRT or instrument flight training and the advanced UPRT course.

(2) For basic UPRT training conducted during the CPL or ATP courses, it is not anticipated that aerobatic category aeroplanes will be required or that aircraft need to be certificated for intentional spins. Aeroplanes with a maximum bank angle limitation may not be suitable for exercises such as steep turns or recovery from spiral dive.

(3) For the advanced UPRT course (FCL.745), the use of an aeroplane certificated in the aerobatic category will provide the greatest safety margin. Aeroplanes certificated in the normal or utility category may also be suitable provided the exercises used during the training take into account the capabilities of the aeroplane and are planned to remain within the training envelope for the aeroplane, as determined by the ATO (see point (f)).

(f) Training envelope

The training envelope is the envelope within which all training exercises will be carried out. It should be specified by the ATO in terms of the range of attitudes, speed and g-loads that can be used for training, taking into account:

(1) the training environment;

(2) the capabilities of the instructors; and

(3) in the case of training in FSTDs, the limitations of the FSTD (as per GM3 FCL.010 for the FSTD training envelope); and

(4) in the case of training in aeroplanes, the capabilities and certification of the aircraft, while considering a margin of safety in order to ensure that unintentional deviations from the training envelope will not exceed aircraft limitations. Different training envelopes may be specified for different aeroplane types even within a single training course.

of ATOs providing flight test training, the operations manual shall comply with the requirements for the flight test operations manual, as established in Part-21.

(d) The operations manual shall establish flight time limitation schemes for flight instructors, including the maximum flying hours, maximum flying duty hours and minimum rest time between instructional duties in accordance with Part-ORO..

AMC1 ORA.ATO.135 Training aircraft and FSTDs

ALL ATOs, EXCEPT THOSE PROVIDING FLIGHT TEST TRAINING

(a) The number of training aircraft may be affected by the availability of FSTDs.

(b) Each training aircraft should be:

(1) equipped as required in the training specifications concerning the course in which it is used;

(2) except in the case of balloons or single-seat aircraft, fitted with primary flight controls that are instantly accessible by both the student and the instructor (for example dual flight controls or a centre control stick). Swing-over flight controls should not be used.

(c) The fleet should include, as appropriate to the courses of training:

(1) aircraft suitably equipped to simulate instrument meteorological conditions (IMC) and for the instrument flight training required. For flight training and testing for the instrument rating and the en-route instrument rating (EIR), an adequate number of IFR-certificated aircraft should be available;

(2) in the case of aeroplanes and sailplanes, aircraft suitable for demonstrating stalling and spin avoidance;

(3) for the flight instructor (FI) training courses on aeroplanes and sailplanes, aircraft suitable for spin recovery at the developed stage;

(4) in the case of helicopters, helicopters suitable for autorotation demonstration;

(5) in the case of a non-complex ATO, one aircraft fulfilling all the required characteristics for a training aircraft might be sufficient;

(6) each FSTD should be equipped as required in the training specifications concerning the course in which it is used.

AMC2 ORA.ATO.135 Training aircraft and FSTDs

EVALUATION PROCESS

Two cases for the evaluation process of Annex-I aircraft are distinguished:

(a) Annex-I aircraft that hold an ICAO-level certificate of airworthiness (CoA)

(1) To support the evaluation process performed by the competent authority and provide the competent authority with sufficient data related to the aircraft in question, an instructor who is qualified in accordance with Annex I (Part-FCL) and nominated by the head of training (HT) of the ATO should assess that the aircraft is appropriately equipped and suitable for the training courses provided. The result of this assessment should be submitted to the competent authority and may be included already in the application for the authorisation.

(2) During the evaluation process, the competent authority should consider aircraft that hold a CoA issued in accordance with Annex 8 to the Chicago Convention to provide a level of safety comparable to that required by Annex II to the Basic Regulation, unless the competent authority determines that the airworthiness requirements used for certification of the aircraft, or the service experience, or the safety system of the State of design, do not provide for a comparable level of safety.

(b) Annex-I aircraft that do not hold an ICAO-level CoA

Before the inclusion of these aircraft in the fleet of an ATO and their use in training to obtain Part-FCL licences and ratings, the ATO should apply for the authorisation to the competent authority that should perform the evaluation process in the following order:

(1) Initial assessment by the competent authority and criteria taken into consideration

The competent authority should take into account the following criteria (non-exhaustive list):

(i) national airworthiness requirements based on which the aircraft CoA was issued;

(ii) aircraft similarities to a certified variant;

(iii) aircraft with a satisfactory in-service experience as training aircraft;

(iv) simple and conventional aircraft design;

(v) aircraft that does not have hazardous design features or details, judging by experience; and

(vi) operable aircraft systems, equipment, and appliances that do not require exceptional skills or strength.

(2) Additional assessment by a qualified instructor

To support the evaluation process performed by the competent authority and provide the competent authority with sufficient data related to the aircraft in question, after the positive initial assessment by the competent authority as per point (1), an instructor who is qualified in accordance with Part-FCL and nominated by the HT of the ATO should show through an evaluation report that the aircraft is appropriately equipped and suitable for the training courses provided. That evaluation report should consider all of the following criteria:

(i) the aircraft should be safely controllable and manoeuvrable under all anticipated operating conditions, including after failure of one or more propulsion systems;

(ii) the aircraft should allow for a smooth transition from one flight phase to another without requiring exceptional piloting skills, alertness, strength, or workload under any probable operating conditions;

(iii) the aircraft should have sufficient stability to ensure that the demands made on the pilot are not excessive, considering the phase and duration of flight; and

(iv) the assessment should take into account control forces, flight deck environment, pilot workload, and other human factors (HF) considerations, depending on the phase and duration of flight.

Subject to a positive evaluation report as per point (2), the competent authority should issue the authorisation.

AMC1 ORA.ATO.140 Aerodromes and operating sites

GENERAL

(a) Except in the case of balloons, the base aerodrome or operating site and any alternative base aerodromes at which flight training is being conducted should have at least the following facilities:

(1) at least one runway or final approach and take-off area (FATO) that allows training aircraft to make a normal take-off or landing within the performance limits of all the aircraft used for the training flights.

(2) a wind direction indicator that is visible at ground level from the ends of each runway or at the appropriate holding points;

(3) adequate runway electrical lighting if used for night training;

(4) an air traffic service, except for uncontrolled aerodromes or operating sites where the training requirements may be satisfied safely by another acceptable means of air-to-ground communication.

(b) Except in the case of ATOs providing flight test training, in addition to (a), for helicopters, training sites should be available for:

(1) confined area operation training;

(2) simulated engine off autorotation; and

(3) sloping ground operation.

(c) In the case of balloons, the take-off sites used by the ATO should allow a normal take-off and clearing of all obstacles in the take-off flight path by at least 50 ft.

AMC1 ORA.ATO.145 Pre-requisites for training

ENTRANCE REQUIREMENTS

ATOs providing training for other than the LAPL, PPL, SPL or BPL and the associated ratings and certificates should establish entrance requirements for students in their procedures. The entrance requirements should ensure that the students have enough knowledge, particularly of physics and mathematics, to be able to follow the courses.

SECTION II – ADDITIONAL REQUIREMENTS FOR ATOS PROVIDING TRAINING FOR CPL, MPL AND ATPL AND THE ASSOCIATED RATINGS AND CERTIFICATES

AMC1 ORA.ATO.210 Personnel requirements

GENERAL

(a) The management structure should ensure supervision of all grades of personnel by persons having the experience and qualities necessary to ensure the maintenance of high standards. Details of the management structure, indicating individual responsibilities, should be included in the ATOs operations manual.

(b) The ATO should demonstrate to the competent authority that an adequate number of qualified, competent staff is employed.

(c) In the case of an ATO offering integrated courses, the head of training (HT), the chief flying instructor (CFI) and the chief theoretical-knowledge instructor (CTKI) should be employed full-time or part-time, depending upon the scope of training offered.

(d) In the case of an ATO offering only one of the following:

(1) modular courses,

(2) type rating courses, and

(3) theoretical knowledge instruction,

the positions of HT, CFI and CTKI may be combined and filled by one or two persons with extensive experience in the training conducted by the training organisation, full-time or part-time, depending upon the scope of training offered.

(e) In the case of an ATO that provides flight training only, no CTKI function is required in the ATO. In the case of an ATO that provides theoretical-knowledge instruction only, no CFI function is required in the ATO.

(f) The ratio of all students to all flight instructors, excluding the HT, should not exceed 6:1.

(g) Classes in ground subjects that require maximal supervision or intensive practical work should not include more than 28 students.

THEORETICAL KNOWLEDGE INSTRUCTORS

(h) The theoretical knowledge instruction for type or class ratings should be conducted by instructors holding the appropriate type or class rating, or having appropriate experience in aviation and knowledge of the aircraft concerned.

(i) For this purpose, a flight engineer, a maintenance engineer or a flight operations officer should be considered as having appropriate experience in aviation and knowledge of the aircraft concerned.

AMC2 ORA.ATO.210 Personnel requirements

QUALIFICATION OF HEAD OF TRAINING AND CHIEF FLIGHT INSTRUCTOR

(a) Head of training (HT)

The nominated HT should hold or have held in the 3 years prior to first appointment as HT, a professional pilot licence and associated ratings or certificates issued in accordance with Part-FCL, related to the flight training courses provided.

(b) Chief flight instructor (CFI)

(1) The CFI may delegate standardisation and supervision to the flight instructors. In all cases it is the CFI who is ultimately responsible for ensuring quality and standards.

(2) The CFI should, except in the case of ATOs providing flight test training, have completed 1 000 hours of flight time as pilot-in-command (PIC).

At least 500 of those hours should be on flying instructional duties related to the flying courses provided, of which 200 hours may be instrument ground time.

AMC1 ORA.ATO.230(a) Training manual and operations manual

TRAINING MANUAL

Training manuals for use at an ATO to conduct integrated or modular flight training courses should include the following:

(a) The training plan:

(1) The aim of the course (ATP, CPL/IR, CPL, etc. as applicable)	A statement of what the student is expected to do as a result of the training, the level of performance, and the training constraints to be observed.
(2) Pre-entry requirements	(i) Minimum age, educational requirements (including language), medical requirements; (ii) Any individual Member State requirements.
(3) Credits for previous experience	To be obtained from the competent authority before training begins.
(4) Training syllabi	As applicable, the flying syllabus (single-engine or multiengine, as applicable), the flight simulation training syllabus and the theoretical knowledge training syllabus.
(5) The time scale and scale, in weeks, for each syllabus	Arrangements of the course and the integration of syllabi time.
(6) Training programme	(i) The general arrangements of daily and weekly programmes for flying, theoretical knowledge training and training in FSTDs, if applicable; (ii) Bad weather constraints; (iii) Programme constraints in terms of maximum student training times, (flying, theoretical knowledge, on FSTDs), for example per day, week or month; (iv) Restrictions in respect of duty periods for students; (v) Duration of dual and solo flights at various stages; (vi) Maximum flying hours in any day or night; (vii) Maximum number of training flights in any day or night; (viii)Minimum rest period between duty periods.
(7) Training records	(i) Rules for security of records and documents; (ii) Attendance records; (iii) The form of training records to be kept; (iv) Persons responsible for checking records and students' log books; (v) The nature and frequency of record checks; (vi) Standardisation of entries in training records; (vii) Rules concerning log book entries.
(8) Safety training	(i) Individual responsibilities; (ii) Essential exercises; (iii) Emergency drills (frequency); (iv) Dual checks (frequency at various stages); (v) Requirement before first solo day, night or navigation etc. if applicable.

(9) Assessments, tests and examinations	(i) Flying: (A) progress checks; (B) skill tests. (ii) Theoretical knowledge: (A) progress tests; (B) theoretical knowledge examinations. (C) Area 100 KSA assessments. (iii) Authorisation for test; (iv) Rules concerning refresher training before retest; (v) Test and assessment reports and records; (vi) Procedures for examination paper preparation, type of question and assessment, standard required for 'pass'; (vii) Procedure for question analysis and review and for raising replacement papers; (viii) Examination resit procedures.
(10) Training effectiveness	(i) Individual responsibilities; (ii) General assessment; (iii) Liaison between departments; (iv) Identification of unsatisfactory progress (individual students); (v) Actions to correct unsatisfactory progress; (vi) Procedure for changing instructors; (vii) Maximum number of instructor changes per student; (viii) Internal feedback system for detecting training deficiencies; (ix) Procedure for suspending a student from training; (x) Discipline; (xi) Reporting and documentation.
(11) Standards and level of performance at various stages	(i) Individual responsibilities; (ii) Standardisation; (iii) Standardisation requirements and procedures; (iv) Application of test criteria.

(b) Briefing and air exercises:

(1) Air exercise	A detailed statement of the content specification of all the air exercises to be taught, arranged in the sequence to be flown with main and subtitles.
(2) Air exercise reference list	An abbreviated list of the above exercises giving only main and subtitles for quick reference, and preferably in flip-card form to facilitate daily use by instructors.
(3) Course structure: phase of training	A statement of how the course will be divided into phases, indication of how the above air exercises will be divided between the phases and how they will be arranged to ensure that they are completed in the most suitable learning sequence and that essential (emergency) exercises are repeated at the correct frequency. Also, the syllabus hours for each phase and for groups of exercises within each phase

	should be stated and when progress tests are to be conducted, etc.
(4) Course structure: integration of syllabi	The manner in which theoretical knowledge and flight training in an aircraft or an FSTD will be integrated so that as the flying training exercises are carried out students will be able to apply the knowledge gained from the associated theoretical knowledge instruction and flight training.
(5) Student progress	The requirement for student progress and include a brief but specific statement of what a student is expected to be able to do and the standard of proficiency he/she must achieve before progressing from one phase of air exercise training to the next. Include minimum experience requirements in terms of hours, satisfactory exercise completion, etc. as necessary before significant exercises, for example night flying.
(6) Instructional methods	The ATO requirements, particularly in respect of pre- and postflying briefing, adherence to syllabi and training specifications, authorisation of solo flights, etc.
(7) Progress tests	The instructions given to examining staff in respect of the conduct and documentation of all progress tests.
(8) Glossary of terms	Definition of significant terms as necessary.
(9) Appendices	(i) Progress test report forms; (ii) Skill test report forms; (iii) ATO certificates of experience, competence, etc. as required.

(c) Flight training in an FSTD, if applicable: Structure generally as for (b)

(d) Theoretical knowledge instruction:

(1) Structure of the theoretical knowledge course	A statement of the structure of the course, including the general sequence of the topics to be taught in each subject, the time allocated to each topic, the breakdown per subject and an example of a course schedule. Distance learning courses should include instructions of the material to be studied for individual elements of the course.
(2) Lesson plans	A description of each lesson or group of lessons including teaching materials, training aids, progress test organisation and inter-connection of topics with other subjects.
(3) Teaching materials	Specification of the training aids to be used (for example study materials, course manual references, exercises, self-study materials, demonstration equipment).
(4) Student progress	The requirement for student progress, including a brief but specific statement of the standard that must be achieved and the mechanism for achieving this, before application for theoretical knowledge examinations.
(5) Progress testing	The organisation of progress testing in each subject, including topics covered, evaluation methods and documentation.

(6) Review procedure	The procedure to be followed if the standard required at any stage of the course is not achieved, including an agreed action plan with remedial training if required.
(7) Appendices	(i) Examples of Area 100 KSA summative assessments; (ii) Area 100 KSA mental maths test example.

AMC2 ORA.ATO.230(a) Training manual and operations manual

THEORETICAL KNOWLEDGE COURSE DESIGN REQUIREMENTS

An ATO that delivers theoretical knowledge instruction for professional pilot licences should ensure that:

(a) the courses are designed and developed using the instructional systems design (ISD) methodology, which is supported by a robust and effective management system;

(b) the courses include a standardised and dynamic assessment and testing system;

(c) instructors that deliver KSA instruction have received appropriate training covering at least learning styles, teaching methods, facilitation techniques, threat and error management (TEM), the applicable competencies, and the content of the subject(s) and exercises that they are to deliver;

(d) the recurrent training of instructors is conducted at least annually;

(e) the instructors that are responsible for assessing Area 100 KSA have received appropriate training regarding the assessment(s) that they are to conduct, and are to be standardised to ensure that the assessment grades awarded are consistent across the ATO; this standardisation should include at least familiarisation with the performance indicators, the ATO's word pictures for grading, and the ATO's debriefing system; and

(f) recurrent standardisation training is conducted at least annually to ensure continued inter-rater reliability.

AMC3 ORA.ATO.230(a) Training manual and operations manual

AREA KSA 100 02 AND 100 03 LEARNING OBJECTIVES, ASSESSMENTS AND RECORDS

(a) An ATO that delivers theoretical knowledge instruction for professional pilot licences should ensure that for the learning objectives (LOs) in topics 100 02 and 100 03 of Area 100 KSA there are at least two summative assessments and at least one formative assessment. The summative assessments are to be documented in the student's training records. Both the summative assessments and the formative assessment(s) should be debriefed.

(b) The formative assessment(s) should:

(1) be designed such that the student has the opportunity to ask questions and develop competencies in most of the LOs in 100 02 and 100 03 of Area 100 KSA;

(2) be conducted during the training; the ATO may in addition conduct a formative evaluation (continuous assessment) over a specified phase of the course; and

(3) be conducted by an instructor that is trained to deliver the formative assessment.

(c) The summative assessments should:

(1) be designed so that they collectively give the student the opportunity to demonstrate competency in all LOs in 100 02 and 100 03 of Area 100 KSA; each individual summative assessment may address some of the LOs in 100 02 and 100 03 of Area 100 KSA;

(2) be satisfactorily completed before the student is recommended by the ATO for their first attempt to take the final theoretical knowledge examination paper, and the outcome of the assessments should be included in the student's training record;

(3) require that for a student to be considered that they have achieved a 'Satisfactory' standard, they:

(i) meet at least 35 % (which defines the term 'some' used in the word pictures) of the indicators relevant to the assessment exercise, in each competency;

(ii) have an overall positive effect on the outcome or completion of the exercise without any external input from the instructor, or where the assessment requires the instructor to facilitate the exercise, without the instructor providing any knowledge or corrective input to assist in the completion of the exercise; and

(4) be conducted by an instructor that is trained to deliver the summative assessments.

(d) The training manual should include the following elements regarding the theoretical knowledge training and assessment of the LOs in topics 100 02 and 100 03 of Area 100 KSA:

(1) the positions, or range of positions, of the formative assessment exercise(s) and summative assessment exercises in the training programme;

(2) a description of the summative assessments, including a matrix that shows which Area 100 KSA LOs are covered in each exercise;

(3) the grading system of the Area 100 KSA summative assessment and a description of the ATO's minimum required standard;

(4) the template for the information about Area 100 KSA to be included in the student's training record, which should include at least the dates and result

('Pass' or 'Fail') of the summative assessments and the date and score of the mental maths test;

(5) the method of assessment debrief for each summative and formative assessment;

(6) for a student who performs below the satisfactory standard in a summative assessment(s), the method to further develop the student's competencies and how to conduct the reassessment.

(e) Access to the information on Area 100 KSA kept in the student's training records should be restricted to the student and authorised ATO personnel, and should not be disclosed outside the ATO. The information on the record should first be de-identified before it is used to support course design improvements.

AMC4 ORA.ATO.230(a) Training manual and operations manual

AREA 100 04 LEARNING OBJECTIVES: MENTAL MATHS TEST AND RECORDS

(a) An ATO that delivers theoretical knowledge instruction for professional pilot licences should ensure that at least one KSA mental maths test is conducted and the outcome(s) documented in the student's training records.

(b) The mental maths test(s) may be written or oral in format and should, where possible, be scenario-based, with at least two questions per LO in topic 100 04 of Area 100 KSA.

(c) The minimum score to pass the Area 100 KSA mental maths test(s) should be 75 % of the marks allocated to a test. However, a higher pass mark may be defined by the ATO.

(d) The mental maths test(s) should be satisfactorily completed before the student is recommended by the ATO for their first attempt to take their final theoretical knowledge examination paper.

GM1 ORA.ATO.230(a) Training manual and operations manual

ASSESSMENT OF STUDENTS IN AREA 100 KSA

(a) The Area 100 KSA formative assessment(s) and summative assessments may include but not be limited to: written planning exercises combining multiple subjects; practical exercises using training devices (if available); scenario-based oral board (viva voce); scenario-based communications exercises; written assignments or project work; and preparation and delivery of group or individual presentations.

(b) The format of formative and summative assessment debriefs should be effective, highlighting the student's strengths and weaknesses and enabling future improvement.

GM2 ORA.ATO.230(a) Training manual and operations manual

AREA 100 KSA WORD PICTURES

(a) 'Word pictures' are a proven assessment tool that standardises pilot core competencies, and can be used to assess student's competency in the Area 100 KSA LOs in topics 100 02 and 100 03. Word pictures describe the student's performance. Each word picture is associated with a numerical grade; within the range of grades, the minimum acceptable standard is defined. Additionally, a word picture describing performance that falls below the minimum satisfactory standard should be included in the range, as well as additional word pictures that relate to grades which exceed this minimum satisfactory standard.

Word pictures enable the standardisation of the assessment performance and facilitate inter-rater reliability within an ATO.

(b) This GM provides two examples of word pictures.

(c) The most commonly used word pictures are shown in Section A below. They are based on performance indicators, which explain what the student should demonstrate in order to attain the specific Area 100 KSA LOs that are addressed by the assessment exercise. Word pictures are formed of elements that contain the following:

(1) HOW MANY of the performance indicators were observed and, where relevant, HOW OFTEN;

(2) HOW WELL the competency was demonstrated in the assessment exercise to have an overall positive effect on the outcome or completion of the assessment exercise;

(3) the level of success in the OUTCOME of the assessment exercise.

(d) An ATO could establish its own set of word picture descriptions as long as they are comparable in the grading of each competency, similar to the 'Communication' and 'Application of knowledge, UPRT and resilience' word pictures example in Section B below.

(e) The advantage of word pictures is that they provide meaningful and standard data to enable identification of individual, crew, class, instructor and ATO trends, which can be analysed in order to provide feedback for further improvement or development.

(f) An ATO should ensure that the detailed information obtained through its grading in Area 100 KSA is de-identified before using it to support course improvement.

SECTION A — EXAMPLE 1

AREA 100 KSA WORD PICTURE GRADE LEVELS (USING INDICATORS)

(g) The example shown below in this Section contains the most commonly used word pictures, which are formed of elements that contain the following:

(1) HOW MANY of the performance indicators in the table further below relevant to that summative assessment were observed in that competency (as a percentage);

(2) HOW WELL the competency was demonstrated in the assessment; and

(3) the level of success in the OUTCOME of the summative assessment.

(h) In order to satisfactorily complete an Area KSA 100 summative assessment, the student should reach at least the minimum satisfactory level in each competency covered by that assessment. In case the student fails to reach the minimum satisfactory level in each competency, the student should repeat the summative assessment or another summative assessment that covers the competency(ies) where performance was previously assessed as unsatisfactory.

Table 1: Example generic competency framework that can be applied for assessing the student's level of performance

Competency	Level 1 Unsatisfactory	Level 2 Satisfactory	Level 3 Good	Level 4 Very good	Level 5 Excellent
General description of each competency level. To be applied to each individual competency in LOs 100 02 and 100 03 of Area 100 KSA.	The student's performance in this competency was ineffective or inadequate, which in relation to this competency had a neutral or negative effect on others or on the outcome of the exercise. The student showed none or few of the relevant performance indicators in this competency.	The student's performance in this competency was satisfactory, which had a slightly positive effect on the satisfactory outcome of the exercise, and in group situations had a slightly positive effect on others. The student showed at least some* of the relevant performance indicators in this competency.	The student's performance in this competency was effective, which in the case of an exercise where the student is the only participant, significantly contributed to a good outcome. In group situations, the student's contribution had a good effect on others and significantly contributed to the overall outcome of the exercise. The student showed most of the relevant	The student's performance in this competency was highly effective, which in the case of an exercise where the student is the only participant, significantly enhanced the very good outcome. In group situations, the student's contribution had a very good effect on others and significantly enhanced the overall outcome of the exercise. The student showed most	The student's performance in this competency was exemplary, which in the case of an exercise where the student is the only participant, had an outstanding effect on the excellent outcome of the exercise. In group situations, the student's contribution had an excellent effect on others and had an outstanding effect on the overall outcome of the exercise.

			performance indicators to a good standard.	or all of the relevant performance indicators to a very good standard.	The student showed all of the relevant performance indicators to an excellent standard.
* 'Some' is defined as showing at least 35 % of the performance indicators in that competency, which were relevant to that exercise.					

AREA 100 KSA ASSESSMENT PERFORMANCE INDICATORS

(i) The performance indicators that relate to the LOs in topics 100 02 and 100 03 of Area 100 KSA can be used to form a word picture.

Table 2: Performance indicators relevant to the LOs in topics 100 02 to 100 03 of Area 100 KSA

Competency	Competency description	Indicators
Communication	Demonstrates effective oral, non-verbal and written communication skills in classroom exercise and assessment situations	— Ensures the recipient is ready and prepared to receive the information. — Selects appropriately what, when, how and with whom to communicate. — Conveys messages clearly, accurately and concisely. — Confirms that the recipient correctly understands important information. — Listens actively and demonstrates understanding of the information they receive. — Asks relevant and effective questions. — Adheres to standard radio-telephony phraseology. — Accurately reads, interprets, constructs and responds to given documentation in English. — Correctly interprets non-verbal communication. — Uses eye contact, body language and gestures that are consistent with and support verbal messages.
Leadership and teamwork	Displays effective leadership and teamwork.	— Creates an atmosphere of open communication and encourages team participation. — Uses initiative and gives directions when required. — Admits mistakes and takes responsibility.

		— Anticipates and responds appropriately to others' needs. — Carries out instructions when directed. — Communicates relevant concerns and intentions. — Gives and receives feedback constructively. — Demonstrates empathy and shows respect and tolerance for others. — Engages others in planning and allocates activities fairly and appropriately according to abilities. — Addresses and resolves conflicts and disagreements in a constructive manner. — Projects self-control.
Problem-solving and decision-making	Accurately identifies risks and resolves problems. Uses the appropriate decision-making processes.	— Seeks accurate and adequate information from appropriate sources. — Identifies and verifies what and why things have gone wrong. — Employs proper problem-solving strategies. — Perseveres in working through problems. — Uses appropriate decision-making processes in a timely manner. — Sets priorities appropriately. — Identifies and considers options effectively. — Monitors, reviews, and adapts decisions as required. — Identifies and manages risks effectively.
Situation awareness	Perceives and comprehends all the relevant information available, anticipates what could happen that could affect the exercise or situations discussed in the classroom, and gives effective solutions to resolve the situation.	— Identifies and assesses accurately the general environment as it may affect the operation. — Identifies and manages threats, errors, and undesirable aircraft states.
Workload management	Manages available resources or time to efficiently prioritise and complete or perform tasks in a timely manner.	— Maintains self-control. — Plans, prioritises and schedules tasks effectively. — Manages time efficiently when carrying out tasks. — Offers and accepts assistance, delegates when necessary, and asks for help early.

		— Manages and recovers from interruptions, distractions, variations, and failures effectively.
Application of knowledge, UPRT and resilience	Demonstrates correct and deep understanding of the subject(s), and is able to effectively relate this knowledge between subjects and apply the knowledge for effective threat and error management (TEM).	— Correctly completes pre-flight planning in the practical exercise. — Demonstrates KSA and TEM relating to phases of flight in the ground training environment. — Correctly and effectively applies knowledge to identify and manage threats and errors that could lead to a potential upset in scenario situations. — Recognises potential upset 'threats' and suggests effective 'threat management' in scenario situations. — Recognises potential upset 'errors' and suggests effective 'error management' in scenario situations. — Identifies the causes of and contributing factors to upsets in aircraft accident and incident reviews and in reported recovered situations or scenarios. — Is resilient, i.e. recognises and adapts to disruptions during scenarios and other exercises. — Identifies the signs of stress and discusses the effects of stress, fatigue and aviation lifestyle on situation awareness, including how to cope with these in order to maintain situation awareness.

SECTION B — EXAMPLE 2

AREA 100 KSA WORD PICTURES (USING DESCRIPTIONS)

(j) An ATO may devise its own word pictures for each of the competencies, to be used alongside or combined with those given in EXAMPLE 1.

A descriptive word picture typically includes descriptive examples that the ATO's instructors could readily identify and then equate to given competency levels. Below are two examples (for 'Communication' and 'Application of knowledge, UPRT and resilience').

Table 3: Example word pictures using descriptions

Competency	Level 1 Unsatisfactory	Level 2 Satisfactory	Level 3 Good	Level 4 Very good	Level 5 Excellent

Communication	The student's performance in communication had a neutral or negative effect on the exercise or situation. The student may not have contributed to the exercise or the communication was unclear or insufficient. The student may have occasionally interrupted others, not listened, or showed frustration or inappropriate nonobjective communication. The student may have asked unrelated or unclear questions, or provided insufficient clarity in directions or comments for others to understand. The student may have written without structure or clarity.	The student's written or oral communication was sufficient to convey the intent of the exercise. In oral communication the listener may have rarely needed to ask for clarification which the student then positively and clearly provided. The student listened to instructions but may have occasionally been reticent and hesitant to ask questions or make comments. The student may have rarely shown underconfidence or passiveness during the exercise. However, overall their communication was sufficient to ensure a positive outcome of the exercise.	The student's written or oral communication was good. Explanations, discussions, directions and comments were well-structured and clear. The student listened to others actively and when unsure asked appropriate questions to seek clarification. The student showed appropriate confidence and open body language.	The student's written or oral communication was consistently very good. All communication was clear, concise and well-structured, which ensured a very effective outcome. In group situations, the student's ability to interpret others' body language, and the use of body language to ensure a positive outcome, was very effective. At all times the student was calm, engaged and confident.	The student's communication skills were exemplary. At all times the student observed others and ensured that their own communication was extremely effective. In group situations, the student's communication enabled all members to contribute to their greatest ability whilst also ensuring an excellent outcome of the exercise. In group situations, when appropriate, the student proactively and subtly managed the group's mood or motivated the group members appropriately.
Competency	**Level 1** **Unsatisfactory**	**Level 2** **Satisfactory**	**Level 3** **Good**	**Level 4** **Very good**	**Level 5** **Excellent**
Application of knowledge, UPRT and resilience	The student's knowledge was at times insufficient or incorrect, which	The student had the minimum acceptable level of knowledge to complete the	The student demonstrated a good level of knowledge with the ability	The student demonstrated a very good level of knowledge,	The student had an excellent level of understanding

	had an adverse effect on the exercise. The student displayed limited ability to relate knowledge between subjects or to apply knowledge to scenarios, exercises or in answers to questions.	exercise to a satisfactory standard. The student occasionally demonstrated the ability to relate knowledge between subjects. The student could identify some threats or errors, and when presented with a threat or error could in most situations suggest at least one possible effective method of mitigation.	to relate this knowledge effectively between subjects and in scenario exercises or situations. The student identified many threats and errors, and when presented with threats or errors used their knowledge effectively to suggest appropriate mitigations and actions.	and correctly and readily related this knowledge across subjects and in scenario situations. The student identified most threats and errors, and immediately used their knowledge to manage them effectively.	which they immediately and appropriately applied across subjects and to the exercise or scenario situation. The student identified all actual threats and errors in scenario situations, anticipated some possible threats and errors (what if's), and used their knowledge to manage them efficiently and very effectively.

GM3 ORA.ATO.230(a) Training manual and operations manual

AREA 100 KSA EXERCISES AND ASSESSMENTS

Exercises and assessments are to be interwoven into the theoretical knowledge training, utilising a range of learning styles; they should address subject or cross-subject topics, with the application of threat and error management (TEM) and, where possible, be scenario-based. The exercises and assessments do not need to be confined to a classroom.

(a) Area 100 KSA exercises may be of short duration within a lesson, and the student's performance in the exercises does not need to be recorded, although the main subject and KSA learning points are likely to be discussed (or for distance learning, reviewed) within a post exercise debrief or lesson summary. To allow for flexibility and development, the exercises do not need to be specified in the training plan.

(b) When a single formative assessment is specified in the training plan, it is likely to be extensive as it will cover many of the LOs in Area KSA 100 02 and 100 03. Alternatively, an ATO may specify a number of shorter-duration formative assessments that each covers a narrower range of LOs, and these may build in terms of content difficulty.

(c) The exercises and formative and summative assessments may include but not be limited to: scenario planning exercises combining multiple subjects; practical exercises using training devices (where available); oral communication exercises; written assignments and/or project work; discussions; the preparation and delivery of group or individual presentations and discussions; and enable scenario-based content and individual, pair or group situation(s).

(d) The type of assessment and the environment should be recorded in the ATO's training plan.

GM4 ORA.ATO.230(a) Training manual and operations manual

AREA 100 KSA INSTRUCTION AND ASSESSMENT TRAINING

(a) The following material has been developed to provide additional guidance to organisations to help them develop an effective KSA 100 instruction and assessment training programme that satisfies the provisions in AMC2 ORA.ATO.230 (c) to (f).

(b) An ATO should ensure that an instructor who conducts the Area 100 KSA formative assessment(s) has received adequate training to be familiar with the:

(1) relevant competencies and performance indicators;

(2) Area 100 KSA Learning Objectives (LOs);

(3) formative assessment(s) that they will conduct including: the applicable LOs, purpose and content of the assessment(s) and position(s) in the training plan, assessment resources, assessment environment;

(4) Area 100 KSA grading system, including familiarisation with the performance indicators and the ATO's word pictures; and

(5) student debrief methods and procedure.

(c) An ATO should ensure that an instructor who conducts the Area 100 KSA summative assessments has received adequate training to be familiar with:

(1) the summative assessments that they will conduct including: the applicable LOs, purpose and content of the exercise(s) and position(s) in the training plan, assessment resources, assessment environment, and the minimum acceptable level;

(2) the assessment feedback, evaluation and development process; and

(3) KSA candidate appeal procedure.

(d) An Area 100 KSA instruction and assessment course should include practical training on the conduct of an assessment, including grading to achieve inter-rater reliability, and the debrief under supervision.

GM5 ORA.ATO.230(a) Training manual and operations manual

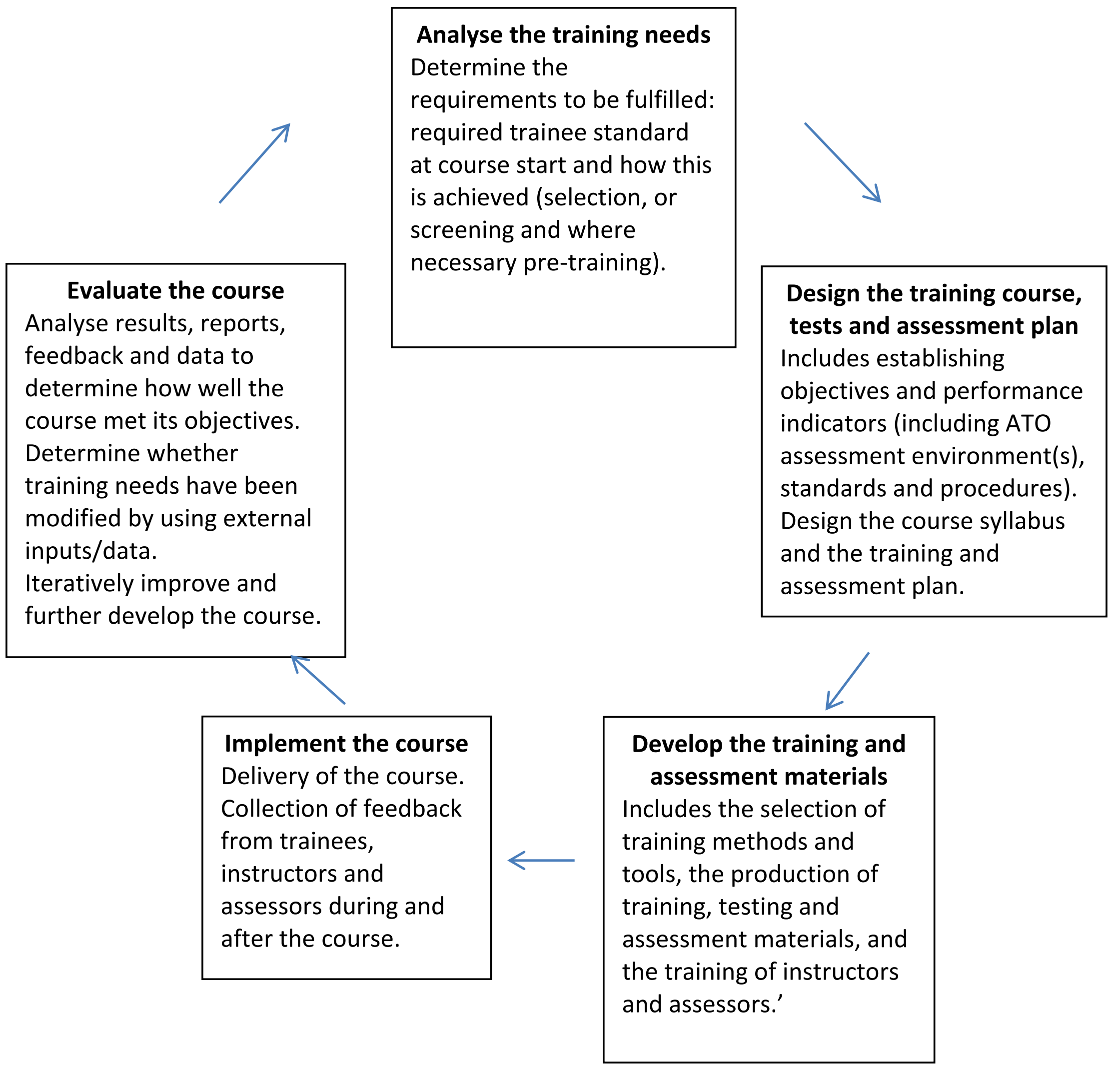
INSTRUCTIONAL SYSTEMS DESIGN

(a) The instructional systems design (ISD) provides a systematic and iterative process for course design based on educational best practices. There are several effective ISD models in use today, with the analyse, design, develop, implement and evaluate (ADDIE) framework being generic to all.

The purpose of using ISD to design training courses is to facilitate the students' efficient and effective acquisition of knowledge and skills based on current training needs.

(b) To provide evidence of the effective use of the ISD methodology in the design and continued development of their course(s), an ATO may use documentation and records that relate to the ISD phases.

(d) ADDIE model example. The 'analysis', 'design', 'development', 'implementation' and 'evaluation' phases of the ADDIE model are shown below with brief phase descriptions.



AMC1 ORA.ATO.230(b) Training manual and operations manual

ALL ATOs, EXCEPT THOSE PROVIDING FLIGHT TEST TRAINING

OPERATIONS MANUAL

The operations manual for use at an ATO conducting integrated or modular flight training courses should include the following:

(a) General:

(1) a list and description of all volumes in the operations manual;

(2) administration (function and management);

(3) responsibilities (all management and administrative staff);

(4) student discipline and disciplinary action;

(5) approval or authorisation of flights;

(6) preparation of flying programme (restriction of numbers of aircraft in poor weather);

(7) command of aircraft;

(8) responsibilities of the PIC;

(9) carriage of passengers;

(10) aircraft documentation;

(11) retention of documents;

(12) flight crew qualification records (licences and ratings);

(13) revalidation (medical certificates and ratings);

(14) flight duty period and flight time limitations (flying instructors);

(15) flight duty period and flight time limitations (students);

(16) rest periods (flight instructors);

(17) rest periods (students);

(18) pilots' log books;

(19) flight planning (general);

(20) safety (general): equipment, radio listening watch, hazards, accidents and incidents (including reports), safety pilots etc..

(b) Technical:

(1) aircraft descriptive notes;

(2) aircraft handling (including checklists, limitations, maintenance and technical logs, in accordance with relevant requirements, etc.);

(3) emergency procedures;

(4) radio and radio navigation aids;

(5) allowable deficiencies (based on the master minimum equipment list (MMEL), if available).

(c) Route:

(1) performance (legislation, take-off, route, landing etc.);

(2) flight planning (fuel, oil, minimum safe altitude, navigation equipment etc.);

(3) loading (load sheets, mass, balance and limitations);

(4) weather minima (flying instructors);

(5) weather minima (students – at various stages of training);

(6) training routes or areas.

(d) Personnel training

(1) appointments of persons responsible for standards/competence of flight personnel;

(2) initial training;

(3) refresher training;

(4) standardisation training;

(5) proficiency checks;

(6) upgrading training;

(7) ATO personnel standards evaluation.

SECTION III – ADDITIONAL REQUIREMENTS FOR ATOS PROVIDING SPECIFIC TYPES OF TRAINING

CHAPTER 1 – DISTANCE LEARNING COURSE

AMC1 ORA.ATO.300 General

DISTANCE LEARNING

(a) A variety of methods is open to ATOs to present course material. It is, however, necessary for ATOs to maintain comprehensive records in order to ensure that students make satisfactory academic progress and meet the time constraints laid down in Part-FCL for the completion of modular courses.

(b) The following are given as planning guidelines for ATOs developing the distance learning element of modular courses:

(1) an assumption that a student will study for at least 15 hours per week;

(2) an indication throughout the course material of what constitutes a week's study;

(3) a recommended course structure and order of teaching;

(4) one progress test for each subject for every 15 hours of study, which should be submitted to the ATO for assessment. Additional self-assessed progress tests should be completed at intervals of five to 10 study hours;

(5) appropriate contact times throughout the course when a student can have access to an instructor by telephone, fax, email or the Internet;

(6) measurement criteria to determine whether a student has satisfactorily completed the appropriate elements of the course to a standard that, in the judgement of the HT, or CGI, will enable them to be entered for the Part-FCL theoretical examinations with a good prospect of success;

(7) if the ATO provides the distance learning by help of IT solutions, for example the Internet, instructors should monitor students' progress by appropriate means.

(c) Where an assessment (e.g. planning, written, scenario or practical exercise, or other assessment) is conducted outside the classroom via distance learning, the ATO should have a procedure or process in place to establish that the student themselves have completed the assessment and that the assessment method(s) for that particular exercise has (have) been effective.

AMC1 ORA.ATO.305(b) Classroom instruction

Classroom instruction delivered by an instructor to a student may include videoconferencing appropriate to the task if the necessary level of communication is ensured and appropriate equipment and tools are available.

CHAPTER 2 – ZERO FLIGHT-TIME TRAINING

AMC1 ORA.ATO.330 General

INITIAL APPROVAL

For an initial approval to conduct ZFTT, the operator should have held an air operator's certificate for commercial air transport for at least 1 year. This period may be reduced where the operator and the ATO have experience of type rating training.

SUBPART FSTD – REQUIREMENTS FOR ORGANISATIONS OPERATING FLIGHT SIMULATION TRAINING DEVICES (FSTDs) AND THE QUALIFICATION OF FSTDs

SECTION I – REQUIREMENTS FOR ORGANISATIONS OPERATING FSTDs

AMC1 ORA.FSTD.100 General

COMPLIANCE MONITORING PROGRAMME – ORGANISATIONs OPERATING FSTDs

(a) Introduction.

(1) The purpose of this AMC is to provide additional and specific information to an organisation operating FSTDs on how to establish a compliance monitoring programme (CMP) that enables compliance with the applicable requirements.

(b) Compliance monitoring programme

(1) Typical subject areas for inspections are the following:

(i) actual FSTD operation;

(ii) maintenance;

(iii) technical standards

(iv) FSTD safety features.

(c) Audit scope

(1) Organisations operating FSTDs are required to monitor compliance with the procedures they have designed to ensure specified performance and functions. In doing so they should as a minimum, and where appropriate, monitor the following:

(i) organisation;

(ii) plans and objectives;

(iii) maintenance procedures;

(iv) FSTD qualification level;

(v) supervision;

(vi) FSTD technical status;

(vii) manuals, logs and records;

(viii) defect deferral;

(ix) personnel training;

(x) aircraft modifications;

(xi) FSTD configuration management.

AMC2 ORA.FSTD.100 General

COMPLIANCE MONITORING PROGRAMME – ORGANISATIONs OPERATING FSTDs

One acceptable means of measuring FSTD performance is contained in ARINC report 433-1 (December 14th, 2007 or as amended) *Standard Measurements for Flight Simulation Quality*.

AMC3 ORA.FSTD.100 General

COMPLIANCE MONITORING PROGRAMME – ORGANISATIONS OPERATING BASIC INSTRUMENT TRAINING DEVICES (BITDs)

(a) The compliance monitoring programme together with a statement acknowledging completion of a periodic review by the accountable manager should include the following:

(1) a maintenance facility that provides suitable BITD hardware and software test and maintenance capability;

(2) a recording system in the form of a technical log in which defects, deferred defects and development work are listed, interpreted, actioned and reviewed within a specified time scale; and

(3) planned routine maintenance of the BITD and periodic running of the qualification test guide (QTG) with adequate manning to cover BITD operating periods and routine maintenance work.

(b) A planned audit schedule and a periodic review should be used to verify that corrective action was carried out and that it was effective. The auditor should have adequate knowledge of BITDs.

GM1 ORA.FSTD.100 General

COMPLIANCE MONITORING – ORGANISATIONs OPERATING FSTDs – GENERAL

(a) The concept of compliance monitoring (CM) is a fundamental requirement for organisations operating FSTDs. An effective CM function is vitally important in supporting operation of the devices, in a structured way, to ensure they remain in compliance with the technical standards of CS-FSTD(A) and CS-FSTD(H) and continue to be effective training tools. An effective CM function is also essential to support any level of extended recurrent evaluation period as permitted by ORA.FSTD.225(b).

(b) The following guidance has been developed to provide additional material to help both organisations operating FSTDs and competent authorities in developing effective CM that satisfy the applicable requirements and ensure the highest standards of training are maintained.

(c) Additional GM provide a compliance checklist for organisations operating FSTDs (GM2 ORA.FSTD.100) and guidance detailing the preparation for an evaluation by the competent authority (GM3 ORA.FSTD.100). The compliance checklist should be used by the competent authorities as a standardised checklist for the elements that are expected in the CM function of an organisation operating FSTDs. The organisation should complete as a minimum the second column of the checklist by providing appropriate manual or procedure references for each of the identified elements of the CM function. Additional information can be provided in the third column to aid assessment of the checklist as appropriate. This would then be provided to the competent authority. Use of this checklist should assist in ensuring a consistent approach by the competent authorities and also provide organisations operating FSTDs with additional guidance on all the elements of a CM function that the competent authorities will expect. The guidance is provided to help organisations operating FSTDs to prepare for authority visits.

(d) The documentation of the CM may be electronic, provided the necessary controls can be demonstrated. This should include control of any paper copies that may be downloaded for use by individuals. It is recommended that any such copies are automatically designated as uncontrolled as part of the download process. Whilst electronic signatures on master documents may be accepted, with appropriate protections, a hardcopy master of the CM manual should be provided, with wet-ink signatures to be held by the applicant.

(e) It should be recognised that whatever CM is developed, it will not be effective unless it becomes an integral part of the way in which the organisation works. It includes both the necessary procedures for maintaining compliance with all the applicable requirements and a compliance monitoring programme (CMP) to monitor the execution of these procedures. A successful CM will ensure that the highest training tool is available at all times. If the CM is viewed as an addon to existing processes it will become a burden and it will never be wholly effective. It should also be noted that compliance control or inspection is only a small part of a CM. If the CM is working effectively, inspections such as fly-outs should become routine revealing little beyond day-to-day unserviceabilities. Systematic defects should be captured by the CMP.

(f) The competent authority should be satisfied that the accountable manager is able to adequately provide the required level of resources to properly support the FSTD. Detailed knowledge of FSTD requirement standards are not necessary, only sufficient to understand his/her responsibility for ensuring the FSTD is properly supported. The assessment of the compliance monitoring manager should concentrate on establishing that the nominee has sufficient knowledge and experience of both CM management and FSTD operations to operate a compliance monitoring system (CMS) within an organisation operating FSTDs. This is likely to require experience of working in the compliance monitoring field and sufficient knowledge of FSTDs and the technical standards with which they should comply.

(g) If an organisation operating FSTDs is certified under any international quality standard it should assure that it fully covers the applicable organisation requirements of Part-ORA and the qualification basis.

(h) For small organisations, it is perfectly acceptable to combine the roles of compliance monitoring manager and accountable manager. For other organisations that hold multiple certificates and may cover multiple sites, it is advantageous to have a common CM function with an overall compliance monitoring manager. However, it is essential, particularly where sites may be significantly separated geographically, that there is a nominated representative at each site and possibly for each certificate. These representatives should hold the delegated responsibility of the CM manager for the day-to-day CM role at their site and in their function and have the necessary direct reporting line to the overall CM manager. It will also be necessary to ensure that local representatives are also acceptable to the local competent authority. In many cases the local representatives may perform other functions in addition to this role. This is acceptable provided the necessary independence of any compliance monitoring activity is maintained.

(i) CM, as a whole, begins with the requirements with which the system seeks to comply. These include both the technical standards, in this case the relevant parts of CS-FSTD(A)/(H) plus any other specific standards, for example health and safety regulations, and the compliance monitoring objectives, such as defect rates and rectification intervals and FSTD reliability targets. The CM should define the process by which these standards are made available to those who require them.

(j) The next part of CM is that part which defines the day-to-day procedures or working practices by which the standards will be achieved. These procedures should include as a minimum defect reporting systems, defect rectification processes, tracking mechanisms, preventative maintenance programmes, spares handling, equipment calibration and configuration management of the device. They should include checks to assess the compliance of the performed actions. These procedures and standards should be made readily available to anybody involved in the maintenance and day-to-day operation of the FSTD.

(k) The third part of CM is the method by which the organisation operating an FSTD confirms the device is maintained in compliance with the defined standards and is being operated in accordance with the defined procedures. This is the compliance monitoring programme (CMP) and includes the audit methods, reporting and corrective action procedures and feedback, management reviews and schedules for audits of all aspects of the FSTD operation.

(l) Across all aspects of CM, and most important to it, are the people. CM includes the definition of the responsibilities of all staff and should include a declaration of the minimum levels of resource proposed for the direct support of the FSTD plus the levels of support and managerial staff proposed. The levels of resource can be affected by factors such as local health and safety regulations, existence of weekend and/or night usage of the device(s), etc. CM also includes definition of the skills and experience required for staff and leads to definition of any required training programmes. Training needs cover both technical training and audit training, including QTG running and checking and fly-out techniques for flight crew.

(m) The documentation of CM may be provided in any number of documents provided there are appropriate cross-references in all documents such that the system is fully traceable in both directions from end to end. For all but small organisations at least two documents would be expected:

(1) Firstly, a CM manual containing the policy, terminology, organisational charts and responsibilities, an overview of all processes, within the system, including those for maintaining regulatory compliance such as QTG running and fly-outs (function and subjective testing), CMP including the audit schedule and audit procedures including reporting and corrective action procedures. In addition, the CM manual should include, either directly or by reference, the identification of skills and experience and associated training.

(2) Secondly, a procedures manual containing, as a minimum, software and hardware control procedures, configuration control procedures including, for example, control of training loads, updates to visual models, navigation and instructor operation station (IOS) databases, QTG running and checking procedures, fly-out procedures, maintenance procedures including both defect rectification and preventative maintenance processes. Any standard forms and checklists should also be included.

(n) The CM documentation also includes all records such as technical logs, QTG runs, fly-out reports and maintenance job cards.

(o) For organisations with several certificates, separate and modular procedures manuals with a single CM manual covering all approvals, may be acceptable.

(p) It is important to understand the difference between compliance assurance and compliance control. An effective CM will contain elements of both. Compliance control is normally done by inspection of the product; it provides confirmation at the time of the inspection that the product conforms to a defined standard.

(q) The compliance assurance element is essential to ensure the standard is maintained throughout the periods between product (FSTD) inspections. Within a CMP, the processes are defined that are necessary to provide confidence that the FSTD(s) is/are being supported and maintained to the highest possible standard and in compliance with the relevant requirements. A programme of internal audits is then set in place to confirm that the processes are being followed and are effective. The competent authority would normally oversee a certified organisation by process and system audit, however, in the case of FSTDs, authority oversight includes an inspection element in the form of the recurrent FSTD evaluation.

(r) In addition to the normal process and system audits, the compliance assurance audit schedule should include the schedule for each FSTD for fly-outs and QTG running through the audit year.

(s) The audit procedure should include, at least, the following: statement of scope, planning, initiation of audit, collection of evidence, analysis, reporting of findings, identification and agreement of corrective actions and feedback, including reporting significant findings to the competent authority, where appropriate. The review of published material could include, in addition to the CM and procedures manuals, QTG records, fly-out reports, technical log sheets, maintenance records and configuration control records.

(t) In addition to basic knowledge of FSTD requirements and operation, it is expected that auditors have received training in CM and audit techniques.

(u) The routine fly-outs of the device are a specialised part of the audit programme. It is essential that the pilots tasked with carrying out these fly-outs are adequately experienced. They would be expected to be type rating instructor/examiner (TRI/TRE) qualified on the type, and should have experience of simulator evaluations carried out by the competent authority. The assignment of such pilots can present difficulties, particularly for the independent organisation operating FSTDs not directly associated with an airline. It is vital for the organisation to ensure their users are aware of the importance of the fly-outs as part of the continued qualification of the device and the need to assist in the provision of suitably qualified pilots to carry them out. It is worth noting that simulator users are required to satisfy themselves that the training devices they use are assessed for continued suitability, as part of their own CMP. Involvement in fly-outs assists in meeting this need.

(v) Whilst it is accepted that the number of audits required in an organisation with a single device will be significantly less than those in larger organisations with multiple devices, the CMP should still meet the same criteria, and cover all aspects of the operation within a 12 month period. The independence of the audit personnel should be maintained at all times. The audit programme, whether by full audit or by using a checklist system should still be sufficiently comprehensive to provide the necessary level of confidence that the device is maintained and operated to the highest possible standard. This includes monitoring and review of corrective actions and feedback processes.

(w) The successful use of sub-contractors who play a significant role in the provision of services, such as maintenance or engineering services, to an organisation operating FSTDs is reliant on the sub-contractor operating under the CM of the organisation. All requirements that an organisation is expected to meet are equally applicable to his/her sub-contractor. It is the organisation's responsibility to ensure that the sub-contractor complies with its CM.

(x) It is essential that a proper understanding of the CM and how it applies to each and every staff member is provided by appropriate training to all, not just those directly involved in operating the CM, such as the accountable manager, the CM manager, representatives and the auditors. The training given to those directly involved in CM should cover the CM, audit techniques and applicable technical standards. CM familiarisation training should be an integral part of any induction training and recurrent training. Update training on technical standards for audit personnel, is also of particular importance.

(y) Any effective CM will include measurement of its effectiveness. The organisation should develop performance measures that can be monitored against objectives.

Such measures, often referred to as metrics, should be reviewed by the competent authority as part of its oversight of the CM within the organisation and during recurrent evaluations. In addition they should form part of the data reviewed during scheduled management reviews as part of the CM.

(z) ARINC 433 provides good guidance on FSTD compliance measurement. Metrics should monitor not only individual FSTD performance but, for larger organisations, how each FSTD is performing within the fleet. It is also recommended that metrics data be shared, regularly, with the FSTD manufacturers to allow monitoring for generic problems such as design issues, which may be best addressed with a fleet-wide solution.

GM2 ORA.FSTD.100 General

COMPLIANCE MONITORING – ASSESSMENT FOR ORGANISATIONS OPERATING FSTDs

COMPLIANCE MONITORING ASSESSMENT FOR ORGANISATIONS OPERATING FSTDs			
Organisation:			
Site Assessed:			
Date of Assessment:			
Accountable Manager:			
Compliance Monitoring Manager:			
Number and Type of FSTDs:			
CM Manual Reference:			
Audit Area	CM/Proc Ref	Comments	Satisfactory Y/N
1. ACCOUNTABLE MANAGER			
Has an accountable manager (AM) with overall responsibility for compliance monitoring (CM) been nominated?			
Does the accountable manager have corporate authority to ensure all necessary activities can be financed and carried out to the standard required by the competent authority?			
Has a formal written compliance policy statement been established, included in the CM manual and signed by the accountable manager?			
2. COMPLIANCE MONITORING MANAGER			
Has a compliance monitoring manager (CM manager) been nominated?			
Are the posts of CM manager and AM combined? If so, is the independence of compliance audits assured?			

Does the CM manager have overall responsibility and authority to: a) verify that standards are met; and b) ensure that the compliance monitoring programme is established, implemented and maintained?			
Does the CM manager have direct access to the AM?			
Does the CM manager have access to all parts of the organisation operating an FSTD and as necessary any sub-contractor's organisation?			
3. COMPLIANCE MONITORING (CM)			
Has CM been established by the operator?			
Is CM properly documented? (see Section 4)			
Is the CM structured according to the size and complexity of the operator?			
Does the CM include the following as a minimum: a) monitoring of compliance with required technical standards; b) identification of corrective actions and person responsible for rectification; c) a feedback system to accountable manager to ensure corrective action are promptly addressed; d) reporting of significant noncompliances to the competent authority; e) a compliance monitoring programme to verify continued compliance with applicable requirements, standards and procedures.		a) b) c) d) e)	
Is the CM structured according to the size and complexity of the operator?			
Are the responsibilities of the CM manager defined to include, as a minimum: a) monitoring of corrective action programme; b) ensuring that the corrective actions contain the necessary elements;		a) b) c)	

c) providing management with an independent assessment of corrective action, implementation and completion; d) evaluation of the effectiveness of the corrective action programme.		d)	
Are adequate financial, material and human resources in place to support CM?			
Are management evaluations/reviews of CM held at least quarterly?			
Does the management evaluation ensure that the CMS is working effectively and is it comprehensive and well documented?			
Does the compliance monitoring programme identify the processes necessary and the persons within the organisation who have the training, experience, responsibility and authority to carry out the following: a) schedule and perform quality inspections and audits, including unscheduled audits when required; b) identify and record any concerns or findings, and the evidence necessary to substantiate such concerns or findings; c) initiate or recommend solutions to concerns or findings through designated reporting channels; d) verify the implementation of solutions within specific timescales.		a) b) c) d)	
Is there sufficient auditor resource available and can their required level of independence be demonstrated?			
Do the auditors report directly to the compliance monitoring manager?			

Does the defined audit schedule cover the following areas, within each 12 month period? a) organisation b) plans and objectives c) maintenance procedures d) FSTD qualification level; e) supervision f) FSTD technical status g) manuals, logs and records h) defect deferral i) personnel training j) aircraft and simulator configuration management, including Airworthiness Directives		a) b) c) d) e) f) g) h) i) j)	
How are audit noncompliances recorded?			
Are procedures in place to ensure that corrective actions are taken in response to findings?			
Are records of the compliance monitoring programme: a) accurate b) complete and c) readily accessible?		a) b) c)	
Is there an acceptable and effective procedure for providing a briefing on the CM to all personnel?			
Is there an acceptable and effective procedure for ensuring that all those responsible for managing the CM receive training covering: a) an introduction to the concept of the CM; b) compliance management; c) the concept of compliance assurance; d) CM manuals; e) audit techniques; f) reporting and recording; g) how the CM supports continuous improvement within the organisation.		a) b) c) d) e) f) g)	
Are suitable training records maintained?			
Are activities within the CM sub-contracted out to external agencies?			
Do written agreements exist between the organisation and the sub-contractor			

clearly defining the services and standard to be provided?			
Are the procedures in place to ensure that the necessary authorisations/ approval when required are held by a sub-contractor?			
Are the procedures in place to establish that the subcontractor has the necessary technical competence?			
4. CM MANUAL			
What is the current status of the CM manual – amendment and issue date?			
Is there a procedure in place to control copies and the distribution of the CM manual?			
Is the CM manual signed by the accountable manager and the compliance monitoring manager?			
Does the CM manual include, either directly or by reference to other documents, the following: a) a description of the organisation; b) reference to appropriate FSTD technical standards; c) allocation of duties and responsibilities; d) audit procedures; e) reporting procedures; f) follow-up and corrective action procedures; g) document retention policy; h) training records		a) b) c) d) e) f) g) h)	
Is there a document retention policy covering: a) audit schedules; b) inspection and audit reports; c) responses to findings; d) corrective action reports; e) follow-up and closure reports; f) management evaluation reports.		a) b) c) d) e) f)	

Does the CM manual include, either directly or by reference to other documents, the following procedures for day to day operation of the FSTD: a) defect reporting systems; b) defect rectification processes; c) tracking mechanisms; d) preventative maintenance programmes; e) spares handling; f) equipment calibration; g) configuration management of the device including visual, IOS and navigation databases; h) configuration control system to ensure the continued integrity of the hardware and software qualified; i) QTG running and function and subjective tests.		a) b) c) d) e) f) g) h) i)	
Does the CM manual include, either directly or by reference to other documents, procedures for notification of the competent authorities of the following: a) any change in the organisation including company name, location, management; b) major changes to a qualified device; c) deactivation or relocation of a qualified device; d) major failures of a qualified device; e) major safety issue associated with the installation.		a) b) c) d) e)	
Does the CM manual define acceptable and effective procedures to ensure compliance with applicable health and safety regulations, including: a) safety briefings; b) fire/smoke detection and suppression; c) protection against electrical, mechanical, hydraulic and pneumatic hazards; d) other items as defined in AMC1 ORA.FSTD.115		a) b) c) d)	

Does the CM manual include acceptable and effective procedures for regularly checking FSTD safety features such as emergency stops and emergency lighting, and are such tests recorded?			
5. COMPLIANCE MEASURES			
Have compliance monitoring objectives been developed from the policy statement, and included either directly or by reference in the CMS manual?			
Does the CMS include processes to produce and review appropriate metrics data?			
Do these compliance measures track the following: a) FSTD availability; b) numbers of defects; c) open defects; d) defect closure rates; e) training session interrupt rates; f) training session compliance rating.		a) b) c) d) e) f)	
Do the compliance measures support the compliance objectives?			
Required actions/Comments Signature:………………………………………………………… Date:…………………………………			

GM3 ORA.FSTD.100 General

COMPLIANCE MONITORING SYSTEM – GUIDANCE FOR ORGANISATIONS OPERATING FSTDs TO PREPARE FOR A COMPETENT AUTHORITY EVALUATION

(a) Introduction

The following material provides guidance on what is expected by the competent authorities to support the discussion during the preliminary briefing, which is a first step of any initial or recurrent evaluation of an FSTD carried out by a competent authority.

This document has been developed as well to standardise working methods throughout Member States and to develop effective CM spot checks to satisfy the applicable requirements and therefore to ensure the highest standards of training are attained.

(b) Document form

Different document forms can be considered. Nevertheless, it appears that the best solution is a dossier, which includes all the information required by the competent authority to perform an evaluation.

(c) Contents of the dossier for an initial evaluation:

(1) type of FSTD and qualification level requested;

(2) evaluation agenda: including date of evaluation, name of people involved for the competent authority, contact details for the FSTD operator, schedules for the subjective flight profile, QTG rerun;

(3) FSTD identification and detailed technical specification including, type of FSTD, manufacturer, registration number, date of entry into service, host computer, visual system, motion system, type of IOS, simulated version(s), standards of all the aircraft computers, if applicable. Manuals needed for an evaluation (e.g. flight manuals, system manuals, acceptance test manual, IOS user manual etc. – if applicable) could already be provided as part of the dossier in an electronic format;

(4) planned modifications;

(5) subjective open defect(s);

(6) airport visual databases including for each visual scene, name of the airport, IATA and ICAO codes, type of visual scene (specific or generic), additional capabilities (e.g. snow model, WGS 84 compliance, enhanced ground proximity warning system (EGPWS)); and

(7) QTG status: the list should include for each QTG test available the status of the tests following the FSTD operator and competent authority reviews.

(d) Contents of the dossier for a recurrent evaluation:

(1) type of FSTD and qualification level requested;

(2) evaluation agenda, including date of evaluation, name of people involved for the competent authority, contact details for the operator, schedules for the subjective flight profile, QTG rerun and QTG review;

(3) FSTD identification, including type of FSTD, manufacturer, registration number, date of entry into service, host computer, visual system, motion system, type of IOS, simulated version(s), standards of all the aircraft computers, if applicable;

(4) status of items raised during the last evaluation and date of closure;

(5) reliability data: training hours month by month during the past year, numbers of complaints mentioned in the technical log, training hours lost, availability rate;

(6) operational data: a list of FSTD users over the previous 12 months should be provided, with number of training hours;

(7) failure tabulation including categorisation of failures (by ATA chapter and Pareto diagram, ARINC classification);

(8) details of main failures leading to training interruption or multiple occurrences of some failures;

(9) hardware and/or software updates or changes since last evaluation and planned hardware and/or software updates or changes;

(10) subjective open defect(s);

(11) airport visual databases including for each visual scene, name of the airport, ATA and ICAO codes, type of visual scene (specific or generic), additional capabilities (snow model, WGS 84 compliance, EGPWS);

(12) QTG status: the list should include for each QTG test available, the date of run during the past year, any comment, and the status of the tests; and

(13) results of scheduled internal audits and additional quality inspections (if any) since last evaluation and a summary of actions taken.

AMC1 ORA.FSTD.110 Modifications

GENERAL

(a) The FSTD, where applicable, should be maintained in a configuration that accurately represents the aircraft being simulated. This may be a specific aircraft tail number or may be a representation of a common standard.

(b) Users of the device should always establish a differences list for any device they intend to use, and to identify how any differences should be covered in training. In order to ensure each device is maintained in the appropriate configuration, the organisation operating an FSTD should have a system that ensures that all relevant airworthiness directives (ADs) are introduced where applicable on affected FSTDs.

(c) ADs from both the State of Design of the aircraft and the State where the FSTD is located should be monitored. ADs from the State of Design of an aircraft are usually automatically applicable, unless specifically varied by the aircraft’s State of Registry.

(d) Where appropriate, ADs issued by States where users of the device have aircraft registered should also be monitored. In addition to ADs, the FSTD operator should also put in place processes that ensure all aircraft modifications are reviewed for any effect on training, testing and checking. This can be achieved by reviewing the aircraft manufacturer’s service bulletins and may require a specific link to the aircraft manufacturer to be developed. In practice this link is often established through aircraft operators who use the device.

(e) Organisations operating FSTDs should notify the competent authority of major changes.

(f) This does not imply that the competent authority will always wish to directly evaluate the change. The competent authority should be mindful of the potential burden placed on the organisation by a special evaluation and should always consider that burden when deciding if such an evaluation is necessary.

(g) The organisation operating FSTDs should have an internal acceptance process for modifications, to be used when implementing all modifications, even if the competent authority has made a decision to carry out an evaluation.

GM1 ORA.FSTD.110 Modifications

EXAMPLES OF MAJOR MODIFICATIONS

The following are examples of modifications that should be considered as major. This list is not exhaustive and modifications need to be classified on a case-by-case basis:

(a) any change that affects the QTG;

(b) introduction of new standards of equipment such as flight management and guidance computer (FMGC) and updated aerodynamic data packages;

(c) re-hosting of the FSTD software;

(d) introduction of features that model new training scenarios; e.g. airborne collision avoidance system (ACAS), EGPWS;

(e) aircraft modifications that could affect the FSTD qualification; and

(f) FSTD hardware or software modifications that could affect the handling qualities, performance or system representation.

AMC1 ORA.FSTD.115 Installations

MINIMUM ELEMENTS FOR SAFE OPERATION

(a) Introduction

  (1) This AMC identifies those elements that are expected to be addressed, as a minimum, to ensure that the FSTD installation provides a safe environment for the users and operators of the FSTD under all circumstances.

(b) Expected elements

  (1) Adequate fire/smoke detection, warning and suppression arrangements should be provided to ensure safe passage of personnel from the FSTD.

  (2) Adequate protection should be provided against electrical, mechanical, hydraulic and pneumatic hazards, including those arising from the control loading and motion systems, to ensure maximum safety of all persons in the vicinity of the FSTD.

  (3) Other areas that should be addressed include the following:

(i) a two-way communication system that remains operational in the event of a total power failure;

(ii) emergency lighting;

(iii) escape exits and escape routes;

(iv) occupant restraints (seats, seat belts etc.);

(v) external warning of motion and access ramp or stairs activity;

(vi) danger area markings;

(vii) guard rails and gates;

(viii) motion and control loading emergency stop controls accessible from either pilot or instructor seats;

(ix) a manual or automatic electrical power isolation switch.

GM1 ORA.FSTD.115 Installations

GENERAL

(a) The intent of ORA.FSTD.115 is to establish that the organisation operating an FSTD has all the necessary procedures in place to ensure that the FSTD installation remains in compliance with all requirements affecting the safety of the device and its users.

(b) Based on experience, the competent authority should pay particular attention to the quality of safety briefings on the FSTD provided to users and instructors, and to the execution of regular checks on the FSTD safety features.

(c) It is recognised that certain checks, such as that of the emergency stop, can have adverse impact on the FSTD if carried out in full.

(d) It is acceptable to develop a procedure that protects elements of the device by shutting them down in advance, in a more controlled manner, provided it can be shown that the procedure still demonstrates the whole device can be shut down by the operation of a single emergency stop button, when required.

SECTION II – REQUIREMENTS FOR THE QUALIFICATION OF FSTDS

AMC1 ORA.FSTD.200 Application for FSTD qualification

LETTER OF APPLICATION FOR INITIAL QUALIFICATION OF AN FSTD; EXCEPT BASIC INSTRUMENT TRAINING DEVICE (BITD)

A sample of letter of application is provided overleaf.

Part A

To be submitted not less than 3 months prior to requested qualification date

(Date)

(Office – Competent Authority)
(Address) ……………………………………………………
(City) ……………………………………………………………
(Country) ……………………………………………………

Type of FSTD	**Aircraft Type/class**	**Qualification Level Sought**				
Full Flight Simulator FFS		A	B	C	D	Sp./Cat
Flight Training Device FTD		1	2	3		
Flight and Navigation Procedures Trainer FNPT		I	II	III	II MCC	III MCC

Interim Qualification Level requested: YES/NO

Dear,
<*Name of Applicant*> requests the evaluation of its flight simulation training device <*operator's identification of the FSTD*> for qualification. The <*FSTD manufacturer's name*> FSTD with its <*visual system and manufacturer's name, if applicable*> visual system.

Evaluation is requested for the following configurations and engine fits as applicable:
e.g. 767 PW/GE and 757RR
1…………..
2…………..
3…………..

Dates requested are: <*date(s)*> and the FSTD will be located at <*place*>.

The objective tests of the QTG will be submitted by <*date*> and in any event not less than 30 days before the requested evaluation date unless otherwise agreed with the competent authority.

Comments:
……
…………………
……
…………………

Signed
…………………………………………………………………

Print name: ....
Position/appointment held: ....
Email address: ....
Telephone number: ....

Part B

To be completed with attached QTG results

(Date) ....

We have completed tests of the FSTD and declare that it meets all applicable requirements except as noted below.
The following QTG tests still have to be provided:

Tests	Comments

(Add boxes as required)

It is expected that they will be completed and submitted 3 weeks prior to the evaluation date.

Signed
....

Print name: ....
Position/appointment held: ....
E-mail address: ....
Telephone number: ....

Part C

To be completed not less than 7 days prior to initial evaluation

(Date) ....

The FSTD has been assessed by the following evaluation team:

(Name) .... Qualification
....

(Name) …………………………………………………… Qualification
………………………………………………………………………
(Name) …………………………………………………… Qualification
………………………………………………………………………
(Name) …………………………………………………… Pilot's Licence Nr
………………………………………………………………
(Name) …………………………………………………… Flight Engineer's Licence Nr (if applicable)
…………………………

☐ FFS/FTD: This team attests that the <*type of FSTD*> conforms to the aeroplane flight deck/helicopter cockpit configuration of <*name of aircraft operator (if applicable), type of aeroplane/helicopter*> aeroplane/helicopter within the requirements for <*type of FSTD and level*> and that the simulated systems and subsystems function equivalently to those in that aeroplane/helicopter. The pilot of this evaluation team has also assessed the performance and the flying qualities of the FSTD and finds that it represents the designated aeroplane/helicopter.

☐ FNPT: This team attest(s) that the <*type of FSTD*> represents the flight deck or cockpit environment of a <*aeroplane/helicopter or class of aeroplane/type of helicopter*> within the requirements for <*type of FSTD and level*> and that the simulated systems appear to function as in the class of aeroplane/type of helicopter. The pilot of this evaluation team has also assessed the performance and the flying qualities of the FSTD and finds that it represents the designated class of aeroplane/type of helicopter.

(Additional comments as required)
…………………………………………………………………
…………………………………………………………………
…………………………………………………………………

Signed
…………………………………………………………………

Print name: …………………
Position/appointment held: …………………
E-mail address: …………………
Telephone number: …………………

GM1 ORA.FSTD.200 Application for FSTD qualification

USE OF FOOTPRINT TESTS IN QUALIFICATION TEST SUBMISSION

(a) Introduction

(1) Recent experience during initial qualification of some FFSs has required acceptance of increasing numbers of footprint tests. This is particularly true for FFSs of smaller or older aircraft types, where there may be a lack of aircraft flight test data. However, the large number of footprint tests offered in some QTGs has given rise to concern.

(2) This guidance is applicable to FFS aeroplane, FTD aeroplane, FFS helicopter and FTD helicopter qualifications.

(b) Terminology

(1) Footprint test - footprint test data are derived from a subjective assessment carried out on the actual FSTD requiring qualification. The assessment and validation of these data are carried out by a pilot appointed by the competent authority. The resulting data are the footprint validation data for the FSTD concerned.

(c) Recommendation

(1) It is permitted to use footprint data where flight test data is not available. Only when all other alternative possible sources of data have been thoroughly reviewed without success may a footprint test be acceptable, subject to a case-by-case review with the competent authorities concerned, and taking into consideration the level of qualification sought for the FSTD.

(2) Footprint test data should be:

(i) constructed with initial conditions and FFS set up in the appropriate configuration (e.g. correct engine rating) for the required validation data;

(ii) a manoeuvre representative of the particular aircraft being simulated;

(iii) manually flown out by a type rated pilot who has current experience on type* and is deemed acceptable by the competent authority**;

(iv) constructed from validation data obtained from the footprint test manoeuvre and transformed into an automatic test;

(v) an automatic test run as a fully integrated test with pilot control inputs; and

(vi) automatically run for the initial qualification and recurrent evaluations.

* In this context, ‘current’ refers to the pilot experience on the aircraft and not to the Part-FCL standards.

** The same pilot should sign off the complete test as being fully representative.

(3) A clear rationale should be included in the QTG for each footprint test. These rationales should be added to and clearly recorded within the validation data roadmap (VDR) in accordance with and as defined in Appendix 2 to AMC1-CS-FSTD(A).300.

(4) Where the number of footprint tests is deemed by the competent authority to be excessive, the maximum level of qualification may be affected. The competent authority should review each area of validation test data where the use of footprint tests as the basis for the validation data is proposed. Consideration should be given to the extent to which footprint tests are used in any given area.

For example, it would be unacceptable if all or the vast majority of takeoff tests were proposed as footprint tests, with little or no flight test data being presented. It should be recognised, therefore, that it may be necessary for new flight test data to be gathered if the use of footprint tests becomes excessive, not just overall, but also in specific areas.

(5) For recurrent evaluation purposes an essential match is to be expected. Validation tests using footprint data which do not provide an essential match should be justified to the satisfaction of the competent authority.

The competent authority should be consulted at the point of definition of the aircraft data for qualification prior to the procurement of the device if footprint tests need to be used.

AMC1 ORA.FSTD.225(b)(4) Duration and continued validity

The assigned person should have experience in FSTDs and training. The person may have FSTD experience or training experience with an education in FSTD evaluation procedures only, provided the other element of expertise is available within the organisation and a procedure for undertaking the annual review and reporting to the competent authority is documented within the compliance monitoring function.

AMC1 ORA.FSTD.230(b) Changes to the qualified FSTD

UPDATING AND UPGRADING EXISTING FSTDs

(a) An update is a result of a change to the existing device where it retains its existing qualification level. The change may be certified through a recurrent inspection or an extra inspection if deemed necessary by the competent authority according to the applicable requirements in effect at the time of initial qualification.

(b) If such a change to an existing device would imply that the performance of the device could no longer meet the requirements at the time of initial qualification, but that the result of the change would, in the opinion of the competent authority, clearly mean an improvement to the performance and training capabilities of the device altogether, then the competent authority might accept the proposed change as an update while allowing the device to retain its original qualification level.

(c) An upgrade is defined as the raising of the qualification level of a device, or an increase in training credits, which can only be achieved by undergoing an initial qualification according to the latest applicable requirements.

(d) As long as the qualification level of the device does not change, all changes made to the device should be considered to be updates pending approval by the competent authority.

(e) An upgrade, and consequent initial qualification according to the latest applicable requirements, is only applicable when the organisation requests another qualification level (recategorisation) for the FSTD.

AMC1 ORA.FSTD.240 Record-keeping

FSTD RECORDS

(a) FSTD records to be kept should include the following:

(1) for the lifetime of the device:

(i) the master QTG (MQTG) of the initial evaluation;

(ii) the qualification certificate of the initial evaluation; and

(iii) the initial evaluation report;

(2) for a period of at least 5 years (in paper or electronic format):

(i) recurrent QTG runs;

(ii) recurrent evaluation reports;

(iii) reports of internal functions and subjective testing;

(iv) technical log;

(v) CMS report;

(vi) audit schedule;

(vii) evaluation programme;

(viii) management evaluation reports;

(ix) obsolete procedures and forms.

SUBPART AeMC – AERO-MEDICAL CENTRES

SECTION I – GENERAL

AMC1 ORA.AeMC.115 Application

GENERAL

(a) The documentation for the approval of an AeMC should include the names and qualifications of all medical staff, a list of medical and technical facilities for initial class 1 aero-medical examinations and of supporting specialist consultants.

(b) The AeMC should provide details of clinical attachments to hospitals, medical institutions and/or specialists.

AMC1 ORA.AeMC.135 Continued validity

EXPERIENCE

(a) At least 200 class 1 aero-medical examinations and assessments should be performed at the AeMC every year.

(b) In Member States where the number of aero-medical examinations and assessments mentioned in (a) cannot be reached due a low number of professional pilots, a proportionate number of class 1 aero-medical examinations and assessments should be performed.

(c) In these cases, the continuing experience of the head of the AeMC and aero-medical examiners on staff should also be ensured by them performing aero-medical examinations and assessments for:

(1) class 2 medical certificates as established in Part-MED; and/or

(2) third country class 1 medical certificates.

(d) Aero-medical research including publication in peer reviewed journals may also be accepted as contributing to the continued experience of the head of, and aero-medical examiners at, an AeMC.

SECTION II – MANAGEMENT

GM1 ORA.AeMC.200 Management system

RESEARCH

If aero-medical research is conducted at an AeMC, its management system should include processes to conduct that research and publish the results.

AMC1 ORA.AeMC.210 Personnel requirements

GENERAL

(a) The aero-medical examiner (AME) should have held class 1 privileges for at least 5 years and have performed at least 200 aero-medical examinations for a class 1 medical certificate before being nominated as head of an AeMC.

(b) The AeMC may provide practical AME training for persons fully qualified and licensed in medicine.

AMC1 ORA.AeMC.215 Facility requirements

MEDICAL-TECHNICAL FACILITIES

The medical-technical facilities of an AeMC should consist of the equipment of a general medical practice and, in addition, of:

(a) Cardiology

Facilities to perform:

(1) 12-lead resting ECG;

(2) stress ECG;

(3) 24-hour blood pressure monitoring; and

(4) 24-hour heart rhythm monitoring.

(b) Ophthalmology

Facilities for the examination of:

(1) near, intermediate and distant vision;

(2) external eye, anatomy, media and fundoscopy;

(3) ocular motility;

(4) binocular vision;

(5) colour vision (anomaloscopy or equivalent);

(6) visual fields;

(7) refraction; and

(8) heterophoria.

(c) Hearing

(1) pure-tone audiometer

(d) Otorhinolaryngology

Facilities for the clinical examination of mouth and throat and:

(1) otoscopy;

(2) rhinoscopy;

(3) tympanometry or equivalent; and

(4) clinical assessment of vestibular system.

(e) Examination of pulmonary function

(1) spirometry

(f) The following facilities should be available at the AeMC or arranged with a service provider:

(1) clinical laboratory facilities; and

(2) ultrasound of the abdomen.

ANNEX I (PART-FCL)

SUBPART A – GENERAL REQUIREMENTS

GM1 FCL.005 Scope

INTERPRETATIVE MATERIAL

(a) Whenever licences, ratings, approvals or certificates are mentioned in Part-FCL, these are meant to be valid licences, ratings, approvals or certificates issued in accordance with Part-FCL. In all other cases, these documents are specified.

(b) Deleted.

(c) Whenever an inclusive or exclusive 'or' is used, it should be understood within the context of the whole meaning of the requirement in which it is used.

GM1 FCL.010 Definitions

ABBREVIATIONS

The following abbreviations apply to the Acceptable Means of Compliance and Guidance Material to Part-FCL:

A	Aeroplane
AC	Alternating Current
ACAS	Airborne Collision Avoidance System
ADF	Automatic Direction Finding
ADS	Aeronautical Design Standard
AFCS	Automatic Flight Control System
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AIS	Aeronautical Information Services
AMC	Acceptable Means of Compliance
AeMC	Aero-medical Centre
AME	Aero-medical Examiner
AoA	Angle of Attack

AOH	Aircraft Operating Handbook
AOM	Aircraft Operating Manual
APU	Auxiliary Power Unit
As	Airship
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATO	Approved Training Organisation
ATP	Airline Transport Pilot
ATPL	Airline Transport Pilot Licence
ATS	Air Traffic Service
AUM	All Up Mass
AUPRTA	Airplane Upset Prevention and Recovery Training Aid
B	Balloon
BEM	Basic Empty Mass
BIR	Basic instrument rating
BITD	Basic Instrument Training Device
BPL	Balloon Pilot Licence
CAS	Calibrated Airspeed
CAT	Clear Air Turbulence
CB-IR	Competency-based training course for Instrument Rating
CDFA	Constant-Descent Final Approach
CDI	Course Deviation Indicator
CFI	Chief Flight Instructor
CG	Centre of Gravity
CP	Co-pilot
CPL	Commercial Pilot Licence
CRE	Class Rating Examiner
CRI	Class Rating Instructor
CRM	Crew Resource Management
CS	Certification Specification
CTKI	Chief Theoretical Knowledge Instructor

DC	Direct Current
DF	Direction Finding
DME	Distance Measuring Equipment
DPATO	Defined Point After Take-Off
DPBL	Defined Point Before Landing
DR	Dead Reckoning navigation
DTO	Declared Training Organisation
DVE	Degraded Visual Environment
EFIS	Electronic Flight Instrument System
EIR	En route Instrument Rating
EOL	Engine Off Landings
ERPM	Engine Revolutions per Minute
ETA	Estimated Time of Arrival
ETOPS	Extended-range Twin-engine Operation Performance Standard
FAF	Final Approach Fix
FAR	Federal Aviation Regulations
FCL	Flight Crew Licensing
FE	Flight Examiner
F/E	Flight Engineer
FEM	Flight Examiner Manual
FFS	Full-Flight Simulator
FI	Flight Instructor
FIE	Flight Instructor Examiner
FIS	Flight Information Service
FMC	Flight Management Computer
FMS	Flight Management System
FNPT	Flight and Navigation Procedures Trainer
FS	Flight Simulator
FSTD	Flight Simulation Training Device
ft	feet
FTD	Flight Training Device

G	Gravity forces
GLONASS	Global Orbiting Navigation Satellite System
GM	Guidance Material
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
H	Helicopter
HF	High Frequency
HOFCS	High Order Flight Control System
HPA	High-Performance Aeroplane
hrs	Hours
HUMS	Health and Usage Monitoring System
HT	Head of Training
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organization
IGE	In-Ground Effect
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IOS	Instructor Operating Station
IR	Instrument Rating
IRE	Instrument Rating Examiner
IRI	Instrument Rating Instructor
ISA	International Standard Atmosphere
JAR	Joint Aviation Requirements
kg	Kilogram
LAPL	Light Aircraft Pilot Licence
LDP	Landing Decision Point
LMT	Local Mean Time
LO	Learning Objectives
LOC-I	Loss of Control In-flight

LOFT	Line-Orientated Flight Training
m	Meter
MCC	Multi-Crew Cooperation
MCCI	Multi-Crew Cooperation Instructor
ME	Multi-Engine
MEL	Minimum Equipment List
MEP	Multi-Engine Piston
MET	Multi-Engine Turboprop
METAR	Meteorological Aerodrome Report
MI	Mountain Rating Instructor
MP	Multi-Pilot
MPA	Multi-Pilot Aeroplane
MPL	Multi-crew Pilot Licence
MPH	Multi-Pilot Helicopter
MTOM	Maximum Take-Off Mass
NDB	Non-Directional Beacon
NM	Nautical Miles
NOTAM	Notice To Airmen
NOTAR	No Tail Rotor
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OEI	One Engine Inoperative
OEM	Original Equipment Manufacturer
OGE	Out of Ground Effect
OML	Operational Multi-pilot Limitation
OSL	Operational Safety Pilot Limitation
OTD	Other Training Devices
PAPI	Precision Approach Path Indicator
PBN	Performance-based Navigation
PF	Pilot Flying

PIC	Pilot-In-Command
PICUS	Pilot-In-Command Under Supervision
PL	Powered-lift
PNF	Pilot Not Flying
POM	Pilot Operating Manual
PPL	Private Pilot Licence
QDM	Magnetic Heading (aircraft to station)
QDR	Magnetic Heading (station to aircraft)
QFE	Atmospheric pressure at aerodrome elevation
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
RAIM	Receiver Autonomous Integrity Monitoring
RNAV	Radio Navigation
RPM	Revolutions per Minute
RRPM	Rotor Revolutions per Minute
R/T	Radio-telephony
S	Sailplane
SATCOM	Satellite Communication
SE	Single-Engine
SEP	Single-Engine Piston
SET	Single-Engine Turboprop
SFE	Synthetic Flight Examiner
SFI	Synthetic Flight Instructor
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Weather
SLPC	Single Lever Power Control
SOP	Standard Operating Procedure
SP	Single-Pilot
SPA	Single-Pilot Aeroplane
SPH	Single-Pilot Helicopter
SPIC	Student PIC
SPL	Sailplane Pilot Licence

SSR	Secondary Surveillance Radar
STI	Synthetic Training Instructor
TAF	(Terminal Area Forecasts) Aerodrome Forecast
TAS	True Airspeed
TAWS	Terrain Awareness Warning System
TCH	Type Certificate Holder
TDP	Take-off Decision Point
TEM	Threat and Error Management
TK	Theoretical Knowledge
TMG	Touring Motor Glider
TORA	Take-Off Run Available
TODA	Take-Off Distance Available
TR	Type Rating
TRE	Type Rating Examiner
TRI	Type Rating Instructor
UPRT	Upset Prevention and Recovery Training
UTC	Universal Time Coordinated
V	Velocity
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOLMET	Meteorological Information for Aircraft in-Flight
VOR	VHF Omni-directional Radio Range
ZFTT	Zero Flight Time Training
ZFM	Zero Fuel Mass

GM2 FCL.010 Definitions – lateral and vertical navigation

Lateral and vertical navigation guidance refers to the guidance provided either by:

(a) a ground-based radio navigation aid; or

(b) computer-generated navigation data from ground-based, space-based, self-contained navigation aids or a combination of these.

GM3 FCL.010 Definitions

UPSET PREVENTION AND RECOVERY TRAINING (UPRT) DEFINITIONS

In the context of UPRT, the following abbreviations apply to the Acceptable Means of Compliance and Guidance Material to Part-FCL:

'Advanced UPRT' refers to the advanced UPRT course in accordance with point FCL.745.A.

'Aeroplane upset' refers to an undesired aircraft state characterised by unintentional divergences from parameters normally experienced during operations. An aeroplane upset may involve pitch and/or bank angle divergences as well as inappropriate airspeeds for the conditions.

'Angle of Attack (AoA)' refers to the angle between the oncoming air, or relative wind, and a defined reference line on the aeroplane or wing.

'Approach-to-stall' refers to flight conditions bordered by the stall warning and stall.

'Basic UPRT' refers to the UPRT elements and exercises integrated into training courses for the issue of a CPL, MPL or Phases 1 to 3 of the integrated ATP course.

'Developed upset' refers to a condition meeting the definition of an aeroplane upset.

'Developing upset' refers to any time the aeroplane begins to unintentionally diverge from the intended flight path or airspeed.

'Energy state' refers to how much of each kind of energy (kinetic, potential or chemical) the aeroplane has available at any given time.

'First indication of a stall' refers to the initial aural, tactile or visual sign of a stall event which can be either naturally or synthetically induced.

'Flight crew resilience' refers to the ability of a flight crew member to recognise, absorb and adapt to disruptions.

'Fidelity level' refers to the level of realism assigned to each of the defined FSTD features.

'Flight path' refers to the trajectory or path of the aeroplane travelling through the air over a given space of time.

'Flight path management' refers to active manipulation, using either the aeroplane's automation or manual handling, to command the aeroplane's flight controls in order to direct the aeroplane along a desired trajectory.

'FSTD validation envelope' refers to the envelope consisting of the following three subdivisions:

(a) Flight test validated region

This is the region of the flight envelope which has been validated with flight test data, typically by comparing the performance of the FSTD against the flight test data through tests incorporated in the qualification test guide (QTG) and other flight test data utilised to further extend the model beyond the minimum requirements. Within this region, there is high confidence that the simulator responds similarly to the aircraft. Note that this region is not strictly limited to what has been tested in the QTG; as long as the aerodynamics mathematical model has been conformed to the flight test results, that portion of the mathematical model can be considered to be within the flight test validated region.

(b) Wind tunnel and/or analytical region

This is the region of the flight envelope for which the FSTD has not been compared to flight test data, but for which there has been wind tunnel testing or the use of other reliable predictive methods (typically by the aircraft manufacturer) to define the aerodynamic model. Any extensions to the aerodynamic model that have been evaluated in accordance with the definition of an exemplar stall model (as described in the stall manoeuvre evaluation section) must be clearly indicated. Within this region, there is moderate confidence that the simulator will respond similarly to the aircraft.

(c) Extrapolated region

This is the region extrapolated beyond the flight test validated and wind tunnel/analytical regions. The extrapolation may be a linear extrapolation, a holding of the last value before the extrapolation began, or some other set of values. Whether this extrapolated data is provided by the aircraft or simulator manufacturer, it is a 'best guess' only. Within this region, there is low confidence that the simulator will respond similarly to the aircraft. Brief excursions into this region may still retain a moderate confidence level in FSTD fidelity; however, the instructor should be aware that the FSTD's response may deviate from that of the actual aircraft.

'Load factor' refers to the ratio of a specified load to the weight of the aeroplane, the former being expressed in terms of aerodynamic forces, propulsive forces or ground reactions.

'Loss of Control In-flight (LOC-I)' refers to a categorisation of an accident or incident resulting from a deviation from the intended flight path.

'Manoeuvre-based training' refers to training that focuses on a single event or manoeuvre in isolation.

'Negative training' refers to training which unintentionally introduces incorrect information or invalid concepts, which could actually decrease rather than increase safety.

'Negative transfer of training' refers to the application (and 'transfer') of what was learned in a training environment (i.e. a classroom, an FSTD) to normal practice, i.e. it describes the degree to which what was learned in training is applied to actual, normal practices. In this context, negative transfer of training refers to the inappropriate generalisation of knowledge and skills to a situation or setting in normal practice that does not equal the training situation or setting.

‘Original Equipment Manufacturer (OEM)’ refers to the original equipment manufacturer of an aircraft or associated parts or equipment or of parts or equipment installed on the basis of a supplemental type certificate (STC).

‘Post-stall regime’ refers to flight conditions at an AoA greater than the critical AoA.

‘Scenario-based training’ refers to training that incorporates manoeuvres into real-world experiences to cultivate practical flying skills in an operational environment.

‘Stall’ refers to loss of lift caused by exceeding the aeroplane’s critical AoA.

Note: A stalled condition can exist at any attitude and airspeed, and may be recognised by continuous stall warning activation accompanied by at least one of the following:

(a) buffeting, which could be heavy at times;

(b) lack of pitch authority and/or roll control; and

(c) inability to arrest the descent rate.

Note: It is possible that in certain conditions the stall warning may not be activated.

‘Stall event’ refers to an occurrence whereby the aeroplane experiences conditions associated with an approach-to-stall or a stall.

‘Stall (event) recovery procedure’ refers to the manufacturer-approved aeroplane-specific stall recovery procedures, such as those contained in the flight crew operations manual (FCOM). If an OEM-approved recovery procedure does not exist, the aeroplane-specific stall recovery procedure developed by the ATO, based on the stall recovery template, may be used.

‘Stall warning’ refers to a natural or synthetic indication provided when approaching a stall that may include one or more of the following indications:

(a) aerodynamic buffeting (some aeroplanes will buffet more than others);

(b) reduced roll stability and aileron effectiveness;

(c) visual or aural cues and warnings;

(d) reduced elevator (pitch) authority;

(e) inability to maintain altitude or arrest rate of descent; and

(f) stick shaker activation (if installed).

Note: A stall warning indicates an immediate need to reduce the AoA.

‘Startle’ refers to the initial, short-term, involuntary physiological and cognitive reactions to an unexpected event that commence the normal human stress response.

‘Stick pusher’ refers to any device that automatically applies a nose-down movement and pitch force to an aeroplane’s control columns to attempt to decrease the aeroplane’s AoA. Device activation may occur before or after aerodynamic stall, depending on the aeroplane type.

Note: A stick pusher is not installed on all aeroplane types.

'Stick shaker' refers to a device that automatically vibrates the control column to warn the pilot of an approaching stall.

Note: A stick shaker is not installed on all aeroplane types.

'Stress (response)' refers to the response to a threatening event that includes physiological, psychological and cognitive effects. These effects may range from positive to negative and can either enhance or decrease performance.

'Surprise' refers to the emotionally based recognition of a difference in what was expected and what is actual.

'Train-to-proficiency' refers to approved training designed to achieve end-state performance objectives, providing sufficient assurances that the trained individual is capable of consistently carrying out specific tasks safely and effectively.

Note: In the context of this definition, 'train-to-proficiency' can be replaced by 'training-to-proficiency'.

'Type-specific UPRT' refers to UPRT elements and exercises integrated into training courses for the issue of a class or type rating pursuant to Part-FCL or during recurrent or refresher training for a specific aeroplane class or type.

'Undesired aircraft state' refers to flight-crew-induced aircraft position or speed deviation, misapplication of controls, or incorrect systems configuration, associated with a reduction in margins of safety.

Note (1): Undesired states can be managed effectively, restoring margins of safety, or flight crew response(s) can induce an additional error, incident or accident.

Note (2): All countermeasures are necessary flight crew actions. However, some countermeasures to threats, errors and undesired aircraft states that flight crew employ are built upon 'hard'/systemic-based resources provided by the aviation system.

'Unsafe situation' refers to a situation which has led to an unacceptable reduction in safety margin.

'Unusual attitude' refers to an aircraft in flight intentionally exceeding the parameters normally experienced in line operations or training, as applicable.

'Incipient spin' refers to a transient flight condition in the post-stall regime where an initial, uncommanded roll in excess of 45° has resulted from yaw asymmetry during a stall and which, if recovery action is not taken, will lead rapidly to a developing spin. Prompt recovery during this incipient spin stage will normally result in an overall heading change, from pre-stall conditions, of not more than 180°.

'Developing spin' refers to a flight condition in the post-stall regime where the aeroplane exhibits abnormal, but varying, rates of yaw and roll, together with changing pitch attitude, following an incipient spin but before the establishment of a developed spin. A developing spin follows an unrecovered incipient spin and will usually persist, in the absence of any recovery action, until a developed spin ensues.

'Developed spin' refers to a flight condition in the post-stall regime where the aeroplane has achieved approximately constant pitch attitude, yaw rate and roll rate on a descending flight path. In transition from a stall with significant, persistent yaw, with no recovery action, to attaining a developed spin, the aeroplane is likely to have rolled through at least 540°.

'FSTD training envelope' refers to the high and moderate confidence regions of the FSTD validation envelope.

GM4 FCL.010 Definitions

DEFINITIONS IN GM3 FCL.010 RELATED TO THE POST-STALL REGIME

The definitions for 'incipient spin', developing spin' and 'developed spin' in GM3 FCL.010 relate to the post-stall regime in aeroplanes that might typically be used in the context of the advanced UPRT in accordance with point FCL.745.A. The definitions are not intended for application to commercial air transport operations.

GM5 FCL.010 Definitions

AVAILABLE AND ACCESSIBLE FSTDs

(a) To determine the availability of an FSTD, the following additional criteria should be taken into account. The FSTD should be:

   (1) certified by CAA within the scope of the Basic Regulation;

   (2) approved by the CAA for use within the scope of the Basic Regulation;

   (3) representative of the operator's or applicant's aircraft class or type, and serviceable; and

   (4) representative of the configuration of the operator's or applicant's aircraft.

(b) To determine the accessibility of an FSTD, the following additional criteria should be taken into account. The FSTD should be:

   (1) accessible to the instructor or examiner of the applicant;

   (2) accessible for use within the scope of the candidate's/operator's training and checking activities; and

   (3) accessible to allow normal programming and prevent excessive scheduling disruptions within the operator's crew roster patterns.

(c) 'irrespective of any time considerations' means that the FSTD may be used at any time during day or night.

(d) If an FSTD is not available or accessible, mitigating measures to ensure the required level of safety should be agreed with the CAA before testing or checking the applicant in an aircraft.

GM6 FCL.010 Definitions

(a) For the purpose of crediting of a pilot's prior experience, 'multi-pilot operation' can be understood to include State aircraft operations (such as military or search & rescue) where two pilots are required by the applicable CAA regulations, the relevant operations manual or an equivalent document.

(b) Operations under MCAR-NCO are not under the 'multi-pilot operation' category, except for operations at an ATO for the purpose of providing training in multi-pilot operations, in accordance with the training manual of the ATO.

AMC1 FCL.015 Application and issue of licences, ratings and certificates

APPLICATION AND REPORT FORMS

Common application and report forms can be found:

(a) For skill tests, proficiency checks for issue, revalidation or renewal of LAPL, BPL, SPL, PPL, CPL and IR in AMC1 to Appendix 7.

(b) For training, skill tests or proficiency checks for ATPL, MPL and class and type ratings, in AMC1 to Appendix 9.

(c) For assessments of competence for instructors, in AMC5 FCL.935.

GM1 FCL.015(a) Application and issue, revalidation and renewal of licences, ratings and certificates

The application for the addition of the remark on the automatic validation of licences under licence item XIII can be submitted either when the pilot applies for the issue, revalidation or renewal of the licence, or independently at any other time.

GM1 FCL.025 Theoretical knowledge examinations for the issue of licences

TERMINOLOGY

The meaning of the following terms used in FCL.025 should be as follows:

(a) 'Entire set of examinations': an examination in all subjects required by the licence level.

(b) 'Examination': the demonstration of knowledge in one or more examination papers.

(c) 'Examination paper': a set of questions, which covers one subject required by the licence level or rating, to be answered by a candidate for examination.

(d) 'Attempt': a try to pass a specific paper.

(e) 'Sitting': a period of time established by the CAA within which a candidate can take an examination. This period should not exceed 10 consecutive days. Only one attempt at each examination paper is allowed in one sitting.

AMC1 FCL.025(a)(2) Theoretical knowledge examinations for the issue of licences and ratings

COMPLETION OF THE AREA 100 KSA ASSESSMENT BEFORE FINAL EXAMINATION

Before being recommended by an ATO to sit the final examination paper at the first attempt, an applicant for a professional licence should have successfully completed the applicable Area 100 KSA summative assessments and mental maths test at the ATO.

AMC1 FCL.050 Recording of flight time

GENERAL

(a) The record of the flights flown should contain at least the following information:

  (1) personal details: name(s) and address of the pilot;

  (2) for each flight:

    (i) name(s) of PIC;

    (ii) date of flight;

    (iii) place and time of departure and arrival;

    (iv) type, including make, model and variant, and registration of the aircraft;

    (v) indication if the aircraft is SE or ME, if applicable;

    (vi) total time of flight;

    (vii) accumulated total time of flight.

  (3) for each FSTD session, if applicable:

    (i) type and qualification number of the training device;

    (ii) FSTD instruction;

    (iii) date;

    (iv) total time of session;

    (v) accumulated total time.

  (4) details on pilot function, namely PIC, including solo, SPIC and PICUS time, co-pilot, dual, FI or FE;

  (5) Operational conditions, namely if the operation takes place at night, or is conducted under instrument flight rules.

(b) Logging of time:

  (1) PIC flight time:

    (i) the holder of a licence may log as PIC time all of the flight time during which he or she is the PIC;

(ii) the applicant for, or holder of, a pilot licence may log as PIC time all solo flight time, flight time as SPIC and flight time under supervision provided that such SPIC time and flight time under supervision are countersigned by the instructor;

(iii) the holder of an instructor certificate may log as PIC all flight time during which he or she acts as an instructor in an aircraft;

(iv) the holder of an examiner's certificate may log as PIC all flight time during which he or she occupies a pilot's seat and acts as an examiner in an aircraft;

(v) a co-pilot acting as PICUS on an aircraft on which more than one pilot is required under the type certification of the aircraft or as required by operational requirements provided that such PICUS time is countersigned by the PIC;

(vi) if the holder of a pilot licence carries out a number of flights upon the same day returning on each occasion to the same place of departure and the interval between successive flights does not exceed 30 minutes, such series of flights may be recorded as a single entry;

(vii) where regulations requires the pilot to act as PIC under the supervision of another pilot (supervisor), both the pilot and the supervisor may log the flight time as PIC.

(2) co-pilot flight time: the holder of a pilot licence occupying a pilot seat as co-pilot may log all flight time as co-pilot flight time on an aircraft on which more than one pilot is required under the type certification of the aircraft, the regulations or the operations manual of the operator under which the flight is conducted;

(3) cruise relief co-pilot flight time: a cruise relief co-pilot may log all flight time as co-pilot when occupying a pilot's seat;

(4) instruction time: a summary of all time logged by an applicant for a licence or rating as flight instruction, instrument flight instruction, instrument ground time, etc., may be logged if certified by the appropriately rated or authorised instructor from whom it was received;

(5) PICUS flight time: provided that the method of supervision is acceptable to the competent authority, a co-pilot may log as PIC flight time flown as PICUS when all the duties and functions of PIC on that flight were carried out in such a way that the intervention of the PIC in the interest of safety was not required.

(c) Format of the record:

(1) details of flights flown under commercial air transport may be recorded in an electronic format maintained by the operator.

In this case an operator should make the records of all flights operated by the pilot, including differences and familiarisation training, available upon request to the flight crew member concerned;

(2) for other types of flights in aeroplanes, helicopters and powered-lift aircraft, the pilot should record the details of the flights flown in the following logbook format, which may be kept in electronic format. All data set out in (a) should be included.

(3) For sailplanes, balloons and airships, a suitable format, which may be electric, should be used. That format should contain the relevant items mentioned in (a) and additional information specific to the type of operation.

PILOT LOGBOOK

Holder's name(s) ______________________________

Holder's licence number ______________________________

HOLDER'S ADDRESS:	
________________ ________________ ________________	________________ ________________ ________________ *[space for address change]*
________________ ________________ ________________ *[space for address change]*	________________ ________________ ________________ *[space for address change]*
________________ ________________ ________________ *[space for address change]*	________________ ________________ ________________ *[space for address change]*

1	2		3		4		5				6		7	8	
DATE (dd/mm/yy)	DEPARTURE		ARRIVAL		AIRCRAFT		SINGLE-PILOT TIME		MULTI-PILOT TIME		TOTAL TIME OF FLIGHT		NAME(S) PIC	LANDINGS	
	PLACE	TIME	PLACE	TIME	MAKE, MODEL, VARIANT	REGISTRATION	SE	ME						DAY	NIGHT
						TOTAL THIS PAGE									
						TOTAL FROM PREVIOUS PAGES									
						TOTAL TIME									

9				**10**								**11**				**12**
OPERATIONAL CONDITION TIME				PILOT FUNCTION TIME								FSTD SESSION				REMARKS AND ENDORSEMENTS
NIGHT		IFR		PIC		CO-PILOT		DUAL		INSTRUCTOR		DATE (dd/mm/yy)	TYPE	TOTAL TIME OF SESSION		
																I certify that the entries in this log are true.
																PILOT'S SIGNATURE

INSTRUCTIONS FOR USE

(d) FCL.050 requires holders of a pilot licence to record details of all flights flown. This logbook enables pilot licence holders to record flying experience in a manner which will facilitate this process while providing a permanent record of the licence holders flying. Pilots who fly regularly aeroplanes and helicopters or other aircraft categories are recommended to maintain separate logbooks for each aircraft category.

(e) Flight crew logbook entries should be made as soon as practicable after any flight undertaken. All entries in the flight crew logbook should comply with the following:

(1) in case of paper records, they should be made in ink or indelible pencil; or

(2) in case of electronic records, they should be made and kept in a way to be readily available at the request of a competent authority, and contain all relevant items that are mentioned in (a), certified by the pilot, and in a format acceptable by the competent authority.

(f) The particulars of every flight in the course of which the holder of a flight crew licence acts as a member of the operating crew of an aircraft are to be recorded in the appropriate columns using one line for each flight, provided that if an aircraft carries out a number of flights upon the same day returning on each occasion to the same place of departure and the interval between successive flights does not exceed 30 minutes, such series of flights may be recorded as a single entry.

(g) Flight time is recorded:

(1) for aeroplanes, touring motor gliders and powered-lift aircraft, from the moment an aircraft first moves to taking off until the moment it finally comes to rest at the end of the flight;

(2) for helicopters, from the moment a helicopter’s rotor blades start turning until the moment the helicopter finally comes to rest at the end of the flight, and the rotor blades are stopped;

(3) for airships, from the moment an airship is released from the mast to taking off until the moment the airship finally comes to rest at the end of the flight, and is secured on the mast;

(h) When an aircraft carries two or more pilots as members of the operating crew, one of them shall, before the flight commences, be designated by the operator as the aircraft PIC, according to operational requirements, who may delegate the conduct of the flight to another suitably qualified pilot. All flying carried out as PIC is entered in the logbook as 'PIC'. A pilot flying as 'PICUS' or 'SPIC' enters flying time as 'PIC' but all such entries are to be certified by the PIC or FI in the 'Remarks' column of the logbook.

(i) Notes on recording of flight time:

(1) column 1: enter the date (dd/mm/yy) on which the flight commences;

(2) column 2 or 3: enter the place of departure and destination either in full or the internationally recognised three or four letter designator. All times should be in UTC;

(3) column 5: indicate whether the operation was SP or MP, and for SP operation whether SE or ME;

Example:

1	**2**		**3**		**4**		**5**				**6**		**7**	**8**	
DATE (dd/mm/yy)	DEPARTURE		ARRIVAL		AIRCRAFT		SINGLE PILOT TIME		MULTI-PILOT TIME		TOTAL TIME OF FLIGHT		NAME(S) PIC	LANDINGS	
	PLACE	TIME	PLACE	TIME	MAKE, MODEL, VARIANT	REGISTRATION	SE	ME						DAY	NIGHT
08/04/12	LFAC	1025	EGBJ	1240	PA34-250	G-SENE		✓			2	15	SELF	1	
09/04/12	EGBJ	1810	EGBJ	1930	C152	G-NONE	✓				1	20	SELF		2
11/04/12	LGW	1645	LAX	0225	B747-400	G-ABCD			9	40	9	40	NAME(S) PIC		1

(4) column 6: total time of flight may be entered in hours and minutes or decimal notation as desired;

(5) column 7: enter the name(s) of PIC or SELF as appropriate;

(6) column 8: indicate the number of landings as pilot flying by day or night;

(7) column 9: enter flight time undertaken at night or under instrument flight rules if applicable;

(8) column 10: pilot function time:

(i) enter flight time as PIC, SPIC and PICUS as PIC;

(ii) all time recorded as SPIC or PICUS is countersigned by the aircraft PIC/FI in the 'remarks' (column 12);

(iii) instructor time should be recorded as appropriate and also entered as PIC.

(9) column 11: FSTD:

(i) for any FSTD enter the type of aircraft and qualification number of the device. For other flight training devices enter either FNPT I or FNPT II as appropriate;

(ii) total time of session includes all exercises carried out in the device, including pre- and after-flight checks;

(iii) enter the type of exercise performed in the 'remarks' (column 12), for example operator proficiency check, revalidation.

(10) column 12: the 'remarks' column may be used to record details of the flight at the holder's discretion. The following entries, however, should always be made:

(i) instrument flight time undertaken as part of the training for a licence or rating;

(ii) details of all skill tests and proficiency checks;

(iii) name and signature of PIC if the pilot is recording flight time as SPIC or PICUS;

(iv) name and signature of instructor if flight is part of an SEP or TMG class rating revalidation;

(v) for multi-pilot operations in single-pilot helicopters, the form of operation, name and signature of the examiner conducting the skill test or proficiency check or operator proficiency check, and the name of the operator in the case of the operator proficiency check.

(j) When each page is completed, accumulated flight time or hours should be entered in the appropriate columns and certified by the pilot in the 'remarks' column.

Example:

9				**10**								**11**				**12**
OPERATIONAL CONDITION TIME				PILOT FUNCTION TIME								FSTD SESSION				REMARKS AND ENDORSEMENTS
NIGHT		IFR		PIC		CO-PILOT		DUAL		INSTRUCTOR		DATE (dd/mm/yy)	TYPE	TOTAL TIME OF SESSION		
		2	15	2	15											
1	20			1	20					1	20					Night rating training
												10/04/12	B747-400 (Q1234)	4	10	Revalidation proficiency check
8	10	9	40	9	40											PIC(US): signature of NAME(S) PIC

GM1 FCL.050 Recording of flight time

EXAMPLES FOR THE USE OF COLUMN 12 'REMARKS' OF THE PILOT LOGBOOK

Pilots may use column 12 'remarks' of the pilot logbook (AMC1 FCL.050) to record the specific nature of a particular flight in the following cases, since a record of relevant experience might be useful with respect to operational requirements:

(a) flight time as a pilot in a specialised operation, using the list provided in GM1 NCO.SPEC.100 and GM1 SPO.GEN.100 (see AMC1 ORO.FC.146(e);(f)&(g) of the AMC and GM to MCAR-ORO;

(b) HEC 1 and 2 cycles, HESLO 1, 2, 3, and 4 cycles, and HHO hoisting cycles by day and night, as pilot flying (see AMC1 SPO.SPEC.HEC.100 and AMC1 SPO.SPEC.HESLO.100 of the AMC and GM to MCAR-SPO and point SPA.HHO.130 of MCAR-SPA(c) HHO hours (see point SPA.HHO.130 of Part-SPA);

(c) HHO hours (see point SPA.HHO.130 of MCAR-SPA);

(d) offshore landings by day / by night, as pilot flying (see point SPA.HOFO.170 of Part-SPA);

(e) NVIS flights or hours (see GM1 SPA.NVIS.130 of the AMC and GM MCAR-SPA);

(f) IFR approaches in the single-pilot role (see point ORO.FC.202 of MCAR-ORO);

(g) any activity deemed necessary to be recorded for evidence purposes.

Pilots may also use column 12 'remarks' to record IFR approaches exercising PBN privileges and RNP APCH approaches in single-pilot operations (see Appendix 8 to MCAR-FCL).

AMC1 FCL.055 Language proficiency

GENERAL

(a) The method of assessment of the language proficiency level (hereafter: assessment) should be designed to reflect a range of tasks undertaken by pilots but with specific focus on language rather than operational procedures.

(b) The assessment should determine the applicant's ability to:

  (1) communicate effectively using standard R/T phraseology;

  (2) deliver and understand messages in plain language in both usual and unusual situations that necessitate departure from standard R/T phraseology.

  Note: refer to the 'Manual on the Implementation of ICAO Language Proficiency Requirements' (ICAO Doc 9835), Appendix A Part III and Appendix B for further guidance.

ASSESSMENT

(c) The assessment may be subdivided into three elements, as follows:

  (1) listening: assessment of comprehension;

(2) speaking: assessment of pronunciation, fluency, structure and vocabulary;

(3) interaction.

(d) The three elements mentioned above may be combined and they can be covered by using a wide variety of means or technologies.

(e) Where appropriate, some or all of these elements may be achieved through the use of the R/T testing arrangements.

(f) When the elements of the testing are assessed separately, the final assessment should be consolidated in the language proficiency endorsement issued by the CAA.

(g) The assessment may be conducted during one of the several existing checking or training activities, such as licence issue or rating issue and revalidation, line training, operator line checks or proficiency checks.

(h) The CAA may use its own resources in developing or conducting the language proficiency assessment, or may delegate this task to language testing bodies.

(i) The CAA should establish an appeal procedure for applicants.

(j) The holder of a licence should receive a statement containing the level and validity of the language endorsements.

(k) Where the assessment method for the English language established by the CAA is equivalent to that established for the assessment of use of the English language in accordance with AMC2 FCL.055, the same assessment may be used for both purposes.

BASIC ASSESSMENT REQUIREMENTS

(l) The aim of the assessment is to determine the ability of an applicant for a pilot licence or a licence holder to speak and understand the language used for R/T communications.

(1) The assessment should determine the ability of the applicant to use both:

(i) standard R/T phraseology;

(ii) plain language, in situations when standardised phraseology cannot serve an intended transmission.

(2) The assessment should include:

(i) voice-only and face-to-face situations;

(ii) common, concrete and work-related topics for pilots.

(3) The applicants should demonstrate their linguistic ability in dealing with an unexpected turn of events, and in solving apparent misunderstandings.

(4) The assessment should determine the applicant's speaking and listening abilities. Indirect assessments, of grammatical knowledge, reading and writing, are not appropriate.

(5) The assessment should determine the language skills of the applicant in the following areas:

(i) pronunciation:

(A) the extent to which the pronunciation, stress, rhythm and intonation are influenced by the applicant's first language or national variations;

(B) how much they interfere with ease of understanding.

(ii) structure:

(A) the ability of the applicant to use both basic and complex grammatical structures;

(B) the extent to which the applicant's errors interfere with the meaning.

(iii) vocabulary:

(A) the range and accuracy of the vocabulary used;

(B) the ability of the applicant to paraphrase successfully when lacking vocabulary.

(iv) fluency:

(A) tempo;

(B) hesitancy;

(C) rehearsed versus spontaneous speech;

(D) use of discourse markers and connectors.

(v) comprehension:

(A) on common, concrete and work-related topics;

(B) when confronted with a linguistic or situational complication or an unexpected turn of events.

Note: the accent or variety of accents used in the test material should be sufficiently intelligible for an international community of users.

(vi) interactions:

(A) quality of response (immediate, appropriate, and informative);

(B) the ability to initiate and maintain exchanges:

(a) on common, concrete and work-related topics;

(b) when dealing with an unexpected turn of events.

(C) the ability to deal with apparent misunderstandings by checking, confirming or clarifying.

Note: the assessment of the language skills in the areas mentioned above is conducted using the rating scale in AMC2 FCL.055.

ASSESSORS

(m) It is essential that the persons responsible for language proficiency assessment (‘assessors’) are suitably trained and qualified. They should be either aviation specialists (for example current or former flight crew members or air traffic controllers), or language specialists with additional aviation related training. An alternative approach would be to form an assessment team consisting of an operational expert and a language expert.

(1) The assessors should be trained on the specific requirements of the assessment.

(2) The assessors should not test applicants to whom they have given language training.

CRITERIA FOR THE ACCEPTABILITY OF LANGUAGE-TESTING BODIES

(n) To ensure an impartial assessment process, the language assessment should be independent of the language training.

(1) To be accepted, the language-testing bodies should demonstrate:

(i) appropriate management and staffing;

(ii) quality system established and maintained to ensure compliance with, and adequacy of, assessment requirements, standards and procedures.

(2) The quality system established by a language-testing body should address the following:

(i) management;

(ii) policy and strategy;

(iii) processes;

(iv) the relevant provisions of ICAO or Part-FCL, standards and assessment procedures;

(v) organisational structure;

(vi) responsibility for the development, establishment and management of the quality system;

(vii) documentation;

(viii) quality assurance programme;

(ix) human resources and training (initial and recurrent);

(x) assessment requirements;

(xi) customer satisfaction.

(3) The assessment documentation and records should be kept for a period of time determined by the CAA and made available to CAA, on request.

(4) The assessment documentation should include at least the following:

(i) assessment objectives;

(ii) assessment layout, time scale, technologies used, assessment samples, voice samples;

(iii) assessment criteria and standards (at least for the levels 4, 5 and 6 of the rating scale mentioned in AMC2 FCL.055);

(iv) documentation demonstrating the assessment validity, relevance and reliability;

(v) assessment procedures and responsibilities:

(A) preparation of individual assessment;

(B) administration: location(s), identity check and invigilation, assessment discipline, confidentiality or security;

(C) reporting and documentation provided to the CAA or to the applicant, including sample certificate;

(D) retention of documents and records.

Note: refer to the 'Manual on the Implementation of ICAO Language Proficiency Requirements' (ICAO Doc 9835) for further guidance.

AMC2 FCL.055 Language proficiency

RATING SCALE

The following table describes the different levels of language proficiency:

LEVEL	**PRONUNCIATION** Assumes a dialect or accent intelligible to the aeronautical community	**STRUCTURE** Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	**VOCABULARY**	**FLUENCY**	**COMPREHENSION**	**INTERACTIONS**
Expert (Level 6)	Pronunciation, stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	Both basic and complex grammatical structures and sentence patterns are consistently well controlled.	Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced and sensitive to register.	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, for example to emphasise a point. Uses appropriate discourse markers and connectors spontaneously.	Comprehension is consistently accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.	Interacts with ease in nearly all situations. Is sensitive to verbal and non-verbal cues, and responds to them appropriately.
Extended (Level 5)	Pronunciation, stress, rhythm, and intonation, though influenced by the first language or	Basic grammatical structures and sentence patterns are consistently well controlled. Complex structures are	Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete,	Able to speak at length with relative ease on familiar topics, but may not vary speech flow as a stylistic device. Can	Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is	Responses are immediate, appropriate, and informative. Manages the speaker or

LEVEL	**PRONUNCIATION** Assumes a dialect or accent intelligible to the aeronautical community	**STRUCTURE** Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	**VOCABULARY**	**FLUENCY**	**COMPREHENSION**	**INTERACTIONS**
	regional variation, rarely interfere with ease of understanding.	attempted but with errors which sometimes interfere with meaning.	and work-related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.	make use of appropriate discourse markers or connectors.	confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect or accent) or registers.	listener relationship effectively.
Operational (Level 4)	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.	Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.	Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary particularly in unusual or	Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers	Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension	Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking,

LEVEL	PRONUNCIATION Assumes a dialect or accent intelligible to the aeronautical community	STRUCTURE Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
			unexpected circumstances.	and connectors. Fillers are not distracting.	may be slower or require clarification strategies.	confirming, or clarifying.
Pre-Operational (Level 3)	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation and frequently interfere with ease of understanding.	Basic grammatical structures and sentence patterns associated with predictable situations are not always well controlled. Errors frequently interfere with meaning.	Vocabulary range and accuracy are often sufficient to communicate effectively on common, concrete, and work-related topics but range is limited and the word choice often inappropriate. Is often unable to paraphrase successfully when lacking vocabulary.	Produces stretches of language, but phrasing and pausing are often inappropriate. Hesitations or slowness in language processing may prevent effective communication. Fillers are sometimes distracting.	Comprehension is often accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. May fall to understand a linguistic or situational complication or an unexpected turn of events.	Responses are sometimes immediate, appropriate, and informative. Can initiate and maintain exchanges with reasonable ease on familiar topics and in predictable situations. Generally inadequate when dealing with an

LEVEL	**PRONUNCIATION** Assumes a dialect or accent intelligible to the aeronautical community	**STRUCTURE** Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	**VOCABULARY**	**FLUENCY**	**COMPREHENSION**	**INTERACTIONS**
						unexpected turn of events.
Elementary (Level 2)	Pronunciation, stress, rhythm, and intonation are heavily influenced by the first language or regional variation and usually interfere with ease of understanding.	Shows only limited control of few simple memorised grammatical structures and sentence patterns.	Limited vocabulary range consisting only of isolated words and memorised phrases.	Can produce very short, isolated, memorised utterances with frequent pausing and a distracting use of fillers to search for expressions and articulate less familiar words.	Comprehension is limited to isolated, memorised phrases when they are carefully and slowly articulated.	Response time is slow, and often inappropriate. Interaction is limited to simple routine exchanges.
Pre-Elementary (Level 1)	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.

Note: operational Level (Level 4) is the minimum required proficiency level for R/T communication.

Levels 1 through 3 describe pre-elementary, elementary and pre-operational levels of language proficiency respectively, all of which describe a level below the language proficiency requirement.

Levels 5 and 6 describe extended and expert levels at levels of proficiency more advanced than the minimum required standard.

AMC3 FCL.055 Language proficiency

SPECIFIC REQUIREMENTS FOR HOLDERS OF AN IR

USE OF ENGLISH LANGUAGE

(a) The requirement of FCL.055(d) includes the ability to use the English language for the following purposes:

(1) flight: R/T relevant to all phases of flight, including emergency situations.

(2) ground: all information relevant to the accomplishment of a flight:

(i) be able to read and demonstrate an understanding of technical manuals written in English, for example an operations manual, a helicopter flight manual, etc.;

(ii) pre-flight planning, weather information collection, NOTAMs, ATC flight plan, etc.;

(iii) use of all aeronautical en-route, departure and approach charts and associated documents written in English.

(3) communication: be able to communicate with other crew members in English during all phases of flight, including flight preparation.

(b) Alternatively, the items in (a) above may be demonstrated:

(1) by having passed a specific examination given by the CAA after having undertaken a course of training enabling the applicant to meet all the objectives listed in (a) above; or

(2) the item in (a)(1) above is considered to be fulfilled, if the applicant has passed an IR, MPL or ATPL skill test and proficiency check during which the two-way R/T communication is performed in English;

(3) the item in (a)(2) above is considered to be fulfilled if the applicant has graduated from an IR, MPL or ATP course given in English or if he or she has passed the theoretical IR or ATPL examination in English;

(4) the item in (a)(3) above is considered to be fulfilled, if the applicant for or the holder of an IR has graduated from an MCC course given in English and is holding a certificate of satisfactory completion of that course or if the applicant has passed a MP skill test and proficiency check for the issue of a class or type rating during which the two-way R/T communication and the communication with other crew members are performed in English.

(c) Where the examination methods referred to above are equivalent to those established for the language proficiency requirements in accordance with AMC1 FCL.055, the examination may be used to issue a language proficiency endorsement.

AMC1 FCL.060(b)(1) Recent experience

When a pilot needs to carry out one or more flights with an instructor or an examiner to comply with the requirement of FCL.060(b)(1) before the pilot can carry passengers, the instructor or examiner on board those flights will not be considered as a passenger.

GM1 FCL.060(b)(1) Recent experience

AEROPLANES, HELICOPTERS, POWERED-LIFT, AIRSHIPS AND SAILPLANES

If a pilot or a PIC is operating under the supervision of an instructor to comply with the required three take-offs, approaches and landings, no passengers may be on board.

AMC1 FCL.060(b)(5) Recent experience

NON-COMPLEX HELICOPTERS

Grouping of non-complex helicopters with similar handling and operational characteristics:

(a) Group 1: Bell 206/206L, Bell 407;

(b) Group 2: Hughes 369, MD 500N, MD 520N, MD 600;

(c) Group 3: SA 341/342, EC 120;

(d) Group 4: SA 313/318, SA 315/316/319, AS 350, EC 130;

(e) Group 5: all types listed in AMC1 FCL.740.H(a)(3) and R 22 and R 44.

SUBPART B – LIGHT AIRCRAFT PILOT LICENCE – LAPL

SECTION 1 – COMMON REQUIREMENTS

AMC1 FCL.115 LAPL(A) – Training course

FLIGHT INSTRUCTION FOR THE LAPL (A)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Flight instruction

(1) The LAPL (A) flight instruction syllabus should take into account the principles of threat and error management and also cover:

(i) pre-flight operations, including mass and balance determination, aircraft inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

(iii) control of the aircraft by external visual reference;

(iv) flight at critically low air speeds, recognition of, and recovery from, incipient and full stalls;

(v) flight at critically high air speeds, recognition of, and recovery from, spiral dive;

(vi) normal and crosswind take-offs and landings;

(vii) maximum performance (short field and obstacle clearance) take-offs, short-field landings;

(viii) cross-country flying using visual reference, dead reckoning and radio navigation aids;

(ix) emergency operations, including simulated aeroplane equipment malfunctions;

(x) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures and communication procedures.

(2) Before allowing applicants to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication can operate the required systems and equipment.

(c) Syllabus of flight instruction

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(i) the applicant's progress and ability;

(ii) the weather conditions affecting the flight;

(iii) the flight time available;

(iv) instructional technique considerations;

(v) the local operating environment;

(vi) applicability of the exercises to the aeroplane or TMG type.

(2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.

(i) Exercise 1a: Familiarisation with the aeroplane or TMG:

(A) characteristics of the aeroplane or TMG;

(B) cockpit layout;

(C) systems;

(D) checklists, drills and controls.

(ii) Exercise 1b: Emergency drills:

(A) action if fire on the ground and in the air;

(B) engine cabin and electrical system fire;

(C) systems failure;

(D) escape drills, location and use of emergency equipment and exits.

(iii) Exercise 2: Preparation for and action after flight:

(A) flight authorisation and aeroplane or TMG acceptance;

(B) serviceability documents;

(C) equipment required, maps, etc.;

(D) external checks;

(E) internal checks;

(F) harness, seat or rudder panel adjustments;

(G) starting and warm-up checks;

(H) power checks;

(I) running down system checks and switching off the engine;

(J) parking, security and picketing (for example tie down);

(K) completion of authorisation sheet and serviceability documents.

(iv) Exercise 3: Air experience: flight exercise.

(v) Exercise 4: Effects of controls:

(A) primary effects when laterally level and when banked;

(B) further effects of aileron and rudder;

(C) effects of:

(a) air speed;

(b) slipstream;

(c) power;

(d) trimming controls;

(e) flaps;

(f) other controls, as applicable.

(D) operation of:

(a) mixture control;

(b) carburettor heat;

(c) cabin heating or ventilation.

(vi) Exercise 5a: Taxiing:

(A) pre-taxi checks;

(B) starting, control of speed and stopping;

(C) engine handling;

(D) control of direction and turning;

(E) turning in confined spaces;

(F) parking area procedure and precautions;

(G) effects of wind and use of flying controls;

(H) effects of ground surface;

(I) freedom of rudder movement;

(J) marshalling signals;

(K) instrument checks;

(L) air traffic control procedures.

(vii) Exercise 5b: Emergencies: brake and steering failure.

(viii) Exercise 6: Straight and level:

(A) at normal cruising power, attaining and maintaining straight and level flight;

(B) flight at critically high air speeds;

(C) demonstration of inherent stability;

(D) control in pitch, including use of trim;

(E) lateral level, direction and balance, trim;

(F) at selected air speeds (use of power);

(G) during speed and configuration changes;

(H) use of instruments for precision.

(ix) Exercise 7: Climbing:

(A) entry, maintaining the normal and max rate climb, levelling off;

(B) levelling off at selected altitudes;

(C) en-route climb (cruise climb);

(D) climbing with flap down;

(E) recovery to normal climb;

(F) maximum angle of climb;

(G) use of instruments for precision.

(x) Exercise 8: Descending:

(A) entry, maintaining and levelling off;

(B) levelling off at selected altitudes;

(C) glide, powered and cruise descent (including effect of power and air speed);

(D) side slipping (on suitable types);

(E) use of instruments for precision flight.

(xi) Exercise 9: Turning:

(A) entry and maintaining medium level turns;

(B) resuming straight flight;

(C) faults in the turn (in correct pitch, bank and balance);

(D) climbing turns;

(E) descending turns;

(F) slipping turns (for suitable types);

(G) turns onto selected headings, use of gyro heading indicator and compass;

(H) use of instruments for precision.

(xii) Exercise 10a: Slow flight: Note: the objective is to improve the student's ability to recognise inadvertent flight at critically low speeds and provide practice in maintaining the aeroplane or TMG in balance while returning to normal air speed.

(A) safety checks;

(B) introduction to slow flight;

(C) controlled flight down to critically slow air speed;

(D) application of full power with correct attitude and balance to achieve normal climb speed.

(xiii) Exercise 10b: Stalling:

(A) safety checks;

(B) symptoms;

(C) recognition;

(D) clean stall and recovery without power and with power;

(E) recovery when a wing drops;

(F) approach to stall in the approach and in the landing configurations, with and without power and recovery at the incipient stage.

(xiv) Exercise 11: Spin avoidance:

(A) safety checks;

(B) stalling and recovery at the incipient spin stage (stall with excessive wing drop, about 45°);

(C) instructor induced distractions during the stall.

(xv) Exercise 12: Take-off and climb to downwind position:

(A) pre-take-off checks;

(B) into wind take-off;

(C) safeguarding the nose wheel (if applicable);

(D) crosswind take-off;

(E) drills during and after take-off;

(F) short take-off and soft field procedure or techniques including performance calculations;

(G) noise abatement procedures.

(xvi) Exercise 13: Circuit, approach and landing:

(A) circuit procedures, downwind and base leg;

(B) powered approach and landing;

(C) safeguarding the nose wheel (if applicable);

(D) effect of wind on approach and touchdown speeds and use of flaps;

(E) crosswind approach and landing;

(F) glide approach and landing;

(G) short landing and soft field procedures or techniques;

(H) flapless approach and landing;

(I) wheel landing (tail wheel aeroplanes);

(J) missed approach and go-around;

(K) noise abatement procedures.

(xvii) Exercise 12/13: Emergencies:

(A) abandoned take-off;

(B) engine failure after take-off;

(C) mislanding and go-around;

(D) missed approach.

Note: in the interests of safety, it will be necessary for pilots trained on nose wheel aeroplanes or TMGs to undergo dual conversion training before flying tail wheel aeroplanes or TMGs, and vice versa.

(xviii) Exercise 14: First solo:

(A) instructor's briefing including limitations;

(B) use of required equipment;

(C) observation of flight and de-briefing by instructor.

Note: during flights immediately following the solo circuit consolidation the following should be revised:

(A) procedures for leaving and rejoining the circuit;

(B) the local area, restrictions, map reading;

(C) use of radio aids for homing;

(D) turns using magnetic compass, compass errors.

(xix) Exercise 15: Advanced turning:

(A) steep turns (45 °), level and descending;

(B) stalling in the turn and recovery;

(C) recoveries from unusual attitudes, including spiral dives.

(xx) Exercise 16: Forced landing without power:

(A) forced landing procedure;

(B) choice of landing area, provision for change of plan;

(C) gliding distance;

(D) descent plan;

(E) key positions;

(F) engine cooling;

(G) engine failure checks;

(H) use of radio;

(I) base leg;

(J) final approach;

(K) landing;

(L) actions after landing.

(xxi) Exercise 17: Precautionary landing:

(A) full procedure away from aerodrome to break-off height;

(B) occasions necessitating a precautionary landing;

(C) in-flight conditions;

(D) landing area selection:

(a) normal aerodrome;

(b) disused aerodrome;

(c) ordinary field.

(E) circuit and approach;

(F) actions after landing.

(xxii) Exercise 18a: Navigation:

(A) flight planning:

(a) weather forecast and actuals;

(b) map selection and preparation:

(1) choice of route;

(2) airspace structure;

(3) safety altitudes.

(c) calculations:

(1) magnetic heading(s) and time(s) en-route;

(2) fuel consumption;

(3) mass and balance;

(4) mass and performance.

(d) flight information:

(1) NOTAMs, etc.;

(2) radio frequencies;

(3) selection of alternate aerodromes.

(e) aeroplane or TMG documentation;

(f) notification of the flight:

(1) pre-flight administrative procedures;

(2) flight plan form.

(B) departure:

(a) organisation of cockpit workload;

(b) departure procedures:

(1) altimeter settings;

(2) ATC liaison in regulated airspace;

(3) setting heading procedure;

(4) noting of ETAs.

(c) maintenance of altitude and heading;

(d) revisions of ETA and heading;

(e) log keeping;

(f) use of radio;

(g) minimum weather conditions for continuation of flight;

(h) in-flight decisions;

(i) transiting controlled or regulated airspace;

(j) diversion procedures;

(k) uncertainty of position procedure;

(l) lost procedure.

(C) arrival and aerodrome joining procedure:

(a) ATC liaison in regulated airspace;

(b) altimeter setting;

(c) entering the traffic pattern;

(d) circuit procedures;

(e) parking;

(f) security of aeroplane or TMG;

(g) refuelling;

(h) closing of flight plan, if appropriate;

(i) post-flight administrative procedures.

(xxiii) Exercise 18b: Navigation problems at lower levels and in reduced visibility:

(A) actions before descending;

(B) hazards (for example obstacles, and terrain);

(C) difficulties of map reading;

(D) effects of wind and turbulence;

(E) vertical situational awareness (avoidance of controlled flight into terrain);

(F) avoidance of noise sensitive areas;

(G) joining the circuit;

(H) bad weather circuit and landing.

(xxiv) Exercise 18c: Radio navigation (basics):

(A) use of GNSS or VOR/ADF:

(a) selection of waypoints or stations;

(b) to or from indications and orientation;

(c) error messages.

(B) use of VHF/DF:

(a) availability, AIP and frequencies;

(b) R/T procedures and ATC liaison;

(c) obtaining a QDM and homing.

(C) use of en-route or terminal radar:

(a) availability and AIP;

(b) procedures and ATC liaison;

(c) pilot's responsibilities;

(d) secondary surveillance radar:

(1) transponders;

(2) code selection;

(3) interrogation and reply.

(xxv) Exercise 19: Stopping and restarting the engine (in the case of TMGs only):

(A) engine cooling;

(B) switching-off procedure;

(C) restarting of the engine.

AMC2 FCL.115 LAPL(H) Training course

FLIGHT INSTRUCTION FOR THE LAPL(H)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Flight instruction

(1) The LAPL(H) flight instruction syllabus should take into account the principles of threat and error management and also cover:

(i) pre-flight operations, including mass and balance determination, helicopter inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

(iii) control of the helicopter by external visual reference;

(iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;

(v) emergency procedures, basic autorotations, simulated engine failure and ground resonance recovery if relevant to type;

(vi) sideways and backwards flight and turns on the spot;

(vii) incipient vortex ring recognition and recovery;

(viii) touchdown autorotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;

(ix) steep turns;

(x) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;

(xi) limited power and confined area operations including selection of and operations to and from unprepared sites;

(xii) cross-country flying by using visual reference, dead reckoning and, where available and radio navigation aids;

(xiii) operations to and from aerodromes; compliance with air traffic services procedures and communication procedures.

(2) Before allowing applicants to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication and can operate the required systems and equipment.

(c) Syllabus of flight instruction

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(i) the applicant's progress and ability;

(ii) the weather conditions affecting the flight;

(iii) the flight time available;

(iv) instructional technique considerations;

(v) the local operating environment;

(vi) applicability of the exercises to the helicopter type.

(2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.

(i) Exercise 1a: Familiarisation with the helicopter:

(A) characteristics of the helicopter, external features;

(B) cockpit layout;

(C) systems;

(D) checklists, procedures, controls.

(ii) Exercise 1b: Emergency procedures:

(A) action if fire on the ground and in the air;

(B) engine, cabin and electrical system fire;

(C) systems failures;

(D) escape drills, location and use of emergency equipment and exits.

(iii) Exercise 2: Preparation for and action after flight:

(A) flight authorisation and helicopter acceptance;

(B) serviceability documents;

(C) equipment required, maps, etc.;

(D) external checks;

(E) internal checks;

(F) seat, harness and flight controls adjustments;

(G) starting and warm-up checks clutch engagement and starting rotors;

(H) power checks;

(I) running down system checks and switching off the engine;

(J) parking, security and picketing;

(K) completion of authorisation sheet and serviceability documents.

(iv) Exercise 3: Air experience:

(A) to introduce the student to rotary wing flight;

(B) flight exercise.

(v) Exercise 4: Effects of controls:

(A) function of flight controls, primary and secondary effect;

(B) effect of air speed;

(C) effect of power changes (torque);

(D) effect of yaw (sideslip);

(E) effect of disc loading (bank and flare);

(F) effect on controls of selecting hydraulics on/off;

(G) effect of control friction;

(H) instruments;

(I) use of carburettor heat or anti-icing control.

(vi) Exercise 5: Power and attitude changes:

(A) relationship between cyclic control position, disc attitude, fuselage attitude and air speed;

(B) flapback;

(C) power required diagram in relation to air speed;

(D) power and air speed changes in level flight;

(E) use of instruments for precision;

(F) engine and air speed limitations.

(vii) Exercise 6a: Straight and level:

(A) at normal cruising power, attaining and maintaining straight and level flight;

(B) control in pitch, including use of control friction or trim;

(C) maintaining direction and balance, (ball or yawstring use);

(D) setting power for selected air speeds and speed changes;

(E) use of instruments for precision.

(viii) Exercise 6b: Climbing:

(A) optimum climb speed, best angle or rate of climb from power required diagram;

(B) initiation, maintaining the normal and maximum rate of climb, levelling off;

(C) levelling off at selected altitudes or heights;

(D) use of instruments for precision.

(ix) Exercise 6c: Descending:

(A) optimum descent speed and best angle or rate of descent from power required diagram;

(B) initiation, maintaining and levelling off;

(C) levelling off at selected altitudes or heights;

(D) descent (including effect of power and air speed);

(E) use of instruments for precision.

(x) Exercise 6d: Turning:

(A) initiation and maintaining medium level turns;

(B) resuming straight flight;

(C) altitude, bank and coordination;

(D) climbing and descending turns and effect on rate of climb or descent;

(E) turns onto selected headings, use of gyro heading indicator and compass;

(F) use of instruments for precision.

(xi) Exercise 7: Basic autorotation:

(A) safety checks, verbal warning and look-out;

(B) entry, development and characteristics;

(C) control of air speed and RRPM, rotor and engine limitations;

(D) effect of AUM, IAS, disc loading, G-forces and density altitude

(E) re-engagement and go-around procedures (throttle over-ride or ERPM control);

(F) vortex condition during recovery;

(G) gentle and medium turns in autorotation;

(H) demonstration of variable flare simulated engine off landing.

(xii) Exercise 8a: Hovering:

(A) demonstrate hover IGE, importance of wind effect and attitude, ground cushion, stability in the hover, effects of over controlling;

(B) student holding cyclic stick only;

(C) student handling collective lever (and throttle) only;

(D) student handling collective lever, (throttle) and pedals;

(E) student handling all controls;

(F) demonstration of ground effect;

(G) demonstration of wind effect;

(H) demonstrate gentle forward running touchdown;

(I) specific hazards, for example snow, dust and litter.

(xiii) Exercise 8b: Hover taxiing and spot turns:

(A) revise hovering;

(B) precise ground speed and height control;

(C) effect of wind direction on helicopter attitude and control margin;

(D) control and coordination during spot turns;

(E) carefully introduce gentle forward running touchdown.

(xiv) Exercise 8c: Hovering and taxiing emergencies:

(A) revise hovering and gentle forward running touchdown, explain (demonstrate where applicable) effect of hydraulics failure in the hover;

(B) demonstrate simulated engine failure in the hover and hover taxi.

(C) demonstrate dangers of mishandling and over-pitching.

(xv) Exercise 9: Take-off and landing

(A) pre-take-off checks or drills;

(B) look-out;

(C) lifting to hover;

(D) after take-off checks;

(E) danger of horizontal movement near ground;

(F) danger of mishandling and overpitching;

(G) landing (without sideways or backwards movement);

(H) after landing checks or drills;

(I) take-off and landing crosswind and downwind.

(xvi) Exercise 10: Transitions from hover to climb and approach to hover:

(A) look-out;

(B) revise take-off and landing;

(C) ground effect, translational lift and its effects;

(D) flapback and its effects;

(E) effect of wind speed and direction during transitions from or to the hover;

(F) the constant angle approach;

(G) demonstration of variable flare simulated engine off landing.

(xvii) Exercise 11a: Circuit, approach and landing:

(A) revise transitions from hover to climb and approach to hover;

(B) circuit procedures, downwind and base leg;

(C) approach and landing with power;

(D) pre-landing checks;

(E) effect of wind on approach and IGE hover

(F) crosswind approach and landing;

(G) go-around;

(H) noise abatement procedures.

(xviii) Exercise 11b: Steep and limited power approaches and landings:

(A) revise the constant angle approach;

(B) the steep approach (explain danger of high sink rate and low air speed);

(C) limited power approach (explain danger of high speed at touch down);

(D) use of the ground effect;

(E) variable flare simulated engine off landing.

(xix) Exercise 11c: Emergency procedures:

(A) abandoned take-off;

(B) missed approach and go-around;

(C) hydraulic off landing (if applicable);

(D) tail rotor control or tail rotor drive failure (briefing only);

(E) simulated emergencies in the circuit to include:

(F) hydraulics failure;

(G) simulated engine failure on take-off, crosswind, downwind and base leg;

(H) governor failure.

(xx) Exercise 12: First solo:

(A) instructor’s briefing, observation of flight and debriefing;

(B) warn of change of attitude from reduced and laterally displaced weight;

(C) warn of low tail, low skid or wheel during hover and landing;

(D) warn of dangers of loss of RRPM and overpitching;

(E) pre-take-off checks;

(F) into wind take-off;

(G) procedures during and after take-off;

(H) normal circuit, approaches and landings;

(I) action if an emergency.

(xxi) Exercise 13: Sideways and backwards hover manoeuvring:

(A) manoeuvring sideways flight heading into wind;

(B) manoeuvring backwards flight heading into wind;

(C) combination of sideways and backwards manoeuvring;

(D) manoeuvring sideways and backwards, heading out of wind;

(E) stability and weather cocking;

(F) recovery from backwards manoeuvring, (pitch nose down);

(G) groundspeed limitations for sideways and backwards manoeuvring.

(xxii) Exercise 14: Spot turns:

(A) revise hovering into wind and downwind;

(B) turn on spot through 360°:

(a) around pilots position;

(b) around tail rotor;

(c) around helicopter geometric centre;

(d) square and safe visibility clearing turn.

(C) rotor RPM control, torque effect, cyclic limiting stops due to CG position and wind speed and direction.

(xxiii) Exercise 15: Hover OGE and vortex ring:

(A) establishing hover OGE;

(B) drift, height or power control;

(C) demonstration of incipient stage of vortex ring, recognition and recovery (from a safe altitude);

(D) loss of tail rotor effectiveness.

(xxiv) Exercise 16: Simulated EOL:

(A) the effect of weight, disc loading, density attitude and RRPM decay;

(B) revise basic autorotation entry;

(C) optimum use of cyclic and collective to control speed or RRPM;

(D) variable flare simulated EOL;

(E) demonstrate constant attitude simulated EOL;

(F) demonstrate simulated EOL from hover or hover taxi;

(G) demonstrate simulated EOL from transition and low level.

(xxv) Exercise 17: Advanced autorotation:

(A) over a selected point at various height and speed;

(B) revise basic autorotation: note ground distance covered;

(C) range autorotation;

(D) low speed autorotation;

(E) constant attitude autorotation (terminate at safe altitude);

(F) ‘S’ turns;

(G) turns through 180° and 360°;

(H) effects on angles of descent, IAS, RRPM and effect of AUM.

(xxvi) Exercise 18: Practice forced landings:

(A) procedure and choice of the forced landing area;

(B) forced landing checks and crash action;

(C) re-engagement and go-around procedures.

(xxvii) Exercise 19: Steep turns:

(A) steep (level) turns (30° bank);

(B) maximum rate turns (45° bank if possible);

(C) steep autorotative turns;

(D) faults in the turn: balance, attitude, bank and coordination;

(E) RRPM control and disc loading;

(F) vibration and control feedback;

(G) effect of wind at low level.

(xxviii) Exercise 20: Transitions:

(A) revise ground effect, translational lift and flapback;

(B) maintaining constant height, (20–30 ft AGL):

(C) transition from hover to minimum 50 knots IAS and back to hover;

(D) demonstrate effect of wind.

(xxix) Exercise 21: Quick stops:

(A) use of power and controls;

(B) effect of wind;

(C) quick stops into wind;

(D) quick stops from crosswind and downwind terminating into wind;

(E) danger of vortex ring;

(F) danger of high disc loading.

(xxx) Exercise 22a: Navigation:

(A) Flight planning:

(a) weather forecast and actuals;

(b) map selection and preparation and use:

(1) choice of route;

(2) controlled airspace, danger and prohibited areas;

(3) safety altitudes and noise abatement considerations.

(c) calculations:

(1) magnetic heading(s) and time(s) en-route;

(2) fuel consumption;

(3) mass and balance.

(d) flight information:

(1) NOTAMs, etc.;

(2) radio frequencies;

(3) selection of alternate landing sites.

(e) helicopter documentation;

(f) notification of the flight:

(1) pre-flight administrative procedures;

(2) flight plan form (where appropriate).

(B) Departure:

(a) organisation of cockpit workload;

(b) departure procedures:

(1) altimeter settings;

(2) ATC liaison in regulated airspace;

(3) setting heading procedure;

(4) noting of ETAs.

(c) maintenance of height or altitude and heading;

(d) revisions of ETA and heading:

(1) 10° line, double track, track error and closing angle;

(2) 1 in 60 rule;

(3) amending an ETA.

(e) log keeping;

(f) use of radio;

(g) minimum weather conditions for continuation of flight;

(h) in-flight decisions;

(i) transiting controlled or regulated airspace;

(j) uncertainty of position procedure;

(k) lost procedure.

(C) Arrival and aerodrome joining procedure:

(a) ATC liaison in regulated airspace;

(b) altimeter setting;

(c) entering the traffic pattern;

(d) circuit procedures;

(e) parking;

(f) security of helicopter;

(g) refuelling;

(h) closing of flight plan, (if appropriate);

(i) post-flight administrative procedures.

(xxxi) Exercise 22b: Navigation problems at low heights and in reduced visibility:

(A) actions before descending;

(B) hazards (for example obstacles and other aircraft);

(C) difficulties in map reading;

(D) effects of wind and turbulence;

(E) avoidance of noise-sensitive areas;

(F) actions in case of DVE;

(G) decision to divert or make a precautionary landing;

(H) bad-weather circuit and landing;

(I) appropriate procedures and choice of landing area;

(J) precautionary landing.

(xxxii) Exercise 22c: Radio navigation (basics):

(A) Use of GNNS or VOR/NDB:

(a) selection of waypoints;

(b) to or from indications or orientation;

(c) error messages.

(B) Use of VHF/DF:

(a) availability, AIP and frequencies;

(b) R/T procedures and ATC liaison;

(c) obtaining a QDM and homing.

(C) Use of en-route or terminal radar:

(a) availability and AIP;

(b) procedures and ATC liaison;

(c) pilot's responsibilities;

(d) secondary surveillance radar:

(1) transponders;

(2) code selection;

(3) interrogation and reply.

(xxxiii) Exercise 23: Advanced take-off, landings and transitions:

(A) landing and take-off out of wind (performance reduction);

(B) ground effect, translational lift and directional stability variation when out of wind;

(C) downwind transitions;

(D) vertical take-off over obstacles;

(E) reconnaissance of landing site;

(F) running landing;

(G) zero speed landing;

(H) crosswind and downwind landings;

(I) steep approach;

(J) go-around.

(xxxiv) Exercise 24: Sloping ground:

(A) limitations and assessing slope angle;

(B) wind and slope relationship: blade and control stops;

(C) effect of CG when on slope;

(D) ground effect on slope and power required;

(E) right skid up slope;

(F) left skid up slope;

(G) nose up slope;

(H) avoidance of dynamic roll over, dangers soft ground and sideways movement on touchdown;

(I) danger of striking main or tail rotor by harsh control movement near ground.

(xxxv) Exercise 25: Limited power:

(A) take-off power check;

(B) vertical take-off over obstacles;

(C) in-flight power check;

(D) running landing;

(E) zero speed landing;

(F) approach to low hover;

(G) approach to hover;

(H) approach to hover OGE;

(I) steep approach;

(J) go-around.

(xxxvi) Exercise 26: Confined areas:

(A) landing capability and performance assessment;

(B) locating landing site and assessing wind speed and direction;

(C) reconnaissance of landing site;

(D) select markers;

(E) select direction and type of approach;

(F) circuit;

(G) approach to committed point and go-around;

(H) approach;

(I) clearing turn;

(J) landing;

(K) power check and performance assessment in and OGE;

(L) normal take-off to best angle of climb speed;

(M) vertical take-off from hover.

AMC1 FCL.115(c) LAPL – Training course

CHANGE OF TRAINING ORGANISATION

In cases where the applicant completes the training course (theoretical knowledge instruction or flight instruction) at a different DTO or ATO ('completing training organisation') from the one where they have started the training course ('starting training organisation'), the applicant should request from the starting training organisation a copy of the records kept in accordance with point DTO.GEN.220 or point ORA.ATO.120.

AMC1 FCL.115; FCL.120 LAPL training course and theoretical knowledge examination

SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE LAPL

(a) The training and examination should cover aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated with the licence and the activity. The DTO or the ATO responsible for the training has to check if all the appropriate elements of the training course of theoretical knowledge instruction have been completed to a satisfactory standard before recommending the applicant for the examination.

(b) The following tables contain the syllabi for the courses of theoretical knowledge, as well as for the theoretical knowledge examinations for the LAPL(B) and LAPL(S). The syllabi for the theoretical knowledge instruction and examination for the PPL(A) and PPL(H) in AMC1 FCL.210; FCL.215 should be used for the LAPL(A) and the LAPL(H), respectively.

I. COMMON SUBJECTS

[FOR LAPL(S) AND LAPL(B)]

1.	**AIR LAW AND ATC PROCEDURES**
1.1.	International law: conventions, agreements and organisations
1.2.	Airworthiness of aircraft
1.3.	Aircraft nationality and registration marks
1.4.	Personnel licensing
1.5.	Rules of the air
1.6.	Procedures for air navigation: aircraft operations
1.7.	Air traffic regulations: airspace structure
1.8.	ATS and air traffic management
1.9.	AIS
1.10.	Aerodromes, external take-off sites
1.11.	Search and rescue
1.12.	Security
1.13.	Accident reporting
1.14.	National law

2.	**HUMAN PERFORMANCE**
2.1.	Human factors: basic concepts
2.2.	Basic aviation physiology and health maintenance
2.3.	Basic aviation psychology
3.	**METEOROLOGY**
3.1.	The atmosphere
3.2.	Wind
3.3.	Thermodynamics
3.4.	Clouds and fog
3.5.	Precipitation
3.6.	Air masses and fronts
3.7	Pressure systems
3.8.	Climatology
3.9.	Flight hazards
3.10.	Meteorological information
4.	**COMMUNICATIONS**
4.1.	VFR communications
4.2.	Definitions
4.3.	General operating procedures
4.4.	Relevant weather information terms (VFR)
4.5.	Action required to be taken in case of communication failure
4.6.	Distress and urgency procedures
4.7.	General principles of VHF propagation and allocation of frequencies

II. ADDITIONAL SUBJECTS FOR EACH CATEGORY

II.A SAILPLANES

5.	**PRINCIPLES OF FLIGHT - SAILPLANE**
5.1.	Aerodynamics (airflow)
5.2.	Flight mechanics
5.3.	Stability
5.4.	Control
5.5.	Limitations (load factor and manoeuvres)
5.6.	Stalling and spinning
6.	**OPERATIONAL PROCEDURES - SAILPLANE**
6.1.	General requirements
6.2.	Launch methods
6.3.	Soaring techniques
6.4.	Circuits and landing
6.5.	Outlanding
6.6.	Special operational procedures and hazards
6.7.	Emergency procedures
7.	**FLIGHT PERFORMANCE AND PLANNING - SAILPLANE**
7.1.	Verifying mass and balance

7.2.	Speed polar of sailplanes or cruising speed
7.3.	Flight planning and task setting
7.4.	ICAO flight plan (ATS flight plan)
7.5.	Flight monitoring and in-flight re-planning
8.	**AIRCRAFT GENERAL KNOWLEDGE, AIRFRAME AND SYSTEMS AND EMERGENCY EQUIPMENT – SAILPLANE**
8.1.	Airframe
8.2.	System design, loads and stresses
8.3.	Landing gear, wheels, tyres and brakes
8.4.	Mass and balance
8.5.	Flight controls
8.6.	Instruments
8.7.	Manuals and documents
8.8.	Airworthiness and maintenance
9.	**NAVIGATION – SAILPLANE**
9.1.	Basics of navigation
9.2.	Magnetism and compasses
9.3.	Charts
9.4.	Dead reckoning navigation
9.5.	In-flight navigation
9.6.	Global navigation satellite systems

II.B. BALLOONS

5.	**PRINCIPLES OF FLIGHT – BALLOON**
5.1.	Principles of flight
5.2.	Aerostatics
5.3.	Loading limitations
5.4.	Operational limitations
6.	**OPERATIONAL PROCEDURES – BALLOON**
6.1.	General requirements
6.2.	Special operational procedures and hazards (general aspects)
6.3.	Emergency procedures
7.	**FLIGHT PERFORMANCE AND PLANNING – BALLOON**
7.1.	Mass
7.1.1.	Purpose of mass considerations
7.1.2.	Loading
7.2.	Performance
7.2.1.	Performance: general
7.3.	Flight planning and flight monitoring
7.3.1.	Flight planning: general
7.3.2.	Fuel planning
7.3.3.	Pre-flight preparation
7.3.4.	ICAO flight plan (ATS flight plan)

7.3.5.	Flight monitoring and in-flight re-planning
8.	**AIRCRAFT GENERAL KNOWLEDGE, ENVELOPE AND SYSTEMS AND EMERGENCY EQUIPMENT – BALLOON**
8.1.	System design, loads, stresses and maintenance
8.2.	Envelope
8.3.	Burner (hot-air balloon and hot-air airship)
8.4.	Fuel cylinders (hot-air balloon or hot-air airship)
8.5.	Basket or gondola
8.6.	Lifting gas (gas balloon)
8.7.	Burning gas (hot-air balloon or hot-air airship)
8.8.	Ballast (gas balloon)
8.9.	Engine (hot-air airship only)
8.10.	Instruments
8.11.	Emergency equipment
9.	**NAVIGATION – BALLOON**
9.1.	General navigation
9.2.	Basics of navigation
9.3.	Magnetism and compasses
9.4.	Charts
9.5.	Dead reckoning navigation
9.6.	In-flight navigation
9.7.	GNSS

AMC1 FCL.120; FCL.125

THEORETICAL KNOWLEDGE EXAMINATION AND SKILL TEST FOR THE LAPL

(a) Theoretical knowledge examination

(1) The examinations should be in written form and should comprise a total of 120 multiple-choice questions covering all the subjects.

(2) For the subject ‘communication’ practical classroom testing may be conducted.

(3) The CAA should inform applicants of the language(s) in which the examinations will be conducted.

(b) Skill test

Further training may be required following any failed skill test or part thereof. There should be no limit to the number of skill tests that may be attempted.

(c) Conduct of the test

(1) If the applicant chooses to terminate a skill test for reasons considered inadequate by the FE, the applicant should retake the entire skill test. If the

test is terminated for reasons considered adequate by the FE, only those sections not completed should be tested in a further flight.

(2) Any manoeuvre or procedure of the test may be repeated once by the applicant. The FE may stop the test at any stage if it is considered that the applicant's demonstration of flying skill requires a complete retest.

(3) An applicant should be required to fly the aircraft from a position where the PIC functions can be performed and to carry out the test as if there is no other crew member. Responsibility for the flight should be allocated in accordance with applicable MCARs.

AMC1 FCL.125 LAPL – Skill test

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(A)

(a) The route to be flown for the skill test should be chosen by the FE. The route should end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test should have a duration of at least 30 minutes which allows the pilot to demonstrate his/her ability to complete a route with at least two identified waypoints and may, as agreed between applicant and FE, be flown as a separate test.

(b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the flight manual or the authorised checklist for the aeroplane or TMG on which the test is being taken. During pre-flight preparation for the test the applicant should be required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the aeroplane or TMG used.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the aeroplane or TMG within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgment and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the aeroplane or TMG at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

(d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the aeroplane or TMG used:

(1) height: normal flight ± 150 ft

(2) speed:

(i) take-off and approach +15/-5 knots

(ii) all other flight regimes ± 15 knots

CONTENT OF THE SKILL TEST

(e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(A):

SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE	
Use of checklist, airmanship, control of aeroplane or TMG by external visual reference, anti/de-icing procedures, etc. apply in all sections.	
a	Pre-flight documentation, NOTAM and weather briefing
b	Mass and balance and performance calculation
c	Aeroplane or TMG inspection and servicing
d	Engine starting and after starting procedures
e	Taxiing and aerodrome procedures, pre-take-off procedures
f	Take-off and after take-off checks
g	Aerodrome departure procedures
h	ATC liaison: compliance
SECTION 2 GENERAL AIRWORK	
a	ATC liaison
b	Straight and level flight, with speed changes
c	Climbing: i. best rate of climb; ii. climbing turns iii. levelling off.
d	Medium (30° bank) turns, look-out procedures and collision avoidance
e	Steep (45 ° bank) turns
f	Flight at critically low air speed with and without flaps
g	Stalling: i. clean stall and recover with power; ii. approach to stall descending turn with bank angle 20 °, approach configuration; iii. approach to stall in landing configuration.
h	Descending: i. with and without power; ii. descending turns (steep gliding turns); iii. levelling off.
SECTION 3 EN-ROUTE PROCEDURES	
a	Flight plan, dead reckoning and map reading
b	Maintenance of altitude, heading and speed
c	Orientation, airspace structure, timing and revision of ETAs, log keeping
d	Diversion to alternate aerodrome (planning and implementation)
e	Flight management (checks, fuel systems, carburettor icing, etc.)

f	ATC liaison: compliance
SECTION 4 APPROACH AND LANDING PROCEDURES	
a	Aerodrome arrival procedures
b	Collision avoidance (look-out procedures)
c	Precision landing (short field landing) and crosswind, if suitable conditions available
d	Flapless landing (if applicable)
e	Approach to landing with idle power
f	Touch and go
g	Go-around from low height
h	ATC liaison
i	Actions after flight
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
This section may be combined with Sections 1 through 4	
a	Simulated engine failure after take-off
b	* Simulated forced landing
c	* Simulated precautionary landing
d	Simulated emergencies
e	Oral questions

* These items may be combined, at the discretion of the FE.

AMC2 FCL.125 LAPL – Skill test

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(H)

(a) The area and route to be flown for the skill test should be chosen by the FE. The route should end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test should consist of at least two legs, each leg of a minimum duration of 10 minutes. The skill test may be conducted in two flights.

(b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the flight manual or the authorised checklist or pilot operating handbook for the helicopter on which the test is being taken. During pre-flight preparation for the test the applicant should be required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the helicopter used.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the helicopter within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgment and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the helicopter at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

(d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the helicopter used:

(1) height:

(i) normal forward flight ± 150 ft

(ii) with simulated major emergency ± 200 ft

(iii) hovering IGE flight ± 2 ft

(2) speed:

(i) take-off approach +15 knots /-10 knots

(ii) all other flight regimes ± 15 knots

(3) round drift:

(i) take-off hover IGE ± 3 ft

(ii) landing no sideways or backward movement

CONTENT OF THE SKILL TEST

(e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(H):

SECTION 1 PRE-FLIGHT OR POST-FLIGHT CHECKS AND PROCEDURES	
Use of checklist, airmanship, control of helicopter by external visual reference, anti/de-icing procedures, etc. apply in all sections.	
a	Helicopter knowledge (for example technical log, fuel, mass and balance, performance), flight planning, NOTAM, and weather briefing
b	Pre-flight inspection or action, location of parts and purpose
c	Cockpit inspection, starting procedure
d	Communication and navigation equipment checks, selecting and setting frequencies
e	Pre-take-off procedure and ATC liaison
f	Parking, shutdown and post-flight procedure
SECTION 2 HOVER MANOEUVRES, ADVANCED HANDLING AND CONFINED AREAS	
a	Take-off and landing (lift off and touch down)
b	Taxi and hover taxi
c	Stationary hover with head, cross and tail wind
d	Stationary hover turns, 360° left and right (spot turns)
e	Forward, sideways and backwards hover manoeuvring
f	Simulated engine failure from the hover
g	Quick stops into and downwind

h	Sloping ground or unprepared sites landings and take-offs
i	Take-offs (various profiles)
j	Crosswind and downwind take-off (if practicable)
k	Take-off at maximum take-off mass (actual or simulated)
l	Approaches (various profiles)
m	Limited power take-off and landing
n	Autorotations (FE to select two items from the following: basic, range, low speed, and 360° turns)
o	Autorotative landing
p	Practice forced landing with power recovery
q	Power checks, reconnaissance technique, approach and departure technique
SECTION 3 NAVIGATION AND EN-ROUTE PROCEDURES	
a	Navigation and orientation at various altitudes or heights and map reading
b	Altitude or height, speed, heading control, observation of airspace and altimeter setting
c	Monitoring of flight progress, flight-log, fuel usage, endurance, ETA, assessment of track error, re-establishment of correct track and instrument monitoring
d	Observation of weather conditions and diversion planning
e	Collision avoidance (look-out procedures)
f	ATC liaison with due observance of regulations
SECTION 4 FLIGHT PROCEDURES AND MANOEUVRES	
a	Level flight, control of heading, altitude or height and speed
b	Climbing and descending turns to specified headings
c	Level turns with up to 30 ° bank, 180 ° to 360 ° left and right
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES (SIMULATED WHERE APPROPRIATE)	
Note: The FE selects 4 items from the following:	
a	Engine malfunctions, including governor failure, carburettor or engine icing and oil system, as appropriate
b	Fuel system malfunction
c	Electrical system malfunction
d	Hydraulic system malfunction, including approach and landing without hydraulics, as applicable
e	Main rotor or anti-torque system malfunction (FFS or discussion only)
f	Fire drills, including smoke control and removal, as applicable
g	Other abnormal and emergency procedures as outlined in appropriate flight manual

AMC1 FCL.125; FCL.235

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(S) AND OF AN SPL

(a) An applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.

(b) The applicant should indicate to the FE the checks and duties carried out.

Checks should be completed in accordance with the flight manual or the authorised checklist for the sailplane on which the test is being taken.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the sailplane within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgment and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the sailplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

CONTENT OF THE SKILL TEST

(d) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(S) and of an SPL:

SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE	
Use of checklist, airmanship (control of sailplane by external visual reference), look-out. Apply in all sections.	
a	Pre-flight sailplane (daily) inspection, documentation, NOTAM and weather briefing
b	Verifying in-limits mass and balance and performance calculation
c	Sailplane servicing compliance
d	Pre-take-off checks
SECTION 2 LAUNCH METHOD Note: at least for one of the three launch methods all the mentioned items are fully exercised during the skill test	
SECTION 2 (A) WINCH OR CAR LAUNCH	
a	Signals before and during launch, including messages to winch driver
b	Adequate profile of winch launch
c	Simulated launch failure
d	Situational awareness
SECTION 2 (B) AEROTOW LAUNCH	
a	Signals before and during launch, including signals to or communications with tow plane pilot for any problems
b	Initial roll and take-off climb
c	Launch abandonment (simulation only or ‘talk-through’)
d	Correct positioning during straight flight and turns
e	Out of position and recovery
f	Correct release from tow
g	Look-out and airmanship through whole launch phase
SECTION 2 (C) SELF-LAUNCH (powered sailplanes only)	

a	ATC compliance (if applicable)
b	Aerodrome departure procedures
c	Initial roll and take-off climb
d	Look-out and airmanship during the whole take-off
e	Simulated engine failure after take-off
f	Engine shut down and stowage
SECTION 3 GENERAL AIRWORK	
a	Maintain straight flight: attitude and speed control
b	Coordinated medium (30 ° bank) turns, look-out procedures and collision avoidance
c	Turning on to selected headings visually and with use of compass
d	Flight at high angle of attack (critically low air speed)
e	Clean stall and recovery
f	Spin avoidance and recovery
g	Steep (45 ° bank) turns, look-out procedures and collision avoidance
h	Local area navigation and awareness
SECTION 4 CIRCUIT, APPROACH AND LANDING	
a	Aerodrome circuit joining procedure
b	Collision avoidance: look-out procedures
c	Pre-landing checks
d	Circuit, approach control and landing
e	Precision landing (simulation of out-landing and short field)
f	Crosswind landing if suitable conditions available

AMC2 FCL.125; FCL.235

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(B) AND A BPL

(a) The take-off site should be chosen by the applicant depending on the actual meteorological conditions, the area which has to be over flown and the possible options for suitable landing sites. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.

(b) An applicant should indicate to the FE the checks and duties carried out. Checks should be completed in accordance with the flight manual or the authorised checklist for the balloon on which the test is being taken. During pre-flight preparation for the test the applicant should be required to perform crew and passenger briefings and demonstrate crowd control. The load calculation should be performed by the applicant in compliance with the operations manual or flight manual for the balloon used.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the balloon within its limitations;

(2) complete all manoeuvres with smoothness and accuracy

(3) exercise good judgment and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the balloon at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

CONTENT OF THE SKILL TEST

(d) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (hot-air balloon) and a BPL (hot-air balloon):

SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF	
Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.	
a	Pre-flight documentation, flight planning, NOTAM and weather briefing
b	Balloon inspection and servicing
c	Load calculation
d	Crowd control, crew and passenger briefings
e	Assembly and layout
f	Inflation and pre-take-off procedures
g	Take-off
h	ATC compliance(if applicable)
SECTION 2 GENERAL AIRWORK	
a	Climb to level flight
b	Level flight
c	Descent to level flight
d	Operating at low level
e	ATC compliance (if applicable)
SECTION 3 EN-ROUTE PROCEDURES	
a	Dead reckoning and map reading
b	Marking positions and time
c	Orientation and airspace structure
d	Maintenance of altitude
e	Fuel management
f	Communication with retrieve crew
g	ATC compliance
SECTION 4 APPROACH AND LANDING PROCEDURES	
a	Approach from low level, missed approach and fly on
b	Approach from high level, missed approach and fly on
c	Pre-landing checks
d	Passenger pre-landing briefing
e	Selection of landing field
f	Landing, dragging and deflation

g	ATC compliance (if applicable)
h	Actions after flight
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
a	Simulated fire on the ground and in the air
b	Simulated pilot light and burner failures
c	Other abnormal and emergency procedures as outlined in the appropriate flight manual.
d	Oral questions

(e) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (gas balloon) and a BPL (gas balloon):

SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF	
Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.	
a	Pre-flight documentation, flight planning, NOTAM and weather briefing
b	Balloon inspection and servicing
c	Load calculation
d	Crowd control, crew and passenger briefings
e	Assembly and layout
f	Inflation and pre-take-off procedures
g	Take-off
h	ATC compliance (if applicable)
SECTION 2 GENERAL AIRWORK	
a	Climb to level flight
b	Level flight
c	Descent to level flight
d	Operating at low level
e	ATC compliance (if applicable)
SECTION 3 EN-ROUTE PROCEDURES	
a	Dead reckoning and map reading
b	Marking positions and time
c	Orientation and airspace structure
d	Maintenance of altitude
e	Ballast management
f	Communication with retrieve crew
g	ATC compliance
SECTION 4 APPROACH AND LANDING PROCEDURES	
a	Approach from low level, missed approach and fly on
b	Approach from high level, missed approach and fly on
c	Pre-landing checks
d	Passenger pre-landing briefing
e	Selection of landing field
f	Landing, dragging and deflation

g	ATC compliance (if applicable)
h	Actions after flight
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
a	Simulated closed appendix during take-off and climb
b	Simulated parachute or valve failure
c	Other abnormal and emergency procedures as outlined in the appropriate flight manual
d	Oral questions

SECTION 2 – SPECIFIC REQUIREMENTS FOR THE LAPL FOR AEROPLANES – LAPL(A)

AMC1 FCL.105.A(b)(2) Privileges and conditions

In the case of previous MPL(A) holders, only those who extended their MPL(A) to include CPL privileges or PPL privileges in accordance with point FCL.405.A(b) may benefit from the exemption of point FCL.105.A(b)(2).

AMC1 FCL.115.A LAPL(A) – Training course

CREDITING: PRE-ENTRY FLIGHT TEST

The pre-entry flight test referred to in FCL.110.A(c) should cover the total content of the syllabus of flight instruction for the issuance of the LAPL(A), in accordance with AMC1 FCL.115.

GM1 FCL.135.A; FCL.135.H

DIFFERENCES AND FAMILIARISATION TRAINING

(a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or the aircraft.

(b) Familiarisation training requires the acquisition of additional knowledge.

AMC1 FCL.140.A; FCL.140.S; FCL.740.A(b)(1)(ii) Recency and revalidation requirements

All hours flown on aeroplanes or sailplanes that are subject to a decision as per Article 2(8) of the Basic Regulation or that are specified in Annex I to the Basic Regulation should count in full towards fulfilling the hourly requirements of points FCL.140.A, FCL.140.S, and FCL.740.A(b)(1)(ii) under the following conditions:

(a) the aircraft matchesthe definition and criteria of the respective MCAR-FCL aircraft category, class, and type ratings; and

(b) the aircraft that is used for training flights with an instructor is an Annex-I aircraft of type (a), (b), (c), or (d) that is subject to an authorisation specified in points ORA.ATO.135 or DTO.GEN.240.

AMC1 FCL.140.A; FCL.140.H; FCL.140.S; FCL.140.B Recency requirements

Training flight items should be based on the exercise items of the proficiency check, as deemed relevant by the instructor, and depending on the experience of the candidate. For aeroplanes and helicopters, the briefing should include a discussion on TEM with special emphasis on decision-making when encountering adverse meteorological conditions or unintentional IMC, as well as on navigation flight capabilities. For sailplanes and balloons, the discussion should place special emphasis on principal occurrence categories of the activity that is covered by the licence.

AMC1 FCL.140.A(b)(1) LAPL(A) Recency requirements

The proficiency check should follow the content of the skill test that is set out in AMC1 FCL.125, point (e).

SECTION 3 – SPECIFIC REQUIREMENTS FOR THE LAPL FOR HELICOPTERS – LAPL(H)

AMC1 FCL.110.H LAPL(H) Experience requirements and crediting

CREDITING: PRE-ENTRY FLIGHT TEST

The pre-entry flight test referred to in FCL.110.H(b) should cover the total content of the syllabus of flight instruction for the issuance of the LAPL(H), in accordance with AMC2 FCL.115.

GM1 FCL.135.A; FCL.135.H

DIFFERENCES AND FAMILIARISATION TRAINING

(a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or the aircraft.

(b) Familiarisation training requires the acquisition of additional knowledge.

AMC1 FCL.140.H(b)(1) LAPL(H) Recency requirements

The proficiency check should follow the content of the skill test that is set out in AMC2 FCL.125, point (e).

SUBPART C – PRIVATE PILOT LICENCE (PPL)

SECTION 1 – COMMON REQUIREMENTS

AMC1 FCL.210 PPL(A) Training course

FLIGHT INSTRUCTION FOR THE PPL(A)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Flight instruction

(1) The PPL(A) flight instruction syllabus takes into account the principles of threat and error management and also covers:

(i) pre-flight operations, including mass and balance determination, aircraft inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

(iii) control of the aircraft by external visual reference;

(iv) flight at critically low air speeds, recognition of, and recovery from, incipient and full stalls;

(v) flight at critically high air speeds, recognition of, and recovery from, spiral dive;

(vi) normal and crosswind take-offs and landings;

(vii) maximum performance (short field and obstacle clearance) takeoffs, short-field landings;

(viii) light by reference solely to instruments, including the completion of a level 180 ° turn;

(ix) cross-country flying using visual reference, dead reckoning and radio navigation aids;

(x) emergency operations, including simulated aeroplane equipment malfunctions;

(xi) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures, communication procedures and phraseology.

(2) Before allowing applicants for a PPL(A) to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication and can operate the required systems and equipment.

(c) Syllabus of flight instruction

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(i) the applicant's progress and ability;

(ii) the weather conditions affecting the flight;

(iii) the flight time available;

(iv) instructional technique considerations;

(v) the local operating environment;

(vi) applicability of the exercises to the aeroplane.

(2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.

(i) Exercise 1a: Familiarisation with the aeroplane:

(A) characteristics of the aeroplane;

(B) cockpit layout;

(C) systems;

(D) checklists, drills and controls.

(ii) Exercise 1b: Emergency drills:

(A) action if fire on the ground and in the air;

(B) engine cabin and electrical system fire;

(C) systems failure;

(D) escape drills, location and use of emergency equipment and exits.

(iii) Exercise 2: Preparation for and action after flight:

(A) flight authorisation and aeroplane acceptance;

(B) serviceability documents;

(C) equipment required, maps, etc.;

(D) external checks;

(E) internal checks;

(F) harness, seat or rudder panel adjustments;

(G) starting and warm-up checks;

(H) power checks;

(I) running down system checks and switching off the engine;

(J) parking, security and picketing (for example tie down);

(K) completion of authorisation sheet and serviceability documents.

(iv) Exercise 3: Air experience: flight exercise.

(v) Exercise 4: Effects of controls:

(A) primary effects when laterally level and when banked;

(B) further effects of aileron and rudder;

(C) effects of:

(a) air speed;

(b) slipstream;

(c) power;

(d) trimming controls;

(e) flaps;

(f) other controls, as applicable.

(D) operation of:

(a) mixture control;

(b) carburettor heat;

(c) cabin heating or ventilation.

(vi) Exercise 5a: Taxiing:

(A) pre-taxi checks;

(B) starting, control of speed and stopping;

(C) engine handling;

(D) control of direction and turning;

(E) turning in confined spaces;

(F) parking area procedure and precautions;

(G) effects of wind and use of flying controls;

(H) effects of ground surface;

(I) freedom of rudder movement;

(J) marshalling signals;

(K) instrument checks;

(L) air traffic control procedures.

(vii) Exercise 5b: Emergencies: brake and steering failure.

(viii) Exercise 6: Straight and level:

(A) at normal cruising power, attaining and maintaining straight and level flight;

(B) flight at critically high air speeds;

(C) demonstration of inherent stability;

(D) control in pitch, including use of trim;

(E) lateral level, direction and balance and trim;

(F) at selected air speeds (use of power);

(G) during speed and configuration changes;

(H) use of instruments for precision.

(ix) Exercise 7: Climbing:

(A) entry, maintaining the normal and max rate climb and levelling off;

(B) levelling off at selected altitudes;

(C) en-route climb (cruise climb);

(D) climbing with flap down;

(E) recovery to normal climb;

(F) maximum angle of climb;

(G) use of instruments for precision.

(x) Exercise 8: Descending:

(A) entry, maintaining and levelling off;

(B) levelling off at selected altitudes;

(C) glide, powered and cruise descent (including effect of power and air speed);

(D) side slipping (on suitable types);

(E) use of instruments for precision flight.

(xi) Exercise 9: Turning:

(A) entry and maintaining medium level turns;

(B) resuming straight flight;

(C) faults in the turn (for example in correct pitch, bank and balance);

(D) climbing turns;

(E) descending turns;

(F) faults in the turns (slipping and skidding on suitable types);

(G) turns onto selected headings, use of gyro heading indicator and compass;

(H) use of instruments for precision.

(xii) Exercise 10a: Slow flight:

Note: the objective is to improve the student's ability to recognise inadvertent flight at critically low speeds and provide practice in maintaining the aeroplane in balance while returning to normal air speed.

(A) safety checks;

(B) introduction to slow flight;

(C) controlled flight down to critically slow air speed;

(D) application of full power with correct attitude and balance to achieve normal climb speed.

(xiii) Exercise 10b: Stalling:

(A) safety checks;

(B) symptoms;

(C) recognition;

(D) clean stall and recovery without power and with power;

(E) recovery when a wing drops;

(F) approach to stall in the approach and in the landing configurations, with and without power and recovery at the incipient stage.

(xiv) Exercise 11: Spin avoidance:

(A) safety checks;

(B) stalling and recovery at the incipient spin stage (stall with excessive wing drop, about 45°);

(C) instructor induced distractions during the stall.

Note 1: at least two hours of stall awareness and spin avoidance flight training should be completed during the course.

Note 2: consideration of manoeuvre limitations and the need to refer to the aeroplane manual and mass and balance calculations.

(xv) Exercise 12: Take-off and climb to downwind position:

(A) pre-take-off checks;

(B) into wind take-off;

(C) safeguarding the nose wheel;

(D) crosswind take-off;

(E) drills during and after take-off;

(F) short take-off and soft field procedure/techniques including performance calculations;

(G) noise abatement procedures.

(xvi) Exercise 13: Circuit, approach and landing:

(A) circuit procedures, downwind and base leg;

(B) powered approach and landing;

(C) safeguarding the nose wheel;

(D) effect of wind on approach and touchdown speeds and use of flaps;

(E) crosswind approach and landing;

(F) glide approach and landing;

(G) short landing and soft field procedures or techniques;

(H) flapless approach and landing;

(I) wheel landing (tail wheel aeroplanes);

(J) missed approach and go-around;

(K) noise abatement procedures.

(xvii) Exercise 12/13: Emergencies:

(A) abandoned take-off;

(B) engine failure after take-off;

(C) mislanding and go-around;

(D) missed approach.

Note: in the interests of safety it will be necessary for pilots trained on nose wheel aeroplanes to undergo dual conversion training before flying tail wheel aeroplanes, and vice-versa.

(xviii) Exercise 14: First solo:

(A) instructor’s briefing, observation of flight and de-briefing;

Note: during flights immediately following the solo circuit consolidation the following should be revised:

(B) procedures for leaving and rejoining the circuit;

(C) the local area, restrictions, map reading;

(D) use of radio aids for homing;

(E) urns using magnetic compass, compass errors.

(xix) Exercise 15: Advanced turning:

(A) steep turns (45°), level and descending;

(B) stalling in the turn and recovery;

(C) recoveries from unusual attitudes, including spiral dives.

(xx) Exercise 16: Forced landing without power:

(A) forced landing procedure;

(B) choice of landing area, provision for change of plan;

(C) gliding distance;

(D) descent plan;

(E) key positions;

(F) engine cooling;

(G) engine failure checks;

(H) use of radio;

(I) base leg;

(J) final approach;

(K) landing;

(L) actions after landing.

(xxi) Exercise 17: Precautionary landing:

(A) full procedure away from aerodrome to break-off height;

(B) occasions necessitating;

(C) in-flight conditions;

(D) landing area selection:

(a) normal aerodrome;

(b) disused aerodrome;

(c) ordinary field.

(E) circuit and approach;

(F) actions after landing.

(xxii) Exercise 18a: Navigation:

(A) flight planning:

(a) weather forecast and actuals;

(b) map selection and preparation:

(1) choice of route;

(2) controlled airspace;

(3) danger, prohibited and restricted areas;

(4) safety altitudes.

(c) calculations:

(1) magnetic heading(s) and time(s) en-route;

(2) fuel consumption;

(3) mass and balance;

(4) mass and performance.

(d) flight information:

(1) NOTAMs etc.;

(2) radio frequencies;

(3) selection of alternate aerodromes.

(e) aeroplane documentation;

(f) notification of the flight:

(1) pre-flight administrative procedures;

(2) flight plan form.

(B) departure:

(a) organisation of cockpit workload;

(b) departure procedures:

(1) altimeter settings;

(2) ATC liaison in controlled or regulated airspace;

(3) setting heading procedure;

(4) noting of ETAs.

(c) maintenance of altitude and heading;

(d) revisions of ETA and heading;

(e) log keeping;

(f) use of radio;

(g) use of navaids;

(h) minimum weather conditions for continuation of flight;

(i) in-flight decisions;

(j) transiting controlled or regulated airspace;

(k) diversion procedures;

(l) uncertainty of position procedure;

(m) lost procedure.

(C) arrival and aerodrome joining procedure:

(a) ATC liaison in controlled or regulated airspace;

(b) altimeter setting;

(c) entering the traffic pattern;

(d) circuit procedures;

(e) parking;

(f) security of aeroplane;

(g) refuelling;

(h) closing of flight plan, if appropriate;

(i) post-flight administrative procedures.

(xxiii) Exercise 18b: Navigation problems at lower levels and in reduced visibility:

(A) actions before descending;

(B) hazards (for example obstacles and terrain);

(C) difficulties of map reading;

(D) effects of wind and turbulence;

(E) vertical situational awareness (avoidance of controlled flight into terrain);

(F) avoidance of noise sensitive areas;

(G) joining the circuit;

(H) bad weather circuit and landing.

(xxiv) Exercise 18c: Radio navigation:

(A) use of GNSS:

(a) selection of waypoints;

(b) to or from indications and orientation;

(c) error messages.

(B) use of VHF omni range:

(a) availability, AIP and frequencies;

(b) selection and identification;

(c) OBS;

(d) to or from indications and orientation;

(e) CDI;

(f) determination of radial;

(g) intercepting and maintaining a radial;

(h) VOR passage;

(i) obtaining a fix from two VORs.

(C) use of ADF equipment: NDBs:

(a) availability, AIP and frequencies;

(b) selection and identification;

(c) orientation relative to the beacon;

(d) homing.

(D) use of VHF/DF:

(a) availability, AIP, frequencies;

(b) R/T procedures and ATC liaison;

(c) obtaining a QDM and homing.

(E) use of en-route or terminal radar:

(a) availability and AIP;

(b) procedures and ATC liaison;

(c) pilot’s responsibilities;

(d) secondary surveillance radar:

(1) transponders;

(2) code selection;

(3) interrogation and reply.

(F) use of DME:

(a) station selection and identification;

(b) modes of operation: distance, groundspeed and time to run.

(xxv) Exercise 19: Basic instrument flight:

(A) physiological sensations;

(B) instrument appreciation; attitude instrument flight;

(C) instrument limitations;

(D) basic manoeuvres:

(a) straight and level at various air speeds and configurations;

(b) climbing and descending;

(c) standard rate turns, climbing and descending, onto selected headings;

(d) recoveries from climbing and descending turns.

(d) BITD

(1) A BITD may be used for flight training for:

(i) flight by reference solely to instruments;

(ii) navigation using radio navigation aids;

(iii) basic instrument flight.

(2) The use of the BITD should be subject to the following:

(i) the training should be complemented by exercises on an aeroplane;

(ii) the record of the parameters of the flight must be available;

(iii) A FI(A) or STI(A) should conduct the instruction.

AMC2 FCL.210 PPL(H) – Training course

FLIGHT INSTRUCTION FOR THE PPL(H)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Ground instruction

Enhanced ground instruction in weather interpretation, planning and route assessment, decision making on encountering DVE including reversing course or conducting a precautionary landing.

(c) Flight instruction

(1) The PPL(H) flight instruction syllabus should take into account the principles of threat and error management and cover:

(i) pre-flight operations, including mass and balance determination, helicopter inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

(iii) control of the helicopter by external visual reference;

(iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;

(v) emergency procedures, basic autorotations, simulated engine failure, ground resonance recovery if relevant to type;

(vi) sideways and backwards flight, turns on the spot;

(vii) incipient vortex ring recognition and recovery;

(viii) touchdown autorotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;

(ix) steep turns;

(x) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;

(xi) limited power and confined area operations, including selection of and operations to and from unprepared sites;

(xii) flight by sole reference to basic flight instruments, including completion of a level 180° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud (this training may be conducted by an FI(H));

(xiii) cross-country flying by using visual reference, DR, GNNS and, where available, radio navigation aids; simulation of deteriorating weather conditions and actions to divert or conduct precautionary landing;

(xiv) operations to, from and transiting controlled aerodromes; compliance with air traffic services procedures, communication procedures and phraseology.

(2) Before allowing applicants for a PPL(H) to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication and can operate the required systems and equipment.

(3) Wherever possible, flight simulation should be used to demonstrate to student pilots the effects of flight into DVE and to enhance their understanding and need for avoidance of this potentially fatal flight regime.

(d) Syllabus of flight instruction

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(i) the applicant's progress and ability;

(ii) the weather conditions affecting the flight;

(iii) the flight time available;

(iv) instructional technique considerations;

(v) the local operating environment;

(vi) applicability of the exercises to the helicopter.

(2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.

(i) Exercise 1a: Familiarisation with the helicopter:

(A) characteristics of the helicopter, external features;

(B) cockpit layout;

(C) systems;

(D) checklists, procedures and controls.

(ii) Exercise 1b: Emergency procedures:

(A) action if fire on the ground and in the air;

(B) engine, cabin and electrical system fire;

(C) systems failures;

(D) escape drills, location and use of emergency equipment and exits.

(iii) Exercise 2: Preparation for and action after flight:

(A) flight authorisation and helicopter acceptance;

(B) serviceability documents;

(C) equipment required, maps, etc.;

(D) external checks;

(E) internal checks;

(F) seat, harness and flight controls adjustments;

(G) starting and warm-up checks clutch engagement and starting rotors;

(H) power checks;

(I) running down system checks and switching off the engine;

(J) parking, security and picketing;

(K) completion of authorisation sheet and serviceability documents.

(iv) Exercise 3: Air experience:

(A) to introduce the student to rotary wing flight;

(B) flight exercise.

(v) Exercise 4: Effects of controls:

(A) function of flight controls, primary and secondary effect;

(B) effects of:

(a) air speed;

(b) power changes (torque);

(c) yaw (sideslip);

(d) disc loading (bank and flare);

(e) controls of selecting hydraulics on/off

(f) control friction.

(C) instruments;

(D) use of carburettor heat or anti-icing control.

(vi) Exercise 5: Power and attitude changes:

(A) relationship between cyclic control position, disc attitude, fuselage attitude and air speed;

(B) flapback;

(C) power required diagram in relation to air speed;

(D) power and air speed changes in level flight;

(E) use of instruments for precision;

(F) engine and air speed limitations.

(vii) Exercise 6: Straight and level:

(A) at normal cruising power, attaining and maintaining straight and level flight;

(B) control in pitch, including use of control friction or trim;

(C) maintaining direction and balance, (ball or yawstring use);

(D) setting power for selected air speeds and speed changes;

(E) use of instruments for precision.

(viii) Exercise 7: Climbing:

(A) optimum climb speed, best angle or rate of climb from power required diagram;

(B) initiation, maintaining the normal and maximum rate of climb, levelling off;

(C) levelling off at selected altitudes or heights

(D) use of instruments for precision.

(ix) Exercise 8: Descending:

(A) optimum descent speed, best angle or rate of descent from power required diagram;

(B) initiation, maintaining and levelling off;

(C) levelling off at selected altitudes or heights;

(D) descent (including effect of power and air speed);

(E) use of instruments for precision.

(x) Exercise 9: Turning:

(A) initiation and maintaining medium level turns;

(B) resuming straight flight;

(C) altitude, bank and co-ordination;

(D) climbing and descending turns and effect on rate of climb or descent;

(E) turns onto selected headings, use of gyro heading indicator and compass;

(F) use of instruments for precision.

(xi) Exercise 10: Basic autorotation:

(A) safety checks, verbal warning and look-out;

(B) entry, development and characteristics;

(C) control of air speed and RRPM, rotor and engine limitations;

(D) effect of AUM, IAS, disc loading, G forces and density altitude;

(E) re-engagement and go-around procedures (throttle over-ride or ERPM control);

(F) vortex condition during recovery;

(G) gentle and medium turns in autorotation;

(H) demonstration of variable flare simulated engine off landing.

(xii) Exercise 11a: Hovering:

(A) demonstrate hover IGE, importance of wind effect and attitude, ground cushion, stability in the hover and effects of over controlling;

(B) student holding cyclic stick only;

(C) student handling collective lever (and throttle) only;

(D) student handling collective lever, (throttle) and pedals;

(E) student handling all controls;

(F) demonstration of ground effect;

(G) demonstration of wind effect;

(H) demonstrate gentle forward running touchdown;

(I) specific hazards for example snow, dust and litter.

(xiii) Exercise 11b: Hover taxiing and spot turns:

(A) revise hovering;

(B) precise ground speed and height control;

(C) effect of wind direction on helicopter attitude and control margin;

(D) control and co-ordination during spot turns;

(E) carefully introduce gentle forward running touchdown.

(xiv) Exercise 11c: Hovering and taxiing emergencies:

(A) revise hovering and gentle forward running touchdown, explain (demonstrate where applicable) effect of hydraulics failure in the hover;

(B) demonstrate simulated engine failure in the hover and hover taxi;

(C) demonstrate dangers of mishandling and over-pitching.

(xv) Exercise 12: Take-off and landing:

(A) pre-take-off checks or drills;

(B) look-out;

(C) lifting to hover;

(D) after take-off checks;

(E) danger of horizontal movement near ground;

(F) danger of mishandling and overpitching;

(G) landing (without sideways or backwards movement);

(H) after landing checks or drills;

(I) take-off and landing crosswind and downwind.

(xvi) Exercise 13: Transitions from hover to climb and approach to hover:

(A) look-out;

(B) revise take-off and landing;

(C) ground effect, translational lift and its effects;

(D) flapback and its effects;

(E) effect of wind speed and direction during transitions from or to the hover;

(F) the constant angle approach;

(G) demonstration of variable flare simulated engine off landing.

(xvii) Exercise 14a: Circuit, approach and landing:

(A) revise transitions from hover to climb and approach to hover;

(B) circuit procedures, downwind and base leg;

(C) approach and landing with power;

(D) pre-landing checks;

(E) effect of wind on approach and IGE hover;

(F) crosswind approach and landing;

(G) go-around;

(H) noise abatement procedures.

(xviii) Exercise 14b: Steep and limited power approaches and landings:

(A) revise the constant angle approach;

(B) the steep approach (explain danger of high sink rate and low air speed)

(C) limited power approach (explain danger of high speed at touch down);

(D) use of the ground effect;

(E) variable flare simulated engine off landing.

(xix) Exercise 14c: Emergency procedures:

(A) abandoned take-off;

(B) missed approach and go-around;

(C) hydraulic off landing (if applicable);

(D) tail rotor control or tail rotor drive failure (briefing only)

(E) simulated emergencies in the circuit to include:

(a) hydraulics failure;

(b) simulated engine failure on take-off, crosswind, downwind and base leg;

(c) governor failure.

(xx) Exercise 15: First solo:

(A) instructor's briefing, observation of flight and debriefing;

(B) warn of change of attitude from reduced and laterally displaced weight;

(C) warn of low tail, low skid or wheel during hover, landing;

(D) warn of dangers of loss of RRPM and overpitching;

(E) pre-take-off checks;

(F) into wind take-off;

(G) procedures during and after take-off;

(H) normal circuit, approaches and landings;

(I) action if an emergency.

(xxi) Exercise 16: Sideways and backwards hover manoeuvring:

(A) manoeuvring sideways flight heading into wind;

(B) manoeuvring backwards flight heading into wind;

(C) combination of sideways and backwards manoeuvring;

(D) manoeuvring sideways and backwards and heading out of wind;

(E) stability and weather cocking;

(F) recovery from backwards manoeuvring (pitch nose down);

(G) limitations for sideways and backwards manoeuvring.

(xxii) Exercise 17: Spot turns:

(A) revise hovering into wind and downwind;

(B) turn on spot through 360°:

(a) around pilots position;

(b) around tail rotor;

(c) around helicopter geometric centre;

(d) square and safe visibility clearing turn.

(C) rotor RPM control, torque effect, cyclic limiting stops due to CG position and wind speed and direction.

(xxiii) Exercise 18: Hover OGE and vortex ring:

(A) establishing hover OGE;

(B) drift, height or power control;

(C) demonstration of incipient stage of vortex ring, recognition and recovery (from a safe altitude);

(D) loss of tail rotor effectiveness.

(xxiv) Exercise 19: Simulated EOL:

(A) the effect of weight, disc loading, density attitude and RRPM decay;

(B) revise basic autorotation entry;

(C) optimum use of cyclic and collective to control speed or RRPM;

(D) variable flare simulated EOL;

(E) demonstrate constant attitude simulated EOL;

(F) demonstrate simulated EOL from hover or hover taxi;

(G) demonstrate simulated EOL from transition and low level.

(xxv) Exercise 20: Advanced autorotation:

(A) over a selected point at various height and speed;

(B) revise basic autorotation: note ground distance covered;

(C) range autorotation;

(D) low speed autorotation;

(E) constant attitude autorotation (terminate at safe altitude);

(F) ‘S’ turns;

(G) turns through 180° and 360°;

(H) effects on angles of descent, IAS, RRPM and effect of AUM.

(xxvi) Exercise 21: Practice forced landings:

(A) procedure and choice of the forced landing area;

(B) forced landing checks and crash action;

(C) re-engagement and go-around procedures.

(xxvii) Exercise 22: Steep turns:

(A) steep (level) turns (30° bank);

(B) maximum rate turns (45° bank if possible);

(C) steep autorotative turns;

(D) faults in the turn: balance, attitude, bank and co-ordination;

(E) RRPM control and disc loading;

(F) vibration and control feedback;

(G) effect of wind at low level.

(xxviii) Exercise 23: Transitions:

(A) revise ground effect, translational lift and flapback;

(B) maintaining constant height, (20-30 ft AGL);

(C) transition from hover to minimum 50 knots IAS and back to hover;

(D) demonstrate effect of wind.

(xxix) Exercise 24: Quick stops:

(A) use of power and controls;

(B) effect of wind;

(C) quick stops into wind;

(D) quick stops from crosswind and downwind terminating into wind;

(E) danger of vortex ring;

(F) danger of high disc loading.

(xxx) Exercise 25a: Navigation:

(A) flight planning:

(a) weather forecast and actuals;

(b) map selection and preparation and use;

(1) choice of route:

(2) controlled airspace, danger and prohibited areas;

(3) safety altitudes and noise abatement considerations.

(c) calculations:

(1) magnetic heading(s) and time(s) en-route;

(2) fuel consumption;

(3) mass and balance.

(d) flight information:

(1) NOTAMs, etc.;

(2) radio frequencies;

(e) helicopter documentation;

(f) notification of the flight:

(1) pre-flight administrative procedures;

(2) flight plan form (where appropriate).

(B) departure:

(a) organisation of cockpit workload;

(b) departure procedures:

(1) altimeter settings;

(2) ATC liaison in controlled or regulated airspace;

(3) setting heading procedure;

(4) noting of ETAs.

(c) maintenance of height or altitude and heading;

(d) revisions of ETA and heading:

(1) 10° line, double track and track error and closing angle;

(2) 1 in 60 rule;

(3) amending an ETA.

(e) log keeping;

(f) use of radio;

(g) use of navaids (if fitted);

(h) minimum weather conditions for continuation of flight;

(i) in-flight decisions;

(j) transiting controlled or regulated airspace;

(k) uncertainty of position procedure;

(l) lost procedure.

(C) arrival and aerodrome joining procedure:

(a) ATC liaison in controlled or regulated airspace;

(b) altimeter setting;

(c) entering the traffic pattern;

(d) circuit procedures.

(e) parking;

(f) security of helicopter;

(g) refuelling;

(h) closing of flight plan (if appropriate);

(i) post-flight administrative procedures.

(xxxi) Exercise 25b: Navigation problems at low heights and in reduced visibility:

(A) actions before descending;

(B) hazards (for example obstacles and other aircraft);

(C) difficulties of map reading;

(D) effects of wind and turbulence;

(E) avoidance of noise sensitive areas;

(F) actions in the event of encountering DVE;

(G) decision to divert or conduct precautionary landing;

(H) bad weather circuit and landing;

(I) appropriate procedures and choice of landing area;

(J) precautionary landing.

(xxxii) Exercise 25c: Radio navigation:

(A) use of GNSS:

(a) selection of waypoints;

(b) to or from indications and orientation;

(c) error messages;

(d) hazards of over-reliance on the use of GNSS in the continuation of flight in DVE.

(B) use of VHF omni range:

(a) availability, AIP and frequencies;

(b) selection and identification;

(c) OBS;

(d) to or from indications and orientation;

(e) CDI;

(f) determination of radial;

(g) intercepting and maintaining a radial;

(h) VOR passage;

(i) obtaining a fix from two VORs.

(C) use of ADF equipment: NDBs:

(a) availability, AIP and frequencies;

(b) selection and identification;

(c) orientation relative to the beacon;

(d) homing.

(D) use of VHF/DF:

(a) availability, AIP and frequencies;

(b) RTF procedures and ATC liaison;

(c) obtaining a QDM and homing.

(E) use of en-route or terminal radar:

(a) availability and AIP;

(b) procedures and ATC liaison;

(c) pilots responsibilities;

(d) secondary surveillance radar (if transponder fitted):

(1) transponders;

(2) code selection;

(3) interrogation and reply.

(F) use of DME:

(a) station selection and identification;

(b) modes of operation: distance, groundspeed and time to run.

(xxxiii) Exercise 26: Advanced take-off, landings and transitions:

(A) landing and take-off out of wind (performance reduction);

(B) ground effect, translational lift and directional stability variation when out of wind;

(C) downwind transitions;

(D) vertical take-off over obstacles;

(E) running take-off;

(F) cushion creep take-off;

(G) reconnaissance of landing site;

(H) running landing;

(I) zero speed landing;

(J) crosswind and downwind landings;

(K) steep approach;

(L) go-around.

(xxxiv) Exercise 27: Sloping ground:

(A) limitations and assessing slope angle;

(B) wind and slope relationship: blade and control stops;

(C) effect of CG when on slope;

(D) ground effect on slope and power required;

(E) right skid up slope;

(F) left skid up slope;

(G) nose up slope;

(H) avoidance of dynamic roll over, dangers of soft ground and sideways movement on touchdown;

(I) danger of striking main or tail rotor by harsh control movement near ground.

(xxxv) Exercise 28: Limited power:

(A) take-off power check;

(B) vertical take-off over obstacles;

(C) in-flight power check;

(D) running landing;

(E) zero speed landing;

(F) approach to low hover;

(G) approach to hover;

(H) approach to hover OGE;

(I) steep approach;

(J) go-around.

(xxxvi) Exercise 29: Confined areas:

(A) landing capability and performance assessment;

(B) locating landing site and assessing wind speed and direction;

(C) reconnaissance of landing site;

(D) select markers;

(E) select direction and type of approach;

(F) circuit;

(G) approach to committed point and go-around;

(H) approach;

(I) clearing turn;

(J) landing;

(K) power check and performance assessment in and out of ground effect;

(L) normal take-off to best angle of climb speed;

(M) vertical take-off from hover.

(xxxvii) Exercise 30: Basic instrument flight:

(A) physiological sensations;

(B) instrument appreciation:

(a) attitude instrument flight;

(b) instrument scan.

(C) instrument limitations;

(D) basic manoeuvres:

(a) straight and level at various air speeds and configurations;

(b) climbing and descending;

(c) standard rate turns, climbing and descending, onto selected headings.

(E) recoveries from climbing and descending turns;

(F) recoveries from unusual attitudes.

AMC1 FCL.210(c) Training course

CHANGE OF TRAINING ORGANISATION

In cases where the applicant completes the training course (theoretical knowledge instruction or flight instruction) at a different DTO or ATO ('completing training organisation') from the one where they have started the training course ('starting training organisation'), the applicant should request from the starting training organisation a copy of the records kept in accordance with point DTO.GEN.220 or point ORA.ATO.120

AMC1 FCL.210; FCL.215 Training course and theoretical knowledge examination

SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE PPL(A) AND PPL(H)

The following tables contain the syllabi for the courses of theoretical knowledge, as well as for the theoretical knowledge examinations for the PPL(A) and PPL(H). The training and examination should cover aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated to the licence and the activity.

The DTO or the ATO responsible for the training should check if all the appropriate elements of the training course of theoretical knowledge instruction have been completed to a satisfactory standard before recommending the applicant for the examination.

The applicable items for each licence are marked with 'x'. An 'x' on the main title of a subject means that all the sub-divisions are applicable.

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
1.	**AIR LAW AND ATC PROCEDURES**				
	International law: conventions, agreements and organisations				
	The Convention on international civil aviation (Chicago) Doc. 7300/6				
	Part I Air Navigation: relevant parts of the following chapters: (a) general principles and application of the convention; (b) flight over territory of Contracting States; (c) nationality of aircraft; (d) measures to facilitate air navigation; (e) conditions to be fulfilled on aircraft; (f) international standards and recommended practices; (g) validity of endorsed certificates and licences; (h) notification of differences.	x		x	
	Part II The International Civil Aviation Organisation (ICAO): objectives and composition	x		x	
	Annex 8: Airworthiness of aircraft				
	Foreword and definitions	x		x	
	Certificate of airworthiness	x		x	
	Annex 7: Aircraft nationality and registration marks				
	Foreword and definitions	x		x	
	Common- and registration marks	x		x	
	Certificate of registration and aircraft nationality	x		x	
	Annex 1: Personnel licensing				
	Definitions	x		x	
	Relevant parts of Annex 1 connected to Part-FCL and Part-Medical	x		x	
	Annex 2: Rules of the air				
	Essential definitions, applicability of the rules of the air, general rules (except water operations), visual flight rules, signals and interception of civil aircraft	x		x	
	Procedures for air navigation: aircraft operations doc. 8168-ops/611, volume 1				
	Altimeter setting procedures (including IACO doc. 7030 – regional supplementary procedures)				
	Basic requirements (except tables),	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	procedures applicable to operators and pilots (except tables)				
	Secondary surveillance radar transponder operating procedures (including ICAO Doc. 7030 – regional supplementary procedures)				
	Operation of transponders	x		x	
	Phraseology	x		x	
	Annex 11: Doc. 4444 air traffic management				
	Definitions	x		x	
	General provisions for air traffic services	x		x	
	Visual separation in the vicinity of aerodromes	x		x	
	Procedures for aerodrome control services	x		x	
	Radar services	x		x	
	Flight information service and alerting service	x		x	
	Phraseologies	x		x	
	Procedures related to emergencies, communication failure and contingencies	x		x	
	Annex 15: Aeronautical information service				
	Introduction, essential definitions	x		x	
	AIP, NOTAM, AIRAC and AIC	x		x	
	Annex 14, volume 1 and 2: Aerodromes				
	Definitions	x		x	
	Aerodrome data: conditions of the movement area and related facilities	x		x	
	Visual aids for navigation: (a) indicators and signalling devices; (b) markings; (c) lights; (d) signs; (e) markers.	x		x	
	Visual aids for denoting obstacles: (a) marking of objects; (b) lighting of objects.	x		x	
	Visual aids for denoting restricted use of areas	x		x	
	Emergency and other services: (a) rescue and fire fighting; (b) apron management service.	x		x	
	Annex 12: Search and rescue				
	Essential definitions	x		x	
	Operating procedures: (a) procedures for PIC at the scene of an accident; (b) procedures for PIC intercepting a distress transmission; (c) search and rescue signals.	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Search and rescue signals: (a) signals with surface craft; (b) ground or air visual signal code; (c) air or ground signals.	x		x	
	Annex 17: Security				
	General: aims and objectives	x		x	
	Annex 13: Aircraft accident investigation				
	Essential definitions	x		x	
	Applicability	x		x	
	National law				
	National law and differences to relevant ICAO Annexes and relevant CAA regulations.	x		x	
2.	**HUMAN PERFORMANCE**				
	Human factors: basic concepts				
	Human factors in aviation				
	Becoming a competent pilot	x		x	
	Basic aviation physiology and health maintenance				
	The atmosphere: (a) composition; (b) gas laws.	x		x	
	Respiratory and circulatory systems: (a) oxygen requirement of tissues; (b) functional anatomy; (c) main forms of hypoxia (hypoxic and anaemic): (1) sources, effects and countermeasures of carbon monoxide; (2) counter measures and hypoxia; (3) symptoms of hypoxia. (d) hyperventilation; (e) the effects of accelerations on the circulatory system; (f) hypertension and coronary heart disease.	x		x	
	Man and environment				
	Central, peripheral and autonomic nervous systems	x		x	
	Vision: (a) functional anatomy; (b) visual field, foveal and peripheral vision; (c) binocular and monocular vision; (d) monocular vision cues; (e) night vision; (f) visual scanning and detection techniques and importance of ‘look-out’; (g) defective vision.	x		x	
	Hearing: (a) descriptive and functional anatomy;	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	(b) flight related hazards to hearing; (c) hearing loss.				
	Equilibrium: (a) functional anatomy; (b) motion and acceleration; (c) motion sickness.	x		x	
	Integration of sensory inputs: (a) spatial disorientation: forms, recognition and avoidance;	x		x	
	(b) illusions: forms, recognition and avoidance: (1) physical origin; (2) physiological origin; (3) psychological origin. (c) approach and landing problems.				
	Health and hygiene				
	Personal hygiene: personal fitness	x		x	
	Body rhythm and sleep: (a) rhythm disturbances; (b) symptoms, effects and management.	x		x	
	Problem areas for pilots: (a) common minor ailments including cold, influenza and gastro-intestinal upset; (b) entrapped gases and barotrauma, (scuba diving); (c) obesity; (d) food hygiene; (e) infectious diseases; (f) nutrition; (g) various toxic gases and materials.	x		x	
	Intoxication:	x		x	
	(a) prescribed medication; (b) tobacco; (c) alcohol and drugs; (d) caffeine; (e) self-medication.				
	Basic aviation psychology				
	Human information processing				
	Attention and vigilance: (a) selectivity of attention; (b) divided attention.	x		x	
	Perception: (A) perceptual illusions; (B) subjectivity of perception; (C) processes of perception.	x		x	
	Memory: (a) sensory memory;	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	(b) working or short term memory; (c) long term memory to include motor memory (skills).				
	Human error and reliability				
	Reliability of human behaviour	x		x	
	Error generation: social environment (group, organisation)	x		x	
	Decision making				
	Decision-making concepts:	x		x	
	(a) structure (phases);				
	(b) limits; (c) risk assessment; (d) practical application.				
	Avoiding and managing errors: cockpit management				
	Safety awareness: (a) risk area awareness; (b) situational awareness.	x		x	
	Communication: verbal and non-verbal communication	x		x	
	Human behaviour				
	Personality and attitudes: (a) development; (b) environmental influences.	x		x	
	Identification of hazardous attitudes (error proneness)	x		x	
	Human overload and underload				
	Arousal	x		x	
	Stress: (a) definition(s); (b) anxiety and stress; (c) effects of stress.	x		x	
	Fatigue and stress management: (a) types, causes and symptoms of fatigue; (b) effects of fatigue; (c) coping strategies; (d) management techniques; (e) health and fitness programmes;	x		x	
3.	**METEOROLOGY**				
	The atmosphere				
	Composition, extent and vertical division				
	Structure of the atmosphere	x		x	
	Troposphere	x		x	
	Air temperature				
	Definition and units	x		x	
	Vertical distribution of temperature	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Transfer of heat	x		x	
	Lapse rates, stability and instability	x		x	
	Development of inversions and types of inversions	x		x	
	Temperature near the earth’s surface, surface effects, diurnal and seasonal variation, effect of clouds and effect of wind	x		x	
	Atmospheric pressure				
	Barometric pressure and isobars	x		x	
	Pressure variation with height	x		x	
	Reduction of pressure to mean sea level	x		x	
	Relationship between surface pressure centres and pressure centres aloft	x		x	
	Air density				
	Relationship between pressure, temperature and density	x		x	
	ISA				
	ICAO standard atmosphere	x		x	
	Altimetry				
	Terminology and definitions	x		x	
	Altimeter and altimeter settings	x		x	
	Calculations	x		x	
	Effect of accelerated airflow due to topography	x		x	
	Wind				
	Definition and measurement of wind				
	Definition and measurement	x		x	
	Primary cause of wind				
	Primary cause of wind, pressure gradient, coriolis force and gradient wind	x		x	
	Variation of wind in the friction layer	x		x	
	Effects of convergence and divergence	x		x	
	General global circulation				
	General circulation around the globe	x		x	
	Local winds				
	Anabatic and katabatic winds, mountain and valley winds, Venturi effects, land and sea breezes	x		x	
	Mountain waves (standing waves, lee waves)				
	Origin and characteristics	x		x	
	Turbulence				
	Description and types of turbulence	x		x	
	Formation and location of turbulence	x		x	
	THERMODYNAMICS				
	Humidity				
	Water vapour in the atmosphere	x		x	
	Mixing ratio	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Temperature/dew point, relative humidity	x		x	
	Change of state of aggregation				
	Condensation, evaporation, sublimation, freezing and melting, latent heat	x		x	
	Adiabatic processes				
	Adiabatic processes, stability of the atmosphere	x		x	
	CLOUDS AND FOG				
	Cloud formation and description				
	Cooling by adiabatic expansion and by advection	x		x	
	Cloud types and cloud classification	x		x	
	Influence of inversions on cloud development	x		x	
	Fog, mist, haze				
	General aspects	x		x	
	Radiation fog	x		x	
	Advection fog	x		x	
	Steaming fog	x		x	
	Frontal fog	x		x	
	Orographic fog (hill fog)	x		x	
	PRECIPITATION				
	Development of precipitation				
	Processes of development of precipitation	x		x	
	Types of precipitation				
	Types of precipitation, relationship with cloud types	x		x	
	AIR MASSES AND FRONTS				
	Air masses				
	Description, classification and source regions of air masses	x		x	
	Modifications of air masses	x		x	
	Fronts				
	General aspects	x		x	
	Warm front, associated clouds, and weather	x		x	
	Cold front, associated clouds, and weather	x		x	
	Warm sector, associated clouds, and weather	x		x	
	Weather behind the cold front	x		x	
	Occlusions, associated clouds, and weather	x		x	
	Stationary front, associated clouds, and weather	x		x	
	Movement of fronts and pressure systems, life cycle	x		x	
	Changes of meteorological elements at a frontal wave	x		x	
	PRESSURE SYSTEMS				
	Anticyclone				
	Anticyclones, types, general properties, cold and warm anticyclones, ridges and wedges, subsidence	x		x	
	Non-frontal depressions				
	Thermal, orographic and polar depressions, troughs	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	CLIMATOLOGY				
	Climatic zones				
	General seasonal circulation in the troposphere	x		x	
	Typical weather situations in the mid-latitudes				
	Westerly situation	x		x	
	High-pressure area	x		x	
	Flat-pressure pattern	x		x	
	Local winds and associated weather				
	e.g. Foehn	x		x	
	FLIGHT HAZARDS				
	Icing				
	Conditions for ice accretion	x		x	
	Types of ice accretion	x		x	
	Hazards of ice accretion, avoidance	x		x	
	Turbulence				
	Effects on flight, avoidance	x		x	
	Wind shear				
	Definition of wind shear	x		x	
	Weather conditions for wind shear	x		x	
	Effects on flight, avoidance	x		x	
	Thunderstorms				
	Conditions for, and process of, development, forecast, location, type specification	x		x	
	Structure of thunderstorms, life cycle, squall lines, electricity in the atmosphere, static charges	x		x	
	Electrical discharges				
	Development and effects of downbursts	x		x	
	Thunderstorm avoidance	x		x	
	Inversions				
	Influence on aircraft performance	x		x	
	Hazards in mountainous areas				
	Influence of terrain on clouds and precipitation, frontal passage	x		x	
	Vertical movements, mountain waves, wind shear, turbulence, ice accretion	x		x	
	Development and effect of valley inversions	x		x	
	Visibility-reducing phenomena				
	Reduction of visibility caused by precipitation and obscuration	x		x	
	Reduction of visibility caused by other phenomena	x		x	
	METEOROLOGICAL INFORMATION				
	Observation				
	Surface observations	x		x	
	Radiosonde observations	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Satellite observations	x		x	
	Weather radar observations	x		x	
	Aircraft observations and reporting	x		x	
	Weather charts				
	Significant weather charts	x		x	
	Surface charts	x		x	
	Information for flight planning				
	Aviation weather messages	x		x	
	Meteorological broadcasts for aviation	x		x	
	Use of meteorological documents	x		x	
	Meteorological warnings	x		x	
	Meteorological services				
	World area forecast system (WAFS) and meteorological offices	x		x	
4.	**COMMUNICATIONS**				
	VFR COMMUNICATIONS				
	Definitions				
	Meanings and significance of associated terms	x		x	
	ATS abbreviations	x		x	
	Q-code groups commonly used in RTF airground communications	x		x	
	Categories of messages	x		x	
	General operating procedures				
	Transmission of letters	x		x	
	Transmission of numbers (including level information)	x		x	
	Transmission of time	x		x	
	Transmission technique	x		x	
	Standard words and phrases (relevant RTF phraseology included)	x		x	
	R/T call signs for aeronautical stations including use of abbreviated call signs	x		x	
	R/T call signs for aircraft including use of abbreviated call signs	x		x	
	Transfer of communication	x		x	
	Test procedures including readability scale	x		x	
	Read back and acknowledgement requirements	x		x	
	Relevant weather information terms (VFR)				
	Aerodrome weather	x		x	
	Weather broadcast	x		x	
	Action required to be taken in case of communication failure	x		x	
	Distress and urgency procedures				
	Distress (definition, frequencies, watch of distress frequencies, distress signal and distress message)	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Urgency (definition, frequencies, urgency signal and urgency message)	x		x	
	General principles of VHF propagation and allocation of frequencies	x		x	
5.	**PRINCIPLES OF FLIGHT**				
5.1.	**PRINCIPLES OF FLIGHT: AEROPLANE**				
	Subsonic aerodynamics				
	Basics concepts, laws and definitions				
	Laws and definitions:	x	x		
	(a) conversion of units; (b) Newton´s laws; (c) Bernoulli’s equation and venture; (d) static pressure, dynamic pressure and total pressure; (e) density; (f) IAS and TAS.				
	Basics about airflow: (a) streamline; (b) two-dimensional airflow; (c) three-dimensional airflow.	x	x		
	Aerodynamic forces on surfaces: (a) resulting airforce; (b) lift; (c) drag; (d) angle of attack.	x	x		
	Shape of an aerofoil section: (a) thickness to chord ratio; (b) chord line; (c) camber line; (d) camber; (e) angle of attack.	x	x		
	The wing shape: (a) aspect ratio; (b) root chord; (c) tip chord; (d) tapered wings; (e) wing planform.	x	x		
	The two-dimensional airflow about an aerofoil				
	Streamline pattern	x	x		
	Stagnation point	x	x		
	Pressure distribution	x	x		
	Centre of pressure	x	x		
	Influence of angle of attack	x	x		
	Flow separation at high angles of attack	x	x		

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	The lift – α graph	x	x		
	The coefficients				
	The lift coefficient C_l: the lift formula	x	x		
	The drag coefficient $C_{d:}$ the drag formula	x	x		
	The three-dimensional airflow round a wing and a fuselage				
	Streamline pattern: (a) span-wise flow and causes; (b) tip vortices and angle of attack; (c) upwash and downwash due to tip vortices; (d) wake turbulence behind an aeroplane (causes, distribution and duration of the phenomenon).	x	x		
	Induced drag: (a) influence of tip vortices on the angle of attack; (b) the induced local α; (c) influence of induced angle of attack on the direction of the lift vector; (d) induced drag and angle of attack.	x	x		
	Drag				
	The parasite drag: (a) pressure drag; (b) interference drag; (c) friction drag.	x	x		
	The parasite drag and speed	x	x		
	The induced drag and speed	x	x		
	The total drag	x	x		
	The ground effect				
	Effect on take off and landing characteristics of an aeroplane	x	x		
	The stall				
	Flow separation at increasing angles of attack: (a) the boundary layer: (1) laminar layer; (2) turbulent layer; (3) transition. (b) separation point; (c) influence of angle of attack; (d) influence on: (1) pressure distribution; (2) location of centre of pressure; (3) $C_{L;}$ (4) $C_{D;}$ (5) pitch moments. (e) buffet; (f) use of controls.	x	x		

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	The stall speed: (a) in the lift formula; (b) 1g stall speed; (c) influence of: (1) the centre of gravity; (2) power setting; (3) altitude (IAS); (4) wing loading; (5) load factor n: (i) definition; (ii) turns; (iii) forces.	x	x		
	The initial stall in span-wise direction: (a) influence of planform; (b) geometric twist (wash out); (c) use of ailerons.	x	x		
	Stall warning: (a) importance of stall warning; (b) speed margin; (c) buffet; (d) stall strip; (e) flapper switch; (f) recovery from stall.	x	x		
	Special phenomena of stall: (a) the power-on stall; (b) climbing and descending turns; (c) t-tailed aeroplane; (d) avoidance of spins: (1) spin development; (2) spin recognition; (3) spin recovery. (e) ice (in stagnation point and on surface): (1) absence of stall warning; (2) abnormal behaviour of the aircraft during stall.	x	x		
	CL augmentation				
	Trailing edge flaps and the reasons for use in take-off and landing: (a) influence on C_L - α-graph; (b) different types of flaps; (c) flap asymmetry; (d) influence on pitch movement.	x	x		
	Leading edge devices and the reasons for use in take-off and landing	x	x		
	The boundary layer				

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Different types: (a) laminar; (b) turbulent.	x	x		
	Special circumstances				
	Ice and other contamination: (a) ice in stagnation point; (b) ice on the surface (frost, snow and clear ice); (c) rain; (d) contamination of the leading edge; (e) effects on stall; (f) effects on loss of controllability; (g) effects on control surface moment; (h) influence on high lift devices during takeoff, landing and low speeds.	x	x		
	Stability				
	Condition of equilibrium in steady horizontal flight				
	Precondition for static stability	x	x		
	Equilibrium: (a) lift and weight; (b) drag and thrust.	x	x		
	Methods of achieving balance				
	Wing and empennage (tail and canard)	x	x		
	Control surfaces	x	x		
	Ballast or weight trim	x	x		
	Static and dynamic longitudinal stability				
	Basics and definitions: (a) static stability, positive, neutral and negative; (b) precondition for dynamic stability; (c) dynamic stability, positive, neutral and negative.	x	x		
	Location of centre of gravity: (a) aft limit and minimum stability margin; (b) forward position; (c) effects on static and dynamic stability.	x	x		
	Dynamic lateral or directional stability				
	Spiral dive and corrective actions	x	x		
	Control				
	General				
	Basics, the three planes and three axis	x	x		
	Angle of attack change	x	x		
	Pitch control				
	Elevator	x	x		
	Downwash effects	x	x		
	Location of centre of gravity	x	x		
	Yaw control				

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Pedal or rudder	x	x		
	Roll control				
	Ailerons: function in different phases of flight	x	x		
	Adverse yaw	x	x		
	Means to avoid adverse yaw: (a) frise ailerons; (b) differential ailerons deflection.	x	x		
	Means to reduce control forces				
	Aerodynamic balance: (a) balance tab and anti-balance tab; (b) servo tab.	x	x		
	Mass balance				
	Reasons to balance: means	x	x		
	Trimming				
	Reasons to trim	x	x		
	Trim tabs	x	x		
	Limitations				
	Operating limitations				
	Flutter	x	x		
	v_{fe}	x	x		
	v_{no}, v_{ne}	x	x		
	Manoeuvring envelope				
	Manoeuvring load diagram: (a) load factor; (b) accelerated stall speed; (c) $v_{a;}$ (d) manoeuvring limit load factor or certification category.	x	x		
	Contribution of mass	x	x		
	Gust envelope				
	Gust load diagram	x	x		
	Factors contributing to gust loads	x	x		
	Propellers				
	Conversion of engine torque to thrust				
	Meaning of pitch	x	x		
	Blade twist	x	x		
	Effects of ice on propeller	x	x		
	Engine failure or engine stop				
	Windmilling drag	x	x		
	Moments due to propeller operation				
	Torque reaction	x	x		
	Asymmetric slipstream effect	x	x		
	Asymmetric blade effect	x	x		
	Flight mechanics				

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Forces acting on an aeroplane				
	Straight horizontal steady flight	x	x		
	Straight steady climb	x	x		
	Straight steady descent	x	x		
	Straight steady glide	x	x		
	Steady coordinated turn: (a) bank angle; (b) load factor; (c) turn radius; (d) rate one turn.	x	x		
5.2.	**PRINCIPLES OF FLIGHT: HELICOPTER**				
	Subsonic aerodynamics				
	Basic concepts, laws and definitions			x	x
	Conversion of units			x	x
	Definitions and basic concepts about air:			x	x
	(a) the atmosphere and International Standard Atmosphere; (b) density; (c) influence of pressure and temperature on density.				
	Newton's laws: (a) Newton's second law: Momentum equation; (b) Newton's third law: action and reaction.			x	x
	Basic concepts about airflow: (a) steady airflow and unsteady airflow; (b) Bernoulli's equation; (c) static pressure, dynamic pressure, total pressure and stagnation point; (d) TAS and IAS; (e) two-dimensional airflow and three-dimensional airflow; (f) viscosity and boundary layer.			x	x
	Two-dimensional airflow			x	x
	Aerofoil section geometry: (a) aerofoil section; (b) chord line, thickness and thickness to chord ratio of a section; (c) camber line and camber; (d) symmetrical and asymmetrical aerofoils sections.			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Aerodynamic forces on aerofoil elements: (a) angle of attack; (b) pressure distribution; (c) lift and lift coefficient (d) relation lift coefficient: angle of attack; (e) profile drag and drag coefficient; (f) relation drag coefficient: angle of attack; (g) resulting force, centre of pressure and pitching moment.			x	x
	Stall: (a) boundary layer and reasons for stalling; (b) variation of lift and drag as a function of angle of attack; (c) displacement of the centre of pressure and pitching moment.			x	x
	Disturbances due to profile contamination: (a) ice contamination; (b) ice on the surface (frost, snow and clear ice).			x	x
	The three-dimensional airflow round a wing and a fuselage			x	x
	The wing:			x	x
	(a) planform, rectangular and tapered wings;				
	(b) wing twist.				
	Airflow pattern and influence on lift:			x	x
	(a) span wise flow on upper and lower surface; (b) tip vortices; (c) span-wise lift distribution.				
	Induced drag: causes and vortices			x	x
	The airflow round a fuselage: (a) components of a fuselage; (b) parasite drag; (c) variation with speed.			x	x
	Transonic aerodynamics and compressibility effects				
	Airflow velocities			x	x
	Airflow speeds: (a) speed of sound; (b) subsonic, high subsonic and supersonic flows.			x	x
	Shock waves: (a) compressibility and shock waves; (b) the reasons for their formation at upstream high subsonic airflow; (c) their effect on lift and drag.			x	x
	Influence of wing planform: sweep-angle			x	x
	Rotorcraft types			x	x
	Rotorcraft			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Rotorcraft types: (a) autogyro; (b) helicopter.			x	x
	Helicopters			x	x
	Helicopters configurations: the single main rotor helicopter			x	x
	The helicopter, characteristics and associated terminology: (a) general lay-out, fuselage, engine and gearbox; (b) tail rotor, fenestron and NOTAR;			x	x
	(c) engines (reciprocating and turbo shaft engines); (d) power transmission;				
	(e) rotor shaft axis, rotor hub and rotor blades; (f) rotor disc and rotor disc area; (g) teetering rotor (two blades) and rotors with more than two blades;				
	(h) skids and wheels; (i) helicopter axes and fuselage centre line;				
	(j) roll axis, pitch axis and normal or yaw axis; (k) gross mass, gross weight and disc loading.				
	Main rotor aerodynamics			x	x
	Hover flight outside ground effect			x	x
	Airflow through the rotor discs and round the blades: (a) circumferential velocity of the blade sections; (b) induced airflow, through the disc and downstream; (c) downward fuselage drag; (d) equilibrium of rotor thrust, weight and fuselage drag; (e) rotor disc induced power; (f) relative airflow to the blade; (g) pitch angle and angle of attack of a blade section; (h) lift and profile drag on the blade element; (i) resulting lift and thrust on the blade and rotor thrust; (j) collective pitch angle changes and necessity of blade feathering; (k) required total main rotor-torque and rotor-power; (l) influence of the air density.			x	x
	Anti-torque force and tail rotor: (a) force of tail rotor as a function of main rotor-torque; (b) anti-torque rotor power;			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	(c) necessity of blade feathering of tail rotor blades and yaw pedals.				
	Maximum hover altitude OGE: (a) total power required and power available; (b) maximum hover altitude as a function of pressure altitude and OAT.			x	x
	Vertical climb			x	x
	Relative airflow and angles of attack:			x	x
	(a) climb velocity V_C, induced and relative velocity and angle of attack; (b) collective pitch angle and blade feathering.				
	Power and vertical speed: (a) induced power, climb power and profile power;			x	x
	(b) total main rotor power and main rotor torque;				
	(c) tail rotor power;				
	(d) total power requirement in vertical flight.				
	Forward flight			x	x
	Airflow and forces in uniform inflow distribution: (a) assumption of uniform inflow distribution on rotor disc; (b) advancing blade (90°) and retreating blade (270°); (c) airflow velocity relative to the blade sections, area of reverse flow; (d) lift on the advancing and retreating blades at constant pitch angles; (e) necessity of cyclic pitch changes; (f) compressibility effects on the advancing blade tip and speed limitations; (g) high angle of attack on the retreating blade, blade stall and speed limitations; (h) thrust on rotor disc and tilt of thrust vector; (i) vertical component of the thrust vector and gross weight equilibrium; (j) horizontal component of the thrust vector and drag equilibrium.			x	x
	The flare (power flight):			x	x
	(a) thrust reversal and increase in rotor thrust; (b) increase of rotor RPM on non governed rotor.				
	Power and maximum speed: (a) induced power as a function of helicopter speed; (b) rotor profile power as a function of helicopter speed; (c) fuselage drag and parasite power as a function of forward speed; (d) tail rotor power and power ancillary equipment;			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	(e) total power requirement as a function of forward speed; (f) influence of helicopter mass, air density and drag of additional external equipment;				
	(g) translational lift and influence on power required.				
	Hover and forward flight in ground effect			x	x
	Airflow in ground effect and downwash: rotor power decrease as a function of rotor height above the ground at constant helicopter mass			x	x
	Vertical descent			x	x
	Vertical descent, power on:			x	x
	(a) airflow through the rotor, low and moderate descent speeds; (b) vortex ring state, settling with power and consequences.				
	Autorotation: (a) collective lever position after failure; (b) up flow through the rotor, auto-rotation and anti-autorotation rings; (c) tail rotor thrust and yaw control; (d) control of rotor RPM with collective lever; (e) landing after increase of rotor thrust by pulling collective and reduction in vertical speed.			x	x
	Forward flight: Autorotation			x	x
	Airflow through the rotor disc: (a) descent speed and up flow through the disc; (b) the flare, increase in rotor thrust, reduction of vertical speed and ground speed.			x	x
	Flight and landing:			x	x
	(a) turning; (b) flare; (c) autorotative landing; (d) height or velocity avoidance graph and dead man’s curve.				
	Main rotor mechanics			x	x
	Flapping of the blade in hover			x	x
	Forces and stresses on the blade: (a) centrifugal force on the blade and attachments; (b) limits of rotor RPM; (c) lift on the blade and bending stresses on a rigid attachment; (d) the flapping hinge of the articulated rotor and flapping hinge offset; (e) the flapping of the hinge less rotor and flexible element.			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Coning angle in hover:			x	x
	(a) lift and centrifugal force in hover and blade weight negligible (b) flapping, tip path plane and disc area.				
	Flapping angles of the blade in forward flight			x	x
	Forces on the blade in forward flight without cyclic feathering: (a) aerodynamic forces on the advancing and retreating blades without cyclic feathering; (b) periodic forces and stresses, fatigue and flapping hinge; (c) phase lag between the force and the flapping angle (about 90°); (d) flapping motion of the hinged blades and tilting of the cone and flap back of rotor; (e) rotor disc attitude and thrust vector tilt.			x	x
	Cyclic pitch (feathering) in helicopter mode, forward flight: (a) necessity of forward rotor disc tilt and thrust vector tilt; (b) flapping and tip path plane, virtual rotation axis or no flapping axis and plane of rotation; (c) shaft axis and hub plane; (d) cyclic pitch change (feathering) and rotor thrust vector tilt; (e) collective pitch change, collective lever, swash plate, pitch link and pitch horn; (f) cyclic stick, rotating swash plate and pitch link movement and phase angle.			x	x
	Blade lag motion			x	x
	Forces on the blade in the disc plane (tip path plane) in forward flight: (a) forces due to the Coriolis effect because of the flapping; (b) alternating stresses and the need of the drag or lag hinge.			x	x
	The drag or lag hinge: (a) the drag hinge in the fully articulated rotor; (b) the lag flexure in the hinge less rotor; (c) drag dampers.			x	x
	Ground resonance: (a) blade lag motion and movement of the centre of gravity of the blades and the rotor; (b) oscillating force on the fuselage; (c) fuselage, undercarriage and resonance.			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Rotor systems			x	x
	See-saw or teetering rotor			x	x
	Fully articulated rotor: (a) three hinges arrangement; (b) bearings and elastomeric hinges.			x	x
	Hinge less rotor and bearing less rotor			x	x
	Blade sailing: (a) low rotor RPM and effect of adverse wind; (b) minimising the danger;			x	x
	(c) droop stops.				
	Vibrations due to main rotor: (a) origins of the vibrations: in plane and vertical; (b) blade tracking and balancing.			x	x
	Tail rotors			x	x
	Conventional tail rotor			x	x
	Rotor description: (a) two-blades tail rotors with teetering hinge; (b) rotors with more than two blades; (c) feathering bearings and flapping hinges; (d) dangers to people and to the tail rotor, rotor height and safety.			x	x
	Aerodynamics: (a) induced airflow and tail rotor thrust; (b) thrust control by feathering, tail rotor drift and roll; (c) effect of tail rotor failure and vortex ring.			x	x
	The fenestron: technical lay-out			x	x
	The NOTAR: technical lay-out			x	x
	Vibrations: high frequency vibrations due to the tail rotors			x	x
	Equilibrium, stability and control			x	x
	Equilibrium and helicopter attitudes			x	x
	Hover: (a) forces and equilibrium conditions; (b) helicopter pitching moment and pitch angle; (c) helicopter rolling moment and roll angle.			x	x
	Forward flight: (a) forces and equilibrium conditions; (b) helicopter moments and angles; (c) effect of speed on fuselage attitude.			x	x
	Control			x	x
	Control power			x	x
	(a) fully articulated rotor; (b) hinge less rotor; (c) teetering rotor.				

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Static and dynamic roll over			x	x
	Helicopter performances Engine performances			x	x
	Piston engines:			x	x
	(a) power available; (b) effects of density altitude.				
	Turbine engines: (a) power available; (b) effects of ambient pressure and temperature.			x	x
	Helicopter performances			x	x
	Hover and vertical flight: (a) power required and power available; (b) OGE and IGE maximum hover height; (c) influence of AUM, pressure, temperature and density.			x	x
	Forward flight: (a) maximum speed; (b) maximum rate of climb speed; (c) maximum angle of climb speed; (d) range and endurance; (e) influence of AUM, pressure, temperature and density.			x	x
	Manoeuvring: (a) load factor; (b) bank angle and number of g's; (c) manoeuvring limit load factor.			x	x
	Special conditions: (a) operating with limited power; (b) over pitch and over torque.			x	x
6.	**OPERATIONAL PROCEDURES**				
	General				
	Operation of aircraft: ICAO Annex 6, General requirements				
	Definitions	x	x	x	x
	Applicability	x	x	x	x
	Special operational procedures and hazards (general aspects)	x	x	x	x
	Noise abatement				
	Noise abatement procedures	x	x	x	x
	Influence of the flight procedure (departure, cruise and approach)	x	x	x	x
	Runway incursion awareness (meaning of surface markings and signals)	x	x	x	x
	Fire or smoke				
	Carburettor fire	x	x	x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Engine fire	x	x	x	x
	Fire in the cabin and cockpit, (choice of extinguishing agents according to fire classification and use of the extinguishers)	x	x	x	x
	Smoke in the cockpit and (effects and action to be taken) and smoke in the cockpit and cabin (effects and actions taken)	x	x	x	x
	Windshear and microburst				
	Effects and recognition during departure and approach	x	x	x	x
	Actions to avoid and actions taken during encounter	x	x	x	x
	Wake turbulence				
	Cause	x	x	x	x
	List of relevant parameters	x	x	x	x
	Actions taken when crossing traffic, during take-off and landing	x	x	x	x
	Emergency and precautionary landings				
	Definition	x	x	x	x
	Cause	x	x	x	x
	Passenger information	x	x	x	x
	Evacuation	x	x	x	x
	Action after landing	x	x	x	x
	Contaminated runways				
	Kinds of contamination	x	x		
	Estimated surface friction and friction coefficient	x	x		
	Rotor downwash			x	x
	Operation influence by meteorological conditions (helicopter)				
	White out, sand or dust			x	x
	Strong winds			x	x
	Mountain environment			x	x
	Emergency procedures				
	Influence by technical problems				
	Engine failure			x	x
	Fire in cabin, cockpit or engine			x	x
	Tail, rotor or directional control failure			x	x
	Ground resonance			x	x
	Blade stall			x	x
	Settling with power (vortex ring)			x	x
	Overpitch			x	x
	Overspeed: rotor or engine			x	x
	Dynamic rollover			x	x
	Mast bumping			x	x
7.	**FLIGHT PERFORMANCE AND PLANNING**				

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
7.1.	**MASS AND BALANCE: AEROPLANES OR HELICOPTERS**				
	Purpose of mass and balance considerations				
	Mass limitations				
	Importance in regard to structural limitations	x	x	x	x
	Importance in regard to performance limitations	x	x	x	x
	CG limitations				
	Importance in regard to stability and controllability	x	x	x	x
	Importance in regard to performance	x	x	x	x
	Loading				
	Terminology				
	Mass terms	x	x	x	x
	Load terms (including fuel terms)	x	x	x	x
	Mass limits				
	Structural limitations	x	x	x	x
	Performance limitations	x	x	x	x
	Baggage compartment limitations	x	x	x	x
	Mass calculations				
	Maximum masses for take-off and landing	x	x	x	x
	Use of standard masses for passengers, baggage and crew	x	x	x	x
	Fundamentals of CG calculations				
	Definition of centre of gravity	x	x	x	x
	Conditions of equilibrium (balance of forces and balance of moments)	x	x	x	x
	Basic calculations of CG	x	x	x	x
	Mass and balance details of aircraft				
	Contents of mass and balance documentation				
	Datum and moment arm	x	x	x	x
	CG position as distance from datum	x	x	x	x
	Extraction of basic mass and balance data from aircraft documentation				
	BEM	x	x	x	x
	CG position or moment at BEM	x	x	x	x
	Deviations from standard configuration	x	x	x	x
	Determination of CG position				
	Methods				
	Arithmetic method	x	x	x	x
	Graphic method	x	x	x	x
	Load and trim sheet				
	General considerations	x	x	x	x
	Load sheet and CG envelope for light aeroplanes and for helicopters	x	x	x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
7.2.	**PERFORMANCE: AEROPLANES**				
	Introduction				
	Performance classes	x	x		
	Stages of flight	x	x		
	Effect of aeroplane mass, wind, altitude, runway slope and runway conditions	x	x		
	Gradients	x	x		
	SE aeroplanes				
	Definitions of terms and speeds	x	x		
	Take-off and landing performance				
	Use of aeroplane flight manual data	x	x		
	Climb and cruise performance				
	Use of aeroplane flight data	x	x		
	Effect of density altitude and aeroplane mass	x	x		
	Endurance and the effects of the different recommended power or thrust settings	x	x		
	Still air range with various power or thrust settings	x	x		
7.3.	**FLIGHT PLANNING AND FLIGHT MONITORING**				
	Flight planning for VFR flights				
	VFR navigation plan				
	Routes, airfields, heights and altitudes from VFR charts	x	x	x	x
	Courses and distances from VFR charts	x	x	x	x
	Aerodrome charts and aerodrome directory	x	x	x	x
	Communications and radio navigation planning data	x	x	x	x
	Completion of navigation plan	x	x	x	x
	Fuel planning				
	General knowledge	x	x	x	x
	Pre-flight calculation of fuel required				
	Calculation of extra fuel	x	x	x	x
	Completion of the fuel section of the navigation plan (fuel log) and calculation of total fuel	x	x	x	x
	Pre-flight preparation				
	AIP and NOTAM briefing				
	Ground facilities and services	x	x	x	x
	Departure, destination and alternate aerodromes	x	x	x	x
	Airway routings and airspace structure	x	x	x	x
	Meteorological briefing				
	Extraction and analysis of relevant data from meteorological documents	x	x	x	x
	ICAO flight plan (ATS flight plan)				
	Individual flight plan				
	Format of flight plan	x	x	x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Completion of the flight plan	x	x	x	x
	Submission of the flight plan	x	x	x	x
	Flight monitoring and in-flight replanning				
	Flight monitoring				
	Monitoring of track and time	x	x	x	x
	In-flight fuel management	x	x	x	x
	In-flight re-planning in case of deviation from planned data	x	x	x	x
7.4.	**PERFORMANCE: HELICOPTERS**				
	General				
	Introduction				
	Stages of flight			x	x
	Effect on performance of atmospheric, airport or heliport and helicopter conditions			x	x
	Applicability of airworthiness requirements			x	x
	Definitions and terminology			x	x
	Performance: SE helicopters				
	Definitions of terms (a) masses; (b) velocities: v_x, v_y;			x	x
	(c) velocity of best range and of maximum endurance; (d) power limitations; (e) altitudes.				
	Take-off, cruise and landing performance **Use and interpretation of diagrams and tables:** (a) Take-off: (1) take-off run and distance available; (2) take-off and initial climb; (3) effects of mass, wind and density altitude; (4) effects of ground surface and gradient. (b) Landing: (1) effects of mass, wind, density altitude and approach speed; (2) effects of ground surface and gradient. (c) In-flight: (1) relationship between power required and power available; (2) performance diagram; (3) effects of configuration, mass, temperature and altitude; (4) reduction of performance during climbing turns;			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	(5) autorotation; (6) adverse effects (icing, rain and condition of the airframe).				
8.	**AIRCRAFT GENERAL KNOWLEDGE**				
8.1.	**AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT**				
	System design, loads, stresses, maintenance				
	Loads and combination loadings applied to an aircraft's structure	x	x	x	x
	Airframe				
	Wings, tail surfaces and control surfaces				
	Design and constructions	x	x		
	Structural components and materials	x	x		
	Stresses	x	x		
	Structural limitations	x	x		
	Fuselage, doors, floor, wind-screen and windows				
	Design and constructions	x	x	x	x
	Structural components and materials	x	x	x	x
	Stresses	x	x	x	x
	Structural limitations	x	x	x	x
	Flight and control surfaces				
	Design and constructions			x	x
	Structural components and materials			x	x
	Stresses and aero elastic vibrations			x	x
	Structural limitations			x	x
	Hydraulics				
	Hydromechanics: basic principles	x	x	x	x
	Hydraulic systems	x	x	x	x
	Hydraulic fluids: types and characteristics, limitations	x	x	x	x
	System components: design, operation, degraded modes of operation, indications and warnings	x	x	x	x
	Landing gear, wheels, tyres and brakes				
	Landing gear				
	Types and materials	x	x	x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Nose wheel steering: design and operation	x	x		
	Brakes				
	Types and materials	x	x	x	x
	System components: design, operation, indications and warnings	x	x	x	x
	Wheels and tyres				
	Types and operational limitations	x	x	x	x
	Helicopter equipments			x	x
	Flight controls				
	Mechanical or powered	x	x	x	x
	Control systems and mechanical	x	x	x	x
	System components: design, operation, indications and warnings, degraded modes of operation and jamming	x	x	x	x
	Secondary flight controls				
	System components: design, operation, degraded modes of operation, indications and warnings	x	x		
	Anti-icing systems				
	Types and operation (pitot and windshield)	x	x	x	x
	Fuel system				
	Piston engine				
	System components: design, operation, degraded modes of operation, indications and warnings	x	x	x	x
	Turbine engine				
	System components: design, operation, degraded modes of operation, indications and warnings			x	x
	Electrics				
	Electrics: general and definitions				
	Direct current: voltage, current, resistance, conductivity, Ohm’s law, power and work	x	x	x	x
	Alternating current: voltage, current, amplitude, phase, frequency and resistance	x	x	x	x
	Circuits: series and parallel	x	x	x	x
	Magnetic field: effects in an electrical circuit	x	x	x	x
	Batteries				
	Types, characteristics and limitations	x	x	x	x
	Battery chargers, characteristics and limitations	x	x	x	x
	Static electricity: general				
	Basic principles	x	x	x	x
	Static dischargers	x	x	x	x
	Protection against interference	x	x	x	x
	Lightning effects	x	x	x	x
	Generation: production, distribution and use				
	DC generation: types, design, operation, degraded modes of operation, indications and warnings	x	x	x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	AC generation: types, design, operation, degraded modes of operation, indications and warnings	x	x	x	x
	Electric components				
	Basic elements: basic principles of switches, circuit-breakers and relays	x	x	x	x
	Distribution				
	General: (a) bus bar, common earth and priority; (b) AC and DC comparison.	x	x	x	x
	Piston engines				
	General				
	Types of internal combustion engine: basic principles and definitions	x	x	x	x
	Engine: design, operation, components and materials	x	x	x	x
	Fuel				
	Types, grades, characteristics and limitations	x	x	x	x
	Alternate fuel: characteristics and limitations	x	x	x	x
	Carburettor or injection system				
	Carburettor: design, operation, degraded modes of operation, indications and warnings	x	x	x	x
	Injection: design, operation, degraded modes of operation, indications and warnings	x	x	x	x
	Icing	x	x	x	x
	Air cooling systems				
	Design, operation, degraded modes of operation, indications and warnings	x	x	x	x
	Lubrication systems				
	Lubricants: types, characteristics and limitations	x	x	x	x
	Design, operation, degraded modes of operation, indications and warnings	x	x	x	x
	Ignition circuits				
	Design, operation, degraded modes of operation	x	x	x	x
	Mixture				
	Definition, characteristic mixtures, control instruments, associated control levers and indications	x	x	x	x
	Propellers				
	Definitions and general: (a) aerodynamic parameters; (b) types; (c) operating modes.	x	x		
	Constant speed propeller: design, operation and system components	x	x		
	Propeller handling: associated control levers, degraded modes of operation, indications and warnings	x	x		

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Performance and engine handling				
	Performance: influence of engine parameters, influence of atmospheric conditions, limitations and power augmentation systems	x	x	x	x
	Engine handling: power and mixture settings during various flight phases and operational limitations	x	x	x	x
	Turbine engines				
	Definitions			x	x
	Coupled turbine engine: design, operation, components and materials			x	x
	Free turbine engine: design, operation, components and materials			x	x
	Fuel				
	Types, characteristics and limitations			x	x
	Main engine components				
	Compressor: (a) types, design, operation, components and materials; (b) stresses and limitations; (c) stall, surge and means of prevention.			x	x
	Combustion chamber: (a) types, design, operation, components and materials; (b) stresses and limitations; (c) emission problems.			x	x
	Turbine: (a) types, design, operation, components and materials; (b) stresses, creep and limitations.			x	x
	Exhaust: (a) design, operation and materials; (b) noise reduction.			x	x
	Fuel control units: types, operation and sensors			x	x
	Helicopter air intake: different types, design, operation, materials and optional equipments			x	x
	Additional components and systems				
	Helicopter additional components and systems: lubrication system, ignition circuit, starter, accessory gearbox, free wheel units: design, operation and components			x	x
	Performance aspects				
	Torque, performance aspects, engine handling and limitations: (a) engine ratings; (b) engine performance and limitations;			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	(c) engine handling.				
	Protection and detection systems				
	Fire detection systems				
	Operation and indications			x	X
	Miscellaneous systems				
	Rotor design			x	x
	Rotor heads				
	Main rotor				
	Types			x	x
	Structural components and materials, stresses and structural limitations			x	x
	Design and construction			x	x
	Adjustment			x	x
	Tail rotor				
	Types			x	x
	Structural components and materials, stresses and structural limitations			x	x
	Design and construction			x	x
	Adjustment			x	x
	Transmission				
	Main gear box				
	Different types, design, operation and limitations			x	x
	Rotor brake				
	Different types, design, operation and limitations			x	x
	Auxiliary systems			x	x
	Drive shaft and associated installation			x	x
	Intermediate and tail gear box				
	Different types, design, operation and limitations			x	x
	Blades				
	Main rotor blade				
	Design and construction			x	x
	Structural components and materials			x	x
	Stresses			x	x
	Structural limitations			x	x
	Adjustment			x	x
	Tip shape			x	x
	Tail rotor blade				
	Design and construction			x	x
	Structural components and materials			x	x
	Stresses			x	x
	Structural limitations			x	x
	Adjustment			x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
8.2.	**INSTRUMENTATION**				
	Instrument and indication systems				
	Pressure gauge				
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	Temperature sensing				
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	Fuel gauge				
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	Flow meter				
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	Position transmitter				
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	Torque meter				
	Design, operation, characteristics and accuracy			x	x
	Tachometer				
	Design, operation, characteristics and accuracy	x	x	x	x
	Measurement of aerodynamic parameters				
	Pressure measurement				
	Static pressure, dynamic pressure, density and definitions	x	x	x	x
	Design, operation, errors and accuracy	x	x	x	x
	Temperature measurement: aeroplane				
	Design, operation, errors and accuracy	x	x		
	Displays	x	x		
	Temperature measurement: helicopter				
	Design, operation, errors and accuracy			x	x
	Displays			x	x
	Altimeter				
	Standard atmosphere	x	x	x	x
	The different barometric references (QNH, QFE and 1013.25)	x	x	x	x
	Height, indicated altitude, true altitude, pressure altitude and density altitude	x	x	x	x
	Design, operation, errors and accuracy	x	x	x	x
	Displays	x	x	x	x
	Vertical speed indicator				
	Design, operation, errors and accuracy	x	x	x	x
	Displays	x	x	x	x

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Air speed indicator				
	The different speeds IAS, CAS, TAS: definition, usage and relationships	x	x	x	x
	Design, operation, errors and accuracy	x	x	x	x
	Displays	x	x	x	x
	Magnetism: direct reading compass				
	Earth magnetic field	x	x	x	x
	Direct reading compass				
	Design, operation, data processing, accuracy and deviation	x	x	x	x
	Turning and acceleration errors	x	x	x	x
	Gyroscopic instruments				
	Gyroscope: basic principles				
	Definitions and design	x	x	x	x
	Fundamental properties	x	x	x	x
	Drifts	x	x	x	x
	Turn and bank indicator				
	Design, operation and errors	x	x	x	x
	Attitude indicator				
	Design, operation, errors and accuracy	x	x	x	x
	Directional gyroscope				
	Design, operation, errors and accuracy	x	x	x	x
	Communication systems				
	Transmission modes: VHF, HF and SATCOM				
	Principles, bandwidth, operational limitations and use	x	x	x	x
	Voice communication				
	Definitions, general and applications	x	x	x	x
	Alerting systems and proximity systems				
	Flight warning systems				
	Design, operation, indications and alarms	x	x	x	x
	Stall warning				
	Design, operation, indications and alarms	x	x		
	Radio-altimeter				
	Design, operation, errors, accuracy and indications			x	x
	Rotor or engine over speed alert system				
	Design, operation, displays and alarms			x	x
	Integrated instruments: electronic displays				
	Display units				
	Design, different technologies and limitations	x	x	x	x
9.	**NAVIGATION**				
9.1.	**GENERAL NAVIGATION**				
	Basics of navigation				
	The solar system				

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Seasonal and apparent movements of the sun	x		x	
	The earth				
	Great circle, small circle and rhumb line	x		x	
	Latitude and difference of latitude	x		x	
	Longitude and difference of longitude	x		x	
	Use of latitude and longitude co-ordinates to locate any specific position	x		x	
	Time and time conversions				
	Apparent time	x		x	
	UTC	x		x	
	LMT	x		x	
	Standard times	x		x	
	Dateline	x		x	
	Definition of sunrise, sunset and civil twilight	x		x	
	Directions				
	True north, magnetic north and compass north	x		x	
	Compass deviation	x		x	
	Magnetic poles, isogonals, relationship between true and magnetic	x		x	
	Distance				
	Units of distance and height used in navigation: nautical miles, statute miles, kilometres, metres and ft	x		x	
	Conversion from one unit to another	x		x	
	Relationship between nautical miles and minutes of latitude and minutes of longitude	x		x	
	Magnetism and compasses				
	General principles				
	Terrestrial magnetism	x		x	
	Resolution of the earth's total magnetic force into vertical and horizontal components	x		x	
	Variation-annual change	x		x	
	Aircraft magnetism				
	The resulting magnetic fields	x		x	
	Keeping magnetic materials clear of the compass	x		x	
	Charts				
	General properties of miscellaneous types of projections				
	Direct Mercator	x		x	
	Lambert conformal conic	x		x	
	The representation of meridians, parallels, great circles and rhumb lines				
	Direct Mercator	x		x	
	Lambert conformal conic	x		x	
	The use of current aeronautical charts				

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Plotting positions	x		x	
	Methods of indicating scale and relief (ICAO topographical chart)	x		x	
	Conventional signs	x		x	
	Measuring tracks and distances	x		x	
	Plotting bearings and distances	x		x	
	DR navigation				
	Basis of DR				
	Track	x		x	
	Heading (compass, magnetic and true)	x		x	
	Wind velocity	x		x	
	Air speed (IAS, CAS and TAS)	x		x	
	Groundspeed	x		x	
	ETA	x		x	
	Drift and wind correction angle	x		x	
	DR position fix	x		x	
	Use of the navigational computer				
	Speed	x		x	
	Time	x		x	
	Distance	x		x	
	Fuel consumption	x		x	
	Conversions	x		x	
	Air speed	x		x	
	Wind velocity	x		x	
	True altitude	x		x	
	The triangle of velocities				
	Heading	x		x	
	Ground speed	x		x	
	Wind velocity	x		x	
	Track and drift angle	x		x	
	Measurement of DR elements				
	Calculation of altitude	x		x	
	Determination of appropriate speed	x		x	
	In-flight navigation				
	Use of visual observations and application to in-flight navigation	x		x	
	Navigation in cruising flight, use of fixes to revise navigation data				
	Ground speed revision	x		x	
	Off-track corrections	x		x	
	Calculation of wind speed and direction	x		x	
	ETA revisions	x		x	
	Flight log	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
9.2.	**RADIO NAVIGATION**				
	Basic radio propagation theory				
	Antennas				
	Characteristics	x		x	
	Wave propagation				
	Propagation with the frequency bands	x		x	
	Radio aids				
	Ground DF				
	Principles	x		x	
	Presentation and interpretation	x		x	
	Coverage	x		x	
	Range	x		x	
	Errors and accuracy	x		x	
	Factors affecting range and accuracy	x		x	
	NDB/ADF				
	Principles	x		x	
	Presentation and interpretation	x		x	
	Coverage	x		x	
	Range	x		x	
	Errors and accuracy	x		x	
	Factors affecting range and accuracy	x		x	
	VOR				
	Principles	x		x	
	Presentation and interpretation	x		x	
	Coverage	x		x	
	Range	x		x	
	Errors and accuracy	x		x	
	Factors affecting range and accuracy	x		x	
	DME				
	Principles	x		x	
	Presentation and interpretation	x		x	
	Coverage	x		x	
	Range	x		x	
	Errors and accuracy	x		x	
	Factors affecting range and accuracy	x		x	
	Radar				
	Ground radar				
	Principles	x		x	
	Presentation and interpretation	x		x	
	Coverage	x		x	
	Range	x		x	
	Errors and accuracy	x		x	
	Factors affecting range and accuracy	x		x	

		Aeroplane		Helicopter	
		PPL	Bridge course	PPL	Bridge course
	Secondary surveillance radar and transponder				
	Principles	x		x	
	Presentation and interpretation	x		x	
	Modes and codes	x		x	
	GNSS				
	GPS, GLONASS OR GALILEO				
	Principles	x		x	
	Operation	x		x	
	Errors and accuracy	x		x	
	Factors affecting accuracy	x		x	

AMC2 FCL.210; FCL.215

SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE PPL(AS)

The following table contains the syllabi for the courses of theoretical knowledge, as well as for the theoretical knowledge examinations for the PPL(As). The training and examination should cover aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated to the licence and the activity.

		PPL
1.	**AIR LAW AND ATC PROCEDURES**	
	International law: conventions, agreements and organisations	x
	Airworthiness of aircraft	x
	Aircraft nationality and registration marks	x
	Personnel licensing	x
	Rules of the air	x
	Procedures for air navigation services: aircraft operations	x
	Air traffic services and air traffic management	x
	Aeronautical information service	x
	Aerodromes	x
	Search and rescue	x
	Security	x
	Aircraft accident and incident investigation	x
	National law	x

		PPL
2.	**HUMAN PERFORMANCE**	
	Human factors: basic concepts	x
	Basic aviation physiology and health maintenance	x
	Basic aviation psychology	x

		PPL
3.	**METEOROLOGY**	

	The atmosphere	x
	Wind	x
	Thermodynamics	x
	Clouds and fog	x
	Precipitation	x
	Air masses and fronts	x
	Pressure systems	x
	Climatology	x
	Flight hazards	x
	Meteorological information	x

		PPL
4.	**COMMUNICATIONS**	
	VFR COMMUNICATIONS	
	Definitions	x
	General operating procedures	x
	Relevant weather information terms (VFR)	x
	Action required to be taken in case of communication failure	x
	Distress and urgency procedures	x
	General principles of VHF propagation and allocation of frequencies	x

		PPL
5.	**PRINCIPLES OF FLIGHT**	
	Basics of aerostatics	x
	Basics of subsonic aerodynamics	x
	Aerodynamics of airships	x
	Stability	x
	Controllability	x
	Limitations	x
	Propellers	x
	Basics of airship flight mechanics	x

		PPL
6.	**OPERATIONAL PROCEDURES**	
	General requirements	x
	Special operational procedures and hazards (general aspects)	x
	Emergency procedures	x

		PPL
7.	**FLIGHT PERFORMANCE AND PLANNING**	
7.1	**MASS AND BALANCE**	
	Purpose of mass and balance considerations	x
	Loading	x
	Fundamentals of CG calculations	x
	Mass and balance details of aircraft	x
	Determination of CG position	x
	Passenger, cargo and ballast handling	x
7.2	**PERFORMANCE**	
	Airworthiness requirements	x
	Basics of airship performance	x

	Definitions and terms	x
	Stages of flight	x
	Use of flight manual	x
7.3	**FLIGHT PLANNING AND FLIGHT MONITORING**	
	Flight planning for VFR flights	x
	Fuel planning	x
	Pre-flight preparation	x
	ATS flight plan	x
	Flight monitoring and in-flight re-planning	x

		PPL
8.	**AIRCRAFT GENERAL KNOWLEDGE**	
8.1	**ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT**	
	Design, materials, loads and stresses	x
	Envelope and airbags	x
	Framework	x
	Gondola	x
	Flight controls	x
	Landing gear	x
	Hydraulics and pneumatics	x
	Heating and air conditioning	x
	Fuel system	x
	Piston engines (propellers)	x
	Turbine engines (basics)	x
	Electrics	x
	Fire protection and detection systems	x
	Maintenance	x
8.2	**INSTRUMENTATION**	
	Sensors and instruments	x
	Measurement of air data and gas parameters	x
	Magnetism: direct reading compass and flux valve	x
	Gyroscopic instruments	x
	Communication systems	x
	Alerting systems	x
	Integrated instruments: electronic displays	x
	Flight management system (general basics)	x
	Digital circuits and computers	x

		PPL
9.	**NAVIGATION**	
9.1.	**GENERAL NAVIGATION**	
	Basics of navigation	x
	Magnetism and compasses	x
	Charts	x
	DR navigation	x
	In-flight navigation	x
9.2.	**RADIO NAVIGATION**	
	Basic radio propagation theory	x

	Radio aids	x
	Radar	x
	GNSS	x

AMC3 FCL.210; FCL.215 Training course and theoretical knowledge examination

SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE BPL AND SPL

The syllabi for the theoretical knowledge instruction and examination for the LAPL(B) and LAPL(S) in AMC1 FCL.115; FCL.120 should be used for the BPL and SPL, respectively.

AMC1 FCL.125; FCL.235

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(S) AND OF AN SPL

(a) An applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.

(b) The applicant should indicate to the FE the checks and duties carried out.

Checks should be completed in accordance with the flight manual or the authorised checklist for the sailplane on which the test is being taken.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the sailplane within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgment and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the sailplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

CONTENT OF THE SKILL TEST

(d) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(S) and of an SPL:

SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE	
Use of checklist, airmanship (control of sailplane by external visual reference), look-out. Apply in all sections.	
a	Pre-flight sailplane (daily) inspection, documentation, NOTAM and weather briefing
b	Verifying in-limits mass and balance and performance calculation
c	Sailplane servicing compliance
d	Pre-take-off checks
SECTION 2 LAUNCH METHOD	

Note: at least for one of the three launch methods all the mentioned items are fully exercised during the skill test	
SECTION 2 (A) WINCH OR CAR LAUNCH	
a	Signals before and during launch, including messages to winch driver
b	Adequate profile of winch launch
c	Simulated launch failure
d	Situational awareness
SECTION 2 (B) AEROTOW LAUNCH	
a	Signals before and during launch, including signals to or communications with tow plane pilot for any problems
b	Initial roll and take-off climb
c	Launch abandonment (simulation only or 'talk-through')
d	Correct positioning during straight flight and turns
e	Out of position and recovery
f	Correct release from tow
g	Look-out and airmanship through whole launch phase
SECTION 2 (C) SELF-LAUNCH (powered sailplanes only)	
a	ATC compliance (if applicable)
b	Aerodrome departure procedures
c	Initial roll and take-off climb
d	Look-out and airmanship during the whole take-off
e	Simulated engine failure after take-off
f	Engine shut down and stowage
SECTION 3 GENERAL AIRWORK	
a	Maintain straight flight: attitude and speed control
b	Coordinated medium (30 ° bank) turns, look-out procedures and collision avoidance
c	Turning on to selected headings visually and with use of compass
d	Flight at high angle of attack (critically low air speed)
e	Clean stall and recovery
f	Spin avoidance and recovery
g	Steep (45 ° bank) turns, look-out procedures and collision avoidance
h	Local area navigation and awareness
SECTION 4 CIRCUIT, APPROACH AND LANDING	
a	Aerodrome circuit joining procedure
b	Collision avoidance: look-out procedures
c	Pre-landing checks
d	Circuit, approach control and landing
e	Precision landing (simulation of out-landing and short field)
f	Crosswind landing if suitable conditions available

AMC2 FCL.125; FCL.235

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(B) AND A BPL

(a) The take-off site should be chosen by the applicant depending on the actual meteorological conditions, the area which has to be over flown and the possible options for suitable landing sites. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.

(b) An applicant should indicate to the FE the checks and duties carried out. Checks should be completed in accordance with the flight manual or the authorised checklist for the balloon on which the test is being taken. During pre-flight preparation for the test the applicant should be required to perform crew and passenger briefings and demonstrate crowd control. The load calculation should be performed by the applicant in compliance with the operations manual or flight manual for the balloon used.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the balloon within its limitations;

(2) complete all manoeuvres with smoothness and accuracy

(3) exercise good judgment and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the balloon at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

CONTENT OF THE SKILL TEST

(d) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (hot-air balloon) and a BPL (hot-air balloon):

SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF	
Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.	
a	Pre-flight documentation, flight planning, NOTAM and weather briefing
b	Balloon inspection and servicing
c	Load calculation
d	Crowd control, crew and passenger briefings
e	Assembly and layout
f	Inflation and pre-take-off procedures
g	Take-off
h	ATC compliance(if applicable)
SECTION 2 GENERAL AIRWORK	
a	Climb to level flight
b	Level flight

c	Descent to level flight
d	Operating at low level
e	ATC compliance (if applicable)
SECTION 3 EN-ROUTE PROCEDURES	
a	Dead reckoning and map reading
b	Marking positions and time
c	Orientation and airspace structure
d	Maintenance of altitude
e	Fuel management
f	Communication with retrieve crew
g	ATC compliance
SECTION 4 APPROACH AND LANDING PROCEDURES	
a	Approach from low level, missed approach and fly on
b	Approach from high level, missed approach and fly on
c	Pre-landing checks
d	Passenger pre-landing briefing
e	Selection of landing field
f	Landing, dragging and deflation
g	ATC compliance (if applicable)
h	Actions after flight
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
a	Simulated fire on the ground and in the air
b	Simulated pilot light and burner failures
c	Other abnormal and emergency procedures as outlined in the appropriate flight manual.
d	Oral questions

(e) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (gas balloon) and a BPL (gas balloon):

SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF	
Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.	
a	Pre-flight documentation, flight planning, NOTAM and weather briefing
b	Balloon inspection and servicing
c	Load calculation
d	Crowd control, crew and passenger briefings
e	Assembly and layout
f	Inflation and pre-take-off procedures
g	Take-off
h	ATC compliance (if applicable)
SECTION 2 GENERAL AIRWORK	
a	Climb to level flight
b	Level flight

c	Descent to level flight
d	Operating at low level
e	ATC compliance (if applicable)
SECTION 3 EN-ROUTE PROCEDURES	
a	Dead reckoning and map reading
b	Marking positions and time
c	Orientation and airspace structure
d	Maintenance of altitude
e	Ballast management
f	Communication with retrieve crew
g	ATC compliance
SECTION 4 APPROACH AND LANDING PROCEDURES	
a	Approach from low level, missed approach and fly on
b	Approach from high level, missed approach and fly on
c	Pre-landing checks
d	Passenger pre-landing briefing
e	Selection of landing field
f	Landing, dragging and deflation
g	ATC compliance (if applicable)
h	Actions after flight
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
a	Simulated closed appendix during take-off and climb
b	Simulated parachute or valve failure
c	Other abnormal and emergency procedures as outlined in the appropriate flight manual
d	Oral questions

AMC1 FCL.215; FCL.235

THEORETICAL KNOWLEDGE EXAMINATION AND SKILL TEST FOR THE PPL

(a) Theoretical knowledge examination

(1) The examinations should comprise a total of 120 multiple-choice questions covering all the subjects.

(2) Communication practical classroom testing may be conducted.

(3) The period of 18 months mentioned in FCL.025(b)(2) should be counted from the end of the calendar month when the applicant first attempted an examination.

(b) Skill test

Further training may be required following any failed skill test or part thereof. There should be no limit to the number of skill tests that may be attempted.

(c) Conduct of the test

(1) If the applicant chooses to terminate a skill test for reasons considered inadequate by the FE, the applicant should retake the entire skill test. If the test is terminated for reasons considered adequate by the FE, only those sections not completed should be tested in a further flight.

(2) Any manoeuvre or procedure of the test may be repeated once by the applicant. The FE may stop the test at any stage if it is considered that the applicant's demonstration of flying skill requires a complete retest.

(3) An applicant should be required to fly the aircraft from a position where the PIC functions can be performed and to carry out the test as if there is no other crew member. Responsibility for the flight should be allocated in accordance with national regulations.

AMC1 FCL.235 Skill test

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A PPL(A)

(a) The route to be flown for the navigation test should be chosen by the FE. The route may end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test should have a duration that allows the pilot to demonstrate his/her ability to complete a route with at least three identified waypoints and may, as agreed between the applicant and FE, be flown as a separate test.

(b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the authorised checklist for the aeroplane on which the test is being taken. During pre-flight preparation for the test the applicant should be required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the aeroplane used.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the aeroplane within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgment and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the aeroplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

(d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the aeroplane used:

(1) height:

(i) normal flight ± 150 ft

(ii) with simulated engine failure ± 200 ft (if ME aeroplane is used)

(2) heading or tracking of radio aids:

(i) normal flight ± 10°

(ii) with simulated engine failure ± 15° (if ME aeroplane is used)

(3) speed:

(i) take-off and approach +15/–5 knots

(ii) all other flight regimes ± 15 knots

CONTENT OF THE SKILL TEST

(e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a PPL(A) on SE and ME aeroplanes or on TMGs.

SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE	
Use of checklist, airmanship, control of aeroplane by external visual reference, anti/de-icing procedures, etc. apply in all sections.	
a	Pre-flight documentation, NOTAM and weather briefing
b	Mass and balance and performance calculation
c	Aeroplane inspection and servicing
d	Engine starting and after starting procedures
e	Taxiing and aerodrome procedures, pre-take-off procedures
f	Take-off and after take-off checks
g	Aerodrome departure procedures
h	ATC compliance and R/T procedures
SECTION 2 GENERAL AIRWORK	
a	ATC compliance and R/T procedures
b	Straight and level flight, with speed changes
c	Climbing: i. best rate of climb; ii. climbing turns; iii. levelling off.
d	Medium (30 ° bank) turns
e	Steep (45 ° bank) turns (including recognition and recovery from a spiral dive)
f	Flight at critically low air speed with and without flaps
g	Stalling: i. clean stall and recover with power; ii. approach to stall descending turn with bank angle 20°, approach configuration; iii. approach to stall in landing configuration.

h	Descending: i. with and without power; ii. descending turns (steep gliding turns); iii. levelling off.
SECTION 3 EN-ROUTE PROCEDURES	
a	Flight plan, dead reckoning and map reading
b	Maintenance of altitude, heading and speed
c	Orientation, timing and revision of ETAs and log keeping
d	Diversion to alternate aerodrome (planning and implementation)
e	Use of radio navigation aids
f	Basic instrument flying check (180° turn in simulated IMC)
g	Flight management (checks, fuel systems and carburettor icing, etc.)
h	ATC compliance and R/T procedures
SECTION 4 APPROACH AND LANDING PROCEDURES	
a	Aerodrome arrival procedures
b	* Precision landing (short field landing), crosswind, if suitable conditions available
c	* Flapless landing
d	* Approach to landing with idle power (SE only)
e	Touch and go
f	Go-around from low height
g	ATC compliance and R/T procedures
h	Actions after flight
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
This section may be combined with sections 1 through 4	
a	Simulated engine failure after take-off (SE only)
b	* Simulated forced landing (SE only)
c	Simulated precautionary landing (SE only)
d	Simulated emergencies
e	Oral questions
SECTION 6 SIMULATED ASYMMETRIC FLIGHT AND RELEVANT CLASS OR TYPE ITEMS	
This section may be combined with sections 1 through 5	
a	Simulated engine failure during take-off (at a safe altitude unless carried out in an FFS)
b	Asymmetric approach and go-around
c	Asymmetric approach and full stop landing
d	Engine shutdown and restart
e	ATC compliance, R/T procedures or airmanship
f	As determined by the FE: any relevant items of the class or type rating skill test to include, if applicable: i. aeroplane systems including handling of auto pilot; ii. operation of pressurisation system; iii. use of de-icing and anti-icing system.
g	Oral questions

* These items may be combined, at the discretion of the FE.

AMC2 FCL.235 Skill test

CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A PPL(H)

(a) The area and route to be flown should be chosen by the FE and all low level and hover work should be at an adequate aerodrome or site. Routes used for section 3 may end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test, as set out in this AMC should consist of at least three legs, each leg of a minimum duration of 10 minutes. The skill test may be conducted in two flights.

(b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the authorised checklist or pilot operating handbook for the helicopter on which the test is being taken. During pre-flight preparation for the test the applicant is required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the helicopter used.

FLIGHT TEST TOLERANCE

(c) The applicant should demonstrate the ability to:

(1) operate the helicopter within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgement and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the helicopter at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

(d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the helicopter used.

(1) height:

(i) normal forward flight ± 150 ft

(ii) with simulated major emergency ± 200 ft

(iii) hovering IGE flight ± 2 ft

(2) heading or tracking of radio aids:

(i) normal flight ± 10°

(ii) with simulated major emergency ± 15°

(3) speed:

(i) take-off approach – 10 knots/+15 knots

(ii) all other flight regimes ± 15 knots

(4) ground drift:

(i) take-off hover IGE ± 3 ft

(ii) landing no sideways or backwards movement

CONTENT OF THE SKILL TEST

(e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a PPL(H) on SE or ME helicopters.

SECTION 1 PRE-FLIGHT OR POST-FLIGHT CHECKS AND PROCEDURES	
Use of checklist, airmanship, control of helicopter by external visual reference, anti-icing procedures, etc. apply in all sections	
a	Helicopter knowledge, (for example technical log, fuel, mass and balance, performance), flight planning, NOTAM and weather briefing
b	Pre-flight inspection or action, location of parts and purpose
c	Cockpit inspection and starting procedure
d	Communication and navigation equipment checks, selecting and setting frequencies
e	Pre-take-off procedure, R/T procedure and ATC compliance
f	Parking, shutdown and post-flight procedure
SECTION 2 HOVER MANOEUVRES, ADVANCED HANDLING AND CONFINED AREAS	
a	Take-off and landing (lift-off and touch down)
b	Taxi and hover taxi
c	Stationary hover with head, cross or tail wind
d	Stationary hover turns, 360° left and right (spot turns)
e	Forward, sideways and backwards hover manoeuvring
f	Simulated engine failure from the hover
g	Quick stops into and downwind
h	Sloping ground or unprepared sites landings and take-offs
i	Take-offs (various profiles)
j	Crosswind and downwind take-off (if practicable)
k	Take-off at maximum take-off mass (actual or simulated)
l	Approaches (various profiles)
m	Limited power take-off and landing
n	Autorotations, (FE to select two items from: basic, range, low speed and 360° turns)
o	Autorotative landing
p	Practice forced landing with power recovery
q	Power checks, reconnaissance technique, approach and departure technique
SECTION 3 NAVIGATION - EN ROUTE PROCEDURES	
a	Navigation and orientation at various altitudes or heights and map reading
b	Altitude or height, speed, heading control, observation of airspace and altimeter setting
c	Monitoring of flight progress, flight log, fuel usage, endurance, ETA, assessment of track error and re-establishment of correct track and instrument monitoring

d	Observation of weather conditions and diversion planning
e	Use of navigation aids (where available)
f	ATC liaison with due observance of regulations, etc.
SECTION 4 FLIGHT PROCEDURES AND MANOEUVRES	
a	Level flight, control of heading, altitude or height and speed
b	Climbing and descending turns to specified headings
c	Level turns with up to 30° bank, 180° to 360° left and right
d	Level turns 180° left and right by sole reference to instruments
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES (SIMULATED WHERE APPROPRIATE)	
Note (1) Where the test is conducted on an ME helicopter, a simulated engine failure drill, including an SE approach and landing should be included in the test.	
Note (2) The FE should select four items from the following:	
a	Engine malfunctions, including governor failure, carburettor or engine icing and oil system, as appropriate
b	Fuel system malfunction
c	Electrical system malfunction
d	Hydraulic system malfunction, including approach and landing without hydraulics, as applicable
e	Main rotor or anti-torque system malfunction (FFS or discussion only)
f	Fire drills, including smoke control and removal, as applicable
g	Other abnormal and emergency procedures as outlined in an appropriate flight manual and with reference to Appendix 9 C to MCAR-FCL, sections 3 and 4, including for ME helicopters: (a) Simulated engine failure at take-off: (1) rejected take-off at or before TDP or safe forced landing at or before DPATO; (2) shortly after TDP or DPATO. (b) Landing with simulated engine failure: (1) landing or go-around following engine failure before LDP or DPBL; (2) following engine failure after LDP or safe forced landing after DPBL.

AMC3 FCL.235 Skill test

CONTENT OF THE SKILL TEST FOR THE ISSUE OF THE PPL(AS)

(a) The area and route to be flown is chosen by the FE. Routes used for section 3 may end at the aerodrome of departure or at another aerodrome and one destination should be a controlled aerodrome. The skill test may be conducted in two flights. The total duration of the flight(s) should be at least 60 minutes.

(b) The applicant should demonstrate the ability to:

(1) operate the airship within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgement and airmanship;

(4) apply aeronautical knowledge;

(5) maintain control of the airship at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

FLIGHT TEST TOLERANCES

(c) The following limits should apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the airship used.

(1) height:

(i) normal flight ±200 ft

(ii) simulated major emergency ±300 ft

(2) tracking on radio aids: ±15°

(3) heading:

(i) normal flight ±15°

(ii) simulated major emergency ±20°

CONTENT OF THE TEST

(d) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a PPL(As).

(e) Items in sections 5 and 6 may be performed in an FNPT (As) or a FS (As).

SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE	
Use of airship checklists, airmanship, control of airship by external visual reference, anti-icing procedures, and principles of threat and error management, etc. apply in all sections	
a	Pre-flight, including: flight planning, documentation, mass and balance, NOTAM and weather briefing
b	Airship inspection and servicing
c	Off-mast procedure, ground manoeuvring and take-off
d	Performance considerations and trim
e	Aerodrome and traffic pattern operations
f	Departure procedure, altimeter setting, collision avoidance (look-out)
g	ATC compliance and R/T procedures
SECTION 2 GENERAL AIRWORK	
a	Control of the airship by external visual reference, including straight and level, climb, descent and look-out
b	Flight close to pressure height
c	Turns
d	Steep descents and climbs
e	Flight by reference solely to instruments, including: i. Level flight, control of heading, altitude and air speed; ii. Climbing and descending turns; iii. Recoveries from unusual attitudes.

f	ATC compliance and R/T procedures
SECTION 3 EN-ROUTE PROCEDURES	
a	Flight plan, dead reckoning and map reading
b	Maintenance of altitude, heading and speed and collision avoidance (look-out procedures)
c	Orientation, timing and revision of ETAs and log keeping
d	Observation of weather conditions and diversion to alternate aerodrome (planning and implementation)
e	Use of radio navigation aids
f	Flight management (checks, fuel systems, etc.)
g	ATC compliance and R/T procedures
SECTION 4 APPROACH AND LANDING PROCEDURES	
a	Aerodrome arrival procedures, altimeter setting, checks and look-out
b	ATC compliance and R/T procedures
c	Go-around action
d	Normal landing
e	Short field landing
f	Post-flight actions
SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES	
This section may be combined with sections 1 through 4	
a	Simulated engine failure after take-off (at a safe altitude) and fire drill
b	Equipment malfunctions
c	Forced landing (simulated)
d	ATC compliance and R/T procedures
e	Oral questions
SECTION 6 RELEVANT TYPE ITEMS	
This section may be combined with sections 1 through 5	
a	Simulated engine failure during take-off (at a safe altitude unless carried out in a FFS)
b	Approach and go-around with failed engine(s)
c	Approach and full stop landing with failed engine(s)
d	Malfunctions in the envelope pressure system
e	ATC compliance, R/T procedures and airmanship
f	As determined by the FE: any relevant items of the type rating skill test to include, if applicable: i. Airship systems; ii. Operation of envelope pressure system.
g	Oral questions

SECTION 2 – SPECIFIC REQUIREMENTS FOR THE PPL AEROPLANES – PPL(A)

Reserved

SECTION 3 – SPECIFIC REQUIREMENTS FOR THE PPL HELICOPTERS – PPL(H)

Reserved

SECTION 4 – SPECIFIC REQUIREMENTS FOR THE PPL AIRSHIPS – PPL(AS)

AMC1 FCL.210.As PPL(As) – Experience requirements and crediting

FLIGHT INSTRUCTION FOR THE PPL(AS)

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Flight instruction

(1) The PPL(As) flight instruction syllabus should take into account the principles of threat and error management and cover:

(i) pre-flight operations, including mass and balance determination, airship inspection and servicing;

(ii) ground manoeuvring, masting and unmasting procedures;

(iii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

(iv) control of the airship by external visual reference;

(v) take-offs and landings;

(vi) flight by reference solely to instruments, including the completion of a level 180 ° turn;

(vii) cross-country flying using visual reference, dead reckoning and radio navigation aids;

(viii) emergency operations, including simulated airship equipment malfunctions;

(ix) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures, communication procedures and phraseology.

(2) Before allowing the applicant for a PPL(As) to undertake his/her first solo flight, the FI should ensure that the applicant can use R/T communication.

(c) Syllabus of flight instruction

(1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(i) the applicant's progress and ability;

(ii) the weather conditions affecting the flight;

(iii) the flight time available;

(iv) instructional technique considerations;

(v) the local operating environment;

(vi) applicability of the exercises to the airship.

(2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.

(i) Exercise 1a: Familiarisation with the airship:

(A) characteristics of the airship;

(B) cockpit layout;

(C) systems;

(D) checklists, drills and controls.

(ii) Exercise 1b: Emergency drills:

(A) action if fire on the ground and in the air;

(B) engine cabin and electrical system fire;

(C) systems failure;

(D) escape drills, location and use of emergency equipment and exits.

(iii) Exercise 2: Preparation for and action after flight:

(A) flight authorisation and airship acceptance;

(B) serviceability documents;

(C) equipment required, maps, etc.;

(D) mass and balance;

(E) external checks;

(F) ground crew briefing;

(G) internal checks;

(H) harness, seat or rudder panel adjustments;

(I) starting and warm-up checks;

(J) power checks;

(K) running down system checks and switching off the engine;

(L) parking, security and masting;

(M) completion of authorisation sheet and serviceability documents.

(iv) Exercise 3: Air experience: flight exercise.

(v) Exercise 4: Effects of controls:

(A) primary effects;

(B) further effects;

(C) effects of:

(a) air speed;

(b) power;

(c) trimming controls;

(d) other controls, as applicable.

(D) operation of:

(a) mixture control;

(b) carburettor heat;

(c) cabin heating or ventilation.

(vi) Exercise 5: Ground manoeuvring:

(A) pre-taxi checks;

(B) starting, control of speed and stopping;

(C) engine handling;

(D) masting procedures;

(E) control of direction and turning;

(F) effects of wind;

(G) effects of ground surface;

(H) marshalling signals;

(I) instrument checks;

(J) air traffic control procedures;

(K) emergencies.

(vii) Exercise 6a: Take-off procedures:

(A) pre-take-off checks;

(B) take-off with different static heaviness;

(C) drills during and after take-off;

(D) noise abatement procedures.

(viii) Exercise 6b: Emergencies:

(A) abandoned take-off;

(B) engine failure after take-off;

(C) malfunctions of thrust vector control;

(D) aerodynamic control failures;

(E) electrical and system failures.

(ix) Exercise 7: Climbing:

(A) entry, maintaining the normal and max rate climb and levelling off;

(B) levelling off at selected altitudes;

(C) maximum angle of climb;

(D) maximum rate of climb.

(x) Exercise 8: Straight and level:

(A) attaining and maintaining straight and level flight;

(B) flight at or close to pressure height;

(C) control in pitch, including use of trim;

(D) at selected air speeds (use of power);

(E) during speed changes;

(F) use of instruments for precision.

(xi) Exercise 9: Descending:

(A) entry, maintaining and levelling off;

(B) levelling off at selected altitudes;

(C) maximum rate of descent;

(D) maximum angle of descent;

(E) use of instruments for precision flight.

(xii) Exercise 10: Turning:

(A) entry and maintaining level turns;

(B) resuming straight flight;

(C) faults in the turn;

(D) climbing turns;

(E) descending turns;

(F) turns onto selected headings, use of gyro heading indicator and compass;

(G) use of instruments for precision.

(xiii) Exercise 11: Hovering: hovering manoeuvres (as applicable);

(xiv) Exercise 12a: Approach and landing:

(A) effect of wind on approach and touchdown speeds;

(B) landing with different static heaviness;

(C) missed approach and go-around procedures;

(D) noise abatement procedures.

(xv) Exercise 12b: Emergencies:

(A) aborted approach or go-around;

(B) malfunction of thrust vector control;

(C) envelope emergencies;

(D) fire emergencies;

(E) aerodynamic control failures;

(F) electrical and system failures.

(xvi) Exercise 13: Precautionary landing:

(A) occasions necessitating;

(B) in-flight conditions;

(C) landing area selection;

(D) circuit and approach;

(E) actions after landing;

(xvii) Exercise 14a: Navigation:

(A) flight planning:

(a) weather forecast and actuals;

(b) map selection and preparation:

(1) choice of route;

(2) airspace structure;

(3) sensitive areas;

(4) safety altitudes.

(c) calculations:

(1) magnetic heading(s) and time(s) en-route;

(2) fuel consumption;

(3) mass and balance;

(4) performance.

(d) flight information:

(1) NOTAMs etc.;

(2) radio frequencies;

(3) selection of alternate aerodromes.

(e) airship documentation;

(f) notification of the flight:

(1) pre-flight administrative procedures;

(2) flight plan form.

(B) departure:

(a) organisation of cockpit workload;

(b) departure procedures:

(1) altimeter settings;

(2) ATC liaison in controlled or regulated airspace;

(3) setting heading procedure;

(4) noting of ETAs.

(c) maintenance of altitude and heading;

(d) revisions of ETA and heading;

(e) log keeping;

(f) use of radio;

(g) use of navaids;

(h) minimum weather conditions for continuation of flight;

(i) in-flight decisions;

(j) transiting controlled or regulated airspace;

(k) diversion procedures;

(l) uncertainty of position procedure;

(m) lost procedure.

(C) arrival, aerodrome joining procedure:

(a) ATC liaison in controlled or regulated airspace;

(b) altimeter setting;

(c) entering the traffic pattern;

(d) circuit procedures;

(e) parking or on masting;

(f) security of airship;

(g) refuelling;

(h) closing of flight plan, if appropriate;

(i) post-flight administrative procedures.

(xviii) Exercise 14b: Navigation problems at lower levels and in reduced visibility:

(A) actions before descending;

(B) hazards (for example obstacles, and terrain);

(C) difficulties of map reading;

(D) effects of winds, turbulence and precipitation;

(E) vertical situational awareness;

(F) avoidance of noise sensitive areas;

(G) joining the circuit;

(H) bad weather circuit and landing.

(xix) Exercise 14c: Radio navigation:

(A) use of GNSS

(a) selection of waypoints;

(b) to or from indications and orientation;

(c) error messages.

(B) use of VHF omni range (if applicable):

(a) availability, AIP and frequencies;

(b) selection and identification;

(c) OBS;

(d) to or from indications and orientation;

(e) CDI;

(f) determination of radial;

(g) intercepting and maintaining a radial;

(h) VOR passage;

(i) obtaining a fix from two VORs.

(C) use of ADF equipment: NDBs (if applicable):

(a) availability, AIP and frequencies;

(b) selection and identification;

(c) orientation relative to the beacon;

(d) homing.

(D) use of VHF/DF:

(a) availability, AIP and frequencies;

(b) R/T procedures and ATC liaison;

(c) obtaining a QDM and homing.

(E) use of en-route or terminal radar:

(a) availability and AIP;

(b) procedures and ATC liaison;

(c) pilot's responsibilities;

(d) secondary surveillance radar:

(1) transponders;

(2) code selection;

(3) interrogation and reply.

(F) use of DME (if applicable);

(a) station selection and identification;

(b) modes of operation: distance, groundspeed and time to run.

(xx) Exercise 15: Basic instrument flight:

(A) physiological sensations;

(B) instrument appreciation: attitude instrument flight;

(C) instrument limitations;

(D) basic manoeuvres:

(a) straight and level;

(b) climbing and descending;

(c) turns, climbing and descending, onto selected headings;

(d) recoveries from climbing and descending turns.

(d) BITD

(1) A BITD may be used for flight training for:

(i) flight by reference solely to instruments;

(ii) navigation using radio navigation aids;

(iii) basic instrument flight.

(2) The use of the BITD should be subject to the following:

(i) the training should be complemented by exercises on an airship;

(ii) the record of the parameters of the flight must be available; and an FI(As) should conduct the instruction.

SUBPART D – COMMERCIAL PILOT LICENCE – CPL

SECTION 1 – COMMON REQUIREMENTS

AMC1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations

LEARNING OBJECTIVES FOR ATPL, CPL, IR, CB-IR(A) and BIR

(a) Aeroplanes and helicopters

GENERAL

In the tables of this AMC, the applicable LOs for each ATPL, CPL, IR, CB-IR(A) are marked with an 'X', and for the BIR exam and BIR BK with the number 1, 2 or 3 (corresponding to the modules as mentioned in FCL.835 'Basic instrument rating (BIR)'.

The LOs define the subject knowledge and applied knowledge, skills and attitudes that a student pilot should have assimilated during the theoretical knowledge course.

The LOs are intended to be used by an approved training organisation (ATO) when developing the Part-FCL theoretical knowledge elements of the appropriate course. It should be noted, however, that the LOs do not provide a ready-made ground training syllabus for individual ATOs, and should not be seen by organisations as a substitute for a thorough course design. Adherence to the LOs should become part of the ATO's compliance monitoring scheme as required by ORA.GEN.200(a)(6).

ATOs are required to produce a training plan for each of their courses based on the instructional systems design (ISD) methodology as specified in AMC2 ORA.ATO.230.

Additional guidance on the meaning and taxonomy of the verbs used in the LOs can be found in GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d).

TRAINING AIMS

After completion of the training, a student pilot should:

— be able to understand and apply the subject knowledge in order to be able to identify and manage threats and errors effectively;

— meet at least the Area 100 KSA minimum standard.

INTERPRETATION

The abbreviations used are ICAO abbreviations listed in ICAO Doc 8400 'ICAO Abbreviations and Codes', or those listed in GM1 FCL.010.

Where a LO refers to a definition, e.g. 'Define the following terms' or 'Define and understand' or 'Explain the definitions in ...', candidates are also expected to be able to recognise a given definition.

Below is a table showing the short references to applicable legislation and standards:

Reference	Legislation/Standard
The Basic Regulation	ANNEX VI - Essential Requirements for Aircrew (Part-ERA) of MCAR Aircrew
The Aircrew Regulation	MCAR Aircrew
Part-FCL	MCAR Aircrew Annex I – Flight Crew Licensing
Part-MED	ANNEX IV- Medical Requirements for Licensing
CS-23, AMC & GM to CS-23, CS-25, CS-27, CS-29, CS-E and CS-Definitions	Refer to the respective Certification Specifications / AMC & GM

'Applicable operational requirements' refers to, for the ATPL(A), CPL(A), ATPL(H)/IR, ATPL(H)/VFR, CPL(H), IR and CBIR, MCAR Air Operations and other MCARs related to Operations as described by MCAR Air Operations.

The General Student Pilot Route Manual (GSPRM) contains planning data plus aerodrome and approach charts that may be used in theoretical knowledge training courses. The guidelines on its content can be found in this AMC, before the LO table for Subject 033 'Flight planning and monitoring'.

Excerpts from any aircraft manuals including but not limited to CAP 696, 697 and 698 for aeroplanes, and CAP 758 for helicopters may be used in training. Where questions refer to excerpts from aircraft manuals, the associated aircraft data will be provided in the examinations.

Some numerical data (e.g. speeds, altitudes/levels and masses) used in questions for theoretical knowledge examinations may not be representative for helicopter operations, but the data is satisfactory for the calculations required.

Note: In all subject areas, the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LOs FOR ATPL, CPL, IR, CB-IR(A) and BIR

GENERAL

The detailed theoretical knowledge syllabus outlines the topics that should be taught and examined in order to meet the theoretical knowledge requirements appropriate to ATPL, MPL, CPL, IR, CB-IR(A) and BIR.

For each topic in the detailed theoretical knowledge syllabus, one or more LOs are set out in the appendices as shown below:

— Appendix 010 AIR LAW

- Appendix 021 AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT
- Appendix 022 AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION
- Appendix 031 FLIGHT PERFORMANCE AND PLANNING – MASS AND BALANCE
- Appendix 032 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES
- Appendix 033 FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING
- Appendix 034 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS
- Appendix 040 HUMAN PERFORMANCE AND LIMITATIONS
- Appendix 050 METEOROLOGY
- Appendix 061 NAVIGATION – GENERAL NAVIGATION
- Appendix 062 NAVIGATION – RADIO NAVIGATION
- Appendix 070 OPERATIONAL PROCEDURES
- Appendix 081 PRINCIPLES OF FLIGHT – AEROPLANES
- Appendix 082 PRINCIPLES OF FLIGHT – HELICOPTERS
- Appendix 090 RADIO COMMUNICATIONS
- Appendix AREA 100 KNOWLEGDE, SKILLS AND ATTITUDES (KSA)

(b) Airships

SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR

The applicable items for each licence or rating are marked with ‘x’. An ‘x’ on the main title of a subject means that all the subdivisions are applicable.'

		CPL	IR
1.	**AIR LAW AND ATC PROCEDURES**	x	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		x
	RULES OF THE AIR		x

		CPL	IR
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		x
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		x
	AERONAUTICAL INFORMATION SERVICE		x
	AERODROMES		x
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		
2.	**AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT**	x	
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIRBAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
3.	**AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION**	x	
	SENSORS AND INSTRUMENTS		

		CPL	IR
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		
	GYROSCOPIC INSTRUMENTS		
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
4.	**FLIGHT PERFORMANCE AND PLANNING**	x	
4.1.	**MASS AND BALANCE: AIRSHIPS**	x	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
4.2.	**FLIGHT PLANNING AND FLIGHT MONITORING**		
	FLIGHT PLANNING FOR VFR FLIGHTS	x	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	x	x
	PRE-FLIGHT PREPARATION	x	x
	ATS FLIGHT PLAN	x	x
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x
4.3.	**PERFORMANCE: AIRSHIPS**	x	

		CPL	IR
	AIRWORTHINESS REQUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		
5.	**HUMAN PERFORMANCE**	x	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSYCHOLOGY		
6.	**METEOROLOGY**	x	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		
	FLIGHT HAZARDS		
	METEOROLOGICAL INFORMATION		
7.	**NAVIGATION**		
7.1.	**GENERAL NAVIGATION**	x	
	BASICS OF NAVIGATION		
	MAGNETISM AND COMPASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
7.2.	**RADIO NAVIGATION**		
	BASIC RADIO PROPAGATION THEORY	x	x
	RADIO AIDS	x	x
	RADAR	x	x
	INTENTIONALLY LEFT BLANK		

		CPL	IR
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	x	x
8.	**OPERATIONAL PROCEDURES AIRSHIP**	x	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
9.	**PRINCIPLES OF FLIGHT**	x	
9.1.	**PRINCIPLES OF FLIGHT: AIRSHIPS**	x	
	BASICS OF AEROSTATICS		
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
10.	**COMMUNICATIONS**		
10.1.	**VFR COMMUNICATIONS**	x	
	DEFINITIONS	x	
	GENERAL OPERATING PROCEDURES	x	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	x	
	DISTRESS AND URGENCY PROCEDURES	x	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	
10.2.	**IFR COMMUNICATIONS**		
	DEFINITIONS		x

		CPL	IR
	GENERAL OPERATING PROCEDURES		x
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x
	DISTRESS AND URGENCY PROCEDURES		x
	RELEVANT WEATHER INFORMATION TERMS (IFR)		x
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		x
	MORSE CODE		x

Appendix to AMC1 FCL.310; FCL.515(b); FCL.615(b) Theoretical knowledge examinations

SUBJECT 021 – AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
020 00 00 00		**AIRCRAFT GENERAL KNOWLEDGE**										
021 00 00 00		**AIRCRAFT GENERAL KNOWLEDGE — AIRFRAME, SYSTEMS AND POWER PLANT**										
021 01 00 00		**SYSTEM DESIGN, LOADS, STRESSES, MAINTENANCE**										
021 01 01 00		**System design**										
021 01 01 01		***Design concepts***										
(01)	X	Describe the following structural design philosophy: — safe life; — fail-safe (multiple load paths); — damage-tolerant.	X	X	X	X	X					
(02)		Explain the purpose of redundancy in aircraft design.	X	X	X	X	X					
021 01 01 02		***Level of certification***										
(01)	X	Explain why some systems are duplicated or triplicated.	X	X	X	X	X					
(02)	X	Explain that all aircraft are certified according to specifications determined by the competent authority, and that these certification	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		specifications cover aspects such as design, material quality and build quality.										
(03)	X	State that the certification specifications for aeroplanes issued by EASA are: — CS-23 for Normal, Utility, Aerobatic and Commuter Aeroplanes; — CS-25 for Large Aeroplanes.	X	X								
(04)	X	State that the certification specifications for rotorcraft issued by EASA are: — CS-27 for Small Rotorcraft; — CS-29 for Large Rotorcraft.			X	X	X					
021 01 02 00		**Loads and stresses**										
021 01 02 01		***Stress, strain and loads***										
(01)		Explain how stress and strain are always present in an aircraft structure both when parked and during manoeuvring. *Remark: Stress is the internal force per unit area inside a structural part as a result of external loads. Strain is the deformation caused by the action of stress on a material.*	X	X	X	X	X					
(02)		Describe the following types of loads that an aircraft may be subjected to, when they occur, and how a pilot may affect their magnitude: — static loads; — dynamic loads;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— cyclic loads.										
(03)		Describe the areas typically prone to stress that should be given particular attention during a pre-flight inspection, and highlight the limited visual cues of any deformation that may be evident.	X	X	X	X	X					
021 01 03 00		**Fatigue and corrosion**										
021 01 03 01		***Describe and explain fatigue and corrosion***										
(01)		Describe the effects of corrosion and how it can be visually identified by a pilot during the pre-flight inspection.	X	X	X	X	X					
(02)		Describe the operating environments where the risk of corrosion is increased and how to minimise the effects of the environmental factors.	X	X	X	X	X					
(03)		Explain that aircraft have highly corrosive fluids on board as part of their systems and equipment.	X	X	X	X	X					
(04)		Explain fatigue, how it affects the useful life of an aircraft, and the effect of the following factors on the development of fatigue: — corrosion; — number of cycles; — type of flight manoeuvres; — stress level;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— level and quality of maintenance.										
021 01 04 00		**Intentionally left blank**										
021 01 05 00		**Maintenance**										
021 01 05 01		***Maintenance methods: hard-time and on-condition monitoring***										
(01)		Explain the following terms: — hard-time or fixed-time maintenance; — on-condition maintenance; — condition monitoring.	X	X	X	X	X					
021 02 00 00		**AIRFRAME**										
021 02 01 00		**Attachment methods**										
021 02 01 01		***Attachment methods and detecting the development of faulty attachments***										
(01)		Describe the following attachment methods used for aircraft parts and components: — riveting; — welding; — bolting; — pinning; — adhesives (bonding); — screwing.	X	X	X	X	X					
(02)		Explain how the development of a faulty attachment between aircraft parts or	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		components can be detected by a pilot during the pre-flight inspection.										
021 02 02 00		**Materials**										
021 02 02 01		***Composite and other materials***										
(01)	X	Explain the principle of a composite material, and give examples of typical non-metallic materials used on aircraft: — carbon; — glass; — Kevlar aramid; — resin or filler.	X	X	X	X	X					
(02)	X	State the advantages and disadvantages of composite materials compared with metal alloys by considering the following: — strength-to-weight ratio; — capability to tailor the strength to the direction of the load; — stiffness; — electrical conductivity (lightning); — resistance to fatigue and corrosion; — resistance to cost; — discovering damage during a pre-flight inspection.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		State that several types of materials are used on aircraft and that they are chosen based on type of structure or component and the required/desired material properties.	X	X	X	X	X					
021 02 03 00		**Aeroplane: wings, tail surfaces and control surfaces**										
021 02 03 01		***Design***										
(01)		Describe the following types of design and explain their advantages and disadvantages: — high-mounted wing; — low-mounted wing; — low- or mid-set tailplane; — T-tail.	X	X								
021 02 03 02		***Structural components***										
(01)		Describe the function of the following structural components: — spar and its components (web and girder or cap); — rib; — stringer; — skin; — torsion box.	X	X								
021 02 03 03		***Loads, stresses and aeroelastic vibrations (flutter)***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the vertical and horizontal loads on the ground and during normal flight.	X	X								
(02)		Describe the vertical and horizontal loads during asymmetric flight following an engine failure for a multi-engine aeroplane, and how a pilot may potentially overstress the structure during the failure scenario.	X	X								
(03)		Explain the principle of flutter and resonance for the wing and control surfaces.	X	X								
(04)		Explain the following countermeasures used to achieve stress relief and reduce resonance: — chord-wise and span-wise position of masses (e.g. engines, fuel, balance masses for wing and control balance masses); — torsional stiffness; — bending flexibility; — fuel-balancing procedures during flight (automatic or applied by the pilot).	X	X								
021 02 04 00		**Fuselage, landing gear, doors, floor, windscreen and windows**										
021 02 04 01		***Construction, functions, loads***										
(01)	X	Describe the following types of fuselage construction: — monocoque, — semi-monocoque.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Describe the construction and the function of the following structural components of a fuselage: — frames; — bulkhead; — pressure bulkhead; — stiffeners, stringers, longerons; — skin, doublers; — floor suspension (crossbeams); — floor panels; — firewall.	X	X	X	X	X					
(03)		Describe the loads on the fuselage due to pressurisation.	X	X								
(04)		Describe the following loads on a main landing gear: — touch-down loads (vertical and horizontal); — taxi loads on bogie gear (turns).	X	X								
(05)		Describe the structural danger of a nose-wheel landing with respect to: — fuselage loads; — nose-wheel strut loads.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe the structural danger of a tail strike with respect to: — fuselage and aft bulkhead damage (pressurisation).	X	X								
(07)		Describe the door and hatch construction for pressurised and unpressurised aeroplanes including: — door and frame (plug type); — hinge location; — locking mechanism.	X	X								
(08)	X	Explain the advantages and disadvantages of the following fuselage cross sections: — circular; — double bubble; — oval; — rectangular.	X	X								
(09)		Explain why flight-deck windows are constructed with different layers.	X	X								
(10)		Explain the function of window heating for structural purposes.	X	X								
(11)		Explain the implication of a direct-vision window (see CS 25.773(b)(3)).	X	X								
(12)		Explain the need for an eye-reference position.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(13)		Explain the function of floor venting (blow-out panels).	X	X								
(14)		Describe the construction and fitting of sliding doors.			X	X	X					
021 02 05 00		**Helicopter: structural aspects of flight controls**										
021 02 05 01		***Design and construction***										
(01)		List the functions of flight controls.			X	X	X					
(02)		Explain why vertical and horizontal stabilisers may have different shapes and alignments.			X	X	X					
021 02 05 02		***Structural components and materials***										
(01)		Describe the fatigue life and methods of checking for serviceability of the components and materials of flight and control surfaces.			X	X	X					
021 02 05 03		***Loads, stresses and aeroelastic vibrations***										
(01)		Describe the dangers and stresses regarding safety and serviceability in flight when the manufacturer's design envelope is exceeded.			X	X	X					
(02)		Explain that blade tracking is important both to minimise vibration and to help ensure uniformity of flow through the disc.			X	X	X					
(03)		Describe the early indications and vibrations which are likely to be experienced when the main-rotor blades and tail rotor are out of balance or tracking, including the possible early indications due to possible fatigue and overload.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain how a vibration harmonic can be set up in other components which can lead to their early failure.			X	X	X					
(05)		State the three planes of vibration measurement, i.e. vertical, lateral, fore and aft.			X	X	X					
021 02 06 00		**Structural limitations**										
021 02 06 01		***Maximum structural masses***										
(01)		Define and explain the following maximum structural masses: — maximum ramp mass; — maximum take-off mass; — maximum zero fuel mass; — maximum landing mass. *Remark: These limitations may also be found in the relevant part of Subjects 031 ‘Mass and balance’, 032 ‘Performance (aeroplane)’ and 034 ‘Performance (helicopter)’.*	X	X								
(02)		Explain that airframe life is limited by fatigue, created by alternating stress and the number of load cycles.	X	X								
(03)		Explain the maximum structural masses: — maximum take-off mass.			X	X	X					
(04)		Explain that airframe life is limited by fatigue, created by load cycles.			X	X	X					
021 03 00 00		**HYDRAULICS**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 03 01 00		**Hydromechanics: basic principles**										
021 03 01 01		***Concepts and basic principles***										
(01)	X	Explain the concept and basic principles of hydromechanics including: — hydrostatic pressure; — Pascal's law; — the relationship between pressure, force and area; — transmission of power: multiplication of force, decrease of displacement.	X	X	X	X	X					
021 03 02 00		**Hydraulic systems**										
021 03 02 01		***Hydraulic fluids: types, characteristics, limitations***										
(01)	X	List and explain the desirable properties of a hydraulic fluid with regard to: — thermal stability; — corrosiveness; — flashpoint and flammability; — volatility; — viscosity.	X	X	X	X	X					
(02)	X	State that hydraulic fluids are irritating to skin and eyes.	X	X	X	X	X					
(03)		List the two different types of hydraulic fluids:	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— synthetic; — mineral.										
(04)		State that different types of hydraulic fluids cannot be mixed.	X	X	X	X	X					
(05)	X	State that at the pressures being considered, hydraulic fluid is considered incompressible.	X	X	X	X	X					
021 03 02 02		***System components: design, operation, degraded modes of operation, indications and warnings***										
(01)		Explain the working principle of a hydraulic system.	X	X	X	X	X					
(02)		Describe the difference in the principle of operation between a constant pressure system and a system pressurised only on specific demand.	X	X	X	X	X					
(03)		State the differences in the principle of operation between a passive hydraulic system (without a pressure pump) and an active hydraulic system (with a pressure pump).	X	X	X	X	X					
(04)	X	List the main advantages and disadvantages of system actuation by hydraulic or purely mechanical means with respect to: — weight; — size; — force.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		List the main uses of hydraulic systems.	X	X	X	X	X					
(06)		State that hydraulic systems can be classified as either high pressure (typically 3000 psi or higher) or low pressure (typically up to 2000 psi).	X	X	X	X	X					
(07)		State that a high-pressure hydraulic system is typically operating at 3000 psi but on some aircraft a hydraulic pressure of 4000 to 5000 psi may also be used.	X	X	X	X	X					
(08)		Explain the working principle of a low-pressure (0–2000 psi) system.	X	X	X	X	X					
(09)		Explain the advantages and disadvantages of a high-pressure system over a low-pressure system.	X	X	X	X	X					
(10)		Describe the working principle and functions of pressure pumps including: — constant pressure pump (swash plate or cam plate); — pressure pump whose output is dependent on pump revolutions per minute (rpm) (gear type).	X	X	X	X	X					
(11)		Explain the following different sources of hydraulic pressure, their typical application and potential operational limitations: — manual; — engine gearbox;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— electrical; — air (pneumatic and ram-air turbine); — hydraulic (power transfer unit) or reversible motor pumps; — accessory.										
(12)		Explain the following different sources of hydraulic pressure, their typical application and potential operational limitations: — manual; — engine; — gearbox; — electrical.			X	X	X					
(13)		Describe the working principle and functions of the following hydraulic system components: — reservoir (pressurised and unpressurised); — accumulators; — case drain lines and fluid cooler return lines; — piston actuators (single- and double-acting); — hydraulic motors;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— filters; — non-return (check) valves; — relief valves; — restrictor valves; — elector valves (linear and basic rotary selectors, two and four ports); — bypass valves; — shuttle valves; — fire shut-off valves; — priority valves; — fuse valves; — pressure and return pipes.										
(14)		Explain the function of the demand pump installed on many transport aeroplanes.	X	X								
(15)		Explain how redundancy is obtained by giving examples.	X	X	X	X	X					
(16)		Interpret a typical hydraulic system schematic to the level of detail as found in an aircraft flight crew operating manual (FCOM).	X	X	X	X	X					
(17)		Explain the implication of a high system demand.	X	X	X	X	X					
(18)		List and describe the instruments and alerts for monitoring a hydraulic system.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(19)		State the indications and explain the implications of the following malfunctions: — system leak or low level; — low pressure; — high temperature.	X	X	X	X	X					
021 04 00 00		**LANDING GEAR, WHEELS, TYRES, BRAKES**										
021 04 01 00		**Landing gear**										
021 04 01 01		***Types***										
(01)	X	Name, for an aeroplane, the following different landing-gear configurations: — nose wheel; — tail wheel.	X	X								
(02)	X	Name, for a helicopter, the following different landing-gear configurations: — nose wheel; — tail wheel; — skids.			X	X	X					
021 04 01 02		***System components, design, operation, indications and warnings, on-ground/in-flight protections, emergency extension systems***										
(01)		Explain the function of the following components of a landing gear: — oleo leg/shock strut;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— axles; — bogies and bogie beam; — drag struts; — side stays/struts; — torsion links; — locks (over centre); — gear doors.										
(02)		Explain the function of the following components of a landing gear: — oleo leg/shock strut; — axles; — drag struts; — side stays/struts; — torsion links; — locks (over centre); — gear doors.			X	X	X					
(03)		Name the different components of a landing gear, using a diagram.	X	X	X	X	X					
(04)		Describe the sequence of events during normal operation of the landing gear.	X	X	X	X	X					
(05)		State how landing-gear position indication and alerting is implemented.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Describe the various protection devices to avoid inadvertent gear retraction on the ground and explain the implications of taking off with one or more protection devices in place: — ground lock (pins); — protection devices in the gear retraction mechanism.	X	X	X	X	X					
(07)		Explain the speed limitations for gear operation (VLO (maximum landing gear operating speed) and VLE (maximum landing gear extended speed)).	X	X	X	X	X					
(08)		Describe the sequence for emergency gear extension: — unlocking; — operating; — down-locking.	X	X	X	X	X					
(09)		Describe some methods for emergency gear extension including: — gravity/free fall; — air or nitrogen pressure; — manually/mechanically.	X	X	X	X	X					
021 04 02 00		**Nose-wheel steering**										
021 04 02 01		***Design, operation***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the operating principle of nose-wheel steering.	X	X	X	X	X					
(02)		Explain, for a helicopter, the functioning of differential braking with free-castoring nose wheel.			X	X	X					
(03)		Describe, for an aeroplane, the functioning of the following systems: — differential braking with free-castoring nose wheel; — tiller or hand wheel steering; — rudder pedal nose-wheel steering.	X	X								
(04)		Explain the centring mechanism of the nose wheel.	X	X	X	X	X					
(05)		Define the term 'shimmy' and the possible consequences of shimmy for the nose- and the main-wheel system and explain the purpose of a shimmy damper to reduce the severity of shimmy.	X	X								
(06)		Explain the purpose of main-wheel (body) steering.	X	X								
021 04 03 00		**Brakes**										
021 04 03 01		***Types and materials***										
(01)		Describe the basic operating principle of a disc brake.	X	X	X	X	X					
(02)		State the different materials used in a disc brake (steel, carbon).	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Describe the characteristics, advantages and disadvantages of steel and carbon brake discs with regard to: — weight; — temperature limits; — internal-friction coefficient; — wear.	X	X	X	X	X					
021 04 03 02		***System components, design, operation, indications and warnings***										
(01)		Explain the limitation of brake energy and describe the operational consequences.	X	X								
(02)		Explain how brakes are actuated: hydraulically, electrically.	X	X	X	X	X					
(03)		Explain the purpose of an in-flight wheel brake system.	X	X								
(04)		Describe the function of a brake accumulator.	X	X	X	X	X					
(05)		Describe the function of the parking brake.	X	X	X	X	X					
(06)		Explain the function of brake-wear indicators.	X	X								
(07)		Explain the reason for the brake-temperature indicator.	X	X								
021 04 03 03		***Anti-skid***										
(01)		Describe the operating principle of anti-skid where excessive brake pressure applied is	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		automatically reduced for optimum breaking performance.										
(02)		Explain that the anti-skid computer compares wheel speed to aeroplane reference speed to provide the following: — slip ratio for maximum braking performance; — locked-wheel prevention (protection against deep skid on one wheel); — touchdown protection (protection against brake-pressure application during touchdown); — hydroplane protection.	X	X								
(03)		Give examples of the impact of an anti-skid system on performance, and explain the implications of anti-skid system failure.	X	X								
021 04 03 04		***Autobrake***										
(01)		Describe the operating principle of an autobrake system.	X	X								
(02)		Explain why the anti-skid system must be available when using autobrakes.	X	X								
(03)		Explain the difference between the three modes of operation of an autobrake system: — OFF (system off or reset);	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— Armed (the system is ready to operate under certain conditions); — Activated/Deactivated (application of pressure on brakes).										
(04)		Describe how an autobrake system setting will either apply maximum braking (RTO or MAX) or result in a given rate of deceleration, where the amount of braking applied may be affected by: — the use of reverse thrust; — slippery runway.	X	X								
021 04 04 00		**Wheels, rims and tyres**										
021 04 04 01		***Types, structural components and materials, operational limitations, thermal plugs***										
(01)	X	Describe the different types of tyres such as: — tubeless; — diagonal (cross ply); — radial (circumferential bias).	X	X	X	X	X					
(02)	X	Define the following terms: — ply rating; — tyre tread; — tyre creep; — retread (cover).	X	X	X	X	X					
(03)		Explain the function of thermal/fusible plugs.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the implications of and how to identify tread separation and wear or damage with associated increased risk of tyre burst.	X	X								
(05)		Explain why the ground speed of tyres is limited.	X	X								
(06)		Describe the following tyre checks a pilot will perform during the pre-flight inspection and identify probable causes: — cuts and damages; — flat spots.	X	X								
021 04 05 00		**Helicopter equipment**										
021 04 05 01		***Flotation devices***										
(01)		Explain flotation devices, how they are operated, and their limitations.			X	X	X					
(02)		Explain why indicated airspeed (IAS) limitations before, during and after flotation-device deployment must be observed.			X	X	X					
021 05 00 00		**FLIGHT CONTROLS**										
021 05 01 00		**Aeroplane: primary flight controls**										
021 05 01 01		***Definition and control surfaces***										
(01)		Define a ‘primary flight control’.	X	X								
(02)		List the following primary flight control surfaces: — elevator; — aileron, roll spoilers, flaperon;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— rudder.										
(03)		List the various means of control surface actuation including: — manual; — fully powered (irreversible); — partially powered (reversible).	X	X								
021 05 01 02		***Manual controls***										
(01)		Explain the basic principle of a fully manual control system.	X	X								
021 05 01 03		***Fully powered controls (irreversible)***										
(01)		Explain the basic principle of a fully powered control system.	X	X								
(02)		Explain the concept of irreversibility in a flight control system.	X	X								
(03)		Explain the need for a ‘feel system’ in a fully powered control system.	X	X								
(04)		Explain the operating principle of a stabiliser trim system in a fully powered control system.	X	X								
(05)		Explain the operating principle of rudder and aileron trim in a fully powered control system.	X	X								
021 05 01 04		***Partially powered controls (reversible)***										
(01)		Explain the basic principle of a partially powered control system.	X	X								
(02)		Explain why a ‘feel system’ is not necessary in a partially powered control system.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 05 01 05		***System components, design, operation, indications and warnings, degraded modes of operation, jamming***										
(01)		List and describe the function of the following components of a flight control system: — actuators; — control valves; — cables; — electrical wiring; — control surface position sensors.	X	X								
(02)		Explain how redundancy is obtained in primary flight control systems of large transport aeroplanes.	X	X								
(03)		Explain the danger of control jamming and the means of retaining sufficient control capability.	X	X								
(04)		Explain the methods of locking the controls on the ground and describe ‘gust or control lock’ warnings.	X	X								
(05)		Explain the concept of a rudder deflection limitation (rudder limiter) system and the various means of implementation (rudder ratio changer, variable stops, blow-back).	X	X								
021 05 02 00		**Aeroplane: secondary flight controls**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 05 02 01		***System components, design, operation, degraded modes of operation, indications and warnings***										
(01)		Define a 'secondary flight control'.	X	X								
(02)		List the following secondary flight control surfaces: — lift-augmentation devices (flaps and slats); — speed brakes; — flight and ground spoilers; — trimming devices such as trim tabs, trimmable horizontal stabiliser.	X	X								
(03)		Describe secondary flight control actuation methods and sources of actuating power.	X	X								
(04)		Explain the function of a mechanical lock when using hydraulic motors driving a screw jack.	X	X								
(05)		Describe the requirement for limiting flight speeds for the various secondary flight control surfaces.	X	X								
(06)		For lift-augmentation devices, explain the load-limiting (relief) protection devices and the functioning of an auto-retraction system.	X	X								
(07)		Explain how a flap/slat asymmetry protection device functions, and describe the implications of a flap/slat asymmetry situation.	X	X								
(08)		Describe the function of an auto-slat system.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(09)		Explain the concept of control surface blow-back (aerodynamic forces overruling hydraulic forces).	X	X								
021 05 03 00		**Helicopter: flight controls**										
021 05 03 01		***Droop stops, control systems, trim systems, control stops***										
(01)		Explain the methods of locking the controls on the ground.			X	X	X					
(02)		Describe main-rotor droop stops and how rotor flapping is restricted.			X	X	X					
(03)		Explain the principle of phase lag and advance angle.			X	X	X					
(04)		Describe the following four axes of control operation, their operating principle and their associated cockpit controls: — collective control; — cyclic fore and aft (pitch axis); — cyclic lateral (roll axis); — yaw.			X	X	X					
(05)		Describe the swash plate or azimuth star control system including the following: — swash plate inputs; — the function of the non-rotating swash plate; — the function of the rotating swash plate;			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— how swash plate tilt is achieved; — swash plate pitch axis; — swash plate roll axis; — balancing of pitch/roll/collective inputs to the swash plate to equalise torsional loads on the blades.										
(06)		Describe the operation of the spider control system.			X	X	X					
(07)		State the need for artificial feel in a hydraulically actuated flight control system.			X	X	X					
(08)		Describe and explain the purpose of a trim system using the following terms: — force-trim switch; — force gradient; — parallel trim actuator; — cyclic 4-way trim switch; — interaction of trim system with an SAS/SCAS/ASS stability system; — trim-motor indicators.			X	X	X					
(09)		Describe the different types of control runs.			X	X	X					
(10)		Explain the use of control stops.			X	X	X					
021 05 04 00		**Aeroplane: fly-by-wire (FBW) control systems**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 05 04 01		***Composition, explanation of operation, modes of operation***										
(01)		Explain that an FBW flight control system is composed of the following: — pilot's input command (control column/sidestick/rudder pedals); — electrical signalling paths, including: — pilot input to computer; — computer to flight control surfaces; — feedback from aircraft response to computer; — flight control computers; — actuators; — flight control surfaces.	X	X								
(02)		State the advantages of an FBW system in comparison with a conventional flight control system including: — weight; — pilot workload; — flight-envelope protection.	X	X								
(03)		Explain why an FBW system is always irreversible.	X	X								
(04)		Explain the different modes of operation:	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— normal operation (e.g. normal law or normal mode); — downgraded operation (e.g. alternate law or secondary mode); — direct law.										
(05)		Describe the implications of mode degradation in relation to pilot workload and flight-envelope protection.	X	X								
(06)		— *Intentionally left blank*										
(07)		For aircraft using sidestick for manual control, describe the implications of: — dual control input made by the pilot; — the control takeover facility available to the pilot.	X	X								
(08)		*Intentionally left blank*										
(09)		Explain why several types of computers are needed and why they should be dissimilar.	X	X								
(10)		Explain why several control surfaces on every axis are needed on FBW aircraft.	X	X								
(11)		Explain why several sensors are needed on critical parameters.	X	X								
021 05 05 00		**Helicopter: fly-by-wire (FBW) control systems**										
		To be introduced at a later date.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
021 06 00 00		**PNEUMATICS — PRESSURISATION AND AIR-CONDITIONING SYSTEMS**										
021 06 01 00		**Pneumatic/bleed-air supply**										
021 06 01 01		***Piston-engine air supply***										
(01)		Describe the following means of supplying air for the pneumatic systems for piston-engine aircraft: — compressor; — vacuum pump.	X	X	X	X	X					
(02)		State that an air supply is required for the following systems: — instrumentation; — heating; — de-icing.	X	X	X	X	X					
021 06 01 02		***Gas turbine engine: bleed-air supply***										
(01)		State that the possible bleed-air sources for gas turbine engine aircraft are the following: — engine; — auxiliary power unit (APU); — ground supply.	X	X	X	X	X					
(02)		State that for an aeroplane a bleed-air supply can be used for the following systems or components: — ice protection;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— engine air starter; — pressurisation of a hydraulic reservoir; — air-driven hydraulic pumps; — pressurisation and air conditioning.										
(03)		State that for a helicopter a bleed-air supply can be used for the following systems or components: — anti-icing; — engine air starter; — pressurisation of a hydraulic reservoir.			X	X	X					
(04)		State that the bleed-air supply system can comprise the following: — pneumatic ducts; — isolation valve; — pressure-regulating valve; — engine bleed valve (HP/IP valves); — fan-air pre-cooler; — temperature and pressure sensors.	X	X	X	X	X					
(05)		Interpret a basic pneumatic system schematic to the level of detail as found in an FCOM.	X	X	X	X	X					
(06)		Describe the cockpit indications for bleed-air systems.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(07)		Explain how the bleed-air supply system is controlled and monitored.	X	X	X	X	X					
(08)		State the following bleed-air malfunctions: — over-temperature; — over-pressure; — low pressure; — overheat/duct leak; and describe the potential consequences.	X	X	X	X	X					
021 06 02 00		**Helicopter: air-conditioning systems**										
021 06 02 01		***Types, system components, design, operation, degraded modes of operation, indications and warnings***										
(01)		Describe the purpose of an air-conditioning system.			X	X	X					
(02)		Explain how an air-conditioning system is controlled.			X	X	X					
(03)		Describe the vapour cycle air-conditioning system including system components, design, operation, degraded modes of operation and system malfunction indications.			X	X	X					
(04)		Identify the following components from a diagram of an air-conditioning system and describe the operating principle and function: — air-cycle machine (pack, bootstrap system);			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— pack-cooling fan; — water separator; — mixing valves; — flow-control valves; — isolation valves; — recirculation fans; — filters for recirculation; — temperature sensors.										
(05)		List and describe the controls, indications and warnings related to an air-conditioning system.			X	X	X					
021 06 03 00		**Aeroplane: pressurisation and air-conditioning system**										
021 06 03 01		***System components, design, operation, degraded modes of operation, indications and warnings***										
(01)		Explain that a pressurisation and an air-conditioning system of an aeroplane controls: — ventilation; — temperature; — pressure.	X	X								
(02)		Explain how humidity is controlled.	X	X								
(03)		Explain that the following components constitute a pressurisation system:	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— pneumatic system as the power source; — outflow valve; — outflow valve actuator; — pressure controller; — excessive differential pressure-relief valve; — negative differential pressure-relief valve.										
(04)		Explain that the following components constitute an air-conditioning system and describe their operating principles and function: — air-cycle machine (pack, bootstrap system); — pack-cooling fan; — water separator; — mixing valves; — flow-control valves (outflow valve); — isolation valves; — ram-air valve; — recirculation fans; — filters for recirculated air; — temperature sensors.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		Remark: The bootstrap system is the only air-conditioning system considered for Part-FCL aeroplane examinations.										
(05)		Describe the use of hot trim air.	X	X								
(06)		Define the following terms: — cabin altitude; — cabin vertical speed; — differential pressure; — ground pressurisation.	X	X								
(07)		Describe the operating principle of a pressurisation system.	X	X								
(08)		Describe the emergency operation by manual setting of the outflow valve position.	X	X								
(09)		Describe the working principle of an electronic cabin-pressure controller.	X	X								
(10)		State how the maximum operating altitude is determined.	X	X								
(11)		Explain: — why the maximum allowed value of cabin altitude is limited; — a typical value of maximum differential pressure for large transport aeroplanes; — the relation between cabin altitude, the maximum differential pressure and maximum aeroplane operating altitude.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)		Explain the typical warning on a transport category aircraft when cabin altitude exceeds 10 000 ft.	X	X								
(13)		List and interpret typical indications of the pressurisation system.	X	X								
(14)		Describe the main operational differences between a bleed-air-driven air-conditioning system and an electrically driven air-conditioning system as found on aircraft without engine bleed-air system.	X	X								
021 07 00 00		**ANTI-ICING AND DE-ICING SYSTEMS**										
021 07 01 00		**Types, operation, indications**										
021 07 01 01		***Types, design, operation, indications and warnings, operational limitations***										
(01)		Explain the concepts of anti-icing and de-icing.	X	X	X	X	X					
(02)		Name the components of an aircraft which can be protected from ice accretion.	X	X	X	X	X					
(03)		State that on some aeroplanes the tail does not have an ice-protection system.	X	X								
(04)		State the different types of anti-icing/de-icing systems and describe their operating principle: — hot air; — electrical; — fluid.	X	X	X	X	X					
(05)		Describe the operating principle of the inflatable boot de-icing system.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 07 02 00		**Ice warning systems**										
021 07 02 01		***Types, operation, and indications***										
(01)		Describe the different operating principles of the following ice detectors: — mechanical systems using air pressure; — electromechanical systems using resonance frequencies.	X	X								
(02)		Describe the principle of operation of ice warning systems.	X	X								
021 07 03 00		**Helicopter blade heating systems**										
021 07 03 01		***Limitations***										
(01)		Explain the limitations on blade heating and the fact that on some helicopters the heating does not heat all the main-rotor blades at the same time.			X	X	X					
021 08 00 00		**FUEL SYSTEM**										
021 08 01 00		**Piston engine**										
021 08 01 01		***Fuel: types, characteristics, limitations***										
(01)		State the types of fuel used by a piston engine and their associated limitations: — diesel; — JET-A1 (for high-compression engines); — AVGAS; — MOGAS.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.	X	X	X	X	X					
021 08 01 02		***Design, operation, system components, indications***										
(01)		State the tasks of the fuel system.	X	X	X	X	X					
(02)		Name the following main components of a fuel system, and state their location and their function: — lines; — boost pump; — pressure valves; — filter, strainer; — tanks (wing, tip, fuselage); — vent system; — sump; — drain; — fuel-quantity sensor; — fuel-temperature sensor.	X	X	X	X	X					
(03)		Describe a gravity fuel feed system and a pressure feed fuel system.	X	X	X	X	X					
(04)		Describe the construction of the different types of fuel tanks and state their advantages and disadvantages:	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— drum tank; — bladder tank; — integral tank.										
(05)		Explain the function of cross-feed.	X	X	X	X	X					
(06)		Define the term 'unusable fuel'.	X	X	X	X	X					
(07)		List the following parameters that are monitored for the fuel system: — fuel quantity (low-level warning); — fuel temperature.	X	X	X	X	X					
021 08 02 00		**Turbine engine**										
021 08 02 01		***Fuel: types, characteristics, limitations***										
(01)		State the types of fuel used by a gas turbine engine: — JET-A; — JET-A1; — JET-B.	X	X	X	X	X					
(02)		State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.	X	X	X	X	X					
(03)		State the existence of additives for freezing.	X	X	X	X	X					
021 08 02 02		***Design, operation, system components, indications***										
(01)		Explain the function of the fuel system:	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— lines; — centrifugal boost pump; — pressure valves; — fuel shut-off valve; — filter, strainer; — tanks (wing, tip, fuselage, tail); — bafflers/baffles; — sump; — vent system; — drain; — fuel-quantity sensor; — fuel-temperature sensor; — refuelling/defueling system; — fuel dump/jettison system.										
(02)		Name the main components of the fuel system and state their location and their function: — trim fuel tanks; — bafflers; — refuelling/defueling system; — fuel dump/jettison system.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		Remark: For completion of list, please see 021 08 01 02 (02).										
(03)		Interpret a typical fuel system schematic to the level of detail as found in an aircraft FCOM.	X	X	X	X	X					
(04)		Explain the limitations in the event of loss of booster pump fuel pressure.	X	X	X	X	X					
(05)		Describe the use and purpose of drip sticks (manual magnetic indicators) (may also be known as dip stick or drop stick).	X	X								
(06)		Explain the considerations for fitting a fuel dump/jettison system and, if fitted, its function.	X	X	X	X	X					
021 09 00 00		**ELECTRICS**										
		Remark: For any reference to the direction of current flow, the conventional current flow shall be used, i.e. from positive to negative.										
021 09 01 00		**General, definitions, basic applications: circuit breakers, logic circuits**										
021 09 01 01		**Static electricity**										
(01)		Explain static electricity and describe the flying conditions where aircraft are most susceptible to build-up of static electricity.	X	X	X	X	X					
(02)		Describe a static discharger and explain the following: — its purpose; — typical locations;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— pilot’s role of observing it during pre-flight inspection.										
(03)		Explain why an aircraft must first be grounded before refuelling/defueling.	X	X	X	X	X					
(04)		Explain the reason for electrical bonding.	X	X	X	X	X					
021 09 01 02		***Direct current (DC)***										
(01)		Explain the term ‘direct current’ (DC), and state that current can only flow in a closed circuit.	X	X	X	X	X					
(02)	X	Explain the basic principles of conductivity and give examples of conductors, semiconductors and insulators.	X	X	X	X	X					
(03)		Describe the difference in use of the following mechanical switches and explain the difference in observing their state (e.g. ON/OFF), and why some switches are guarded: — toggle switch; — rocker switch; — pushbutton switch; — rotary switch. Explain the difference in observing their state (e.g. ON/OFF) and why some switches are guarded.	X	X	X	X	X					
(04)		Define voltage and current, and state their unit of measurement.	X	X	X	X	X					
(05)	X	Explain Ohm’s law in qualitative terms.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)	X	Explain the effect on total resistance when resistors are connected in series or in parallel.	X	X	X	X	X					
(07)	X	State that resistances can have a positive or a negative temperature coefficient (PTC/NTC) and state their use.	X	X	X	X	X					
(08)		Define electrical power and state the unit of measurement.	X	X	X	X	X					
021 09 01 03		***Alternating current (AC)***										
(01)	X	Explain the term 'alternating current' (AC), and compare its use to DC with regard to complexity.	X	X	X	X	X					
(02)		Define the term 'phase', and explain the basic principle of single-phase and three-phase AC.	X	X	X	X	X					
(03)		State that aircraft can use single-phase or three-phase AC.	X	X	X	X	X					
(04)		Define frequency and state the unit of measurement.	X	X	X	X	X					
(05)	X	Define 'phase shift' in qualitative terms.	X	X	X	X	X					
021 09 01 04		***Intentionally left blank***										
021 09 01 05		***Intentionally left blank***										
021 09 01 06		***Electromagnetism***										
(01)		State that an electrical current produces a magnetic field.	X	X	X	X	X					
(02)		Describe how the strength of the magnetic field changes with the magnitude of the current.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the purpose and the working principle of a solenoid.	X	X	X	X	X					
(04)		Explain the purpose and the working principle of a relay.	X	X	X	X	X					
(05)		Explain the principle of electromagnetic induction and how two electrical components or systems may affect each other through this principle.	X	X	X	X	X					
021 09 01 07		***Circuit protection***										
(01)		Explain the working principle of a fuse and a circuit breaker.	X	X	X	X	X					
(02)		Explain how a fuse is rated.	X	X	X	X	X					
(03)		Describe the principal difference between the following types of circuit breakers: — thermal circuit breaker sensing magnitude of current; — magnetic circuit breaker sensing direction of current.	X	X	X	X	X					
(04)		Describe how circuit breakers may be used to reset aircraft systems/computers in the event of system failure (when part of a described procedure).	X	X	X	X	X					
(05)		Explain a short circuit in practical terms using Ohm’s Law, power and energy expressions highlighting the risk of fire due to power transfer and extreme energy dissipation.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Explain the risk of fire resulting from excessive heat in a circuit subjected to overcurrent.	X	X	X	X	X					
(07)		Explain that overcurrent situations may be transient.	X	X	X	X	X					
(08)		Explain the hazards of multiple resets of a circuit breaker or the use of incorrect fuse rating when replacing blown fuses.	X	X	X	X	X					
021 09 01 08		**Semiconductors and logic circuits**										
(01)		Describe the effect of temperature on semiconductors with regard to function and longevity of the component.	X	X	X	X	X					
(02)		Describe the following five basic logic functions, as used in aircraft FCOM documentation, and recognise their schematic symbols according to the ANSI/MIL standard: — AND; — OR; — NOT; — NOR; — NAND.	X	X	X	X	X					
(03)		Interpret a typical logic circuit schematic to the level of detail as found in an aircraft FCOM.	X	X	X	X	X					
021 09 02 00		***Batteries***										
021 09 02 01		***Types, characteristics and limitations***										
(01)		State the function of an aircraft battery.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Name the types of rechargeable batteries used in aircraft: — lead-acid; — nickel-cadmium; — lithium-ion; — lithium-polymer.	X	X	X	X	X					
(03)		Compare the different battery types with respect to: — load behaviour; — charging characteristics; — risk of thermal runaway.	X	X	X	X	X					
(04)		Explain the term 'cell voltage' and describe how a battery may consist of several cells that combined provide the desirable voltage and capacity.	X	X	X	X	X					
(05)		Explain the difference between battery voltage and charging voltage.	X	X	X	X	X					
(06)		Define the term 'capacity of batteries' and state the unit of measurement used.	X	X	X	X	X					
(07)		State the effect of temperature on battery capacity and performance.	X	X	X	X	X					
(08)		State that in the case of loss of all generated power (battery power only) the remaining electrical power is time-limited.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(09)		Explain how lithium-type batteries pose a threat to aircraft safety and what affects this risk: — numbers of batteries on board an aircraft including those brought on board by passengers; — temperature, of both battery and environment; — physical condition of the battery; — battery charging.	X	X	X	X	X					
(10)		Describe how to contain a battery thermal runaway highlighting the following: — how one cell can affect the neighbouring cells; — challenges if it happens in an aircraft during flight.	X	X	X	X	X					
021 09 03 00		**Generation**										
		Remark: For standardisation purposes, the following standard expressions are used: — DC generator: produces DC output; — DC alternator: produces AC, rectified by integrated rectifying unit, the output is DC; — DC alternator: producing a DC output by using a rectifier;										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— AC generator: produces AC output; — starter generator: integrated combination of a generator and a starter motor; — permanent magnet alternator/ generator: self-exciting AC generator.										
021 09 03 01		***DC generation***										
(01)		Describe the basic working principle of a simple DC generator or DC alternator.	X	X	X	X	X					
(02)		Explain the principle of voltage control and why it is required.	X	X	X	X	X					
(03)		Explain the purpose of reverse current protection from the battery/busbar to the alternator.	X	X	X	X	X					
(04)		Describe the basic operating principle of a starter generator and state its purpose.	X	X	X	X	X					
021 09 03 02		***AC generation***										
(01)		Describe the working principle of a brushless three-phase AC generator.	X	X	X	X	X					
(02)		State that the generator field current is used to control voltage.	X	X	X	X	X					
(03)		State the relationship between output frequency and the rpm of a three-phase AC generator.	X	X	X	X	X					
(04)		Explain the term ‘frequency wild generator’.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		List the following different power sources that can be used for an aeroplane to drive an AC generator: — engine; — APU; — RAT; — hydraulic.	X	X								
(06)		List the following different power sources that can be used for a helicopter to drive an AC generator: — engine; — APU; — gearbox.			X	X	X					
021 09 03 03		***Constant speed drive (CSD) and integrated drive generator (IDG) systems***										
(01)		Describe the function of a CSD.	X	X								
(02)		Explain the parameters of a CSD that are monitored.	X	X								
(03)		Describe the function of an IDG.	X	X								
(04)		Explain the consequences of a mechanical disconnection during flight for a CSD and an IDG.	X	X								
(05)		Explain that a CSD/IDG has its own, independent oil system and how a leak from this may appear as an engine oil leak.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 09 03 04		***Transformers, transformer rectifier units (TRUs), static inverters***										
(01)		State the function of a transformer.	X	X	X	X	X					
(02)		State the function of a TRU and its purpose, including type of output.	X	X	X	X	X					
(03)		State the function of a static inverter and its purpose, including type of output.	X	X	X	X	X					
021 09 04 00		**Distribution**										
021 09 04 01		***General***										
(01)		Explain the function of a busbar.	X	X	X	X	X					
(02)		Describe the function of the following buses: — AC bus; — DC bus; — emergency AC or DC bus; — essential AC or DC bus; — battery bus; — hot bus, ground servicing or maintenance bus.	X	X	X	X	X					
(03)		State that the aircraft structure can be used as a part of the electrical circuit (common earth) and explain the implications for electrical bonding.	X	X	X	X	X					
(04)		Explain the function of external power.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		State that a priority sequence exists between the different sources of electrical power on ground and in flight.	X	X	X	X	X					
(06)		Explain the term 'load sharing'.	X	X	X	X	X					
(07)		Explain the term 'load shedding'.	X	X	X	X	X					
(08)		Describe typical systems that can be shed in the event of a supply failure, such as passenger entertainment system and galley power.	X	X	X	X	X					
(09)		Interpret a typical electrical system schematic to the level of detail as found in an aircraft FCOM.	X	X	X	X	X					
(10)		Explain the difference between a supply (e.g. generator) failure and a bus failure, and the operating consequences of either.	X	X	X	X	X					
021 09 04 02		***DC distribution***										
(01)		Describe a simple DC electrical system of a single-engine aircraft.	X	X	X	X	X					
(02)		Describe a DC electrical system of a multi-engine aircraft (CS-23/CS-27) including the distribution consequences of loss of generator(s) or bus failure.	X	X	X	X	X					
(03)		Describe the DC part of an electrical system of a transport aircraft (CS-25/CS-29) including the distribution consequences of loss of DC supply or bus failure.	X	X	X	X	X					
(04)		Give examples of DC consumers.	X	X	X	X	X					
021 09 04 03		***AC distribution***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Explain the difference in the principle of operation for a split AC electrical system and a parallel AC electrical system.	X	X	X	X	X					
(02)		Describe the following distribution consequences: — power transfer between different power supplies; — power transfer in the event of a supply failure; — loss of all normal AC supplies.	X	X	X	X	X					
(03)		Give examples of AC consumers.	X	X	X	X	X					
(04)		Explain the conditions to be met for paralleling AC generators.	X	X	X	X	X					
(05)		State that volt-ampere (VA) is the unit for total power consumed in an AC system.	X	X	X	X	X					
021 09 04 04		***Electrical load management and monitoring systems: automatic generators and bus switching during normal and failure operation, indications and warnings***										
(01)		Give examples of system control, monitoring and annunciators using the following terms: — generator control unit (GCU) for monitoring generator output and providing network protection; — exciter contactor/breaker/relay for control of generator exciter field;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— generator contactor/breaker/relay for connecting the generator to the network; — bus-tie contactor/breaker/relay for connecting busbars together; — generator switch on the flight deck for manual control of exciter contactor; — IDG/CSD disconnect switch on the flight deck for mechanical disconnection of the generator; — bus-tie switch on the flight deck with AUTO and OFF positions only.										
(02)		Describe, for normal and degraded modes of operation, the following functions of an electrical load management system on ground and in flight using the terms in 021 09 04 04 (01): — distribution; — monitoring; — protection in the event of incorrect voltage; — protection in the event of incorrect frequency; — protection in the event of a differential fault.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Describe the requirement for monitoring the aircraft batteries.	X	X	X	X	X					
(04)		Explain the importance of monitoring the temperature of nickel-cadmium and lithium-type batteries.	X	X	X	X	X					
(05)		Interpret various different ammeter indications of an ammeter which monitors the charge current of the battery.	X	X	X	X	X					
021 09 05 00		**Electrical motors**										
021 09 05 01		***General***										
(01)	X	State that the purpose of an electrical motor is to convert electrical energy into mechanical energy.	X	X	X	X	X					
(02)		State that because of the similarity in design, a generator and an electrical motor may be combined into a starter generator.	X	X	X	X	X					
(03)		Explain that the size of the engine determines how much energy is required for starting, and state the following: — small turbine engines may be able to use the battery for a very limited number of start attempts; — large turbine engines require one or more power sources, either external or on-board.	X	X	X	X	X					
021 09 05 02		***Operating principle***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Describe how the torque of an electrical motor is determined by the supplied voltage and current, and the resulting magnetic fields within the motor.	X	X	X	X	X					
(02)	X	State that electrical motors can be either AC or DC.	X	X	X	X	X					
(03)		Explain the consequences of the following: — rotor seizure; — rotor runaway.	X	X	X	X	X					
021 09 05 03		**Components**										
(01)	X	Name the following components of an electrical motor: — rotor (rotating part of an electrical motor); — stator (stationary part of an electrical motor).	X	X	X	X	X					
021 10 00 00		**PISTON ENGINES**										
		Remark: This topic includes diesel and petrol engines.										
021 10 01 00		**General**										
021 10 01 01		***Types of internal-combustion engines: basic principles, definitions***										
(01)		Define the following terms and expressions: — rpm; — torque;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— manifold absolute pressure (MAP); — power output; — specific fuel consumption; — compression ratio, clearance volume, swept (displaced) volume, total volume.										
021 10 01 02		***Engine: design, operation, components***										
(01)		Describe the basic operating principle of a piston engine: — crankcase; — crankshaft; — connecting rod; — piston; — piston pin; — piston rings; — cylinder; — cylinder head; — valves; — valve springs; — push rod; — camshaft; — rocker arm;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— camshaft gear; — bearings.										
(02)		Name and identify the various types of engine design with regard to cylinder arrangement and their advantages/disadvantages: — horizontally opposed; — in line; — radial; and — working cycle (four stroke: petrol and diesel).	X	X	X	X	X					
(03)		Describe the differences between petrol and diesel engines with respect to: — means of ignition; — maximum compression ratio; — regulating air or mixture supply to the cylinder; — pollution from the exhaust.	X	X	X	X	X					
021 10 02 00		**Fuel**										
021 10 02 01		***Types, grades, characteristics, limitations***										
(01)		Name the type of fuel used for petrol engines including its colour (AVGAS); — 100 (green); — 100LL (blue).	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Name the type of fuel normally used for aviation diesel engines (JET-A1).	X	X	X	X	X					
(03)	X	Define the term ‘octane rating’.	X	X	X	X	X					
(04)		Define the term ‘detonation’ and describe the causes and effects of detonation for both petrol and diesel engines.	X	X	X	X	X					
(05)		Define the term ‘pre-ignition’ and describe the causes and effects of pre-ignition for both petrol and diesel engines.	X	X	X	X	X					
(06)		Identify the conditions and power settings that promote detonation for petrol engines.	X	X	X	X	X					
(07)		Describe how detonation in petrol engines is recognised.	X	X	X	X	X					
(08)		Describe the method and occasions for checking the fuel for water content.	X	X	X	X	X					
(09)		State the typical value of fuel density for aviation gasoline and diesel fuel.	X	X	X	X	X					
(10)		Explain volatility, viscosity and vapour locking for petrol and diesel fuels.	X	X	X	X	X					
021 10 03 00		**Engine fuel pumps**										
021 10 03 01		***Engine-driven fuel pump***										
(01)		Explain the need for a separate engine-driven fuel pump.	X	X	X	X	X					
021 10 04 00		**Carburettor/injection system**										
021 10 04 01		***Carburettor: design, operation, degraded modes of operation, indications and warnings***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the purpose of a carburettor.	X	X	X	X	X					
(02)		Describe the operating principle of the simple float chamber carburettor.	X	X	X	X	X					
(03)		Describe the methods of obtaining mixture control over the whole operating engine power setting range (compensation jet, diffuser).	X	X	X	X	X					
(04)		Describe the methods of obtaining mixture control over the whole operating altitude range.	X	X	X	X	X					
(05)		Explain the purpose and the operating principle of an accelerator pump.	X	X	X	X	X					
(06)		Explain the purpose of power enrichment.	X	X	X	X	X					
(07)		Describe the function of the carburettor heat system.	X	X	X	X	X					
(08)		Explain the effect of carburettor heat on mixture ratio and power output.	X	X	X	X	X					
(09)		Explain the purpose and the operating principle of a primer pump.	X	X	X	X	X					
(10)		Discuss other methods for priming an engine (acceleration pumps).	X	X	X	X	X					
(11)		Explain the danger of carburettor fire, including corrective measures.	X	X	X	X	X					
021 10 04 02		***Injection: design, operation, degraded modes of operation, indications and warnings***										
(01)		Explain the advantages and difference in operation of an injection system compared with a carburettor system.	X	X	X	X	X					
021 10 04 03		***Icing***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Describe the causes and effects of carburettor icing and the action to be taken if carburettor icing is suspected.	X	X	X	X	X					
(02)		Name the meteorological conditions under which carburettor icing may occur.	X	X	X	X	X					
(03)		Describe the indications of the presence of carburettor icing for both a fixed pitch and a constant speed propeller.	X	X								
(04)		Describe the indications of the presence of carburettor icing for a helicopter.			X	X	X					
(05)		Describe the indications that will occur upon selection of carburettor heat depending on whether ice is present or not.	X	X	X	X	X					
(06)		Explain the reason for the use of alternate air on fuel injection systems and describe its operating principle.	X	X	X	X	X					
(07)		State the meteorological conditions under which induction system icing may occur.	X	X	X	X	X					
021 10 05 00		**Cooling systems**										
021 10 05 01		***Design, operation, indications and warnings***										
(01)		Specify the reasons for cooling a piston engine.	X	X	X	X	X					
(02)		Describe the design features to enhance cylinder air cooling for aeroplanes.	X	X								
(03)		Describe the design features to enhance cylinder air cooling for helicopters (e.g. engine-driven impeller and scroll assembly, baffles).			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Compare the differences between liquid- and air-cooling systems.	X	X	X	X	X					
(05)		Identify the cylinder head temperature indication to monitor engine cooling.	X	X	X	X	X					
(06)		Describe the function and the operation of cowl flaps.	X	X								
021 10 06 00		**Lubrication systems**										
021 10 06 01		***Lubricants: characteristics, limitations***										
(01)		Describe the term ‘viscosity’ including the effect of temperature.	X	X	X	X	X					
(02)		Describe the viscosity grade numbering system used in aviation.	X	X	X	X	X					
021 10 06 02		***Design, operation, indications and warnings***										
(01)		State the functions of a piston-engine lubrication system.	X	X	X	X	X					
(02)		Describe the working principle of a dry-sump lubrication system and describe the functions of the following components: — oil tank (reservoir) and its internal components: hot well, de-aerator, vent, expansion space; — check valve (non-return valve); — pressure pump and pressure-relief valve; — scavenge pump; — filters (suction, pressure and scavenge);	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— oil cooler; — oil cooler bypass valve (anti-surge and thermostatic); — pressure and temperature sensors; — lines.										
(03)		Describe a wet-sump lubrication system.	X	X	X	X	X					
(04)		State the differences between a wet- and a dry-sump lubrication system and their advantages and disadvantages.	X	X	X	X	X					
(05)		List the following factors that influence oil consumption: — oil grade; — cylinder and piston wear; — condition of piston rings.	X	X	X	X	X					
(06)		Describe the interaction between oil pressure, oil temperature and oil quantity.	X	X	X	X	X					
021 10 07 00		**Ignition circuits**										
021 10 07 01		***Design, operation***										
(01)		Describe the working principle of a magneto-ignition system and the functions of the following components: — magneto; — contact-breaker points;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— capacitor (condenser); — coils or windings; — ignition switches; — distributor; — spark plug; — high-tension (HT) cable.										
(02)		State why piston engines are equipped with two electrically independent ignition systems.	X	X	X	X	X					
(03)		State the function and operating principle of the following methods of spark augmentation: — starter vibrator (booster coil); — impulse-start coupling.	X	X								
(04)		State the function and operating principle of the following methods of spark augmentation: — starter vibrator (booster coil); — both magnetos live.			X	X	X					
(05)		Explain the function of the magneto check.	X	X	X	X	X					
(06)		Explain how combustion is initiated in diesel engines.	X	X	X	X	X					
021 10 08 00		**Mixture**										
021 10 08 01		***Definition, characteristic mixtures, control instruments, associated control levers, indications***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Define the following terms: — mixture; — chemically correct ratio (stoichiometric); — best power ratio; — lean (weak) mixture (lean or rich side of the exhaust gas temperature (EGT) top); — rich mixture.	X	X	X	X	X					
(02)		State the typical fuel-to-air ratio values or range of values for the above mixtures.	X	X	X	X	X					
(03)		Describe the advantages and disadvantages of weak and rich mixtures.	X	X	X	X	X					
(04)		Describe the relation between engine-specific fuel consumption and mixture ratio.	X	X	X	X	X					
(05)		Describe the use of the exhaust gas temperature as an aid to mixture-setting.	X	X	X	X	X					
(06)		Explain the relation between mixture ratio, cylinder head temperature, detonation and pre-ignition.	X	X	X	X	X					
(07)		Explain the absence of mixture control in diesel engines.	X	X	X	X	X					
021 10 09 00		**Aeroplane: propellers**										
021 10 09 01		***Definitions, general***										
		Remark: Definitions and aerodynamic concepts are detailed in Subject 081 'Principles of flight	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		(aeroplane)', Topic 07 (Propellers), but need to be appreciated for this Subject as well.										
021 10 09 02		***Constant-speed propeller: design, operation, system components***										
(01)		Describe the operating principle of a constant-speed propeller system under normal flight operations with the aid of a schematic.	X	X								
(02)		Explain the need for a MAP indicator to control the power setting with a constant-speed propeller.	X	X								
(03)		State the purpose of a torque-meter.	X	X								
(04)		State the purpose and describe the operation of a low-pitch stop (centrifugal latch).	X	X								
(05)		Describe the operating principle of a single-acting and a double-acting variable pitch propeller for single- and multi-engine aeroplanes.	X	X								
(06)		Describe the function and the basic operating principle of synchronising and synchro-phasing systems.	X	X								
(07)		Explain the purpose and the basic operating principle of an auto-feathering system and unfeathering.	X	X								
021 10 09 03		***Reduction gearing: design***										
(01)		State the purpose of reduction gearing.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 10 09 04		***Propeller handling: associated control levers, degraded modes of operation, indications and warnings***										
(01)		Describe the checks to be carried out on a constant-speed propeller system after engine start.	X	X								
(02)		Describe the operation of a constant-speed propeller system during flight at different true airspeeds (TAS) and rpm including an overspeeding propeller.	X	X								
(03)		Describe the operating principle of a variable pitch propeller when feathering and unfeathering, including the operation of cockpit controls.	X	X								
(04)		Describe the operating principle of a variable pitch propeller when reverse pitch is selected, including the operation of cockpit controls.	X	X								
(05)		Describe the operation of the propeller levers during different phases of flight.	X	X								
021 10 10 00		**Performance and engine handling**										
021 10 10 01		***Performance***										
(01)		Describe the effect on power output of a petrol and diesel engine taking into consideration the following parameters: — ambient pressure, exhaust back pressure; — temperature;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— density altitude; — humidity.										
(02)		Explain the term ‘normally aspirated engine’.	X	X	X	X	X					
(03)		Power-augmentation devices: explain the requirement for power augmentation (turbocharging) of a piston engine.	X	X	X	X	X					
(04)		Describe the function and the principle of operation of the following main components of a turbocharger: — turbine; — compressor; — waste gate; — waste-gate actuator.	X	X	X	X	X					
(05)		Explain the difference between an altitude-boosted turbocharger and a ground-boosted turbocharger.	X	X	X	X	X					
(06)		Explain turbo lag.	X	X	X	X	X					
(07)		Define the term ‘critical altitude’.	X	X	X	X	X					
(08)		Explain the function of an intercooler.	X	X	X	X	X					
(09)		Define the terms ‘full-throttle height’ and ‘rated altitude’.	X	X	X	X	X					
(10)		Explain the purpose of a supercharger and the basic differences from a turbocharger.	X	X	X	X	X					
021 10 10 02		***Engine handling***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		State the correct procedures for setting the engine controls when increasing or decreasing power.	X	X	X	X	X					
(02)		Define the following terms: — take-off power; — maximum continuous power.	X	X	X	X	X					
(03)		Describe the start problems associated with extreme cold weather.	X	X	X	X	X					
(04)		Describe the principal difference between a full-authority digital engine control (FADEC) system-controlled engine and traditional manual engine controls.	X	X	X	X	X					
(05)		Describe the engine controls available on the flight deck for a FADEC-controlled engine.	X	X	X	X	X					
(06)		Explain that the FADEC has full authority of the control of all engine parameters ensuring efficient and correct running of the engine, including protection in the event of failure.	X	X	X	X	X					
(07)		Explain the need for FADEC redundancy with regard to power supply and data input and output.	X	X	X	X	X					
021 11 00 00		**TURBINE ENGINES**										
021 11 01 00		**Basic principles**										
021 11 01 01		***Basic generation of thrust and the thrust formula***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe how thrust is produced by a basic gas turbine engine.	X	X								
(02)		Describe the simple form of the thrust formula for a basic, straight jet engine and perform simple calculations (including pressure thrust).	X	X								
(03)		State that thrust can be considered to remain approximately constant over the whole aeroplane subsonic speed range.	X	X								
021 11 01 02		***Design, types and components of turbine engines***										
(01)		List the main components of a basic gas turbine engine: — inlet; — compressor; — combustion chamber; — turbine; — outlet.	X	X	X	X	X					
(02)		Describe the variation of static pressure, temperature and axial velocity in a gas turbine engine under normal operating conditions and with the aid of a working cycle diagram.	X	X	X	X	X					
(03)		Describe the differences between absolute, circumferential (tangential) and axial velocity.	X	X	X	X	X					
(04)		List the different types of gas turbine engines: — straight jet;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— turbofan; — turboprop.										
(05)		State that a gas turbine engine can have one or more spools.	X	X	X	X	X					
(06)		Describe how thrust is produced by turbojet and turbofan engines.	X	X								
(07)		Describe how power is produced by turboprop engines.	X	X								
(08)		Describe the term ‘equivalent horsepower’ (= thrust horsepower + shaft horsepower).	X	X								
(09)		Explain the principle of a free turbine or free-power turbine.	X	X	X	X	X					
(10)		Define the term ‘bypass ratio’ and perform simple calculations to determine it.	X	X								
(11)		Define the terms ‘propulsive power’, ‘propulsive efficiency’, ‘thermal efficiency’ and ‘total efficiency’.	X	X								
(12)		Describe the influence of compressor-pressure ratio on thermal efficiency.	X	X	X	X	X					
(13)		Explain the variations of propulsive efficiency with forward speed for turbojet, turbofan and turboprop engines.	X	X								
(14)		Define the term ‘specific fuel consumption’ for turbojets and turboprops.	X	X								
021 11 01 03		***Coupled turbine engine: design, operation, components and materials***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Name the main assembly parts of a coupled turbine engine and explain its operation.			X	X	X					
(02)		Explain the limitations of the materials used with regard to maximum turbine temperature, engine and drive train torque limits.			X	X	X					
(03)		Describe the possible effects on engine components when limits are exceeded.			X	X	X					
(04)		Explain that when engine limits are exceeded, this event must be reported.			X	X	X					
021 11 01 04		***Free-turbine engine: design, components and materials***										
(01)		Describe the design methods to keep the engine's size small for installation in helicopters.			X	X	X					
(02)		List the main components of a free-turbine engine.			X	X	X					
(03)		Describe how the power is developed by a turboshaft/free-turbine engine.			X	X	X					
(04)		Explain how the exhaust gas temperature is used to monitor turbine stress.			X	X	X					
021 11 02 00		**Main-engine components**										
021 11 02 01		***Aeroplane: air intake***										
(01)		State the functions of the engine air inlet/air intake.	X	X								
(02)		Describe the geometry of a subsonic (pitot-type) air inlet.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the gas-parameter changes in a subsonic air inlet at different flight speeds.	X	X								
(04)		Describe the reasons for, and the dangers of, the following operational problems concerning the engine air inlet: — airflow separation; — inlet icing; — inlet damage; — foreign object damage (FOD); — heavy in-flight turbulence.	X	X								
021 11 02 02		***Compressor and diffuser***										
(01)		State the purpose of the compressor.	X	X	X	X	X					
(02)		Describe the working principle of a centrifugal and an axial flow compressor.	X	X	X	X	X					
(03)		Name the following main components of a single stage and describe their function for a centrifugal compressor: — impeller; — diffuser.	X	X	X	X	X					
(04)		Name the following main components of a single stage and describe their function for an axial compressor: — rotor vanes; — stator vanes.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the gas-parameter changes in a compressor stage.	X	X	X	X	X					
(06)		Define the term 'pressure ratio' and state a typical value for one stage of a centrifugal and an axial flow compressor and for the complete compressor.	X	X	X	X	X					
(07)		State the advantages and disadvantages of increasing the number of stages in a centrifugal compressor.	X	X	X	X	X					
(08)		Explain the difference in sensitivity for FOD of a centrifugal compressor compared with an axial flow type.	X	X	X	X	X					
(09)		Explain the convergent air annulus through an axial flow compressor.	X	X	X	X	X					
(10)		Describe the reason for twisting the compressor blades.	X	X	X	X	X					
(11)		State the tasks of inlet guide vanes (IGVs).	X	X	X	X	X					
(12)		State the reason for the clicking noise whilst the compressor slowly rotates on the ground.	X	X	X	X	X					
(13)		State the advantages of increasing the number of spools.	X	X	X	X	X					
(14)		Explain the implications of tip losses and describe the design features to minimise the problem.	X	X	X	X	X					
(15)		Explain the problems of blade bending and flapping and describe the design features to minimise the problem.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(16)		Explain the following terms: — compressor stall; — engine surge.	X	X	X	X	X					
(17)		State the conditions that are possible causes of stall and surge.	X	X	X	X	X					
(18)		Describe the indications of stall and surge.	X	X	X	X	X					
(19)		Describe the design features used to minimise the occurrence of stall and surge.	X	X	X	X	X					
(20)		Describe a compressor map (surge envelope) with rpm lines, stall limit, steady state line and acceleration line.	X	X	X	X	X					
(21)		Describe the function of the diffuser.	X	X	X	X	X					
021 11 02 03		***Combustion chamber***										
(01)		Define the purpose of the combustion chamber.	X	X	X	X	X					
(02)		List the requirements for combustion.	X	X	X	X	X					
(03)		Describe the working principle of a combustion chamber.	X	X	X	X	X					
(04)		Explain the reason for reducing the airflow axial velocity at the combustion chamber inlet (snout).	X	X	X	X	X					
(05)		State the function of the swirl vanes (swirler).	X	X	X	X	X					
(06)		State the function of the drain valves.	X	X	X	X	X					
(07)		Define the terms ‘primary airflow’ and ‘secondary airflow’, and explain their purpose.	X	X	X	X	X					
(08)		Explain the following two mixture ratios:	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— primary airflow to fuel; — total airflow (within the combustion chamber) to fuel.										
(09)		Describe the gas-parameter changes in the combustion chamber.	X	X	X	X	X					
(10)		State a typical maximum value of the outlet temperature of the combustion chamber.	X	X	X	X	X					
(11)		Describe the following types of combustion chambers and state the differences between them: — can type; — can-annular, cannular or turbo-annular; — annular; — reverse-flow annular.	X	X	X	X	X					
021 11 02 04		***Turbine***										
(01)		Explain the purpose of a turbine in different types of gas turbine engines.	X	X	X	X	X					
(02)		Describe the principles of operation of impulse, reaction and impulse-reaction axial flow turbines.	X	X	X	X	X					
(03)		Name the main components of a turbine stage and their function.	X	X	X	X	X					
(04)		Describe the working principle of a turbine.	X	X	X	X	X					
(05)		Describe the gas-parameter changes in a turbine stage.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Describe the function and the working principle of active clearance control.	X	X								
(07)		Describe the implications of tip losses and the means to minimise them.	X	X	X	X	X					
(08)		Explain why the available engine thrust is limited by the turbine inlet temperature.	X	X								
(09)		Explain the divergent gas-flow annulus through an axial-flow turbine.	X	X	X	X	X					
(10)		Explain the high mechanical thermal stress in the turbine blades and wheels/discs.	X	X	X	X	X					
021 11 02 05		***Aeroplane: exhaust***										
(01)		Name the following main components of the exhaust unit and their function: — jet pipe; — propelling nozzle; — exhaust cone.	X	X								
(02)		Describe the working principle of the exhaust unit.	X	X								
(03)		Describe the gas-parameter changes in the exhaust unit.	X	X								
(04)		Define the term ‘choked exhaust nozzle’ (not applicable to turboprops).	X									
(05)		Explain how jet exhaust noise can be reduced.	X	X								
021 11 02 06		***Helicopter: air intake***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Name and explain the main task of the engine air intake.			X	X	X					
(02)		Describe the use of a convergent air-intake ducting on helicopters.			X	X	X					
(03)		Describe the reasons for and the dangers of the following operational problems concerning engine air intake: — airflow separations; — intake icing; — intake damage; — FOD; — heavy in-flight turbulence.			X	X	X					
(04)		Describe the conditions and circumstances during ground operations when FOD is most likely to occur.			X	X	X					
(05)		Describe and explain the principles of air intake filter systems that can be fitted to some helicopters for operations in icing and sand conditions.			X	X	X					
(06)		Describe the function of the heated pads on some helicopter air intakes.			X	X	X					
021 11 02 07		***Helicopter: exhaust***										
(01)		Describe the working principle of the exhaust unit.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Describe the gas-parameter changes in the exhaust unit.			X	X	X					
021 11 03 00		**Additional components and systems**										
021 11 03 01		***Engine fuel system***										
(01)		Name the main components of the engine fuel system and state their function: — filters; — low-pressure (LP) pump; — high-pressure (HP) pump; — fuel manifold; — fuel nozzles; — HP fuel cock; — fuel control; or — hydromechanical unit.	X	X	X	X	X					
(02)		Name the two types of engine-driven high-pressure pumps, such as: — gear-type; — swash plate-type.	X	X	X	X	X					
(03)		State the tasks of the fuel control unit.	X	X	X	X	X					
(04)		List the possible input parameters to a fuel control unit to achieve a given thrust/power setting.	X	X	X	X	X					
021 11 03 02		***Engine control system***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the tasks of the engine control system.	X	X	X	X	X					
(02)		List the following different types of engine control systems: — hydromechanical; — hydromechanical with a limited authority electronic supervisor; — single-channel FADEC with hydromechanical backup; — dual-channel FADEC with no backup or any other combination.	X	X	X	X	X					
(03)		Describe a FADEC as a full-authority dual-channel system including functions such as an electronic engine control unit, wiring, sensors, variable vanes, active clearance control, bleed configuration, electrical signalling of thrust lever angle (TLA) (see also AMC to CS-E-50), and an EGT protection function and engine overspeed.	X		X	X						
(04)		Explain how redundancy is achieved by using more than one channel in a FADEC system.	X		X	X						
(05)		State the consequences of a FADEC single input data failure.	X		X	X						
(06)		State that all input and output data is checked by both channels in a FADEC system.	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(07)		State that a FADEC system uses its own sensors and that, in some cases, also data from aircraft systems is used.	X		X	X						
(08)		State that a FADEC must have its own source of electrical power.	X		X	X						
021 11 03 03		***Engine lubrication***										
(01)		State the tasks of an engine lubrication system.	X	X								
(02)		Name the following main components of a lubrication system and state their function: — oil tank and centrifugal breather; — oil pumps (pressure and scavenge pumps); — oil filters (including the bypass); — oil sumps; — chip detectors; — coolers.	X	X								
(03)		Explain that each spool is fitted with at least one ball bearing and two or more roller bearings.	X	X								
(04)		Explain the use of compressor air in oil-sealing systems (e.g. labyrinth seals).	X	X								
021 11 03 04		***Engine auxiliary gearbox***										
(01)		State the tasks of the auxiliary gearbox.	X	X								
(02)		Describe how the gearbox is driven and lubricated.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 11 03 05		***Engine ignition***										
(01)		State the task of the ignition system.	X	X								
(02)		Name the following main components of the ignition system and state their function: — power sources; — igniters.	X	X								
(03)		State why jet turbine engines are equipped with two electrically independent ignition systems.	X	X								
(04)		Explain the different modes of operation of the ignition system.	X	X								
021 11 03 06		***Engine starter***										
(01)		Name the main components of the starting system and state their function.	X	X								
(02)		Explain the principle of a turbine engine start.	X	X								
(03)		Describe the following two types of starters: — electric; — pneumatic.	X	X								
(04)		Describe a typical start sequence (on ground/in flight) for a turbofan.	X	X								
(05)		Define ‘self-sustaining rpm’.	X	X								
021 11 03 07		***Reverse thrust***										
(01)		Name the following main components of a reverse-thrust system and state their function: — reverse-thrust select lever;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— power source (pneumatic or hydraulic); — actuators; — doors; — annunciations.										
(02)		Explain the principle of a reverse-thrust system.	X	X								
(03)		Identify the advantages and disadvantages of using reverse thrust.	X	X								
(04)		Describe and explain the following different types of thrust-reverser systems: — hot-stream reverser; — clamshell or bucket-door system; — cold-stream reverser (only turbofan engines); — blocker doors; — cascade vanes.	X	X								
(05)		Explain the implications of reversing the cold stream (fan reverser) only on a high bypass ratio engine.	X	X								
(06)		Describe the protection features against inadvertent thrust-reverse deployment in flight as present on most transport aeroplanes.	X	X								
(07)		Describe the controls and indications provided for the thrust-reverser system.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 11 03 08		***Helicopter specifics on design, operation and components for additional components and systems such as lubrication system, ignition circuit, starter, accessory gearbox***										
(01)		State the task of the lubrication system.			X	X	X					
(02)		List and describe the common helicopter lubrication systems.			X	X	X					
(03)		Name the following main components of a helicopter lubrication system: — reservoir; — pump assembly; — external oil filter; — magnetic chip detectors, electronic chip detectors; — thermostatic oil coolers; — breather.			X	X	X					
(04)		Identify and name the components of a helicopter lubrication system from a diagram.			X	X	X					
(05)		Identify the indications used to monitor a lubrication system including warning systems.			X	X	X					
(06)		Explain the differences and appropriate use of straight oil and compound oil, and describe the oil numbering system for aviation use.			X	X	X					
(07)		Explain and describe the ignition circuit for engine start and engine relight facility when the			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		selection is set for both automatic and manual functions.										
(08)		Explain and describe the starter motor and the sequence of events when starting, and that for most helicopters the starter becomes the generator after the starting sequence is over.			X	X	X					
(09)		Explain and describe why the engine drives the accessory gearbox.			X	X	X					
021 11 04 00		**Engine operation and monitoring**										
021 11 04 01		***General***										
(01)		Explain the following aeroplane engine ratings: — take-off; — go-around; — maximum continuous thrust/power; — maximum climb thrust/power.	X	X								
(02)		Explain spool-up time.	X	X	X	X	X					
(03)		Explain the reason for the difference between ground and approach flight idle values (rpm).	X	X								
(04)		State the parameters that can be used for setting and monitoring the thrust/power.	X	X	X	X	X					
(05)		Describe the terms ‘alpha range’, ‘beta range’ and ‘reverse thrust’ as applied to a turboprop power lever.	X	X								
(06)		Explain the dangers of inadvertent beta-range selection in flight for a turboprop.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Explain the purpose of engine trending.	X	X								
(08)		Explain how the exhaust gas temperature is used to monitor turbine stress.	X	X	X	X	X					
(09)		Describe the effect of engine acceleration and deceleration on the EGT.	X	X	X	X						
(10)		Describe the possible effects on engine components when EGT limits are exceeded.	X	X	X	X	X					
(11)		Explain why engine-limit exceedances must be reported.	X	X	X	X	X					
(12)		Explain the limitations on the use of the thrust-reverser system at low forward speed.	X	X			X					
(13)		Explain the term ‘engine seizure’.	X	X	X	X	X					
(14)		State the possible causes of engine seizure and explain their preventative measures.	X	X	X	X	X					
(15)		Describe the potential consequences of a leak in the following two designs of fuel and oil heat exchanger: — oil pressure higher than fuel pressure with oil leaking into the fuel system, potentially affecting the combustion and running of the engine; — fuel pressure higher than oil pressure with fuel leaking into the oil system, potentially increasing the risk of a fire due to fuel entering warm parts of the engine that should be free from fuel.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(16)		Explain oil-filter clogging (blockage) and the implications for the lubrication system.	X	X	X	X	X					
(17)		Give examples of monitoring instruments of an engine.	X	X	X	X	X					
(18)		Describe how to identify and assess engine damage based on instrument indications.	X	X	X	X	X					
021 11 04 02		***Starting malfunctions***										
(01)		Describe the indications and the possible causes of the following aeroplane starting malfunctions: — false (dry or wet) start; — tailpipe fire (torching); — hot start; — abortive (hung) start; — no N1 rotation; — no FADEC indications.	X	X								
(02)		Describe the indications and the possible causes of the following helicopter starting malfunctions: — false (dry or wet) start; — tailpipe fire (torching); — hot start; — abortive (hung) start;			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— no N1 rotation; — freewheel failure; — no FADEC indications.										
021 11 04 03		***Relight envelope***										
(01)		Explain the relight envelope.	X	X								
021 11 05 00		**Performance aspects**										
021 11 05 01		***Thrust, performance aspects, and limitations***										
(01)		Describe the variation of thrust and specific fuel consumption with altitude at constant TAS.	X	X								
(02)		Describe the variation of thrust and specific fuel consumption with TAS at constant altitude.	X	X								
(03)		Explain the term 'flat-rated engine' by describing the change of take-off thrust, turbine inlet temperature and engine rpm with outside air temperature (OAT).	X	X								
(04)		Define the term 'engine pressure ratio' (EPR).	X	X								
(05)		Explain the use of reduced (flexible) and derated thrust for take-off, and explain the advantages and disadvantages when compared with a full-rated take-off.	X	X								
(06)		Describe the effects of use of bleed air on rpm, EGT, thrust, and specific fuel consumption.	X	X								
021 11 05 02		***Helicopter engine ratings, engine performance and limitations, engine handling: torque, performance aspects and limitations***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe engine rating torque limits for take-off, transient and maximum continuous.			X	X	X					
(02)		Describe turbine outlet temperature (TOT) limits for take-off.			X	X	X					
(03)		Explain why TOT is a limiting factor for helicopter performance.			X	X	X					
(04)		Describe and explain the relationship between maximum torque available and density altitude, which leads to decreasing torque available with the increase of density altitude.			X	X	X					
(05)		Explain that hovering downwind, on some helicopters, will noticeably increase the engine TOT.			X	X	X					
(06)		Explain the reason why the engine performance is less when aircraft accessories (i.e. anti-ice, heating, hoist, filters) are switched on.			X	X	X					
(07)		Describe the effects of use of bleed air on engine parameters.			X	X	X					
(08)		Explain that, on some helicopters, exceeding the TOT limit may cause the main rotor to droop (slow down).			X	X	X					
(09)		Describe overtorquing and explain the consequences.			X	X	X					
021 11 06 00		**Auxiliary power unit (APU)**										
021 11 06 01		***Design, operation, functions, operational limitations***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State that an APU is a gas turbine engine and list its tasks.	X		X	X						
(02)		State the difference between the two types of APU inlets.	X		X	X						
(03)		Define ‘maximum operating and maximum starting altitude’.	X		X	X						
(04)		Name the typical APU control and monitoring instruments.	X		X	X						
(05)		Describe the APU’s automatic shutdown protection.	X		X	X						
021 12 00 00		**PROTECTION AND DETECTION SYSTEMS**										
021 12 01 00		**Smoke detection**										
021 12 01 01		***Types, design, operation, indications and warnings***										
(01)		Explain the operating principle of the following types of smoke detection sensors: — optical; — ionising.	X	X	X	X	X					
(02)		Give an example of warnings, indications and function tests.	X	X	X	X	X					
021 12 02 00		**Fire-protection systems**										
021 12 02 01		***Fire extinguishing (engine and cargo compartments)***										
(01)		Explain the operating principle of a built-in fire-extinguishing system and describe its components.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that two discharges must be provided for each engine (see CS 25.1195(c) Fire-extinguisher systems).	X	X								
021 12 02 02		***Fire detection***										
(01)		Explain the following principles of fire detection: — resistance and capacitance; — gas pressure.	X	X	X	X	X					
(02)		Explain fire-detection applications such as: — bimetallic; — continuous loop; — gaseous loop (gas-filled detectors).	X	X	X	X	X					
(03)		Explain why generally double-loop systems are used.	X	X	X	X	X					
(04)		Give an example of warnings, indications and function tests of a fire-protection system.	X	X	X	X	X					
021 12 03 00		**Rain-protection system**										
021 12 03 01		***Principle and method of operation***										
(01)		Explain the principle and method of operation of the following windshield rain-protection systems for an aeroplane: — wipers; — liquids (rain-repellent); — coating.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Explain the principle and method of operation of wipers for a helicopter.			X	X	X					
021 13 00 00		**OXYGEN SYSTEMS**										
021 13 01 00		**Cockpit, portable and chemical oxygen systems**										
021 13 01 01		***Operating principles, actuation methods, comparison***										
(01)		Describe the basic operating principle of a cockpit oxygen system and describe the following different modes of operation: — normal (diluter demand); — 100 %; — emergency.	X	X								
(02)		Describe the operating principle and the purposes of the following two portable oxygen systems: — smoke hood; — portable bottle.	X	X								
(03)		Describe the following two oxygen systems that can be used to supply oxygen to passengers: — fixed system (chemical oxygen generator or gaseous system); — portable.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe the actuation methods (automatic and manual) and the functioning of a passenger oxygen mask.	X	X								
(05)		Compare chemical oxygen generators to gaseous systems with respect to: — capacity; — flow regulation.	X	X								
(06)		State the dangers of grease or oil related to the use of oxygen systems.	X	X								
021 14 00 00		**HELICOPTER: MISCELLANEOUS SYSTEMS**										
021 14 01 00		**Variable rotor speed, active vibration suppression, night-vision goggles (NVG)**										
021 14 01 01		***Variable rotor speed***										
(01)		Explain the system for 'beeping' the NR to its upper limit.			X	X	X					
021 14 01 02		***Active vibration suppression***										
(01)		Explain and describe how the active vibration suppression system works through high-speed actuators and accelerometer inputs.			X	X	X					
021 14 01 03		***NVG***										
		To be introduced at a later date.			X	X	X					
021 15 00 00		**HELICOPTER: ROTOR HEADS**										
021 15 01 00		**Main rotor**										
021 15 01 01		***Types***										
(01)		Describe the following rotor-head systems:			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— teetering (semi-articulated); — articulated; — hingeless (rigid); — bearingless (semi-articulated).										
(02)		Describe in basic terms the following configuration of rotor systems and their advantages and disadvantages: — tandem; — coaxial; — side by side.			X	X	X					
(03)		Explain how flapping, dragging and feathering is achieved in each rotor-head system.			X	X	X					
021 15 01 02		***Structural components and materials, stresses, structural limitations***										
(01)		Identify from a diagram the main structural components of the main types of rotor-head systems.			X	X	X					
(02)		List and describe the methods used to detect damage and cracks.			X	X	X					
(03)		Explain and describe the structural limitations to respective rotor systems, including the dangers of negative G inputs to certain rotor-head systems.			X	X	X					
(04)		Describe the various rotor-head lubrication methods.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 15 01 03		***Design and construction***										
(01)		Describe the material technology used in rotor-head design, including construction, using the following materials or mixture of materials: — composites; — fibreglass; — alloys; — elastomers.			X	X	X					
021 15 01 04		***Adjustment***										
(01)		Describe and explain the methods of adjustment which are possible on various helicopter rotor-head assemblies.			X	X	X					
021 15 02 00		**Tail rotor**										
021 15 02 01		***Types***										
(01)		Describe the following tail-rotor systems: — delta-3 hinge effect; — multi-bladed delta-3 effect; — Fenestron or ducted fan tail rotor; — no tail rotor (NOTAR) low-velocity air jet flows from tangential slots (the Coandă effect); — NOTAR high-velocity air jet flows from adjustable nozzles (the Coandă effect).			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Identify from a diagram the main structural components of the four main types of tail-rotor systems.			X	X	X					
(03)		Explain and describe the methods to detect damage and cracks on the tail rotor and assembly.			X	X	X					
(04)		Explain and describe the structural limitations to the respective tail-rotor systems and possible limitations regarding the turning rate of the helicopter.			X	X	X					
(05)		Explain and describe the following methods that helicopter designers use to minimise tail-rotor drift and roll: — reducing the couple arm (tail rotor on a pylon); — offsetting the rotor mast; — use of 'bias' in cyclic control mechanism.			X	X	X					
(06)		Explain pitch-input mechanisms.			X	X	X					
(07)		Explain the relationship between tail-rotor thrust and engine power.			X	X	X					
(08)		Describe how the vertical fin on some types reduces the power demand of the tail rotor.			X	X	X					
021 15 02 02		***Design and construction***										
(01)		List and describe the various tail-rotor designs and construction methods used on helicopters currently in service.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 16 00 00		**HELICOPTER: TRANSMISSION**										
021 16 01 00		**Main gearbox**										
021 16 01 01		***Different types, design, operation, limitations***										
(01)		Describe the following main principles of helicopter transmission systems for single- and twin-engine helicopters: — drive for the main and tail rotor; — accessory drive for the generator(s), alternator(s), hydraulic and oil pumps, oil cooler(s) and tachometers.			X	X	X					
(02)		Describe the reason for limitations on multi-engine helicopter transmissions in various engine-out situations.			X	X	X					
(03)		Describe how the passive vibration control works with gearbox mountings.			X	X	X					
021 16 02 00		**Rotor brake**										
021 16 02 01		***Types, operational considerations***										
(01)		Describe the main function of the disc type of rotor brake.			X	X	X					
(02)		Describe both hydraulic- and cable-operated rotor-brake systems.			X	X	X					
(03)		Describe the different options for the location of the rotor brake.			X	X	X					
(04)		List the following operational considerations for the use of rotor brakes: — rotor speed at engagement of rotor brake;			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— risk of blade sailing in windy conditions; — risk of rotor-brake overheating and possible fire when brake is applied above the maximum limit, particularly when spilled hydraulic fluid is present; — avoid stopping blades over jet-pipe exhaust with engine running; — cockpit annunciation of rotor-brake operation.										
021 16 03 00		**Auxiliary systems**										
021 16 03 01		***Powering the air-conditioning system***										
(01)		Explain how power for the air-conditioning system is taken from the auxiliary gearbox.			X	X	X					
021 16 04 00		**Driveshaft and associated installation**										
021 16 04 01		***Power, construction, materials, speed and torque***										
(01)		Describe how power is transmitted from the engine to the main-rotor gearbox.			X	X	X					
(02)		Describe the material and construction of the driveshaft.			X	X	X					
(03)		Explain the need for alignment between the engine and the main- rotor gearbox.			X	X	X					
(04)		Identify how temporary misalignment occurs between driving and driven components.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(05)		Explain the relationship between driveshaft speed and torque.			X	X	X					
(06)		Describe the methods with which power is delivered to the tail rotor.			X	X	X					
(07)		Describe and identify the construction and materials of tail-rotor/Fenestron driveshafts.			X	X	X					
021 16 05 00		**Intermediate and tail gearbox**										
021 16 05 01		***Lubrication, gearing***										
(01)		Explain and describe the various arrangements when the drive changes direction and the need for an intermediate or tail gearbox.			X	X	X					
(02)		Explain the lubrication requirements for intermediate and tail-rotor gearboxes and methods of checking levels.			X	X	X					
(03)		Explain how on most helicopters the tail-rotor gearbox contains gearing, etc., for the tail-rotor pitch-change mechanism.			X	X	X					
021 16 06 00		**Clutches**										
021 16 06 01		***Purpose, operation, components, serviceability***										
(01)		Explain the purpose of a clutch.			X	X	X					
(02)		Describe and explain the operation of a: — centrifugal clutch; — actuated clutch.			X	X	X					
(03)		List the typical components of the various clutches.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Identify the following methods by which clutch serviceability can be ascertained: — brake-shoe dust; — vibration; — main-rotor run-down time; — engine speed at time of main-rotor engagement; — belt tensioning; — start protection in a belt-drive clutch system.			X	X	X					
021 16 07 00		**Freewheels**										
021 16 07 01		***Purpose, operation, components, location***										
(01)		Explain the purpose of a freewheel.			X	X	X					
(02)		Describe and explain the operation of a: — cam- and roller-type freewheel; — sprag-clutch-type freewheel.			X	X	X					
(03)		List the typical components of the various freewheels.			X	X	X					
(04)		Identify the various locations of freewheels in power plant and transmission systems.			X	X	X					
(05)		Explain the implications regarding the engagement and disengagement of the freewheel.			X	X	X					
021 17 00 00		**HELICOPTER: BLADES**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
021 17 01 00		**Main-rotor design and blade design**										
021 17 01 01		***Design, construction***										
(01)		Describe the different types of blade construction and the need for torsional stiffness.			X	X	X					
(02)		Describe the principles of heating systems/pads on some blades for anti-icing/de-icing.			X	X	X					
(03)		Describe the fully articulated rotor with hinges and feathering hinges.			X	X	X					
021 17 01 02		***Structural components and materials***										
(01)		List the materials used in the construction of main-rotor blades.			X	X	X					
(02)		List the main structural components of a main-rotor blade and their function.			X	X	X					
(03)		Describe the drag hinge of the fully articulated rotor and the lag flexure in the hingeless rotor.			X	X	X					
(04)		Explain the necessity for drag dampers.			X	X	X					
021 17 01 03		***Forces and stresses***										
(01)		Describe main-rotor blade-loading on the ground and in flight.			X	X	X					
(02)		Describe where the most common stress areas are on rotor blades.			X	X	X					
(03)		Show how the centrifugal forces depend on rotor rpm and blade mass and how they pull on the blade's attachment to the hub. Justify the upper limit of the rotor rpm.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Assume a rigid attachment and show how thrust may cause huge oscillating bending moments which stress the attachment.			X	X	X					
(05)		Explain why flapping hinges do not transfer such moments. Show the small flapping hinge offset on fully articulated rotors and zero offset in the case of teetering rotors.			X	X	X					
(06)		Describe the working principle of the flexible element in the hingeless rotor and describe the equivalent flapping hinge offset compared to that of the articulated rotor.			X	X	X					
021 17 01 04		***Structural limitations***										
(01)		Explain the structural limitations in terms of bending and rotor rpm.			X	X	X					
021 17 01 05		***Adjustment***										
(01)	X	Explain the use of trim tabs.			X	X	X					
021 17 01 06		***Tip shape***										
(01)		Describe the various blade-tip shapes used by different manufacturers and compare their advantages and disadvantages.			X	X	X					
021 17 01 07		***Origins of the vertical vibrations***										
(01)		Explain the lift (thrust) variations per revolution of a blade and the resulting vertical total rotor thrust (TRT) variation in the case of perfectly identical blades.			X	X	X					
(02)		Show the resulting frequencies and amplitudes as a function of the number of blades.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the thrust variation in the case of an out-of-track blade, causes, and frequencies (one-per-revolution).			X	X	X					
021 17 01 08		***Lateral vibrations***										
(01)		Explain blade imbalances, causes, and effects.			X	X	X					
021 17 02 00		**Tail-rotor design and blade design**										
021 17 02 01		***Design, construction***										
(01)		Describe the most common design of tail-rotor blade construction, consisting of stainless steel shell reinforced by a honeycomb filler and stainless steel leading abrasive strip.			X	X	X					
(02)		Explain that ballast weights are located at the inboard trailing edge and tip of blades, and that the weights used are determined when the blades are manufactured.			X	X	X					
(03)		Describe how, for some helicopters, anti-icing/de-icing systems are designed into the blade construction.			X	X	X					
(04)		Describe the two-bladed rotor with a teetering hinge, and rotors with more than two blades.			X	X	X					
(05)		Describe the dangers to ground personnel and to the rotor blades, and how to minimise these dangers.			X	X	X					
021 17 02 02		***Intentionally left blank***										
021 17 02 03		***Stresses, vibrations and balancing***										
(01)		Describe the tail-rotor blade-loading on the ground and in flight.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the sources of vibration of the tail rotor and the resulting high frequencies.			X	X	X					
(03)		Explain balancing and tracking of the tail rotor.			X	X	X					
021 17 02 04		***Structural limitations***										
(01)		Describe the structural limitations of the tail-rotor blades.			X	X	X					
(02)		Describe the method of checking the strike indicators placed on the tip of some tail-rotor blades.			X	X	X					
021 17 02 05		***Adjustment***										
(01)		Describe the adjustment of yaw pedals in the cockpit to obtain full-control authority of the tail rotor.			X	X	X					
021 17 02 06		***The Fenestron***										
(01)		Describe the technical layout of a Fenestron tail rotor.			X	X	X					
(02)		Explain the advantages and disadvantages of a Fenestron tail rotor.			X	X	X					
021 17 02 07		***No tail rotor (NOTAR)***										
(01)		Describe the technical layout of a NOTAR design.			X	X	X					
(02)		Explain the control concepts of a NOTAR.			X	X	X					
(03)		Explain the advantages and disadvantages of a NOTAR design.			X	X	X					

SUBJECT 022 – AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
020 00 00 00		**AIRCRAFT GENERAL KNOWLEDGE**										
022 00 00 00		**AIRCRAFT GENERAL KNOWLEDGE — INSTRUMENTATION**										
022 01 00 00		**SENSORS AND INSTRUMENTS**										
022 01 01 00		**Pressure gauge**										
022 01 01 01		***Units for pressure, sensor types, measurements***										
(01)	X	Define 'pressure', 'absolute pressure' and 'differential pressure'.	X	X	X	X	X					
(02)	X	List the following units used for pressure measurement: — Pascal; — bar; — inches of mercury (in Hg); — pounds per square inch (psi).	X	X	X	X	X					
(03)	X	State the relationship between the different units.	X	X	X	X	X					
(04)		List and describe the following different types of sensors used according to the pressure to be measured:	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— aneroid capsules; — bellows; — diaphragms; — bourdon tube.										
(05)		Identify pressure measurements that are applicable to an aircraft: — liquid-pressure measurement (fuel, oil, hydraulic); — air-pressure measurement (bleed-air systems, air-conditioning systems); — engine-pressure measurement manifold pressure (MAP), engine pressure ratio (EPR)).	X	X	X	X	X					
(06)		Identify and read pressure measurement indications both for engine indications and other systems.	X	X	X	X	X					
(07)		Explain the implications of the following pressure measurement errors both for engine indications and other systems: — loss of pressure sensing; — incorrect pressure indications.	X	X	X	X	X					
022 01 02 00		**Temperature sensing**										
022 01 02 01		***Units for temperature, measurements***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)	X	Explain temperature.	X	X	X	X	X					
(02)	X	List the following units that can be used for temperature measurement: — Kelvin; — Celsius; — Fahrenheit.	X	X	X	X	X					
(03)	X	State the relationship between these units and convert between them.	X	X	X	X	X					
(04)		Identify temperature measurements that are applicable to an aircraft: — gas temperature measurement (ambient air, bleed-air systems, air-conditioning systems, air inlet, exhaust gas, gas turbine outlets); — liquid-temperature measurement (fuel, oil, hydraulic); — component-temperature measurement (generator, transformer rectifier unit (TRU), pumps (fuel, hydraulic), power transfer unit (PTU).	X	X	X	X	X					
(05)		Identify and read temperature measurement indications for both engine indications and other systems.	X	X	X	X	X					
022 01 03 00		**Fuel gauge**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 01 03 01		***Units for fuel, measurements, fuel gauges***										
(01)		State that the quantity of fuel can be measured by volume or mass.	X	X	X	X	X					
(02)		List the following units used for fuel quantity: — kilogramme; — pound; — litres; — gallons (US and imperial).	X	X	X	X	X					
(03)		Convert between the various units.	X	X	X	X	X					
(04)		Explain the parameters that can affect the measurement of the volume or mass of the fuel in a fuel tank: — temperature; — aircraft accelerations and attitudes; — and explain how the fuel-gauge system design compensates for these changes.	X	X	X	X	X					
(05)		Describe and explain the operating principles of the following types of fuel gauges: — float system; — capacitance-type of fuel-gauge system; — ultrasound-type of fuel-gauge system: to be introduced at a later date.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Describe and complete a typical post-refuelling procedure for a pilot: — recording the volume that was filled; — converting to the appropriate unit used by the aircraft fuel gauge(s) to compare the actual indicated fuel content to the calculated fuel content; — assess appropriate action if the numbers does not compare.	X	X	X	X	X					
022 01 04 00		**Fuel flowmeters**										
022 01 04 01		***Fuel flow, units for fuel flow, total fuel consumption***										
(01)		Define 'fuel flow' and where it is measured.	X	X	X	X	X					
(02)		State that fuel flow may be measured by volume or mass per unit of time.	X	X	X	X	X					
(03)		List the following units used for fuel flow when measured by mass per hour: — kilogrammes/hour; — pounds/hour.	X	X	X	X	X					
(04)		List the following units used for fuel flow when measured by volume per hour: — litres/hour; — imperial gallons/hour;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— US gallons/hour.										
(05)		Explain how total fuel consumption is obtained.	X	X	X	X	X					
022 01 05 00		**Tachometer**										
022 01 05 01		***Types, operating principles, units for engine speed***										
(01)	X	List the following types of tachometers, describe their basic operating principle and give examples of use: — mechanical (rotating magnet); — electrical (three-phase tacho-generator); — electronic (impulse measurement with speed probe and phonic wheel); — and describe the operating principle of each type.	X	X	X	X	X					
(02)		Explain the typical units for engine speed: — rpm for piston-engine aircraft; — percentage for turbine-engine aircraft.	X	X	X	X	X					
(03)		Explain that some types of rpm indicators require electrical power to provide an indication.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 01 06 00		**Thrust measurement**										
022 01 06 01		***Parameters, operating principle***										
(01)		List and describe the following two parameters used to represent thrust: — N1; — EPR.	X	X								
(02)		Explain the operating principle of using an engine with EPR indication and explain the consequences of incorrect or missing EPR to the operation of the engine, including reverting to N1 mode.	X	X								
(03)		Give examples of display for N1 and EPR.	X	X								
022 01 07 00		**Engine torquemeter**										
022 01 07 01		***Torque, torquemeters***										
(01)		Define ‘torque’.	X	X	X	X	X					
(02)		Explain the relationship between power, torque and rpm.	X	X	X	X	X					
(03)		List the following units used for torque: — Newton meters; — inch or foot pounds.	X	X	X	X	X					
(04)		State that engine torque can be displayed as a percentage.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)	X	List and describe the following different types of torquemeters, and explain their operating principles: — mechanical; — electronic.	X	X	X	X	X					
(06)	X	Compare the two systems with regard to design and weight.	X	X	X	X	X					
(07)		Give examples of display.	X	X	X	X	X					
022 01 08 00		**Synchroscope**										
022 01 08 01		***Purpose, operating principle, display***										
(01)		State the purpose of a synchroscope.	X	X								
(02)	X	Explain the operating principle of a synchroscope.	X	X								
(03)		Give examples of display.	X	X								
022 01 09 00		**Engine-vibration monitoring**										
022 01 09 01		***Purpose, operating principle of a vibration-monitoring system, display***										
(01)		State the purpose of a vibration-monitoring system for a jet engine.	X	X								
(02)	X	Describe the operating principle of a vibration-monitoring system using the following two types of sensors: — piezoelectric crystal;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— magnet.										
(03)		Explain that there is no specific unit for vibration monitoring, i.e. it is determined by specified numeric threshold values.	X	X								
(04)		Give examples of display.	X	X								
022 01 10 00		**Time measurement**										
022 01 10 01		***On-board clock***										
(01)		Explain that the on-board aircraft clock provides a time reference for several of the on-board systems including aircraft communications addressing and reporting system (ACARS) and engine and systems maintenance.	X	X	X	X	X					
022 02 00 00		**MEASUREMENT OF AIR-DATA PARAMETERS**										
022 02 01 00		**Pressure measurement**										
022 02 01 01		**Definitions**										
(01)		Define the following pressure measurements and state the relationship between them: — static pressure; — dynamic pressure; — total pressure.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 02 01 02		***Pitot/static system: design and errors***										
(01)		Describe the design and the operating principle of a: — static port/source; — pitot tube; — combined pitot/static probe.	X	X	X	X	X	X	X	1		
(02)		For each of these indicate the various locations and describe the following associated errors and how to correct, minimise the effect of or compensate for them: — position errors; — instrument errors; — errors due to a non-longitudinal axial flow (including manoeuvre-induced errors).	X	X	X	X	X	X	X	1		
(03)		Describe a typical pitot/static system and list the possible outputs.	X	X	X	X	X	X				
(04)		Explain the redundancy and the interconnections that typically exist in complex pitot/static systems found in large aircraft.	X	X	X	X	X	X				
(05)		Explain the purpose of pitot/static system heating.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe alternate static sources and their effects when used, particularly in unpressurised aircraft.	X	X	X	X	X	X	X	1		
(07)		Describe a modern pitot static system using solid-state sensors near the pitot probe or static port converting the air data to numerical data (electrical signals) before being sent to the air-data computer(s).	X	X	X	X	X	X				
022 02 02 00		**Temperature measurement**										
022 02 02 01		***Definitions***										
(01)		Define the following and explain the relationship between them: — outside air temperature (OAT); — total air temperature (TAT); — static air temperature (SAT).	X	X	X	X	X	X	X		1	
(02)		Explain the term ‘ram rise’ and convert TAT to SAT.	X					X				
(03)		Explain why TAT is often displayed and that TAT is the temperature input to the air-data computer.	X	X	X	X	X	X	X			
022 02 02 02		***Design and operation***										
(01)		Indicate typical locations for both direct-reading and remote-reading temperature probes, and describe the following errors: — position error;	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— instrument error.										
(02)		Explain the purpose of temperature probe heating and interpret the effect of heating on sensed temperature unless automatically compensated for.	X	X	X	X	X	X				
022 02 03 00		**Angle-of-attack (AoA) measurement**										
022 02 03 01		***Sensor types, operating principles, ice protection, displays, incorrect indications***										
(01)		Describe the following two types of AoA sensors: — null-seeking (slotted) probe; — vane detector.	X	X								
(02)		For each type, explain the operating principles.	X	X								
(03)		Explain how both types are protected against ice.	X	X								
(04)		Give examples of systems that use the AoA as an input, such as: — air-data computer; — stall warning systems; — flight-envelope protection systems.	X	X								
(05)		Give examples of and interpret different types of AoA displays:	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— simple light arrays of green, amber and red lights; — gauges showing a numerical scale.										
(06)		Explain the implications for the pilot if the AoA indication becomes incorrect but still provides data, e.g. if the sensor is frozen in a fixed position.	X	X								
(07)		Explain how an incorrect AoA measurement can affect the controllability of an aircraft with flight-envelope protection.	X	X								
022 02 04 00		**Altimeter**										
022 02 04 01		***Units, terms, types, operating principles, displays, errors, corrections***										
(01)		List the following two units used for altimeters and state the relationship between them: — feet; — metres.	X	X	X	X	X	X				
(02)	X	Define the following terms: — height, altitude; — indicated altitude, true altitude; — pressure altitude, density altitude.	X	X	X	X	X	X	X		1	
(03)	X	Define the following barometric references: ‘QNH’, ‘QFE’, ‘1013.25’.	X	X	X	X	X	X	X		1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Explain the operating principles of an altimeter.	X	X	X	X	X	X	X	1	2, 3	
(05)	X	Describe and compare the following three types of altimeters and reason(s) why particular designs may be required in certain airspace: — simple altimeter (single capsule); — sensitive altimeter (multi-capsule); — servo-assisted altimeter.	X	X	X	X	X	X	X		1	
(06)	X	Give examples of associated displays: pointer, multi-pointer, drum, vertical straight scale.	X	X	X	X	X	X	X		1	
(07)		Describe the following errors: — static system error; — instrument error; — barometric error; — temperature error (air column not at ISA conditions); — lag (altimeter response to change of height).	X	X	X	X	X	X	X		1	
(08)		Demonstrate the use of an altimeter correction table for the following errors: — temperature corrections; — aircraft position errors.	X	X	X	X	X	X	X		1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(09)		Describe the effects of a blockage or a leakage on the static pressure line.	X	X	X	X	X	X	X	1		
(10)		Describe the use of GPS altitude as an alternative means of checking erroneous altimeter indications, and highlight the limitations of the GPS altitude indication.	X	X	X	X	X	X	X		1, 3	
022 02 05 00		**Vertical speed indicator (VSI)**										
022 02 05 01		***VSI and instantaneous vertical speed indicator (IVSI)***										
(01)		List the two units used for VSIs and state the relationship between them: — metres per second; — feet per minute.	X	X	X	X	X	X				
(02)		Explain the operating principles of a VSI and an IVSI.	X	X	X	X	X	X	X	1		
(03)		Describe and compare the following types of VSIs: — barometric type (VSI); — instantaneous barometric type (IVSI); — inertial type (inertial information provided by an inertial reference unit).	X	X	X	X	X	X	X	1		
(04)		Describe the following VSI errors: — static system errors; — instrument errors;	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— time lag.										
(05)		Describe the effects on a VSI of a blockage or a leakage on the static pressure line.	X	X	X	X	X	X	X	1		
(06)		Give examples of a VSI display.	X	X	X	X	X	X				
(07)		Compare the indications of a VSI and an IVSI during flight in turbulence and appropriate pilot technique during manoeuvring using either type.	X	X	X	X	X	X				
022 02 06 00		**Airspeed indicator (ASI)**										
022 02 06 01		***Units, errors, operating principles, displays, position errors, unreliable airspeed indications***										
(01)		List the following three units used for airspeed and state the relationship between them: — nautical miles/hour (kt); — statute miles/hour (mph); — kilometres/hour (km/h).	X	X	X	X	X	X				
(02)		Describe the following ASI errors and state when they must be considered: — pitot/static system errors; — instrument errors; — position errors;	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— compressibility errors; — density errors.										
(03)		Explain the operating principles of an ASI (as appropriate to aeroplanes or helicopters).	X	X	X	X	X	X	X	1		
(04)		Give examples of an ASI display: pointer, vertical straight scale, and digital (HUD display).	X	X	X	X	X	X				
(05)		Demonstrate the use of an ASI correction table for position error.	X	X	X	X	X	X				
(06)		Define and explain the following colour codes that can be used on an ASI: — white arc (flap operating speed range); — green arc (normal operating speed range); — yellow arc (caution speed range); — red line (VNE) or barber's pole (VMO); — blue line (best rate of climb speed, one-engine-out for multi-engine piston light aeroplanes).	X	X								
(07)		Define and explain the following colour codes that can be used on an ASI: — green arc (normal operating speed range); — red line (VNE);			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— blue line (maximum airspeed during autorotation).										
(08)		Describe the effects on an ASI of a blockage or a leakage in the static or total pressure line(s).	X	X	X	X	X	X	X			
(09)		Define the term ‘unreliable airspeed’ and describe the means by which it can be recognised such as: — different airspeed indications between ASIs; — unexpected aircraft behaviour; — buffeting; — aircraft systems warning; — aircraft attitude.	X	X	X	X	X	X	X		1	
(10)		Describe the appropriate procedures available to the pilot in the event of unreliable airspeed indications: — combination of a pitch attitude and power setting; — ambient wind noise inside the aircraft; — use of GPS speed indications and the associated limitations.	X	X	X	X	X	X	X		1	
022 02 07 00		**Machmeter**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 02 07 01		***Operating principle, display, CAS, TAS and Mach number***										
(01)		Define 'Mach number' and 'local speed sound' (LSS). Calculate between LSS, TAS and Mach number.	X									
(02)	X	Describe the operating principle of a Machmeter.	X									
(03)	X	Explain why a Machmeter does not suffer from compressibility error.	X									
(04)		Give examples of a Machmeter display: pointer, drum, vertical straight scale, digital.	X									
(05)		Describe the effects on a Machmeter of a blockage or a leakage in the static or total pressure line(s).	X									
(06)		Explain the relationship between CAS, TAS and Mach number. Explain how CAS, TAS and Mach number vary in relation to each other during a climb, a descent, or in level flight in different temperature conditions.	X									
(07)		State the existence of maximum operating limit speed (VMO) and maximum operating Mach number (MMO).	X									
(08)		Describe typical indications of MMO and VMO on analogue and digital instruments.	X									
(09)		Describe the relationship between MMO and VMO with change in altitude and the	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		implications of climbing at constant IAS and descending at constant Mach number with respect to the margin to MMO and VMO.										
(10)		Describe the implications of climbing or descending at constant Mach number or constant IAS with respect to the margin to the stall speed or maximum speed.	X									
022 02 08 00		**Air-data computer (ADC)**										
022 02 08 01		***Operating principle, data, errors, air-data inertial reference unit***										
(01)		Explain the operating principle of an ADC.	X	X	X	X	X	X				
(02)	X	List the following possible input data: — TAT; — static pressure; — total pressure; — measured temperature; — AoA; — flaps position; — landing gear position; — stored aircraft data.	X	X	X	X	X	X				
(03)	X	List the following possible output data, as applicable to aeroplanes or helicopters: — IAS;	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— TAS; — SAT; — TAT; — Mach number; — AoA; — altitude; — vertical speed; — VMO/MMO pointer.										
(04)		Explain how position, instrument, compressibility and density errors can be compensated/corrected to achieve a TAS calculation.	X	X	X	X	X	X				
(05)		Give examples of instruments or systems which may use ADC output data.	X	X	X	X	X	X				
(06)		Explain that an air-data inertial reference unit (ADIRU) is an ADC integrated with an inertial reference unit (IRU), that there will be separate controls for the ADC part and inertial reference (IR) part, and that incorrect selection during failure scenarios may lead to unintended and potentially irreversible consequences.	X	X	X	X	X	X				
(07)	X	Explain the ADC architecture for air-data measurement including sensors, processing	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		units and displays, as opposed to stand-alone air-data measurement instruments.										
(08)		Describe the consequences of the loss of an ADC compared to the failure of individual instruments.	X	X	X	X	X	X				
022 03 00 00		**MAGNETISM — DIRECT-READING COMPASS AND FLUX VALVE**										
022 03 01 00		**Earth's magnetic field**										
022 03 01 01		***Magnetic field, variation, dip***										
(01)		Describe the magnetic field of the Earth.	X	X	X	X	X	X				
(02)	X	Explain the properties of a magnet.	X	X	X	X	X	X				
(03)		Define the following terms: — magnetic variation; — magnetic dip (inclination).	X	X	X	X	X	X				
(04)		Describe that a magnetic compass will align itself to both the horizontal (azimuth) and vertical (dip) components of the Earth's magnetic field, thus will not function in the vicinity of the magnetic poles.	X	X	X	X	X	X				
(05)		Demonstrate the use of variation values (given as East/West (E/W) or +/–) to calculate: true heading to magnetic heading; magnetic heading to true heading.	X	X	X	X	X	X				
022 03 02 00		**Aircraft magnetic field**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 03 02 01		***Permanent magnetism, electromagnetism, deviation***										
(01)	X	Explain the following differences between permanent magnetism and electromagnetism: when they are present; what affects their magnitude.	X	X	X	X	X	X				
(02)	X	Explain the principles of and the reasons for: — compass swinging (determination of initial deviations); — compass compensation (correction of deviations found); — compass calibration (determination of residual deviations).	X	X	X	X	X	X				
(03)		Explain how permanent magnetism within the aircraft structure and electromagnetism from the aircraft systems affect the accuracy of a compass.	X	X	X	X	X	X				
(04)		Describe the purpose and the use of a deviation correction card.	X	X	X	X	X	X				
(05)		Demonstrate the use of deviation values (either given as E/W or +/–) from a compass deviation card to calculate: — compass heading to magnetic heading; — magnetic heading to compass heading.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
022 03 03 00		**Direct-reading magnetic compass**										
022 03 03 01		***Purpose, errors, timed turns, serviceability***										
(01)		Explain the purpose of a direct-reading magnetic compass.	X	X	X	X	X	X				
(02)		Describe how the direct-reading magnetic compass will only show correct indications during straight, level and unaccelerated flight, and that an error will occur during the following flight manoeuvres (no numerical examples): — acceleration and deceleration; — turning; — during pitch-up or pitch-down manoeuvres.	X	X	X	X	X	X				
(03)		Explain how the use of timed turns eliminates the problem of the turning errors of a direct-reading magnetic compass, and calculate the duration of a rate-1 turn for a given change of heading.	X	X	X	X	X	X				
(04)		Describe the serviceability check for a direct-reading magnetic compass prior to flight, such as: — the physical appearance of the device;	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— comparing the indication to another known direction such as a different compass or runway direction.										
022 03 04 00		**Flux valve**										
022 03 04 01		***Purpose, operating principle, location, errors***										
(01)		Explain the purpose of a flux valve.	X	X	X	X	X	X				
(02)	X	Explain its operating principle.	X	X	X	X	X	X				
(03)		Indicate typical locations of the flux valve(s).	X	X	X	X	X	X				
(04)		Give the remote-reading compass system as example of application for a flux valve.	X	X	X	X	X	X				
(05)		Explain that deviation is compensated for and, therefore, eliminates the need for a deviation correction card.	X	X	X	X	X	X				
(06)		Explain that a flux valve does not suffer from the same magnitude of errors as a direct-reading magnetic compass when turning, accelerating or decelerating and during pitch-up or pitch-down manoeuvres.	X	X	X	X	X	X				
022 04 00 00		**GYROSCOPIC INSTRUMENTS**										
022 04 01 00		**Gyroscope: basic principles**										
022 04 01 01		***Gyroscopic forces, degrees of freedom, gyro wander, driving gyroscopes***										
(01)	X	Define a ‘gyro’.	X	X	X	X	X	X	X		1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)	X	Explain the fundamentals of the theory of gyroscopic forces.	X	X	X	X	X	X	X		1	
(03)	X	Define the 'degrees of freedom' of a gyro. *Remark: As a convention, the degrees of freedom of a gyroscope do not include its own axis of rotation (the spin axis).*	X	X	X	X	X	X	X		1	
(04)	X	Explain the following terms: — rigidity; — precession; — wander (drift/topple).	X	X	X	X	X	X				
(05)		Explain the three types of gyro wander: — real wander; — apparent wander; — transport wander.	X	X	X	X	X	X				
(06)		Describe the two ways of driving gyroscopes and any associated indications: — air/vacuum; — electrically.	X	X	X	X	X	X	X	1		
022 04 02 00		**Rate-of-turn indicator — Turn coordinator — Balance (slip) indicator**										
022 04 02 01		***Indications, relation between bank angle, rate of turn and TAS***										
(01)		Explain the purpose of a rate-of-turn and balance (slip) indicator.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Define a ‘rate-1 turn’.	X	X	X	X	X	X	X	1		
(03)		Describe the indications given by a rate-of-turn indicator.	X	X	X	X	X	X	X		1	
(04)		Explain the relation between bank angle, rate of turn and TAS, and how bank angle becomes the limiting factor at high speed (no calculations).	X	X	X	X	X	X	X	1		
(05)		Explain the purpose of a balance (slip) indicator and its principle of operation.	X	X	X	X	X	X	X	1		
(06)		Describe the indications of a rate-of-turn and balance (slip) indicator during a balanced, slip or skid turn.	X	X	X	X	X	X	X	1		
(07)		Describe the indications given by a turn coordinator (or turn-and-bank indicator).	X	X	X	X	X	X	X	1		
(08)		Compare the indications on the rate-of-turn indicator and the turn coordinator.	X	X	X	X	X	X	X	1		
022 04 03 00		**Attitude indicator (artificial horizon)**										
022 04 03 01		***Purpose, types, effect of aircraft acceleration, display***										
(01)		Explain the purpose of the attitude indicator.	X	X	X	X	X	X	X	1		
(02)		Identify the two types of attitude indicators: — attitude indicator; — attitude and director indicator (ADI).	X	X	X	X	X	X	X	1		
(03)	X	State the degrees of freedom.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Describe the effects of the aircraft's acceleration and turns on instrument indications.	X	X	X	X	X	X				
(05)		Describe a typical attitude display and instrument markings.	X	X	X	X	X	X	X	1		
022 04 04 00		**Directional gyroscope**										
022 04 04 01		***Purpose, types, drift, alignment to compass heading***										
(01)		Explain the purpose of the directional gyroscope.	X	X	X	X	X	X	X	1		
(02)		Identify the two types of gyro-driven direction indicators: direction indicator; horizontal situation indicator (HSI).	X	X	X	X	X	X	X	1		
(03)		Explain how the directional gyroscope will drift over time due to the following: — rotation of the Earth; — aircraft manoeuvring; — aircraft movement over the Earth's surface/direction of travel.	X	X	X	X	X	X				
(04)		Describe the procedure for the pilot to align the directional gyroscope to the correct compass heading.	X	X	X	X	X	X				
022 04 05 00		**Remote-reading compass systems**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 04 05 01		***Operating principles, components, comparison with a direct-reading magnetic compass***										
(01)		Describe the principles of operation of a remote-reading compass system.	X	X	X	X	X	X	X		1	
(02)		Using a block diagram, list and explain the function of the following components of a remote-reading compass system: — flux detection unit; — gyro unit; — transducers, precession amplifiers, annunciator; — display unit (compass card, synchronising and set-heading knob, DG/compass/slave/free switch).	X	X	X	X	X	X	X		1	
(03)		State the advantages and disadvantages of a remote-reading compass system compared to a direct-reading magnetic compass with regard to: — design (power source, weight and volume); — deviation due to aircraft magnetism; — turning and acceleration errors; — attitude errors;	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— accuracy and stability of the information displayed; — availability of the information for several systems (compass card, RMI, automatic flight control system (AFCS)).										
022 04 06 00		**Solid-state systems — attitude and heading reference system (AHRS)**										
022 04 06 01		***Components, indications***										
(01)		Explain that the AHRS is a replacement for traditional gyros using solid-state technology with no moving parts and is a single unit consisting of: — solid-state accelerometers; — solid-state rate sensor gyroscopes; — solid-state magnetometers (measurement of the Earth's magnetic field).	X	X	X	X	X	X	X	1		
(02)		Explain that the AHRS senses rotation and acceleration for all three axes and senses the direction of the Earth's magnetic field where the indications are normally provided on electronic screens (electronic flight instrument system (EFIS)).	X	X	X	X	X	X	X			
022 05 00 00		**INERTIAL NAVIGATION**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 05 01 00		**Basic principles**										
022 05 01 01		***Systems***										
(01)		State that inertial navigation/reference systems are the main source of attitude and one of the main sources of navigational data in commercial air transport aeroplanes.	X		X	X						
(02)		State that inertial systems require no external input, except TAS, to determine aircraft attitude and navigational data.	X		X	X						
(03)		State that earlier gyro mechanically stabilised platforms are (technically incorrectly but conventionally) referred to as inertial navigation systems (INSs) and more modern fixed (strap down) platforms are conventionally referred to as inertial reference systems (IRSs). INSs can be considered to be stand-alone, whereas IRSs are integrated with the FMS.	X		X	X						
(04)		Explain the basic principles of inertial navigation (including double integration of measured acceleration and the necessity for north–south, east–west and vertical components to be measured/extracted).	X		X	X						
(05)		Explain the necessity of applying correction for transport precession, and Earth rate precession, coriolis and gravity.	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		State that in modern aircraft fitted with inertial reference system (IRS) and flight management system (FMS), the flight management computer (FMC) position is normally derived from a mathematical analysis of IRS, global positioning system (GPS), and distance measuring equipment (DME) data, VHF omnidirectional radio range (VOR) and LOC.	X		X	X						
(07)		List all navigational data that can be determined by a stand-alone inertial navigation system.	X		X	X						
(08)		State that a strap-down system is fixed to the structure of the aircraft and normally consists of three laser ring gyros and three accelerometers.	X		X	X						
(09)		State the differences between a laser ring gyro and a conventional mechanical gyro.	X		X	X						
022 05 02 00		**Alignment and operation**										
022 05 02 01		***Alignment process, incorrect data entry, and control panels***										
(01)		State that during the alignment process, the inertial platform is levelled (INS) or the local vertical is determined (IRS), and true north/aircraft heading is established.	X		X	X						
(02)		Explain that the aircraft must be stationary during alignment, the aircraft position is	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		entered during the alignment phase, and that the alignment process takes around 10 to 20 minutes at mid latitudes (longer at high latitudes).										
(03)		State that in-flight realignment is not possible and loss of alignment leads to loss of navigational data although attitude information may still be available.	X		X	X						
(04)		Explain that the inertial navigation system (INS) platform is maintained level and north-aligned after alignment is complete and the aircraft is in motion.	X		X	X						
(05)		State that an incorrect entry of latitude may lead to a loss of alignment and is more critical than the incorrect entry of longitude.	X		X	X						
(06)		State that the positional error of a stand-alone INS varies (a typical value can be quoted as 1–2 NM/h) and is dependent on the gyro drift rate, accelerometer bias, misalignment of the platform, and computational errors.	X		X	X						
(07)		Explain that, on a modern aircraft, there is likely to be an air-data inertial reference unit (ADIRU), which is an inertial reference unit (IRU) integrated with an air-data computer (ADC).	X		X	X						
(08)		Identify examples of IRS control panels.	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		Explain the following selections on the IRU mode selector: — NAV (normal operation); — ATT (attitude only).	X		X	X						
(10)		State that the majority of the IRS data can be accessed through the FMS control and display unit (CDU)/flight management and guidance system (FMGS) multifunction control and display unit (MCDU).	X		X	X						
(11)		Describe the procedure available to the pilot for assessing the performance of individual IRUs after a flight: — reviewing the residual indicated ground speed when the aircraft has parked; — reviewing the drift given as NM/h.	X		X	X						
022 06 00 00		**AEROPLANE: AUTOMATIC FLIGHT CONTROL SYSTEMS**										
022 06 01 00		**General**										
022 06 01 01		***Definitions and control loops***										
(01)		Describe the following purposes of an automatic flight control system (AFCS): — enhancement of flight controls; — reduction of pilot workload.	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Define and explain the following two functions of an AFCS: — aircraft control: stabilise the aircraft around its centre of gravity (CG); — aircraft guidance: guidance of the aircraft’s flight path.	X	X				X				
(03)		Describe the following two automatic control principles: — closed loop, where a feedback from an action or state is compared to the desired action or state; — open loop, where there is no feedback loop.	X	X								
(04)		List the following elements of a closed-loop control system and explain their basic function: — input signal; — error detector; — signal processor providing a measured output signal according to set criteria or laws; — control element such as an actuator; — feedback signal to error detector for comparison with input signal.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(05)		Describe how a closed-loop system may enter a state of self-induced oscillation if the system overcompensates for deviations from the desired state.	X	X								
(06)		Explain how a state of self-induced oscillations may be detected and describe the effects of self-induced oscillations: — aircraft controllability; — aircraft safety; — timely manual intervention as a way of mitigating loss of control; — techniques that may be used to maintain positive control of the aircraft.	X	X								
022 06 02 00		**Autopilot system**										
022 06 02 01		***Design and operation***										
(01)		Define the three basic control channels.	X	X								
(02)		Define the three different types of autopilots: — single or 1 axis (roll); — 2 axes (pith and roll); — 3 axes (pitch, roll and yaw).	X	X								
(03)		Describe the purpose of the following components of an autopilot system:	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— flight control unit (FCU), mode control panel (MCP) or equivalent; — flight mode annunciator (FMA) (see Subject 022 06 04 00); — autopilot computer; — actuator.										
(04)		Explain the following lateral modes: — heading (HDG)/track (TRK); — VOR (VOR)/localiser (LOC); — lateral navigation/managed navigation (LNAV or NAV).	X	X								
(05)		Describe the purpose of control laws for pitch and roll modes.	X	X								
(06)		Explain the following vertical modes: — vertical speed (V/S); — flight path angle (FPA); — level change (LVL CHG)/open climb (OP CLB) or open descent (OP DES); — speed reference system (SRS); — altitude (ALT) hold; — vertical navigation (VNAV)/managed climb (CLB) or descent (DES);	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— glideslope (G/S).										
(07)		Describe how the autopilot uses speed, aircraft configuration or flight phase as a measure for the magnitude of control inputs and how this may affect precision and stability.	X	X								
(08)		Explain the following mixed modes: — take-off; — go-around; — approach (APP).	X	X								
(09)		Describe the two types of autopilot configurations and explain the implications to the pilot for either and when comparing the two principles: — flight-deck controls move with the control surface when the autopilot is engaged; — flight-deck controls remain static when the autopilot is engaged.	X	X								
(10)		Describe the purpose of the following inputs and outputs for an autopilot system: — attitude information; — flight path/trajectory information; — control surface position information;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— airspeed information; — aircraft configuration information; — FCU/MCP selections; — FMAs.										
(11)		Describe the purpose of the synchronisation function when engaging the autopilot and explain why the autopilot should be engaged when the aircraft is in trim.	X	X								
(12)		Define the control wheel steering (CWS) mode as manual manoeuvring of the aircraft through the autopilot computer and autopilot servos/actuators using the control column/control wheel.	X	X								
(13)		Describe the following elements of CWS: — CWS as an autopilot mode; — flight phases where CWS cannot be used; — whether the pilot or the autopilot is controlling the flight path; — the availability of flight path/performance protections; — potential different feel and control response compared to manual flight.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(14)		Describe touch control steering (TCS) and highlight the differences when compared to CWS: — autopilot remains engaged but autopilot servos/actuators are disconnected from the control surfaces; — manual control of the aircraft as long as TCS button is depressed; — autopilot servos/actuators reconnect when TCS button is released and the autopilot returns to previously engaged mode(s).	X	X				X				
(15)		Explain that only one autopilot may be engaged at any time except for when APP is armed in order to facilitate a fail-operational autoland.	X	X				X				
(16)		Explain the difference between an armed and an engaged mode: — not all modes have an armed state available; — a mode will only become armed if certain criteria are met; — an armed mode will become engaged (replacing the previously engaged mode, if any) when certain criteria are met.	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(17)		Describe the sequence of events when a mode is engaged and the different phases: — initial phase where attitude is changed to obtain a new trajectory in order to achieve the new parameter; — the trajectory will be based on rate of closure which is again based on the difference between the original parameter and the new parameter; — capture phase where the aircraft will follow a predefined rate of change of trajectory to achieve the new parameter without overshooting/ undershooting; — tracking or hold phase where the aircraft will maintain the set parameter until a new change has been initiated.	X	X				X				
(18)		Explain automatic mode reversion and typical situations where it may occur: — no suitable data for the current mode such as flight plan discontinuity when in LNAV/managed NAV; — change of parameter during capture phase for original parameter such as change of altitude target during ALT ACQ/ALT*;	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— mismanagement of a mode resulting in engagement of the autopilot envelope protection, e.g. selecting excessive V/S resulting in a loss of speed control.										
(19)		Explain the dangers of mismanagement of the following modes: — use of V/S and lack of speed protection, i.e. excessive V/S or FPA may be selected with subsequent uncontrolled loss or gain of airspeed; — arming VOR/LOC or APP outside the protected area of the localiser or ILS.	X	X				X				
(20)		Describe how failure of other systems may influence the availability of the autopilot and how incorrect data from other systems may result in an undesirable aircraft state, potentially without any failure indications. Explain the importance of prompt and appropriate pilot intervention during such events.	X	X				X				
(21)		Explain an appropriate procedure for disengaging the autopilot and why both aural and visual warnings are used to indicate that the autopilot is being disengaged: — temporary warning for intended disengagement using the design method;	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— continuous warning for unintended disengagement or using a method other than the design method.										
(22)		Explain the following regarding autopilot and aircraft with manual trim: — the autopilot may not engage unless the aircraft controls are in trim; — the aircraft will normally be in trim when the autopilot is disconnected; — use of manual trim when the autopilot is engaged will normally lead to autopilot disconnection and a risk of an out-of-trim situation.	X	X				X				
022 06 03 00		**Flight director: design and operation**										
022 06 03 01		***Purpose, use, indications, modes, data***										
(01)		Explain the purpose of a flight director system.	X	X				X				
(02)		Describe the different types of display: — pitch and roll crossbars; — V-bar.	X	X				X				
(03)		Explain the differences between a flight director and an autopilot and how the flight director provides a means of cross-checking	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		the control/guidance commands sent to the autopilot.										
(04)		Explain why the flight director must be followed when engaged/shown, and describe the appropriate use of the flight director: — flight director only; — autopilot only; — flight director and autopilot; — typical job-share between pilots (pilot flying (PF)/pilot monitoring (PM)) for selecting the parameters when autopilot is engaged versus disengaged; — highlight when the flight director should not be followed or should be disengaged.	X	X				X				
(05)		Give examples of different scenarios and the resulting flight director indications.	X	X				X				
(06)		Explain that the flight director computes and indicates the direction and magnitude of control inputs required in order to achieve an attitude to follow a trajectory.	X	X				X				
(07)		Explain how the modes available for the flight director are the same as those available for the autopilot, and that the same panel (FCU/MCP) is normally used for selection.	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(08)		Explain the importance of checking the FMC data or selected autopilot modes through the FMA when using the flight directors. If the flight directors are showing incorrect guidance, they should not be followed and should be turned off.	X	X				X				
022 06 04 00		**Aeroplane: flight mode annunciator (FMA)**										
022 06 04 01		***Purpose, modes, display scenarios***										
(01)		Explain the purpose of FMAs and their importance being the only indication of the state of a system rather than a switch position.	X	X				X				
(02)		Describe where the FMAs are normally shown and how the FMAs will be divided into sections (as applicable to aircraft complexity): — vertical modes; — lateral modes; — autothrust modes; — autopilot and flight director annunciators; — landing capability.	X	X				X				
(03)		Explain why FMAs for engaged or armed modes have different colour or different font size.	X	X				X				
(04)		Describe the following FMA display scenarios:	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— engagement of a mode; — mode change from armed to becoming engaged; — mode reversion.										
(05)		Explain the importance of monitoring the FMAs and announcing mode changes at all times (including when selecting a new mode) and why only certain mode changes will be accompanied by an aural notification or additional visual cues.	X	X				X				
(06)		Describe the consequences of not understanding what the FMAs imply or missing mode changes, and how it may lead to an undesirable aircraft state.	X	X				X				
022 06 05 00		**Autoland**										
022 06 05 01		***Design and operation***										
(01)		Explain the purpose of an autoland system.	X					X				
(02)		Explain the significance of the following components required for an autoland: — autopilot; — autothrust; — radio altimeter; — ILS receivers.	X					X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Explain the following terms (reference to CS-AWO 'All Weather Operations'): — fail-passive automatic landing system; — fail-operational automatic landing system; — fail-operational hybrid landing system; — alert height.	X									
(04)		Describe the autoland sequence including the following: — FMAs regarding the landing capability of the aircraft; — the significance of monitoring the FMAs to ensure the automatic arming/engagement of modes triggered by defined radio altitudes or other thresholds; — in the event of a go-around, that the aircraft performs the go-around manoeuvre both by reading the FMAs and supporting those readings by raw data; — during the landing phase, that 'FLARE' mode engages at the appropriate radio altitude, including typical time frame and actions if 'FLARE' does not engage;	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— after landing, that 'ROLL-OUT' mode engages and the significance of disconnecting the autopilot prior to vacating the runway.										
(05)		Explain that there are operational limitations in order to legally perform an autoland beyond the technical capability of the aircraft.	X									
(06)		Explain the purpose and significance of alert height, describe the indications and implications, and consider typical pilot actions for a failure situation: — above the alert height; — below the alert height.	X									
(07)		Describe typical failures that, if occurring below the alert height, will trigger a warning: — all autopilots disengage; — loss of ILS signal or components thereof; — excessive ILS deviations; — radio-altimeter failure.	X									
(08)		Describe how the failure of various systems, including systems not directly involved in the autoland process, can influence the ability to perform an autoland or affect the minima	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		down to which the approach may be conducted.										
(09)		Describe the fail-operational hybrid landing system as a primary fail-passive automatic landing system with a secondary independent guidance system such as a head-up display (HUD) to enable the pilot to complete a manual landing if the primary system fails.	X									
022 07 00 00		**HELICOPTER: AUTOMATIC FLIGHT CONTROL SYSTEMS**										
022 07 01 00		**General principles**										
022 07 01 01		***Stabilisation***										
(01)		Explain the similarities and differences between SAS and AFCS (the latter can actually fly the helicopter to perform certain functions selected by the pilot). Some AFCSs just have altitude and heading hold whilst others include a vertical speed or IAS hold mode, where a constant rate of climb/decent or IAS is maintained by the AFCS.			X	X	X					
022 07 01 02		***Reduction of pilot workload***										
(01)		Appreciate how effective the AFCS is in reducing pilot workload by improving basic aircraft control harmony and decreasing disturbances.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
022 07 01 03		***Enhancement of helicopter capability***										
(01)		Explain how an AFCS improves helicopter flight safety during: — search and rescue (SAR) because of increased capabilities; — flight by sole reference to instruments; — underslung load operations; — white-out conditions in snow-covered landscapes; — an approach to land with lack of visual cues.			X	X	X					
(02)		Explain that the SAR modes of AFCS include the following functions: — ability to autohover; — facility for mark on target (MOT) approach to hover; — automatically transition from cruise down to a predetermined point or over-flown point; — ability for the rear crew to move the helicopter around in the hover; — the ability to automatically transition from the hover back to cruise flight; — the ability to fly various search patterns.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Explain that earlier autohover systems use Doppler velocity sensors and modern systems use inertial sensors plus GPS, and normally include a two-dimensional hover-velocity indicator for the pilots.			X	X	X					
(04)		Explain why some SAR helicopters have both radio-altimeter height hold and barometric altitude hold.			X	X	X					
022 07 01 04		**Failures**										
(01)		Explain the various redundancies and independent systems that are built into the AFCSs.			X	X	X					
(02)		Appreciate that the pilot can override the system in the event of a failure.			X	X	X					
(03)		Explain a series actuator ‘hard over’ which equals aircraft attitude runaway.			X	X	X					
(04)		Explain the consequences of a saturation of the series actuators.			X	X	X					
022 07 02 00		**Components: operation**										
022 07 02 01		***Basic sensors***										
(01)		Explain the basic sensors in the system and their functions.			X	X	X					
(02)		Explain that the number of sensors will be dependent on the number of coupled modes of the system.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
022 07 02 02		***Specific sensors***										
(01)		Explain the function of the microswitches and strain gauges in the system which sense pilot input to prevent excessive feedback forces from the system.			X	X	X					
022 07 02 03		***Actuators***										
(01)		Explain the principles of operation of the series and parallel actuators, spring-box clutches and the autotrim system.			X	X	X					
(02)		Explain the principle of operation of the electronic hydraulic actuators in the system.			X	X	X					
022 07 02 04		***Pilot–system interface: control panels, system indications, warnings***										
(01)		Describe the typical layout of the AFCS control panel.			X	X	X					
(02)		Describe the system indications and warnings.			X	X	X					
022 07 02 05		***Operation***										
(01)		Explain the functions of the redundant sensors’ simplex and duplex channels (single/dual channel).			X	X	X					
022 07 03 00		**Stability augmentation system (SAS)**										
022 07 03 01		***General principles and operation***										
(01)		Explain the general principles and operation of an SAS with regard to:			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— rate damping; — short-term attitude hold; — effect on static stability; — effect on dynamic stability; — aerodynamic cross-coupling; — effect on manoeuvrability; — control response; — engagement/disengagement; — authority.										
(02)		Explain and describe the general working principles and primary use of an SAS by damping pitch, roll and yaw motions.			X	X	X					
(03)		Describe a simple SAS with force trim system which uses magnetic clutch and springs to hold cyclic control in the position where it was last released.			X	X	X					
(04)		Explain the interaction of trim with SAS/stability and control augmentation system (SCAS).			X	X	X					
(05)		Appreciate that the system can be overridden by the pilot and that individual channels can be deselected.			X	X	X					
(06)		Describe the operational limits of the system.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Explain why the system should be turned off in severe turbulence or when extreme flight attitudes are reached.			X	X	X					
(08)		Explain the safety design features built into some SASs to limit the authority of the actuators to 10–20 % of the full-control throw in order to allow the pilot to override if actuators demand an unsafe control input.			X	X	X					
(09)		Explain how cross-coupling produces an adverse effect on roll-to-yaw coupling when the helicopter is subjected to gusts.			X	X	X					
(10)		Explain the collective-to-pitch coupling, side-slip-to-pitch coupling and inter-axis coupling.			X	X	X					
022 07 04 00		**Autopilot — automatic stability equipment**										
022 07 04 01		***General principles***										
(01)		Explain the general autopilot principles with regard to: — long-term attitude hold; — fly-through; — changing the reference (beep trim, trim release).			X	X	X					
022 07 04 02		***Basic modes (3/4 axes)***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Explain the AFCS operation on cyclic axes (pitch/roll), yaw axis, and on collective (fourth axis).			X	X	X					
022 07 04 03		***Automatic guidance (upper modes of AFCS)***										
(01)		Explain the function of the attitude-hold system in an AFCS.			X	X	X					
(02)		Explain the function of the heading-hold system in an AFCS.			X	X	X					
(03)		Explain the function of the vertical-speed hold system in an AFCS.			X	X	X					
(04)		Explain the function of the navigation-coupling system in an AFCS.			X	X	X					
(05)		Explain the function of the VOR-/ILS-coupling system in an AFCS.			X	X	X					
(06)		Explain the function of the hover-mode system in an AFCS (including Doppler and radio-altimeter systems).			X	X	X					
(07)		Explain the function of the SAR mode (automatic transition to hover and back to cruise) in an AFCS.			X	X	X					
022 07 04 04		***Flight director: design and operation***										
(01)		Explain the purpose of a flight director system.			X	X	X					
(02)		Describe the different types of display: — pitch and roll crossbars; — V-bar.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		State the difference between the flight director system and the autopilot system. Explain how each can be used independently.			X	X	X					
(04)		List and describe the main components of the flight director system.			X	X	X					
(05)		Give examples of different situations with the respective indications of the command bars.			X	X	X					
(06)		Explain the architecture of the different flight directors fitted to helicopters and the importance to monitor other instruments as well as the flight director.			X	X	X					
(07)		Explain how some helicopter types have the collective setting as a flight director command; however, the command does not provide protection against a transmission overtorque.			X	X	X					
(08)		Describe the collective setting and yaw depiction on flight director for some helicopters.			X	X	X					
022 07 04 05		***Automatic flight control panel (AFCP)***										
(01)		Explain the purpose and the importance of the AFCP.			X	X	X					
(02)		State that the AFCP provides: — AFCS basic and upper modes; — flight director selection, SAS and AP engagement;			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— failure and alert messages.										
022 08 00 00		**TRIMS — YAW DAMPER — FLIGHT-ENVELOPE PROTECTION**										
022 08 01 00		**Trim systems**										
022 08 01 01		***Design and operation***										
(01)		Explain the purpose of the trim system and describe the layout with one trim system for each control axis, depending on the complexity of the aircraft.	X	X								
(02)		Give examples of trim indicators and their function, and explain the significance of a 'green band/area' for the pitch trim.	X	X								
(03)		Describe and explain an automatic pitch-trim system for a conventional aeroplane.	X	X								
(04)		Describe and explain an automatic pitch-trim system for an FBW aeroplane and that it is also operating during manual flight; however, during certain phases it may be automatically disabled to alter the handling characteristics of the aircraft.	X	X								
(05)		Describe the consequences of manual operation on the trim wheel when the automatic pitch-trim system is engaged.	X	X								
(06)		Describe and explain the engagement and disengagement conditions of the autopilot according to trim controls.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Define 'Mach trim' and state that the Mach-trim system can be independent.	X	X								
(08)		Describe the implications for the pilot in the event of a runaway trim or significant out-of-trim state.	X	X								
022 08 02 00		**Yaw damper**										
022 08 02 01		***Design and operation***										
(01)		Explain the purpose of the yaw-damper system.	X	X								
(02)		Explain the purpose of the Dutch-roll filter (filtering of the yaw input signal).	X	X								
(03)		Explain the operation of a yaw-damper system and state the difference between a yaw-damper system and a 3-axis autopilot operation on the rudder channel.	X	X								
022 08 03 00		**Flight-envelope protection (FEP)**										
022 08 03 01		***Purpose, input parameters, functions***										
(01)		Explain the purpose of the FEP.	X	X				X				
(02)		Explain typical input parameters to the FEP: AoA; — aircraft configuration; — airspeed information.	X	X				X				
(03)		Explain the following functions of the FEP: — stall protection;	X	X				X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— overspeed protection.										
(04)		Explain how the stall-protection function and the overspeed-protection function apply to both mechanical/conventional and FBW control systems, but other functions (e.g. pitch or bank limitation) can only apply to FBW control systems.	X	X				X				
022 09 00 00		**AUTOTHRUST — AUTOMATIC THRUST CONTROL SYSTEM**										
022 09 01 00		**Autothrust system**										
022 09 01 01		***Purpose, operation, overcompensation, speed control***										
(01)		Describe the purpose of the autothrust system and explain how the FMAs will be the only indication on active autothrust modes.	X									
(02)		Explain the operation of an autothrust system with regard to the following modes: — take-off/go-around (TOGA); — climb or maximum continuous thrust (MCT), N1 or EPR targeted (THR CLB, THR MCT, N1, THR HOLD, EPR); — speed (SPEED, MCP SPD); — idle thrust (THR IDLE, RETARD/ARM); — landing (RETARD, THR IDLE).	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Describe the two main variants of autothrust systems: — mode selections available on the FCU/MCP and thrust levers move with autothrust commands; — mode selections made using the thrust levers which remain static during autothrust operation.	X									
(04)		Explain how flight in turbulence/wind shear giving fluctuating airspeed indications may lead to the autothrust overcompensating in an oscillating manner and that manual thrust may be required to settle the airspeed. Airspeed indications/trend vectors may give an indication of appropriate thrust adjustments but any reaction should not be too aggressive.	X									
(05)		Explain the threats associated with the use of autothrust resulting in the pilot losing the sense of energy awareness (e.g. speed, thrust).	X									
(06)		Explain the relationship between autopilot pitch modes and autothrust modes, and how the autopilot and autothrust will interact upon selecting modes for one of the systems.	X									
(07)		Explain the principles of speed control and how speed can be controlled:	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— by varying the engine thrust; — by varying the aircraft pitch.										
(08)		Explain the potential implications on speed control when the autothrust controls speed and the autopilot pitch channel has a fixed pitch target for the following mode combinations: — MCP SPD/SPEED and ALT HOLD/ALT; — MCP SPD/SPEED and VSP (climb); — MCP SPD/SPEED and VSP (descent).	X									
(09)		Explain the potential implications on speed control when the autothrust has a fixed thrust target and the autopilot pitch channel controls speed for the following mode combinations: — N1/THR CLB and LVL CHG/OP CLB; — ARM/THR IDLE and LVL CHG/OP DES.	X									
022 10 00 00		**COMMUNICATION SYSTEMS**										
022 10 01 00		**Voice communication, data-link transmission**										
022 10 01 01		***Definitions and transmission modes***										
(01)		Describe the purpose of a data-link transmission system.	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Compare voice communication versus data-link transmission systems.	X		X	X						
(03)		Describe the communication links that are used in aircraft: — high-frequency (HF) communications; — very high-frequency (VHF) communications; — satellite communications (SATCOM).	X		X	X						
(04)		Consider the properties of the communication links with regard to: — signal quality; — range/area coverage; — range; — line-of-sight limitations; — quality of the signal received; — interference due to ionospheric conditions; — data transmission speed.	X		X	X						
(05)		Define and explain the following terms in relation to aircraft data-link communications: — message/data uplink; — message/data downlink.	X		X	X						
022 10 01 02		***Systems: architecture, design and operation***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the purpose of the ACARS network.	X									
(02)		Describe the systems using the ACARS network through the air traffic service unit (ATSU) suite: — aeronautical/airline operational control (AOC); — air traffic control (ATC).	X									
(03)		Explain the purpose of the following parts of the on-board equipment: — ATSU communications computer; — control and display unit (CDU)/multifunction control and display unit (MCDU); — data communication display unit (DCDU); — ATC message visual annunciator; — printer.	X									
(04)		Give examples of airline operations communications (AOC) data-link messages such as: — out of the gate, off the ground, on the ground, into the gate (OOOI); — load sheet;	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— passenger information (connecting flights); — weather reports (METAR, TAF); — maintenance reports (engine exceedances); — aircraft technical data; — free-text messages.										
(05)		Give examples of ATC data-link messages such as: — departure clearance; — oceanic clearance; — digital ATIS (D-ATIS); — controller-pilot data-link communications (CPDLC).	X									
022 10 02 00		**Future air navigation systems (FANSs)**										
022 10 02 01		***Versions, applications, CPDLC messages, ADS contracts***										
(01)		Describe the existence of the ICAO communication, navigation, surveillance/air traffic management (CNS/ATM) concept.	X									
(02)		Explain the two versions of FANSs: — FANS A/FANS 1 using the ACARS network;	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— FANS B/FANS 2 using the ACARS network and the aeronautical telecommunication network (ATN).										
(03)		List and explain the following FANS A/FANS 1 applications: — ATS facility notification (AFN); — automatic dependent surveillance (ADS); — CPDLC.	X									
(04)		Compare the ADS application with the secondary surveillance radar function, and the CPDLC application with VHF communication systems.	X									
(05)		State that an ATCU can use the ADS application only, or the CPDLC application only, or both of them (not including AFN).	X									
(06)		Describe the AFN process for logging on with an ATCU and typical data that will be included in the message.	X									
(07)		Describe typical types of CPDLC messages and the typical pilot work practices when requesting or accepting a CPDLC clearance.	X									
(08)		List and describe the different types of ADS contracts that are controlled by the ATCU and beyond the control of the pilot: — periodic: data sent at set time intervals;	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— on demand: data sent when requested; — on event: data sent when an event occurs (e.g. heading change, climb initiated, etc.); — emergency mode.										
(09)		Describe the purpose of the ADS emergency mode contract and highlight the difference to the ATCU controlled contracts.	X									
022 11 00 00		**FLIGHT MANAGEMENT SYSTEM (FMS)/ FLIGHT MANAGEMENT AND GUIDANCE SYSTEM (FMGS)**										
022 11 01 00		**Design**										
022 11 01 01		***Purpose, architecture, failures, functions***										
(01)		Explain the purpose of an FMS.	X		X	X		X				
(02)		Describe a typical dual FMS architecture including the following components: — flight management computer (FMC); — CDU/MCDU; — cross-talk bus.	X		X	X						
(03)		Describe the following failures of a dual FMS architecture and explain the potential implications to the pilots: — failure of one FMC;	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— failure of one CDU/MCDU; — failure of the cross-talk bus.										
(04)		Describe how the FMS integrates with other systems and gathers data in order to provide outputs depending on its level of complexity.	X		X	X		X				
(05)		Explain how the FMS may provide the following functions: — navigation; — lateral and vertical flight planning; — performance parameters.	X	X	X	X		X				
022 11 02 00		**FMC databases**										
022 11 02 01		***Navigation database***										
(01)		Explain the purpose of, and describe typical content of, the navigation database.	X		X	X		X	X	3	1, 2	
(02)		Describe the 28-day aeronautical information regulation and control (AIRAC) update cycle of the navigation database and explain the reason for having two navigation databases (one active, one standby) and the implication this has to the pilot.	X		X	X		X	X	3	1, 2	
(03)		Explain the purpose of typical user-defined waypoints such as: — latitude/longitude coordinates; — place/bearing/distance (PBD);	X		X	X		X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— place/bearing place/bearing (PBX); — place/distance (PD).										
(04)		Explain that the pilot cannot change or overwrite any of the data in the navigation database and that any user-defined waypoints, routes and inputted data will be erased when a different database is activated.	X		X	X		X	X	3	1, 2	
(05)		Explain the threats and implications to the pilot of changing the database by error either on the ground or while flying.	X		X	X		X		3	1	
022 11 02 02		***Aircraft performance database***										
(01)		Explain the purpose of, and describe the typical content of, the aircraft performance database.	X		X	X		X				
(02)		Explain the importance of verifying that the aircraft performance database is based on the correct data, such as engine type and aircraft variant.	X		X	X		X				
(03)		Explain that the contents of the aircraft performance database cannot be modified by the pilot.	X		X	X		X				
(04)		Explain the purpose of performance factor and how it influences the calculations.	X		X	X		X				
(05)		Explain the purpose of cost index (CI) and how it influences the calculations.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
022 11 03 00		**Operations, limitations**										
022 11 03 01		***Data, calculations, position inputs, raw data***										
(01)		Describe typical data that may be provided by the FMS: — lateral and vertical navigation guidance; — present position; — time predictions; — fuel predictions; — altitude/flight level predictions.	X		X	X		X				
(02)		Explain how the FMS will use a combination of inputted/database and measured data in order to calculate projections and provide output data.	X		X	X		X				
(03)		Explain the issues and threats using inputted/database data and give examples of consequences of inputting data incorrectly/using incorrect data.	X		X	X		X			2, 3	
(04)		Describe fuel consumption calculations during standard operations and explain typical data that will have an influence on the accuracy of the calculations.	X		X	X					2, 3	
(05)		Explain the implications on the accuracy of the calculations during flight in abnormal configurations (such as engine out, gear	X		X	X					2, 3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		down, flaps extended, spoilers extended, etc.) if the FMS is unable to detect the failure.										
(06)		Describe and explain the purpose of an FMS having dedicated radio-navigation receivers that it will tune automatically.	X		X	X						
(07)		Explain typical position inputs to an FMS: — GPS; — IRS; — DME; — VOR; — LOC; — runway threshold (RWY THR).	X		X	X			X	3		
(08)		Explain how the FMS will create its own FMS position fix and that the FMS calculations will be based on the FMS position. Depending on the type of system, the FMS position may be calculated from: — a single source of position data where the most accurate data available at a given time will be used; — multiple sources from which a position will be derived using the combined inputs.	X		X	X						
(09)		Explain the implications of a reduction in available position inputs to the FMS,	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		especially GPS in relation to the capability of performing RNP/PBN approaches.										
(10)		Explain the difference between following the FMS data compared to following raw data from radio-navigation receivers and describe how there may be limitations for using FMS data as primary source to follow an instrument approach procedure (IAP) such as LOC, VOR or NDB.	X		X	X		X				
022 11 04 00		**Human-machine interface (control and display unit (CDU)/ multifunction control and display unit (MCDU))**										
022 11 04 01		***Purpose, scratchpad, data input, set-up process***										
(01)		Describe the purpose of a CDU/MCDU.	X		X	X		X				
(02)		Describe the typical layout of a CDU/MCDU and the general purpose of the following: — screen; — line select keys; — menu select keys; — alphanumerical keys.	X		X	X		X				
(03)		Explain the function of the ‘scratchpad’ part of the screen.	X		X	X		X				
(04)		Describe how input of some data is compulsory for the function of the FMS and	X		X	X		X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		other data is optional, and that different symbology is used to highlight this: — rectangular boxes = compulsory information; — dashed line = optional information.										
(05)		Describe a typical FMS pre-flight set-up process through the CDU/MCDU to cover the most basic information (with the aim to create awareness of required information as this is irrespective of aircraft type and FMS/FMGS make): — ident page (who am I = aircraft type/variant, engine type/rating and appropriate navigation database); — position initialisation (where am I = position for aligning the IRS and FMS position); — route initialisation (where am I going to = place of departure/destination and alternate(s)); — route programming (how will I get there = SIDs, STARS, route (company or otherwise)); — performance initialisation (when will I arrive = weights, flap setting,	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		FLEX/assumed temperature/derate, take-off speeds).										
022 12 00 00		**ALERTING SYSTEMS, PROXIMITY SYSTEMS**										
022 12 01 00		**General**										
022 12 01 01		***Alerting systems according to CS-25 and CS-29***										
(01)		State definitions, category, criteria and characteristics of alerting systems according to CS-25/AMC 25.1322 for aeroplanes and CS-29 for helicopters as appropriate.	X	X	X	X	X					
022 12 02 00		Flight warning systems (FWSs)										
022 12 02 01		Annunciations, master warning, master caution, advisory										
(01)		State the annunciations given by the FWS and typical location for the annunciator(s): — master warning; — master caution; — advisory.	X	X	X	X	X	X				
(02)		Explain master warning: — colour of annunciator: red; — nature of aural alerts: continuous;	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— typical failure scenarios triggering the alert.										
(03)		Explain master caution: — colour of the annunciator: amber or yellow; — nature of aural alerts: attention-getter; — typical failure scenarios triggering the alert.	X	X	X	X	X	X				
(04)		Describe a typical procedure following a master warning or master caution alert: — acknowledging the failure; — silencing the aural warning; — initiating the appropriate response/procedure.	X	X	X	X	X	X				
(05)		Explain advisory: — colour of the annunciator: any other than red, amber, yellow or green; — absence of aural alert; — typical scenarios triggering the advisory.	X	X	X	X	X	X				
022 12 03 00		**Stall warning systems (SWSs)**										
022 12 03 01		***Function, types, components***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the function of an SWS and explain why the warning must be unique.	X	X								
(02)		Describe the different types of SWSs.	X	X								
(03)		List the main components of an SWS.	X	X								
(04)		Explain the difference between the stall warning speed and the actual stalling speed of the aeroplane.	X	X								
022 12 04 00		**Stall protection**										
022 12 04 01		***Function, types***										
(01)		Describe the function of a stall protection system.	X									
(02)		Describe the different types of stall protection systems including the difference between mechanical and FBW controls.	X									
(03)		Explain the difference between an SWS and a stall protection system.	X									
022 12 05 00		**Overspeed warning**										
022 12 05 01		***Purpose, aural warning, VMO/MMO pointer***										
(01)		Explain the purpose of an overspeed warning system (V_{MO}/M_{MO} pointer).	X	X								
(02)		State that for large aeroplanes, an aural warning must be associated to the overspeed warning if an electronic display is used (see AMC 25.11, paragraph 10.b(2), p. 2-GEN-22).	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Describe and give examples of VMO/MMO pointer: barber's/barber pole pointer, barber's/barber pole vertical scale.	X	X								
022 12 06 00		**Take-off warning**										
022 12 06 01		***Purpose***										
(01)		Explain the purpose of a take-off warning system and list the typical abnormal situations which generate a warning (see AMC 25.703, paragraphs 4 and 5).	X									
022 12 07 00		**Altitude alert system**										
022 12 07 01		***Function, displays, alerts***										
(01)		Describe the function of an altitude alert system.	X	X	X	X	X	X				
(02)		Describe different types of displays and possible alerts.	X	X	X	X	X	X				
022 12 08 00		**Radio altimeter**										
022 12 08 01		***Purpose, range, displays, incorrect indications***										
(01)		Explain the purpose of a low-altitude radio altimeter.	X	X	X	X	X	X				
(02)		Describe the principle of the distance (height) measurement.	X	X	X	X	X	X				
(03)		Describe the different types of radio-altimeter displays.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe how the radio altimeter provides input to other systems and how a radio-altimeter failure may impact on the functioning of these systems.	X	X	X	X	X	X				
(05)		State the range of a radio altimeter.	X	X	X	X	X	X				
(06)		Explain the potential implications of a faulty radio-altimeter and how this in particular may affect the following systems: — autothrust (flare/retard); — ground-proximity warning systems (GPWSs).	X	X				X				
022 12 09 00		**Ground-proximity warning systems (GPWSs)**										
022 12 09 01		***GPWSs: design, operation, indications***										
(01)		Explain the purpose of GPWSs.	X		X	X						
(02)		Explain inputs and outputs of a GPWS and describe its operating principle.	X		X	X						
(03)		List and describe the different modes of operation of a GPWS.	X		X	X						
022 12 09 02		***Terrain-avoidance warning system (TAWS); other name: enhanced GPWS (EGPWS)***										
(01)		Explain the purpose of a TAWS for aeroplanes and of a HTAWS for helicopters, and explain the difference from a GPWS.	X		X	X						
(02)		Explain inputs and outputs of a TAWS/HTAWS and describe its working principle.	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Give examples of terrain displays and list the different possible alerts.	X		X	X						
(04)		Give examples of time response left to the pilot according to look-ahead distance, speed and aircraft performances.	X		X	X						
(05)		Explain why the TAWS/HTAWS must be coupled to a precise-position sensor.	X		X	X						
(06)		Explain the possibility of triggering spurious TAWS/HTAWS warnings as a result of mismanaging the flight path in the proximity to obstacles: — high rate of descent; — high airspeed; — a combination of high rate of descent and high airspeed.	X		X	X						
022 12 09 03		***Intentionally left blank***										
022 12 10 00		**ACAS/TCAS**										
022 12 10 01		***Principles and operations***										
(01)		State that ACAS II is an ICAO standard for anti-collision purposes.	X	X	X	X	X	X				
(02)		Explain that ACAS II is an anti-collision system and does not guarantee any specific separation.	X	X	X	X	X	X				
(03)		Describe the purpose of an ACAS II system as an anti-collision system.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe the following outputs from a TCAS: — other intruders; — proximate intruders; — traffic advisory (TA); — resolution advisory (RA).	X	X	X	X	X	X				
(05)		State that ACAS II will issue commands in the vertical plane only (climb, descent or maintain), and that the commands are complied with as a manual manoeuvre.	X	X	X	X	X	X				
(06)		Explain that an RA may or may not require any active control input and the implications of reacting instinctively without awareness of actual control inputs required to comply with the RA.	X	X	X	X	X	X				
(07)		Explain that if two aircraft are fitted with ACAS II, the RA will be coordinated.	X	X	X	X	X	X				
(08)		State that ACAS II equipment can take into account several threats simultaneously.	X	X	X	X	X	X				
(09)		State that a detected aircraft without altitude-reporting can only generate a TA; describe typical type of traffic and how this can create distractions during flight in certain areas of significant air traffic activity.	X	X	X	X	X	X				
(10)		Describe the interaction between the TCAS II system and the transponder, radio altimeter and the air-data computer:	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— antenna used; — computer and links with radio altimeter, air-data computer and mode-S transponder.										
(11)		Explain the principle of TCAS II interrogations.	X	X	X	X	X	X				
(12)		State the typical standard detection range for TCAS II: — 35–40 NM horizontally; — approximately 2 000 ft above and below (any setting); — extension to approximately 10 000 ft above (ABV selected) or approximately 10 000 ft below (BLW selected).	X	X	X	X	X	X				
(13)		Explain the principle of ‘reduced surveillance’.	X	X	X	X	X	X				
(14)		Explain that in high-density traffic areas the range may automatically be decreased in order to enable detection of the threats in the proximity of the aircraft due to a limitation of the maximum number of possible intruders the system is able to process.	X	X	X	X	X	X				
(15)		Identify the equipment which an intruder must be fitted with in order to be detected by TCAS II.	X	X	X	X	X	X				
(16)		Explain in the anti-collision process:	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— the criteria used to trigger an alarm (TA or RA) are the time to reach the closest point of approach (CPA) (called TAU) and the difference of altitude; — an intruder will be classified as ‘proximate’ when being less than 6 NM and 1 200 ft from the TCAS-equipped aircraft; — the time limit to CPA is different depending on aircraft altitude, is linked to a sensitivity level (SL), and state that the value to trigger an RA is from 15 to 35 seconds; — in case of an RA, the intended vertical separation varies from 300 to 600 ft (700 ft above FL420), depending on the SL; — below 1 000 ft above ground, no RA can be generated; — below 1 450 ft (radio-altimeter value) ‘increase descent’ RA is inhibited; — at high altitude, performances of the type of aircraft are taken into account to inhibit ‘climb’ and ‘increase climb’ RA.										
(17)		List and interpret the following information available from TCAS:	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— the different possible statuses of a detected aircraft: ‘other’, ‘proximate’, ‘intruder’; — the appropriate graphic symbols and their position on the horizontal display; — different aural warnings.										
(18)		Explain the indications of a TA and an RA and how an RA will generate a red area on the VSI. Some variants will also include a green area. To manoeuvre the aircraft to comply with the RA, the pilot should ‘avoid the red’ or ‘fly the green’.	X	X	X	X	X	X				
(19)		Explain that the pilot must not interpret the horizontal track of an intruder upon the display.	X	X	X	X	X	X				
022 12 11 00		**Rotor/engine overspeed alert system**										
022 12 11 01		***Design, operation, displays, alarms***										
(01)		Describe the basic design principles, operation, displays and warning/alarm systems fitted to different helicopters.			X	X	X					
022 13 00 00		**INTEGRATED INSTRUMENTS — ELECTRONIC DISPLAYS**										
022 13 01 00		**Electronic display units**										
022 13 01 01		***Design, limitations***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		List the different technologies used, e.g. CRT and LCD, and the associated limitations: — cockpit temperature; — glare; — resolution.	X	X	X	X	X	X	X	1		
022 13 02 00		**Mechanical integrated instruments**										
022 13 02 01		***Attitude and director indicator (ADI)/ horizontal situation indicator (HSI)***										
(01)		Describe an ADI and an HSI.	X	X	X	X	X	X	X	1		
(02)		List all the information that can be displayed on either instrument.	X	X	X	X	X	X	X	1		
022 13 03 00		**Electronic flight instrument systems (EFISs)**										
022 13 03 01		***Design, operation***										
(01)		List the following parts of an EFIS: — control panel; — display units; — symbol generator; — remote light sensor.	X	X	X	X	X	X		1		
(02)		Describe the typical layout of the EFIS display units and how there may be a facility to transfer the information from one display unit on to another if a display unit fails.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Explain the need for standby instruments to supplement the EFIS in the event of all the display units failing and the challenge of using these standby instruments, namely their size and position on the flight deck.	X	X	X	X	X	X		1		
(04)		Explain the difference between a symbol generator failing and a display unit failing, and the implications if there are redundant symbol generators available.	X	X	X	X	X	X		1		
(05)		Describe the purpose of an EFIS control panel and typical selections that may be available: — altimeter pressure setting; — navigation display (ND) mode selector; — ND range selector; — ND data selector (waypoints, facilities, constraints, data, etc.); — radio-navigation aids selector (VOR 1/2 or ADF 1/2); — decision altitude (DA)/decision height (DH) selection.	X	X	X	X	X	X		1		
022 13 03 02		***Primary flight display (PFD), electronic attitude director indicator (EADI)***										
(01)		Describe that a PFD (or an EADI) presents a dynamic colour display of all the parameters necessary to control the aircraft, and that the	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		main layout conforms with the 'basic T' principle: — attitude information in the centre; — airspeed information on the left; — altitude information on the right; — heading/track indication lower centre; — flight mode annunciation; — basic T; — take-off and landing reference speeds; — minimum airspeed; — lower selectable airspeed; — Mach number.										
(02)		Describe the typical design of the attitude information: — artificial horizon with aircraft symbol; — superimposed flight director command bars.	X	X	X	X	X	X	X	1		
(03)		Describe the typical design of the speed tape: — rolling speed scale with numerical read-out of current speed; — limiting airspeeds according to configuration;	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— speed trend vector; — bug/indication for selected airspeed.										
(04)		Explain the Mach number indications and how a selected Mach number is presented with the speed bug on a corresponding IAS on the speed tape with the Mach number shown as a numerical indication outside the speed tape.	X									
(05)		Describe the typical design of the altitude information: — rolling altitude scale with numerical read-out of current altitude; — altimeter pressure setting; — bug/indication for selected altitude; — means of highlighting the altitude if certain criteria are met.	X	X	X	X	X	X	X	1		
(06)		Describe the typical design of the heading/track information: — rolling compass scale/rose with numerical read-out of current heading/track; — bug/indication for selected heading/track.	X	X	X	X	X	X	X	1		
(07)		Describe the typical design and location of the following information:	X	X	X	X	X	X	X	1	3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— flight mode annunciators (FMAs); — vertical speed indicator including TCAS RA command indications; — radio altitude; — ILS localiser/glideslope and RNP/PBN, GBAS or SBAS horizontal/vertical flight path deviation indicator; — decision altitude/height (DA/H).										
022 13 03 03		***Navigation display (ND), electronic horizontal situation indicator (EHSI)***										
(01)		Describe that an ND (or an EHSI) provides a mode-selectable colour flight ND.	X	X	X	X	X	X	X	1		
(02)		List the following four modes typically available to be displayed on an ND unit: — MAP (or ARC); — VOR (or ROSE VOR); — APP (or ROSE LS); — PLAN.	X	X	X	X	X	X		1		
(03)		List and explain the following information that can be displayed with the MAP (or ARC) mode selected on an ND unit: — aircraft symbol, compass scale and range markers;	X	X	X	X	X	X		1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— current heading and track (either one may be 'up' depending on selection), true or magnetic; — selected heading and track; — TAS/GS; — wind direction and speed (W/V); — raw data radio magnetic indicator (RMI) needles/pointers for VOR/automatic direction-finding equipment (ADF), if selected, including the frequency or ident of the selected navigation facility; — route/flight plan data from the FMS; — TO/next waypoint data from the FMS; — data from the navigation database such as airports, waypoints or navigation facilities as selected; — weather radar information; — TCAS traffic information (no TCAS commands); — TAWS (EGPWS) terrain information; — failure flags and messages.										
(04)		List and explain the following information that can be displayed with the VOR or APP (or	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		ROSE VOR or ROSE LS) mode selected on an ND unit: — aircraft symbol and compass scale; — current heading and track (either one may be 'up' depending on selection), true or magnetic; — selected heading and track; — TAS/ground speed (GS); — wind direction and speed (W/V); — VOR or ILS frequency and identification of the selected navigation aid; — VOR selected course, deviation indicator and a TO/FROM indicator in a HSI-type display format when in VOR mode; — localiser selected course, deviation indicator and glideslope indicator in a HSI-type display format when in APP mode. — weather radar information; — TCAS traffic information (no TCAS commands); — TAWS (EGPWS) terrain information; — failure flags and messages.										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(05)		List and explain the following information that can be displayed with the PLAN mode selected on an ND unit: — north-up compass rose and range markers; — aircraft symbol oriented according to aircraft heading; — TAS/GS; — wind direction and speed (W/V); — route/flight plan data from the FMS; — TO/next waypoint data from the FMS; — data from the navigation database such as airports, waypoints or navigation facilities as selected; — failure flags and messages.	X	X	X	X	X	X				
(06)		Explain the purpose of PLAN mode and its characteristics such as: — no compass information; — north is up on the display unit at all times; — the centre waypoint is the selected waypoint on the FMS CDU;	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— scrolling through the flight plan on the FMS CDU will shift the map view along the flight path; — the aircraft symbol will be positioned in the appropriate place along the flight path; — using PLAN mode as the primary mode during flight may lead to disorientation and loss of situational awareness.										
(07)		Distinguish the difference between the appearance of an EXPANDED or FULL/ROSE mode and how the displayed range differs between them.	X	X	X	X	X	X				
(08)		Explain the combination of mode and range selection including how selecting the appropriate range and displayed data can improve situational awareness for a given phase of flight.	X	X	X	X	X	X				
022 13 04 00		**Engine parameters, crew warnings, aircraft systems, procedure and mission display systems**										
022 13 04 01		***Purposes of systems, display systems, checklists***										
(01)		State the purpose of the following systems: — engine instruments centralised display unit;	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— crew alerting system/aircraft display unit; — facility for appropriate on-screen checklists; — that the aircraft systems display unit enables the display of normal and degraded modes of operation of the aircraft systems; — that the systems/aircraft display unit is able to show pictorial systems diagrams/schematics and associated parameters.										
(02)		Describe the similarities to EFIS with regard to basic system architecture.	X		X	X						
(03)		Give the following different names by which engine parameters, crew warnings, aircraft systems and procedures display systems are known: — multifunction display unit (MFDU); — engine indication and crew alerting systems (EICASs); — engine and warning display (EWD); — electronic centralised aircraft monitor (ECAM);	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— systems display (S/D).										
(04)		Give the names of the following different display systems and describe their main functions: — vehicle engine monitoring display (VEMD); — integrated instruments display system (IIDS).			X	X						
(05)		State the purpose of a mission display unit.			X	X						
(06)		Describe the architecture of each system and give examples of display.			X	X						
(07)		Explain why awareness of the consequences of the actions commanded by the automatic checklist is required.	X		X	X						
(08)		Explain the limited ability of the computer to assess a situation other than using the exceedance of certain thresholds to trigger the main and subsequent events and programmed actions.	X		X	X						
(09)		Describe an appropriate procedure for following an on-screen checklist associated with a failure scenario including the following: — confirm the failure with the other flight crew member prior to performing any of the actions;	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— seek confirmation prior to manipulating any guarded switches or thrust levers; — follow the checklist slowly and methodically; — assess the possible implications of making certain selections, such as opening the fuel cross-feed if there is a fuel leak even though the electronic checklist may ask for the action.										
022 13 05 00		**Engine first limit indicator**										
022 13 05 01		***Design, operation, information on display***										
(01)		Describe the principles of design and operation, and compare the different indications and displays available.			X	X	X					
(02)		Describe what information can be displayed on the screen, when the screen is in the limited composite mode.			X	X	X					
022 13 06 00		**Electronic flight bag (EFB)**										
022 13 06 01		***Purpose, certification, malfunctions***										
(01)		Explain the purpose of the EFB and list typical equipment: — computer laptop; — tablet device;	X	X	X	X	X	X		1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— integrated avionics suite in the aircraft.										
(02)		Describe the 'class' hardware certification: — portable: portable electronic device (PED) that can be used inside or outside the aircraft, is not part of the certified aircraft configuration and does not require tools to remove it from the flight-deck cradle, if one exists; — installed: an electronic device that is considered an aircraft part covered by the aircraft airworthiness approval, thus is a minimum equipment list (MEL) item in the event of failure.	X		X	X						
(03)		Describe the 'type' software certification: — type A: applications whose misuse or malfunctions have no adverse effect on flight safety; — type B: applications for which evaluation of the hazards presented by misuse or malfunctions is required.	X		X	X						
(04)		Explain implications of malfunctions with the EFB installation in a fully electronic flight-deck environment: — mass and balance calculations; — performance calculations;	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— access to charts; — access to manuals.										
022 13 07 00		**Head-up display (HUD), synthetic vision system (SVS) and enhanced visual system (EVS)**										
022 13 07 01		***Components, benefits, modes of operation***										
		State the components of a typical HUD installation: — HUD projector and stowable combiner; — HUD controls such as declutter and dimmer; — HUD computer.	X		X	X						
		Explain the reasons and benefits of having an HUD: — increased situational awareness due to reduced need to look inside to view primary flight information; — lower minima for both departure and landing; — improved accuracy of flying thus reduced susceptibility to enter a state of aircraft upset.	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		Describe how the HUD replicates the information on the primary flight display (PFD) by showing the following data: — altitude; — speed, including speed trend; — heading; — flight path vector (track and vertical flight path); — flight mode annunciator (FMA); — CAS, TAWS and wind shear command annunciations.	X		X	X						
		Describe the following modes of operation of an HUD: — normal display mode that may automatically adapt the information based on the phase of flight; — declutter function.	X		X	X						
		Describe the principle of SVS: — an enhanced database used as reference to provide terrain and ground features to be shown on the PFD; — limitations due to being a synthetic image not based on actual sensory	X		X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		information thus not lowering landing minima; — implications if aircraft position accuracy becomes reduced.										
		Describe the principle of EVS: — includes external sensors such as infrared cameras to generate a real-time image on the PFD or on the HUD; — limitation of the fact that an infrared camera uses temperature and temperature difference in order to produce an image; — enables lower minima because of the real-time image, thus enhancing the visibility as experienced by the pilot.	X		X	X						
022 14 00 00		**MAINTENANCE, MONITORING AND RECORDING SYSTEMS**										
022 14 01 00		**Cockpit voice recorder (CVR)**										
022 14 01 01		***Purpose, components, parameters***										
(01)		Describe the purpose of a CVR, its typical location, and explain the implications of knowingly erasing or tampering with any information or equipment.	X	X	X	X	X					
(02)		List the main components of a CVR:	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— a shock-resistant tape recorder or digital storage associated with an underwater locating beacon (ULB); — a cockpit area microphone (CAM); — a control unit with the following controls: auto/on, test and erase, and a headset jack; — limited flight-deck controls such as erase and test switches.										
(023		List the following main parameters recorded on the CVR: — voice communications transmitted from or received on the flight deck; — the aural environment of the flight deck; — voice communication of flight crew members using the aeroplane's interphone system; — voice or audio signals introduced into a headset or speaker; — voice communication of flight crew members using the public address system, if installed.	X	X	X	X	X					
022 14 02 00		**Flight data recorder (FDR)**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
022 14 02 01		***Purpose, components, parameters***										
(02)		Describe the purpose of an FDR and its typical location.	X	X								
(02)		List the main components of an FDR: — a shock-resistant data recorder associated with a ULB; — a data interface and acquisition unit; — a recording system (digital flight data recorder); — two control units (start sequence, event mark setting); — limited flight-deck controls, but includes an event switch.	X	X								
(02)		List the following main parameters recorded on the FDR: — time or relative time count; — attitude (pitch and roll); — airspeed; — pressure altitude; — heading; — normal acceleration;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— propulsive/thrust power on each engine and flight-deck thrust/power lever position, if applicable; — flaps/slats configuration or flight-deck selection; — ground spoilers or speed brake selection.										
(02)		State that additional parameters can be recorded according to FDR capacity and applicable operational requirements.	X									
022 14 03 00		**Maintenance and monitoring systems**										
022 14 03 01		***Helicopter operations monitoring program (HOMP): design, operation, performance***										
(01)		Describe the HOMP as a helicopter version of the aeroplane flight data monitoring (FDM) program.			X	X						
(02)		State that the HOMP software consists of three integrated modules: — flight data events (FDEs); — flight data measurements (FDMs); — flight data traces (FDTs).			X	X						
(03)		Describe and explain the information flow of an HOMP.			X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Describe HOMP operation and management processes.			X	X						
022 14 03 02		***Integrated health and usage monitoring system (IHUMS): design, operation, performance***										
(01)		Describe the main features of an IHUMS: — rotor system health; — cockpit voice recorder (CVR)/flight data recorder (FDR); — gearbox system health; — engine health; — exceedance monitoring; — usage monitoring; — transparent operation; — ground station features; — monitoring; — rotor track and balance; — engine performance trending; — quality controlled to level 2.			X	X						
(02)		Describe the ground station features of an IHUMS.			X	X						
(03)		Summarise the benefits of an IHUMS including:			X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— reduced risk of catastrophic failure of rotor or gearbox; — improved rotor track and balance giving lower vibration levels; — accurate recording of flight exceedances; — CVR/FDR allows accurate accident/incident investigation and HOMP; — maintenance cost savings.										
(04)		State the benefits of an IHUMS and an HOMP.			X	X						
022 14 03 03		***Aeroplane condition monitoring system (ACMS): general, design, operation***										
(01)		State the purpose of an ACMS.	X									
(02)		Describe the structure of an ACMS including: — inputs: aircraft systems (such as air conditioning, autoflight, flight controls, fuel, landing gear, navigation, pneumatic, APU, engine), MCDU; — data management unit; — recording unit: digital recorder; — outputs: printer, ACARS or ATSU.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		State that maintenance messages sent by an ACMS can be transmitted without crew notification.	X									
(05)		Explain that data from the ACMS can be used as part of an FDM and safety programme.	X									
(05)		Explain that the FDM program collects data anonymously; however, grave exceedance of parameters may warrant a further investigation of the event by the operator.	X									
(06)		Explain the purpose of FDM as a system for identifying adverse safety trends and tailoring training programmes in order to enhance the overall safety of the operation.	X									
022 15 00 00		**DIGITAL CIRCUITS AND COMPUTERS**										
022 15 01 00		**Digital circuits and computers**										
022 15 01 01		***General, definitions and design***										
(01)		Define a ‘computer’ as a machine for manipulating data according to a list of instructions.	X		X	X		X	X		1	
(02)		Explain the term ‘bus’ being used as a term for a facility (wiring, optical fibre, etc.) transferring data between different parts of a computer, both internally and externally.	X		X	X		X	X		1	
(03)		Define the terms ‘hardware’ and ‘software’.	X		X	X		X	X		1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)	X	With the help of the relevant 022 references, give examples of airborne computers and list the possible peripheral equipment for each system, such as: — ADC with pitot probe(s), static port(s) and indicators; — FMS with GPS, CDU/MCDU and ND; — GPWS with radio altimeter, ADC and ND.	X		X	X		X	X		1	

SUBJECT 031 – FLIGHT PERFORMANCE AND PLANNING: MASS AND BALANCE – AEROPLANES/HELICOPTERS

Note that the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

(1) DEFINITIONS OF MASSES, LOADS AND INDEXES

Allowed take-off mass

The mass taking into consideration all possible limitations for take-off including restrictions caused by regulated take-off mass and regulated landing mass.

Area load or floor load

The load (or mass) distributed over a defined area. Example units:

— SI: N/m^2, kg/m^2;

— Non-SI: psi, lb/ft^2.

Basic empty mass (BEM)

The mass of an aircraft plus standard items such as: unusable fuel; full operating fluids; fire extinguishers; emergency oxygen equipment. (The lowest mass that is used in FCL exams.)

Dry operating mass (DOM)

The total mass of an aircraft ready for a specific type of operation excluding all usable fuel and traffic load. This mass includes items such as:

— crew and crew baggage;

— catering and removable passenger service equipment (food, beverages, potable water, lavatory chemicals, etc.);

— special operational equipment (e.g. stretchers, rescue hoist, cargo sling).

Dry operating index (DOI)

The aircraft index at dry operating mass.

Index

An index is a moment reduced in a numerical value by an index formula.

In-flight mass/gross mass

The mass of an aircraft in flight at a specified time.

Landing mass

The mass of an aircraft at landing.

Maximum structural in-flight mass with external loads (applicable to helicopters only)

The maximum permissible total mass of the helicopter with external loads.

Maximum structural landing mass

The maximum permissible total mass of an aircraft at landing under normal circumstances.

Maximum structural mass

The maximum permissible total mass of an aircraft at any time. It will be given only if there is no difference between maximum structural taxi mass, maximum structural take-off mass and maximum structural landing mass.

Maximum structural take-off mass

The maximum permissible total mass of an aircraft at commencement of take-off.

Maximum (structural) taxi mass or maximum (structural) ramp mass

The maximum permissible total mass of an aircraft at commencement of taxiing.

Maximum zero fuel mass

The maximum permissible mass of an aircraft with no usable fuel.

Minimum mass (applicable to helicopters only)

The minimum permissible total mass for specific helicopter operations.

Operating mass

The dry operating mass plus take-off fuel.

Payload

The total mass of passengers, baggage and cargo but excluding any non-revenue load.

Performance-limited landing mass

The mass subject to the destination airfield limitations.

Performance-limited take-off mass

The take-off mass subject to departure airfield limitations.

Ramp mass

See ‘taxi mass’.

Regulated landing mass

The lower of performance-limited landing mass and maximum structural landing mass.

Regulated take-off mass

The lower of performance-limited take-off mass and maximum structural take-off mass.

Running (or linear) load

The load (or mass) distributed over a defined length of a cargo compartment irrespective of load width. Example units:

— SI: N/m, kg/m;

— Non-SI: lb/in, lb/ft.

Take-off fuel

The total amount of usable fuel at take-off.

Take-off mass

The mass of an aircraft including everything and everyone carried at the commencement of the take-off for helicopters and take-off run for aeroplanes.

Taxi mass or ramp mass

The mass of an aircraft at the commencement of taxiing.

Traffic load

The total mass of passengers, baggage and cargo, including any non-revenue load.

Zero fuel mass

The dry operating mass plus traffic load.

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
030 00 00 00		**FLIGHT PERFORMANCE AND PLANNING**										
031 00 00 00		**MASS AND BALANCE — AEROPLANES/HELICOPTERS**										
031 01 00 00		**PURPOSE OF MASS-AND-BALANCE CONSIDERATIONS**										
031 01 01 00		**Mass limitations**										
031 01 01 01		**Importance with regard to structural limitations**										
(01)	X	Describe the relationship between aircraft mass and structural stress. *Remark: See also Subject 021 01 01 00.*	X	X	X	X	X					
(02)	X	Describe why mass must be limited to ensure adequate margins of strength.	X	X	X	X	X					
031 01 01 02		***Importance with regard to performance*** *Remark: See also Subjects 032/034 and 081/082.*										
(01)		Describe the relationship between aircraft mass and aircraft performance.	X	X	X	X	X					
(02)	X	Describe why aircraft mass must be limited to ensure adequate aircraft performance.	X	X	X	X	X					
031 01 02 00		**Centre-of-gravity (CG) limitations**										
031 01 02 01		***Importance with regard to stability and controllability***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		Remark: See also Subjects 081/082.										
(01)	X	Describe the relationship between CG position and stability/controllability of the aircraft.	X	X	X	X	X					
(02)		Describe the consequences if CG is in front of the forward limit.	X	X	X	X	X					
(03)		Describe the consequences if CG is behind the aft limit.	X	X	X	X	X					
031 01 02 02		***Importance with regard to performance*** *Remark: See also Subjects 032/034 and 081/082.*										
(01)	X	Describe the relationship between CG position and aircraft performance.	X	X	X	X	X					
(02)		Describe the effects of CG position on performance parameters (speeds, altitude, endurance and range).	X	X	X	X	X					
031 02 00 00		**LOADING**										
031 02 01 00		**Terminology**										
031 02 01 01		***Mass terms***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Define the following mass terms: — basic empty mass; — dry operating mass; — operating mass; — take-off mass; — landing mass; — ramp/taxi mass; — in-flight mass (gross mass); — zero fuel mass.	X	X	X	X	X					
031 02 01 02		***Load terms (including fuel terms)*** *Remark: See also Subject 033.*										
(01)	X	Define the following load terms: — payload/traffic load; — block fuel; — taxi fuel; — take-off fuel; — trip fuel; — reserve fuel (contingency, alternate, final reserve and additional fuel); — extra fuel.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the relationship between the various load-and-mass components listed in 031 02 01 01 and 031 02 01 02.	X	X	X	X	X					
(03)		Calculate the mass of particular components from other given components.	X	X	X	X	X					
(04)		Convert fuel mass, fuel volume and fuel density given in different units used in aviation.	X	X	X	X	X					
031 02 02 00		**Mass limits**										
031 02 02 01		***Structural limitations***										
(01)	X	Define the maximum zero fuel mass.	X	X								
(02)	X	Define the maximum ramp/taxi mass.	X									
(03)	X	Define the maximum take-off mass.	X	X	X	X	X					
(04)	X	Define the maximum in-flight (gross) mass with external load.			X	X	X					
(05)	X	Define the maximum landing mass.	X	X	X	X	X					
031 02 02 02		***Performance and regulated limitations***										
(01)		Describe the following performance and regulated mass limitations: — performance-limited take-off mass; — performance-limited landing mass; — regulated take-off mass;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— regulated landing mass.										
031 02 02 03		***Cargo compartment limitations***										
(01)	X	Describe the maximum floor load (maximum load per unit of area).	X	X	X	X	X					
(02)	X	Describe the maximum running load (maximum load per unit of fuselage length).	X	X	X	X	X					
031 02 03 00		**Mass calculations**										
031 02 03 01		***Maximum masses for take-off and landing***										
(01)		Calculate the maximum mass for take-off (regulated take-off mass) given mass-and-load components and structural/ performance limits.	X	X	X	X	X					
(02)		Calculate the maximum mass for landing (regulated landing mass) given mass-and-load components and structural/ performance limits.	X	X	X	X	X					
(03)		Calculate the allowed mass for take-off.	X	X	X	X	X					
031 02 03 02		***Allowed traffic load and fuel load***										
(01)		Calculate the maximum allowed traffic load and fuel load in order not to exceed the given allowed take-off mass.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Calculate 'under load'/'over load' given the allowed mass for take-off, operating mass and actual traffic load.	X	X	X	X	X					
031 02 03 03		***Use of standard masses for passengers, baggage and crew***										
(01)	X	Extract the appropriate standard masses for passengers, baggage and crew from relevant documents or operator requirements.	X	X	X	X	X					
(02)		Calculate the traffic load by using standard masses.	X	X	X	X	X					
031 03 00 00		**INTENTIONALLY LEFT BLANK**										
031 04 00 00		**MASS-AND-BALANCE DETAILS OF AIRCRAFT**										
031 04 01 00		**Contents of mass-and-balance documentation**										
031 04 01 01		***Datum, moment arm***										
(01)	X	State where the datum and moment arms for aircraft can be found.	X	X	X	X	X					
(02)	X	Extract the appropriate data from given documents.	X	X	X	X	X					
(03)	X	Define 'datum' (reference point), 'moment arm' and 'moment'.	X	X	X	X	X					
031 04 01 02		***CG position as distance from datum***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	State where the CG position for an aircraft at basic empty mass can be found.	X	X	X	X	X					
(02)	X	State where the CG limits for an aircraft can be found.	X	X	X	X	X					
(03)		Describe the different forms in presenting CG position as distance from datum or other references.	X	X	X	X	X					
(04)		Explain the meaning of centre of gravity (CG).	X	X	X	X	X					
031 04 01 03		***CG position as percentage of mean aerodynamic chord (% MAC)*** *Remark: Knowledge of the definition of MAC is covered under Subject 081 01 01 05.*										
(01)		Extract MAC information from aircraft documents.	X	X								
(02)		Explain the principle of using % MAC for the description of the CG position.	X	X								
(03)		Calculate the CG position as % MAC.	X	X								
031 04 01 04		***Longitudinal CG limits***										
(01)		Extract the appropriate data from given sample documents.	X	X	X	X	X					
031 04 01 05		***Lateral CG limits***										
(01)		Extract the appropriate data from given sample documents.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
031 04 01 06		***Details of passenger and cargo compartments***										
(01)		Extract the appropriate data (e.g. seating schemes, compartment dimensions and limitations) from given sample documents.	X	X	X	X	X					
031 04 01 07		***Details of fuel system relevant to mass-and-balance considerations***										
(01)	X	Extract the appropriate data (e.g. fuel-tank capacities and fuel-tank positions) from given sample documents.	X	X	X	X	X					
(02)		Explain aircraft CG movement as flight progresses given location of fuel tank (inner wing, outer wing, central, additional aft central, horizontal stabiliser) and mass of fuel consumed from that tank and aeroplane's previous CG.	X									
(03)		Explain advantages and risks associated with fuel tanks in the aeroplane's fin or horizontal stabiliser.	X									
031 04 02 00		**Determination of aircraft empty mass and CG position by weighing**										
031 04 02 01		***Weighing of aircraft (general aspects)***										
(01)		Describe the general procedure and regulations relating to when an aircraft	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		should be weighed, reweighed or data recalculated. *Remark: See the applicable operational requirements.*										
(02)	X	Extract and interpret entries from/in 'mass (weight) report' of an aircraft.	X	X	X	X	X					
031 04 02 02		***Calculation of mass and CG position of an aircraft using weighing data***										
(01)		Calculate the mass and CG position of an aircraft from given reaction forces on jacking points.	X	X	X	X	X					
031 04 03 00		**Extraction of basic empty mass (BEM) and CG data from aircraft documentation**										
031 04 03 01		***BEM or dry operating mass (DOM)***										
(01)	X	Extract values for BEM or DOM from given documents.	X	X	X	X	X					
031 04 03 02		***CG position or moment at BEM/DOM***										
(01)		Extract values for CG position and moment at BEM or DOM from given documents.	X	X	X	X	X					
031 04 03 03		***Deviations from standard configuration***										
(01)		Extract values from given documents for deviation from standard configuration as a	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		result of varying crew, optional equipment, optional fuel tanks, etc.										
031 05 00 00		**DETERMINATION OF CG POSITION**										
031 05 01 00		**Methods**										
031 05 01 01		***Arithmetic method***										
(01)		Calculate the CG position of an aircraft by using the formula: — CG position = sum of moments / total mass.	X	X	X	X	X					
031 05 01 02		***Graphic method***										
(01)		Determine the CG position of an aircraft by using the loading graphs given in sample documents.	X	X	X	X	X					
031 05 01 03		***Index method***										
(01)	X	Explain the principle of the index method.	X	X	X	X	X					
(02)		Define the terms ‘index’ and ‘dry operating index’ (DOI), and calculate the DOI given the relevant formula and data.	X	X	X	X	X					
(03)		Explain the advantage(s) of the index method.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
031 05 02 00		**Load and trim sheet**										
031 05 02 01		***General considerations***										
(01)	X	Explain the principle and the purpose of load sheets.	X	X								
(02)	X	Explain the principle and the purpose of trim sheets.	X									
031 05 02 02		***Load sheet/balance schedule and CG envelope for light aeroplanes and for helicopters***										
(01)		Add loading data and calculate masses in a sample load sheet/balance schedule.	X	X	X	X	X					
(02)		Calculate moments and CG positions.	X	X	X	X	X					
(03)		Check CG position at zero fuel mass and take-off mass to be within the CG envelope including last-minute changes, if applicable.	X	X	X	X	X					
031 05 02 03		***Load sheet for large aeroplanes***										
(01)		Complete a sample load sheet to determine the ‘allowed mass for take-off’, ‘allowed traffic load’ and ‘under load’.	X									
(02)		Explain the purpose of each load sheet section.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain that the purpose of boxed maximum figures in load sheet sections is to cross-check the actual and limiting mass values.	X									
(04)		Complete and cross-check a sample load sheet.	X									
031 05 02 04		***Trim sheet for large aeroplanes***										
(01)		Explain the purpose of the trim sheet and the methods to determine the CG position.	X									
(02)		Check if the zero fuel mass CG or index is within the limits.	X									
(03)		Determine the fuel index by using the ‘fuel index correction table’ and determine the CG position as % MAC.	X									
(04)		Check that the take-off mass CG or index are within the limits.	X									
(05)		Determine ‘stabiliser trim units’ for take-off.	X									
(06)		Explain the difference between certified and operational CG limits.	X									
(07)		Determine the zero fuel mass CG or index.	X									
(08)		Explain the relationship between pitch control and CG position and the operational significance.	X									
031 05 02 05		***Intentionally left blank***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
031 05 02 06		***Other methods to present load and trim information***										
(01)	X	Describe information from other methods of presenting load and balance information, e.g. aircraft communications addressing and reporting system (ACARS), electronic flight bags (EFBs), and the 'less paper in the cockpit' (LPC) software.	X									
031 05 03 00		**Repositioning of CG**										
031 05 03 01		***Repositioning of CG by shifting the load***										
(01)		Calculate the mass to be moved over a given distance, or to/from given compartments, to establish a defined CG position.	X	X	X	X	X					
(02)		Calculate the distance to move a given mass to establish a defined CG position.	X	X	X	X	X					
(03)	X	Describe the methods to check that cargo has been loaded in correct position in relation to the loading manifest, including identifying hazard of cargo loaded in reverse order (visual inspection of one or more unit load devices (ULDs).	X	X								
(04)		Determine whether CG remains within limits if cargo has been loaded in incorrect order or at incorrect location.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
031 05 03 02		***Repositioning of CG by additional load or ballast or by load or ballast removal***										
(01)		Calculate the amount of additional load or ballast to be loaded at or removed from a given position or compartment to establish a defined CG position.	X	X	X	X	X					
(02)		Calculate the loading position or compartment for a given amount of additional load or ballast to establish a defined CG position.	X	X	X	X	X					
031 06 00 00		**CARGO HANDLING**										
031 06 01 00		**Types of cargo**										
031 06 01 01		***Types of cargo (general aspects)***										
(01)		Describe the typical types of cargo, e.g. containerised cargo, palletised cargo, bulk cargo, and the advantages of containerised and palletised cargo.	X	X	X	X	X					
031 06 02 00		**Floor-area load and running-load limitations**										
031 06 02 01		***Floor-area load and running-load limitations in cargo compartments***										
(01)		Calculate the required floor-contact area for a given load to avoid exceeding the	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		maximum permissible floor load of a cargo compartment.										
(02)		Calculate the maximum mass of a container with given floor-contact area to avoid exceeding the maximum permissible floor load of a cargo compartment.	X	X	X	X	X					
(03)		Calculate the linear load distribution of a container to avoid exceeding the maximum permissible running load.	X	X	X	X	X					
031 06 03 00		**Securement of load**										
031 06 03 01		***Securement of load (reasons and methods)***										
(01)		Explain the reasons to restrain or secure cargo and baggage.	X	X	X	X	X					
(02)		Describe the basic methods to restrain or secure loads (unit load devices secured by latches on roller tracks or to tie down points by straps; bulk cargo restrained by restraining nets attached to attachment points and tie-down points).	X	X	X	X	X					

SUBJECT 032 – FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES

Note that the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

For theoretical knowledge examination purposes:

'climb angle' is assumed to be air-mass-related;

'flight-path angle' is assumed to be ground-related;

'screen height for take-off' is the vertical distance between the take-off surface and the take-off flight path at the end of the take-off distance;

'screen height for landing' is the vertical distance between the landing surface and the landing flight path from which the landing distance begins.

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
030 00 00 00		**FLIGHT PERFORMANCE AND PLANNING**										
032 00 00 00		**PERFORMANCE — AEROPLANES**										
032 01 00 00		**GENERAL**										
032 01 01 00		**Performance legislation**										
032 01 01 01		***Applicability of airworthiness requirements of CS-23 and CS-25***										

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Describe the application of certification specification (CSs) with regard to the different kinds of aeroplanes.	X	X								
(02)	X	Describe the general differences between aeroplanes certified according to CS-23 and CS-25.	X									
032 01 01 02		***Operational regulations and safety***										
(01)	X	Describe the basic concept that the applicable operational requirements differ depending on aeroplane performance.	X	X								
(02)		Describe the performance classes for commercial air transport according to the applicable operational requirements.	X	X								
032 01 01 03		***Performance and safety***										
(01)	X	State that aeroplane performance required for commercial air transport may limit the weight of a dispatched aeroplane in order to achieve a sufficient level of safety.	X	X								
(02)	X	Describe that the minimum level of safety required for commercial air transport is ensured through the combination of airworthiness requirements and operational limitations, i.e. the more stringent airworthiness requirements of CS-25 enable a wider range of operating conditions for these aeroplanes.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
032 01 01 04		***Performance definitions and safety factors***										
(01)	X	Describe measured performance and explain how it is determined.	X	X								
(02)		Describe gross performance.	X	X								
(03)		Describe net performance and safety factors.	X	X								
(04)	X	Describe that the size of a safety factor depends on the likelihood of the event and the range of the measured performance data.	X	X								
(05)		Describe the relationship between net and gross take-off and landing distances, and net and gross climb and descent gradients.	X	X								
032 01 02 00		**General performance theory**										
032 01 02 01		***Intentionally left blank***										
032 01 02 02		***Definitions and terms***										
(01)	X	Define the terms ‘climb angle’ and ‘climb gradient’.	X	X								
(02)	X	Define the terms ‘flight-path angle’ and ‘flight-path gradient’.	X	X								
(03)	X	Define the terms ‘descent angle’ and ‘descent gradient’.	X	X								
(04)	X	Explain the difference between climb/descent angle and flight-path angle.	X	X								
(05)	X	Define ‘absolute ceiling’.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe 'clearway' and 'stopway' according to CS-Definitions.	X	X								
(07)		Describe: — take-off run available (TORA); — take-off distance available (TODA); — accelerate-stop distance available (ASDA); and determine each from given data or appropriate aerodrome charts.	X	X								
(08)		Describe 'screen height' including its various values.	X	X								
(09)	X	Define the terms 'range' and 'endurance'.	X	X								
(10)		Define an aeroplane's 'specific range' (SR) in terms of nautical air miles (NAM) per unit of fuel, and 'specific range over the ground' (SRG) in terms of nautical ground miles (NGM) per unit of fuel.	X	X								
(11)		Define the power available and power required.	X	X								
032 01 02 03		***Variables influencing performance***										
(01)	X	Name the following factors that affect aeroplane performance: pressure altitude and temperature, wind, aeroplane weight, aeroplane configuration, aeroplane anti-skid status, aeroplane centre of	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		gravity (CG), aerodrome runway surface, and aerodrome runway slope.										
(02)	X	Describe how, for different density altitudes, the thrust and power available vary with speed for a propeller-driven aeroplane.	X	X								
(03)	X	Describe how, for different density altitudes, the thrust and power available vary with speed for a turbojet aeroplane.	X									
(04)		Describe how, for different density altitudes, the drag and power required vary with indicated airspeeds (IAS) and true airspeeds (TAS).	X	X								
(05)		Describe how, for different aeroplane weights and configurations, the drag and power required vary with IAS and TAS.	X	X								
032 01 03 00		**Level flight, range and endurance**										
032 01 03 01		***Steady level flight***										
(01)	X	Explain how drag (thrust) and power required vary with speed in straight and level flight.	X	X								
(02)	X	Explain the effect of excess thrust and power on speed in level flight.	X	X								
(03)		Interpret the ‘thrust/power required’ and ‘thrust/power available’ curves in straight and level flight.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe how the maximum achievable straight and level flight IAS and TAS vary with altitude.	X	X								
(05)		Describe situations in which a pilot may elect to fly for 'maximum endurance' or 'maximum range'.	X	X								
032 01 03 02		***Range***										
(01)		Define a turbojet aeroplane's specific fuel consumption (SFC) and describe how it affects fuel flow and specific range.	X									
(02)		Define a propeller-driven aeroplane's SFC and describe how it affects fuel flow and specific range.	X	X								
(03)		Explain the optimum speed for maximum SR for a turbojet aeroplane in relation to the drag curve.	X									
(04)		Explain the optimum speed to achieve maximum SR for a propeller-driven aeroplane in relation to the power required and drag graphs.	X	X								
(05)		Explain the effect of aeroplane weight and CG position on fuel consumption, range and the optimum speed for maximum SR.	X	X								
(06)		State how a turbojet engine's SFC varies with temperature and thrust setting.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Explain how SR for a turbojet aeroplane varies with altitude and under different meteorological conditions.	X									
(08)		Explain how SRG for a propeller-driven aeroplane varies with altitude and under different meteorological conditions.	X	X								
(09)		Explain the effect of weight on the optimum altitude for maximum range.	X	X								
(10)		Describe the effect of wind on SRG and the optimum speed for SRG , when compared to SR, and the optimum speed for SR.	X	X								
032 01 03 03		***Maximum endurance***										
(01)		Explain fuel flow in relation to TAS and thrust for a turbojet aeroplane.	X									
(02)		State the speed for maximum endurance for a turbojet aeroplane.	X									
(03)		Explain fuel flow in relation to TAS and thrust for a propeller-driven aeroplane.	X	X								
(04)		State the speed for maximum endurance for a propeller-driven aeroplane and the disadvantages of holding at this speed (e.g. high angle of attack (AoA) and lack of speed stability).	X	X								
(05)		Explain the effect of wind and altitude on endurance, and the maximum endurance speed for a turbojet aeroplane.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain the effect of wind and altitude on endurance, and the maximum endurance speed for a propeller-driven aeroplane.	X	X								
(07)		Describe the benefits of managing your en-route airspeed to reduce or avoid holding time, and the operational situations when it could be used (commanded by the pilot or air traffic control (ATC), when delays at arrival airport occur).	X	X								
032 01 04 00		**Climbing**										
032 01 04 01		***Climbing (climb performance)***										
(01)		Resolve the forces during a steady climb.	X	X								
(02)		Define and explain the following terms: — critical engine; — speed for best angle of climb (V_X); — speed for best rate of climb (V_Y).	X	X								
(03)		Explain climb performance in relation to the thrust available and thrust required (angle of climb), and power available and power required (rate of climb).	X	X								
(04)		Explain the meaning and effect of ‘excess thrust’ and ‘excess power’ in a steady climb.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Interpret the ‘thrust/power required’ and ‘thrust/power available’ curves in a steady climb.	X	X								
(06)		State the difference between climb angle and gradient.	X	X								
(07)		Explain the effect of weight on the climb angle and rate of climb, and the speed for best angle and best rate of climb.	X	X								
(08)		Explain the effects of pressure altitude and temperature, including an inversion on climb performance (angle and rate of climb).	X	X								
(09)		Explain the effect of configuration on climb performance (angle and rate of climb, and V_X and V_Y).	X	X								
(10)		Describe the effect of engine failure on climb performance (angle and rate of climb, and V_X and V_Y).	X	X								
(11)		Calculate the all-engine and one-engine-out climb gradient from given values of engine thrust and aeroplane drag and weight.	X	X								
032 01 05 00		**Descending**										
032 01 05 01		***Descending (descent performance)***										
(01)		Resolve the forces during steady descent and in the glide.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain descent performance in relation to thrust available and thrust required (drag), and power available and power required.	X	X								
(03)		Explain the meaning of 'excess thrust required' (excess drag) and 'excess power required' in a steady descent.	X	X								
(04)		Interpret the 'thrust/power required' and 'thrust/power available' curves in a steady descent.	X	X								
(05)		Explain the effect of mass, altitude, wind, speed and configuration on the glide descent.	X	X								
(06)		Explain the effect of mass, altitude, wind, speed and configuration on the powered descent.	X	X								
032 02 00 00		**CS-23/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS B — THEORY**										
032 02 01 00		**Airworthiness requirements**										
032 02 01 01		***Airworthiness requirements and definitions***										
(01)	X	Define the following speeds: — stall speeds V_S, V_{S0} and V_{S1}; — rotation speed V_R; — speed at 50 ft above the take-off surface level; — reference landing speed V_{REF}.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the limitations on V_R, on the speed at 50 ft above the take-off surface and on V_{REF}, and given the appropriate stall speed, estimate the values based on these limitations for a single-engine, class B aeroplane.	X	X								
(03)		Describe the limitations on V_R, on the speed at 50 ft above the take-off surface and on V_{REF}, and given the appropriate stall speed, estimate the values based on these limitations for a multi-engine, class B aeroplane.	X	X								
(04)	X	Describe the European Union airworthiness requirements according to CS-23 relating to aeroplane performance (stall, take-off, climb, landing).	X	X								
(05)		Define and identify the critical engine of a multi-engine propeller aeroplane.	X	X								
(06)		Explain the effect of an engine failure on the power required, the total drag (thrust required) and climb performance of a multi-engine aeroplane.	X	X								
(07)		Explain the effect of engine failure on the minimum control speed of a multi-engine aeroplane under given conditions (temperature and pressure altitude).	X	X								
032 02 02 00		**Intentionally left blank**										
032 02 03 00		**Take-off and landing**										

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
032 02 03 01		***Take-off and landing (definitions and effects)***										
(01)	X	Define the following distances and masses: — take-off distance; — landing distance; — ground-roll distance; — maximum allowed take-off mass; — maximum allowed landing mass.	X	X								
(02)		Explain the effect of flap-setting on the take-off, landing and ground-roll distances.	X	X								
(03)		Explain the effects of the following runway (RWY) variables on take-off distances: — RWY slope; — RWY surface conditions: dry, wet and contaminated; — RWY elevation.	X	X								
(04)		For both fixed-pitch and constant-speed propeller aeroplanes, explain the effect of airspeed on thrust during the take-off run.	X	X								
(05)		Describe the effects of brake release before take-off power is set on the TOD and ASD.	X	X								
(06)		Explain the effect of wind on take-off and landing distances, and determine the actual headwind/tailwind component given the	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		runway direction, wind speed and direction, by use of wind component graphs, mathematical calculations, and rule of thumb.										
(07)		Explain why an aeroplane has maximum crosswind limit(s) and determine the crosswind component given the runway direction, wind speed and direction, by use of wind component graphs, mathematical calculations, and rule of thumb.	X	X								
(08)		Explain the percentage of accountability for headwind and tailwind components during take-off and landing calculations.	X	X								
(09)		Explain the effect of runway conditions on the landing distance.	X	X								
(10)		Explain the effects of pressure altitude and temperature on the take-off distance, take-off climb, landing distance and approach climb.	X	X								
(11)		Describe the landing airborne distance and ground-roll distance and estimate the effect on the landing distance when the aeroplane is too fast or too high at the screen.	X	X								
(12)		Describe the take-off flight path for a multi-engine, class B aeroplane.	X	X								
(13)		Describe the dimensions of the take off flight path accountability area (domain).	X	X								
032 02 04 00		**Climb, cruise and descent**										

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
032 02 04 01		***Climb, cruise and descent (requirements and calculations)***										
(01)		Describe the climb and en-route requirements according to the applicable operational requirements.	X	X								
(02)		For a single-engine aeroplane, calculate the expected obstacle clearance (in visual meteorological conditions (VMC)) given gross climb performance, obstacle height and distance from reference zero.	X	X								
(03)		For a single-engine aeroplane, calculate the net glide gradient and net glide distance, given aeroplane altitude, terrain elevation, gross gradient or lift/drag ratio (L/D ratio), and headwind or tailwind component.	X	X								
032 03 00 00		**CS-23/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS B — USE OF AEROPLANE PERFORMANCE DATA FOR SINGLE- AND MULTI-ENGINE AEROPLANES**										
032 03 01 00		**Intentionally left blank**										
032 03 02 00		**Intentionally left blank**										
032 03 03 00		**Use of aeroplane performance data**										

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
032 03 03 01		***Take-off***										
(01)		Determine the field-length-limited take-off mass and take-off speeds given defactored distance, configuration, pressure altitude, temperature and headwind/tailwind component.	X	X								
(02)		Determine the accelerate-go distance and accelerate-stop distance data.	X	X								
(03)		Determine the ground-roll distance and take-off distance from graphs.	X	X								
(04)		Determine the all-engine-out and critical-engine-out take-off climb data.	X	X								
(05)		Determine take off flight path for a MEP aeroplane of given mass and given airfield conditions, and calculate the obstacle clearance based on the take off flight path.	X	X								
(06)		Determine the minimum headwind or maximum tailwind component required for take-off for a given mass and given airfield conditions.	X	X								
(07)		Given take-off run available (TORA), TODA and ASDA, slope and surface conditions, calculate the defactored distance to be used for commercial air transport using the appropriate take-off graphs.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Calculate the minimum TORA or TODA for commercial air transport given the defactored take-off distance or run, runway surface and slope.	X	X								
032 03 03 02		***Climb***										
(01)		Determine rate of climb.	X	X								
(02)		Calculate obstacle clearance climb data.	X	X								
(03)		Determine the still-air and flight-path gradients for given IAS, altitude, temperature, aeroplane weight and, if relevant, wind component.	X	X								
032 03 03 03		***Intentionally left blank***										
032 03 03 04		***Landing***										
(01)		Determine the field-length-limited landing mass and landing speeds given defactored distance, configuration, pressure altitude, temperature and headwind or tailwind component.	X	X								
(02)		Determine landing climb data in the event of balked landing.	X	X								
(03)		Determine landing distance and ground-roll distance for given flap position, aeroplane weight and airfield data.	X	X								
(04)		Calculate, given the landing distance available (LDA), slope and surface type and condition,	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		the defactored distance to be used for commercial air transport using the appropriate landing graphs.										
(05)		Calculate the minimum landing distance (LD) that must be available for commercial air transport given the defactored landing distance, runway surface and slope.	X	X								
032 04 00 00		**CS-25/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS A — THEORY**										
032 04 01 00		**Take-off**										
032 04 01 01		***Take-off performance, definitions of and relationships between terms***										
(01)	X	Explain the forces affecting the aeroplane during the take-off run.	X									
(02)	X	State the effects of thrust-to-weight ratio and flap-setting on ground roll.	X									
(03)		Describe the European Union airworthiness requirements according to CS-25 relating to large aeroplane performance (General and Take-off).	X									
(04)		Describe the terms 'aircraft classification number' (ACN) and 'pavement classification number' (PCN), and the requirements and hazards of operating on aerodrome surfaces with PCNs smaller than the ACNs.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Define and explain the following speeds in accordance with CS-25 or CS-Definitions: — reference stall speed (V_{SR}); — reference stall speed in a specific configuration (V_{SR1}); — 1-g stall speed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight (V_{S1g}); — minimum control speed with critical engine inoperative (V_{MC}); — minimum control speed on or near the ground (V_{MCG}); — minimum control speed at take-off climb (V_{MCA}); — engine failure speed (V_{EF}); — take-off decision speed (V_1); — rotation speed (V_R); — take-off safety speed (V_2); — minimum take-off safety speed (V_{2MIN}); — minimum unstick speed (V_{MU}); — lift-off speed (V_{LOF}); — maximum brake energy speed (V_{MBE});	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— maximum tyre speed ($V_{Max\ Tyre}$).										
(06)		Explain the interdependence between the above-mentioned speeds where relevant.	X									
(07)		Define the following distances in accordance with CS-25: — take-off run with all engines operating and one-engine-inoperative; — take-off distance with all engines operating and one-engine-inoperative; — accelerate-stop distance with all engines operating and one-engine-inoperative.	X									
(08)		Explain how loss of TORA due to alignment is accounted for.	X									
(09)		Explain the effect of the interdependency of relevant speeds in 032 04 01 01 (05) and the situations in which these interdependencies can cause speed and performance restrictions.	X									
032 04 01 02		***Take-off distances***										
(01)		Explain the effects of the following runway (RWY) variables on take-off distances: — RWY slope; — RWY surface conditions: dry, wet and contaminated;	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— RWY elevation.										
(02)		Explain the effects of the following aeroplane variables on take-off distance: — aeroplane mass; — take-off configuration; — bleed-air configurations.	X									
(03)		Explain the effects of the following meteorological variables on take-off distances: — wind; — temperature; — pressure altitude.	X									
(04)		Explain the consequence of errors in rotation technique on take-off distance: — early and late rotation; — too high and too low rotation angle; — too high and too low rotation rate.	X									
(05)		Compare the take-off distance for specified conditions and configuration for all engines operating and one-engine-inoperative.	X									
(06)		Explain the effect of using clearway on the field-length-limited take-off mass.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Explain the influence of aeroplane mass, air density and flap settings on V_1, V_2 and V_{2MIN} and thereby on take-off distance.	X									
(08)		Explain the effect of an error in V_1 on the resulting one-engine-out take-off distance.	X									
032 04 01 03		***Accelerate-stop distance***										
(01)		Explain how the accelerate-stop distance is affected by given conditions and configuration for all engines operating and one-engine-inoperative.	X									
(02)		Explain the effect of using a stopway on the field-length-limited take-off mass.	X									
(03)		Explain the effect of an error in V_1 on the resulting accelerate-stop distance.	X									
(04)		Explain the effect of runway slope or wind component on the accelerate-stop distance.	X									
(05)		Explain how the accelerate-stop distance is determined and discuss the deceleration procedure.	X									
(06)		Explain how the accelerate-stop distance is affected by the use of brakes, anti-skid, reverse thrust, ground spoilers (lift dumpers) and by brake energy absorption limits, delayed temperature rise and brake temperature indication.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)	X	Explain the hazards of rejecting a take-off from high ground speed or high take-off mass, and how to manage these hazards.	X									
032 04 01 04		***Balanced field length concept***										
(01)	X	Define the term 'balanced field length'.	X									
(02)		Describe the relationship between take-off distance and accelerate-stop distance, and identify on a diagram the balanced field length and balanced V_1.	X									
(03)	X	Describe the applicability of a balanced field length.	X									
032 04 01 05		***Unbalanced field length concept***										
(01)	X	Describe the applicability of an unbalanced field length.	X									
(02)		Explain the effect of additional stopway on the allowed take-off mass and appropriate V_1 when using an unbalanced field.	X									
(03)		Explain the effect of additional clearway on the allowed take-off mass and appropriate V_1 when using an unbalanced field.	X									
032 04 01 06		***Field-length-limited take-off mass (FLLTOM)***										
(01)		Explain the factors that affect the FLLTOM.	X									
(02)		Explain the concept of a 'range of V_1' and explain reasons for the placement of the	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		designated V_1 towards the faster or slower end of the range.										
032 04 01 07		***Contaminated runways*** *Remark: See 010 09 02 04 and 071 02 13 02*										
(01)		Define a 'contaminated runway', 'wet runway', and a 'dry runway'.	X	X								
(02)		Describe the different types of contamination: wet or water patches, frost-covered, dry snow, wet snow, slush, ice, compacted or rolled snow, frozen ruts or ridges.	X	X								
(03)		*Intentionally left blank*										
(04)		*Intentionally left blank*										
(05)		Define the different types of hydroplaning.	X	X								
(06)		Explain the difference between the two dynamic hydroplaning speeds and state which of them is the most limiting for an aircraft operating on a wet runway.	X	X								
(07)		State that some wind limitations may apply in case of contaminated runways. Those limitations are to be found in Part B of the Operations Manual — Limitations.	X	X								
(08)		State that the procedures associated with take-off and landing on contaminated runways are to be found in Part B of the Operations Manual — Normal procedures.	X	X								

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		State that the performance associated with contaminated runways is to be found in Part B of the Operations Manual — Performance.	X	X								
032 04 01 08		***Take-off climb***										
(01)		Explain the difference between the flat-rated and non-flat-rated part in performance charts.	X									
(02)		State the differences in climb-gradient requirements for two-, three- and four-engined aeroplanes.	X									
(03)		Explain the effects of aeroplane configuration and meteorological conditions on the take-off climb.	X									
(04)		Determine the climb-limited take-off mass.	X									
032 04 01 09		***Obstacle-limited take-off***										
(01)		Describe the operational regulations for obstacle clearance in the net take-off flight path (NTOFP).	X									
(02)		Define the actual and NTOFP with one-engine-inoperative in accordance with CS-25.	X									
(03)		Explain the effects of aeroplane configuration and meteorological conditions on the obstacle-limited take-off mass.	X									
(04)		Describe the segments of the actual take-off flight path.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the changes in the configuration, power, thrust and speed in the NTOFP climb segments.	X									
(06)		State the standard maximum bank angle(s) in the first and second segment, and determine the effect on the stall speed and implication on V_2.	X									
(07)		Explain the influence of airspeed selection, acceleration and turns on the climb gradient.	X									
(08)		Describe the European Union airworthiness requirements according to CS-25 relating to aeroplane performance take-off climb and flight path.	X									
032 04 01 10		***Performance-limited take-off mass (PLTOM) and regulated take-off mass (RTOM) tables***										
(01)		Define PLTOM and RTOM.	X									
(02)	X	Describe the use of RTOM tables or similar to find PLTOM and how this can also be done using an EFB.	X									
(03)		Interpret what take-off limitation (field length, obstacle, climb, structural, etc.) is restricting a particular RTOM as it is presented in RTOM tables or similar.	X									
(04)		Describe why data from an EFB can differ from data derived from RTOM tables or similar.	X									
032 04 01 11		***Take-off performance on wet and contaminated runways***										

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the differences between the take-off performance determination on a wet or contaminated runway and on a dry runway.	X									
(02)		Describe a wet V_1 and explain the consequences of using a wet V_1.	X									
(03)		Describe the hazards, effects and management of operating from a contaminated runway.	X									
(04)		Describe displacement drag, impingement drag, and the methods to monitor acceleration.	X									
(05)		Explain the benefits and implications of using a derated take-off on a contaminated runway.	X									
032 04 01 12		***Use of reduced (flexible or flex) and derated thrust***										
(01)		Explain the advantages and disadvantages of using reduced (flex) and derated thrust.	X									
(02)		Explain the difference between and principles behind reduced (flex) and derated thrust.	X									
(03)		Explain when reduced (flex) and derated thrust may and may not be used.	X									
(04)		Explain the effect of using reduced (flex) and derated thrust on take-off performance including take-off speeds, take-off distance, climb performance and obstacle clearance.	X									
(05)		Explain the assumed temperature method for determining reduced (flex) thrust performance.	X									
032 04 01 13		***Take-off performance using different take-off flap settings***										

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the advantages and disadvantages of using different take-off flap settings to optimise the performance-limited take-off mass (PLTOM).	X									
(02)		Determine the optimum flap position and PLTOM from given figures.	X									
032 04 01 14		***Take-off performance using increased V_2 speeds ('improved climb performance')***										
(01)		Explain the advantages and disadvantages of the increased V_2 procedure.	X									
(02)		Explain under what circumstances this procedure can be used.	X									
(03)		Explain the hazards of the fast V_1 and V_{LOF} speeds associated with the increased V_2 procedure and how they can be managed.	X									
032 04 01 15		***Brake-energy and tyre-speed limit***										
(01)		Explain the effects on take-off performance of brake-energy and tyre-speed limits.	X									
(02)		Explain under what conditions they are more likely to become limiting.	X									
032 04 02 00		**Climb**										
032 04 02 01		***Climb techniques***										
(01)		Explain the effect of climbing at constant IAS on:	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— TAS; — Mach number; — climb gradient; — rate of climb.										
(02)		Explain the effect of climbing at constant Mach number on: — TAS; — IAS; — climb gradient; — rate of climb.	X									
(03)		Explain the correct sequence of climb speeds for turbojet transport aeroplanes.	X									
(04)		Determine the effect on TAS when climbing in and above the troposphere at constant Mach number.	X									
032 04 02 02		***Influence of variables on climb performance***										
(01)		Explain the effect on the operational speed limit when climbing at constant IAS and at constant Mach number.	X									
(02)		Explain the term 'crossover altitude' which occurs during the climb speed schedule (IAS–Mach number).	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
032 04 03 00		**Cruise**										
032 04 03 01		***Intentionally left blank***										
032 04 03 02		***Intentionally left blank***										
032 04 03 03		***Intentionally left blank***										
032 04 03 04		***Long-range cruise***										
(01)		Define the term ‘long-range cruise’.	X									
(02)		Explain the differences between flying at long-range speed and maximum-range speed with regard to fuel-flow and speed stability.	X									
032 04 03 05		***Intentionally left blank***										
032 04 03 06		***Cruise altitudes***										
(01)	X	Define the term ‘optimum cruise altitude’.	X									
(02)		Explain the factors that affect optimum cruise altitude.	X									
(03)		Explain the factors that can affect or limit the maximum operating cruise altitude.	X									
(04)		Explain the purpose of, and operational reasons for, a step climb and when such a climb would be initiated for optimum range.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the buffet onset boundary (BOB) and determine the high- and low-speed buffet (speed/Mach number only).	X									
(06)		Analyse the influence of bank angle, mass and the 1.3g buffet margin on a step climb.	X									
(07)		Describe that the high-speed buffet can occur at speeds slower or faster than M_{MO}.	X									
(08)		Explain the reasons why a step climb may not be used (e.g. for short sectors, advantageous winds, avoiding turbulence, and due to air traffic restrictions).	X									
032 04 03 07		***Cost index (CI)***										
(01)		Describe 'cost index'.	X									
(02)		Describe the reason for economical cruise speed.	X									
(03)		Describe the effect of cost index on climb, cruise and descent speeds.	X									
032 04 04 00		**En-route one-engine-inoperative**										
032 04 04 01		***Drift-down***										
(01)		Describe the determination of en-route flight-path data with one-engine-inoperative in accordance with the CS-25 provision on en-route flight paths.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the minimum obstacle-clearance height prescribed in the applicable operational requirements.	X									
(03)		Describe the optimum speed that the pilot should select during drift-down.	X									
(04)		Explain the influence of deceleration on the drift-down profiles.	X									
032 04 04 02		***Influence of variables on the en-route one-engine-inoperative performance***										
(01)		Describe and explain the factors which affect the en-route net drift-down flight path.	X									
032 04 05 00		**Descent**										
032 04 05 01		***Descent techniques***										
(01)		Explain the effect of descending at constant Mach number.	X									
(02)		Explain the effect of descending at constant IAS.	X									
(03)		Explain the correct sequence of descent speeds for turbojet transport aeroplanes.	X									
(04)		Determine the effect on TAS when descending in and above the troposphere at constant Mach number.	X									
(05)		Describe the following limiting speeds for descent: — maximum operating speed (V_{MO});	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— maximum Mach number (M_{MO}).										
(06)		Explain the effect of a descent at constant Mach number on the margin to low- and high-speed buffet.	X									
032 04 05 02		***Energy management in the descent***										
(01)		Explain the advantages and principle of a continuous descent.	X									
(02)	X	Describe energy management in terms of chemical, potential and kinetic energy.	X									
(03)		Describe the effect of increasing/decreasing headwind and tailwind on profile management.	X									
(04)		Describe the effect of the Mach number to IAS transition (speed conversion) on profile management.	X									
(05)		Describe situations during the descent and approach in which a pilot could find that an aeroplane flies high or fast, and explain how the pilot can manage descent angle/excess energy.	X									
032 04 06 00		**Approach and landing**										
032 04 06 01		***Approach requirements***										
(01)		Describe the CS-25 requirements for the approach climb (one-engine-inoprative).	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the CS-25 requirements for the landing climb.	X									
(03)		Explain the effect of temperature and pressure altitude on approach and landing-climb performance.	X									
032 04 06 02		***Landing-field-length and landing-speed requirements***										
(01)	X	Describe the landing distance determined according to CS 25 ('demonstrated' landing distance).	X									
(02)		Describe the landing-field-length requirements for dry, wet and contaminated runways and the applicable operational requirements.	X									
(03)	X	Define the 'landing distance available' (LDA).	X									
(04)		Define and explain the following speeds in accordance with CS-25 or CS-Definitions: — reference stall speed in the landing configuration (V_{SR0}); — reference landing speed (V_{REF}); — minimum control speed, approach and landing (V_{MCL}).	X									
032 04 06 03		***Influence of variables on landing performance***										
(01)		Explain the effect of runway slope, surface conditions and wind on the maximum landing mass for a given landing distance available in	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		accordance with the applicable operational requirements.										
(02)		Explain the effect on landing distance and maximum allowable landing mass of the following devices affecting deceleration: — reverse; — anti-skid; — ground spoilers or lift dumpers; — autobrakes.	X									
(03)		Explain the effect of temperature and pressure altitude on the maximum landing mass for a given landing distance available.	X									
(04)		Explain the effect of hydroplaning on landing distance required and methods of managing landing on contaminated or wet runways.	X									
032 04 06 04		***Quick turnaround limit***										
(01)		Describe how brake temperature limits the turnaround times.	X									
032 05 00 00		**CS-25/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS A — USE OF AEROPLANE PERFORMANCE DATA**	X									
032 05 01 00		**Take-off**										
032 05 01 01		***Take-off (performance data)***										

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Determine from given graphs the field-lenght-limited take-off mass (FLLTOM) and describe situations in which this limitation could be most restrictive for take-off.	X									
(02)		Determine from given graphs the climb-limited take-off mass and describe situations in which this limitation could be most restrictive for take-off.	X									
(03)		Determine from given graphs the obstacle-limited mass and describe situations in which this limitation could be most restrictive for take-off.	X									
(04)		Determine from given graphs the tyre-speed-limited take-off mass.	X									
(05)		Determine from given graphs the maximum brake-energy-limited take-off mass.	X									
(06)		Determine the take-off V speeds for the actual take-off mass.	X									
(07)		Determine the maximum take-off mass using given RTOM tables.	X									
(08)		Using RTOM tables, determine the take-off V speeds for the actual take-off weight using appropriate corrections.	X									
(09)		Determine the assumed/flex temperature and take-off V speeds using the RTOM tables.	X									
(10)		Calculate the break cooling time following a rejected take-off given appropriate data.	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
032 05 02 00		**Drift-down and stabilising altitude**										
032 05 02 01		***Drift-down and stabilising altitude (performance data)***										
(01)		Determine the one-engine-out net stabilising altitude (level-off altitude) from given graphs/tables.	X									
(02)		Determine the maximum mass at which the net stabilising altitude with one-engine-out clears the highest relevant obstacle by the required clearance margin.	X									
(03)		Determine, using drift-down graphs, fuel used, time and distance travelled in a descent from a cruise flight level to a given altitude.	X									
032 05 03 00		**Landing**										
032 05 03 01		***Landing (performance data)***										
(01)		Determine the field length required for landing with a given landing mass from the aeroplane performance data sheets.	X									
(02)		Determine the landing and approach climb-limited landing mass from the aeroplane performance data sheets.	X									
(03)		Calculate the maximum allowable landing mass as the lowest of:	X									

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— approach-climb- and landing-climb-limited landing mass; — landing-field-length-limited landing mass; — structural-limited landing mass.										
(04)		Determine the brake cooling time for different landing masses using the aeroplane performance data sheets.	X									

SUBJECT 033 – FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING

General Student Pilot Route Manual (GSPRM)

This document shall be referred to as the General Student Pilot Route Manual (GSPRM) and should contain as a minimum:

1. a table of contents and a list of effective pages;
2. introduction with the instrument flight rules (IFR) charts' legends;
3. 1:500 000 visual flight rule (VFR) aeronautical chart of Germany;
4. en-route low- and high-altitude IFR charts to cover the airspace above all EU Member States plus Norway, Switzerland, Liechtenstein and the Balkans;
5. en-route high-altitude chart of the North Pole (a polar stereographic projection) to illustrate current polar routes;
6. a plotting chart of the North Atlantic (with information on extended range operations with two-engined aeroplanes (ETOPS));

7. area, aerodrome/heliport, aerodrome ground movement, standard instrument departure (SID), standard instrument arrival (STAR) and instrument approach charts (IACs) for Alicante Elche, Amsterdam Schiphol, Dubrovnik Čilipi, London Heathrow, Nantes/Atlantique, Santorini and Stuttgart for aeroplane operations, and Aberdeen, De Kooy and Tromso for helicopter operations;
8. microwave landing system (MLS) approach chart for Galbraith Lake Alaska;
9. an example of a completed air traffic service (ATS) flight plan (with instructions on how to complete it), including the ICAO model flight plan form;
10. introduction with the VFR charts' legends, aerodrome directories for Croatia, France, Germany, Spain and United Kingdom, and area, aerodrome/heliport and visual approach charts (VACs) for Aberdeen Dyce, Alicante Elche, Dubrovnik Čilipi, Friedrichshafen, Gloucestershire and Nantes/Atlantique.

The charts should have a frozen date (e.g. 01.01.2017), and be reissued on a regular basis (e.g. every 4–5 years).

The charts listed above will form the basis for the questions in licensing examinations.

There will be no obligation for any student or approved training organisation (ATO) to buy, use or issue the GSPRM (nor will it have any other subject-matter material in it), but the content will be the basis for charts which may appear in Part-FCL exams. Any chart provider (Lido, Jeppesen, Navtech, etc.) may provide the GSPRM, but the students will not be expected to learn non-ICAO standard symbology or chart requirements.

Note that the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
030 00 00 00		**FLIGHT PERFORMANCE AND PLANNING**										
033 00 00 00		**FLIGHT PLANNING AND MONITORING**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
033 01 00 00		**FLIGHT PLANNING FOR VFR FLIGHTS** *Remark: Using the GSPRM VFR charts.*										
033 01 01 00		**VFR navigation plan**										
033 01 01 01		***Airspace, communication, visual and radio-navigation data from VFR charts***										
(01)		Select routes taking the following criteria into account: — classification of airspace; — restricted areas; — VFR semicircular rules; — visually conspicuous points; — radio-navigation aids.	X	X	X	X	X					
(02)		Find the frequencies or identifiers of radio-navigation aids from charts.	X	X	X	X	X					
(03)		Find the communication frequencies and call signs for the following: — control agencies and service facilities; — flight information service (FIS); — weather information stations; — automatic terminal information service (ATIS).	X	X	X	X	X					
033 01 01 02		***Planning courses, distances and cruising levels with VFR charts***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Choose visual waypoints in accordance with specified criteria (large, unique, contrast, vertical extent, etc.).	X	X	X	X	X					
(02)		Measure courses and distances from a VFR chart.	X	X	X	X	X					
(03)		Find the highest obstacle within a given distance on either side of the course.	X	X	X	X	X					
(04)		Find the following data from a VFR chart and transfer them to a navigation plan: — waypoints or turning points; — distances; — true/magnetic courses.	X	X	X	X	X					
(05)		Calculate the minimum pressure altitude with a given obstacle clearance or true altitude from a given altitude or pressure altitude from minimum grid-area altitude using outside air temperature (OAT) and QNH.	X	X	X	X	X					
(06)		Calculate the vertical or horizontal distance and time to climb or descend to/from a given level or altitude with given data.	X	X	X	X	X					
(07)		Explain how to determine the position of a significant VFR point for insertion into a global navigation satellite system (GNSS) flight plan, using the distance and bearing from an existing significant point and using coordinates.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
033 01 01 03		***Aerodrome charts and aerodrome directory***										
(01)	X	Explain the reasons for studying the visual departure procedures and the available approach procedures.	X	X	X	X	X					
(02)		Find all visual procedures which can be expected at the departure, destination and alternate aerodromes.	X	X	X	X	X					
(03)		Find all relevant aeronautical and regulatory information required for VFR flight planning from the aerodrome charts or aerodrome directory.	X	X	X	X	X					
033 01 01 04		***Intentionally left blank***										
033 01 01 05		***Completion of navigation plan***										
(01)		Calculate the true airspeed (TAS) from given aircraft performance data, altitude and OAT.	X	X	X	X	X					
(02)		Calculate wind correction angles (WCAs), drift and ground speeds (GS).	X	X	X	X	X					
(03)		Calculate individual and accumulated times for each leg to destination and alternate aerodromes.	X	X	X	X	X					
033 02 00 00		**FLIGHT PLANNING FOR IFR FLIGHTS** *Remark: Using the GSPRM IFR charts.*										
033 02 01 00		**IFR navigation plan**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
033 02 01 01		***Air traffic service (ATS) routes***										
(01)		Identify suitable routings by identifying all relevant aeronautical and regulatory information (including information published in the national aeronautical information publication (AIP)) required for IFR flight planning.	X		X			X	X	2	3	
(02)		Identify and describe ATS routes (conventional, area navigation (RNAV), required navigation performance (RNP), conditional routes (CDRs), and direct routes).	X		X			X	X			
033 02 01 02		***Courses and distances from en-route charts***										
(01)		Determine courses and distances.	X		X			X	X	2	3	
(02)		Determine bearings and distances of waypoints from radio-navigation aids.	X		X			X	X	2	3	
033 02 01 03		***Altitudes***										
(01)		Define the following altitudes: — minimum en-route altitude (MEA); — minimum obstacle clearance altitude (MOCA); — minimum sector altitude (MSA); — minimum off-route altitude (MORA);	X		X			X	X	2	3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— grid minimum off-route altitude (Grid MORA); — maximum authorised altitude (MAA); — minimum crossing altitude (MCA); — minimum holding altitude (MHA).										
(02)		Extract the following altitudes from the chart(s): — MEA; — MOCA; — MSA; — MORA; — Grid MORA; — MAA; — MCA; — MHA.	X		X			X	X	2	3	
(03)		State who is responsible for terrain separation during IFR flight inside and outside controlled airspace.	X		X			X	X			
(04)		State the minimum obstacle clearance requirements for en-route IFR flight inside and outside controlled airspace.	X		X			X	X			
(05)		State when a temperature error correction must be applied by either the pilot or ATC.	X		X			X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Identify and explain the use of minimum radar vectoring altitudes.	X		X			X	X			
(07)		Calculate the minimum pressure altitude required with a given obstacle clearance, magnetic track, OAT, QNH and reduced vertical separation minimum (RVSM)/non-RVSM information.	X		X			X	X			
(08)		Calculate true altitude above a given datum using a given pressure altitude, OAT and QNH.	X		X			X	X			
033 02 01 04		***Standard instrument departure (SID) and standard instrument arrival (STAR) routes***										
(01)	X	State the reasons for studying SID and STAR charts.	X		X			X	X			
(02)	X	State that SID and STAR charts show procedures only in a pictorial presentation style which may not be true to scale.	X		X			X	X			
(03)		Interpret all data and information represented on SID and STAR charts, particularly: — routings; — distances; — courses; — radials; — altitudes/levels;	X		X			X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— frequencies; — restrictions; — RNAV waypoints and non-RNAV intersection; — fly-over and fly-by waypoints.										
(04)		Identify SID and STAR charts which might be relevant for a planned flight.	X		X			X	X	2		
(05)		Define SID and STAR for RNAV only.	X		X			X	X			
(06)		Describe the difference between SID/STAR, RNAV SID/STAR and RNAV SID/STAR overlay.	X		X			X	X			
033 02 01 05		***Instrument-approach charts***										
(01)	X	State the reasons for being familiar with instrument-approach procedures (IAPs) and appropriate data for departure, destination and alternate aerodromes.	X		X			X	X			
(02)		Select IAPs appropriate for departure, destination and alternate aerodromes.	X		X			X	X	2		
(03)		Interpret all procedures, data and information represented on instrument-approach charts, particularly: — courses and radials; — distances; — altitudes/levels/heights;	X		X			X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— restrictions; — obstructions; — frequencies; — speeds and times; — decision altitudes/heights (DAs/Hs); — (DA/H) and minimum descent altitudes/heights (MDAs/Hs); — visibility and runway visual ranges (RVRs); — approach-light systems.										
(04)		Explain the following IAP terms: — type A and B; — 2D and 3D; — CAT I, II and III; — precision approach (conventional and ground-based augmentation system (GBAS)); — non-precision approach (conventional and required navigation performance approach (RNP APCH) (lateral navigation (LNAV), LNAV/vertical navigation (VNAV), localiser performance (LP), localiser	X		X			X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		performance with vertical guidance (LPV), and required navigation performance authorisation required approach (RNP AR APCH)); — approach procedure with vertical guidance (APV) (APV Baro and APV satellite-based augmentation system (SBAS)).										
033 02 01 06		***Communications and radio-navigation planning data***										
(01)		Find the communication frequencies and call signs for aeronautical services for IFR flights from en-route charts.	X		X			X	X	2	3	
(02)		Find the frequency or identifiers of radio-navigation aids for IFR flights from en-route charts.	X		X			X	X	2	3	
033 02 01 07		***Completion of a manual navigation plan***										
(01)		Complete a navigation plan with the courses, distances and frequencies taken from charts.	X		X			X	X		3	
(02)		Find the SID and STAR routes to be flown or to be expected.	X		X			X	X	2	3	
(03)		Determine the position of top of climb (TOC) and top of descent (TOD) from given appropriate data.	X		X			X	X	2	3	
(04)		Determine variation and calculate magnetic/true courses.	X		X			X	X		3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Calculate TAS from given aircraft performance data, altitude and OAT.	X		X			X	X		3	
(06)		Calculate wind correction angles (WCAs)/drift and ground speeds (GSs).	X		X			X	X		3	
(07)		Calculate individual and accumulated times for each leg to destination and alternate aerodromes.	X		X			X	X			
(08)		Describe the advantages of global navigation satellite system/flight management computer (GNSS/FMC) equipment regarding: — automatic calculation and display of tracks and leg distances; — additional route information in the database (minimum altitudes, approach procedures); — time and fuel estimates over waypoints; — ability to adjust speed to arrive over a waypoint at a defined time; — time and fuel revisions based on predicted and actual wind.	X		X			X	X			
(09)		Describe the limitations of using GNSS/FMC equipment: — pilot-inputted errors (flight levels, wind, temperature, fuel);	X		X			X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— the effect of other than predicted wind on fuel and time estimates; — the effect of aircraft's non-standard configuration on flight management system (FMS) predictions.										
033 03 00 00		**FUEL PLANNING — OPERATIONAL REQUIREMENTS**										
033 03 01 00		**General**										
033 03 01 01		***Fuel planning (general)***										
(01)		Convert to volume, mass and density given in different units which are commonly used in aviation.	X	X	X	X	X	X	X		3	
(02)		Determine relevant data, such as fuel capacity, fuel flow/ consumption at different power/thrust settings, altitudes and atmospheric conditions, from the flight manual.	X	X	X	X	X	X	X		3	
(03)		Calculate the attainable flight time/range from given average fuel flow/consumption and available amount of fuel.	X	X	X	X	X	X	X	3		
(04)		Calculate the required fuel from given average fuel flow/ consumption and required time/range to be flown.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Calculate the required fuel for a VFR flight from given forecast meteorological conditions.	X	X	X	X	X	X	X	3		
(06)		State the minimum amount of remaining fuel required on arrival at the destination and alternate aerodromes/ heliports.	X	X	X	X	X	X	X			
(07)		Explain and describe how to calculate nautical air miles (NAM) from nautical ground miles (NGM).	X	X	X	X	X	X	X			
(08)		Calculate the required fuel for an IFR flight from given forecast meteorological conditions.	X		X			X	X	3		
033 03 02 00		**Pre-flight fuel planning for commercial flights**										
033 03 02 01		***Taxi fuel***										
(01)		Determine the fuel required for engine start and taxiing by consulting the fuel-usage tables or graphs from the flight manual taking into account all the relevant conditions.	X	X	X	X	X					
033 03 02 02		***Trip fuel***										
(01)		Define trip fuel and name the segments of flight for which the trip fuel is relevant.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Determine the trip fuel for the flight by using data from the fuel tables or graphs from the flight manual.	X	X	X	X	X					
033 03 02 03		***Reserve fuel and its components***										
		Contingency fuel										
(01)		Explain the reasons for having contingency fuel.	X	X	X	X	X					
(02)		Calculate the contingency fuel according to the applicable operational requirements.	X	X	X	X	X					
		Alternate fuel										
(03)		Explain the reasons and regulations for having alternate fuel and name the segments of flight for which the alternate fuel is relevant.	X	X	X	X	X					
(04)		Calculate the alternate fuel in accordance with the applicable operational requirements and relevant data from the navigation plan and the flight manual.	X	X	X	X	X					
		Final reserve fuel										
(05)		Explain the reasons and regulations for having final reserve fuel.	X	X	X	X	X					
(06)		Calculate the final reserve fuel for an aircraft in accordance with the applicable operational requirements and by using relevant data from the flight manual.	X	X	X	X	X					
		Additional fuel										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Explain the reasons and regulations for having additional fuel.	X	X	X	X	X					
(08)		Calculate the additional fuel for a flight in accordance with the applicable operational requirements.	X	X	X	X	X					
033 03 02 04		***Extra fuel***										
(01)		Explain the reasons and regulations for having extra fuel in accordance with the applicable operational requirements.	X	X	X	X	X					
(02)		Calculate the possible extra fuel under given conditions.	X	X	X	X	X					
(03)		Explain the fuel penalty incurred when loading extra fuel (i.e. the additional fuel consumption due to increased mass).	X	X	X	X	X					
033 03 02 05		***Calculation of total fuel and completion of the fuel section of the navigation plan (fuel plan)***										
(01)		Calculate the total fuel required for a given flight.	X	X	X	X	X					
(02)		Complete the fuel plan.	X	X	X	X	X					
033 03 03 00		**Specific fuel-calculation procedures**										
033 03 03 01		***Reduced contingency fuel procedure***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Explain the reasons and regulations for reduced contingency fuel as stated in the applicable operational requirements.	X									
(02)		Calculate the contingency fuel and trip fuel required in accordance with the reduced contingency fuel procedure.	X									
033 03 03 02		***Isolated aerodrome or heliport procedure***										
(01)	X	Explain the basic procedures for an isolated aerodrome or heliport as stated in the applicable operational requirements.	X		X	X						
(02)		Calculate the additional fuel for aeroplanes or helicopters according to the isolated aerodrome or heliport procedures.	X		X	X						
033 03 03 03		***Predetermined-point procedure***										
(01)	X	Explain the basic idea of the predetermined-point procedure as stated in the applicable operational requirements.	X									
033 03 03 04		***Fuel-tankering***										
(01)		Explain the basic idea of fuel-tankering procedures.	X									
(02)		Calculate how much fuel to tank by using given appropriate graphs, tables or data.	X									
033 03 03 05		***Intentionally left blank***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
033 04 00 00		**PRE-FLIGHT PREPARATION**										
033 04 01 00		**Notice to airmen (NOTAM) briefing**										
033 04 01 01		***Ground- and satellite-based facilities and services***										
(01)		Check that the ground- and satellite-based facilities and services required for the planned flight are available and adequate.	X	X	X	X	X	X	X		3	
033 04 01 02		***Departure, destination and alternate aerodromes***										
(01)		Find and analyse the latest state at the departure, destination and alternate aerodromes, in particular for: — opening hours; — work in progress (WIP); — special procedures due to WIP; — obstructions; — changes of frequencies for communications, navigation aids and facilities.	X	X	X	X	X	X	X	3		
(02)		Check that satellite-based facilities are available during the expected time of use.	X	X	X	X	X	X	X			
(03)		Check that GBAS/SBAS augmentation is available during the expected time of use.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
033 04 01 03		***Airway routings and airspace structure***										
(01)		Find and analyse the latest en-route state for: — airway(s) or route(s); — restricted, danger and prohibited areas; — changes of frequencies for communications, navigation aids and facilities.	X	X	X	X	X	X	X	3		
033 04 01 04		***Pre-flight preparation of GNSS achievability***										
(01)		Define why it is important to check GNSS achievability.	X									
(02)		Define receiver autonomous integrity monitoring (RAIM), NOTAM and notice advisory to NavStar users (NANU) messages.	X									
(03)		Explain the difference in use of augmented and non-augmented GNSS in connection with the achievability check.	X									
(04)		Explain the difference in planned and unplanned outage of GNSS or SBAS.	X									
033 04 02 00		**Meteorological briefing**										
033 04 02 01		***Intentionally left blank***										
033 04 02 02		***Update of navigation plan using the latest meteorological information***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Confirm the most fuel-efficient altitude from given wind, temperature and aircraft data.	X	X					X	3		
(02)		Confirm true altitudes from given atmospheric data to ensure that statutory minimum clearance is attained.	X	X	X	X	X	X				
(03)		Confirm magnetic headings and GSs.	X	X	X	X	X	X	X		3	
(04)		Confirm the individual leg times and the total time en route.	X	X	X	X	X	X	X		3	
(05)		Confirm the total time en route for the trip to the destination.	X	X	X	X	X	X	X			
(06)		Confirm the total time from destination to the alternate aerodrome.	X	X	X	X	X	X	X		3	
033 04 02 03		***Intentionally left blank***										
033 04 02 04		***Intentionally left blank***										
033 04 02 05		***Update of fuel plan***										
(01)		Calculate the revised fuel data in accordance with the changed conditions.	X	X	X	X	X	X			3	
033 04 03 00		**Point of equal time (PET) and point of safe return (PSR)**										
033 04 03 01		***Point of equal time (PET)***										
(01)		Define 'PET'.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Calculate the position of a PET and the estimated time of arrival (ETA) at the PET from given relevant data.	X	X	X	X	X					
033 04 03 02		***Point of safe return (PSR)***										
(01)		Define 'PSR'.	X	X	X	X	X					
(02)		Calculate the position of a PSR and the ETA at the PSR from given relevant data.	X	X	X	X	X					
033 05 00 00		**ICAO FLIGHT PLAN (ATS flight plan (FPL))**										
033 05 01 00		**Individual FPL**										
033 05 01 01		***Format of FPL***										
(01)	X	State the reasons for a fixed format of an ICAO ATS FPL.	X	X	X	X	X	X	X			
(02)		Determine the correct entries to complete an ATS FPL plus decode and interpret the entries in a completed ATS FPL, particularly for the following: — aircraft identification (Item 7); — flight rules and type of flight (Item 8); — number and type of aircraft and wake-turbulence category (Item 9); — equipment (Item 10);	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— departure aerodrome and time (Item 13); — route (Item 15); — destination aerodrome, total estimated elapsed time and alternate aerodrome (Item 16); — other information (Item 18); — supplementary information (Item 19).										
033 05 01 02		***Intentionally left blank***										
033 05 02 00		**Repetitive flight plan (RPL)**										
033 05 02 01		***Repetitive flight plan (RPL)***										
(01)	X	Explain the difference between an individual FPL and an RPL.	X		X	X						
033 06 00 00		**FLIGHT MONITORING AND IN-FLIGHT REPLANNING**										
033 06 01 00		**Flight monitoring**										
033 06 01 01		***Monitoring of track and time***										
(01)		State the reasons for possible deviations from the planned track and planned timings.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Calculate GS by using actual in-flight parameters.	X	X	X	X	X	X				
(03)		Calculate the expected leg times by using actual in-flight parameters.	X	X	X	X	X	X				
(04)		Enter, in the progress of flight, at the checkpoint or turning point, the 'actual time-over' and the 'estimated time-over' for the next checkpoint into the flight plan.	X	X	X	X	X					
(05)		State that it is necessary to determine the position of the aircraft accurately before commencing descent in order to ensure safe ground clearance.	X	X	X	X	X					
(06)		Calculate revised ETA based on changes to the pre-flight plan, including changes of W/V, cruise level, OAT, distances, Mach number and calibrated airspeed (CAS).	X	X	X	X	X					
033 06 01 02		***In-flight fuel management***										
(01)		Explain why fuel checks must be carried out in flight at regular intervals and why relevant fuel data must be recorded.	X	X	X	X	X	X				
(02)		Assess deviations of actual fuel consumption from planned consumption.	X	X	X	X	X	X				
(03)		Calculate fuel quantity used, fuel consumption, and fuel remaining at navigation checkpoints/waypoints.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Compare the actual with the planned fuel consumption by means of calculation.	X	X	X	X	X	X				
(05)		Determine the remaining range and endurance by means of calculation.	X	X	X	X	X	X				
(06)		Calculate the revised fuel consumption based on changes to the pre-flight plan, including changes of W/V, cruise level, OAT, distances, Mach number and CAS.	X	X	X	X	X	X				
033 06 02 00		**In-flight replanning**										
033 06 02 01		***Deviation from planned data***										
(01)		State that the commander is responsible for ensuring that, even in case of diversion, the remaining fuel is not less than the fuel required to proceed to an aerodrome where a safe landing can be made, with final reserve fuel remaining.	X	X	X	X	X					
(02)		Explain that, in the case of an in-flight update, the commander has to check the following: — the suitability of the new destination or alternate aerodrome; — meteorological conditions on revised routing and at revised destination or alternate aerodrome;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— the aircraft must be able to land with the prescribed final reserve fuel.										
(03)		Calculate the revised destination/alternate aerodrome landing mass from given latest data.	X	X	X	X	X					

SUBJECT 034 – FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS

Note that the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
030 00 00 00		**FLIGHT PERFORMANCE AND PLANNING**										
034 00 00 00		**PERFORMANCE — HELICOPTERS**										
034 01 00 00		**GENERAL**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
034 01 01 00		**Performance legislation**										
034 01 01 01		***Airworthiness requirements***										
(01)		Interpret the airworthiness requirements of CS-27 and CS-29.			X	X	X					
(02)		Name the general differences between helicopters certified according to CS-27 and CS-29.			X	X	X					
034 01 01 02		**Operational regulations**										
(01)		State that the person responsible for complying with operational procedures is the commander.			X	X	X					
(02)		Use and interpret diagrams and tables associated with CAT A and CAT B procedures in order to select and develop Class 1, 2 and 3 performance profiles according to available heliport size and location (surface or elevated).			X	X						
(03)		Interpret the charts showing minimum clearances associated with CAT A and CAT B procedures.			X	X						
034 01 02 00		**General performance theory**										
034 01 02 01		***Phases of flight***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the following phases of flight: — take-off; — climb; — level flight; — descent; — approach and landing.			X	X	X					
(02)		Describe the necessity for different take-off and landing procedures.			X	X	X					
034 01 02 02		***Definitions and terms***										
(01)		Define the following terms: — CAT A; — CAT B; — Performance Class 1, 2 and 3; — congested area; — elevated heliport; — helideck; — heliport; — hostile environment; — maximum operational passenger seating configuration (MOPSC); — non-hostile environment;			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— obstacle; — rotor radius (R); — take-off mass; — touchdown and lift-off area (TLOF); — safe forced landing; — speed for best rate of climb (V_y); — never exceed speed (V_{NE}); — velocity landing gear extended (V_{LE}); — velocity landing gear operation (V_{LO}); — cruising speed and maximum cruising speed.										
(02)		Define the following terms: — reported headwind component; — take-off decision point (TDP); — defined point after take-off (DPATO); — take-off distance required helicopter (TODRH); — take-off distance available helicopter (TODAH); — distance required (DR);			X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— rejected take-off distance required helicopter (RTODRH); — rotation point (RP); — committal point (CP); — defined point before landing (DPBL); — landing decision point (LDP); — landing distance available helicopter (LDAH); — landing distance required helicopter (LDRH); — ditching (see operations).										
(03)		Understand the meaning and significance of the acronyms AEO and OEI.			X	X						
(04)		Define the terms ‘climb angle’ and ‘climb gradient’.			X	X						
(05)		Define the terms ‘flight-path angle’ and ‘flight-path gradient’.			X	X						
(06)		Define ‘$V_{maxRange}$’ (speed for maximum range) and V_{maxEnd} (speed for maximum endurance).			X	X	X					
(07)		Define and calculate the gradient by using power, wind, and helicopter mass.			X	X						
(08)		Explain the terms ‘operational ceiling’ and ‘absolute ceiling’.			X	X	X					
(09)		Explain the term ‘service ceiling OEI’.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(10)		Explain the difference between hovering in ground effect (HIGE) and hovering out of ground effect (HOGE).			X	X	X					
034 01 02 03		***Power required/power available curves***										
(01)		Understand and interpret the power required/power available versus TAS graphs.			X	X	X					
034 01 02 04		***Height–velocity graphs***										
(01)		Understand and interpret height–velocity graphs.			X	X	X					
034 01 02 05		***Influencing variables on performance***										
(01)		Explain how the following factors affect helicopter performance: — pressure altitude; — humidity; — temperature; — wind; — helicopter mass; — helicopter configuration; — helicopter centre of gravity (CG).			X	X	X					
034 02 00 00		**PERFORMANCE CLASS 3 — SINGLE-ENGINE HELICOPTERS**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
034 02 01 00		**Effect of variables on single-engine (SE) helicopter performance**										
034 02 01 01		***Effect of variables on SE helicopter performance***										
(01)		Determine the wind component, altitude and temperature for hovering, take-off and landing.			X	X	X					
(02)		Explain that operations are to be conducted only from/to heliports and over such routes, areas and diversions contained in a non-hostile environment where a safe forced landing can be carried out (point CAT.OP.MPA.137 of the MCAR on air operations, except when the helicopter is approved to operate in accordance with point CAT.POL.H.420). (Consider the exception: Operations may be conducted in a hostile environment. Ground level exposure — and exposure for elevated final approach and take-off areas (FATOs) or helidecks in non-hostile environments — is allowed for operations approved under CAT.POL.H.305, during the take-off and landing phases.)			X	X	X					
(03)		Explain the effect of temperature, wind and altitude on climb, cruise and descent performance.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
034 02 02 00		**Take-off and landing**										
034 02 02 01		***Take-off and landing (including hover)***										
(01)		Explain the take-off and landing requirements.			X	X	X					
(02)		Explain the maximum allowed take-off and landing mass.			X	X	X					
(03)		Explain that mass has to be restricted to HIGE.			X	X	X					
(04)		Explain that if HIGE is unlikely to be achieved (for example, blocked by an obstruction), then mass must be restricted to HOGE.			X	X	X					
034 02 03 00		**Climb, cruise and descent**										
034 02 03 01		***Climb, cruise and descent (capabilities)***										
(01)		State that the helicopter must be capable of flying its intended track without flying below the appropriate minimum flight altitude and be able to perform a safe forced landing.			X	X	X					
(02)		Explain the effect of altitude on the maximum endurance speed.			X	X	X					
034 02 04 00		**Use of helicopter performance data**										
034 02 04 01		***Take-off (including hover)***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Find the maximum wind component.			X	X	X					
(02)		Find the maximum allowed take-off mass for certain conditions.			X	X	X					
(03)		Find the height–velocity parameters.			X	X	X					
034 02 04 02		***Climb***										
(01)		Find the time, distance and fuel required to climb for certain conditions.			X	X	X					
(02)		Find the rate of climb under given conditions and the best rate-of-climb speed V_Y.			X	X	X					
034 02 04 03		***Cruise***										
(01)		Find the cruising speed and fuel consumption for certain conditions.			X	X	X					
(02)		Calculate the range and endurance under given conditions.			X	X	X					
034 02 04 04		***Landing (including hover)***										
(01)		Find the maximum wind component.			X	X	X					
(02)		Find the maximum allowed landing mass for certain conditions.			X	X	X					
(03)		Find the height–velocity parameters.			X	X	X					
034 03 00 00		**PERFORMANCE CLASS 2**										
		General remark: The Learning Objectives for Performance Class 2 are principally identical										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		with those for Performance Class 1. (See 034 04 00 00) *Additional Learning Objectives are shown below.*										
034 03 01 00		**Operations without an assured safe forced landing capability**										
034 03 01 01		***Responsibility for operations without an assured safe forced landing capability***										
(01)		State the responsibility of the operator for assuring safe forced landings (point CAT.POL.H.305 of the MCAR on air operations).			X	X						
034 03 02 00		**Take-off**										
034 03 02 01		***Take-off requirements***										
(01)		State the climb and other requirements for take-off.			X	X						
034 03 03 00		**Take-off flight path**										
034 03 03 01		***Take-off flight path requirements***										
(01)		State the height above the take-off surface at which at least the requirements for the take-off flight path for Performance Class 1 are to be met.			X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
034 03 04 00		**Landing**										
034 03 04 01		***Landing requirements***										
(01)		State the requirements for the climb capability when OEI.			X	X						
(02)		State the options for a Performance Class 2 operation in the case of a critical power-unit failure at any point in the approach path.			X	X						
(03)		State the limitations for operations to/from a helideck.			X	X						
034 04 00 00		**PERFORMANCE CLASS 1 — HELICOPTERS CERTIFIED ACCORDING TO CS-29 ONLY**										
034 04 01 00		**Take-off**										
034 04 01 01		***Take-off distances***										
(01)		Explain the effects of the following variables on the flight-path and take-off distances: — take-off with HIGE or HOGE; — take-off procedure; — obstacle clearances both laterally and vertically; — take-off from non-elevated heliports;			X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— take-off from elevated heliports or helidecks; — take-off from a TLOF.										
(02)		Explain the effects of the following variables on take-off distances: — mass; — take-off configuration; — bleed-air configurations.			X	X						
(03)		Explain the effects of the following meteorological conditions on take-off distances: — wind; — temperature; — pressure altitude.			X	X						
(04)		Explain the take-off distances for specified conditions and configuration for AEO and OEI.			X	X						
(05)		Explain the effect of obstacles on the take-off distance required.			X	X						
(06)		State the assumed reaction time between engine failure and recognition.			X	X						
(07)		Explain that the flight must be carried out visually up to TDP.			X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
034 04 01 02		***Rejected take-off distance required (helicopter) (RTODR(H))***										
(01)		Explain RTODR(H) for specified conditions and configuration for AEO and OEI.			X	X						
(02)		Explain the time-to-decide allowance (decision time) and deceleration procedure.			X	X						
034 04 01 03		***Intentionally left blank***										
034 04 01 04		***Take-off climb***										
(01)		Define the segments of the take-off flight path.			X	X						
(02)		Explain the effect of changes in the configuration on power and speed in the segments.			X	X						
(03)		Explain the climb-gradient requirements for OEI.			X	X						
(04)		State the minimum altitude over the take-off path when flying at the take-off safety speed in a Category A helicopter (V_{TOSS}).			X	X						
(05)		Describe the influence of airspeed selection, acceleration and turns on the climb gradient and best rate-of-climb speed.			X	X						
034 04 01 05		***Obstacle-limited take-off***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the operational regulations for obstacle clearance of the take-off flight path in the departure sector with OEI.			X	X						
034 04 01 06		***Use of helicopter performance data***										
(01)		Determine from helicopter performance data sheets the maximum mass that satisfies the operational regulations for take-off in terms of regulated take-off mass, TODRH and minimum gradients for climb and obstacle clearance.			X	X						
034 04 02 00		**Climb**										
034 04 02 01		***Climb techniques***										
(01)		Explain the effect of climbing with best rate-of-climb speed (V_Y).			X	X						
(02)		Explain the influence of altitude on V_Y.			X	X						
034 04 02 02		***Use of helicopter flight data***										
(01)		Find the rate of climb and calculate the time to climb to a given altitude.			X	X						
034 04 03 00		**Cruise**										
034 04 03 01		***Cruise techniques***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the cruise procedures for 'maximum endurance' and 'maximum range'.			X	X						
034 04 03 02		***Maximum endurance***										
(01)		Explain fuel flow in relation to true airspeed (TAS).			X	X						
(02)		Explain the speed for maximum endurance.			X	X						
034 04 03 03		***Maximum range***										
(01)		Explain the speed for maximum range.			X	X						
034 04 03 04		***Maximum cruise***										
(01)		Explain the speed for maximum cruise.			X	X						
034 04 03 05		***Cruise altitudes***										
(01)		Explain the factors which might affect or limit the operating altitude.			X	X						
(02)		Understand the relation between power setting, fuel consumption, cruising speed and altitude.			X	X						
034 04 03 06		***Use of helicopter performance data***										
(01)		Determine the fuel consumption from the helicopter performance data sheets in accordance with altitude and helicopter mass.			X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
034 04 04 00		**En-route one-engine-inoperative (OEI)**										
034 04 04 01		***Requirements for en-route flights with OEI***										
(01)		State the flight-path clearance requirements.			X	X						
(02)		Explain drift-down techniques.			X	X						
(03)		State the reduction in the flight-path width when navigational accuracy can be achieved.			X	X						
034 04 04 02		***Use of helicopter flight data***										
(01)		Find the single-engine service ceiling, range and endurance from given engine-inoperative charts.			X	X						
(02)		Find OEI operating data from suitable charts.			X	X						
(03)		Find the amount of fuel to be jettisoned in order to reduce helicopter mass.			X	X						
(04)		Calculate the relevant parameters for drift-down procedures.			X	X						
034 04 05 00		**Descent**										
034 04 05 01		***Use of helicopter flight data***										
(01)		Find the rate of descent and calculate the time to descend to a given altitude.			X	X						
034 04 06 00		**Landing**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
034 04 06 01		***Landing requirements***										
(01)		State the requirements for landing.			X	X						
034 04 06 02		***Landing procedures***										
(01)		Explain the procedure for critical power-unit failure before and after the landing decision point.			X	X						
(02)		Explain that the portion of flight after the landing decision point must be carried out visually.			X	X						
(03)		Explain the procedures and required obstacle clearances for landings on different heliports/helidecks.			X	X						
034 04 06 03		***Use of helicopter performance data***										
(01)		Determine from helicopter performance data sheets the maximum mass that satisfies the operational regulations for landing in terms of regulated landing mass, LDRH and minimum gradients for climb and obstacle clearance.			X	X						

SUBJECT 040 – HUMAN PERFORMANCE AND LIMITATIONS

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
040 00 00 00		**HUMAN PERFORMANCE AND LIMITATIONS**										
040 01 00 00		**HUMAN FACTORS: BASIC CONCEPTS**										
040 01 01 00		**Human factors in aviation**										
040 01 01 01		***Becoming a competent pilot***										
(01)		State that competence is based on knowledge, skills and attitudes of the individual pilot, and list the ICAO eight core competencies: — application of procedures; — communication; — aircraft flight path management, automation; — aircraft flight path management, manual control; — leadership and teamwork; — problem-solving and decision-making; — situation awareness; — workload management.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
040 01 02 00		**Intentionally left blank**										
040 01 03 00		**Flight safety concepts**										
040 01 03 01		***Threat and error management (TEM) model and SHELL model***										
(01)		Explain the three components of the TEM model.	X	X	X	X	X	X	X			
(02)		Explain and give examples of latent threats.	X	X	X	X	X	X	X	1		
(03)		Explain and give examples of environmental threats.	X	X	X	X	X	X	X	1		
(04)		Explain and give examples of organisational threats.	X	X	X	X	X	X	X	1		
(05)		Explain and give a definition of ‘error’ according to the TEM model of ICAO Doc 9683 (Part II, Chapter 2).	X	X	X	X	X	X	X	1		
(06)		Give examples of different countermeasures which may be used in order to manage threats, errors, and undesired aircraft states.	X	X	X	X	X	X	X	1		
(07)		Explain and give examples of procedural error, communication errors, and aircraft handling errors.	X	X	X	X	X	X	X	1		
(08)		Explain and give examples of ‘undesired aircraft states’.	X	X	X	X	X	X				
(09)		State the components of the SHELL model.	X	X	X	X	X	X				
(10)		State the relevance of the SHELL model to the work in the cockpit.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
040 01 04 00		**Safety culture**										
040 01 04 01		***Safety culture and safety management***										
(01)		Distinguish between 'open cultures' and 'closed cultures'.	X	X	X	X	X	X	X		1	
(02)		Illustrate how safety culture is reflected in national culture.	X	X	X	X	X	X	X		1	
(03)		Discuss the established expression 'safety first' in a commercial entity.	X	X	X	X	X	X				
(04)		Explain James Reason's 'Swiss Cheese Model'.	X	X	X	X	X	X	X	1		
(05)		State the important factors that promote a good safety culture.	X	X	X	X	X	X	X		1	
(06)		Distinguish between 'just culture' and 'non-punitive culture'.	X	X	X	X	X	X	X		1	
(07)		Name the five components which form safety culture (according to James Reason: informed culture, reporting culture, learning culture, just culture, flexible culture).	X	X	X	X	X	X	X		1	
(08)		Name the basic concepts of safety management system (SMS) (including hazard identification and risk management) and its relationship with safety culture in order to: — define how the organisation is set up to manage risks;	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— identify workplace risk and implement suitable controls; — implement effective communication across all levels of the organisation.										
040 02 00 00		**BASICS OF AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE**										
040 02 01 00		**Basics of flight physiology**										
040 02 01 01		***The atmosphere***										
(01)		State that the volume percentage of the gases in ambient air will remain constant at all altitudes at which conventional aircraft operate.	X	X	X	X	X	X				
040 02 01 02		***Respiratory and circulatory system***										
(01)		List the main components of the respiratory system and their function.	X	X	X	X	X	X				
(02)		Identify the different volumes of air in the lungs and state the normal respiratory rate.	X	X	X	X	X	X			1	
(03)		Explain the role of carbon dioxide in the control and regulation of respiration.	X	X	X	X	X	X			1	
(04)		Describe the basic processes of external respiration and internal respiration.	X	X	X	X	X	X				
(05)		List the factors that determine pulse rate.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Name the major components of the circulatory system and describe their function.	X	X	X	X	X	X				
(07)		State the values for a normal pulse rate and the average cardiac output (heart rate × stroke volume) of an adult at rest.	X	X	X	X	X	X				
(08)		Define ‘systolic’ and ‘diastolic’ blood pressure.	X	X	X	X	X	X				
(09)		State the normal blood pressure ranges and units of measurement.	X	X	X	X	X	X				
(10)		List the main constituents of blood and describe their functions.	X	X	X	X	X	X				
(11)		Stress the function of haemoglobin in the circulatory system.	X	X	X	X	X	X				
(12)		Define ‘anaemia’ and state its common causes.	X	X	X	X	X	X				
(13)		Indicate the effect of increasing altitude on haemoglobin oxygen saturation.	X	X	X	X	X	X			1	
		Hypertension and hypotension										
(14)		Define ‘hypertension’ and ‘hypotension’.	X	X	X	X	X	X				
(15)		List the effects that high and low blood pressure will have on some normal functions of the human body.	X	X	X	X	X	X				
(16)		State that both hypotension and hypertension may disqualify a pilot from obtaining medical clearance to fly.	X	X	X	X	X	X				
(17)		List the factors which can lead to hypertension for an individual.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(18)		State the corrective actions that may be taken to reduce high blood pressure.	X	X	X	X	X	X				
(19)		Stress that hypertension is the major factor of strokes in the general population.	X	X	X	X	X	X				
		Coronary artery disease										
(20)		Differentiate between 'angina' and 'heart attack'.	X	X	X	X	X	X				
(21)		Explain the major risk factors for coronary disease.	X	X	X	X	X	X				
(22)		State the role physical exercise plays in reducing the chances of developing coronary disease.	X	X	X	X	X	X				
		Hypoxia										
(23)		Define the two major forms of hypoxia (hypoxic and anaemic), and the common causes of both.	X	X	X	X	X	X				
(24)		State the symptoms of hypoxia.	X	X	X	X	X	X			1	
(25)		State that healthy people are able to compensate for altitudes up to approximately 10 000–12 000 ft.	X	X	X	X	X	X				
(26)		Name the three physiological thresholds and allocate the corresponding altitudes for each of them: — reaction threshold (7 000 ft); — disturbance threshold (10–12 000 ft); and	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— critical threshold (22 000 ft).										
(27)		State the altitude at which short-term memory begins to be affected by hypoxia.	X	X	X	X	X	X			1	
(28)		Define the terms ‘time of useful consciousness’ (TUC) and ‘effective performance time’ (EPT).	X	X	X	X	X	X				
(29)		State that TUC varies among individuals, but the approximate values for a person seated (at rest) are: — 20 000 ft 30 min — 30 000 ft 1–2 min — 35 000 ft 30–90 s — 40 000 ft 15–20 s	X	X	X	X	X	X				
(30)		List the factors that determine the severity of hypoxia.	X	X	X	X	X	X				
(31)		State the equivalent altitudes when breathing ambient air and 100 % oxygen at mean sea level (MSL) and at approximately 10 000, 30 000 and 40 000 ft.	X	X	X	X	X	X				
		Hyperventilation										
(32)		Describe the role of carbon dioxide in hyperventilation.	X	X	X	X	X	X				
(33)		Define the term ‘hyperventilation’.	X	X	X	X	X	X				
(34)		List the factors that cause hyperventilation.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(35)		State that hyperventilation may be caused by psychological or physiological reasons.	X	X	X	X	X	X				
(36)		List the signs and symptoms of hyperventilation.	X	X	X	X	X	X				
(37)		List the measures which may be taken to counteract hyperventilation: breath slowly, close one opening of the nose, speak loudly, place a paper bag over nose and mouth.	X	X	X	X	X	X				
		Decompression sickness/illness										
(38)		State the normal range of cabin pressure altitude in pressurised commercial air transport aircraft and describe its protective function for aircrew and passengers.	X	X	X	X	X	X				
(39)		List the vital actions the crew has to perform when cabin pressurisation is lost (oxygen mask on, emergency descent, land as soon as possible, and no further flight for the next minimum 24 hours). State that decompression sickness symptoms can occur up to 24 hours later.	X	X	X	X	X	X				
(40)		Identify the causes of decompression sickness in flight operation.	X	X	X	X	X	X				
(41)		State how decompression sickness can be prevented.	X	X	X	X	X	X				
(42)		List the symptoms of decompression sickness (bends, creeps, chokes, staggers).	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(43)		Indicate how decompression sickness may be treated.	X	X	X	X	X	X				
(44)		Define the hazards of diving and flying, and give the recommendations associated with these activities.	X	X	X	X	X	X			1	
		Acceleration										
(45)		Define 'linear acceleration' and 'angular acceleration'.	X	X	X	X	X	X	X	1		
(46)		Describe the effects of z-acceleration on the circulation and blood volume distribution.	X	X	X	X	X	X		1		
(47)		List magnitude, duration and onset as factors that determine the effects of acceleration on the human body.	X	X	X	X	X	X	X	1		
(48)		List the effects of positive acceleration with respect to type, sequence and corresponding G-load.	X	X	X	X	X	X		1		
		Carbon monoxide										
(49)		State how carbon monoxide is produced.	X	X	X	X	X	X		1		
(50)		State how the presence of carbon monoxide in the blood affects the distribution of oxygen.	X	X	X	X	X	X				
(51)		List the signs and symptoms of carbon-monoxide poisoning.	X	X	X	X	X	X		1		
(52)		Explain immediate countermeasures on suspicion of carbon-monoxide poisoning and how poisoning can be treated later on the ground.	X	X	X	X	X	X		1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
040 02 01 03		***High-altitude environment***										
(01)		State how an increase in altitude may change the proportion of ozone in the atmosphere and that aircraft can be equipped with special ozone removers.	X									
		Radiation										
(02)		State the sources of radiation at high altitude.	X									
(03)		List the effects of excessive exposure to radiation.	X									
		Humidity										
(04)		List the factors that affect the relative humidity of both the atmosphere and cabin air.	X									
(05)		List the effects of low humidity on human body to be spurious thirst, dry eyes, skin and mucous membranes, and indicate measures that can be taken: drinking water, using eye drops and aqueous creams.	X									
040 02 02 00		**People and the environment: the sensory system**										
040 02 02 01		***The different senses***										
(01)		List the different senses.	X	X	X	X	X	X	X		1	
040 02 02 02		***Central, peripheral and autonomic nervous system***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Define the term ‘sensory threshold’.	X	X	X	X	X	X				
(02)		Define the term ‘sensitivity’, especially in the context of vision.	X	X	X	X	X	X				
(03)		Give examples of sensory adaptation.	X	X	X	X	X	X				
(04)		Define the term ‘habituation’ and state its implication for flight safety.	X	X	X	X	X	X				
040 02 02 03		***Vision***										
		Functional anatomy										
(01)		Name the most important parts of the eye and the pathway to the visual cortex.	X	X	X	X	X					
(02)		State the basic functions of the parts of the eye.	X	X	X	X	X	X		1		
(03)		Define ‘accommodation’.	X	X	X	X	X	X				
(04)		Distinguish between the functions of the rod and cone cells.	X	X	X	X	X	X				
(05)		Describe the distribution of rod and cone cells in the retina and explain their relevance to vision.	X	X	X	X	X	X				
		The fovea (fovea centralis) and peripheral vision										
(06)		Explain the terms ‘visual acuity’, ‘visual field’, ‘central vision’, ‘peripheral vision’ and ‘the fovea’, and explain their function in the process of vision.	X	X	X	X	X	X				
(07)		List the factors that may degrade visual acuity and the importance of ‘lookout’.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		State the limitations of night vision and the different scanning techniques at both night and day.	X	X	X	X	X	X				
(09)		State the time necessary for the eye to adapt both to bright light and the dark.	X	X	X	X	X	X		1		
(10)		State the effect of hypoxia, smoking and altitude in excess of 5 000 ft on night vision.	X	X	X	X	X	X				
(11)		Explain the nature of colour blindness.	X	X	X	X	X	X				
		Binocular and monocular vision										
(12)		Distinguish between monocular and binocular vision.	X	X	X	X	X	X				
(13)		Explain the basis of depth perception and its relevance to flight performance.	X	X	X	X	X	X				
(14)		List the possible monocular cues for depth perception.	X	X	X	X	X	X				
(15)		State that for high-energy blue light and UV rays, sunglasses can prevent damage to the retina.	X	X	X	X	X	X				
		Defective vision										
(16)		Explain long-sightedness, short-sightedness and astigmatism.	X	X	X	X	X	X				
(17)		List the causes of and the precautions that may be taken to reduce the probability of vision loss due to: — presbyopia; — cataract;	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— glaucoma.										
(18)		List the types of sunglasses that could cause perceptional problems in flight.	X	X	X	X	X	X				
(19)		List the measures that may be taken to protect oneself from flash blindness.	X	X	X	X	X	X				
(20)		State the possible problems associated with contact lenses.	X	X	X	X	X	X				
(21)		State the current rules/regulations governing the wearing of corrective spectacles and contact lenses when operating as a pilot.	X	X	X	X	X	X				
(22)		Explain the significance of the 'blind spot' on the retina in detecting other traffic in flight.	X	X	X	X	X	X				
040 02 02 04		***Hearing***										
		Descriptive and functional anatomy										
(01)		State the basic parts and functions of the outer, the middle and the inner ear.	X	X	X	X	X	X				
(02)		Differentiate between the functions of the vestibular apparatus and the cochlea in the inner ear.	X	X	X	X	X	X				
		Hearing loss										
(03)		Define the main causes of the following hearing defects/loss: — 'conductive deafness'; — 'noise-induced hearing loss' (NIHL);	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— ‘presbycusis’.										
(04)		Summarise the effects of environmental noise on hearing.	X	X	X	X	X	X				
(05)		State the decibel level of received noise that will cause NIHL.	X	X	X	X	X	X				
(06)		Identify the potential occupational risks that may cause hearing loss.	X	X	X	X	X	X				
(07)		List the main sources of hearing loss in the flying environment.	X	X	X	X	X	X				
(08)		List the precautions that may be taken to reduce the probability of onset of hearing loss.	X	X	X	X	X	X				
040 02 02 05		***Equilibrium***										
		Functional anatomy										
(01)		List the main elements of the vestibular apparatus.	X	X	X	X	X	X		1		
(02)		State the functions of the vestibular apparatus on the ground and in flight.	X	X	X	X	X	X		1		
(03)		Distinguish between the component parts of the vestibular apparatus in the detection of linear and angular acceleration as well as on gravity.	X	X	X	X	X	X		1		
(04)		Explain how the semicircular canals are stimulated.	X	X	X	X	X	X			1	
		Motion sickness										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe air sickness and its accompanying symptoms.	X	X	X	X	X	X	X	1		
(06)		List the causes of air sickness.	X	X	X	X	X	X	X	1		
(07)		Describe the necessary actions to be taken to counteract the symptoms of air sickness.	X	X	X	X	X	X		1		
040 02 02 06		***Integration of sensory inputs***										
(01)		State the interaction between vision, equilibrium, proprioception and hearing to obtain spatial orientation in flight.	X	X	X	X	X	X	X	1		
(02)		Define the term 'illusion'.	X	X	X	X	X	X	X	1		
(03)		Give examples of visual illusions based on shape constancy, size constancy, aerial perspective, atmospheric perspective, the absence of focal or ambient cues, autokinesis, vectional false horizons, field myopia, and surface planes.	X	X	X	X	X	X	X	1		
(04)		Relate these illusions to problems that may be experienced in flight and identify the danger attached to them.	X	X	X	X	X	X	X	1		
(05)		List approach and landing illusions for slope of the runway, black-hole approach, and terrain around runway, and state the danger involved with recommendations to avoid or counteract the problems with high or low approach or flare at the wrong time.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		State the problems associated with flickering lights (strobe lights, anti-collision lights, propellers and rotors under certain light conditions, etc.).	X	X	X	X	X	X	X	1		
(07)		Describe vestibular illusions caused by the angular accelerations (the Leans, Coriolis) and linear accelerations (somatogravic, G-effect).	X	X	X	X	X	X	X	1		
(08)		Relate the above-mentioned vestibular illusions to problems encountered in flight and state the dangers involved.	X	X	X	X	X	X	X	1		
(09)		State that the 'seat-of-the-pants' sense is completely unreliable when visual contact with the ground is lost or when flying in instrument meteorological conditions (IMC) or with a poor visual horizon.	X	X	X	X	X	X	X	1		
(10)		Differentiate between vertigo, Coriolis effect, and spatial disorientation.	X	X	X	X	X	X	X	1		
(11)		List the measures to prevent or overcome spatial disorientation.	X	X	X	X	X	X	X	1		
040 02 03 00		**Health and hygiene**										
040 02 03 01		***Intentionally left blank***										
040 02 03 02		***Body rhythm and sleep***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Name some internal body rhythms and their relevance to sleep. Explain that the most important of which is body temperature.	X	X	X	X						
(02)		Explain the term ‘circadian rhythm’.	X	X	X	X	X					
(03)		State the approximate duration of a ‘free-running’ rhythm.	X	X	X	X	X					
(04)		Explain the significance of the ‘internal clock’ in regulating the normal circadian rhythm.	X	X	X	X	X					
(05)		State the effect of the circadian rhythm of body temperature on an individual’s performance standard and on an individual’s sleep patterns.	X	X	X	X	X					
(06)		List and describe the stages of a sleep cycle.	X	X	X	X	X					
(07)		Differentiate between rapid eye movement (REM) and non-REM sleep.	X	X	X	X	X					
(08)		Explain the function of sleep and describe the effects of insufficient sleep on performance.	X	X	X	X	X					
(09)		Explain the simple calculations for the sleep/wake credit/debit situation.	X	X	X	X	X					
(10)		Explain how sleep debit can become cumulative.	X	X	X	X	X					
(11)		State the time formula for the adjustment of body rhythms to the new local time scale after crossing time zones.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)		State the problems caused by circadian disrhythmia (jet lag) with regard to an individual's performance and sleep.	X	X	X	X	X					
(13)		Differentiate between the effects of westbound and eastbound travel.	X	X	X	X	X					
(14)		Explain the interactive effects of circadian rhythm and vigilance on a pilot's performance during flight as the duty day elapses.	X	X	X	X	X					
(15)		Describe the main effects of lack of sleep on an individual's performance.	X	X	X	X	X					
(16)		List the possible strategies to cope with jet lag.	X	X	X	X	X					
040 02 03 03		***Problem areas for pilots***										
		Common minor ailments										
(01)		State the role of the Eustachian tube in equalising pressure between the middle ear and the environment.	X	X	X	X	X	X				
(02)		State that the in-flight environment may increase the severity of symptoms which may be minor while on the ground.	X	X	X	X	X	X				
(03)		List the negative effects of suffering from colds or flu on flight operations especially with regard to the middle ear, the sinuses, and the teeth.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		State when a pilot should seek medical advice from an aeromedical examiner (AME) or aeromedical centre (AeMC).	X	X	X	X	X	X				
(05)		Describe the measures to prevent or clear problems due to pressure changes during flight.	X	X	X	X	X	X				
		Entrapped gases and barotrauma										
(06)		Define 'barotrauma'.	X	X	X	X	X	X				
(07)		Differentiate between otic, sinus, gastrointestinal and aerodontalgia (of the teeth) barotraumas and explain avoidance strategies.	X	X	X	X	X	X				
(08)		Explain why the effects of otic barotrauma can be worse in the descent.	X	X	X	X	X	X				
		Gastrointestinal upsets										
(09)		State the effects of gastrointestinal upsets that may occur during flight.	X	X	X	X	X	X				
(10)		List the precautions that should be observed to reduce the occurrence of gastrointestinal upsets.	X	X	X	X	X	X				
(11)		Indicate the major sources of gastrointestinal upsets.	X	X	X	X	X	X				
		Obesity										
(12)		Define 'obesity'.	X	X	X	X	X	X				
(13)		State the following harmful effects obesity can cause:	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— possibility of developing coronary problems; — increased chances of developing diabetes; — reduced ability to withstand G-forces; — development of problems with the joints of the limbs; — general circulatory problems; — reduced ability to cope with hypoxia or decompression sickness; — sleep apnoea.										
(14)		Describe the problems associated with Type 2 (mostly adult) diabetes: — risk factors; — insulin resistance; — complications (vascular, neurological) and the consequences for the medical licence; — pilots are not protected from Type 2 diabetes more than other people.	X	X	X	X	X	X				
(15)		Describe the typical back problems (unspecific back pain, slipped disc) that pilots have. Explain also the ways of preventing and treating these problems:	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— good sitting posture; — lumbar support; — good physical condition; — in-flight exercise, if possible; — physiotherapy.										
		Food hygiene										
(16)		Stress the importance of and methods to be adopted by aircrew, especially when travelling abroad, to avoid contaminated food and liquids.	X	X	X	X	X	X				
(17)		List the major contaminating sources in foodstuffs.	X	X	X	X	X	X				
(18)		State the major constituents of a healthy diet.	X	X	X	X	X	X				
(19)		State the measure to avoid hypoglycaemia.	X	X	X	X	X	X				
(20)		State the importance of adequate hydration.	X	X	X	X	X	X				
		Tropical climates										
(21)		List the problems associated with operating in tropical climates.	X	X	X	X	X					
(22)		State the possible causes/sources of incapacitation in tropical countries with reference to: — standards of hygiene; — quality of water supply;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— insect-borne diseases; — parasitic worms; — rabies or other diseases that may be spread through contact with animals; — sexually transmitted diseases.										
(23)		State the precautions to be taken to reduce the risks of developing problems in tropical areas.	X	X	X	X	X					
		Infectious diseases										
(24)		State the major infectious diseases that may severely incapacitate or kill individuals.	X	X	X	X	X	X				
(25)		State the precautions that must be taken to ensure that disease-carrying insects are not transported between areas.	X	X	X	X	X	X				
040 02 03 04		***Intoxication***										
		Tobacco										
(01)		State the harmful effects of tobacco on: — the respiratory system; — the cardiovascular system; — the ability to resist hypoxia; — the ability to withstand G-forces; — night vision.	X	X	X	X	X	X			1	
		Caffeine										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Indicate the level of caffeine dosage at which performance is degraded.	X	X	X	X	X	X				
(03)		Besides coffee, indicate other beverages containing caffeine.	X	X	X	X	X	X				
		Alcohol										
(04)		State the maximum acceptable limit of alcohol for flight crew according to the applicable regulations.	X	X	X	X	X	X				
(05)		State the effects of alcohol consumption on: — the ability to reason; — inhibitions and self-control; — vision; — the sense of balance and sensory illusions; — sleep patterns; — hypoxia.	X	X	X	X	X	X				
(06)		State the effects alcohol may have if consumed together with other drugs.	X	X	X	X	X	X				
(07)		List the signs and symptoms of alcoholism.	X	X	X	X	X	X				
(08)		List the factors that may be associated with the development of alcoholism.	X	X	X	X	X	X				
(09)		Define the ‘unit’ of alcohol and state the approximate elimination rate from the blood.	X	X	X	X	X	X				
(10)		State the maximum daily and weekly intake of units of alcohol which may be consumed	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		without causing damage to the organs and systems of the human body.										
(11)		Discuss the actions that might be taken if a crew member is suspected of being an alcoholic.	X		X	X						
		Prescription and non-prescription drugs and self-medication										
(12)		State the dangers associated with the use of non-prescription drugs.	X	X	X	X	X	X			1	
(13)		State the side effects of common non-prescription drugs used to treat colds, flu, hay fever and other allergies, especially medicines containing antihistamine preparations.	X	X	X	X	X	X			1	
(14)		Interpret the rules relevant to using (prescription or non-prescription) drugs that the pilot has not used before.	X	X	X	X	X	X			1	
(15)		Interpret the general rule that 'if a pilot is so unwell that they require any medication, then they should consider themselves unfit to fly'.	X	X	X	X	X	X			1	
		Toxic materials										
(16)		List those materials present in an aircraft which may, when uncontained, cause severe health problems.	X	X	X	X	X	X				
(17)		List those aircraft-component parts which if burnt may give off toxic fumes.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(18)		Describe a fume event and the possible incapacitating effects on those exposed to it.	X	X	X	X	X	X				
040 02 03 05		***Incapacitation in flight***										
(01)		State that incapacitation is most dangerous when its onset is insidious.	X	X	X	X	X	X				
(02)		List the major causes of in-flight incapacitation.	X	X	X	X	X	X				
(03)		State the importance of crew to be able to recognise and promptly react upon incapacitation of other crew members, should it occur in flight.	X		X	X						
(04)		Explain methods and procedures to cope with incapacitation in flight.	X	X	X	X	X	X				
040 03 00 00		**BASIC AVIATION PSYCHOLOGY**										
040 03 01 00		**Human information processing**										
040 03 01 01		***Attention and vigilance***										
(01)		Differentiate between ‘attention’ and ‘vigilance’.	X	X	X	X	X	X				
(02)		Differentiate between ‘selective’ and ‘divided’ attention.	X	X	X	X	X	X				
(03)		Define ‘hypovigilance’.	X	X	X	X	X	X				
(04)		Identify the factors that may affect the state of vigilance.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		List the factors that may forestall hypovigilance during flight.	X	X	X	X	X	X				
(06)		Indicate the signs of reduced vigilance.	X	X	X	X	X	X				
(07)		List the factors that affect a person's level of attention.	X	X	X	X	X	X				
040 03 01 02		***Perception***										
(01)		Name the basis of the perceptual process.	X	X	X	X	X	X				
(02)		Describe the mechanism of perception ('bottom-up'/'top-down' process).	X	X	X	X	X	X				
(03)		Illustrate why perception is subjective and state the relevant factors that influence interpretation of perceived information.	X	X	X	X	X	X				
(04)		Describe some basic perceptual illusions.	X	X	X	X	X	X				
(05)		Illustrate some basic perceptual concepts.	X	X	X	X	X	X				
(06)		Give examples where perception plays a decisive role in flight safety.	X	X	X	X	X	X				
(07)		Stress how persuasive and believable mistaken perception can manifest itself both for an individual and a group.	X	X	X	X	X	X				
040 03 01 03		***Memory***										
(01)		Explain the link between the types of memory (to include sensory, working/short-term and long-term memory).	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Describe the differences between the types of memory in terms of capacity and retention time.	X	X	X	X	X	X				
(03)		Justify the importance of sensory-store memories in processing information.	X	X	X	X	X	X				
(04)		State the average maximum number of separate items that may be held in working memory (5 ± 2).	X	X	X	X	X	X				
(05)		Stress how interruption can affect short-term/working memory.	X	X	X	X	X	X				
(06)		Give examples of items that are important for pilots to hold in working memory during flight.	X	X	X	X	X	X				
(07)		Describe how the capacity of the working-memory store may be increased.	X	X	X	X	X	X				
(08)		State the subdivisions of long-term memory and give examples of their content.	X	X	X	X	X	X				
(09)		Explain that skills are kept primarily in the long-term memory.	X	X	X	X	X	X				
(10)		Describe amnesia and how it affects memory.	X	X	X	X	X	X				
(11)		Name the common problems with both the long- and short-term memories and the best methods to try to counteract them.	X	X	X	X	X	X				
040 03 01 04		***Response selection***										
		Learning principles and techniques										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain and distinguish between the following basic forms of learning: — classic and operant conditioning (behaviouristic approach); — learning by insight (cognitive approach); — learning by imitating (modelling).	X	X	X	X	X	X				
(02)		Recognise pilot-related examples as behaviouristic, cognitive or modelling forms of learning.	X	X	X	X	X	X				
(03)		State the factors that are necessary for and promote the quality of learning: — intrinsic motivation; — good mental health; — rehearsals for improvement of memory; — consciousness; — vigilance; — application in practical exercises.	X	X	X	X	X	X				
(04)		Explain ways to facilitate the memorisation of information with the following learning techniques: — mnemonics;	X	X	X	X	X	X			1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— mental training.										
(05)		Describe the advantage of planning and anticipation of future actions: — define the term 'skills'; — state the three phases of learning a skill (Anderson: cognitive, associative and autonomous phase).	X	X	X	X	X	X			1	
(06)		Explain the term 'motor programme' or 'mental schema'.	X	X	X	X	X	X				
(07)		Describe the advantages and disadvantages of mental schemas.	X	X	X	X	X	X				
(08)		Explain the Rasmussen model which describes the guidance of a pilot's behaviour in different situations.	X	X	X	X	X	X				
(09)		State the possible problems or risks associated with skill-, rule- and knowledge-based behaviour.	X	X	X	X	X	X				
		Motivation										
(10)		Define 'motivation'.	X	X	X	X	X	X				
(11)		Explain the relationship between motivation and learning.	X	X	X	X	X	X				
(12)		Explain the problems of over-motivation, especially in the context of the extreme need to achieve.	X	X	X	X	X	X				
040 03 02 00		**Human error and reliability**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
040 03 02 01		***Reliability of human behaviour***										
(01)		Name and explain the factors that influence human reliability.	X	X	X	X	X	X				
040 03 02 02		***Mental models and situation awareness***										
(01)		Define the term 'situation awareness'.	X	X	X	X	X	X	X		1	
(02)		List the cues that indicate loss of situation awareness and name the steps to regain it.	X	X	X	X	X	X	X	1		
(03)		List the factors that influence one's situation awareness both positively and negatively, and stress the importance of situation awareness in the context of flight safety.	X	X	X	X	X	X	X	1		
(04)		Define the term 'mental model' in relation to a surrounding complex situation.	X	X	X	X	X	X	X	1		
(05)		Describe the advantages/disadvantages of mental models.	X	X	X	X	X	X	X	1		
(06)		Explain the relationship between personal 'mental models' and the creation of cognitive illusions.	X	X	X	X	X	X	X	1		
040 03 02 03		***Theory and model of human error***										
(01)		Explain the concept of the 'error chain'.	X	X	X	X	X	X	X	1		
(02)		Differentiate between an isolated error and an error chain.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Distinguish between the main forms/types of errors (i.e. slips, faults, omissions and violations).	X	X	X	X	X	X	X	1		
(04)		Discuss the above errors and their relevance in flight.	X	X	X	X	X	X	X	1		
(05)		Distinguish between an active and a latent error, and give examples.	X	X	X	X	X	X	X	1		
040 03 02 04		***Error generation***										
(01)		Distinguish between internal and external factors in error generation.	X	X	X	X	X	X	X	1		
(02)		Identify possible sources of internal error generation.	X	X	X	X	X	X	X	1		
(03)		Define and discuss the two errors associated with motor programmes (action slip and environmental capture).	X	X	X	X	X	X	X	1		
(04)		List the three main sources of external error generation in the flight crew compartment.	X	X	X	X	X	X	X	1		
(05)		Give examples to illustrate the following factors in external error generation in the flight crew compartment: — ergonomics; — economics; — social environment.	X	X	X	X	X	X	X	1		
(06)		Name the major goals in the design of human-centred human–machine interfaces.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Define the term 'error tolerance'.	X	X	X	X	X	X	X	1		
(08)		List and describe the strategies that are used to reduce human error.	X	X	X	X	X	X	X	1		
(09)		Describe the advantage of planning and the anticipation of future actions.	X	X	X	X	X	X	X			
040 03 03 00		**Decision-making**										
040 03 03 01		***Decision-making concepts***										
(01)		Define the terms 'deciding' and 'decision-making'.	X	X	X	X	X	X	X		1	
(02)		Describe the major factors on which decision-making should be based during the course of a flight.	X	X	X	X	X	X	X		1	
(03)		Describe the main human attributes with regard to decision-making.	X	X	X	X	X	X	X		1	
(04)		Discuss the nature of bias and its influence on the decision-making process.	X	X	X	X	X	X	X		1	
(05)		Describe the main error sources and limits in an individual's decision-making mechanism.	X	X	X	X	X	X	X		1	
(06)		State the factors upon which an individual's risk assessment is based.	X	X	X	X	X	X	X		1	
(07)		Explain the relationship between risk assessment, commitment and pressure of time in decision-making strategies.	X	X	X	X	X	X	X		1	
(08)		Explain the risks associated with dispersion or channelised attention during the	X	X	X	X	X	X			1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		application of procedures requiring a high workload within a short time frame (e.g. a go-around).										
(09)		Describe the positive and negative influences exerted by other group members on an individual's decision-making process (risky shift).	X	X	X	X	X	X	X		1	
(10)		Explain the general idea behind the creation of a model for decision-making based upon: — definition of the aim; — collection of information; — risk assessment; — development of options; — evaluation of options; — decision; — implementation; — consequences; — review and feedback.	X	X	X	X	X	X	X		1	
040 03 04 00		**Avoiding and managing errors: cockpit management**										
040 03 04 01		***Safety awareness***										
(01)		Justify the need for being aware of not only one's own performance but that of others	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		before and during a flight and the possible consequences or risks.										
040 03 04 02		***Coordination (multi-crew concepts)***										
(01)		Name the objectives of the multi-crew concept.	X		X	X						
(02)		State and explain the elements of multi-crew concepts.	X		X	X						
(03)		Describe the concepts of 'standard operating procedures' (SOPs), checklists and crew briefings.	X	X	X	X	X					
(04)		Describe the purpose of and procedure for crew briefings.	X		X	X						
(05)		Describe the purpose of and procedure for checklists.	X	X	X	X	X					
(06)		Describe the function of communication in a coordinated team.	X		X	X						
(07)		Explain the advantages of SOPs.	X	X	X	X	X					
(08)		Explain how SOPs contribute to avoiding, reducing and managing threats and errors.	X	X	X	X	X					
(09)		Explain potential threats of SOPs, for example during company or type conversion (e.g. motor programmes, company culture, hazardous attitudes, developed habits).	X	X	X	X	X					
040 03 04 03		***Cooperation***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Distinguish between cooperation and coaction.	X	X	X	X	X					
(02)		Define the term 'group'.	X	X	X	X	X					
(03)		Illustrate the influence of interdependence in a group.	X	X	X	X	X					
(04)		List the advantages and disadvantages of teamwork.	X	X	X	X	X					
(05)		Explain the term 'synergy'.	X	X	X	X	X					
(06)		Define the term 'cohesion'.	X	X	X	X	X					
(07)		Define the term 'groupthink'.	X	X	X	X	X					
(08)		State the essential conditions for good teamwork.	X	X	X	X	X					
(09)		Explain the function of role and norm in a group.	X	X	X	X	X					
(10)		Name the different role patterns which occur in a group situation.	X	X	X	X	X					
(11)		Explain how behaviour can be affected by the following factors: — persuasion; — conformity; — compliance; — obedience.	X	X	X	X	X					
(12)		Distinguish between status and role.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(13)		Stress the inherent dangers of a situation where there is a mix of role and status within the flight crew compartment.	X	X	X	X	X					
(14)		Explain the terms ‘leadership’ and ‘followership’.	X	X	X	X	X					
(15)		Describe the trans-cockpit authority gradient and its affiliated leadership styles (i.e. autocratic, laissez-faire and synergistic).	X	X	X	X	X					
(16)		Name the most important attributes of a positive leadership style.	X	X	X	X	X					
040 03 04 04		***Communication***										
(01)		Define the term ‘communication’.	X	X	X	X	X	X				
(02)		List the most basic components of interpersonal communication.	X	X	X	X	X	X				
(03)		Explain the advantages of in-person two-way communication as opposed to one-way communication.	X	X	X	X	X	X				
(04)		*Intentionally left blank*										
(05)		Name the importance of non-verbal communication.	X	X	X	X	X	X				
(06)		Describe the general aspects of non-verbal communication.	X	X	X	X	X	X				
(07)		Describe the advantages/disadvantages of implicit and explicit communication.	X	X	X	X	X	X				
(08)		Describe the advantages and possible problems of using ‘social’ and ‘professional’	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		language in high-and low-workload situations.										
(09)		Name and explain the major obstacles to effective communication.	X	X	X	X	X	X				
(10)		Explain the difference between intrapersonal and interpersonal conflict.	X	X	X	X	X	X				
(11)		Describe the escalation process in human conflict.	X	X	X	X	X	X				
(12)		List the typical consequences of conflicts between crew members.	X	X	X	X	X	X				
(13)		Explain the following terms as part of the communication practice with regard to preventing or resolving conflicts: — inquiry; — active listening; — advocacy; — feedback; — metacommunication; — negotiation.	X	X	X	X	X	X				
(14)		Describe the limitations of communication in situations of high workload in the flight crew compartment in view of listening, verbal, non-verbal and visual effects.	X	X	X	X	X	X				
040 03 05 00		**Human behaviour**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
040 03 05 01		***Personality, attitude and behaviour***										
(01)		Describe the factors that determine an individual's behaviour.	X	X	X	X	X	X				
(02)		Define and distinguish between 'personality', 'attitude' and 'behaviour'.	X	X	X	X	X	X				
(03)		State the origin of personality and attitude.	X	X	X	X	X	X				
(04)		State that with behaviour good and bad habits can be formed.	X	X	X	X	X	X				
(05)		Explain how behaviour is generally a product of personality, attitude and the environment to which one was exposed at significant moments (childhood, schooling and training).	X	X	X	X	X	X				
(06)		State that personality differences and selfish attitude may have effects on flight crew performance.	X	X	X	X	X	X				
040 03 05 02		***Individual differences in personality and motivation***										
(01)		Describe the individual differences in personality by means of a common trait model (e.g. Eysenck's personality factors) and use it to describe today's ideal pilot.	X	X	X	X	X	X				
		Self-concept										
(02)		Define the term 'self-concept' and the role it plays in any change of personality.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain how a self-concept of under-confidence may lead to an outward show of aggression and self- assertiveness.	X	X	X	X	X	X				
		Self-discipline										
(04)		Define ‘self-discipline’ and justify its importance for flight safety.	X	X	X	X	X	X				
040 03 05 03		***Identification of hazardous attitudes (error proneness)***										
(01)		Explain dangerous attitudes in aviation: — anti-authority; — macho; — impulsivity; — invulnerability; — complacency; — resignation.	X	X	X	X	X				1	
(02)		Describe the personality, attitude and behaviour patterns of an ideal crew member.	X	X	X	X	X					
(03)		Summarise how a person’s attitude influences their work in the flight crew compartment.	X	X	X	X	X					
040 03 06 00		**Human overload and underload**										
040 03 06 01		***Arousal***										
(01)		Explain the term ‘arousal’.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the relationship between arousal and performance.	X	X	X	X	X	X				
(03)		Explain the circumstances under which underload may occur and its possible dangers.	X	X	X	X	X	X			1	
040 03 06 02		***Stress***										
(01)		Explain the term 'stress' and why stress is a natural human reaction.	X	X	X	X	X	X				
(02)		State that the physiological response to stress is generated by the 'fight or flight' response.	X	X	X	X	X	X				
(03)		Describe the function of the autonomic nervous system (ANS) in stress response.	X	X	X	X	X	X				
(04)		Explain the relationship between arousal and stress.	X	X	X	X	X	X				
(05)		State the relationship between stress and performance.	X	X	X	X	X	X	X			
(06)		State the basic categories of stressors.	X	X	X	X	X	X	X			
(07)		List and discuss the major environmental sources of stress in the flight crew compartment.	X	X	X	X	X	X	X		1	
(08)		Discuss the concept of 'break point' with regard to stress, overload and performance.	X	X	X	X	X	X	X		1	
(09)		Name the principal causes of domestic stress.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(10)		State that the stress experienced as a result of particular demands varies among individuals.	X	X	X	X	X	X				
(11)		Explain the factors that lead to differences in the levels of stress experienced by individuals.	X	X	X	X	X	X	X			
(12)		List the factors that influence the tolerance of stressors.	X	X	X	X	X	X			1	
(13)		State that stress is a result of perceived demands and perceived ability.	X	X	X	X	X	X				
(14)		Explain the relationship between stress and anxiety.	X	X	X	X	X	X	X			
(15)		Describe the effects of anxiety on human performance.	X	X	X	X	X	X	X			
(16)		State the general effect of acute stress on people.	X	X	X	X	X	X	X			
(17)		Describe the relationship between stress, arousal and vigilance.	X	X	X	X	X	X				
(18)		State the general effect of chronic stress and the biological reaction by means of the three stages of the general adaptation syndrome (Selye): alarm, resistance, and exhaustion.	X	X	X	X	X	X				
(19)		Explain the differences between psychological, psychosomatic and somatic stress reactions.	X	X	X	X	X	X				
(20)		Name the typical common physiological and psychological symptoms of human overload.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(21)		Describe the effects of stress on human behaviour.	X	X	X	X	X	X				
(22)		Explain how stress is cumulative and how stress from one situation can be transferred to a different situation.	X	X	X	X	X	X	X	1		
(23)		Explain how successful completion of a stressful task will reduce the amount of stress experienced when a similar situation arises in the future.	X	X	X	X	X	X	X	1		
(24)		Describe the effect of human underload/overload on effectiveness in the flight crew compartment.	X	X	X	X	X	X	X	1		
(25)		List sources and symptoms of human underload.	X	X	X	X	X	X	X	1		
040 03 06 03		***Intentionally left blank***										
040 03 06 04		***Intentionally left blank***										
040 03 06 05		***Fatigue and stress management***										
(01)		Explain the term ‘fatigue’ and differentiate between the two types of fatigue (short-term and chronic fatigue).	X	X	X	X	X	X				
(02)		Name the causes of short-term and chronic fatigue.	X	X	X	X	X	X				
(03)		Identify the symptoms and describe the effects of fatigue.	X	X	X	X	X	X			1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		List the strategies that prevent or delay the onset of fatigue and hypovigilance.	X	X	X	X	X	X				
(05)		List and describe strategies for coping with stress factors and stress reactions.	X	X	X	X	X	X				
(06)		Distinguish between short-term and long-term methods of stress management.	X	X	X	X	X	X				
(07)		Give examples of short-term methods of stress management.	X	X	X	X	X	X				
(08)		Give examples of long-term methods of coping with stress.	X	X	X	X	X	X				
(09)		Describe the fatigue risk management system (FRMS) as follows: a data-driven means of continuously monitoring and managing fatigue-related safety risks, based upon scientific principles and knowledge as well as operational experience that aims to ensure relevant personnel are performing at adequate levels of alertness.	X	X	X	X	X	X				
040 03 07 00		**Advanced cockpit automation**										
040 03 07 01		***Advantages and disadvantages***										
(01)		Compare the two basic concepts of automation: — as per Boeing, where the pilot remains the last operator;	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— and as per Airbus, where automated systems can correct erroneous pilot action.										
(02)		Explain the fundamental restrictions of autoflight systems to be lack of creativity in unknown situations, and lack of personal motivation with regard to safety.	X	X	X	X	X	X	X	1		
(03)		List the principal strengths and weaknesses of pilot versus autopilot systems to be creativity, decision-making, prioritisation of tasks, safety attitude versus precision, reliability.	X	X	X	X	X	X	X	1		
(04)		Explain the 'ironies of automation': designers' errors due to wrong interpretation of the data, leaving tasks to the pilot that are too complex to automate, loss of manual and cognitive skills of the pilot. State the necessity for regular training flights as one possible countermeasure.	X	X	X	X	X	X	X	1		
(05)		Describe methods to overcome the drawbacks of autoflight systems to be loss of manual flying capabilities, additional workload through programming, risk of slips during programming, and hypovigilance during cruise.	X	X	X	X	X	X	X	1		
040 03 07 02		***Automation complacency***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the main weaknesses in the monitoring of automatic systems to be hypovigilance during flight, and loss of flying skills.	X	X	X	X	X	X	X			
(02)		Explain some basic flight crew errors and terms that arise with the introduction of automation: — passive monitoring; — blinkered concentration; — confusion; — mode awareness.	X	X	X	X	X	X	X	1		
(03)		Explain how the method of call-outs counteracts ineffective monitoring of automatic systems.	X	X	X	X	X	X	X	1		
(04)		Define 'complacency'.	X	X	X	X	X	X	X	1		
040 03 07 03		***Working concepts***										
(01)		Explain that the potential disadvantages of automation on crew communication are loss of awareness of input errors, flight modes, failure detection, failure comprehension, status of the aircraft and aircraft position.	X		X	X						
(02)		Explain how the negative effects of automation on pilots may be alleviated by degrading to a lower level of automation to recover comprehension of the flight status	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		from VNAV/LNAV to ALT/HDG or even to manual flying.										
(03)		Interpret the role of automation with respect to flight safety regarding the basic principle of the use of manual versus autoflight in normal operations, frequent changes in the flight profile, and in abnormal situations.	X	X	X	X	X	X	X	1		

SUBJECT 050 – METEOROLOGY

The operation of an aircraft is affected by the weather conditions within the atmosphere. The pilot should prove that they fulfil the following objectives in order to complete a flight safely in given meteorological conditions.

(1) Training aims

(i) Knowledge. After completion of the training, the pilot should be able to:

— understand the physical processes in the atmosphere;

— interpret the actual and forecast weather conditions in the atmosphere; and

— demonstrate understanding of the meteorological hazards and their effects on aircraft.

(ii) Skills. After completion of the training, the pilot should be able to:

— collect all the weather information which may affect a given flight;

— analyse and evaluate available weather information before flight as well as that collected in flight; and

— resolve any problems presented by the given weather conditions.

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 00 00 00		**METEOROLOGY**										
050 01 00 00		**THE ATMOSPHERE**										
050 01 01 00		**Composition, extent, vertical division**										
050 01 01 01		***Structure of the atmosphere***										
(01)		Describe the vertical division of the atmosphere up to flight level (FL) 650, based on the temperature variations with height.	X	X	X	X	X	X	X			
(02)		List the different layers and their main qualitative characteristics up to FL 650.	X	X	X	X	X	X	X			
050 01 01 02		***Troposphere***										
(01)		Describe the troposphere.	X	X	X	X	X	X	X			
(02)		Describe the main characteristics of the tropopause.	X	X	X	X	X	X	X			
(03)		Describe the proportions of the most important gases in the air in the troposphere.	X	X	X	X	X	X	X			
(04)		Describe the variations of the FL and temperature of the tropopause from the poles to the equator.	X	X	X	X	X	X	X			
(05)		Describe the breaks in the tropopause along the boundaries of the main air masses.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Indicate the variations of the FL of the tropopause with the seasons and the variations of atmospheric pressure.	X		X	X						
050 01 01 03		***Stratosphere***										
(01)		Describe the stratosphere up to FL 650.	X									
(02)		Describe that ozone can occur at jet cruise altitudes and that it constitutes a hazard.	X		X	X						
050 01 02 00		**Air temperature**										
050 01 02 01		***Definition and units***										
(01)		Define 'air temperature'.	X	X	X	X	X	X	X			
(02)	X	List the units of measurement of air temperature used in aviation meteorology (Celsius, Fahrenheit, Kelvin). *(Refer to Subject 050 10 01 01)*	X	X	X	X	X	X	X			
050 01 02 02		***Vertical distribution of temperature***										
(01)		Describe the mean vertical distribution of temperature up to FL 650.	X	X	X	X	X	X	X			
(02)		Mention the general causes of the cooling of the air in the troposphere with increasing altitude.	X	X	X	X	X	X	X			
(03)		Calculate the temperature and temperature deviations (in relation to International	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		Standard Atmosphere (ISA)) at specified levels.										
050 01 02 03		***Transfer of heat***										
(01)		Explain how local cooling or warming processes result in transfer of heat.	X	X	X	X	X	X	X			
(02)		Describe radiation.	X	X	X	X	X	X	X			
(03)		Describe solar radiation reaching the Earth.	X	X	X	X	X	X	X			
(04)		Describe the filtering effect of the atmosphere on solar radiation.	X	X	X	X	X	X	X			
(05)		Describe terrestrial radiation.	X	X	X	X	X	X	X			
(06)		Explain how terrestrial radiation is absorbed by some components of the atmosphere.	X	X	X	X	X	X	X			
(07)		Explain the effect of absorption and radiation in connection with clouds.	X	X	X	X	X	X	X			
(08)		Explain the process of conduction.	X	X	X	X	X	X	X			
(09)		Explain the role of conduction in the cooling and warming of the atmosphere.	X	X	X	X	X	X	X			
(10)		Explain the process of convection.	X	X	X	X	X	X	X			
(11)		Name the situations in which convection occurs.	X	X	X	X	X	X	X			
(12)		Explain the process of advection.	X	X	X	X	X	X	X			
(13)		Name the situations in which advection occurs.	X	X	X	X	X	X	X			
(14)		Describe the transfer of heat by turbulence.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(15)		Describe the transfer of latent heat.	X	X	X	X	X	X	X			
050 01 02 04		***Lapse rates***										
(01)		Describe qualitatively and quantitatively the temperature lapse rates of the troposphere (mean value 0.65 °C/100 m or 2 °C/1 000 ft and actual values).	X	X	X	X	X	X	X		1	
050 01 02 05		***Development of inversions, types of inversions***										
(01)		Describe the development and types of inversions.	X	X	X	X	X	X	X		1	
(02)		Explain the characteristics of inversions and of an isothermal layer concerning stability and vertical motions.	X	X	X	X	X	X	X		1	
(03)		Explain the reasons for the formation of the following inversions: — ground inversion (nocturnal radiation/advection), subsidence inversion, frontal inversion, inversion above friction layer, valley inversion.	X	X	X	X	X	X	X	1		
050 01 02 06		***Temperature near the Earth's surface, insolation, surface effects, effect of clouds, effect of wind***										
(01)		Explain the cooling/warming of the surface of the Earth by radiation.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the cooling/warming of the air by molecular or turbulent heat transfer to/from the earth or sea surfaces.	X	X	X	X	X	X	X	1		
(03)		Describe qualitatively the influence of the clouds on the cooling and warming of the surface and the air near the surface.	X	X	X	X	X	X	X	1		
(04)		Explain the influence of the wind on the cooling and warming of the air near the surfaces.	X	X	X	X	X	X	X	1		
050 01 03 00		**Atmospheric pressure**										
050 01 03 01		***Barometric pressure, isobars***										
(01)		Define 'atmospheric pressure'.	X	X	X	X	X	X	X		1	
(02)	X	List the units of measurement of the atmospheric pressure used in aviation (hPa, inches of mercury). *(Refer to Subject 050 10 01 01)*	X	X	X	X	X	X	X		1	
(03)	X	Describe the principle of the barometers (mercury barometer, aneroid barometer).	X	X	X	X	X	X				
(04)		Define isobars and identify them on surface weather charts.	X	X	X	X	X	X	X		1	
(05)		Define 'high', 'low', 'trough', 'ridge', 'col'.	X	X	X	X	X	X	X		1	
050 01 03 02		***Pressure variation with height, contours (isohypses)***										
(01)		Explain the pressure variation with height.	X	X	X	X	X	X	X		1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe quantitatively the variation of the barometric lapse rate. *Remark: An approximation of the average value for the barometric lapse rate near mean sea level (MSL) is 30 ft (9 m) per 1 hPa.*	X	X	X	X	X	X	X		1	
(03)		State that (under conditions of ISA) pressure is approximately 50 % of MSL at 18 000 ft and density is approximately 50 % of MSL at 22 000 ft and 25 % of MSL at 40 000 ft.	X	X	X	X	X	X	X			
050 01 03 03		***Reduction of pressure to QFF (MSL)***										
(01)		Define 'QFF'.	X	X	X	X	X	X	X		1	
(02)		Explain the reduction of measured pressure (QFE) to QFF (MSL).	X	X	X	X	X	X	X		1	
(03)		Mention the use of QFF for surface weather charts.	X	X	X	X	X	X	X		1	
050 01 03 04		***Relationship between surface pressure centres and pressure centres aloft***										
(01)		Illustrate with a vertical cross section of isobaric surfaces the relationship between surface pressure systems and upper-air pressure systems.	X	X	X	X	X	X	X		1	
050 01 04 00		**Air density**										
050 01 04 01		***Relationship between pressure, temperature and density***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the relationship between pressure, temperature and density.	X	X	X	X	X	X	X	1		
(02)		Describe the vertical variation of the air density in the atmosphere.	X	X	X	X	X	X	X	1		
050 01 05 00		**International Standard Atmosphere (ISA)**										
050 01 05 01		***International Standard Atmosphere (ISA)***										
(01)		Explain the use of standardised values for the atmosphere.	X	X	X	X	X	X	X	1		
(02)		List the main values of the ISA MSL pressure, MSL temperature, the vertical temperature lapse rate up to FL 650, height and temperature of the tropopause.	X	X	X	X	X	X	X	1		
050 01 06 00		**Altimetry**										
050 01 06 01		***Terminology and definitions***										
(01)		Define the following terms and explain how they are related to each other: height, altitude, pressure altitude, FL, pressure level, true altitude, true height, elevation, QNH, QFE, and standard altimeter setting.	X	X	X	X	X	X	X	1		
(02)		Describe the terms ‘transition altitude’, ‘transition level’, ‘transition layer’, ‘terrain clearance’, ‘lowest usable flight level’.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 01 06 02		***Altimeter settings***										
(01)		Name the altimeter settings associated to height, altitude, pressure altitude and FL.	X	X	X	X	X	X	X			
(02)		Describe the altimeter-setting procedures.	X	X	X	X	X	X	X	1		
050 01 06 03		***Calculations***										
(01)		Calculate the different readings on the altimeter when the pilot uses different settings (QNH, 1013.25, QFE).	X	X	X	X	X	X	X			
(02)		Illustrate with a numbered example the changes of altimeter setting and the associated changes in reading when the pilot climbs through the transition altitude or descends through the transition level.	X	X	X	X	X	X	X			
(03)		Derive the reading of the altimeter of an aircraft on the ground when the pilot uses the different settings.	X	X	X	X	X	X	X			
(04)		Explain the influence of the air temperature on the distance between the ground and the level read on the altimeter and between two FLs.	X	X	X	X	X	X	X	1		
(05)		Explain the influence of pressure areas on true altitude.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Determine the true altitude/height for a given altitude/height and a given ISA temperature deviation.	X	X	X	X	X	X	X			
(07)		Calculate the terrain clearance and the lowest usable FL for given atmospheric temperature and pressure conditions.	X	X	X	X	X	X	X			
(08)		State that the 4 %-rule can be used to calculate true altitude from indicated altitude, and also indicated altitude from true altitude (not precise but sufficient due to the approximation of the 4 %-rule.)	X	X	X	X	X	X	X			
		Remark: The following rules should be considered for altimetry calculations: *a) All calculations are based on rounded pressure values to the nearest lower hPa.* *b) The value for the barometric lapse rate between MSL and 700 hPa to be used is 30 ft/hPa as an acceptable approximation of the barometric lapse rate.* *c) To determine the true altitude/height, the following rule of thumb, called the '4 %-rule', shall be used: the altitude/height changes by 4 % for each 10 °C temperature deviation from ISA.*										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		d) If no further information is given, the deviation of the outside-air temperature from ISA is considered to be constantly the same given value in the whole layer. *e) The elevation of the aerodrome has to be taken into account. The temperature correction has to be considered for the layer between the ground and the position of the aircraft.*										
050 01 06 04		***Effect of accelerated airflow due to topography***										
(01)		Describe qualitatively how the effect of accelerated airflow due to topography (the Bernoulli effect) affects altimetry.	X	X	X	X	X	X	X			
050 02 00 00		**WIND**										
050 02 01 00		**Definition and measurement of wind**										
050 02 01 01		***Definition and measurement***										
(01)		Define 'wind' and 'surface wind'.	X	X	X	X	X	X	X			
(02)		State the units of wind directions (degrees true in reports; degrees magnetic from tower) and speed (kt, m/s).	X	X	X	X	X	X	X			
(03)		Describe that the reported wind is an average wind derived from measurements	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		with an anemometer at a height of 10 m over 2 min for local routine and special reports and ATS units, and over 10 min for aerodrome routine meteorological reports (METARs) and aerodrome special meteorological reports (SPECIs).										
050 02 02 00		**Primary cause of wind**										
050 02 02 01		***Primary cause of wind, pressure gradient, Coriolis force, gradient wind***										
(01)		Define the term 'horizontal pressure gradient'.	X	X	X	X	X	X	X			
(02)		Explain how the pressure gradient force acts in relation to the pressure gradient.	X	X	X	X	X	X	X			
(03)		Explain how the Coriolis force acts in relation to the wind.	X	X	X	X	X	X	X			
(04)		Explain the development of the geostrophic wind.	X	X	X	X	X	X	X			
(05)		Indicate how the geostrophic wind flows in relation to the isobars/isohypses in the northern and in the southern hemisphere.	X	X	X	X	X	X	X			
(06)		Analyse the effect of changing latitude on the geostrophic wind speed.	X		X	X						
(07)		Explain the gradient wind effect and indicate how the gradient wind differs from the	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		geostrophic wind in cyclonic and anticyclonic circulation.										
050 02 02 02		***Variation of wind in the friction layer***										
(01)		Describe why and how the wind changes direction and speed with height in the friction layer in the northern and in the southern hemisphere (rule of thumb).	X	X	X	X	X	X	X	1		
(02)		State the surface and air-mass conditions that influence the wind in the friction layer (diurnal variation).	X	X	X	X	X	X	X			
(03)		Name terrain, wind speed and stability as the main factors that influence the vertical extent of the friction layer.	X	X	X	X	X	X	X			
(04)		Explain the relationship between isobars and wind (direction and speed).	X	X	X	X	X	X	X	1		
		Remark: Approximate value for variation of wind in the friction layer (values to be used in examinations):										

Type of landscape	*Wind speed in friction layer in % of the geostrophic wind*	*The wind in the friction layer blows across the isobars towards the low pressure.*

Syllabus reference	BK	Syllabus details and associated Learning Objectives			Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
					ATPL	CPL	ATPL/IR	ATPL	CPL					
				Angle between wind direction and isobars.										
		over water	*ca 70 %*	*ca 10°*										
		over land	*ca 50 %*	*ca 30°*										
		WMO - No. 266												
050 02 02 03		***Effects of convergence and divergence***												
(01)		Describe atmospheric convergence and divergence.			X	X	X	X	X	X	X	1		
(02)		Explain the relationship between convergence and divergence on the following: pressure systems at the surface and aloft; wind speed; vertical motion and cloud formation (relationship between upper-air conditions and surface pressure systems).			X	X	X	X	X	X	X	1		
050 02 03 00		**General global circulation**												
050 02 03 01		***General circulation around the globe***												
(01)		Describe the general global circulation. *(Refer to Subject 050 08 01 01)*			X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Name and sketch or indicate on a map the global distribution of the surface pressure and the resulting wind pattern for all latitudes at low level in January and July.	X		X	X						
(03)		Sketch or indicate on a map the westerly and easterly tropospheric winds at high level in January and July.	X		X	X						
050 02 04 00		**Local winds**										
050 02 04 01		***Anabatic and katabatic winds, mountain and valley winds, Venturi effects, land and sea breezes***										
(01)		Describe and explain anabatic and katabatic winds.	X	X	X	X	X	X	X		1	
(02)		Describe mountain and valley winds.	X	X	X	X	X	X	X		1	
(03)		Describe the Venturi effect, convergence in valleys and mountain areas.	X	X	X	X	X	X	X		1	
(04)		Describe land and sea breezes, and sea-breeze front.	X	X	X	X	X	X	X	1		
(05)		Describe that local, low-level jet streams can develop in the evening.	X	X	X	X	X	X	X			
050 02 05 00		**Mountain waves (standing waves, lee waves)**										
050 02 05 01		***Origin and characteristics***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the origin and formation of mountain waves.	X	X	X	X	X	X	X		1	
(02)		State the conditions necessary for the formation of mountain waves.	X	X	X	X	X	X	X		1	
(03)		Describe the structure and properties of mountain waves.	X	X	X	X	X	X	X		1	
(04)		Explain how mountain waves may be identified by their associated meteorological phenomena.	X	X	X	X	X	X	X	1		
(05)		Describe that mountain wave effects can exceed the performance or structural capability of aircraft.	X	X	X	X	X	X	X			
(06)		Describe that mountain wave effects can propagate from low to high level, e.g. over Greenland and elsewhere.	X	X	X	X	X	X	X			
050 02 06 00		**Turbulence**										
050 02 06 01		***Description and types of turbulence***										
(01)		Describe turbulence and gustiness.	X	X	X	X	X	X	X		1	
(02)		List the common types of turbulence (convective, mechanical, orographic, frontal, clear-air turbulence).	X	X	X	X	X	X	X		1	
050 02 06 02		***Formation and location of turbulence***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the formation of convective turbulence, mechanical and orographic turbulence, and frontal turbulence.	X	X	X	X	X	X	X		1	
(02)		State where turbulence will normally be found (rough-ground surfaces, relief, inversion layers, cumulonimbus (CB), thunderstorm (TS) zones, unstable layers).	X	X	X	X	X	X	X		1	
050 02 06 03		***Clear-air turbulence (CAT) — description, cause and location***										
(01)		Describe CAT.	X	X				X	X			
(02)		Describe the formation of CAT.	X	X	X	X	X	X	X			
(03)		State where CAT is found in association with jet streams, in high-level troughs and in other disturbed high-level air flows. *(Refer to Subject 050 09 02 02)*	X									
(04)		State that remote sensing of CAT from satellites is not possible and that forecasting is limited.	X	X				X	X			
(05)		State that pilot reports of turbulence are a very valuable source of information as remote measurements are not available.	X	X	X	X	X	X	X			
050 02 07 00		**Jet streams**										
050 02 07 01		***Description***										
(01)		Describe jet streams.	X	X				X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State the defined minimum speed of a jet stream (60 kt).	X	X				X	X			
(03)		State the typical figures for the dimensions of jet streams.	X	X				X	X			
050 02 07 02		***Formation and properties of jet streams***										
(01)		Explain the formation and state the heights, the speeds, the seasonal variations of speeds, the geographical positions, the seasonal occurrence and the seasonal movements of the arctic (front) jet stream, the polar (front) jet stream, the subtropical jet stream, and the tropical (easterly/equatorial) jet stream.	X	X								
050 02 07 03		***Location of jet streams and associated CAT areas***										
(01)		Sketch or describe where polar front and arctic jet streams are found in the troposphere in relation to the tropopause and to fronts.	X	X								
(02)		Describe and indicate the areas of worst wind shear and CAT.	X	X								
050 02 07 04		***Intentionally left blank***										
050 03 00 00		**THERMODYNAMICS**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 03 01 00		**Humidity**										
050 03 01 01		***Water vapour in the atmosphere***										
(01)		State that the density of moist air is less than the density of dry air.	X	X	X	X	X	X	X		1	
(02)		Describe the significance for meteorology of water vapour in the atmosphere.	X	X	X	X	X	X	X		1	
(03)		Indicate the sources of atmospheric humidity.	X	X	X	X	X	X	X		1	
(04)		Define ‘saturation of air by water vapour’.	X	X	X	X	X	X				
050 03 01 02		***Intentionally left blank***										
050 03 01 03		***Temperature/dew point, relative humidity***										
(01)		Define ‘dew point’.	X	X	X	X	X	X	X		1	
(02)		Define ‘relative humidity’.	X	X	X	X	X	X	X		1	
(03)		Explain the factors that influence the relative humidity at constant pressure.	X	X	X	X	X	X	X		1	
(04)		Explain the diurnal variation of the relative humidity.	X	X	X	X	X	X	X		1	
(05)		Describe the relationship between temperature and dew point.	X	X	X	X	X	X	X		1	
(06)		Estimate the relative humidity of the air from the difference between dew point and temperature.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 03 02 00		**Change of state of water**										
050 03 02 01		***Condensation, evaporation, sublimation, freezing and melting, latent heat***										
(01)		Define ‘condensation’, ‘evaporation’, ‘sublimation’, ‘freezing and melting’ and ‘latent heat’.	X	X	X	X	X	X	X			
(02)		List the conditions for condensation/evaporation.	X	X	X	X	X	X	X			
(03)		Explain the condensation process.	X	X	X	X	X	X	X			
(04)		Explain the nature of and the need for condensation nuclei.	X	X	X	X	X	X	X			
(05)		Explain the effects of condensation on the weather.	X	X	X	X	X	X	X			
(06)		List the conditions for freezing/melting.	X	X	X	X	X	X	X	1		
(07)		Explain the process of freezing.	X	X	X	X	X	X	X			
(08)		Explain the nature of and the need for freezing nuclei.	X	X	X	X	X	X	X			
(09)		Define ‘supercooled water’. *(Refer to Subject 050 09 01 01)*	X	X	X	X	X	X	X	1		
(10)		List the conditions for sublimation.	X	X	X	X	X	X	X			
(11)		Explain the sublimation process.	X	X	X	X	X	X	X			
(12)		Explain the nature of and the need for sublimation nuclei.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(13)		Describe the absorption or release of latent heat in each change of state of water.	X	X	X	X	X	X	X			
(14)		Illustrate all the changes of state of water with practical examples.	X	X	X	X	X	X	X	1		
050 03 03 00		**Adiabatic processes**										
050 03 03 01		***Adiabatic processes, stability of the atmosphere***										
(01)		Describe the adiabatic process in an unsaturated rising or descending air particle.	X	X	X	X	X	X	X			
(02)		Explain the variation of temperature of an unsaturated rising or descending air particle.	X	X	X	X	X	X	X			
(03)		Explain the variation of humidity of an unsaturated rising or descending air particle.	X	X	X	X	X	X	X			
(04)		Describe the adiabatic process in a saturated rising or descending air particle.	X	X	X	X	X	X	X			
(05)		Explain the variation of temperature of a saturated air particle with changing altitude.	X	X	X	X	X	X	X			
(06)		Explain the static stability of the atmosphere using the actual temperature curve with reference to the adiabatic lapse rates.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Define qualitatively and quantitatively the terms 'stable', 'conditionally unstable', 'unstable' and 'indifferent'.	X	X	X	X	X	X	X			
(08)		Illustrate with a schematic sketch the formation of Foehn.	X	X	X	X	X	X	X	1		
(09)		Explain the effect of the advection of air (warm or cold) on the stability of the air. *Remark: Dry adiabatic lapse rate = 1 °C/100 m or 3 °C/1 000 ft; average value at lower levels for saturated adiabatic lapse rate = 0.6 °C/100 m or 1.8 °C/1 000 ft (values to be used in examinations).*	X	X	X	X	X	X	X			
050 04 00 00		**CLOUDS AND FOG**										
050 04 01 00		**Cloud formation and description**										
050 04 01 01		***Cloud formation***										
(01)		Explain cloud formation by adiabatic cooling, conduction, advection and radiation.	X	X	X	X	X	X	X	1		
(02)		Describe cloud formation based on the following lifting processes: — unorganised lifting in thin layers and turbulent mixing;	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— forced lifting at fronts or over mountains; — free convection.										
(03)		List cloud types typical for stable and unstable air conditions.	X	X	X	X	X	X	X	1		
(04)		Summarise the conditions for the dissipation of clouds.	X	X	X	X	X	X	X	1		
050 04 01 02		***Cloud types and cloud classification***										
(01)		Describe the different cloud types and their classification.	X	X	X	X	X	X	X		1	
(02)		Identify by shape cirriform, cumuliform and stratiform clouds.	X	X	X	X	X	X	X		1	
(03)		Identify by shape and typical level the 10 cloud types (general).	X	X	X	X	X	X	X		1	
(04)		Describe and identify by shape the following species and supplementary features: castellanus, lenticularis, congestus, calvus, capillatus and virga.	X	X	X	X	X	X	X		1	
(05)		Distinguish between low-, medium- and high-level clouds according to the World Meteorological Organization’s (WMO) ‘cloud etage’.	X	X	X	X	X	X	X	1		
(06)		Distinguish between ice clouds, mixed clouds and pure-water clouds.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 04 01 03		***Influence of inversions on cloud development***										
(01)		Explain the influence of inversions on vertical movements in the atmosphere.	X	X	X	X	X	X	X	1		
(02)		Explain the influence of an inversion on the formation of stratus clouds.	X	X	X	X	X	X	X	1		
(03)		Explain the influence of ground inversion on the formation of fog.	X	X	X	X	X	X	X	1		
(04)		Describe the role of the tropopause inversion with regard to the vertical development of clouds.	X	X	X	X	X					
050 04 01 04		***Flying conditions in each cloud type***										
(01)		Assess the 10 cloud types for icing and turbulence.	X	X	X	X	X	X	X		1	
050 04 02 00		**Fog, mist, haze**										
050 04 02 01		***General aspects***										
(01)		Define 'fog', 'mist' and 'haze' with reference to the WMO standards of visibility range.	X	X	X	X	X	X	X		1	
(02)		Explain briefly the formation of fog, mist and haze.	X	X	X	X	X	X	X		1	
(03)		Name the factors that generally contribute to the formation of fog and mist.	X	X	X	X	X	X	X		1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Name the factors that contribute to the formation of haze.	X	X	X	X	X	X	X		1	
(05)		Describe freezing fog and ice fog.	X	X	X	X	X	X	X		1	
050 04 02 02		***Radiation fog***										
(01)		Explain the formation of radiation fog.	X	X	X	X	X	X	X	1		
(02)		Describe the significant characteristics of radiation fog, and its vertical extent.	X	X	X	X	X	X	X	1		
(03)		Summarise the conditions for the dissipation of radiation fog.	X	X	X	X	X	X	X	1		
050 04 02 03		***Advection fog***										
(01)		Explain the formation of advection fog.	X	X	X	X	X	X	X	1		
(02)		Describe the different possibilities of advection-fog formation (over land, sea and coastal regions).	X	X	X	X	X	X	X	1		
(03)		Describe the significant characteristics of advection fog.	X	X	X	X	X	X	X	1		
(04)		Summarise the conditions for the dissipation of advection fog.	X	X	X	X	X	X	X	1		
050 04 02 04		***Sea smoke***										
(01)		Explain the formation of sea smoke.	X	X	X	X	X	X	X	1		
(02)		Explain the conditions for the development of sea smoke.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Summarise the conditions for the dissipation of sea smoke.	X	X	X	X	X	X	X	1		
050 04 02 05		***Frontal fog***										
(01)		Explain the formation of frontal fog.	X	X	X	X	X	X	X	1		
(02)		Describe the significant characteristics of frontal fog.	X	X	X	X	X	X	X	1		
(03)		Summarise the conditions for the dissipation of frontal fog.	X	X	X	X	X	X	X	1		
050 04 02 06		***Orographic fog (hill fog)***										
(01)		Summarise the features of orographic fog.	X	X	X	X	X	X	X	1		
(02)		Describe the significant characteristics of orographic fog.	X	X	X	X	X	X	X	1		
(03)		Summarise the conditions for the dissipation of orographic fog.	X	X	X	X	X	X	X	1		
050 05 00 00		**PRECIPITATION**										
050 05 01 00		**Development of precipitation**										
050 05 01 01		***Process of development of precipitation***										
(01)		Describe the two basic processes of forming precipitation (the Wegener–Bergeron–Findeisen process, Coalescence).	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Summarise the outlines of the ice-crystal process (the Wegener–Bergeron–Findeisen process).	X	X	X	X	X	X	X	1		
(03)		Summarise the outlines of the coalescence process.	X	X	X	X	X	X	X	1		
(04)		Explain the development of snow, rain, drizzle and hail.	X	X	X	X	X	X	X	1		
050 05 02 00		**Types of precipitation**										
050 05 02 01		***Types of precipitation, relationship with cloud types***										
(01)		List and describe the types of precipitation given in the aerodrome forecast (TAF) and METAR codes (drizzle, rain, snow, snow grains, ice pellets, hail, small hail, snow pellets, ice crystals, freezing drizzle, freezing rain).	X	X	X	X	X	X	X		1	
(02)		State the ICAO/WMO approximate diameters for cloud, drizzle and rain drops.	X	X	X	X	X	X	X	1		
(03)		State that, because of their size, hail stones can cause significant damage to aircraft.	X	X	X	X	X	X	X	1		
(04)	X	Explain the mechanism for the formation of freezing precipitation.	X	X	X	X	X	X	X		1	
(05)		Describe the weather conditions that give rise to freezing precipitation.	X	X	X	X	X	X	X	1		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Distinguish between the types of precipitation generated in convective and stratiform clouds.	X	X	X	X	X	X	X	1		
(07)		Assign typical precipitation types and intensities to different cloud types.	X	X	X	X	X	X	X	1		
(08)		Explain the relationship between moisture content and visibility during different types of winter precipitation (e.g. large vs small snowflakes).	X	X	X	X	X	X	X			
050 06 00 00		**AIR MASSES AND FRONTS**										
050 06 01 00		**Air masses**										
050 06 01 01		***Description, classification and source regions of air masses***										
(01)		Define the term ‘air mass’.	X	X	X	X	X	X	X		3	
(02)		Describe the properties of the source regions.	X	X	X	X	X	X	X		3	
(03)		Summarise the classification of air masses by source regions.	X	X	X	X	X	X	X		3	
(04)		State the classifications of air masses by temperature and humidity at source.	X	X	X	X	X	X	X		3	
(05)		State the characteristic weather in each of the air masses.	X	X	X	X	X	X	X		3	
(06)		Name the three main air masses that affect Europe.	X	X	X	X	X	X	X		3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Classify air masses on a surface weather chart.	X	X	X	X	X	X	X		3	
		Remark: Names and abbreviations of air masses used in examinations: — *first letter: humidity* — *continental (c)* — *maritime (m)* — *second letter: type of air mass* — *arctic (A)* — *polar (P)* — *tropical (T)* — *equatorial (E)* — *third letter: temperature* — *cold (c)* — *warm (w)*										
050 06 01 02		***Modifications of air masses***										
(01)		List the environmental factors that affect the final properties of an air mass.	X	X	X	X	X	X	X		3	
(02)		Explain how maritime and continental tracks modify air masses.	X	X	X	X	X	X	X		3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the effect of passage over cold or warm surfaces.	X	X	X	X	X	X	X		3	
(04)		Explain how air-mass weather is affected by the season, the air-mass track and by orographic and thermal effects over land.	X	X	X	X	X	X	X		3	
(05)		Assess the tendencies of the stability of an air mass and describe the typical resulting air-mass weather including the hazards for aviation.	X	X	X	X	X	X	X		3	
050 06 02 00		**Fronts**										
050 06 02 01		***General aspects***										
(01)		Describe the boundaries between air masses (fronts).	X	X	X	X	X	X	X		3	
(02)		Define ‘front’ and ‘frontal zone’.	X	X	X	X	X	X	X		3	
(03)		Name the global frontal systems (polar front, arctic front).	X	X	X	X	X	X				
(04)		State the approximate seasonal latitudes and geographic positions of the polar front and the arctic front.	X	X	X	X	X	X				
050 06 02 02		***Warm front, associated clouds and weather***										
(01)		Define a ‘warm front’.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards at a warm	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		front depending on the stability of the warm air.										
(03)		Explain the seasonal differences in the weather at warm fronts.	X	X	X	X	X	X	X	3		
(04)		Describe the structure, slope and dimensions of a warm front.	X	X	X	X	X	X	X		3	
(05)		Sketch a cross section of a warm front showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
050 06 02 03		***Cold front, associated clouds and weather***										
(01)		Define a ‘cold front’.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards at a cold front depending on the stability of the warm air.	X	X	X	X	X	X	X	3		
(03)		Explain the seasonal differences in the weather at cold fronts.	X	X	X	X	X	X	X	3		
(04)		Describe the structure, slope and dimensions of a cold front.	X	X	X	X	X	X	X		3	
(05)		Sketch a cross section of a cold front showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
050 06 02 04		***Warm sector, associated clouds and weather***										
(01)		Describe fronts and air masses associated with the warm sector.	X	X	X	X	X	X	X		3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the cloud, weather, ground visibility and aviation hazards in a warm sector.	X	X	X	X	X	X	X	3		
(03)		Explain the seasonal differences in the weather in the warm sector.	X	X	X	X	X	X	X	3		
(04)		Sketch a cross section of a warm sector showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
050 06 02 05		***Weather behind the cold front***										
(01)		Describe the cloud, weather, ground visibility and aviation hazards behind the cold front.	X	X	X	X	X	X	X	3		
(02)		Explain the seasonal differences in the weather behind the cold front.	X	X	X	X	X	X	X	3		
050 06 02 06		***Occlusions, associated clouds and weather***										
(01)	X	Define the term ‘occlusion’ and ‘occluded front’.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards in a cold occlusion.	X	X	X	X	X	X	X	3		
(03)		Describe the cloud, weather, ground visibility and aviation hazards in a warm occlusion.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the seasonal differences in the weather at occlusions.	X	X	X	X	X	X	X	3		
(05)		Sketch a cross section of occlusions showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
(06)		On a sketch illustrate the development of an occlusion and the movement of the occlusion point.	X	X	X	X	X	X	X		3	
050 06 02 07		***Stationary front, associated clouds and weather***										
(01)		Define a 'stationary front'.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards in a stationary front.	X	X	X	X	X	X	X	3		
050 06 02 08		***Movement of fronts and pressure systems, life cycle***										
(01)		Describe the movements of fronts and pressure systems and the life cycle of a mid-latitude depression.	X	X	X	X	X	X	X		3	
(02)		State the rules for predicting the direction and the speed of movement of fronts.	X	X	X	X	X	X	X		3	
(03)		State the difference in the speed of movement between cold and warm fronts.	X	X	X	X	X	X	X		3	
(04)		State the rules for predicting the direction and the speed of movement of frontal depressions.	X	X	X	X	X	X	X		3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe, with a sketch if required, the genesis, development and life cycle of a frontal depression with associated cloud and rain belts.	X	X	X	X	X	X	X		3	
050 06 02 09		***Changes of meteorological elements at a frontal wave***										
(01)		Sketch a plan and a cross section of a frontal wave (warm front, warm sector, and cold front) and illustrate the changes of pressure, temperature, surface wind and wind in the vertical axis.	X	X	X	X	X	X	X		3	
050 07 00 00		**PRESSURE SYSTEMS**										
050 07 01 00		**The principal pressure areas**										
050 07 01 01		***Location of the principal pressure areas***										
(01)		Identify or indicate on a map the principal global high-pressure and low-pressure areas in January and July.	X		X	X						
(02)		Explain how these pressure areas are formed.	X		X	X						
(03)		Explain how the pressure areas move with the seasons.	X		X	X						
050 07 02 00		**Anticyclone**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 07 02 01		***Anticyclones, types, general properties, cold and warm anticyclones, ridges and subsidence***										
(01)		List the different types of anticyclones.	X	X	X	X	X	X	X		3	
(02)		Describe the effect of high-level convergence in producing areas of high pressure at ground level.	X	X	X	X	X	X	X		3	
(03)		Describe air-mass subsidence, its effect on the environmental lapse rate, and the associated weather.	X	X	X	X	X	X	X		3	
(04)		Describe the formation of warm and cold anticyclones.	X	X	X	X	X	X	X	3		
(05)		Describe the formation of ridges.	X	X	X	X	X	X	X		3	
(06)		Describe the properties of and the weather associated with warm and cold anticyclones.	X	X	X	X	X	X	X			
(07)		Describe the properties of and the weather associated with ridges.	X	X	X	X	X	X	X	3		
(08)		Describe the blocking anticyclone and its effects.	X	X	X	X	X	X	X		3	
050 07 03 00		**Non-frontal depressions**										
050 07 03 01		***Thermal, orographic, polar and secondary depressions; troughs***										
(01)		Describe the effect of high-level divergence in producing areas of low pressure at ground level.	X	X	X	X	X	X	X		3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the formation and properties of thermal, orographic (lee lows), polar and secondary depressions.	X	X	X	X	X	X	X	3		
(03)		Describe the formation, the properties and the associated weather at troughs.	X	X	X	X	X	X	X		3	
050 07 04 00		**Tropical revolving storms**										
050 07 04 01		***Characteristics of tropical revolving storms***										
(01)		State the conditions necessary for the formation of tropical revolving storms.	X	X	X	X	X					
(02)		State how a tropical revolving storm generally moves in its area of occurrence.	X	X	X	X	X					
(03)		Name the stages of the development of tropical revolving storms (tropical disturbance, tropical depression, tropical storm, severe tropical storm, tropical revolving storm).	X	X	X	X	X					
(04)		Describe the meteorological conditions in and near a tropical revolving storm.	X	X	X	X	X					
(05)		State the approximate dimensions of a tropical revolving storm.	X	X	X	X	X					
(06)		State that the movement of a tropical revolving storm can only rarely be forecast exactly, and that utmost care is necessary near a tropical revolving storm.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 07 04 02		***Origin and local names, location and period of occurrence***										
(01)		List the areas of origin and occurrence of tropical revolving storms, and their specified names (hurricane, typhoon, tropical cyclone).	X	X	X	X	X					
(02)		State the expected times of occurrence of tropical revolving storms in each of the source areas, and their approximate frequency.	X	X	X	X	X					
050 08 00 00		**CLIMATOLOGY**										
050 08 01 00		**Climatic zones**										
050 08 01 01		***General circulation in the troposphere and lower stratosphere***										
(01)	X	Describe the general tropospheric and low stratospheric circulation. *(Refer to Subject 050 02 03 01)*	X	X	X	X	X					
050 08 01 02		***Climatic classification***										
(01)		Describe the characteristics of the tropical rain climate, the dry climate, the mid-latitude climate (warm temperate rain climate), the subarctic climate (cold snow	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		forest climate) and the snow climate (polar climate).										
(02)		Explain how the seasonal movement of the sun generates the transitional climate zones.	X	X	X	X	X					
(03)		State the typical locations of each major climatic zone.	X		X	X						
050 08 02 00		**Tropical climatology**										
050 08 02 01		***Cause and development of tropical showers and thunderstorms: humidity, temperature, tropopause***										
(01)		State the conditions necessary for the formation of tropical showers and thunderstorms (mesoscale convective complex, cloud clusters).	X	X	X	X	X					
(02)		Describe the characteristics of tropical squall lines.	X	X	X	X	X					
(03)		Explain the formation of convective cloud structures caused by convergence at the boundary of the NE and SE trade winds (Intertropical Convergence Zone (ITCZ)).	X	X	X	X	X					
(04)		State the typical figures for tropical surface air temperatures and humidities, and for heights of the zero-degree isotherm.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 08 02 02		***Seasonal variations of weather and wind, typical synoptic situations***										
(01)		Indicate on a map the trade winds (tropical easterlies) and describe the associated weather.	X	X	X	X	X					
(02)		Indicate on a map the doldrums and describe the associated weather.	X	X	X	X	X					
(03)		Indicate on a sketch the latitudes of subtropical high (horse latitudes) and describe the associated weather.	X	X								
(04)		Indicate on a map the major monsoon winds.	X	X	X	X	X					
050 08 02 03		***Intertropical Convergence Zone (ITCZ), weather in the ITCZ, general seasonal movement***										
(01)		Identify or indicate on a map the positions of the ITCZ in January and July.	X	X								
(02)		Explain the seasonal movement of the ITCZ.	X	X								
(03)		Describe the weather and winds at the ITCZ.	X	X								
(04)		Explain the flight hazards associated with the ITCZ.	X	X								
050 08 02 04		***Monsoon, sandstorms, cold-air outbreaks***										
(01)		Define in general the term 'monsoon' and give a general overview of regions of occurrence.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the major monsoon conditions. *(Refer to Subject 050 08 02 02)*		X			X					
(03)		Explain how trade winds change character after a long track and become monsoon winds.	X	X	X	X	X					
(04)		Explain the weather and the flight hazards associated with a monsoon.	X	X	X	X	X					
(05)		Explain the formation of the SW/NE monsoon over West Africa and describe the weather, stressing the seasonal differences.	X	X	X	X	X					
(06)		Explain the formation of the SW/NE monsoon over India and describe the weather, stressing the seasonal differences.	X	X	X	X	X					
(07)		Explain the formation of the monsoon over the Far East and northern Australia and describe the weather, stressing the seasonal differences.	X	X	X	X	X					
(08)		Describe the formation and properties of sandstorms.	X	X	X	X	X					
(09)		Indicate when and where outbreaks of cold polar air can enter subtropical weather systems.	X	X	X	X	X					
(10)		Name well-known examples of polar-air outbreaks (Blizzard, Pampero).	X	X	X	X	X					
050 08 02 05		***Easterly waves***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the effect of easterly waves on tropical weather systems.	X		X	X						
050 08 03 00		**Typical weather situations in the mid-latitudes**										
050 08 03 01		***Westerly situation (westerlies)***										
(01)		Identify on a weather chart the typical westerly situation with travelling polar front waves.	X	X				X	X		3	
050 08 03 02		***High-pressure area***										
(01)		Describe the high-pressure zones with the associated weather.	X	X	X	X	X	X	X		3	
(02)		Identify on a weather chart the high-pressure regions.	X	X	X	X	X	X	X		3	
050 08 03 03		***Intentionally left blank***										
050 08 03 04		***Cold-air drop***										
(01)		Define ‘cold-air drop’.	X	X	X	X	X	X	X			
(02)		Describe the formation of a cold-air drop.	X	X	X	X	X	X	X			
(03)		Identify cold-air drops on weather charts.	X	X	X	X	X	X	X			
(04)		Explain the problems and dangers of cold-air drops for aviation.	X	X	X	X	X	X	X			
050 08 04 00		**Local winds and associated weather**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 08 04 01		***Foehn, Mistral, Bora***										
(01)		Describe the mechanism for the development of Foehn winds (including Chinook).	X	X	X	X	X	X				
(02)		Describe the weather associated with Foehn winds.	X	X	X	X	X	X				
(03)		Describe the formation of, the characteristics of, and the weather associated with Mistral and Bora.	X	X	X	X	X	X				
050 08 04 02		***Harmattan***										
(01)		Describe the Harmattan wind and the associated visibility problems as an example of local winds affecting visibility.	X	X	X	X	X					
050 09 00 00		**FLIGHT HAZARDS**										
050 09 01 00		**Icing**										
050 09 01 01		***Conditions for ice accretion***										
(01)		Summarise the general conditions under which ice accretion occurs on aircraft (temperatures of outside air; temperature of the airframe; presence of supercooled water	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		in clouds, fog, rain and drizzle; possibility of sublimation).										
(02)		Explain the general weather conditions under which ice accretion occurs in a venturi carburettor.	X	X	X	X	X	X	X		3	
(03)		Explain the general weather conditions under which ice accretion occurs on airframe.	X	X	X	X	X	X	X	3		
(04)		*Explain the formation of supercooled water in clouds, rain and drizzle.* *(Refer to Subject 050 03 02 01)*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*3*		
(05)		Explain qualitatively the relationship between the air temperature and the amount of supercooled water.	X	X	X	X	X	X	X	3		
(06)		Explain qualitatively the relationship between the type of cloud and the size and number of the droplets in cumuliform and stratiform clouds.	X	X	X	X	X	X	X	3		
(07)		Indicate in which circumstances ice can form on an aircraft on the ground: air temperature, humidity, precipitation.	X	X	X	X	X	X	X	3		
(08)		Explain in which circumstances ice can form on an aircraft in flight: inside clouds, in precipitation, and outside clouds and precipitation.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		Explain the influence of fuel temperature, radiative cooling of the aircraft surface and temperature of the aircraft surface (e.g. from previous flight) on ice formation.	X	X	X	X	X	X	X	3		
(10)		Describe the different factors that influence the intensity of icing: air temperature, amount of supercooled water in a cloud or in precipitation, amount of ice crystals in the air, speed of the aircraft, shape (thickness) of the airframe parts (wings, antennas, etc.).	X	X	X	X	X	X	X	3		
(11)		Explain the effects of topography on icing.	X	X	X	X	X	X	X	3		
(12)		Explain the higher concentration of water drops in stratiform orographic clouds.	X	X	X	X	X	X	X	3		
050 09 01 02		***Types of ice accretion***										
(01)	X	Define 'clear ice'.	X	X	X	X	X	X	X			
(02)		Describe the conditions for the formation of clear ice.	X	X	X	X	X	X	X			
(03)		Explain the formation of the structure of clear ice with the release of latent heat during the freezing process.	X	X	X	X	X	X	X			
(04)		Describe the aspects of clear ice: appearance, weight, solidity.	X	X	X	X	X	X	X			
(05)		Define 'rime ice'.	X	X	X	X	X	X	X			
(06)		Describe the conditions for the formation of rime ice.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Describe the aspects of rime ice: appearance, weight, solidity.	X	X	X	X	X	X	X	3		
(08)		Define 'mixed ice'.	X	X	X	X	X	X	X	3		
(09)		Describe the conditions for the formation of mixed ice.	X	X	X	X	X	X	X	3		
(10)		Describe the aspects of mixed ice: appearance, weight, solidity.	X	X	X	X	X	X	X	3		
(11)		Describe the possible process of ice formation in snow conditions.	X	X	X	X	X	X	X	3		
(12)		Define 'hoar frost'.	X	X	X	X	X	X	X	3		
(13)		Describe the conditions for the formation of hoar frost.	X	X	X	X	X	X	X	3		
(14)		Describe the aspects of hoar frost: appearance, solidity.	X	X	X	X	X	X	X	3		
050 09 01 03		***Hazards of ice accretion, avoidance***										
(01)		State the ICAO qualifying terms for the intensity of icing.	X	X	X	X	X	X	X	3		
(02)		Describe, in general, the hazards of icing.	X	X	X	X	X	X	X	3		
(03)		Assess the dangers of the different types of ice accretion.	X	X	X	X	X	X	X	3		
(04)		Describe the position of the dangerous zones of icing in fronts, in stratiform and cumuliform clouds, and in the different precipitation types.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Indicate the possibilities of avoiding dangerous zones of icing: — in the flight planning: weather briefing, selection of track and altitude; — during flight: recognition of the dangerous zones, selection of appropriate track and altitude.	X	X	X	X	X	X	X	3		
050 09 01 04		***Ice crystal icing***										
(01)		Describe ice crystal icing.	X	X	X	X	X	X	X		3	
(02)		Describe the atmospheric processes leading to high ice crystal concentration. Define the variable ice water content (IWC).	X	X	X	X	X	X	X		3	
(03)		Identify weather situations and their relevant areas where high concentrations of ice crystals are likely to occur.	X	X	X	X	X	X	X	3		
(04)		Name, in general, the flight hazards associated with high concentrations of ice crystals.	X	X	X	X	X	X	X	3		
(05)		Explain how a pilot may possibly avoid areas with a high concentration of ice crystals.	X	X	X	X	X	X	X	3		
050 09 02 00		**Turbulence**										
050 09 02 01		***Effects on flight, avoidance***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the ICAO qualifying terms for the intensity of turbulence.	X	X	X	X	X	X	X	3		
(02)		Describe the effects of turbulence on an aircraft in flight.	X	X	X	X	X	X	X	3		
(03)		Indicate the possibilities of avoiding turbulence: — in the flight planning: weather briefing, selection of track and altitude; — during flight: selection of appropriate track and altitude.	X	X	X	X	X	X	X	3		
(04)		Describe atmospheric turbulence and distinguish between turbulence, gustiness and wind shear.	X	X	X	X	X	X	X			
(05)		Describe that forecasts of turbulence are not very reliable and state that pilot reports of turbulence are very valuable as they help others to prepare for or avoid turbulence.	X	X	X	X	X	X	X			
050 09 02 02		***Clear-air turbulence (CAT): effects on flight, avoidance***										
(01)		Describe the effects of CAT on flight. *(Refer to Subject 050 02 06 03)*	X	X	X	X	X					
(02)		Indicate the possibilities of avoiding CAT in flight:	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— in the flight planning: weather briefing, selection of track and altitude; — during flight: selection of appropriate track and altitude.										
050 09 03 00		**Wind shear**										
050 09 03 01		***Definition of wind shear***										
(01)		Define 'wind shear' (vertical and horizontal).	X	X	X	X	X	X	X	3		
(02)		Define 'low-level wind shear'.	X	X	X	X	X	X	X	3		
050 09 03 02		***Weather conditions for wind shear***										
(01)		Describe the conditions, where and how wind shear can form (e.g. thunderstorms, squall lines, fronts, inversions, land and sea breeze, friction layer, relief).	X	X	X	X	X	X	X	3		
050 09 03 03		***Effects on flight, avoidance***										
(01)		Describe the effects of wind shear on flight.	X	X	X	X	X	X	X	3		
(02)		Indicate the possibilities of avoiding wind shear in flight: — in the flight planning; — during flight.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 09 04 00		**Thunderstorms**										
050 09 04 01		***Conditions for and process of development, forecast, location, type specification***										
(01)		Name the cloud types which indicate the development of thunderstorms.	X	X	X	X	X	X	X	3		
(02)		Describe the different types of thunderstorms, their location, the conditions for and the process of development, and list their properties (air-mass thunderstorms, frontal thunderstorms, squall lines, supercell storms, orographic thunderstorms).	X	X	X	X	X	X	X	3		
050 09 04 02		***Structure of thunderstorms, life cycle***										
(01)		Assess the average duration of thunderstorms and their different stages.	X	X	X	X	X	X	X	3		
(02)		Describe a supercell storm: initial, supercell, tornado and dissipating stage.	X	X	X	X	X	X	X	3		
(03)		Summarise the flight hazards associated with a fully developed thunderstorm.	X	X	X	X	X	X	X	3		
(04)		Indicate on a sketch the most dangerous zones in and around a single-cell and a multi-cell thunderstorm.	X	X	X	X	X	X	X	3		
050 09 04 03		***Electrical discharges***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the basic outline of the electric field in the atmosphere.	X	X	X	X	X	X	X	3		
(02)		Describe types of lightning, i.e. ground stroke, intra-cloud lightning, cloud-to-cloud lightning, upward lightning.	X	X	X	X	X	X	X	3		
(03)		Describe and assess the 'St. Elmo's fire' weather phenomenon.	X	X	X	X	X	X	X		3	
(04)		Describe the development of lightning discharges.	X	X	X	X	X	X	X	3		
(05)		Describe the effect of lightning strike on aircraft and flight execution.	X	X	X	X	X	X	X	3		
050 09 04 04		***Development and effects of downbursts***										
(01)		Define the term 'downburst'.	X	X	X	X	X	X	X	3		
(02)		Distinguish between macroburst and microburst.	X	X	X	X	X	X	X	3		
(03)		State the weather situations leading to the formation of downbursts.	X	X	X	X	X	X	X	3		
(04)		Describe the process of development of a downburst.	X	X	X	X	X	X	X	3		
(05)		Give the typical duration of a downburst.	X	X	X	X	X	X	X	3		
(06)		Describe the effects of downbursts.	X	X	X	X	X	X	X			
050 09 04 05		***Thunderstorm avoidance***										
(01)		Explain how the pilot can anticipate each type of thunderstorm: through pre-flight	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		weather briefing, observation in flight, use of specific meteorological information, use of information given by ground weather radar and by airborne weather radar. *(Refer to Subject 050 10 01 04), use of a lightning detector (stormscope).* *(Refer to Subject 050 10 01 04), use of the stormscope (lightning detector).*										
(02)		Describe practical examples of flight techniques used to avoid the hazards of thunderstorms.	X	X	X	X	X	X	X	3		
050 09 05 00		**Tornadoes**										
050 09 05 01		***Properties and occurrence***										
(01)		Define ‘tornado’.	X	X	X	X	X	X	X		3	
(02)		Describe the formation of a tornado.	X	X	X	X	X					
(03)		Describe the typical features of a tornado such as appearance, season, time of day, stage of development, speed of movement, and wind speed.	X	X	X	X	X					
(04)		Compare the occurrence of tornadoes in Europe with the occurrence in other locations, especially in the United States of America.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Compare the dimensions and properties of tornadoes and dust devils.	X	X	X	X	X					
050 09 06 00		**Inversions**										
050 09 06 01		***Influence on aircraft performance***										
(01)		Compare the flight hazards during take-off and approach associated with a strong inversion alone and with a strong inversion combined with marked wind shear.	X	X	X	X	X	X	X	3		
050 09 07 00		**Stratospheric conditions**										
050 09 07 01		***Influence on aircraft performance***										
(01)		Summarise the advantages of stratospheric flights.	X	X	X	X	X					
(02)		List the influences of the phenomena associated with the lower stratosphere (wind, temperature, air density, turbulence).	X	X	X	X	X					
050 09 08 00		**Hazards in mountainous areas**										
050 09 08 01		***Influence of terrain on clouds and precipitation, frontal passage***										
(01)		Describe the influence of mountainous area on a frontal passage.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 09 08 02		***Vertical movements, mountain waves, wind shear, turbulence, ice accretion***										
(01)		Describe the vertical movements, wind shear and turbulence that are typical of mountain areas.	X	X	X	X	X	X	X	3		
(02)		Indicate on a sketch of a chain of mountains the turbulent zones (mountain waves, rotors).	X	X	X	X	X	X	X	3		
(03)		Explain the influence of relief on ice accretion.	X	X	X	X	X	X	X	3		
050 09 08 03		***Development and effect of valley inversions***										
(01)		Describe the formation of a valley inversion due to katabatic winds.	X	X	X	X	X	X	X	3		
(02)		Describe the valley inversion formed by warm winds aloft.	X	X	X	X	X	X	X	3		
(03)		Describe the effects of a valley inversion for an aircraft in flight.	X	X	X	X	X	X	X	3		
050 09 09 00		**Visibility-reducing phenomena**										
050 09 09 01		***Reduction of visibility caused by precipitation and obscurations***										
(01)		Describe the reduction of visibility caused by precipitation: drizzle, rain, snow.	X	X	X	X	X	X	X	3		
(02)		Describe the reduction of visibility caused by obscurations:	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— fog, mist, haze, smoke, volcanic ash.										
(03)		Describe the reduction of visibility caused by obscurations: — sand (SA), dust (DU).	X		X	X				3		
(04)		Describe the differences between ground and flight visibility, and slant and vertical visibility when an aircraft is above or within a layer of haze or fog.	X	X	X	X	X	X	X	3		
050 09 09 02		***Reduction of visibility caused by other phenomena***										
(01)		Describe the reduction of visibility caused by low drifting and blowing snow.	X	X	X	X	X	X	X	3		
(02)		Describe the reduction of visibility caused by low drifting and blowing dust and sand.	X	X	X	X	X					
(03)		Describe the reduction of visibility caused by dust storm (DS) and sandstorm (SS).	X	X	X	X	X					
(04)		Describe the reduction of visibility caused by icing (windshield).	X	X	X	X	X	X	X	3		
(05)		Describe the reduction of visibility caused by the position of the sun relative to the visual direction.	X	X	X	X	X	X	X	3		
(06)		Describe the reduction of visibility caused by the reflection of the sun’s rays from the top of the layers of haze, fog and clouds.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 10 00 00		**METEOROLOGICAL INFORMATION**										
050 10 01 00		**Observation**										
050 10 01 01		***Surface observations***										
(01)		Define 'gusts', as given in METARs.	X	X	X	X	X	X	X			
(02)		Distinguish wind given in METARs and wind given by the control tower for take-off and landing.	X	X	X	X	X	X	X			
(03)		Define 'visibility'.	X	X	X	X	X	X	X		2	
(04)		Describe the meteorological measurement of visibility.	X	X	X	X	X	X	X		2	
(05)		Define 'prevailing visibility'.	X	X	X	X	X	X	X			
(06)		Define 'ground visibility'.	X	X	X	X	X	X	X	2		
(07)		List the units used for visibility (m, km, statute mile).	X	X	X	X	X	X	X		2	
(08)		Define 'runway visual range'.	X	X	X	X	X	X	X	2		
(09)		Describe the meteorological measurement of runway visual range.	X	X	X	X	X	X	X	2		
(10)		Indicate where the transmissometers/ forward-scatter meters are placed on the aerodrome.	X	X	X	X	X	X	X	2		
(11)		List the units used for runway visual range (m, ft).	X	X	X	X	X	X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)		List the different possibilities to transmit information to pilots about runway visual range.	X	X	X	X	X	X	X	2		
(13)		Compare ground visibility, prevailing visibility, and runway visual range.	X	X	X	X	X	X	X	2		
(14)		Indicate the means of observation of present weather.	X	X	X	X	X	X				
(15)		Indicate the means of observing clouds for the purpose of recording: type, amount, height of base (ceilometers), and top.	X	X	X	X	X	X				
(16)		State the clouds which are indicated in METAR, TAF and SIGMET.	X	X	X	X	X	X	X	2		
(17)		Define 'oktas'.	X	X	X	X	X	X	X		2	
(18)		Define 'cloud base'.	X	X	X	X	X	X	X		2	
(19)		Define 'ceiling'.	X	X	X	X	X	X	X		2	
(20)		Name the unit and the reference level used for information about cloud base (ft).	X	X	X	X	X	X	X		2	
(21)		Define 'vertical visibility'.	X	X	X	X	X	X	X		2	
(22)		Explain briefly how and when vertical visibility is measured.	X	X	X	X	X	X	X	2		
(23)		Name the units used for vertical visibility (ft, m).	X	X	X	X	X	X	X		2	
(24)		Indicate the means of observation of air temperature (thermometer).	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(25)		Name the units of relative humidity (%) and dew-point temperature (Celsius, Fahrenheit).	X	X	X	X	X	X				
050 10 01 02		***Radiosonde observations***										
(01)		Describe the principle of radiosondes.	X	X	X	X	X	X				
(02)	X	Describe and interpret the sounding by radiosonde given on a simplified temperature–pressure (T–P) diagram.	X	X	X	X	X	X				
050 10 01 03		***Satellite observations***										
(01)		Describe the basic outlines of satellite observations.	X	X	X	X	X	X	X			
(02)		Name the main uses of satellite pictures in aviation meteorology.	X	X	X	X	X	X	X			
(03)		Describe the different types of satellite imagery.	X	X	X	X	X	X	X			
(04)		Interpret qualitatively the satellite pictures in order to get useful information for flights: — location of clouds (distinguish between stratiform and cumuliform clouds).	X	X	X	X	X	X	X			
(05)		Interpret qualitatively the satellite pictures in order to get useful information for flights: — location of fronts.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Interpret qualitatively the satellite pictures in order to get useful information for flights using atmospheric motion vector images to locate jet streams.	X									
050 10 01 04		***Weather radar observations*** *(Refer to Subject 050 09 04 05)*										
(01)		Describe the basic principle and the type of information given by a ground weather radar.	X	X	X	X	X	X				
(02)		Interpret ground weather radar images.	X	X	X	X	X	X	X	2		
(03)		Describe the basic principle and the type of information given by airborne weather radar.	X	X	X	X	X	X	X	2		
(04)		Describe the limits and the errors of airborne weather radar information.	X	X	X	X	X	X	X	2		
(05)		Interpret typical airborne weather radar images.	X	X	X	X	X	X	X	2		
050 10 01 05		***Aircraft observations and reporting***										
(01)		Describe routine air-report and special air-report (ARS).	X	X	X	X	X	X	X			
(02)		State the obligation of a pilot to prepare air-reports.	X	X	X	X	X	X	X			
(03)		Name the weather phenomena to be stated in an ARS.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 10 02 00		**Weather charts**										
050 10 02 01		***Significant weather charts***										
(01)		Decode and interpret significant weather charts (low, medium and high level).	X	X	X	X	X	X	X	2		
(02)		Describe from a significant weather chart the flight conditions at designated locations or along a defined flight route at a given FL.	X	X	X	X	X	X	X	2		
050 10 02 02		***Surface charts***										
(01)		Recognise the following weather systems on a surface weather chart (analysed and forecast): ridges, cols and troughs; fronts; frontal side, warm sector and rear side of mid-latitude frontal lows; high- and low-pressure areas.	X	X	X	X	X	X	X	2		
(02)		Determine from surface weather charts the wind direction and speed.	X	X	X	X	X	X	X			
050 10 02 03		***Upper-air charts***										
(01)		Define ‘constant-pressure chart’.	X	X	X							
(02)		Define ‘isohypse (contour line)’. *(Refer to Subject 050 01 03 02)*	X	X	X							
(03)		Define ‘isotherm’.	X	X	X							
(04)		Define ‘isotach’.	X	X	X							

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe forecast upper-wind and temperature charts.	X	X	X							
(06)		For designated locations or routes determine from forecast upper-wind and temperature charts, if necessary by interpolation, the spot/average values for outside-air temperature, temperature deviation from ISA, wind direction, and wind speed.	X	X	X							
050 10 02 04		***Gridded forecast products***										
(01)		State that numerical weather prediction uses a 3D grid of weather data, consisting of horizontal data (latitude-longitude) and vertical data (height or pressure).	X	X	X	X	X					
(02)		Explain that world area forecast centres prepare global sets of gridded forecasts for flight planning purposes (upper wind, temperature, humidity).	X	X	X	X	X					
(03)		State that the WAFCs also produce gridded datasets for Flight Level and temperature of the tropopause, direction and speed of maximum wind, cumulonimbus clouds, icing and turbulence.	X	X	X	X	X					
(04)		Explain that the data on CB and turbulence can be used in the visualization of flight hazards.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(05)		Explain that the gridded forecasts can be merged in information processing systems with data relayed from aircraft or pilot reports, e.g. of turbulence, to provide improved situation awareness.	X	X	X	X	X					
050 10 03 00		**Information for flight planning**										
050 10 03 01		***Aviation weather messages***										
(01)		Describe, decode and interpret the following aviation weather messages (given in written or graphical format): METAR, aerodrome special meteorological report (SPECI), trend forecast (TREND), TAF, information concerning en-route weather phenomena which may affect the safety of aircraft operations (SIGMET), information concerning en-route weather phenomena which may affect the safety of low-level aircraft operations (AIRMET), area forecast for low-level flights (GAMET), ARS, volcanic ash advisory information.	X	X	X	X	X	X	X	2	3	
(02)		Describe, decode and interpret the tropical cyclone advisory information in written and graphical form.	X	X	X	X	X					
(03)		Describe the general meaning of MET REPORT and SPECIAL REPORT.	X	X	X	X	X	X	X	2	1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		List, in general, the cases when a SIGMET and an AIRMET are issued.	X	X	X	X	X	X	X	2	1	
(05)		Describe, decode (by using a code table) and interpret the following messages: runway state message (as written in a METAR). *Remark: For runway state message, refer to ICAO* *Doc 7754 'Air Navigation Plan — European Region'.*	X	X	X	X	X	X	X	2	1	
050 10 03 02		***Meteorological broadcasts for aviation***										
(01)		Describe the meteorological content of broadcasts for aviation: — meteorological information for aircraft in flight (VOLMET); — automatic terminal information service (ATIS).	X	X	X	X	X	X	X	2	1	
(02)		Describe the meteorological content of broadcasts for aviation: — HF-VOLMET.	X	X	X	X	X					
050 10 03 03		***Use of meteorological documents***										
(01)		Describe meteorological briefing and advice.	X	X	X	X	X	X	X	2	1	
(02)		List the information that a flight crew can receive from meteorological services for pre-flight planning and apply the content of	X	X	X	X	X	X	X	2	1	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		this information on a designated flight route.										
(03)		List the meteorological information that a flight crew can receive from flight information services during flight and apply the content of this information for the continuation of the flight.	X	X	X	X	X	X	X	2	1	
050 10 03 04		***Meteorological warnings***										
(01)		Describe and interpret aerodrome warnings and wind-shear warnings and alerts.	X	X	X	X	X	X	X	2	1	
050 10 04 00		**Meteorological services**										
050 10 04 01		***World area forecast system and meteorological offices***										
(01)	X	Name the world area forecast centres (WAFCs) as the provider for upper-air forecasts: WAFCs prepare upper-air gridded forecasts of upper winds; upper-air temperature and humidity; direction, speed and flight level of maximum wind; flight level and temperature of tropopause, areas of cumulonimbus clouds, icing, clear-air and in-cloud turbulence, and geopotential altitude of flight levels.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	Name the meteorological (MET) offices as the provider for aerodrome forecasts and briefing documents.	X	X	X	X	X	X	X			
(03)	X	Name the meteorological watch offices (MWOs) as the provider for SIGMET and AIRMET information.	X	X	X	X	X	X				
(04)	X	Name the aeronautical meteorological stations as the provider for METAR and MET reports.	X	X	X	X	X	X				
(05)	X	Name the volcanic ash advisory centres (VAACs) as the provider for forecasts of volcanic ash clouds.	X	X	X	X	X	X				
(06)	X	Name the tropical cyclone advisory centres (TCACs) as the provider for forecasts of tropical cyclones.	X		X	X						
050 10 04 02		***International organisations***										
(01)	X	Describe briefly the following organisations and their chief activities in relation to weather for aviation: — International Civil Aviation Organization (ICAO) (Refer to Subject 010 ‘Air Law’); — World Meteorological Organization (WMO).	X	X	X	X	X	X				

SUBJECT 061 – NAVIGATION – GENERAL NAVIGATION

Mental dead reckoning (MDR)

Where the term 'mental dead reckoning' (MDR) is used within a Learning Objective (LO), the applicable technique which will be used for the European Central Question Bank (ECQB) questions is based on the methods shown below.

Examination questions will state that an MDR technique is required to produce the solution. If other techniques (e.g. trigonometry) are used to determine the answer, then the determined answer may be incorrect.

MDR crosswind component (XWC)

The XWC can be calculated using a 'clock code rule', where each 15° of wind angle is represented by 1/4 of an hour — meaning 1/4 the wind strength.

The XWC can be estimated using the values from the table below:

Wind angle	15°	30°	45°	60°
% of wind speed	25	50	75	100

(Wind angle (WA) is the angle between the wind vector and the track/runway direction to the nearest 10°)

Example:

RWY 04 and surface wind from tower is 085°/20 kt. What is the XWC?
WA = 45°
XWC = (0.75) × 20
= 15 kt

MDR headwind component (HWC)/tailwind component (TWC)

The H/TWC can be estimated using the values from the following table:

90° – wind angle	10°	20°	30°	40°	50°	60°
% of wind speed	0.2	0.3	0.5	0.6	0.8	0.9

To assist recall, an aid is shown below:

90° – wind angle	10°	20°	30°	40°	50°	60°
Aid	1	1	2	2	3	3
% of wind speed	0.2	0.3	0.5	0.6	0.8	0.9

Example:

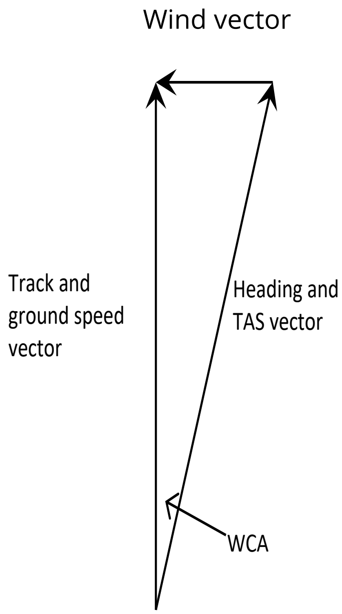
RWY 04 and surface wind from tower is 080°/20 kt. What is the HWC?
WA = 40°
90° – WA = 50°
HWC = (0.8) × 20
= <u>16 kt</u>

Alternately, for XWC and TWC/HWC MDR calculations, the values in the following table can be used, assuming XWC = wind velocity × sine WA and TWC/HWC = wind velocity × cosine WA:

Wind angle	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
Sine	0	0.2	0.3	0.5	0.6	0.8	0.9	0.9	1	1
Aid	0	1	1	2	2	3	3	2	2	1

MDR triangle of velocities (TOV)

Heading is determined by calculating the XWC as previously described, then applying the 1:60 rule to the TOV as follows:



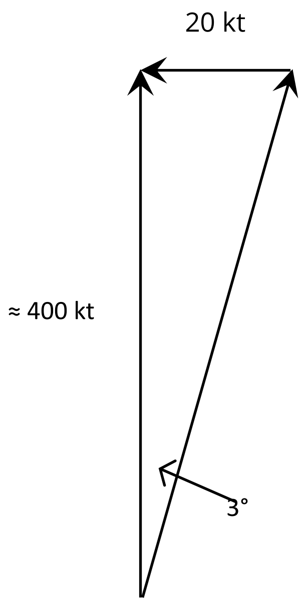
This MDR technique works for the relatively small WCAs which are typical for medium to high TAS values (the ground speed (GS) therefore can be assumed to be equal to the TAS for application of the 1:60 rule).

Example 1:

Planned track = 070° (T)
TAS = 400 kt
WV = 100° (T)/40 kt

WA = 30°

XWC = (0.5) × 40
= 20 kt



Heading required = 073° (T)

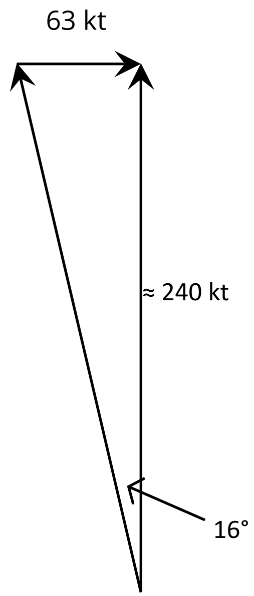
GS is determined by using the headwind/tailwind example previously explained.

WA = 30°
90° – 30° = 60°
HWC = (0.9) × 40
= 36 kt
GS = 400 – 36 = 364 kt

Example 2:

Planned track = 327° (T)
TAS = 240 kt
WV = 210° (T)/70 kt

WA = 60°
XWC = (0.9) × 7
= <u>63 kt</u>



WCA = 16°

Heading required = <u>311° (T)</u>

GS is determined by using the headwind/tailwind example previously explained.

WA = 60°
90° – 60° = 30°
TWC = (0.5) × 70
= 35 kt
GS = 240 + 35 = <u>275 kt</u>

VFR navigation (061 02 00 00)

The techniques referred to within the LOs are based on the methods as described below.

Mental dead reckoning (MDR) off-track corrections

Based on the 1:60 rule

1 NM of cross-track error (XTE) for every 60 NM along track from waypoint = 1° of track error angle (TKE).

1 NM of XTE for every 60 NM along track to waypoint = 1° of closing angle (CA).

Change of heading required to regain track in same distance as covered from waypoint to position off track = <u>2 × TKE</u>.

Change of heading required to reach next waypoint from position off track = <u>TKE + CA</u>.

Example 1:

Planned heading is 162° (T), and after 40 NM along track the aircraft position is fixed 2 NM right of planned track. What heading is required to regain track in approximately the same time as has taken to the fix position?

TKE = 3°

Heading required = 156° (T)

Example 2:

Planned heading is 317° (T), and after 22 NM along track the aircraft position is fixed 3.5 NM left of planned track. What heading is required to fly direct to the next waypoint which is another 45 NM down track?

TKE = 10°, CA = 5°
Heading required = 332° (T)

Mental dead reckoning (MDR) estimated time of arrival (ETA) calculations

Round the GS to the nearest NM/min, and then make the same percentage adjustment for the distance.

Example:

Distance to go = 42 NM
GS = 132 kt

GS rounded to 120 kt = 2 NM/min
Percentage change = 10 %
Distance = 42 – 10 % = 38 NM
Time = 38 / 2 = 19 min

Unsure-of-position procedure

As soon as the position of the aircraft is in doubt:

1. note the time;
2. communicate if in contact with an air traffic control (ATC) unit to request assistance;
3. consider using any radio-navigation aids that may be available to give position information (do not become distracted from flying the aircraft safely);

4. if short of fuel or near controlled airspace, and not in contact with ATC, set 121.5 MHz and make a PAN call;
5. if that is not necessary, check the directional indicator (DI) and compass are still synchronised and continue to fly straight and level and on route plan heading;
6. estimate the distance travelled since the last known position;
7. compare the ground with your estimated position on the map (look at the terrain for hills and valleys or line features such as a motorway, railway, river or coastline);
8. once the position has been re-established, keep checking the heading (and look out for other aircraft) and continue the flight by updating the estimated position regularly while looking for unique features such as a lake, wood, built-up area, mast, or a combination of roads, rivers and railways.

Procedure when lost

If the unsure-of-position procedure does not resolve the problem:

1. inform someone — call first on the working frequency and state the word 'LOST';
2. if there is no contact on that frequency or there is no frequency selected, change to 121.5 MHz and make a PAN call; select 7700 with ALT on the transponder if fitted.

In all cases: maintain visual meteorological conditions (VMC), note the fuel state, and try to identify an area suitable for a precautionary landing.

Consider the 'HELP ME' mnemonic:

H. High ground/obstructions — are there any nearby?

E. Entering controlled airspace — is that a possibility?

L. Limited experience, low time or student pilot — let someone know.

P. PAN call in good time — don't leave it too late.

M. MET conditions — is the weather deteriorating?

E. Endurance — is fuel getting low?

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
060 00 00 00		**NAVIGATION**										
061 00 00 00		**GENERAL NAVIGATION**										
061 01 00 00		**BASICS OF NAVIGATION**										
061 01 01 00		**The Earth**										
061 01 01 01		***Form***										
(01)	X	State that the geoid is an irregular shape based on the surface of the oceans influenced only by gravity and centrifugal force.	X	X	X	X	X					
(02)	X	State that a number of different ellipsoids are used to describe the shape of the Earth for mapping but that WGS-84 is the reference ellipsoid required for geographical coordinates.	X	X	X	X	X					
(03)		State that the circumference of the Earth is approximately 40 000 km or approximately 21 600 NM.	X	X	X	X	X					
061 01 01 02		***Earth rotation***										
(01)	X	Describe the rotation of the Earth around its own spin axis and the plane of the	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		ecliptic (including the relationship of the spin axis to the plane of the ecliptic).										
(02)		Explain the effect that the inclination of the Earth’s spin axis has on insolation and duration of daylight.	X	X	X	X	X					
061 01 02 00		**Position**										
061 01 02 01		***Position reference system***										
(01)	X	State that geodetic latitude and longitude is used to define a position on the WGS-84 ellipsoid.	X	X	X	X	X					
(02)		Define geographic (geodetic) latitude and parallels of latitude.	X	X	X	X	X					
(03)		Calculate the difference in latitude between any two given positions.	X	X	X	X	X					
(04)		Define geographic (geodetic) longitude and meridians.	X	X	X	X	X					
(05)		Calculate the difference in longitude between any two given positions.	X	X	X	X	X					
061 01 03 00		**Direction**										
061 01 03 01		***Datums***										
(01)	X	Define ‘true north’ (TN).	X	X	X	X	X					
(02)		Measure a true direction on any given aeronautical chart.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)	X	Define 'magnetic north' (MN).	X	X	X	X	X					
(04)		Define and apply variation.	X	X	X	X	X					
(05)		Explain changes of variation with time and position.	X	X	X	X	X					
(06)	X	Define 'compass north' (CN).	X	X	X	X	X					
(07)		Apply deviation.	X	X	X	X	X					
061 01 03 02		***Track and heading***										
(01)		Calculate XWC by: – trigonometry; and – MDR.	X	X	X	X	X					
(02)		Explain and apply the concepts of drift and WCA.	X	X	X	X	X					
(03)		Calculate the actual track with appropriate data of heading and drift.	X	X	X	X	X					
(04)		Calculate TKE with appropriate data of WCA and drift.	X	X	X	X	X					
(05)		Calculate the heading change at an off-course fix to directly reach the next waypoint using the 1:60 rule.	X	X	X	X	X					
(06)		Calculate the average drift angle based upon an off-course fix observation.	X	X	X	X	X					
061 01 04 00		**Distance**										
061 01 04 01		***WGS-84 ellipsoid***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)	X	State that 1 NM is equal to 1 852 km, which is the average distance of 1' of latitude change on the WGS-84 ellipsoid.	X	X	X	X	X					
(02)		State that 1' of longitude change at the equator on the WGS-84 ellipsoid is approximately equal to 1 NM.	X	X	X	X	X					
061 01 04 02		***Units***										
(01)		Convert between units of distance (nautical mile (NM), kilometre (km), statute mile (SM), feet (ft), inches (in)).	X	X	X	X	X					
061 01 04 03		***Graticule distances***										
(01)		Calculate the distance between positions on the same meridian, on opposite (antipodal) meridians, on the same parallel of latitude, and calculate new latitude/longitude when given distances north-south and east-west.	X	X	X	X	X					
061 01 04 04		***Air mile***										
(01)		Evaluate the effect of wind and altitude on air distance.	X	X	X	X	X					
(02)		Convert between ground distance (NM) and air distance (NAM) using the formula: NAM = NM × TAS/GS.	X	X	X	X	X					
061 01 05 00		**Speed**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
061 01 05 01		***True airspeed (TAS)***										
(01)		Calculate TAS from CAS, and CAS from TAS by: – mechanical computer; and – rule of thumb (2 % per 1 000 ft).	X	X	X	X	X					
061 01 05 02		***Mach number (M)***										
(01)		Calculate TAS from M, and M from TAS.	X	X								
061 01 05 03		***CAS/TAS/M relationship***										
(01)		Deduce the CAS, TAS and M relationship in climb/descent/cruise (flying at constant CAS or M).	X	X								
(02)		Deduce CAS and TAS in climb/descent/cruise (flying at constant CAS).			X	X	X					
061 01 05 04		***Ground speed (GS)***										
(01)		Calculate headwind component (HWC) and tailwind component (TWC) by: – trigonometry; and – MDR.	X	X	X	X	X					
(02)		Apply HWC and TWC to determine GS from TAS and vice versa.	X	X	X	X						

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)	X	Explain the relationship between GS and TAS with increasing WCA.	X	X	X	X	X					
(04)		Calculate GS with: – mechanical computer (TOV solution); and – MDR (given track, TAS and WV).	X	X	X	X	X					
(05)		Perform GS, distance and time calculations.	X	X	X	X	X					
(06)		Calculate revised GS to reach a waypoint at a specific time.	X	X	X	X	X					
(07)		Calculate the average GS based on two observed fixes.	X	X	X	X	X					
061 01 05 05		***Flight log***										
(01)		Enter revised navigational en-route data, for the legs concerned, into the flight plan (e.g. updated wind and GS and correspondingly losses or gains in time and fuel consumption).	X	X	X	X	X					
061 01 05 06		***Gradient versus rate of climb/descent***										
(01)		Estimate average climb/descent gradient (%) or glide path degrees according to the following rule of thumb: — Gradient in degrees = (vertical distance (ft) / 100) / ground distance (NM))	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— Gradient in % = (vertical distance (ft) / 60) / ground distance (NM)) — Gradient in degrees = arctan (altitude difference (ft) / ground distance (ft)). *N.B. These rules of thumb approximate 1 NM to 6 000 ft and are based on the 1:60 rule.*										
(02)		Calculate rate of descent (ROD) on a given glide-path angle or gradient using the following rule of thumb formulae: — ROD (ft/min) = GP° × GS (NM/min) × 100 — ROD (ft/min) = GP% × GS (kt)	X	X	X	X	X					
(03)		Calculate climb/descent gradient (ft/NM, % and degrees), GS or vertical speed according to the following formula: — Vertical speed (ft/min) = (GS (kt) × gradient (ft/NM)) / 60.	X	X	X	X	X					
(04)	X	State that it is necessary to determine the position of the aircraft accurately before commencing descent in order to ensure safe ground clearance.	X	X	X	X	X					
061 01 06 00		**Triangle of velocities (TOV)**										
061 01 06 01		***Construction***										
(01)		Draw and correctly label the TOV.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
061 01 06 02		***Solutions***										
(01)		Resolve the TOV for: — heading and GS (with mechanical computer and MDR); — WV (with mechanical computer); and — track and GS (with mechanical computer and MDR.	X	X	X	X	X					
061 01 07 00		**Dead reckoning (DR)**										
061 01 07 01		***Dead reckoning (DR) technique***										
(01)		Determine a DR position.	X	X	X	X	X					
(02)		Evaluate the difference between a DR and a fix position.	X	X	X	X	X					
(03)		Define ‘speed factor’ (SF). Speed divided by 60, used for mental flight-path calculations.	X	X	X	X	X					
(04)		Calculate wind correction angle (WCA) using the formula: — WCA = XWC (crosswind component)/SF	X	X	X	X	X					
061 01 08 00		**Navigation in climb and descent**										
061 01 08 01		***Average airspeed***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Average TAS used for climb problems is calculated at the altitude 2/3 of the cruising altitude.	X	X	X	X	X					
(02)		Average TAS used for descent problems is calculated at the altitude 1/2 of the descent altitude.	X	X	X	X	X					
061 01 08 02		***Average wind velocity (WV)***										
(01)		WV used for climb problems is the WV at the altitude 2/3 of the cruising altitude.	X	X	X	X	X					
(02)		WV used for descent problems is the WV at the altitude 1/2 of the descent altitude.	X	X	X	X	X					
(03)		Calculate the average climb/descent GS from given TAS at various altitudes, and WV at various altitudes and true track.	X	X	X	X	X					
061 01 08 03		***Ground speed (GS)/distance covered during climb or descent***										
(01)	X	State that most aircraft operating handbooks supply graphical material to calculate climb and descent problems.	X	X	X	X	X					
(02)		Calculate the flying time and distance during climb/descent from given average rate of climb/descent and using average GS using the following formulae valid for a 3°-glide path: — rate of descent = (GS × 10) / 2	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— rate of descent = speed factor (SF) × glide-path angle × 100										
(03)		Given distance, speed and present altitude, calculate the rate of climb/descent in order to reach a certain position at a given altitude.	X	X	X	X	X					
(04)		Given speed, rate of climb/descent and altitude, calculate the distance required in order to reach a certain position at a given altitude.	X	X	X	X	X					
(05)		Given speed, distance to go and altitude to climb/descent, calculate the rate of climb/descent.	X	X	X	X	X					
061 02 00 00		**VISUAL FLIGHT RULES (VFR) NAVIGATION**										
061 02 01 00		**Ground features**										
061 02 01 01		***Ground features***										
(01)		Recognise which elements would make a ground feature suitable for use for VFR navigation.	X	X	X	X	X					
061 02 01 02		***Visual identification***										
(01)		Describe the problems of VFR navigation at lower levels and the causes of reduced visibility.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Describe the problems of VFR navigation at night.	X	X	X	X	X					
061 02 02 00		**VFR navigation techniques**										
061 02 02 01		***Use of visual observations and application to in-flight navigation***										
(01)	X	Describe what is meant by the term 'map reading'.	X	X	X	X	X					
(02)	X	Define the term 'visual checkpoint'.	X	X	X	X	X					
(03)		Discuss the general features of a visual checkpoint and give examples.	X	X	X	X	X					
(04)		State that the evaluation of the differences between DR positions and actual position can refine flight performance and navigation.	X	X	X	X	X					
(05)	X	Establish fixes on navigational charts by plotting visually derived intersecting lines of position.	X	X	X	X	X					
(06)	X	Describe the use of a single observed position line to check flight progress.	X	X	X	X	X					
(07)	X	Describe how to prepare and align a map/chart for use in visual navigation.	X	X	X	X	X					
(08)		Describe visual-navigation techniques including: — use of DR position to locate identifiable landmarks;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— identification of charted features/landmarks; — factors affecting the selection of landmarks; — an understanding of seasonal and meteorological effects on the appearance and visibility of landmarks; — selection of suitable landmarks; — estimation of distance from landmarks from successive bearings; — estimation of the distance from a landmark using an approximation of the sighting angle and the flight altitude.										
(09)		Describe the action to be taken if there is no visual checkpoint available at a scheduled turning point.	X	X	X	X	X					
(10)		Understand the difficulties and limitations that may be encountered in map reading in some geographical areas due to the nature of terrain, lack of distinctive landmarks, or lack of detailed and accurate charted data.	X	X	X	X	X					
(11)	X	State the function of contour lines on a topographical chart.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)	X	Indicate the role of 'layer tinting' (colour gradient) in relation to the depiction of topography on a chart.	X	X	X	X	X					
(13)		Using the contours shown on a chart, describe the appearance of a significant feature.	X	X	X	X	X					
(14)		Apply the techniques of DR, map reading, orientation, timing and revision of ETAs and headings.	X	X	X	X	X					
061 02 02 02		***Unplanned events***										
(01)		Explain what needs to be considered in case of diversion, when unsure of position and when lost.	X	X	X	X	X					
061 03 00 00		**GREAT CIRCLES AND RHUMB LINES**										
061 03 01 00		**Great circles**										
061 03 01 01		***Properties***										
(01)		Describe the geometric properties of a great circle (including the vertex) and a small circle.	X	X								
(02)		Describe the geometric properties of a great circle and a small circle, up to 30° difference of longitude.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)	X	Explain why a great-circle route is the shortest distance between any two positions on the Earth.	X	X	X	X	X					
(04)		Name examples of great circles on the surface of the Earth.	X	X	X	X	X					
061 03 01 02		***Convergence***										
(01)	X	Explain why the track direction of a great-circle route (other than following a meridian or the equator) changes.	X	X	X	X	X					
(02)		State the formula used to approximate the value of Earth convergence as change of longitude × sine mean latitude.	X	X	X	X	X					
(03)		Calculate the approximate value of Earth convergence between any two positions, up to 30° difference of longitude.	X	X	X	X	X					
061 03 02 00		**Rhumb lines**										
061 03 02 01		***Properties***										
(01)	X	Describe the geometric properties of a rhumb line.	X	X	X	X	X					
(02)	X	State that a rhumb-line route is not the shortest distance between any two positions on the Earth (excluding meridians and equator).	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
061 03 03 00		**Relationship**										
061 03 03 01		***Distances***										
(01)		Explain that the variation in distance of the great-circle route and rhumb-line route between any two positions increases with increasing latitude or change in longitude.	X	X	X	X	X					
061 03 03 02		***Conversion angle***										
(01)		Calculate and apply the conversion angle.	X	X								
061 04 00 00		**CHARTS**										
061 04 01 00		**Chart requirements**										
061 04 01 01		***ICAO Annex 4 'Aeronautical Charts'***										
(01)		State the requirement for conformality and for a straight line to approximate a great circle.	X	X	X	X	X					
061 04 01 02		***Convergence***										
(01)		Explain and calculate the constant of the cone (sine of parallel of origin).	X	X	X	X	X					
(02)		Explain the relationship between Earth and chart convergence with respect to the ICAO	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		requirement for a straight line to approximate a great circle.										
061 04 01 03		**Scale**										
(01)		Recognise methods of representing scale on aeronautical charts.	X	X	X	X	X					
(02)		Perform scale calculations based on typical en-route chart scales.	X	X	X	X	X					
061 04 02 00		**Projections**										
061 04 02 01		***Methods of projection***										
(01)	X	Identify azimuthal, cylindrical and conical projections.	X	X	X	X	X					
061 04 02 02		***Polar stereographic***										
(01)		State the properties of a polar stereographic projection.	X	X	X	X	X					
(02)		Calculate straight line track changes on a polar stereographic chart.	X	X	X	X	X					
061 04 02 03		***Direct Mercator***										
(01)		State the properties of a direct Mercator projection.	X	X	X	X	X					
(02)		Given the scale at one latitude, calculate the scale at different latitudes.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(03)		Given a chart length at one latitude, show that it represents a different Earth distance at other latitudes.	X	X	X	X	X					
061 04 02 04		***Lambert***										
(01)		State the properties of a Lambert projection.	X	X	X	X	X					
(02)		Calculate straight line track changes on a Lambert chart.	X	X	X	X	X					
(03)		Explain the scale variation throughout the charts as follows: — the scale indicated on the chart will be correct at the standard parallels; — the scale will increase away from the parallel of origin; — the scale within the standard parallels differs by less than 1 % from the scale stated on the chart.	X	X	X	X	X					
(04)		Given appropriate data, calculate initial, final or rhumb-line tracks between two positions (lat./long.).	X	X	X	X	X					
(05)		Given two positions (lat./long.) and information to determine convergency between the two positions, calculate the parallel of origin.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Given a Lambert chart, determine the parallel of origin, or constant of cone.	X	X	X	X	X					
(07)		Given constant of cone or parallel of origin, great-circle track at one position and great-circle track at another position, calculate the difference of longitude between the two positions.	X	X	X	X	X					
061 04 03 00		**Practical use**										
061 04 03 01		***Symbology***										
(01)		Recognise ICAO Annex 4 symbology.	X	X	X	X	X					
061 04 03 02		***Plotting***										
(01)		Measure tracks and distances on VFR and IFR en-route charts.	X	X	X	X	X					
(02)		Fix the aircraft position on an en-route chart with information from VOR and DME equipment.	X	X	X	X	X					
(03)		Resolve bearings of an NDB station for plotting on an aeronautical chart.	X	X	X	X	X					
061 05 00 00		**TIME**										
061 05 01 00		**Local Mean Time (LMT)**										
061 05 01 01		***Mean solar day***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Explain the concepts of a mean solar day and LMT.	X	X	X	X	X					
061 05 01 02		***Local Mean Time (LMT) and Universal Time Coordinated (UTC)***										
(01)		Perform LMT and UTC calculations.	X	X	X	X	X					
061 05 02 00		**Standard time**										
061 05 02 01		***Standard time and daylight saving time***										
(01)		Explain and apply the concept of standard time and daylight saving time, and perform standard time and daylight saving time calculations.	X	X	X	X	X					
061 05 02 02		***International Date Line***										
(01)		State the changes when crossing the International Date Line.	X	X	X	X	X					
061 05 03 00		**Sunrise and sunset**										
061 05 03 01		***Sunrise and sunset times***										
(01)		Define sunrise, sunset, and civil twilight, and extract times from a suitable source (e.g. an almanac).	X	X	X	X	X					
(02)		Explain the changes to sunrise, sunset, and civil twilight times with date, latitude and altitude.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain at which time of the year the duration of daylight changes at the highest rate.	X	X	X	X	X					

SUBJECT 062 – NAVIGATION – RADIO NAVIGATION

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
060 00 00 00		**NAVIGATION**										
062 00 00 00		**RADIO NAVIGATION**										
062 01 00 00		**BASIC RADIO PROPAGATION THEORY**										
062 01 01 00		**Basic principles**										
062 01 01 01		***Electromagnetic waves***										
(01)	X	State that radio waves travel at the speed of light, being approximately 300 000 km/s.	X	X	X	X	X	X				
(02)	X	Define a ‘cycle’: a complete series of values of a periodical process.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 01 01 02		***Frequency, wavelength, amplitude, phase angle***										
(01)	X	Define 'frequency': the number of cycles occurring in 1 second expressed in Hertz (Hz).	X	X	X	X	X	X				
(02)	X	Define 'wavelength': the physical distance travelled by a radio wave during one cycle of transmission.	X	X	X	X	X	X				
(03)	X	Define 'amplitude': the maximum deflection in an oscillation or wave.	X	X	X	X	X	X				
(04)	X	State that the relationship between wavelength and frequency is: wavelength (λ) = speed of light (c) / frequency (f).	X	X	X	X	X	X				
(05)	X	Define 'phase angle': the fraction of one wavelength expressed in degrees from 000° to 360°.	X	X	X	X	X	X				
(06)	X	Define 'phase angle difference/shift': the angular difference between the corresponding points of two cycles of equal wavelength, which is measurable in degrees (°).	X	X	X	X	X	X				
062 01 01 03		***Frequency bands, sidebands, single sideband***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		List the bands of the frequency spectrum for electromagnetic waves: — very low frequency (VLF): 3–30 kHz; — low frequency (LF): 30–300 kHz; — medium frequency (MF): 300–3 000 kHz; — high frequency (HF): 3–30 MHz; — very high frequency (VHF): 30–300 MHz; — ultra-high frequency (UHF): 300–3 000 MHz; — super high frequency (SHF): 3–30 GHz; — extremely high frequency (EHF): 30–300 GHz.	X	X	X	X	X	X				
(02)		State that when a carrier wave is modulated, the resultant radiation consists of the carrier frequency plus additional upper and lower sidebands.	X	X	X	X	X	X				
(03)		State that HF meteorological information for aircraft in flight (VOLMET) and HF two-way communication use a single sideband.	X	X	X	X	X	X				
(04)		State that the following abbreviations (classifications according to International Telecommunication Union (ITU)	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		regulations) are used for aviation applications: — N0N: carrier without modulation as used by non-directional radio beacons (NDBs); — A1A: carrier with keyed Morse code modulation as used by NDBs; — A2A: carrier with amplitude modulated Morse code as used by NDBs; — A3E: carrier with amplitude modulated speech used for communication (VHF-COM).										
062 01 01 04		***Pulse characteristics***										
(01)		Define the following terms that are associated with a pulse string: — pulse length; — pulse power; — continuous power.	X	X	X	X	X	X				
062 01 01 05		***Carrier, modulation***										
(01)	X	Define 'carrier wave': the radio wave acting as the carrier or transporter.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	Define 'modulation': the technical term for the process of impressing and transporting information by radio waves.	X	X	X	X	X	X				
062 01 01 06		***Kinds of modulation (amplitude, frequency, pulse, phase)***										
(01)	X	Define 'amplitude modulation': the information that is impressed onto the carrier wave by altering the amplitude of the carrier.	X	X	X	X	X	X				
(02)	X	Define 'frequency modulation': the information that is impressed onto the carrier wave by altering the frequency of the carrier.	X	X	X	X	X	X				
(03)	X	Describe 'pulse modulation': a modulation form used in radar by transmitting short pulses followed by larger interruptions.	X	X	X	X	X	X				
(04)	X	Describe 'phase modulation': a modulation form used in GPS where the phase of the carrier wave is reversed.	X	X	X	X	X	X				
062 01 02 00		**Antennas**										
062 01 02 01		***Characteristics***										
(01)	X	Define 'antenna': an antenna or aerial is an electrical device which converts electric power into radio waves, and vice versa.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	State that the simplest type of antenna is a dipole, which is a wire of length equal to one half of the wavelength.	X	X	X	X	X	X				
(03)	X	State that an electromagnetic wave always consists of an oscillating electric (E) and an oscillating magnetic (H) field which propagates at the speed of light.	X	X	X	X	X	X				
(04)	X	State that the E and H fields are perpendicular to each other. The oscillations are perpendicular to the propagation direction and are in-phase.	X	X	X	X	X	X				
062 01 02 02		***Polarisation***										
(01)	X	State that the polarisation of an electromagnetic wave describes the orientation of the plane of oscillation of the electrical component of the wave with regard to its direction of propagation.	X	X	X	X	X	X				
062 01 02 03		***Types of antennas***										
(01)		Name the common different types of directional antennas: — loop antenna used in old automatic direction-finding (ADF) receivers; — parabolic antenna used in weather radars;	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— slotted planar array used in more modern weather radars.										
(02)		Explain ‘antenna shadowing’.	X	X	X	X	X					
(03)		Explain the importance of antenna placement on aircraft.	X	X	X	X	X					
062 01 03 00		**Wave propagation**										
062 01 03 01		***Structure of the ionosphere and its effect on radio waves***										
(01)	X	State that the ionosphere is the ionised component of the Earth’s upper atmosphere from approximately 60 to 400 km above the surface, which is vertically structured in three regions or layers.	X	X	X	X	X	X				
(02)	X	State that the layers of the ionosphere are named D, E and F layers, and their depth varies with time.	X	X	X	X	X	X				
(03)	X	State that electromagnetic waves refracted from the E and F layers of the ionosphere are called sky waves.	X	X	X	X	X	X				
(04)	X	Explain how the different layers of the ionosphere influence wave propagation.	X	X	X	X	X	X				
062 01 03 02		***Ground waves***										
(01)	X	Define ‘ground or surface waves’: the electromagnetic waves travelling along the surface of the Earth.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 01 03 03		***Space waves***										
(01)	X	Define 'space waves': the electromagnetic waves travelling through the air directly from the transmitter to the receiver.	X	X	X	X	X	X				
062 01 03 04		***Propagation with the frequency bands***										
(01)		State that radio waves in VHF, UHF, SHF and EHF propagate as space waves.	X	X	X	X	X	X				
(02)		State that radio waves in LF, MF and HF propagate as surface/ground waves and sky waves.	X	X	X	X	X	X				
062 01 03 05		***Doppler principle***										
(01)	X	State that the Doppler effect is the phenomenon where the frequency of a wave will increase or decrease if there is relative motion between the transmitter and the receiver.	X	X	X	X	X	X				
062 01 03 06		***Factors affecting propagation***										
(01)	X	Define 'skip distance': the distance between the transmitter and the point on the surface of the Earth where the first sky wave return arrives.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that skip zone/dead space is the distance between the limit of the surface wave and the sky wave.	X	X	X	X	X	X				
(03)		Describe 'fading': when a receiver picks up two signals with the same frequency, and the signals will interfere with each other causing changes in the resultant signal strength and polarisation.	X	X	X	X	X	X				
(04)		State that radio waves in the VHF band and above are limited in range as they are not reflected by the ionosphere and do not have a surface wave.	X	X	X	X	X	X				
(05)	X	Describe the physical phenomena 'reflection', 'refraction', 'diffraction', 'absorption' and 'interference'.	X	X	X	X	X	X				
(06)		State that multipath is when the signal arrives at the receiver via more than one path (the signal being reflected from surfaces near the receiver).	X	X	X	X	X	X				
062 02 00 00		**RADIO AIDS**										
062 02 01 00		**Ground direction finding (DF)**										
062 02 01 01		***Principles***										
(01)	X	Describe the use of a ground DF.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Explain the limitation of range because of the path of the VHF signal.	X	X	X	X	X	X				
062 02 01 02		***Presentation and interpretation***										
(01)		Define the term ‘QDM’: the magnetic bearing to the station.	X	X	X	X	X	X	X		1	
(02)		Define the term ‘QDR’: the magnetic bearing from the station.	X	X	X	X	X	X	X		1	
(03)		Explain that by using more than one ground station, the position of an aircraft can be determined and transmitted to the pilot.	X	X	X	X	X	X				
062 02 01 03		***Coverage and range***										
(01)		Use the formula: $1.23 \times \sqrt{\text{transmitter height in feet}} + 1.23 \times \sqrt{\text{receiver height in feet}}$ to calculate the range in NM.	X	X	X	X	X	X	X		2	
062 02 01 04		***Errors and accuracy***										
(01)	X	Explain why synchronous transmissions will cause errors.	X	X	X	X	X	X				
(02)	X	Describe the effect of ‘multipath signals’.	X	X	X	X	X	X				
(03)		Explain that VDF information is divided into the following classes according to ICAO Annex 10:	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		– Class A: accurate to a range within ± 2°; – Class B: accurate to a range within ± 5°; – Class C: accurate to a range within ± 10°; – Class D: accurate to less than Class C.										
062 02 02 00		**Non-directional radio beacon (NDB)/automatic direction finding (ADF)**										
062 02 02 01		***Principles***										
(01)	X	Define the acronym ‘NDB’: non-directional radio beacon.	X	X	X	X	X	X	X		2	
(02)	X	Define the acronym ‘ADF’: automatic direction-finding equipment.	X	X	X	X	X	X	X		2	
(03)	X	State that the NDB is the ground part of the system.	X	X	X	X	X	X	X		2	
(04)	X	State that the ADF is the airborne part of the system.	X	X	X	X	X	X	X		2	
(05)		State that the NDB operates in the LF and MF frequency bands.	X	X	X	X	X	X	X	2		
(06)		State that the frequency band assigned to aeronautical NDBs according to ICAO Annex 10 is 190–1 750 kHz.	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Define a 'locator beacon': an LF/MF NDB used as an aid to final approach usually with a range of 10–25 NM.	X	X	X	X	X	X	X	2		
(08)	X	State that certain commercial radio stations transmit within the frequency band of the NDB.	X	X	X	X	X	X	X		2	
(09)	X	State that according to ICAO Annex 10, an NDB station has an automatic ground monitoring system.	X	X	X	X	X	X	X			
(10)		Describe the use of NDBs for navigation.	X	X	X	X	X	X	X	2		
(11)		Describe the procedure to identify an NDB station.	X	X	X	X	X	X	X	2		
(12)	X	Interpret the term 'cone of confusion' in respect of an NDB.	X	X	X	X	X	X	X		2	
(13)	X	State that an NDB station emits a N0N/A1A or a N0N/A2A signal.	X	X	X	X	X	X	X		2	
(14)	X	State the function of the beat frequency oscillator (BFO).	X	X	X	X	X	X	X		2	
(15)	X	State that in order to identify a N0N/A1A NDB, the BFO circuit of the receiver has to be activated.	X	X	X	X	X	X	X		2	
(16)	X	State that on modern aircraft, the BFO is activated automatically.	X	X	X	X	X	X	X		2	
062 02 02 02		***Presentation and interpretation***										
(01)	X	Name the types of indicators commonly in use:	X	X	X	X	X	X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		– electronic display; – radio magnetic indicator (RMI); – fixed-card ADF (radio compass); – moving-card ADF.										
(02)		Interpret the indications given on RMI, fixed-card and moving-card ADF displays.	X	X	X	X	X	X	X	2		
(03)		Given a display, interpret the relevant ADF information.	X	X	X	X	X	X	X	2		
(04)		Calculate the true bearing from the compass heading and relative bearing.	X	X	X	X	X	X	X	2		
(05)		Convert the compass bearing into magnetic bearing and true bearing.	X	X	X	X	X	X	X	2		
(06)		Describe how to fly the following in-flight ADF procedures: – homing and tracking, and explain the influence of wind; – interception of inbound QDM and outbound QDR; – changing from one QDM/QDR to another; – determining station passage and the abeam point.	X	X	X	X	X	X	X	2		
062 02 02 03		***Coverage and range***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	State that the power of the transmitter limits the range of an NDB.	X	X	X	X	X	X	X		2	
(02)		Explain the relationship between power and range.	X	X	X	X	X	X	X			
(03)	X	Describe the propagation path of NDB radio waves with respect to the ionosphere and the Earth's surface.	X	X	X	X	X	X	X		2	
(04)		Explain that the interference between sky waves and ground waves leads to 'fading'.	X	X	X	X	X	X	X	2		
(05)		Define that the accuracy the pilot has to fly the required bearing in order to be considered established during approach, according to ICAO Doc 8168, has to be within ± 5°.	X	X	X	X	X	X	X	2		
(06)		State that there is no warning indication of NDB failure.	X	X	X	X	X	X	X	2		
062 02 02 04		***Errors and accuracy***										
(01)	X	Explain 'coastal refraction': as a radio wave travelling over land crosses the coast, the wave speeds up over water and the wave front bends.	X	X	X	X	X	X	X		2	
(02)	X	Define 'night/twilight effect': the influence of sky waves and ground waves arriving at the ADF receiver with a difference of phase and polarisation which introduce bearing errors.	X	X	X	X	X	X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		State that interference from other NDB stations on the same frequency may occur at night due to sky-wave contamination.	X	X	X	X	X	X	X	2		
062 02 02 05		***Factors affecting range and accuracy***										
(01)		Describe diffraction of radio waves in mountainous terrain (mountain effect).	X	X	X	X	X	X	X	2		
(02)		State that static radiation energy from a cumulonimbus cloud may interfere with the radio wave and influence the ADF bearing indication.	X	X	X	X	X	X	X	2		
(03)		Explain that the bank angle of the aircraft causes a dip error.	X	X	X	X	X	X	X			
062 02 03 00		**VHF omnidirectional radio range (VOR): conventional VOR (CVOR) and Doppler VOR (DVOR)**										
062 02 03 01		***Principles***										
(01)	X	Explain the working principle of VOR using the following general terms: — reference phase; — variable phase; — phase difference.	X	X	X	X	X	X				
(02)		State that the frequency band allocated to VOR according to ICAO Annex 10 is VHF,	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		and the frequencies used are 108.0–117.975 MHz.										
(03)		State that frequencies within the allocated VOR range 108.0–111.975 MHz, which have an odd number in the first decimal place, are used by instrument landing system (ILS).	X	X	X	X	X	X	X	2		
(04)		State that the following types of VOR are in operation: — conventional VOR (CVOR): a first-generation VOR station emitting signals by means of a rotating antenna; — Doppler VOR (DVOR): a second-generation VOR station emitting signals by means of a combination of fixed antennas utilising the Doppler principle; — en-route VOR for use by IFR traffic; — terminal VOR (TVOR): a station with a shorter range used as part of the approach and departure structure at major aerodromes; — test VOR (VOT): a VOR station emitting a signal to test VOR indicators in an aircraft.	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		State that automatic terminal information service (ATIS) information is transmitted on VOR frequencies.	X	X	X	X	X	X	X	2		
(06)	X	List the three main components of VOR airborne equipment: — the antenna; — the receiver; — the indicator.	X	X	X	X	X	X	X		2	
(07)		Describe the identification of a VOR in terms of Morse-code letters and additional plain text.	X	X	X	X	X	X	X	2		
(08)	X	State that according to ICAO Annex 10, a VOR station has an automatic ground monitoring system.	X	X	X	X	X	X				
(09)		State that failure of the VOR station to stay within the required limits can cause the removal of identification and navigation components from the carrier or radiation to cease.	X	X	X	X	X	X	X	2		
062 02 03 02		***Presentation and interpretation***										
(01)		Read off the radial on an RMI.	X	X	X	X	X	X		2		
(02)		Read off the angular displacement in relation to a preselected radial on a horizontal situation indicator (HSI) or omnibearing indicator (OBI).	X	X	X	X	X	X		2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the use of the TO/FROM indicator in order to determine aircraft position relative to the VOR considering also the heading of the aircraft.	X	X	X	X	X	X		2		
(04)		Interpret VOR information as displayed on HSI, CDI and RMI.	X	X	X	X	X	X		2		
(05)		Describe the following in-flight VOR procedures: — tracking, and explain the influence of wind when tracking; — interception of a radial inbound and outbound to/from a VOR; — changing from one radial inbound/outbound to another; — determining station passage and the abeam point.	X	X	X	X	X	X		2		
(06)		State that when converting a radial into a true bearing, the variation at the VOR station has to be taken into account.	X	X	X	X	X	X		2		
062 02 03 03		***Intentionally left blank***										
062 02 03 04		***Errors and accuracy***										
(01)		Define that the accuracy the pilot has to fly the required bearing in order to be considered established on a VOR track	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		when flying approach procedures, according to ICAO Doc 8168, has to be within the half-full scale deflection of the required track.										
(02)		State that due to reflections from terrain, radials can be bent and lead to wrong or fluctuating indications, which is called 'scalloping'.	X	X	X	X	X	X	X	2		
062 02 04 00		**Distance-measuring equipment (DME)**										
062 02 04 01		***Principles***										
(01)		State that DME operates in the UHF band.	X	X	X	X	X	X	X	2		
(02)	X	State that the system comprises two basic components: — the aircraft component: the interrogator; — the ground component: the transponder.	X	X	X	X	X	X	X		2	
(03)		Describe the principle of distance measurement using DME in terms of a timed transmission from the interrogator and reply from the transponder on different frequencies.	X	X	X	X	X	X				
(04)		Explain that the distance measured by DME is slant range.	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Illustrate that a position line using DME is a circle with the station at its centre.	X	X	X	X	X	X	X	2		
(06)		State that the pairing of VHF and UHF frequencies (VOR/DME) enables the selection of two items of navigation information from one frequency setting.	X	X	X	X	X	X	X		2	
(07)	X	Describe, in the case of co-location with VOR and ILS, the frequency pairing and identification procedure.	X	X	X	X	X	X	X		2	
(08)		State that military UHF tactical air navigation aid (TACAN) stations may be used for DME information.	X	X	X	X	X	X	X	2		
062 02 04 02		***Presentation and interpretation***										
(01)	X	State that when identifying a DME station co-located with a VOR station, the identification signal with the higher-tone frequency is the DME which identifies itself approximately every 40 seconds.	X	X	X	X	X	X	X		2	
(02)		Calculate ground distance from given slant range and altitude.	X	X	X	X	X	X	X	2		
(03)		Describe the use of DME to fly a DME arc in accordance with ICAO Doc 8168 Volume 1.	X	X	X	X	X	X	X	2		
(04)	X	State that a DME system may have a ground speed (GS) and time to station read-out combined with the DME read-out.	X	X	X	X	X	X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 02 04 03		***Coverage and range***										
(01)		Explain why a ground station can generally respond to a maximum of 100 aircraft.	X	X	X	X	X	X	X	2		
(02)		Explain which aircraft will be denied a DME range first when more than 100 interrogations are being made.	X	X	X	X	X	X	X	2		
062 02 04 04		***Intentionally left blank***										
062 02 04 05		***Factors affecting range and accuracy***										
(01)		Explain why the GS read-out from a DME can be less than the actual GS, and is zero when flying a DME arc.	X	X	X	X	X	X	X			
062 02 05 00		**Instrument landing system (ILS)**										
062 02 05 01		***Principles***										
(01)		Name the three main components of an ILS: — the localiser (LOC); — the glide path (GP); — range information (markers or DME).	X		X			X	X	2		
(02)	X	State the site locations of the ILS components:	X		X			X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— the LOC antenna should be located on the extension of the runway centre line at the stop-end; — the GP antenna should be locate beyond the runway threshold, laterally displaced to the side of the runway centre line.										
(03)		Explain that marker beacons produce radiation patterns to indicate predetermined distances from the threshold along the ILS GP.	X		X			X	X	2		
(04)		State that marker beacons are sometimes replaced by a DME paired with the LOC frequency.	X		X			X	X	2		
(05)		State that in the ILS LOC frequency assigned band 108.0–111.975 MHz, only frequencies which have an odd number in the first decimal are ILS LOC frequencies.	X		X			X	X	2		
(06)		State that the GP operates in the UHF band.	X		X			X	X	2		
(07)	X	Describe the use of the 90-Hz and the 150-Hz signals in the LOC and GP transmitters/receivers, stating how the signals at the receivers vary with angular deviation.	X		X			X	X			
(08)		State that the UHF GP frequency is selected automatically by being paired with the LOC frequency.	X		X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		Explain that both the LOC and the GP antenna radiates side lobes (false beams) which can give rise to false centre-line and false GP indication.	X		X			X	X	2		
(10)	X	Explain that the back beam from the LOC antenna may be used as a published 'non-precision approach'.	X		X			X	X		2	
(11)		State that the recommended GP is 3°.	X		X			X	X	2		
(12)		Name the frequency, modulation and identification assigned to all marker beacons. All marker beacons operate on 75-MHz carrier frequency. The modulation frequencies of the audio are: — outer marker: low; — middle marker: medium; — inner marker: high. The audio frequency modulation (for identification) is the continuous modulation of the audio frequency and is keyed as follows: — outer marker: 2 dashes per second continuously; — middle marker: a continuous series of alternate dots and dashes;	X		X			X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— inner marker: 6 dots per second continuously. — The outer-marker cockpit indicator is coloured blue, the middle marker amber, and the inner marker white.										
(13)		State that the final-approach area contains a fix or facility that permits verification of the ILS GP–altimeter relationship. The outer marker or DME is usually used for this purpose.	X		X			X	X	2		
062 02 05 02		***Presentation and interpretation***										
(01)		Describe the ILS identification regarding frequency and Morse code or plain text.	X		X			X	X	2		
(02)		State that an ILS installation has an automatic ground monitoring system.	X		X			X				
(03)		State that the LOC and GP monitoring system monitors any shift in the LOC and GP mean course line or reduction in signal strength.	X		X			X				
(04)		State that warning flags will appear for both the LOC and the GP if the received signal strength is below a threshold value.	X		X			X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the circumstances in which warning flags will appear for both the LOC and the GP: — absence of the carrier frequency; — absence of the modulation simultaneously; — the percentage modulation of the navigation signal reduced to 0.	X		X			X				
(06)		Interpret the indications on a CDI and an HSI: — full-scale deflection of the CDI needle corresponds to approximately 2.5° displacement from the ILS centre line; — full-scale deflection on the GP corresponds to approximately 0.7° from the ILS GP centre line.	X		X			X	X	2		
(07)		Interpret the aircraft’s position in relation to the extended runway centre line on a back-beam approach.	X		X			X		2		
(08)		Explain the setting of the course pointer of an HSI and the course selector of an omnibearing indicator (OBI) for front-beam and back-beam approaches.	X		X			X		2		
062 02 05 03		***Coverage and range***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Sketch the standard coverage area of the LOC and GP with angular sector limits in degrees and distance limits from the transmitter: LOC coverage area is 10° on either side of the centre line to a distance of 25 NM from the runway, and 35° on either side of the centre line to a distance of 17 NM from the runway; GP coverage area is 8° on either side of the centre line to a distance of minimum 10 NM from the runway.	X		X			X	X	2		
062 02 05 04		***Errors and accuracy***										
(01)		Explain that ILS approaches are divided into facility performance categories defined in ICAO Annex 10.	X		X			X	X			
(02)		Define the following ILS operation categories: — Category I; — Category II; — Category IIIA; — Category IIIB; — Category IIIC.	X		X			X				
(03)		Explain that all Category III ILS operations guidance information is provided from the	X		X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		coverage limits of the facility to, and along, the surface of the runway.										
(04)		Explain why the accuracy requirements are progressively higher for CAT I, CAT II and CAT III ILS.	X		X			X				
(05)		Explain the following in accordance with ICAO Doc 8168: — the accuracy the pilot has to fly the ILS LOC to be considered established on an ILS track is within the half-full scale deflection of the required track; — the aircraft has to be established within the half-scale deflection of the LOC before starting descent on the GP; — the pilot has to fly the ILS GP to a maximum of half-scale fly-up deflection of the GP in order to stay in protected airspace.	X		X			X	X	2		
(06)		State that if a pilot deviates by more than half-course deflection on the LOC or by more than half-dot deflection on the GP, an immediate go-around should be executed because obstacle clearance may no longer be guaranteed.	X		X			X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Describe ILS beam bends as deviations from the nominal LOC and GP respectively which can be assessed by flight test.	X		X			X				
(08)		Explain that multipath interference is caused by reflections from objects within the ILS coverage area.	X		X			X				
062 02 05 05		***Factors affecting range and accuracy***										
(01)		Define the 'ILS-critical area': an area of defined dimensions around the LOC and GP antennas where vehicles, including aircraft, are excluded during all ILS operations.	X		X			X	X			
(02)		Define the 'ILS-sensitive area': an area extending beyond the ILS-critical area where the parking or movement of vehicles, including aircraft, is controlled to prevent the possibility of unacceptable interference to the ILS signal during ILS operations.	X		X			X	X			
062 02 06 00		**Microwave landing system (MLS)**										
062 02 06 01		***Principles***										
(01)		Explain the principle of operation: — horizontal course guidance during the approach;	X		X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— vertical guidance during the approach; — horizontal guidance for departure and missed approach; — DME (DME/P) distance; — transmission of special information regarding the system and the approach conditions.										
(02)		State that MLS operates in the SHF band on any one of 200 channels, on assigned frequencies.	X		X			X				
(03)		Explain the reason why MLS can be installed at aerodromes where, as a result of the effects of surrounding buildings or terrain, ILS siting is difficult.	X		X			X				
062 02 06 02		***Presentation and interpretation***										
(01)		Interpret the display of airborne equipment designed to continuously show the position of the aircraft in relation to a preselected course and glide path, along with distance information, during approach and departure.	X		X			X				
(02)		Explain that segmented approaches can be carried out with a presentation with two cross bars directed by a computer which	X		X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		has been programmed with the approach to be flown.										
(03)		Illustrate that segmented and curved approaches can only be executed with DME/P installed.	X		X			X				
(04)		Explain why aircraft are equipped with a multimode receiver (MMR) in order to be able to receive ILS, MLS and GPS.	X		X			X				
(05)		Explain why MLS without DME/P gives an ILS lookalike straight-line approach.	X		X			X				
062 02 06 03		***Coverage and range***										
(01)		Describe the coverage area for the approach direction as being within a sector of ± 40° of the centre line out to a range of 20 NM from the threshold (according to ICAO Annex 10).	X		X			X				
062 03 00 00		**RADAR**										
062 03 01 00		***Pulse techniques***										
062 03 01 01		***Pulse techniques and associated terms***										
(01)		Name the different applications of radar with respect to air traffic control (ATC), weather observations, and airborne weather radar (AWR).	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	Describe the pulse technique and echo principle on which primary radar systems are based.	X	X	X	X	X	X			2	
(03)	X	State that the range of a radar depends on pulse repetition frequency (PRF), pulse length, pulse power, height of aircraft, height of antenna and frequency used.	X	X	X	X	X	X				
062 03 02 00		**Ground radar**										
062 03 02 01		***Principles***										
(01)		Explain that primary radar provides bearing and distance of targets.	X		X	X		X	X	2		
(02)	X	Explain that primary ground radar is used to detect aircraft that are not equipped with a secondary radar transponder.	X		X	X		X	X		2	
062 03 02 02		***Presentation and interpretation***										
(01)		State that modern ATC systems use inputs from various sensors to generate the display.	X		X	X		X	X		2	
062 03 03 00		**Airborne weather radar**										
062 03 03 01		***Principles***										
(01)		List the two main tasks of the weather radar in respect of weather and navigation.	X		X	X		X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that modern weather radars employ frequencies that give wavelengths of about 3 cm that reflect best on wet hailstones.	X		X	X		X	X			
(03)	X	State that the antenna is stabilised in the horizontal plane with signals from the aircraft’s attitude reference system.	X		X	X		X	X			
(04)	X	Describe the cone-shaped pencil beam of about 3 to 5° beam width used for weather detection.	X		X	X		X	X			
062 03 03 02		***Presentation and interpretation***										
(01)		Explain the functions of the following different controls on the radar control panel: – off/on switch; – function switch with WX, WX+T and MAP modes; – gain-control setting (auto/manual); – tilt/autotilt switch.	X		X	X		X	X			
(02)		Name, for areas of differing reflection intensity, the colour gradations (green, yellow, red and magenta) indicating the increasing intensity of precipitation.	X		X	X		X	X			
(03)	X	State the use of azimuth-marker lines and range lines in respect of the relative bearing	X		X	X		X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		and the distance to a thunderstorm on the screen.										
062 03 03 03		***Coverage and range***										
(01)		Explain how the radar is used for weather detection and for mapping (range, tilt and gain, if available).	X		X	X		X	X			
062 03 03 04		***Errors, accuracy, limitations***										
(01)		Explain why AWR should be used with extreme caution when on the ground.	X		X	X		X	X			
062 03 03 05		***Factors affecting range and accuracy***										
(01)		Explain the danger of the area behind heavy rain (shadow area) where no radar waves will penetrate.	X		X	X		X	X			
(02)		Describe appropriate tilt settings in relation to altitude and thunderstorms.	X		X	X		X	X			
(03)		Explain why a thunderstorm may not be detected when the tilt is set too high.	X		X	X		X	X			
062 03 03 06		***Application for navigation***										
(01)		Describe the navigation function of the radar in the mapping mode.	X		X	X		X	X			
(02)		Describe the use of the weather radar to avoid a thunderstorm (Cb).	X		X	X		X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain how turbulence (not CAT) can be detected by a modern weather radar.	X		X	X		X	X			
(04)		Explain how wind shear can be detected by a modern weather radar.	X		X	X		X	X			
062 03 04 00		**Secondary surveillance radar and transponder**										
062 03 04 01		***Principles***										
(01)		State that the ATC system is based on the replies provided by the airborne transponders in response to interrogations from the ATC secondary radar.	X	X	X	X	X	X	X	2		
(02)	X	State that the ground ATC secondary radar uses techniques which provide the ATC with information that cannot be acquired by the primary radar.	X	X	X	X	X	X	X		2	
(03)	X	State that an airborne transponder provides coded-reply signals in response to interrogation signals from the ground secondary radar and from aircraft equipped with traffic alert and collision avoidance system (TCAS).	X	X	X	X	X	X	X		2	
(04)		State the advantages of secondary surveillance radar (SSR) over a primary radar regarding range and collected information due to transponder principal information and active participation of the aircraft.	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
062 03 04 02		***Modes and codes***										
(01)	X	State that the interrogator transmits its interrogations in the form of a series of pulse pairs.	X	X	X	X	X	X	X		2	
(02)		Name the interrogation modes: — Mode A; — Mode C; — Mode S.	X	X	X	X	X	X	X		2	
(03)		State that the interrogation frequency and the reply frequency are different.	X	X	X	X	X					
(04)		Explain that the decoding of the time interval between the pulse pairs determines the operating mode of the transponder: — Mode A: transmission of aircraft transponder code; — Mode C: transmission of aircraft pressure altitude; — Mode S: selection of aircraft address and transmission of flight data for the ground surveillance.	X	X	X	X	X					
(05)		State that Mode A designation is a sequence of four digits which can be	X	X	X	X	X	X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		manually selected from 4 096 available codes.										
(06)		State that in Mode C reply, the pressure altitude is reported in 100-ft increments.	X	X	X	X	X	X			2	
(07)		State that in addition to the information provided, on request from ATC, a special position identification (SPI) pulse can be transmitted but only as a result of a manual selection by the pilot (IDENT button).	X	X	X	X	X	X			2	
(08)	X	State the need for compatibility of Mode S with Mode A and C.	X	X	X	X	X	X			2	
(09)		Explain that Mode S transponders receive interrogations from TCAS and SSR ground stations.	X	X	X	X	X	X			2	
(10)	X	State that Mode S interrogation contains either the aircraft address, selective call or all-call address.	X	X	X	X	X	X			2	
(11)		State that every aircraft is allocated an ICAO aircraft address, which is hard-coded into the Mode S transponder (Mode S address).	X	X	X	X	X	X	X		2	
(12)		Explain that a 24-bit address is used in all Mode S transmissions, so that every interrogation can be directed to a specific aircraft.	X	X	X	X	X	X				
(13)		State that Mode S can provide enhanced vertical tracking, using a 25-ft altitude increment.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(14)		State that SSR can be used for automatic dependent surveillance — broadcast (ADS-B).	X	X	X	X	X	X				
062 03 04 03		***Presentation and interpretation***										
(01)		State that an aircraft can be identified by a unique code.	X	X	X	X	X	X	X	2		
(02)		State which information can be presented on the ATC display system: — pressure altitude; — flight level; — flight number or aircraft registration number; — GS.	X	X	X	X	X	X	X	2		
(03)	X	Explain the use and function of the selector modes: OFF, Standby, ON (Mode A), ALT (Mode A, C and S), TEST, and of the reply lamp.	X	X	X	X	X	X	X		2	
062 04 00 00		**INTENTIONALLY LEFT BLANK**										
062 05 00 00		**INTENTIONALLY LEFT BLANK**										
062 06 00 00		**GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSSs)**										
062 06 01 00		**Global navigation satellite systems (GNSSs)**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 06 01 01		***General***										
(01)		State that there are four main GNSSs. These are: — USA NAVigation System with Timing And Ranging Global Positioning System (NAVSTAR GPS); — Russian GLObal NAvigation Satellite System (GLONASS); — European Galileo (under construction); — Chinese BeiDou (under construction).	X	X	X	X	X	X	X	2		
(02)	X	State that all four systems (will) consist of a constellation of satellites which can be used by a suitably equipped receiver to determine position.	X	X	X	X	X	X	X		2	
062 06 01 02		***Operation***										
		Global navigation satellite system (GNSS)										
(01)		State that there are currently two modes of operation: standard positioning service (SPS) for civilian users, and precise positioning service (PPS) for authorised users.	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		SPS was originally designed to provide civilian users with a less accurate positioning capability than PPS.	X	X	X	X	X	X	X	2		
(03)	X	Name the three GNSS segments as follows: — space segment; — control segment; — user segment.	X	X	X	X	X	X	X		2	
		Space segment (example: NAVSTAR GPS)										
(04)		State that each satellite broadcasts ranging signals on two UHF frequencies: L1 and L2.	X	X	X	X	X	X				
(05)		State that SPS is a positioning and timing service provided on frequency L1.	X	X	X	X	X	X				
(06)		State that PPS uses both frequencies L1 and L2.	X	X	X	X	X	X				
(07)	X	State that the satellites transmit a coded signal used for ranging, identification (satellite individual PRN code), timing and navigation.	X	X	X	X	X	X				
(08)	X	State that the navigation message contains: — satellite clock correction parameters; — Universal Time Coordinated (UTC) parameters; — an ionospheric model; — satellite health data.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)	X	State that an ionospheric model is used to calculate the time delay of the signal travelling through the ionosphere.	X	X	X	X	X	X	X		2	
(10)	X	State that two codes are transmitted on the L1 frequency, namely a coarse acquisition (C/A) code and a precision (P) code. The P code is not used for standard positioning service (SPS).	X	X	X	X	X	X				
(11)	X	State that satellites are equipped with atomic clocks which allow the system to keep very accurate time reference.	X	X	X	X	X	X	X		2	
		Control segment										
(12)	X	State that the control segment comprises: — a master control station; — a ground antenna; — monitoring stations.	X	X	X	X	X	X	X		2	
(13)	X	State that the control segment provides: — monitoring of the constellation status; — correction of orbital parameters; — navigation data uploading.	X	X	X	X	X	X	X			
		User segment										
(14)	X	State that GNSS supplies three-dimensional position fixes and speed data, plus a precise time reference.	X	X	X	X	X	X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(15)	X	State that a GNSS receiver is able to determine the distance to a satellite by determining the difference between the time of transmission by the satellite and the time of reception.	X	X	X	X	X	X	X		2	
(16)	X	State that the initial distance calculated to the satellites is called pseudo-range because the difference between the GNSS receiver and the satellite time references initially creates an erroneous range.	X	X	X	X	X	X			2	
(17)	X	State that each range defines a sphere with its centre at the satellite.	X	X	X	X	X	X	X		2	
(18)	X	State that there are four unknown parameters (x, y, z and Δt) (receiver clock error) which require the measurement of ranges to four different satellites in order to get the position.	X	X	X	X	X	X	X		2	
(19)	X	State that the GNSS receiver is able to synchronise to the correct time reference when receiving four satellites.	X	X	X	X	X	X	X		2	
(20)	X	State that the receiver is able to calculate aircraft ground speed using the space vehicle (SV) Doppler frequency shift or the change in receiver position over time.	X	X	X	X	X	X			2	
		NAVigation System with Timing And Ranging Global Positioning System (NAVSTAR GPS) integrity										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(21)		Define 'receiver autonomous integrity monitoring (RAIM)' as a technique that ensures the integrity of the provided data by redundant measurements.	X	X	X	X	X	X	X	2		
(22)		State that RAIM is achieved by consistency checks among range measurements.	X	X	X	X	X	X	X	2		
(23)		State that basic RAIM requires five satellites. A sixth one is for isolating a faulty satellite from the navigation solution.	X	X	X	X	X	X	X			
(24)		State that agreements have been concluded between the appropriate agencies for the compatibility and interoperability by any approved user of NAVSTAR and GLONASS systems.	X	X	X	X	X	X				
(25)	X	State that the different GNSSs use different data with respect to reference systems, orbital data, and navigation services.	X	X	X	X	X	X				
062 06 01 03		***Errors and factors affecting accuracy***										
(01)		List the most significant factors that affect accuracy: — ionospheric propagation delay; — dilution of precision; — satellite clock error; — satellite orbital variations; — multipath.	X	X	X	X	X	X	X			

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that a user equivalent range error (UERE) can be computed from all these factors.	X	X	X	X	X	X				
(03)	X	State that the error from the ionospheric propagation delay (IPD) can be reduced by modelling, using a model of the ionosphere, or can almost be eliminated by using two frequencies.	X	X	X	X	X	X				
(04)	X	State that ionospheric delay is the most significant error.	X	X	X	X	X	X				
(05)		State that dilution of precision arises from the geometry and number of satellites in view. It is called geometric dilution of precision (GDOP).	X	X	X	X	X	X				
(06)		State that the UERE in combination with the geometric dilution of precision (GDOP) allows for an estimation of position accuracy.	X	X	X	X	X	X				
(07)	X	State that errors in the satellite orbits are due to: — solar winds; — gravitation of the Sun and the Moon.	X	X	X	X	X	X				
062 06 02 00		**Ground-, satellite- and aircraft-based augmentation systems**										
062 06 02 01		***Ground-based augmentation systems (GBASs)***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the principle of a GBAS: to measure on the ground the errors in the signals transmitted by GNSS satellites and relay the measured errors to the user for correction.	X	X	X	X	X	X	X			
(02)	X	State that the ICAO GBAS standard is based on this technique through the use of a data link in the VHF band of ILS–VOR systems (108–118 MHz).	X	X	X	X	X	X	X			
(03)		State that for a GBAS station the coverage is about 20 NM.	X	X	X	X	X	X	X			
(04)		State that GBAS provides information for guidance in the terminal area, and for three-dimensional guidance in the final approach segment (FAS) by transmitting the FAS data block.	X	X	X	X	X	X	X			
(05)		State that one ground station can support all the aircraft subsystems within its coverage providing the aircraft with approach data, corrections and integrity information for GNSS satellites in view via a VHF data broadcast (VDB).	X	X	X	X	X	X				
(06)	X	State that the minimum software designed coverage area is 10° on either side of the final approach path to a distance between 15 and 20 NM, and 35° on either side of the final approach path up to a distance of 15 NM.	X	X	X	X	X	X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State that outside this area the FAS data of GBAS is not used.	X	X	X	X	X	X				
(08)	X	State that GBAS based on GPS is sometimes called local area augmentation system (LAAS).	X	X	X	X	X	X				
(09)		State that a GBAS-based approach is called GLS approach (GLS-GNSS landing system).	X	X	X	X	X	X				
062 06 02 02		***Satellite-based augmentation systems (SBASs)***										
(01)	X	Explain the principle of an SBAS: to measure on the ground the errors in the signals received from the satellites and transmit differential corrections and integrity messages for navigation satellites.	X	X	X	X	X	X	X		2	
(02)	X	State that the frequency band of the data link is identical to that of the GPS signals.	X	X	X	X	X	X	X		2	
(03)	X	Explain that the use of geostationary satellites enables messages to be broadcast over very wide areas.	X	X	X	X	X	X	X		2	
(04)	X	State that pseudo-range measurements to these geostationary satellites can also be made, as if they were GPS satellites.	X	X	X	X	X	X	X		2	
(05)	X	State that SBAS consists of two elements: — ground infrastructure (monitoring and processing stations); — communication satellites.	X	X	X	X	X	X	X		2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		State that SBAS allows the implementation of three-dimensional Type A and Type B approaches.	X	X	X	X	X	X	X	2		
(07)	X	State the following examples of SBAS: — European Geostationary Navigation Overlay Service (EGNOS) in western Europe and the Mediterranean; — wide area augmentation system (WAAS) in the USA; — multi-functional transport satellite (MTSAT)-based augmentation system (MSAS) in Japan; — GPS and geostationary earth orbit augmented navigation (GAGAN) in India.	X	X	X	X	X	X	X		2	
(08)	X	State that SBAS is designed to significantly improve accuracy and integrity.	X	X	X	X	X	X	X		2	
(09)		Explain that integrity and safety are improved by alerting SBAS users within 6 seconds if a GPS malfunction occurs.	X	X	X	X	X	X	X	2		
062 06 02 03		***Intentionally left blank***										
062 06 02 04		***Aircraft-based augmentation systems (ABASs)***										
(01)		Explain the principle of ABAS: to use redundant elements within the GPS	X	X	X	X	X	X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		constellation (e.g. multiplicity of distance measurements to various satellites) or the combination of GNSS measurements with those of other navigation sensors (such as inertial systems) in order to develop integrity control.										
(02)		State that the type of ABAS using only GNSS information is named receiver autonomous integrity monitoring (RAIM).	X	X	X	X	X	X	X	2		
(03)		State that a system using information from additional onboard sensors is named aircraft autonomous integrity monitoring (AAIM).	X	X	X	X	X	X	X	2		
(04)		Explain that the typical sensors used are barometric altimeter and inertial reference system (IRS).	X	X	X	X	X	X	X	2		
062 07 00 00		**PERFORMANCE-BASED NAVIGATION (PBN)**										
062 07 01 00		**Performance-based navigation (PBN) concept** **(as described in ICAO Doc 9613)**										
062 07 01 01		***PBN principles***										
(01)		List the factors used to define area navigation (RNAV) or required navigation performance (RNP) system performance requirements (accuracy, integrity and continuity).	X		X			X	X		3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	State that these RNAV and RNP systems are necessary to optimise the utilisation of available airspace.	X		X			X			2, 3	
(03)		State that it is necessary for flight crew and air traffic controllers to be aware of the on-board RNAV or RNP system capabilities in order to determine whether the performance of the RNAV or RNP system is appropriate for the specific airspace requirements.	X		X			X			2, 3	
(04)		Define accuracy as the conformance of the true position and the required position.	X		X			X			2, 3	
(05)		Define continuity as the capability of the system to perform its function without unscheduled interruptions during the intended operation.	X		X			X	X	2	3	
(06)		Define integrity as a measure of the trust that can be placed in the correctness of the information supplied by the total system. Integrity includes the ability of a system to provide timely and valid alerts to the user.	X		X			X	X	2	3	
(07)		State that, unlike conventional navigation, PBN is not sensor-specific.	X		X			X	X	2	3	
(08)		Explain the difference between raw data and computed data.	X		X			X	X	2	3	
(09)		Define availability as the percentage of time (annually) during which the system is available for use.	X		X			X	X	2	3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 07 01 02		***PBN components***										
(01)		List the components of PBN as navigational aid (NAVAID) infrastructure, navigation specification and navigation application.	X		X			X				
062 07 01 03		***PBN scope***										
(01)		State that in oceanic/remote, en-route and terminal phases of flight, PBN is limited to operations with linear lateral performance requirements and time constraints.	X		X			X				
(02)		State that in the approach phases of flight, PBN accommodates both linear and angular laterally guided operations, and explain the difference between the two.	X		X			X				
062 07 02 00		**Navigation specifications**										
062 07 02 01		***Area navigation (RNAV) and required navigation performance (RNP)***										
(01)		State the difference between RNAV and RNP in terms of the requirement for on-board performance monitoring and alerting.	X		X			X	X	2	3	
062 07 02 02		***Navigation functional requirements***										
(01)	X	List the basic functional requirements of the RNAV and RNP specifications	X		X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		(continuous indication of lateral deviation, distance/bearing to active waypoint, GS or time to active waypoint, navigation data storage and failure indication).										
062 07 02 03		***Designation of RNP and RNAV specifications***										
(01)		Interpret X in RNAV X or RNP X as the lateral navigation (LNAV) accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 % of the flight time by the population of aircraft operating within the given airspace, route or procedure.	X		X			X		2	3	
(02)		State that aircraft approved to the more stringent accuracy requirements may not necessarily meet some of the functional requirements of the navigation specification that has a less stringent accuracy requirement.	X		X			X	X	2	3	
(03)		State that RNAV 10 and RNP 4 are used in the oceanic/remote phase of flight.	X		X			X				
(04)		State that RNAV 5 is used in the en-route and arrival phases of flight.	X		X			X	X	2	3	
(05)		State that RNAV 2 and RNP 2 are also used as navigation specifications.	X		X			X				
(06)		State that RNP 2 is used in the en-route and oceanic/remote phases of flight.	X		X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State that RNAV 2 might be used in the en-route continental, arrival and departure phases of flight.	X		X			X				
(08)		State that RNAV 1 and RNP 1 are used in the arrival and departure phases of flight.	X		X			X	X	2		
(09)		State that required navigation performance approach (RNP APCH) is used in the approach phase of flight.	X		X			X	X	2		
(10)		State that required navigation performance authorisation required approach (RNP AR APCH) is used in the approach phase of flight.	X		X			X	X	2		
(11)		State that RNP 0.3 navigation specification is used in all phases of flight except for oceanic/remote and final approach, primarily for helicopters.	X		X			X				
(12)		State that RNAV 1, RNP 1 and RNP 0.3 may also be used in en-route phases of low-level instrument flight rule (IFR) helicopter flights.	X		X			X				
062 07 03 00		**Use of performance-based navigation (PBN)**										
062 07 03 01		***Intentionally left blank***										
062 07 03 02		***Intentionally left blank***										
062 07 03 03		***Specific RNAV and RNP system functions***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Recognise the definition of radius to fix (RF) leg.	X		X			X	X	2	3	
(02)		Recognise the definition of a fixed radius transition (FRT).	X		X			X	X	2	3	
(03)		State the importance of respecting the flight director guidance and the speed constraints associated with an RF procedure.	X		X			X	X	2	3	
(04)		Explain the difference between a fly-by-turn and a fly-over.	X		X			X	X	2	3	
(05)		State that the Aeronautical Radio, Incorporated (ARINC) 424 path terminators set the standards for coding the SIDs, STARs and instrument approach procedures (IAPs) from the official published government source documentation into the ARINC navigation database format.	X		X			X				
(06)		State that the path terminators define a specific type of termination of the previous flight path.	X		X			X				
(07)		Define the term ‘offset flight path’.	X		X			X	X	2	3	
062 07 03 04		***Intentionally left blank***										
062 07 04 00		**Performance-based navigation (PBN) operations**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 07 04 01		***Performance-based navigation (PBN) principles***										
(01)		Define 'path definition error' (PDE).	X		X			X	X	2	3	
(02)		Define 'flight technical error' (FTE) and state that the FTE is the error in following the prescribed path, either by the auto-flight system or by the pilot.	X		X			X	X	2	3	
(03)		Define 'navigation system error' (NSE) and state that the accuracy of a navigation system may be referred to as NSE.	X		X			X	X	2	3	
(04)		Define 'total system error' (TSE) and state that the geometric sum of the PDE, FTE and NSE equals the TSE.	X		X			X	X	2	3	
(05)		State that navigation accuracy depends on the TSE.	X		X			X				
062 07 04 02		***On-board performance monitoring and alerting***										
(01)		State that on-board performance monitoring and alerting of flight technical errors is managed by on-board systems or flight crew procedures.	X		X			X	X	2	3	
(02)		State that on-board performance monitoring and alerting of navigation system errors is a requirement of on-board equipment for RNP.	X		X			X	X	2	3	
(03)		State that, dependent on the navigation sensor, the estimated position error (EPE) is	X		X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		compared with the required navigation specification.										
(04)		Explain how a navigation system assesses the EPE.	X		X			X				
(05)		Give an example of how the loss of the ability to operate in RNP airspace may be indicated by the navigation system.	X		X			X				
(06)		State that on-board performance monitoring and alerting of path definition error is managed by gross reasonableness checks of navigation data.	X		X			X	X	2	3	
062 07 04 03		***Abnormal situations***										
(01)		State that abnormal and contingency procedures are to be used in case of loss of the PBN capability.	X		X			X	X	2	3	
062 07 04 04		***Database management***										
(01)		State that, unless otherwise specified in the operations documentation or acceptable means of compliance (AMCs), the navigational database must be valid for the current aeronautical information regulation and control (AIRAC) cycle.	X		X			X	X	2	3	
062 07 05 00		**Requirements of specific RNAV and RNP specifications**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 07 05 01		***RNAV 10***										
(01)		State that RNAV 10 requires that aircraft operating in oceanic and remote areas be equipped with at least two independent and serviceable long-range navigation systems (LRNSs) comprising an INS, an inertial reference system (IRS)/flight management system (FMS) or a GNSS.	X		X			X				
(02)		State that operators may extend their RNAV 10 navigation capability time by updating.	X		X			X				
062 07 05 02		***RNAV 5***										
(01)		State that manual data entry is acceptable for RNAV 5.	X		X			X	X	2	3	
062 07 05 03		***RNAV 1/RNAV 2/RNP 1/RNP 2***										
(01)		State that pilots must not fly an RNAV 1, RNAV 2, RNP 1 or RNP 2 standard instrument departure (SID) or standard instrument arrival (STAR) unless it is retrievable by route name from the on-board navigation database and conforms to the charted route.	X		X			X	X	2	3	
(02)		State that the route may subsequently be modified through the insertion (from the	X		X			X	X	2	3	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		database) or deletion of specific waypoints in response to ATC clearances.										
(03)		State that the manual entry, or creation of new waypoints by manual entry, of either latitude and longitude or place/bearing/distance values is not permitted.	X		X			X	X	2	3	
062 07 05 04		***Intentionally left blank***										
062 07 05 05		***Required navigation performance approach (RNP APCH)***										
(01)		State that pilots must not fly an RNP APCH unless it is retrievable by procedure name from the on-board navigation database and conforms to the charted procedure.	X		X			X	X	2		
(02)		State that an RNP APCH to LNAV minima is a non-precision IAP designed for two-dimensional approach operations.	X		X			X	X	2		
(03)		State that an RNP APCH to lateral navigation (LNAV)/vertical navigation (VNAV) minima has lateral guidance based on GNSS and vertical guidance based on either SBAS or barometric vertical navigation (Baro-VNAV).	X		X			X	X	2		
(04)		State that an RNP APCH to LNAV/VNAV minima may only be conducted with vertical guidance certified for the purpose.	X		X			X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain why an RNP APCH to LNAV/VNAV minima based on Baro-VNAV may only be conducted when the aerodrome temperature is within a promulgated range if the barometric input is not automatically temperature-compensated.	X		X			X	X	2		
(06)		State that the correct altimeter setting is critical for the safe conduct of an RNP APCH using Baro-VNAV.	X		X			X	X	2		
(07)		State that an RNP APCH to LNAV/VNAV minima is a three-dimensional operation.	X		X			X	X	2		
(08)		State that an RNP APCH to localiser performance with vertical guidance (LPV) minima is a three-dimensional operation.	X		X			X	X	2		
(09)		State that RNP APCH to LPV minima requires a final approach segment (FAS) data block.	X		X			X	X	2		
(10)		State that RNP approaches to LPV minima require SBAS.	X		X			X	X	2		
(11)		State that the FAS data block is a standard data format to describe the final approach path.	X		X			X	X	2		
062 07 05 06		***Required navigation performance authorisation required approach (RNP AR APCH)***										
(01)		State that RNP AR APCH requires authorisation.	X		X			X	X	2		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
062 07 05 07		***Advanced required navigation performance (A-RNP)***										
(01)		State that A-RNP incorporates the navigation specifications RNAV 5, RNAV 2, RNAV 1, RNP 2, RNP 1 and RNP APCH.	X		X			X				
062 07 05 08		***PBN point-in-space (PinS) departure***										
(01)		State that a PinS departure is a departure procedure designed for helicopters only.			X			X				
(02)		State that a PinS departure procedure includes either a 'proceed VFR' or a 'proceed visually' instruction from the landing location to the initial departure fix (IDF).			X			X				
(03)		Recognise the differences in the instructions 'proceed VFR' and 'proceed visually'.			X			X				
062 07 05 09		***PBN point-in-space (PinS) approach***										
(01)		State that a PinS approach procedure is an instrument RNP APCH procedure designed for helicopters only, and that it may be published with LNAV minima or LPV minima.			X			X				
(02)		State that a PinS approach procedure includes either a 'proceed VFR' or a 'proceed visually' instruction from the missed approach point (MAPt) to a landing location.			X			X				

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Recognise the differences between 'proceed VFR' and 'proceed visually'.			X			X				

SUBJECT 070 – OPERATIONAL PROCEDURES

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
070 00 00 00		**OPERATIONAL PROCEDURES**										
071 01 00 00		**GENERAL REQUIREMENTS**										
071 01 01 00		**ICAO Annex 6**										
071 01 01 01		***Definitions***										
(01)		Define the following: alternate aerodrome: flight time (aeroplanes); take-off alternate; en-route alternate; destination alternate.	X	X								
(02)		Define 'alternate heliport'; 'flight time (helicopters)'. ***Source:***			X	X	X					
071 01 01 02		***Applicability***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State that Part I shall be applicable to the operation of aeroplanes by operators authorised to conduct international commercial air transport (CAT) operations.	X	X								
(02)		State that Part III shall be applicable to all helicopters engaged in international CAT operations or in international general aviation operations, except helicopters engaged in aerial work.			X	X	X					
071 01 01 03		***General***										
(01)		Explain the compliance with laws, regulations and procedures.	X	X	X	X	X					
(02)		State the condition(s) required for the establishment of a flight data analysis programme, and state what this programme is part of.	X	X	X	X	X					
(03)		Explain what is a flight safety documents system.	X	X	X	X	X					
(04)		Explain what is maintenance release.	X	X	X	X	X					
(05)		List and describe the lights to be displayed by aircraft.	X	X	X	X	X					
071 01 02 00		**Operational requirements**										
071 01 02 01		***Applicability***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	State the operational regulations applicable to CAT and other activities (e.g. specialised operations (SPO)).	X	X	X	X	X					
(02)		State the nature of CAT operations and exceptions.	X	X	X	X	X					
071 01 02 02		***General***										
(01)	X	Explain why CAT flights must meet the applicable operational requirements.	X	X	X	X	X					
(02)		Define ‘flight manual limitations — flight through the height velocity (HV) envelope’.			X	X	X					
(03)		Define ‘helicopter emergency medical service (HEMS)’.			X	X	X					
(04)		Define ‘operations over a hostile environment — applicability’. Explain that there are certain areas which should not be overflown and state possible sources of that information (e.g. governmental warnings, operator risk assessment).			X	X	X					
(05)		Define ‘local area operations — approval’.			X	X	X					
(06)		Explain the requirements about language used for crew communication and in the operations manual.	X	X	X	X	X					
(07)		Explain which are the operator requirements regarding the management system.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Explain which are the operator requirements regarding accident prevention and the flight safety programme.	X	X	X	X	X					
(09)		Explain which are the regulations concerning the carriage of persons on an aircraft.	X	X	X	X	X					
(10)		Explain the operator’s and commander’s responsibility concerning portable electronic devices (PEDs).	X	X	X	X	X					
(11)		Explain the operator’s and commander’s responsibility regarding admission in an aircraft of a person under the influence of drug or alcohol.	X	X	X	X	X					
(12)		Explain the regulations concerning the endangerment of safety.	X	X	X	X	X					
(13)		List the documents to be carried on each flight.	X	X	X	X	X					
(14)		Explain the operator’s responsibility regarding manuals to be carried on board an aircraft.	X	X	X	X	X					
(15)		List the additional information and forms to be carried on board an aircraft.	X	X	X	X	X					
(16)		List the copies of items of information to be retained on the ground by the operator.	X	X	X	X	X					
(17)		Explain what responsibilities the operator and the commander have regarding the production of and access to records and documents.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
071 01 02 03		***Operator certification and supervision***										
(01)		Explain what requirement has to be satisfied for the issue of an air operator certificate (AOC).	X	X	X	X	X					
(02)		Explain what the rules applicable to air operator certification are.	X	X	X	X	X					
(03)		Explain the conditions to be met for the issue or revalidation of an AOC.	X	X	X	X	X					
(04)		Explain the contents and conditions of the AOC.	X	X	X	X	X					
071 01 02 04		***Operational procedures (except preparation for long-range flight)***										
(01)		Define the terms used for operational procedures.	X	X								
(02)		State the operator’s responsibilities regarding the use of air traffic services (ATS).	X	X	X	X	X					
(03)		State the operator’s responsibilities regarding authorisation of aerodromes/heliports by the operator.	X	X	X	X	X					
(04)		Explain which elements must be considered by the operator when specifying aerodrome/heliport operating minima.	X	X	X	X	X					
(05)		Explain what the operator’s responsibilities are regarding departure and approach procedures.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain which parameters should be considered in noise-abatement procedures.	X	X								
(07)		Explain which elements should be considered regarding routes and areas of operation.	X	X	X	X	X					
(08)		Explain the requirements for flights in reduced vertical separation minima (RVSM) airspace.	X	X								
(09)		List the factors to be considered when establishing minimum flight altitude.	X	X	X	X	X					
(10)		Explain the requirements for carrying persons with reduced mobility.	X	X	X	X	X					
(11)		Explain the operator’s responsibilities for the carriage of inadmissible passengers, deportees or persons in custody.	X	X	X	X	X					
(12)		Explain the requirements regarding passenger seating and emergency evacuation.	X	X	X	X	X					
(13)		Detail the procedures for passenger briefing in respect of emergency equipment and exits.	X	X	X	X	X					
(14)		State the flight preparation forms to be completed before flight.	X	X	X	X	X					
(15)		State the commander’s responsibilities during flight preparation.	X	X	X	X	X					
(16)		State the rules for aerodrome/heliport selection.	X	X	X	X	X					
(17)		Explain the planning minima for instrument flight rule (IFR) flights.	X		X							

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(18)		Explain the rules for refuelling/defueling with passengers on board.	X	X	X	X	X					
(19)		Explain the 'crew members at station' policy.	X	X	X	X	X					
(20)		Explain the use of seats, safety belts and harnesses.	X	X	X	X	X					
(21)		Explain the requirements for securing passenger cabin and galley.	X	X	X	X	X					
(22)		Explain the commander's responsibility regarding smoking on board.	X	X	X	X	X					
(23)		State under which conditions a commander can commence or continue a flight regarding meteorological conditions.	X	X	X	X	X					
(24)		Explain the commander's responsibility regarding ice and other contaminants.	X	X	X	X	X					
(25)		Explain the commander's responsibility regarding fuel to be carried and in-flight fuel management.	X	X	X	X	X					
(26)		Detail the rules regarding carriage and use of supplemental oxygen for passengers and aircrew.	X	X	X	X	X					
		Flight preparation										
(27)		Explain the commander's responsibility regarding approach and landing.	X	X	X	X	X					
(28)		Explain the circumstances under which a report shall be submitted.	X	X	X	X	X					
071 01 02 05		***All-weather operations***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the operator's responsibility regarding aerodrome/heliport operating minima.	X		X							
(02)		Define the following terms: 'circling', 'low-visibility procedures', 'low-visibility take-off', 'visual approach'.	X		X							
(03)		Define the following terms: 'flight control system', 'fail-passive flight control system', 'fail-operational flight control system', 'fail-operational hybrid landing system'.	X									
(04)		Define the following terms: 'final approach and take-off area'.			X							
(05)		Explain the general operating requirements for low-visibility operations.	X		X							
(06)		Define aerodrome/heliport considerations regarding low-visibility operations.	X		X							
(07)		Explain the training and qualification requirements for flight crew to conduct low-visibility operations.	X		X							
(08)		Explain the operating procedures for low-visibility operations.	X		X							
(09)		Explain the operator's and commander's responsibilities regarding minimum equipment for low-visibility operations.	X		X							
(10)		Explain the VFR operating minima.	X		X							
(11)		Aerodrome operating minima: explain under which conditions the commander can commence take-off.	X		X							

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)		Aerodrome operating minima: explain that take-off minima are expressed as visibility or runway visual range (RVR).	X		X							
(13)		Aerodrome operating minima: explain the take-off RVR value depending on the aerodrome facilities.	X		X							
(14)		Aerodrome operating minima: explain the system minima for non-precision approach (NPA) (minimum descent altitude/height (MDA/H) and decision altitude/height (DA/H), not RVR).	X		X							
(15)		Aerodrome operating minima: explain under which conditions a pilot can continue the approach below MDA/H or DA/H.	X		X							
(16)		Aerodrome operating minima: explain the lowest minima for precision approach category 1 (including single-pilot operations).	X		X							
(17)		Aerodrome operating minima: explain the lowest minima for precision approach category 2 operations.	X		X							
(18)		Aerodrome operating minima: explain the lowest minima for precision approach category 3 operations.	X									
(19)		Aerodrome operating minima: explain the lowest minima for circling and visual approach.	X		X							

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(20)		Aerodrome operating minima: explain the RVR value and cloud ceiling depending on the aerodrome.			X							
(21)		Aerodrome operating minima: explain under which conditions an airborne radar approach can be performed and state the relevant minima.			X							
071 01 02 06		***Instruments and equipment***										
(01)		Explain which items do not require an equipment approval.	X	X	X	X	X					
(02)		Explain the requirements regarding availability of spare electrical fuses.	X	X								
(03)		Explain the requirements regarding windshield wipers.	X	X								
(04)		List the minimum equipment required for day and night VFR flights.	X	X	X	X	X					
(05)		List the minimum equipment required for IFR flights.	X		X							
(06)		Explain the required additional equipment for single-pilot operations under IFR.	X		X							
(07)		State the requirements for an altitude alerting system.	X	X								
(08)		State the requirements for radio altimeters.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		State the requirements for ground proximity warning system (GPWS)/terrain awareness and warning system (TAWS).	X	X								
(10)		State the requirements for airborne collision avoidance system (ACAS).	X	X								
(11)		State the conditions under which an aircraft must be fitted with a weather radar.	X	X	X	X	X					
(12)		State the circumstances under which a cockpit voice recorder (CVR) is compulsory (after 1998).	X	X	X	X	X					
(13)		State the rules regarding the location, construction, installation, and operation of cockpit voice recorders (CVRs) (after 1998).	X	X	X	X	X					
(14)		State the circumstances under which a flight data recorder (FDR) is compulsory (after 1998).	X	X	X	X	X					
(15)		State the rules regarding the location, construction, installation, and operation of flight data recorders (FDRs) (after 1998).	X	X	X	X	X					
(16)		Explain the requirements about seats, seat safety belts, harnesses, and child-restraint devices.	X	X	X	X	X					
(17)		Explain the requirements about 'Fasten seat belt' and 'No smoking' signs.	X	X	X	X	X					
(18)		Explain the requirements regarding internal doors and curtains.	X	X								
		First-aid and emergency equipment										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(19)		Explain the requirements regarding first-aid kits.	X	X	X	X	X					
(20)		Explain the requirements regarding emergency medical kits and first-aid oxygen.	X	X								
(21)		Detail the rules regarding crew protective breathing equipment.	X	X								
(22)		Describe the type and location of handheld fire extinguishers.	X	X	X	X	X					
(23)		Describe the location of crash axes and crowbars.	X	X								
(24)		Specify the colours and markings used to indicate break-in points.	X	X	X	X	X					
(25)		Explain the requirements for means of emergency evacuation.	X	X								
(26)		Explain the requirements for megaphones.	X	X	X	X	X					
(27)		Explain the requirements for emergency lighting and marking.	X	X	X	X	X					
(28)		Explain the requirements for an emergency locator transmitter (ELT).	X	X	X	X	X					
(29)		Explain the requirements for life jackets, life rafts, survival kits, and ELTs.	X	X	X	X	X					
(30)		Explain the requirements for crew survival suit.			X	X	X					
(31)		Explain the requirements for survival equipment.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(32)		Explain the additional requirements for helicopters operating to or from helidecks located in hostile sea areas.			X	X	X					
(33)		Explain the requirements for emergency flotation equipment.			X	X	X					
071 01 02 07		***Communication and navigation equipment***										
(01)		Explain the general requirements for communication and navigation equipment.	X	X	X	X	X					
(02)		Explain why the radio-communication equipment must be able to send and receive on 121.5 MHz.	X	X	X	X	X					
(03)		Explain the requirements regarding the provision of an audio selector panel.	X	X	X	X	X					
(04)		List the requirements for radio equipment when flying under VFR by reference to visual landmarks.	X	X	X	X	X					
(05)		List the requirements for communication and navigation equipment when operating under IFR or under VFR over routes not navigated by reference to visual landmarks.	X	X	X	X	X					
(06)		Explain what equipment is required to operate in airspace with reduced vertical separation minima (RVSM).	X	X								
(07)		Explain the conditions under which a crew member interphone system and public address system are mandatory.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		List the equipment for operations requiring a radio communication.			X	X	X					
(09)		List the equipment for operations that require a radio navigation system.			X	X	X					
(10)		Explain the requirements regarding the provision of a transponder.	X	X	X	X	X					
(11)		Explain the requirements regarding the management of aeronautical databases.	X	X								
071 01 02 08		***Intentionally left blank***										
071 01 02 09		***Flight crew***										
(01)		Explain the requirement regarding flight crew composition and in-flight relief.	X	X	X	X	X					
(02)		Explain the requirement for conversion training and checking.	X	X	X	X	X					
(03)		Explain the requirement for differences training and familiarisation training.	X	X	X	X	X					
(04)		Explain the conditions for upgrade from co-pilot to commander.	X	X	X	X	X					
(05)		Explain the minimum qualification requirements to operate as a commander.	X	X	X	X	X					
(06)		Explain the requirement for recurrent training and checking.	X	X	X	X	X					
(07)		Explain the requirement for a pilot to operate on either pilot’s seat.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Explain the minimum recent experience requirements for the commander and the co-pilot.	X	X	X	X	X					
(09)		Specify the route and aerodrome/heliport knowledge required for a PIC/commander.	X	X	X	X	X					
(10)		Explain the requirement to operate on more than one aircraft type or variant.	X	X	X	X	X					
(11)		Explain that when a flight crew member operates both helicopters and aeroplanes, the operations are limited to one of each type.	X	X	X	X	X					
(12)		Explain the requirement(s) for training records.	X	X	X	X	X					
(13)		Explain the crew members' responsibilities in the execution of their duties, and define the commander's authority.	X	X	X	X	X					
(14)		Explain the operator's and commander's responsibilities regarding persons on board, admission to the flight crew compartment and carriage of unauthorised persons or cargo.	X	X	X	X	X					
(15)		Explain the requirements for the initial operator's crew resource management (CRM) training.	X	X	X	X	X					
071 01 02 10		***Cabin crew/crew members other than flight crew***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain who is regarded as cabin crew member.	X	X	X	X	X					
(02)		Detail the requirements regarding the number and composition of cabin crew.	X	X	X	X	X					
(03)		Explain the conditions and the additional conditions for assignment to duties.	X	X	X	X	X					
(04)		Explain the requirements regarding senior cabin crew members.	X	X	X	X	X					
(05)		Explain the conditions for operating on more than one aircraft type or variant.	X	X	X	X	X					
(06)		Explain what is the operator’s responsibility regarding the distinction between cabin crew members and additional crew members.	X	X	X	X	X					
071 01 02 11		***Intentionally left blank***										
071 01 02 12		***Flight and duty time limitations and rest requirements***										
(01)		Explain the definitions used for the regulation of flight time limitations.	X	X								
(02)		Explain the flight and duty time limitations.	X	X								
(03)		Explain the requirements regarding the maximum daily flight duty period.	X	X								
(04)		Explain the requirements regarding rest periods.	X	X								
(05)		Explain the possible extension of flight duty period due to in-flight rest.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain that it is the captain’s discretion to extend flight duty in case of unforeseen circumstances in actual flight operations.	X	X								
(07)		Explain the requirement regarding standby.	X	X								
071 01 03 00		**Long-range flights**										
071 01 03 01		***Flight management***										
(01)		Minimum time routes: define and interpret minimum time route (route that gives the shortest flight time from departure to destination adhering to all ATC and airspace restrictions).	X									
(02)		State the circumstances in which a take-off alternate must be selected.	X		X							
(03)		State the maximum flight distance of a take-off alternate for: – two-engined aeroplanes; – ETOPS-approved aeroplanes; – three- or four-engined aeroplanes.	X		X							
(04)		State the factors to be considered in the selection of a take-off alternate.	X		X							
(05)		State when a destination alternate need not be selected.	X		X							
(06)		State when two destination alternates must be selected.	X		X							

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State the factors to be considered in the selection of a destination alternate aerodrome.	X		X							
(08)		State the factors to be considered in the selection of an en-route alternate aerodrome.	X		X							
071 01 03 02		***Transoceanic and polar flights (ICAO Doc 7030 'Regional Supplementary Procedures — North Atlantic Operations and Airspace Manual')***										
(01)		According to ICAO Doc 7030, explain that special rules apply to the North Atlantic (NAT) Region, and crews need to be specifically trained before flying in this area.	X									
(02)		Describe the possible indications of navigation system degradation, including any system-generated warning.	X									
(03)		Describe by what emergency means course and inertial navigation system (INS) can be cross-checked in the case of three navigation systems and two navigation systems.	X									
(04)		Describe the general ICAO procedures applicable in NAT airspace if the aircraft is unable to continue the flight in accordance with its air traffic control (ATC) clearance.	X									
(05)		Describe the ICAO procedures applicable in NAT airspace in case of radio-communication failure.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe the recommended initial action if an aircraft is unable to obtain a revised ATC clearance.	X									
(07)		Describe the subsequent action for aircraft able to maintain assigned flight level and for aircraft unable to maintain assigned flight level.	X									
(08)		Describe determination of tracks and courses for random routes in NAT airspace.	X									
(09)		Specify the method by which planned tracks are defined (by latitude and longitude) in the NAT airspace: when operating predominately in an east–west direction south of 70°N, and when operating predominately in an east–west direction north of 70°N.	X									
(10)		State the maximum flight time recommended between significant points on random routes.	X									
(11)		Specify the method by which planned tracks for random routes are defined for flights operating predominantly in a north–south direction.	X									
(12)		Describe how the desired random route must be specified in the ATC flight plan.	X									
(13)		Describe what precautions can be taken when operating in the area of compass unreliability as a contingency against INS failure.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
071 01 03 03		***North Atlantic High Level Airspace (NAT HLA)***										
		NAT Region North Atlantic Operations and Airspace Manual										
(01)		State the lateral dimensions (in general terms) and vertical limits of the NAT HLA.	X									
(02)		Define the following acronyms: LRNS, MASPS, NAT HLA, OCA, OTS, PRM, RVSM, SLOP, and WATRS.	X									
(03)		State the NAT HLA operations.	X									
(04)		Describe the routes for aircraft with only one long-range navigation system (LRNS).	X									
(05)		Describe the routes for aircraft with short-range navigation equipment only.	X									
(06)		Explain why the horizontal (i.e. latitudinal and longitudinal) and vertical navigation performance of operators within NAT HLA is monitored on a continual basis.	X									
(07)		Describe the organised track system (OTS).	X									
(08)		State the OTS changeover periods.	X									
(09)		Describe the NAT track message.	X									
(10)		Illustrate routes between northern Europe and the Spain/Canaries/Lisbon flight information region (FIR) within NAT HLA.	X									
(11)		Describe the function of the North American Routes (NARs) and Shannon Oceanic	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		Transition Area (SOTA) and Northern Oceanic Transition Area (NOTA).										
(12)		State that all flights should plan to operate on great-circle tracks joining successive significant waypoints.	X									
(13)		State that during the hours of validity of the OTS, operators are encouraged to plan flights: — in accordance with the OTS; — or along a route to join or leave an outer track of the OTS; — or on a random route to remain clear of the OTS, either laterally or vertically.	X									
(14)		State which flight levels are available on OTS tracks during OTS periods.	X									
(15)		State which flight levels are to be planned on random tracks or outside OTS periods.	X									
(16)		Selection of cruising altitude. Specify the appropriate cruising levels for normal long-range IFR flights and for those operating on the North Atlantic OTS.	X									
(17)		*Intentionally left blank*										
(18)		State that pilots should notify the oceanic area control centre (OAC) of the maximum acceptable flight level possible at the boundary.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(19)		State that at some aerodromes which are situated close to oceanic boundaries, the oceanic clearance must be obtained before departure.	X									
(20)		State that if an aircraft encounters, whilst en-route to the NAT Oceanic Airspace, an in-flight equipment failure relevant to the airspace, then the pilot must advise ATC when requesting oceanic clearance.	X									
(21)		State that after obtaining and reading back the clearance, the pilot should monitor the forward estimate for oceanic entry, and if this changes by 3 minutes or more, unless providing position reports via automatic dependent surveillance — contract (ADS-C), the pilot must pass a revised estimate on to ATC.	X									
(22)		State that pilots should pay particular attention when the issued clearance differs from the flight plan as a significant proportion of navigation errors investigated in the NAT Region involve aircraft which have followed their flight plan rather than the differing clearance.	X									
(23)		State that if the entry point of the oceanic route for which the flight is cleared differs from that originally requested or the oceanic flight level differs from the current flight level,	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		the pilot is responsible for requesting and obtaining the necessary domestic re-clearance.										
(24)		State that there are three elements to an oceanic clearance: route, speed, and flight level, and that these elements serve to provide for the three basic elements of separation: lateral, longitudinal, and vertical.	X									
(25)		***Communications and position-reporting procedures*** State that pilots communicate with OACCs via aeradio stations staffed by communicators who have no executive ATC authority.	X									
(26)		State that messages are relayed from the ground station to the air traffic controllers of the relevant OACC for action.	X									
(27)		State that frequencies from the lower HF bands tend to be used for communications during night-time and those from the higher bands during daytime. When initiating contact with an aeradio station, the pilot should state the HF frequency in use.	X									
(28)		State that since oceanic traffic typically communicates with ATC through aeradio facilities, a satellite communication (SATVOICE) call, made due to unforeseen inability to communicate by other means, should be made to such a facility rather than	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		the ATC centre, unless the urgency of the communication dictates otherwise.										
(29)		State that an air-to-air VHF frequency has been established for worldwide use when aircraft are out of range of VHF ground stations which utilise the same or adjacent frequencies. This frequency, 123.450 MHz, is intended for pilot-to-pilot exchanges of operationally significant information.	X									
(30)		State that any pilot, who provides position reports via data link and encounters significant meteorological phenomena (such as moderate/severe turbulence or icing, volcanic ash or thunderstorms), should report this information.	X									
(31)		State that all turbine-engined aeroplanes having a maximum certified take-off mass exceeding 5 700 kg or authorised to carry more than 19 passengers are required to carry and operate airborne collision avoidance system (ACAS) II in the NAT Region.	X									
(32)		State that even with the growing use of data-link communications, a significant volume of NAT air–ground communications are conducted using voice on single sideband (SSB) HF frequencies. To support air–ground ATC communications in the North Atlantic Region,	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		24 HF frequencies have been allocated, in bands ranging from 2.8 to 18 MHz.										
(33)		***Application of the Mach number technique (NAT HLA)*** State that practical experience has shown that when two or more turbojet aircraft, operating along the same route at the same flight level, maintain the same Mach number, they are more likely to maintain a constant time interval between each other than when using other methods.	X									
(34)		State that after leaving oceanic airspace, pilots must maintain their assigned Mach number in domestic controlled airspace unless and until the appropriate ATC unit authorises a change.	X									
		North Atlantic High Level Airspace (NAT HLA) flight operation and navigation procedures										
(35)		***NAT HLA flight operation and navigation procedures*** State that the pre-flight procedures for any NAT HLA flight must include a Universal Time Coordinated (UTC) time check.	X									
(36)		Describe the function and use of the master document.	X									
(37)		State the requirements for position plotting.	X									
(38)		Describe the pre-flight procedures for:	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— the alignment of IRS; — the satellite navigation availability prediction programme for flights using global navigation satellite long-range navigation system (GNSS LRNS); — loading of initial waypoints; and — flight plan check.										
(39)		Describe the strategic lateral offset procedure (SLOP) and state that along a route or track there will be three positions that an aircraft may fly: centre line, or up to 2 NM right.	X									
(40)		State that RNAV 10 retains the RNP 10 designation, as specified in the Performance-based Navigation Manual (ICAO Doc 9613) (ICAO Doc 7030, NAT Chapter 4).	X									
(41)		State that both aircraft and operators must be RNP 10- or RNP 4-approved by the State of the Operator or the State of Registry, as appropriate.	X									
(42)		State that RNP 10 is the minimum navigation specification for the application of 93 km (50 NM) lateral separation.	X									
(43)		***Reduced vertical separation minima (RVSM) flight in NAT HLA*** State the altimeter cross-check to be performed before entering NAT HLA.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(44)		State the altimeter cross-check to be performed when entering and flying in NAT HLA.	X									
(45)		State that pilots not using controller–pilot data-link communications (CPDLC)/ADS-C always report to ATC immediately on leaving the current cruising level and on reaching any new cruising level.	X									
(46)		State that flight crew should report when a 300-ft deviation or more occurs.	X									
(47)		Navigation planning procedures List the factors to be considered by the commander before commencing the flight.	X									
		Navigation system degradation										
(48)		For this part, consider aircraft equipped with only two operational LRNSs and state the requirements for the following situations: – one system fails before take-off; – one system fails before the OCA boundary is reached; – one system fails after the OCA boundary is crossed; and – the remaining system fails after entering NAT HLA.	X									
		Special procedures for in-flight contingencies										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(49)		State the general procedures and also state that the general concept of these NAT in-flight contingency procedures is, whenever operationally feasible, to offset the assigned route by 5 NM and climb or descend to a level which differs from those normally used by 500 ft if below FL 410 or by 1 000 ft if above FL 410.	X									
(50)		State all the factors which may affect the direction of turn including: — direction to an alternate aerodrome; — terrain clearance; — levels allocated on adjacent routes or tracks and any known SLOP offsets adopted by other nearby traffic.	X									
(51)		State that if the deviation around severe weather is to be greater than 5 NM, the assigned flight level must be changed by ± 300 ft depending on the followed track and the direction of the deviation.	X									
071 01 03 04		***Extended-range operations with two-engined aeroplanes (ETOPS)***										
(01)		State that ETOPS approval is part of an AOC.	X									
(02)		State that prior to conducting an ETOPS flight, an operator shall ensure that a suitable ETOPS en-route alternate is available, within either the approved diversion time or a	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		diversion time based on the MEL-generated serviceability status of the aeroplane, whichever is shorter.										
(03)		State the requirements for take-off alternate.	X									
(04)		State the planning minima for ETOPS en-route alternate.	X									
(05)		Navigation-planning procedures. Describe the operator’s responsibilities concerning ETOPS routes.	X									
(06)		Selection of a route. Describe the limitations on extended-range operations with two-engined aeroplanes with and without ETOPS approval.	X									
(07)		Selection of alternate aerodrome. State the maximum flight distance of a take-off alternate for: – two-engined aeroplanes; – ETOPS-approved aeroplanes; – three- or four-engined aeroplanes.	X									
(08)		State the maximum distance from an adequate aerodrome for two-engined aeroplanes without an ETOPS approval.	X									
(09)		State the requirement for alternate aerodrome accessibility check for ETOPS operations.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
071 02 00 00		**SPECIAL OPERATIONAL PROCEDURES AND HAZARDS — GENERAL ASPECTS**										
071 02 01 00		**Operations manual**										
071 02 01 01		***Operating procedures***										
(01)		Explain the general rules for the operations manual.	X	X	X	X	X					
(02)		Explain the structure and subject headings of the operations manual.	X	X	X	X	X					
(03)		Explain the requirements for a journey log or equivalent.	X	X	X	X	X					
(04)		Describe the requirements regarding the operational flight plan.	X	X	X	X	X					
(05)		Explain the requirements for document-storage periods.	X	X	X	X	X					
(06)		Explain that all non-type-related operational policies, instructions and procedures required for a safe operation are included in Part A of the operations manual.	X	X	X	X	X					
(07)		State that the following items are included into Part A: — de-icing and anti-icing on the ground; — adverse and potentially hazardous atmospheric conditions; — wake turbulence;	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— incapacitation of crew members; — use of the minimum equipment list (MEL) and configuration deviation list(s) (CDL); — security; — handling of accidents and occurrences.										
(08)		State that the following items are included into Part A: — altitude alerting system procedures; — ground proximity warning system procedures; — policy and procedures for the use of traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS).	X	X								
(09)		State that rotor downwash is included into Part A.			X	X	X					
071 02 01 02		***Aeroplane/helicopter operating matters — type-related***										
(01)		State that all type-related instructions and procedures required for a safe operation are included in Part B of the operations manual. They take account of any differences between types, variants or individual aircraft used by an operator.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that the following items are included into Part B: – abnormal and emergency procedures; – configuration deviation list (CDL); – minimum equipment list (MEL); – emergency evacuation procedures.	X	X								
(03)		State that the following items are included into Part B: – emergency procedures; – configuration deviation list (CDL); – minimum equipment list (MEL); – emergency evacuation procedures.			X	X	X					
071 02 01 03		***Minimum equipment list (MEL) and master minimum equipment list (MMEL)***										
(01)		Describe the following terms: 'commencement of flight', 'inoperative', 'MEL', 'MMEL', 'rectification interval'.	X	X	X	X	X					
(02)		Explain the relation between MMEL and MEL.	X	X	X	X	X					
(03)		Define the 'extent of the MEL'.	X	X	X	X	X					
(04)		Explain the responsibilities of the operator and the competent authority with regard to MEL and MMEL.	X	X	X	X	X					
(05)		Explain the responsibilities of the flight crew members with regard to MEL.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Explain the responsibilities of the commander with regard to MEL.	X	X	X	X	X					
071 02 02 00		**Icing conditions**										
071 02 02 01		***On-ground de-icing/anti-icing procedures, types of de-icing/anti-icing fluids***										
(01)		Define the following terms: ‘anti-icing’, ‘de-icing’, ‘one-step de-icing/anti-icing’, ‘two-step de-icing/anti-icing’, ‘holdover time’.	X	X								
(02)		Describe ‘the clean aircraft concept’ as presented in the relevant chapter of ICAO Doc 9640.	X	X								
(03)		List the types of de-icing/anti-icing fluids available.	X	X	X	X	X					
(04)		Explain the procedure to be followed when an aeroplane has exceeded the holdover time.	X	X								
(05)		Interpret the guidelines for fluid holdover times and list the factors which can reduce the fluid protection time.	X	X								
(06)		Explain how the pre-take-off check, which is the responsibility of the pilot-in-command, ensures that the critical surfaces of the aircraft are free of ice, snow, slush or frost just prior to take-off. This check shall be accomplished as close to the time of take-off	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		as possible and is normally made from within the aeroplane by visually checking the wings.										
(07)		Explain why an aircraft has to be treated symmetrically.	X	X								
(08)		Explain why an operator shall establish procedures to be followed when ground de-icing and anti-icing and related inspections of the aircraft are necessary.	X	X	X	X	X					
(09)		Explain why a commander shall not commence take-off unless the external surfaces are clear of any deposit which might adversely affect the performance or controllability of the aircraft except as permitted in the flight manual.	X	X	X	X	X					
(10)		Explain the requirements for operations in icing conditions.	X	X	X	X	X					
(11)		Explain why safety must come before commercial pressures in relation to de-icing and anti-icing of aircraft. (Consider time and financial cost versus direct and indirect effects of an incident/accident).	X	X	X	X	X					
071 02 02 02		***Procedure to apply in case of performance deterioration, on ground/in flight***										
(01)		Explain that the effects of icing are wide-ranging, unpredictable and dependent upon individual aircraft design. The magnitude of these effects is dependent upon many	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		variables, but the effects can be both significant and dangerous.										
(02)		Explain that in icing conditions, for a given speed and a given angle of attack, wing lift can be reduced by as much as 30 % and drag increased by up to 40 %. State that these changes in lift and drag will significantly increase stall speed, reduce controllability, and alter flight characteristics.	X	X	X	X	X					
(03)		Explain that ice on critical surfaces and on the airframe may also break away during take-off and be ingested into engines, possibly damaging fan and compressor blades.	X	X	X	X	X					
(04)		Explain that ice forming on pitot tubes and static ports or on angle-of-attack vanes may give false altitude, airspeed, angle-of-attack and engine-power information for air-data systems.	X	X	X	X	X					
(05)		Explain that ice, frost and snow formed on the critical surfaces on the ground can have a totally different effect on aircraft flight characteristics than ice, frost and snow formed in flight.	X	X	X	X	X					
(06)		Explain that flight in known icing conditions is subject to limitations that are contained in Part B of the operations manual.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Explain where procedures and performances regarding flight in expected or actual icing conditions can be found.	X	X	X	X	X					
071 02 03 00		**Bird-strike risk**										
071 02 03 01		***Bird-strike risk and avoidance***										
(01)		Explain that the presence of birds that constitute a potential hazard to aircraft operations is part of the pre-flight information.	X	X	X	X	X					
(02)		Explain how information concerning the presence of birds observed by aircrews is made available to the aeronautical information service (AIS) for distribution as the circumstances dictate.	X	X	X	X	X					
(03)		Explain that the Aeronautical Information Publication (AIP) Section En-route (ENR) 5.6 contains information regarding bird migrations.	X	X	X	X	X					
(04)		Explain significant data regarding bird strikes contained in ICAO Doc 9137 ‘Airport Services Manual’.	X	X	X	X	X					
(05)		Explain why birds constitute a hazard to aircraft (damage to probes, sensors, engines, windscreens, airframes, degradation in vision, etc.).	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Define the commander's responsibilities regarding the reporting of bird hazards and bird strikes.	X	X	X	X	X					
(07)		State that birds tend to flock to areas where food is plentiful. Such areas include: rubbish (garbage) facilities; open sewage treatment works; recently ploughed land; as well as their natural habitats.	X	X	X	X	X					
071 02 04 00		**Noise abatement**										
071 02 04 01		***Noise-abatement procedures***										
(01)		Define the operator's responsibilities regarding the establishment of noise-abatement procedures.	X	X	X	X	X					
(02)		State the main purpose of noise-abatement departure procedure (NADP) 1 and NADP 2.	X	X	X	X	X					
(03)		State that the PIC/commander has the authority to decide not to execute an NADP if conditions preclude the safe execution of the procedure.	X	X	X	X	X					
071 02 04 02		***Influence of the flight procedure (departure, cruise, approach)***										
(01)		List the main parameters for NADP 1 and NADP 2 (i.e. speeds, heights and configuration).	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		State that a runway lead-in lighting system should be provided where it is desired to provide visual guidance along a specific approach path for noise-abatement purposes.	X	X	X	X	X					
(03)		State that detailed information about noise-abatement procedures is to be found in Part 'Aerodromes' (AD), Sections 2 and 3 of the AIP.	X	X	X	X	X					
071 02 04 0 3		***Influence by the pilot (power setting, low drag)***										
(01)		List the adverse operating conditions under which noise-abatement procedures in the form of reduced-power take-off should not be required.	X	X								
(02)		List the adverse operating conditions under which noise-abatement procedures during approach should not be required.	X	X								
(03)		State the rule regarding the use of reverse thrust on landing.	X	X								
071 02 04 04		***Influence by the pilot (power setting, track of helicopter)***										
(01)		List the adverse operating conditions under which noise-abatement procedures in the form of reduced-power take-off should not be required.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
071 02 05 00		**Fire and smoke**										
071 02 05 01		***Carburettor fire***										
(01)		Explain that the actions to be taken in the event of a carburettor fire may be type-specific and should be known by the pilot.	X	X	X	X	X					
071 02 05 02		***Engine fire***										
(01)		Explain that the actions to be taken in the event of an engine fire may be type-specific and should be known by the pilot.	X	X	X	X	X					
071 02 05 03		***Fire in the cabin, in the flight crew compartment and in the cargo compartment***										
(01)		Identify the different types of extinguishants used in handheld fire extinguishers and the type of fire for which each one may be used.	X	X	X	X	X					
(02)		Describe the precautions to be considered when applying fire extinguishants.	X	X	X	X	X					
(03)		Identify the appropriate handheld fire extinguishers to be used in the flight crew compartment, the passenger cabin and lavatories, and in the cargo compartments.	X	X	X	X	X					
071 02 05 04		***Smoke in the flight crew compartment and in the cabin***										
(01)		Explain which actions should be taken in the event of smoke in the flight crew	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		compartment or in the cabin, why these actions may be type-specific, and why they should be known by the pilot.										
071 02 05 05		***Actions in case of overheated brakes***										
(01)		Describe the problems and safety precautions in the event that brakes overheat after a heavy-weight landing or a rejected take-off.	X	X								
(02)		Explain the difference in the way steel and carbon brakes react to energy absorption and the operational consequences.	X	X								
071 02 06 00		**Decompression of pressurised cabin**										
071 02 06 01		***Slow decompression***										
(01)		Explain what can cause, and how to detect, a slow decompression or an automatic pressurisation system failure.	X	X								
(02)		Describe the actions required following a slow decompression.	X	X								
071 02 06 02		***Rapid and explosive decompression***										
(01)		Explain what can cause, and how to detect, a rapid or an explosive decompression.	X	X								
071 02 06 03		***Dangers and action to be taken***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the actions required following a rapid or explosive decompression.	X	X								
(02)		Describe the effects on aircraft occupants of a slow decompression and of a rapid or explosive decompression.	X	X								
071 02 07 00		**Wind shear and microburst**										
071 02 07 01		***Effects and recognition during departure and approach***										
(01)		Explain how to identify low-level wind shear.	X	X	X	X	X					
071 02 07 02		***Actions to avoid and actions to take when encountering wind shear***										
(01)		Describe the effects of wind shear and the actions required when wind shear is encountered at take-off and approach.	X	X	X	X	X					
(02)		Describe the precautions to be taken when wind shear is suspected at take-off and approach.	X	X	X	X	X					
(03)		Describe the effects of wind shear and the actions required following entry into a strong downdraft wind shear.	X	X	X	X	X					
(04)		Describe a microburst and its effects.	X	X	X	X	X					
071 02 08 00		**Wake turbulence**										
071 02 08 01		***Cause***										
(01)		Describe the term ‘wake turbulence’.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe tip vortex circulation.	X	X	X	X	X					
(03)		State when vortex generation begins and ends.	X	X	X	X	X					
(04)		Describe vortex circulation on the ground with and without crosswind.	X	X	X	X	X					
071 02 08 02		***List of relevant parameters***										
(01)		List the three main factors which, when combined, give the strongest vortices (heavy, clean, slow).	X	X	X	X	X					
(02)		Describe the wind conditions which are worst for wake turbulence near the ground.	X	X	X	X	X					
071 02 08 03		***Actions to be taken when crossing traffic, during take-off and landing***										
(01)		Describe the actions to be taken to avoid wake turbulence, specifically separations.	X	X	X	X	X					
071 02 09 00		**Security (unlawful events)**										
071 02 09 01		***ICAO Annex 17 and Regulation (EC) No 300/2008***										
(01)		Define the following terms: ‘aircraft security check’, ‘screening’, ‘security’, ‘security-restricted area’, ‘unidentified baggage’.	X	X	X	X	X					
(02)		State the objectives of security.	X	X	X	X	X					
071 02 09 02		***Use of secondary surveillance radar (SSR)***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the commander's responsibilities concerning notifying the appropriate ATS unit.	X	X	X	X	X					
(02)		Describe the commander's responsibilities concerning operation of SSR.	X	X	X	X	X					
(03)		Describe the commander's responsibilities concerning departing from assigned track or cruising level.	X	X	X	X	X					
(04)		Describe the commander's responsibilities concerning the action required or being requested by an ATS unit to confirm SSR code and ATS interpretation response.	X	X	X	X	X					
071 02 09 03		***Security (Regulation (EC) No 300/2008 and ICAO Annex 17)***										
(01)		Describe the relationship between Regulation (EC) No 300/2008 and ICAO Annex 17.	X	X	X	X	X					
(02)		Explain the requirements regarding training programmes.	X	X	X	X	X					
(03)		State the requirements regarding reporting acts of unlawful interference.	X	X	X	X	X					
(04)		State the requirements regarding aircraft search procedures.	X	X	X	X	X					
071 02 10 00		**Emergency and precautionary landing, and ditching**										
071 02 10 01		***Descriptions***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the meaning of: ‘ditching’, ‘precautionary landing’, and ‘emergency landing’.	X	X	X	X	X					
(02)		Describe a ditching procedure.	X	X	X	X	X					
(03)		Describe a precautionary landing procedure.	X	X	X	X	X					
(04)		Describe an emergency landing procedure.	X	X	X	X	X					
(05)		Explain the factors to be considered when deciding to conduct a precautionary/emergency landing or ditching.	X	X	X	X	X					
071 02 10 02		***Cause***										
(01)		List some circumstances that may require a ditching, a precautionary landing or an emergency landing.	X	X	X	X	X					
071 02 10 03		***Passenger information***										
(01)		Describe the briefing to be given to passengers before conducting a precautionary/emergency landing or ditching (including evacuation).	X	X	X	X	X					
071 02 10 04		***Action after a precautionary/emergency landing or ditching***										
(01)		Describe the actions and responsibilities of crew members after landing.	X	X	X	X	X					
071 02 10 05		***Evacuation***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain why the aircraft must be stopped and the engine(s) shut down before launching an emergency evacuation.	X	X	X	X	X					
(02)		Explain the CS-25 requirements regarding evacuation procedures.	X	X								
071 02 11 00		**Fuel jettisoning**										
071 02 11 01		***Safety aspects***										
(01)		Explain why an aircraft may need to jettison fuel so as to reduce its landing mass in order to make a safe landing.	X	X								
(02)		Explain that when an aircraft that operates within controlled airspace needs to jettison fuel, the flight crew shall coordinate with ATC the following: — route to be flown which, if possible, should be clear of cities and towns, preferably over water and away from areas where thunderstorms have been reported or are expected; — the flight level to be used, which should be not less than 1 800 m (6 000 ft); and — the duration of fuel jettisoning.	X	X								
(03)		Explain how flaps and slats may adversely affect fuel jettisoning.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
071 02 11 02		***Requirements***										
(01)		Explain why a fuel-jettisoning system must be capable of jettisoning enough fuel within 15 minutes.	X	X								
071 02 12 00		**Transport of dangerous goods by air**										
071 02 12 01		***ICAO Annex 18***										
(01)		Define the following terms: ‘dangerous goods’, ‘dangerous goods accident’, ‘dangerous goods incident’, ‘exemption’, ‘incompatible’, ‘packaging’, ‘UN number’.	X	X	X	X	X					
(02)		Explain that detailed provisions for the transport of dangerous goods by air are contained in the Technical Instructions for the Safe Transport of Dangerous Goods by Air.	X	X	X	X	X					
(03)		State that in the event of an in-flight emergency, the pilot-in-command must inform the ATC of the transport of dangerous goods by air.	X	X	X	X	X					
071 02 12 02		***Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Doc 9284)***										
(01)		Explain the principle of dangerous goods compatibility and segregation.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the special requirements for the loading of radioactive materials.	X	X	X	X	X					
(03)		Explain the use of the dangerous goods list.	X	X	X	X	X					
(04)		Identify the labels.	X	X	X	X	X					
071 02 12 03		***MCAR-CAT and MCAR-SPA***										
(01)		Explain the terminology relevant to dangerous goods.	X	X	X	X	X					
(02)		Explain the scope of that Regulation.	X	X	X	X	X					
(03)		Explain why the transport of dangerous goods by air is subject to operator approval.	X	X	X	X	X					
(04)		Explain the limitations on the transport of dangerous goods by air.	X	X	X	X	X					
(05)		Explain the requirements for the acceptance of dangerous goods.	X	X	X	X	X					
(06)		Explain the requirements regarding inspection for damage, leakage or contamination.	X	X	X	X	X					
(07)		Explain the requirement for the provision of information to flight crew.	X	X	X	X	X					
(08)		Explain the requirements for dangerous goods incident and accident reports.	X	X	X	X	X					
(09)		State that some articles and substances, which would otherwise be classed as dangerous goods, can be exempted if they are part of the aircraft equipment, or required for use during aeromedical flights.	X	X	X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(10)		Explain why some articles and substances may be forbidden for transport by air.	X	X	X	X	X					
(11)		Explain why packing must comply with the specifications of the Technical Instructions.	X	X	X	X	X					
(12)		Explain the need for an inspection prior to loading dangerous goods on an aircraft.	X	X	X	X	X					
(13)		Explain why some dangerous goods are designated for carriage only on cargo aircraft.	X	X	X	X	X					
(14)		Explain how misdeclared or undeclared dangerous goods found in baggage are to be reported.	X	X	X	X	X					
071 02 13 00		**Contaminated runways**										
071 02 13 01		***Intentionally left blank***										
071 02 13 02		***Runway condition, braking action***										
(01)		*Intentionally left blank*										
(02)		State the runway condition codes for good braking action, and when a special air report is required.	X	X								
071 02 13 03		***Hydroplaning principles and effects***										
(01)		Define the different types of hydroplaning.	X	X								
(02)		Compute the two dynamic hydroplaning speeds using the following formulas:	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— spin-down speed (rotating tire) (kt) = 9 square root (pressure in PSI) — spin-up speed (non-rotating tire) (kt) = 7.7 square root (pressure in PSI).										
(03)		State that it is the spin-up speed rather than the spin-down speed which represents the actual tire situation for aircraft touchdown on flooded runways.	X	X								
071 02 13 04		***Intentionally left blank***										
071 02 13 05		***SNOWTAM and contamination on the aerodrome***										
(01)		Interpret from a SNOWTAM the contamination and braking action on a runway, taxiways and apron.	X	X								
(02)		Explain which hazards can be identified from the SNOWTAM/METAR and how to mitigate them.	X	X	X	X	X					
071 02 14 00		**Rotor downwash**										
071 02 14 01		***Describe downwash***										
(01)		Describe the downwash.			X	X	X					
071 02 14 02		***Effects***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain its effects: soil erosion, water dispersal and spray, recirculation, damage to property, loose articles.			X	X	X					
071 02 15 00		**Operation influence by meteorological conditions (helicopter)**										
071 02 15 01		***White-out/sand/dust***										
(01)		Give the definition of 'white-out'.			X	X	X					
(02)		Describe loss of spatial orientation.			X	X	X					
(03)		Describe take-off and landing techniques.			X	X	X					
071 02 15 02		***Strong winds***										
(01)		Describe blade sailing.			X	X	X					
(02)		Describe wind operating envelopes.			X	X	X					
(03)		Describe vertical speed problems.			X	X	X					
071 02 15 03		***Mountain environment***										
(01)		Describe constraints associated with mountain environment.			X	X	X					
071 03 00 00		**EMERGENCY PROCEDURES (HELICOPTER)**										
071 03 01 00		**Influence of technical problems**										
071 03 01 01		***Engine failure***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe recovery techniques in the event of engine failure during hover, climb, cruise, approach.			X	X	X					
071 03 01 02		***Fire in the cabin, in the flight crew compartment and in the engine(s)***										
(01)		Describe the basic actions when encountering fire in the cabin, flight deck or engine(s).			X	X	X					
071 03 01 03		***Tail-rotor directional control failure***										
(01)		Describe the basic actions following loss of tail rotor.			X	X	X					
(02)		Describe the basic actions following loss of directional control.			X	X	X					
071 03 01 04		***Ground resonance***										
(01)		Describe recovery actions.			X	X	X					
071 03 01 05		***Blade stall***										
(01)		Describe cause of and recovery actions when encountering retreating blade stall.			X	X	X					
071 03 01 06		***Settling with power (vortex ring)***										
(01)		Describe potential conditions for this event and recovery actions.			X	X	X					
071 03 01 07		***Overpitch***										
(01)		Describe recovery actions.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
071 03 01 08		***Overspeed: rotor/engine***										
(01)		Describe overspeed control.			X	X	X					
071 03 01 09		***Dynamic rollover***										
(01)		Describe potential conditions for this event and recovery action.			X	X	X					
071 03 01 10		***Mast bumping***										
(01)		Describe potential conditions of the ‘conducive to’ and ‘avoidance of’ effect.			X	X	X					
071 04 01 00		**SPECIALISED OPERATIONS MCAR SPO**										
071 04 01 0 1		***Additional requirements for commercial specialised operations and CAT operations (Annex III (Part-ORO), Subpart FC, Section 3)***										
(01)		Explain the requirements related to flight crew recurrent training and checking and operator proficiency check.	X	X	X	X	X					
071 04 01 02		***General requirements (Annex VIII (Part-SPO), Subpart A)***										
(01)		Explain the task specialist’s responsibilities.	X	X	X	X	X					
071 04 01 03		***Helicopter external sling load operations (HESLO) (Annex VIII (Part-SPO), Subpart E)***			X	X	X					
(01)		Explain the standard operating procedures and equipment requirements.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
071 04 01 04		***Human external cargo operations (HEC) (Annex VIII (Part-SPO), Subpart E)***			X	X	X					
(01)		Explain the standard operating procedures and equipment requirements.			X	X	X					

SUBJECT 081 – PRINCIPLES OF FLIGHT – AEROPLANES

(1) The following standard symbols and their corresponding meanings are used for certain mathematical operations:

*	multiplication
≥	greater than or equal to
≤	less than or equal to
SQRT(...)	square root of the function, symbol or number in round brackets

(2) Normally, it should be assumed that the effect of a variable under review is the only variation that needs to be addressed, unless specifically stated otherwise.

(3) Candidates are expected in simple calculations to be able to convert knots (kt) into metres/second (m/s), and know the appropriate conversion factors by heart.

(4) In the subsonic range, as covered under Subject 081 01, compressibility effects normally are not considered, unless specifically mentioned.

(5) For those questions related to propellers (Subject 081 07), as a simplification of the physical reality, the inflow speed into the propeller plane is taken as the aeroplane’s true airspeed (TAS).

(6) In addition, when discussing propeller rotational direction, it will always be specified as seen from behind the propeller plane.

(7) Note that the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe ‘mass’. The professional pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
080 00 00 00		**PRINCIPLES OF FLIGHT**										
081 00 00 00		**PRINCIPLES OF FLIGHT — AEROPLANES**										
081 01 00 00		**SUBSONIC AERODYNAMICS**										
081 01 01 00		**Basics, laws and definitions**										
081 01 01 01		***Laws and definitions***										
(01)		List the international system of units of measurement (SI) for mass, acceleration, weight, velocity, energy, density, temperature, pressure, force, wing loading, and power.	X	X								
(02)	X	Define ‘mass’, ‘force’, ‘acceleration’, and ‘weight’.	X	X								
(03)		State and interpret Newton’s three laws of motion.	X	X								
(04)	X	Explain air density.	X	X								
(05)	X	List the atmospheric properties that effect air density.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(06)		Explain how temperature and pressure changes affect air density.	X	X								
(07)	X	Define ‘static pressure’.	X	X								
(08)	X	Define ‘dynamic pressure’.	X	X								
(09)	X	State the formula for ‘dynamic pressure’.	X	X								
(10)		Describe dynamic pressure in terms of an indication of the energy in the system, and how it is related to indicated airspeed (IAS) and air density for a given altitude and speed.	X	X								
(11)		State Bernoulli’s equation for incompressible flow.	X	X								
(12)		Define ‘total pressure’ and explain that the total pressure differs in different systems.	X	X								
(13)		Apply Bernoulli’s equation to flow through a venturi stream tube for incompressible flow.	X	X								
(14)		Describe how IAS is acquired from the pitot static system.	X	X								
(15)		Describe the relationship between density, temperature, and pressure for air.	X	X								
(16)		Explain the equation of continuity and its application to the flow through a stream tube.	X	X								
(17)	X	Define ‘IAS’, ‘CAS’, ‘EAS’, and ‘TAS’.	X	X								
081 01 01 02		***Basics of airflow***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Describe steady and unsteady airflow.	X	X								
(02)	X	Explain the concept of a streamline and a stream tube.	X	X								
(03)	X	Describe and explain airflow through a stream tube.	X	X								
(04)	X	Explain the difference between two- and three-dimensional airflow.	X	X								
081 01 01 03		***Aerodynamic forces on aerofoils***										
(01)		Describe the originating point and direction of the resultant force caused by the pressure distribution around an aerofoil.	X	X								
(02)	X	Resolve the resultant force into the components ‘lift’ and ‘drag’.	X	X								
(03)		Describe the direction of lift and drag.	X	X								
(04)	X	Define the ‘aerodynamic moment’.	X	X								
(05)	X	List the factors that affect the aerodynamic moment.	X	X								
(06)		Describe the aerodynamic moment for a symmetrical aerofoil.	X	X								
(07)		Describe the aerodynamic moment for a positively and negatively cambered aerofoil.	X	X								
(08)	X	Define ‘angle of attack’ (α).	X	X								
081 01 01 04		***Shape of an aerofoil section***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)	X	Describe the following parameter of an aerofoil section: leading edge.	X	X								
(02)	X	Describe the following parameter of an aerofoil section: trailing edge.	X	X								
(03)		Describe the following parameter of an aerofoil section: chord line.	X	X								
(04)		Describe the following parameter of an aerofoil section: thickness-to-chord ratio or relative thickness.	X	X								
(05)		Describe the following parameter of an aerofoil section: location of maximum thickness.	X	X								
(06)		Describe the following parameter of an aerofoil section: camber line.	X	X								
(07)		Describe the following parameter of an aerofoil section: camber.	X	X								
(08)	X	Describe the following parameter of an aerofoil section: nose radius.	X	X								
(09)	X	Describe a symmetrical and an asymmetrical aerofoil section.	X	X								
081 01 01 05		***Wing shape***										
(01)	X	Describe the following parameter of a wing: span.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	Describe the following parameter of a wing: tip and root chord.	X	X								
(03)		Describe the following parameter of a wing: taper ratio.	X	X								
(04)	X	Describe the following parameter of a wing: wing area.	X	X								
(05)		Describe the following parameter of a wing: wing planform.	X	X								
(06)	X	Describe the following parameter of a wing: mean geometric chord.	X	X								
(07)		Describe the following parameter of a wing: mean aerodynamic chord (MAC).	X	X								
(08)		Describe the following parameter of a wing: aspect ratio.	X	X								
(09)	X	Describe the following parameter of a wing: dihedral angle.	X	X								
(10)	X	Describe the following parameter of a wing: sweep angle.	X	X								
(11)	X	Describe the following parameter of a wing: wing twist, geometric and aerodynamic.	X	X								
(12)		Describe the following parameter of a wing: angle of incidence. *Remark: In certain textbooks, angle of incidence is used as angle of attack (α). For Part-FCL theoretical knowledge examination purposes, this use is discontinued, and the*	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		angle of incidence is defined as the angle between the aeroplane longitudinal axis and the wing-root chord line.										
081 01 02 00		**Two-dimensional airflow around an aerofoil**										
081 01 02 01		***Streamline pattern***										
(01)	X	Describe the streamline pattern around an aerofoil.	X	X								
(02)		Describe converging and diverging streamlines, and their effect on static pressure and velocity.	X	X								
(03)	X	Describe upwash and downwash.	X	X								
081 01 02 02		***Stagnation point***										
(01)		Describe the stagnation point.	X	X								
(02)		Describe the movement of the stagnation point as the α changes.	X	X								
081 01 02 03		***Pressure distribution***										
(01)		Describe pressure distribution and local speeds around an aerofoil including effects of camber and α.	X	X								
(02)		***Intentionally left blank***										
081 01 02 04		***Centre of pressure (CP) and aerodynamic centre (AC)***										
(01)		Explain CP and AC.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 01 02 05		***Intentionally left blank***										
081 01 02 06		***Drag and wake***										
(01)	X	List two physical phenomena that cause drag.	X	X								
(02)		Describe skin friction drag.	X	X								
(03)		Describe form (pressure) drag.	X	X								
(04)	X	Explain why drag and wake cause loss of energy (momentum).	X	X								
081 01 02 07		***Influence of angle of attack (α)***										
(01)		Explain the influence of α on lift.	X	X								
081 01 02 08		***Intentionally left blank***										
081 01 02 09		***The lift coefficient (C_L) – angle of attack (α) graph***										
(01)		Describe the C_L–α graph.	X	X								
(02)		Explain the significant points: — point where the curve crosses the horizontal axis (zero lift); — point where the curve crosses the vertical axis (α = 0); — point where the curve reaches its maximum (C_{LMAX}).	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 01 03 00		**Coefficients**										
081 01 03 01		***General use of coefficients***										
(01)	X	Explain why coefficients are used in general.	X	X								
081 01 03 02		***The lift coefficient (C_L)***										
(01)		Explain the lift formula, the factors that affect lift, and perform simple calculations.	X	X								
(02)		Describe the effect of camber on the C_L–α graph (symmetrical and positively/negatively cambered aerofoils).	X	X								
(03)		Describe the typical difference in the C_L–α graph for fast and slow aerofoil design.	X	X								
(04)	X	Define 'C_{LMAX}' (maximum lift coefficient) and 'α_{CRIT}' (stalling α) on the graph.	X	X								
(05)		Describe C_L and explain the variables that affect it in low subsonic flight.	X	X								
081 01 03 03		***Drag***										
(01)		Describe the two-dimensional drag formula.	X	X								
(02)		Discuss the effect of the shape of a body, cross-sectional area, and surface roughness on the drag coefficient.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 01 04 00		**Three-dimensional airflow around an aeroplane**										
081 01 04 01		***Angle of attack (α)***										
(01)	X	Define 'angle of attack' (α). *Remark: For theoretical knowledge examination purposes, the angle-of-attack definition requires a reference line. This reference line for 3D has been chosen to be the longitudinal axis and for 2D the chord line.*	X	X								
(02)		Explain the difference between the α and the attitude of an aeroplane.	X	X								
081 01 04 02		***Streamline pattern***										
(01)		Describe the general streamline pattern around the wing, tail section, and fuselage.	X	X								
(02)		Explain and describe the causes of spanwise flow over top and bottom surfaces.	X	X								
(03)		Describe wing tip vortices and their contribution to downwash behind the wing.	X	X								
(04)		Explain why wing tip vortices vary with α.	X	X								
(05)		Describe spanwise lift distribution including the effect of wing planform.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe the causes, distribution and duration of the wake turbulence behind an aeroplane.	X	X								
(07)		Describe the influence of flap deflection on the wing tip vortex.	X	X								
(08)		Describe the parameters that influence wake turbulence.	X	X								
081 01 04 03		***Induced drag***										
(01)		Explain the factors that cause induced drag.	X	X								
(02)		Describe the approximate formula for the induced drag coefficient (including variables but excluding constants).	X	X								
(03)		Describe the relationship between induced drag and total drag in straight and level flight with variable speed.	X	X								
(04)		Describe the effect of mass on induced drag at a given IAS.	X	X								
(05)		Describe the means to reduce induced drag: — aspect ratio; — winglets; — tip tanks; — wing twist;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— camber change.										
(06)		Describe the influence of lift distribution on induced drag.	X	X								
(07)		Describe the influence of downwash on the effective airflow.	X	X								
(08)		Explain induced and effective local α.	X	X								
(09)		Explain the influence of the induced α on the direction of the lift vector.	X	X								
(10)		Explain the relationship between induced drag and: — speed; — aspect ratio; — wing planform; — bank angle in a horizontal coordinated turn.	X	X								
(11)		Explain the induced drag coefficient and its relationship with the lift coefficient and aspect ratio.	X	X								
(12)		Explain the influence of induced drag on: — the CL–α graph, and show the effect on the graph when comparing high- and low-aspect ratio wings; — the C_L–C_D (aeroplane polar), and show the effect on the graph when	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		comparing high- and low-aspect ratio wings; — the parabolic aeroplane polar in a graph and as a formula [$C_D = C_{PD} + kC_L^2$], where C_D = coefficient of drag and C_{PD} = coefficient of parasite drag.										
(13)		Describe the C_L–C_D graph (polar).	X	X								
(14)		Indicate minimum drag on the graph.	X	X								
(15)		Explain why the C_L–C_D ratio is important as a measure of performance.	X	X								
(16)		***Intentionally left blank***										
081 01 05 00		**Total drag**										
081 01 05 01		***Total drag in relation to parasite drag and induced drag***										
(01)	X	State that total drag consists of parasite drag and induced drag.	X	X								
081 01 05 02		***Parasite drag***										
(01)		Describe the types of drag that are included in parasite drag.	X	X								
(02)		Describe form (pressure) drag and the factors which affect its magnitude.	X	X								
(03)		Describe interference drag and the factors which affect its magnitude.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Describe friction drag and the factors which affect its magnitude.	X	X								
081 01 05 03		***Parasite drag and speed***										
(01)		Describe the relationship between parasite drag and speed.	X	X								
081 01 05 04		***Induced drag and speed*** *(Refer to 081 01 04 03)*										
081 01 05 05		***Total drag***										
(01)		Explain the total drag–speed graph and the constituent drag components.	X	X								
(02)		Indicate the speed for minimum drag.	X	X								
081 01 05 06		***Intentionally left blank***										
081 01 05 07		***Variables affecting the total drag–speed graph***										
(01)		Describe the effect of aeroplane gross mass on the graph.	X	X								
(02)		Describe the effect of pressure altitude on: — drag–IAS graph; — drag–TAS graph.	X	X								
(03)		Describe speed stability from the graph.	X	X								
(04)		Describe non-stable, neutral, and stable IAS regions.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain what happens to the IAS and drag in the non-stable region if speed suddenly decreases and why this could occur.	X	X								
081 01 06 00		**Ground effect**										
081 01 06 01		***Influence of ground effect***										
(01)		Explain the influence of ground effect on wing tip vortices, downwash, airflow pattern, lift, and drag.	X	X								
(02)		Describe the influence of ground effect on induced α and the coefficient of induced drag (C_{Di}).	X	X								
(03)		Explain the effects of entering and leaving ground effect.	X	X								
081 01 06 02		***Effect on stalling angle of attack (α_{CRIT})***										
(01)		Describe the influence of ground effect on α_{CRIT}.	X	X								
081 01 06 03		***Effect on lift coefficient (C_L)***										
(01)		Describe the influence of ground effect on the effective α and C_L.	X	X								
081 01 06 04		***Effect on take-off and landing characteristics of an aeroplane***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Describe the influence of ground effect on take-off and landing characteristics and performance of an aeroplane.	X	X								
(02)		Describe the difference in take-off and landing characteristics of high- and low-wing aeroplanes.	X	X								
081 01 07 00		**The relationship between lift coefficient and speed in steady, straight, and level flight**										
081 01 07 01		***Represented by an equation***										
(01)		Explain the effect on C_L during speed increase/decrease in steady, straight, and level flight, and perform simple calculations.	X	X								
081 01 07 02		***Represented by a graph***										
(01)		Explain, by using a graph, the effect on speed of C_L changes at a given weight.	X	X								
081 01 08 00		**Intentionally left blank**										
081 01 09 00		**CLMAX augmentation**										
081 01 09 01		***Trailing-edge flaps and the reasons for their use in take-off and landing***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		From the given relevant diagrams, describe or identify the following types of trailing-edge flaps: — split flaps; — plain flaps; — slotted flaps; — Fowler flaps.	X	X								
(02)		Describe how the wing's effective camber increases the C_L and C_D, and the reasons why this can be beneficial.	X	X								
(03)		Describe their effect on: — the location of CP; — pitching moments (due to wing CP movement); — stall speed.	X	X								
(04)		Compare their influence on the C_L–α graph: — indicate the variation in C_L at any given α; — indicate their effect on C_{LMAX}; — indicate their effect on critical α; — indicate their effect on the α at a given C_L.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Compare their influence on the C_L–C_D graph: — indicate how the $(C_L/C_D)_{MAX}$ differs from that of a clean wing.	X	X								
(06)		Explain the influence of trailing-edge flap deflection on the glide angle.	X	X								
(07)		Describe flap asymmetry: — explain the effect on aeroplane controllability.	X	X								
(08)		Describe trailing-edge flap effect on take-off and landing: — explain the advantages of lower-nose attitudes; — explain why take-off and landing speeds/distances are reduced.	X	X								
(09)		Explain the effects of flap-setting errors, such as mis-selection and premature/late extension or retraction of flaps, on: — take-off and landing distance and speeds; — climb and descent performance; — stall buffet margins.	X	X								
081 01 09 02		***Leading-edge devices and the reasons for their use in take-off and landing***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		From the given relevant diagrams, describe or identify the different types of leading-edge high-lift devices: — Krueger flaps; — variable camber flaps; — slats.	X	X								
(02)		Describe the function of the slot.	X	X								
(03)		Describe how the wing's effective camber increases with a leading-edge flap.	X	X								
(04)		Explain the effect of leading-edge flaps on the stall speed, also in comparison with trailing-edge flaps.	X	X								
(05)		Compare their influence on the C_L–α graph, compared with trailing-edge flaps and a clean wing: — indicate the effect of leading-edge devices on C_{LMAX}; — explain how the C_L curve differs from that of a clean wing; — indicate the effect of leading-edge devices on α_{CRIT}.	X	X								
(06)		Compare their influence on the C_L–C_D graph.	X	X								
(07)		Describe slat asymmetry:	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		– describe the effect on aeroplane controllability.										
(08)		Explain the reasons for using leading-edge high-lift devices on take-off and landing: — explain the disadvantage of increased nose-up attitudes; — explain why take-off and landing speeds/distances are reduced.	X	X								
081 01 09 03		***Vortex generators***										
(01)		Explain the purpose of vortex generators.	X	X								
(02)		Describe the basic operating principle of vortex generators.	X	X								
(03)		State their advantages and disadvantages.	X	X								
081 01 10 00		**Means to reduce the C_L–C_D ratio**										
081 01 10 01		***Spoilers and the reasons for their use in the different phases of flight***										
(01)		Describe the aerodynamic functioning of spoilers: — roll spoilers; — flight spoilers (speed brakes); — ground spoilers (lift dumpers).	X	X								
(02)		Describe the effect of spoilers on the C_L–α graph and stall speed.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe the influence of spoilers on the C_L–C_D graph and lift-drag ratio.	X	X								
081 01 10 02		***Speed brakes and the reasons for their use in the different phases of flight***										
(01)		Describe speed brakes and the reasons for using them in the different phases of flight.	X	X								
(02)		State their influence on the C_L–C_D graph and lift–drag ratio.	X	X								
(03)		Explain how speed brakes increase parasite drag.	X	X								
(04)		Describe how speed brakes affect the minimum drag speed.	X	X								
(05)		Describe their effect on rate and angle of descent.	X	X								
081 01 11 00		**Intentionally left blank**										
081 01 12 00		**Aerodynamic degradation**										
081 01 12 01		***Ice and other contaminants***										
(01)		Describe the locations on an aeroplane where ice build-up will occur during flight.	X	X								
(02)		Explain the aerodynamic effects of ice and other contaminants on: — lift (maximum C_L);	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— drag; — stall speed; — α_{CRIT}; — stability and controllability.										
(03)		Explain the aerodynamic effects of icing during take-off.	X	X								
081 01 12 02		***Deformation and modification of airframe, ageing aeroplanes***										
(01)		Describe the effect of airframe deformation and modification of an ageing aeroplane on aeroplane performance.	X	X								
(02)		Explain the effect on boundary layer condition of an ageing aeroplane.	X	X								
081 02 00 00		**HIGH-SPEED AERODYNAMICS**										
081 02 01 00		**Speeds**										
081 02 01 01		***Speed of sound***										
(01)	X	Define 'speed of sound'.	X									
(02)		Explain the variation of the speed of sound with altitude.	X									
(03)		Explain the influence of temperature on the speed of sound.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 02 01 02		***Mach number***										
(01)		Define 'Mach number' as a function of TAS and speed of sound.	X									
081 02 01 03		***Influence of temperature and altitude on Mach number***										
(01)		Explain the absence of change of Mach number with varying temperature at constant flight level and calibrated airspeed.	X									
(02)		Explain the relationship between Mach number, TAS and IAS during climb and descent at constant Mach number or IAS, and explain variation of lift coefficient, α, pitch and flight-path angle.	X									
(03)		Explain: — risk of exceeding the maximum operation speed (VMO) when descending at constant Mach number; — risk of exceeding the maximum operating Mach number (M_{MO}) when climbing at constant IAS; — risk of a low-speed stall at high altitude when climbing at a too low Mach number.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 02 01 04		***Compressibility***										
(01)		State that compressibility means that density can change along a streamline, and that this occurs in the high subsonic (from Mach 0.4), transonic, and supersonic flow.	X									
(02)	X	State that compressibility negatively affects the pressure gradient, leading to an overall reduction of the C_L.	X									
(03)	X	State that Mach number is a measure of compressibility.	X									
(04)		Describe that compressibility increases low-speed stall speed and decreases α_{CRIT}.	X									
081 02 01 05		***Subdivision of aerodynamic flow***										
(01)	X	List the subdivision of aerodynamic flow: — subsonic flow below compressibility; — subsonic flow above compressibility; — transonic flow; — supersonic flow.	X									
(02)		Describe the characteristics of the flow regimes listed above.	X									
(03)		Explain why some transport aeroplanes cruise at Mach numbers above the critical Mach number (M_{CRIT}).	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 02 02 00		**Shock waves**										
081 02 02 01		***Definition of shock wave***										
(01)	X	Define a 'shock wave'.	X									
081 02 02 02		***Normal shock waves***										
(01)		Describe a normal shock wave with respect to changes in: — static temperature; — static and total pressure; — velocity; — local speed of sound; — Mach number; — density.	X									
(02)		Describe a normal shock wave with respect to orientation relative to the wing surface.	X									
(03)		Explain the influence of increasing Mach number on a normal shock wave, at positive lift, with respect to: — strength; — position relative to the wing; — second shock wave at the lower surface.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the influence of α on shock-wave intensity and shock-wave location at constant Mach number.	X									
081 02 03 00		**Effects of exceeding the critical Mach number (M_{CRIT})**										
081 02 03 01		***Critical Mach number (M_{CRIT})***										
(01)		Define 'M_{CRIT}'.	X									
(02)		Explain how a change in α, aeroplane weight, manoeuvres, and centre-of-gravity (CG) position influences M_{CRIT}.	X									
081 02 03 02		***Effect on lift***										
(01)		Describe the behaviour of C_L versus Mach number at constant α.	X									
(02)		Explain the consequences of exceeding M_{CRIT} with respect to C_L and C_{LMAX}.	X									
(03)		Explain the change in stall indicated airspeed (IAS) with altitude.	X									
(04)		Discuss the effect on α_{CRIT}.	X									
(05)		Explain the advantages of exceeding M_{CRIT} in aeroplanes with supercritical aerofoils with respect to: — speed versus drag ratio; — specific range; — optimum altitude.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 02 03 03		***Effect on drag***										
(01)		Describe wave drag.	X									
(02)		Describe the behaviour of C_D versus Mach number at constant α.	X									
(03)		Explain the effect of Mach number on the C_L–C_D graph.	X									
(04)		Describe the effects and hazards of exceeding $M_{DRAG\ DIVERGENCE}$, namely: — drag rise; — instability; — Mach tuck; — shock stall.	X									
(05)		State the relation between M_{CRIT} and $M_{DRAG\ DIVERGENCE}$.	X									
081 02 03 04		***Effect on pitching moment***										
(01)		Discuss the effect of Mach number on the CP location.	X									
(02)		Describe the overall change in pitching moment above M_{CRIT} and explain the ‘tuck under’ or ‘Mach tuck’ effect.	X									
(03)	X	State the requirement for a Mach trim system to compensate for the effect of the CP movement and ‘tuck under’ effect.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)	X	Discuss the aerodynamic functioning of the Mach trim system.	X									
(05)		Discuss the corrective measures if the Mach trim fails.	X									
081 02 03 05		***Effect on control effectiveness***										
(01)		Discuss the effects on the effectiveness of control surfaces.	X									
081 02 04 00		***Intentionally left blank***										
081 02 05 00		**Means to influence critical Mach number (M_{CRIT})**										
081 02 05 01		***Wing sweep***										
(01)		Explain the influence of the angle of sweep on: — M_{CRIT}; — effective thickness/chord change or velocity component perpendicular to the quarter chord line.	X									
(02)		Describe the influence of the angle of sweepback at subsonic speed on: — C_{LMAX}; — efficiency of and requirement for high-lift devices;	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— pitch-up stall behaviour.										
(03)		Discuss the effect of wing sweepback on drag.	X									
081 02 05 02		***Aerofoil shape***										
(01)		Explain the use of thin aerofoils with reduced camber.	X									
(02)		Explain the main purpose of supercritical aerofoils.	X									
(03)		*Intentionally left blank*										
(04)		Explain the advantages and disadvantages of supercritical aerofoils for wing design.	X									
081 02 05 03		***Vortex generators***										
(01)		Explain the use of vortex generators as a means to avoid or restrict flow separation caused by the presence of a normal shock wave.	X									
081 03 00 00		**Stall, Mach tuck, and upset prevention and recovery**										
081 03 01 00		**The stall**										
081 03 01 01		***Flow separation at increasing α***										
(01)	X	Define the ‘boundary layer’.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)	X	Describe the thickness of a typical laminar and turbulent boundary layer.	X	X								
(03)		Describe the properties, advantages and disadvantages of the laminar boundary layer.	X	X								
(04)		Describe the properties, advantages and disadvantages of the turbulent boundary layer.	X	X								
(05)		Define the ‘transition point’.	X	X								
(06)		Explain why the laminar boundary layer separates easier than the turbulent boundary layer does.	X	X								
(07)		Describe why the airflow over the aft part of a wing slows down as the α increases.	X	X								
(08)		Define the ‘separation point’ and describe its location as a function of α.	X	X								
(09)	X	Define α_{CRIT}.	X	X								
(10)		Describe in straight and level flight the influence of increasing the α and the phenomenon that may occur regarding: — the forward stagnation point; — the pressure distribution; — the CP location (straight and swept-back wing); — C_L;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— C_D and D (drag); — the pitching moment (straight and swept-back wing); — buffet onset; — deterrent buffet for a clean wing at high Mach number; — lack of pitch authority; — uncommanded pitch down; — uncommanded roll.										
(11)		Explain what causes the possible natural buffet on the aeroplane in a pre-stall condition.	X	X								
(12)		Describe the effectiveness of the flight controls in a pre-stall condition.	X	X								
(13)		Describe and explain the normal post-stall behaviour of a straight-wing aeroplane.	X	X								
(14)		Describe the effect and dangers of using the controls close to the stall.	X	X								
(15)		Describe the deterrent buffet.	X	X								
(16)		Explain the occurrence of the deterrent buffet and why this phenomenon is considered to be a stall limit.	X	X								
081 03 01 02		***The stall speed***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Explain V_{S0}, V_{S1}, V_{SR}, and V_{S1G}.	X	X								
(02)		Solve V_{S1G} from the lift formula given varying C_L.	X	X								
(03)		Describe and explain the influence of the following parameters on stall speed: — CG; — thrust component; — slipstream; — wing loading; — mass; — wing contamination; — angle of sweep; — altitude (for compressibility effects, see 081 02 03 02).	X	X								
(04)	X	Define the 'load factor n'.	X	X								
(05)		Explain why the load factor increases in a turn.	X	X								
(06)		Explain why the load factor increases in a pull-up and decreases in a push-over manoeuvre.	X	X								
(07)		Describe and explain the influence of the 'load factor n' on stall speed.	X	X								
(08)	X	Explain the expression 'accelerated stall'.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		Remark: Sometimes, accelerated stall is also erroneously referred to as high-speed stall. This latter expression will not be used for Subject 081.										
(09)		Calculate the change of stall speed as a function of the load factor.	X	X								
(10)		Calculate the increase of stall speed in a horizontal coordinated turn as a function of bank angle.	X	X								
(11)		Calculate the change of stall speed as a function of the gross mass.	X	X								
081 03 01 03		***The initial stall in spanwise direction***										
(01)		Explain the initial stall sequence on the following planforms: — elliptical; — rectangular; — moderate and high taper; — sweepback or delta.	X	X								
(02)		Explain the purpose of aerodynamic and geometric twist (washout).	X	X								
(03)		*Intentionally left blank*										
(04)		Explain the influence of fences, vortilons, saw teeth, vortex generators, and strakes on engine nacelles.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 03 01 04		***Stall warning***										
(01)	X	Explain why stall warning is necessary.	X	X								
(02)	X	Explain when aerodynamic and artificial stall warnings are used.	X	X								
(03)		Explain why CS-23 and CS-25 require a margin to stall speed for take-off and landing speeds.	X	X								
(04)	X	Describe: — buffet; — stall strip; — flapper switch (leading-edge stall-warning vane); — angle-of-attack vane; — angle-of-attack probe; — stick shaker.	X	X								
(05)		Describe the recovery after: — stall warning; — stall; — stick-pusher actuation.	X	X								
081 03 01 05		**Special phenomena of stall**										
(01)		*Intentionally left blank*										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the difference between power-off and power-on stalls and recovery.	X	X								
(03)		Describe stall and recovery in a climbing and descending turn.	X	X								
(04)		Describe the pitch-up effect on a swept wing aeroplane and also an aeroplane with a T-tail.	X	X								
(05)		Describe super stall or deep stall.	X	X								
(06)		Describe the philosophy behind the stick-pusher system.	X	X								
(07)		Describe the factors that can lead to the absence of stall warning and explain the associated risks.	X	X								
(08)		Describe the indications and explain the consequences of premature stabiliser stall due to ice contamination (negative tail stall).	X	X								
(09)		Describe when to expect in-flight icing.	X	X								
(10)		Explain how the effect is changed when retracting/extending lift-augmentation devices.	X	X								
(11)		*Intentionally left blank*										
(12)		Explain the effect of a contaminated wing on the stall speed and α_{CRIT}.	X	X								
(13)		Explain the hazards associated with airframe contamination when parked and during ground operations in winter	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		conditions, and the aerodynamic effects when attempting a take-off.										
(14)		Explain de-icing/anti-icing holdover time and the likely hazards after it has expired.	X	X								
(15)		Describe the aerodynamic effects of heavy tropical rain on stall speed and drag, and the appropriate mitigation in such conditions.	X	X								
081 03 01 06		***The spin***										
(01)		Explain how to avoid spins.	X	X								
(02)		List the factors that cause a spin to develop.	X	X								
(03)		Describe an ‘incipient’ and ‘developed’ spin, recognition and recovery.	X	X								
(04)		Describe the differences in spin attitude with forward and aft CG.	X	X								
081 03 02 00		**Buffet onset boundary**										
081 03 02 01		***Mach buffet***										
(01)		Explain shock-induced separation, and describe its relationship with Mach buffet (high speed buffet) and Mach tuck.	X									
(02)		*Intentionally left blank*										
081 03 02 02		***Buffet onset***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Explain the concept of buffet margin, and describe the influence of the following parameters on the concept of buffet margin: — α; — Mach number; — pressure altitude; — mass; — load factor; — angle of bank; — CG location.	X									
(02)		Explain how the buffet onset boundary chart can be used to determine: — manoeuvrability; — buffet margin.	X									
(03)		Describe the consequences of exceeding M_{MO}: light buffet, buffet onset.	X									
(04)		Explain ‘aerodynamic ceiling’ and ‘coffin corner’.	X									
(05)		Explain the concept of the ‘1.3g’ buffet margin altitude.	X									
(06)		Find (using an example graph): — buffet free range;	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— aerodynamic ceiling at a given mass; — load factor and bank angle at which buffet occurs at a given mass, Mach number, and pressure altitude.										
(07)		Explain why descent increases the buffet free range.	X									
081 03 03 00		**Situations in which buffet or stall could occur**										
081 03 03 01		**Explain why buffet or stall occurs**										
(01)		Explain why buffet or stall could occur in the following pilot-induced situations, and the methods to mitigate them: — inappropriate take-off configuration, detailing the consequences of errors associated with leading-edge devices; — steep turns; — go-around using take-off/go-around (TOGA) setting (underslung engines).	X	X								
(02)		Explain why buffet or stall could occur in the following environmental conditions at low altitude, and how to mitigate them: — thunderstorms; — wind shear and microburst;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— turbulence; — wake turbulence; — icing conditions.										
(03)		Explain why buffet or stall could occur in the following environmental conditions at high altitude, and how to mitigate them: — thunderstorms in the intertropical convergence zone (ITCZ); — jet streams; — clear-air turbulence.	X									
(04)		Explain why buffet or stall could occur in the following situations, and how to mitigate them: — inappropriate autopilot climb mode; — loss of, or unreliable, airspeed indication.	X	X								
081 03 04 00		**Recognition of stalled condition**										
081 03 04 01		***Recognition and explanation of stalled condition***										
(01)		Explain why a stalled condition can occur at any airspeed, or attitude or altitude.	X	X								
(02)		Explain that a stall may be recognised by continuous stall-warning activation	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		accompanied by at least one of the following: — buffet, that can be heavy; — lack of pitch authority; — uncommanded pitch down and uncommanded roll; — inability to arrest the descent rate.										
(03)		Explain that 'stall warning' means a natural or synthetic indication provided when approaching the stall that may include one or more of the following indications: — aerodynamic buffeting; — reduced roll stability and aileron effectiveness; — visual or aural clues and warnings; — reduced elevator (pitch) authority; — inability to maintain altitude or arrest a rate of descent; — stick-shaker activation.	X	X								
081 04 00 00		**STABILITY**										
081 04 01 00		**Static and dynamic stability**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 04 01 01		***Basics and definitions***										
(01)		Define 'static stability': — describe/identify a statically stable, neutral, and unstable condition (positive, neutral, and negative static stability), and — explain why aeroplanes are statically stable.	X	X								
(02)		Explain manoeuvrability.	X	X								
(03)		Explain the relationship between static stability and manoeuvrability.	X	X								
(04)		Define 'dynamic stability': — describe/identify a dynamically stable, neutral, and unstable motion (positive, neutral, and negative dynamic stability); — describe/identify periodic and aperiodic motion.	X	X								
(05)		*Intentionally left blank*										
081 04 01 02		***Precondition for static stability***										
(01)	X	Explain an equilibrium of forces and moments as the initial condition for static stability.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 04 01 03		***Sum of forces***										
(01)	X	Identify the forces considered in the equilibrium of forces.	X	X								
081 04 01 04		***Sum of moments***										
(01)		Identify the moments about all three axes considered in the equilibrium of moments.	X	X								
(02)		Discuss the effect of sum of moments not being zero.	X	X								
081 04 02 00		**Intentionally left blank**										
081 04 03 00		**Static and dynamic longitudinal stability**										
081 04 03 01		***Methods for achieving balance***										
(01)	X	Explain the stabiliser as the means to satisfy the condition of nullifying the total sum of the moments about the lateral axis.	X	X								
(02)		Explain the influence of the location of the wing CP relative to the CG on the magnitude and direction of the balancing force on the stabiliser.	X	X								
(03)		Explain the influence of the indicated airspeed on the magnitude and direction of the balancing force on the stabiliser.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Explain the use of the elevator deflection or stabiliser angle for the generation of the balancing force and its direction.	X	X								
(05)		Explain the elevator deflection required to balance thrust change as a function of engine position.	X	X								
081 04 03 02		***Static longitudinal stability***										
(01)		Discuss the effect of the CG location on pitch manoeuvrability and longitudinal stability.	X	X								
081 04 03 03		***Neutral point***										
(01)	X	Define ‘neutral point’.	X	X								
(02)	X	Explain why the location of the neutral point is only dependent on the aerodynamic design of the aeroplane.	X	X								
081 04 03 04		***Factors affecting neutral point***										
(01)		Describe the location of the neutral point relative to the locations of the aerodynamic centre of the wing and tail.	X	X								
081 04 03 05		***Location of centre of gravity (CG)***										
(01)		Explain the influence of the CG location on the static longitudinal stability of the aeroplane.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)		Explain the CG forward and aft limits with respect to: — longitudinal control forces; — elevator effectiveness; — stability.	X	X								
(03)		Define ‘static margin’.	X	X								
081 04 03 06		***The C_m–α graph***										
(01)	X	Describe the C_m–α graph with respect to the relationship between the slope of the graph and static stability.	X	X								
081 04 03 07		***Factors affecting the C_m–α graph***										
(01)		Explain: — the effect on the C_m–α graph of a shift of CG in the forward and aft direction; — the effect on the C_m–α graph when the elevator is moved up or down; — the effect on the C_m–α graph when the trim is moved; — the effect of the wing contribution; — the tail contribution.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 04 03 08		***Intentionally left blank***										
081 04 03 09		***Intentionally left blank***										
081 04 03 10		***The stick force versus speed graph (IAS)***										
(01)		Explain how a pilot perceives stable static longitudinal stick force stability regarding changes in: — speed; — altitude; — mass distribution (CG location).	X	X								
081 04 03 11		***Intentionally left blank***										
081 04 03 12		***The manoeuvring stability/stick force per g***										
(01)	X	Define the 'stick force per g', and describe that the stick force increases linearly with increase in g.	X	X								
(02)		Explain why: — the stick force per g has a prescribed minimum and maximum value; — the stick force per g decreases with pressure altitude.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 04 03 13		***Intentionally left blank***										
081 04 03 14		***Factors affecting the manoeuvring stability/stick force per g***										
(01)		Explain the influence on stick force per g of: — CG location; — trim setting.	X	X								
081 04 03 15		***Intentionally left blank***										
081 04 03 16		***Dynamic longitudinal stability***										
(01)		Describe the phugoid and short-period motion in terms of period, damping, variations (if applicable) in speed, altitude, and α.	X	X								
(02)		Explain why the short-period motion is more hazardous than the phugoid.	X	X								
(03)		Describe ‘pilot-induced oscillations’.	X	X								
(04)		Explain the effect of high altitude on dynamic stability.	X	X								
(05)		Describe the influence of the CG location on the dynamic longitudinal stability of the aeroplane.	X	X								
081 04 04 00		**Static directional stability**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 04 04 01		***Definition and effects of static directional stability***										
(01)	X	Define 'static directional stability'.	X	X								
(02)		Explain the effects of static directional stability being too weak or too strong.	X	X								
081 04 04 02		***Sideslip angle***										
(01)		Define 'sideslip angle'.	X	X								
(02)		Identify β as the symbol used for the sideslip angle.	X	X								
081 04 04 03		***Yaw-moment coefficient C_n***										
(01)	X	Define the 'yawing-moment coefficient C_n'.	X	X								
(02)	X	Define the relationship between C_n and β for an aeroplane with static directional stability.	X	X								
081 04 04 04		C_n–β graph										
(01)	X	Explain why: — Cn depends on β; — Cn equals zero for that β that provides static equilibrium about the aeroplane's normal axis; — if no asymmetric engine thrust, flight control or loading condition prevails, the equilibrium β equals zero.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(02)	X	Identify how the slope of the C_n–β graph is a measure for static directional stability.	X	X								
(03)	X	Identify how the slope of the C_n–β graph is affected by altitude.	X	X								
081 04 04 05		***Factors affecting static directional stability***										
(01)		Describe how the following aeroplane components contribute to static directional stability: — wing; — fin; — dorsal fin; — ventral fin; — angle of sweep of the wing; — angle of sweep of the fin; — fuselage at high α; — strakes.	X	X								
(02)		Explain the reduction in static directional stability when the CG moves aft.	X	X								
081 04 05 00		**Static lateral stability**										
081 04 05 01		***Definition and effects of static lateral stability***										
(01)	X	Define 'static lateral stability'.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the effects of static lateral stability being too weak or too strong.	X	X								
081 04 05 02		***Bank angle Ø***										
(01)	X	Define ‘bank angle Ø’.	X	X								
081 04 05 03		***The roll-moment coefficient C_l***										
(01)	X	Define the ‘roll-moment coefficient C_l’.	X	X								
081 04 05 04		***Contribution of sideslip angle (β)***										
(01)		Explain how without coordination the bank angle (Ø) creates sideslip angle (β).	X	X								
081 04 05 05		***The C_l–β graph***										
(01)	X	Describe the C_l–β graph.	X	X								
(02)	X	Identify the slope of the C_l–β graph as a measure for static lateral stability.	X	X								
(03)	X	Identify how the slope of the C_l–β graph is affected by altitude.	X	X								
081 04 05 06		***Factors affecting static lateral stability***										
(01)		Explain the contribution to the static lateral stability of: — dihedral, anhedral; — high wing, low wing;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— sweep angle of the wing; — ventral fin; — vertical tail.										
081 04 06 00		**Dynamic lateral/directional stability**										
081 04 06 01		***Intentionally left blank***										
081 04 06 02		***Tendency to spiral dive***										
(01)		Explain how lateral and directional stability are coupled.	X	X								
(02)		Explain how high static directional stability and low static lateral stability may cause spiral divergence (unstable spiral dive), and under which conditions the spiral dive mode is neutral or stable.	X	X								
(03)		Describe an unstable spiral dive mode with respect to deviations in speed, bank angle, nose low-pitch attitude, and decreasing altitude.	X	X								
081 04 06 03		***Dutch roll***										
(01)		Describe Dutch roll.	X	X								
(02)		Explain:	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— why Dutch roll occurs when the static lateral stability is higher than static directional stability; — the conditions for a stable, neutral or unstable Dutch roll motion; — the function of the yaw damper; — the actions to be taken when the yaw damper is not available.										
(03)		Describe how the asymmetric nature of shock waves on both wings, at high Mach numbers, can lead to Dutch roll.	X									
081 04 06 04		***Effects of altitude on dynamic stability***										
(01)		Explain that increased pressure altitude reduces dynamic lateral/directional stability.	X	X								
081 05 00 00		**CONTROL**										
081 05 01 00		**General**										
081 05 01 01		***Basics — The three planes and three axes***										
(01)	X	Define: — lateral axis; — longitudinal axis;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— normal axis.										
(02)	X	— Define: — pitch angle; — bank angle (Ø); — yaw angle.	X	X								
(03)		Describe the motion about the three axes.	X	X								
(04)		Name and describe the devices that control these motions.	X	X								
081 05 01 02		***Camber change***										
(01)		State that camber is changed by movement of a control surface and explain the effect.	X	X								
081 05 01 03		***Angle-of-attack (α) change***										
(01)	X	Explain the influence of local α change by movement of a control surface.	X	X								
081 05 02 00		**Pitch (longitudinal) control**										
081 05 02 01		***Elevator/all-flying tails***										
(01)		Explain the working principle of the elevator/all-flying tail and describe its function.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 05 02 02		***Downwash effects***										
(01)		Explain the effect of downwash on the tailplane α.	X	X								
(02)		*Intentionally left blank*										
081 05 02 03		***Intentionally left blank***										
081 05 02 04		***Location of centre of gravity (CG)***										
(01)		Explain the relationship between elevator deflection and CG location to produce a given aeroplane response.	X	X								
(02)		Explain the effect of forward CG limit on pitch control.	X	X								
081 05 02 05		***Moments due to engine thrust***										
(01)		Describe the effect of engine thrust on pitching moments for different engine locations.	X	X								
081 05 03 00		**Yaw (directional) control**										
081 05 03 01		***The rudder***										
(01)		Explain the working principle of the rudder and describe its function.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		State the relationship between rudder deflection and the moment about the normal axis. Describe the effect of sideslip on the moment about the normal axis.										
081 05 03 02		***Rudder limiting***										
(01)		Explain why and how rudder deflection is limited on CAT aeroplanes.	X									
081 05 04 00		**Roll (lateral) control**										
081 05 04 01		***Ailerons***										
(01)		Explain the functioning of ailerons.	X	X								
(02)		Describe the adverse effects of aileron deflection. *(Refer to Subjects 081 05 04 04 and 081 06 01 02)*	X	X								
(03)		Explain why some aeroplanes have inboard and outboard ailerons.	X	X								
(04)		State that the outboard ailerons are locked beyond a given speed to prevent: — over-control; — exceeding structural limitations; — aeroelastic phenomena (flutter, divergence and aileron reversal).	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the use of aileron deflection in normal flight, flight with sideslip, crosswind landings, horizontal turns, flight with one-engine-inoperative.	X	X								
(06)	X	Define 'roll rate'.	X	X								
(07)	X	List the factors that affect roll rate.	X	X								
(08)		Describe flaperons and aileron droop.	X	X								
081 05 04 02		***Intentionally left blank***										
081 05 04 03		***Spoilers***										
(01)		Explain how spoilers can be used to control the rolling movement in combination with or instead of the ailerons.	X	X								
081 05 04 04		***Adverse yaw***										
(01)		Explain why the use of ailerons induces adverse yaw.	X	X								
081 05 04 05		***Means to avoid adverse yaw***										
(01)		Explain how the following reduce adverse yaw: — Frise ailerons; — differential aileron deflection; — rudder aileron cross-coupling;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— roll spoilers.										
081 05 05 00		***Roll/yaw interaction***										
081 05 05 01		***Explain roll/yaw interaction***										
(01)		Explain the secondary effect of roll.	X	X								
(02)		Explain the secondary effect of yaw.	X	X								
081 05 06 00		**Means to reduce control forces**										
081 05 06 01		***Aerodynamic balance***										
(01)		Describe the purpose of aerodynamic balance.	X	X								
(02)		Describe the working principle of the horn balance.	X	X								
(03)		Describe the working principle of the internal balance.	X	X								
(04)		Describe the working principle and application of: — balance tab; — anti-balance tab; — spring tab; — servo tab.	X	X								
081 05 06 02		***Artificial means***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		State the differences between fully powered controls and power-assisted controls.	X	X								
(02)		Describe power-assisted controls.	X	X								
(03)		Describe the advantages of artificial feel in fully powered control.	X	X								
081 05 07 00		**Fly-by-wire (FBW)**										
081 05 07 01		***Control laws***										
(01)		Explain which parameters may be controlled in level flight with the pitch control law.	X									
(02)		Explain the advantages of using the CG position in the FBW system.	X									
(03)		Explain what type of flight-degraded control laws may be available in case of failure.	X									
(04)		Explain what are hard and soft protections.	X									
081 05 08 00		**Trimming**										
081 05 08 01		***Reasons to trim***										
(01)		State the reasons for using trimming devices.	X	X								
(02)		Explain the difference between a trim tab and the various balance tabs.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 05 08 02		***Trim tabs***										
(01)		Describe the working principle of a trim tab including cockpit indications.	X	X								
081 05 08 03		***Stabiliser trim***										
(01)		Describe the working principle of a stabiliser trim including the flight deck indications.	X	X								
(02)		Explain the advantages and disadvantages of a stabiliser trim compared to a trim tab.	X	X								
(03)		Explain the relationship between CG position, take-off trim setting, and stabiliser trim position.	X	X								
(04)		Explain the effect of errors in the take-off stabiliser trim setting on the rotation characteristics and stick force during take-off rotation.	X	X								
(05)		Discuss the effects of jammed and runaway stabiliser.	X	X								
(06)		Explain the consequences of a jammed stabiliser during take-off, landing, and go-around.	X	X								
081 06 00 00		**LIMITATIONS**										
081 06 01 00		**Operating limitations**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 06 01 01		***Flutter***										
(01)		Describe the phenomenon of flutter and how IAS and mass distribution affects the likelihood of flutter occurrence.	X	X								
(02)		Describe the use of mass balance to alleviate the flutter problem by adjusting the mass distribution: — wing-mounted engines on pylons; — control surface mass balance.	X	X								
(03)		Explain what is the flight envelope free of flutter.	X	X								
081 06 01 02		***Intentionally left blank***										
(01)		*Intentionally left blank*										
081 06 01 03		***Landing gear/flap operating***										
(01)		Describe the reason for flap/landing gear limitations. Define ‘V_{LO}’. Define ‘V_{LE}’.	X	X								
(02)		Explain why there is a difference between V_{LO} and V_{LE} in the case of some aeroplane types.	X	X								
(03)		Define ‘V_{FE}’ and describe flap limiting speeds.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe flap design features, procedures and warnings to prevent overload.	X	X								
081 06 01 04		***V_{MO}, V_{NO}, and V_{NE}***										
(01)	X	Define 'V_{MO}', 'V_{NO}', and 'V_{NE}'.	X	X								
(02)		Explain the significance of V_{MO}, V_{NO} and V_{NE}, and the differences between these airspeeds.	X	X								
(03)		Explain the hazards of flying at speeds above V_{NE} and V_{MO}.	X	X								
081 06 01 05		***M_{MO}***										
(01)		Define 'M_{MO}' and state its limiting factors.	X									
081 06 02 00		**Manoeuvring envelope**										
081 06 02 01		***Manoeuvring–load diagram***										
(01)		Describe the manoeuvring–load diagram.	X	X								
(02)		Define limit and ultimate load factor, and explain what can happen if these values are exceeded.	X	X								
(03)		Define 'V_A', 'V_B', 'V_C', and 'V_D'.	X	X								
(04)		Identify and explain the varying features on the V_N diagram: — load factor 'n'; — speed scale, equivalent airspeed;	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		— equivalent airspeed envelope; — 1g stall speed; — stall boundary (refer to 081 03 01 02).										
(05)		Describe the relationship between V_{MO} or V_{NE} and V_C.	X	X								
(06)		State all the manoeuvring load-factors limits applicable to CS-23 and CS-25 aeroplanes.	X	X								
(07)		Explain the relationship between V_A and V_S in a formula, and calculate the values.	X	X								
(08)		Explain the significance of V_A and the adverse consequences of applying full, abrupt nose-up elevator deflection when exceeding V_A.	X	X								
081 06 02 02		***Factors affecting the manoeuvring–load diagram***										
(01)		State the relationship of mass to load-factor limits and accelerated stall speed boundary limit.	X	X								
(02)		Calculate the change of V_A with changing mass.	X	X								
(03)		Explain why V_A loses significance at higher altitude.	X									
(04)	X	Define ‘M_C’ and ‘M_D’.	X									

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 06 03 00		**Gust envelope**										
081 06 03 01		***Gust–load diagram***										
(01)		Recognise a typical gust–load diagram, and state the minimum gust speeds in ft/s, m/s and kt that the aeroplane must be designed to withstand at V_B to V_C and V_D.	X	X								
(02)		Discuss considerations for the selection of V_{RA}.	X	X								
(03)		Explain the adverse effects on the aeroplane when flying in turbulence.	X	X								
081 06 03 02		***Factors affecting the gust–load diagram***										
(01)		Describe and explain the relationship between the gust–load factor and the following: lift–curve slope, aspect ratio, angle of sweep, altitude, wing loading, weight, wing area, equivalent airspeed (EAS), and speed of vertical gust. (Note: For examination purposes, the ECQB questions will not be calculation based.)	X	X								
081 07 00 00		**PROPELLERS**										
081 07 01 00		**Conversion of engine torque to thrust**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 07 01 01		***Explain conversion of aerodynamic force on a propeller blade***										
(01)		Explain the resolution of aerodynamic force on a propeller blade element into lift and drag or into thrust and torque.	X	X								
(02)		Describe how propeller thrust and aerodynamic torque vary with IAS.	X	X								
081 07 01 02		***Relevant propeller parameters***										
(01)		Describe the geometry of a typical propeller blade element at the reference section: — blade chord line; — propeller rotational velocity vector; — true airspeed vector; — blade angle of attack; — pitch or blade angle; — advance or helix angle. Define 'geometric pitch', 'effective pitch', and 'propeller slip'. *Remark: For theoretical knowledge examination purposes, the following definition is used for geometric pitch: the theoretical distance a propeller would*	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		advance in one revolution at zero blade angle of attack.										
(02)		Describe how the terms ‘fine pitch’ and ‘coarse pitch’ can be used to express blade angle.	X	X								
081 07 01 03		***Blade twist***										
(01)	X	Define ‘blade twist’.	X	X								
(02)		Explain why blade twist is necessary.	X	X								
081 07 01 04		***Fixed pitch and variable pitch/constant speed***										
(01)	X	List the different types of propellers: — fixed pitch; — adjustable pitch or variable pitch (non-governing); — variable pitch (governing)/constant speed.	X	X								
(02)		Discuss the advantages and disadvantages of fixed-pitch and constant-speed propellers.	X	X								
(03)		Discuss climb and cruise propellers.	X	X								
(04)		Explain the relationship between blade angle, blade angle of attack, and airspeed for fixed and variable pitch propellers.	X	X								
(05)		Describe and explain the forces that act on a rotating blade element in normal,	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		feathered, windmilling, and reverse operation.										
(06)		Explain the effects of changing propeller pitch at constant IAS.	X	X								
081 07 01 05		***Propeller efficiency versus speed***										
(01)		Define 'propeller efficiency'.	X	X								
(02)		Explain and describe the relationship between propeller efficiency and speed (TAS) for different types of propellers.	X	X								
(03)		Explain the relationship between blade angle and thrust.	X	X								
081 07 01 06		***Effects of ice on propeller***										
(01)		Describe the effects and hazards of ice on a propeller.	X	X								
081 07 02 00		**Engine failure**										
081 07 02 01		***Windmilling drag***										
(01)		Describe the effects of an inoperative engine on the performance and controllability of an aeroplane: — thrust loss/drag increase; — influence on yaw moment during asymmetric power.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 07 02 02		***Feathering***										
(01)		Explain the reasons for feathering a propeller, including the effect on the yaw moment, performance and controllability.	X	X								
081 07 03 00		**Design features for power absorption**										
081 07 03 01		***Propeller design characteristics that increase power absorption***										
(01)	X	Name the propeller design characteristics that increase power absorption.	X	X								
081 07 03 02		***Diameter of propeller***										
(01)		Explain the reasons for restricting propeller diameter.	X	X								
081 07 03 03		***Number of blades***										
(01)	X	Define ‘solidity’.	X	X								
(02)		Describe the advantages and disadvantages of increasing the number of blades.	X	X								
081 07 03 04		***Propeller noise***										
(01)	X	Describe how propeller noise can be minimised.	X	X								
081 07 04 00		**Secondary effects of propellers**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 07 04 01		***Torque reaction***										
(01)		Describe the effects of engine/propeller torque.	X	X								
(02)		Describe the following methods for counteracting engine/propeller torque: — counter-rotating propellers; — contra-rotating propellers.	X	X								
081 07 04 02		***Gyroscopic precession***										
(01)	X	Describe what causes gyroscopic precession.	X	X								
(02)	X	Describe the effect on the aeroplane due to the gyroscopic effect.	X	X								
081 07 04 03		***Slipstream effect***										
(01)		Describe the possible effects of the rotating propeller slipstream.	X	X								
081 07 04 04		***Asymmetric blade effect***										
(01)		Explain the asymmetric blade effect (also called P factor).	X	X								
(02)		Explain the influence of direction of rotation on the critical engine on twin-engine aeroplanes.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
081 07 04 05		***Consideration of propeller effects***										
(01)		Describe, given direction of propeller rotation, the propeller effects during take-off run, rotation and initial climb, and their consequence on controllability.	X	X								
(02)		Describe, given the direction of propeller rotation, the propeller effects during a go-around and their consequence on controllability.	X	X								
(03)		Explain how propeller effects during go-around can be affected by: — high engine performance conditions and their effect on the VMC speeds; — loss of the critical engine; — crosswind; — high flap setting;	X	X								
081 08 00 00		**FLIGHT MECHANICS**										
081 08 01 00		**Forces acting on an aeroplane**										
081 08 01 01		***Straight, horizontal, steady flight***										
(01)	X	Describe the forces that act on an aeroplane in straight, horizontal, and steady flight.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	List the four forces and state where they act on.	X	X								
(03)		Explain how the four forces are balanced, including the function of the tailplane.	X	X								
081 08 01 02		***Straight, steady climb***										
(01)	X	Define 'flight-path angle' (γ).	X	X								
(02)		Describe the relationship between pitch attitude, γ and α for zero-wind and zero-bank conditions.	X	X								
(03)	X	Describe the forces that act on an aeroplane in a straight, steady climb.	X	X								
(04)		Name the forces parallel and perpendicular to the direction of flight. — Apply the formula relating to the parallel forces ($T = D + W \sin \gamma$). — Apply the formula relating to the perpendicular forces ($L = W \cos \gamma$).	X	X								
(05)		Explain why thrust is greater than drag.	X	X								
(06)		Explain why lift is less than weight.	X	X								
(07)		Explain the formula (for small angles) that gives the relationship between γ, thrust, weight, and lift–drag ratio, and use this formula for simple calculations.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Explain how IAS, α, and γ change in a climb performed with constant vertical speed and constant thrust setting.	X	X								
081 08 01 03		***Straight, steady descent***										
(01)	X	Describe the forces that act on an aeroplane in a straight, steady descent.	X	X								
(02)		Name the forces parallel and perpendicular to the direction of flight. — Apply the formula for forces parallel to the direction of flight (T = D – W sin γ). — Apply the formula relating to the perpendicular forces (L = W cos γ).	X	X								
(03)		Explain why lift is less than weight.	X	X								
(04)		Explain why thrust is less than drag.	X	X								
081 08 01 04		***Straight, steady glide***										
(01)	X	Describe the forces that act on an aeroplane in a straight, steady glide.	X	X								
(02)		Name the forces parallel and perpendicular to the direction of flight. — Apply the formula for forces parallel to the direction of flight (D = W sin γ). — Apply the formula for forces perpendicular to the direction of	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		flight (L = W cos γ).										
(03)		Describe the relationship between the glide gradient and the lift–drag ratio, and calculate glide range given: — initial height; — L–D ratio; — glide speed and wind speed.	X	X								
(04)		Define V_{MD} (speed for minimum drag) and explain the relationship between α, V_{MD} and the best lift–drag ratio.	X	X								
(05)		Explain the effect of wind component on glide angle, duration, and distance.	X	X								
(06)		Explain the effect of mass change on glide angle, duration, and distance, given that the aeroplane remains at either the same airspeed or at V_{MD}.	X	X								
(07)		Explain the effect of configuration change on glide angle and duration.	X	X								
(08)		Describe the relation between TAS, gradient of descent, and rate of descent.	X	X								
(09)		Define V_{MP} (speed for minimum power) and describe that the minimum rate of descent in the glide will be at V_{MP}, and explain the relationship of this speed to	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		the optimum speed for minimum glide angle.										
(10)		Discuss when a pilot could elect to fly for minimum glide rate of descent or minimum glide angle, and why speed stability or headwinds/tailwinds may favour a speed that is faster or slower than the optimum airspeed in still air.	X	X								
081 08 01 05		***Steady, coordinated turn***										
(01)		Describe the forces that act on an aeroplane in a steady, coordinated turn.	X	X								
(02)		Resolve the forces that act horizontally and vertically during a coordinated turn (tan $\phi = \frac{V^2}{gR}$).	X	X								
(03)		Describe the difference between a coordinated and an uncoordinated turn, and describe how to correct an uncoordinated turn using turn and slip indicator or turn coordinator.	X	X								
(04)		Explain why the angle of bank is independent of mass, and that it only depends on TAS and radius of turn.	X	X								
(05)		Resolve the forces to show that for a given angle of bank the radius of turn is	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		determined solely by airspeed (tan $\phi = \frac{V^2}{gR}$).										
(06)		Calculate the turn radius of a steady turn given TAS and angle of bank.	X	X								
(07)		Explain the effects of bank angle on: – load factor (LF = 1/cos ϕ); – α; – thrust; – drag.	X	X								
(08)	X	Define 'angular velocity'.	X	X								
(09)	X	Define 'rate of turn' and 'rate-1 turn'.	X	X								
(10)		Explain the influence of TAS on rate of turn at a given bank angle.	X	X								
(11)		Calculate the load factor and stall speed in a turn given angle of bank and 1g stall speed.	X	X								
(12)		Explain situations in which turn radius is relevant for safety, such as maximum speed limits on departure or arrival plates, or outbound speed categories on approach plates, and the implications/hazards of exceeding given speeds.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(13)		Describe the hazards of excessive use of rudder to increase the rate of turn in a swept-wing aeroplane.	X	X								
081 08 02 00		**Asymmetric thrust**										
081 08 02 01		***Jet-engined and propeller-driven aeroplanes***										
(01)		Describe the effects on the aeroplane of asymmetric thrust during flight, for both jet-engined and propeller-driven aeroplanes.	X	X								
(02)		Explain critical engine, and explain, for a propeller-driven aeroplane, the effect of the direction of propeller rotation.	X	X								
(03)	X	Explain the effect of steady, asymmetric flight on a conventional (ball) slip indicator/turn indicator.	X	X								
(04)		Explain the effect of a crosswind on asymmetric flight.	X	X								
081 08 02 02		***Balanced moments about the normal axis***										
(01)		Explain the yaw moments about the CG.	X	X								
(02)		Explain the change to the yaw moment caused by the effect of air density on thrust.	X	X								
(03)		Describe the changes to the yaw moment caused by engine distance from CG.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(04)		Describe the methods to achieve directional balance following engine loss.	X	X								
081 08 02 03		***Forces parallel to the lateral axis***										
(01)		Explain: — the force on the vertical fin; — the fuselage side force due to sideslip (using wing-level method); — the use of bank angle to tilt the lift vector (in wing-down method).	X	X								
(02)		Explain the flight hazards at VMC: — α; — side slip; — loads on the fin; — α on the fin.	X	X								
(03)		Explain the effect on fin α due to sideslip.	X	X								
081 08 02 04		***Influence of aeroplane mass***										
(01)		Explain why controllability with one-engine-inoperative is a typical problem arising from the low speeds associated with low aeroplane mass.	X	X								
081 08 02 05		***Intentionally left blank***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 08 02 06		***Intentionally left blank***										
081 08 02 07		***Intentionally left blank***										
081 08 02 08		***Minimum control speed (V_{MC})***										
(01)		Define 'V_{MC}'.	X	X								
(02)		Describe how V_{MC} is determined.	X	X								
(03)		Explain the influence of the CG location.	X	X								
081 08 02 09		***Minimum control speed during approach and landing (V_{MCL})***										
(01)		Define 'V_{MCL}'.	X	X								
(02)		Describe how V_{MCL} is determined.	X	X								
(03)		Explain the influence of the CG location.	X	X								
081 08 02 10		***Minimum control speed on the ground (V_{MCG})***										
(01)		Define 'V_{MCG}'.	X	X								
(02)		Describe how V_{MCG} is determined.	X	X								
(03)		Explain the influence of the CG location.	X	X								
081 08 02 11		***Influence of density***										
(01)		Describe the influence of density on thrust during asymmetric flight.	X	X								
(02)		Explain why V_{MC}, V_{MCL} and V_{MCG} reduce with a reduction in thrust.	X	X								

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
081 08 03 00		**Significant points on a polar curve**										
081 08 03 01		***Identify and explain***										
(01)		Identify and explain the significant points on a polar curve.	X	X								

SUBJECT 082 – PRINCIPLES OF FLIGHT – HELICOPTERS

(1) VOCABULARY OF MECHANICS

Speed is a scalar quantity; it has only magnitude.

Velocity is a vector quantity with magnitude and direction.

The velocity of a point on a rotor blade, when rotating around an axis, is the 'linear' or 'tangential' velocity which can be expressed in revolutions per minute (rpm).

Density is the mass of the fluid per unit volume (kg/m3) in the international system of units of measurement (SI (*Système International*)).

(2) AERONAUTICAL DEFINITIONS

A rotor blade is a high-aspect ratio aerofoil attached by its root to the rotor hub with hinges or flexible elements.

A blade element is a spanwise slice of the blade, so thin that the aerodynamic forces involved may be assumed not to vary. The forces produce lift (L), drag (D), and a pitching moment. Such a cross section has a contour, a leading and trailing edge, a chord line, a mean camber line, a maximum thickness or depth, and a thickness-to-chord ratio.

The centre of pressure (CP) is defined as the point on the chord line where the resultant of all aerodynamic forces acts.

The planform is the shape of a blade as seen from above.

The pitch angle (of a blade or an element) is the angle between the chord line and the plane of rotation.

The blade is not twisted when the pitch angle is constant from root to tip.

A blade is twisted when the pitch angle of its elements' sections varies with their distance from the root (in other words, the chord lines of the elements involved are not parallel). Washout exists when the pitch angle decreases towards the blade tip.

The vector sum of the undisturbed upstream velocity (i.e. that found in the plane of rotation of the blades) and the induced velocity is the relative airflow.

The angle between the relative airflow and the chord line of a blade element is the angle of attack (α).

Lift is the component of the aerodynamic force on a blade element that is perpendicular to the relative airflow.

Profile drag is the component of the aerodynamic force on a blade element that is parallel to the plane of rotation. Induced drag is the component of the aerodynamic force on a blade element that is parallel to the relative airflow.

Profile drag consists of pressure forces and skin friction acting on the surface of the blade element. The component of profile drag that arises from pressure forces (between the leading and trailing edges) is pressure or form drag. The component of profile drag due to shear forces over the surface is skin friction.

The total rotor thrust is the vertical upwards force from the rotor disc as a whole, as the sum of all the blade thrusts. This term has been reinstated because there is already the term 'rotor thrust' that is used to denote the thrust along the axis of rotation that acts directly opposite the weight of the helicopter in a blade element.

(3) HELICOPTER CHARACTERISTICS

Disc loading is the mass (M) of the helicopter divided by the area of the disc.

Blade loading is the mass divided by the total planform area of the blades.

The area of a rectangular blade is given by the chord multiplied by the blade tip radius. For tapered blades, the mean geometric chord is taken as an approximately equivalent chord.

Rotor solidity is the ratio of the total blade area to the disc area.

(4) PLANES, AXES AND REFERENCE SYSTEMS OF THE ROTOR

— Shaft axis: The physical axis of the rotor shaft (mast).

— Hub plane: A plane perpendicular to the shaft axis through the centre of the hub.

— Tip path plane: The plane traced out by the blade tips.

— Virtual rotation axis: The axis through the centre of the hub and perpendicular to the tip path plane.

— Rotor disc: The disc traced out by the blade tips in the tip path plane.

— Plane of rotation: The plane parallel to the tip path plane that acts through the hub centre.

(5) ANGLES OF THE BLADES, INDUCED VELOCITY

— Pitch angle of a blade element: The angle between the chord line of the element and its plane of rotation, sometimes called ‘local pitch angle’.

— Blade pitch angle: Taken to be equivalent to the pitch angle of the blade element found at 75 % of the blade radius.

— Flapping angle: The angle between the longitudinal axis of the blade and the hub plane.

— Coning angle: The angle between the longitudinal axis of the blade and the tip path plane. Induced velocity is that induced by the engine power perpendicular to the plane of rotation.

Aerodynamic forces on the blades and the rotor

The thrust from a blade (blade thrust) is the sum of the thrusts from each blade element.

The sum of the thrusts from all blades is the (total) rotor thrust acting perpendicular to the tip path in the direction of the virtual rotation axis.

The result of the induced drag forces on all the blade elements of all blades is a torque on the shaft which, multiplied by the angular velocity of the blade, gives the required induced power.

The result of the profile drag forces is a torque on the shaft which, multiplied by the angular velocity of the blade, gives the required profile power.

(6) TYPES OF ROTOR HUBS

There are basically four types of rotor hubs in use:

1. Teetering rotor or seesaw rotor: The two blades are connected together; the 'hinge' is on the shaft axis, and the head is underslung. A variation is the gimballed hub; the blades and the hub are attached to the rotor shaft by means of a gimbal or universal joint (Bell 47). It is sometimes called semi-rigid because there is no movement of the blade in a drag-wise sense.
2. Fully articulated rotor: There are more than two rotor blades and each has a flapping hinge, a lead-lag (drag) hinge, and a feathering hinge or bearing.
3. Hingeless rotor: There are no flapping or dragging hinges. They are replaced by flexible elements (virtual hinges) at some part of the blade radius which allow such movements. A feathering bearing allows feathering of the blade.
4. Bearingless rotor: There are no hinges or rotating bearings. Flapping and dragging movements are obtained with flexible elements called elastomeric hinges. Feathering is obtained by twisting the element.

When referring to their equipment, Airbus call this a 'semi-articulated head' (ref.: their training material).

Two remarks:

1. Hinge offset and equivalent hinge offset

   The hinge offset is the distance between the shaft axis and the axis of the hinge. Hingeless and bearingless rotors have an equivalent hinge offset.

2. Elastomeric hinges

   This bearing consists of alternate layers of elastomer and metal. The flexibility of the elastomer allows flapping, dragging and feathering.

(7) DRAG AND POWERS

Induced power is that required to generate the induced velocity in the rotor disc for the production of lift. For any given thrust, induced power is minimum when the induced velocity is uniform over the rotor disc. This can be approximated by using washout and ensuring that the blades are in track (a truly uniform velocity cannot be obtained).

Rotor profile drag results from those components acting in the opposite direction to the blade velocities (i.e. the sum of all the profile drags from each blade element). The power required to overcome it is rotor profile power (the sum of the powers required to overcome the torque).

Parasite drag is the drag from the helicopter fuselage including that from the rotor hub and all external equipment such as wheels, the winch, external loads, etc. (any drag from the tail rotor is included, but not from the rotor blades, which produce profile drag). The power to overcome this drag is parasite power.

In level flight at constant speed, induced power, rotor profile power and parasite power are summed to give the total power required to drive the main rotor.

Induced power and profile power for the tail rotor are summed to give the power required to drive the tail rotor.

The power required to drive auxiliary services, such as oil pumps and electrical generators, is called accessory or ancillary power. It includes the power required to overcome mechanical friction in transmissions.

The total power required in level flight at constant speed is the sum of all the above.

When transitioning from the hover, the power required decreases as speed increases. This is called translational lift.

The term limited power means that the total power required to hover out of ground effect (HOGE) is greater than the available power.

(8) PHASE ANGLE IN FLAPPING MOVEMENT OF THE BLADE

The movement of the cyclic control tilts the rotor disc in the direction of the intended movement of the helicopter.

For teetering heads, the flapping response is 90° later than the applied cyclic control movement (less than 90° for rotors with offset hinges).

The pitch mechanism consists of the swash plate, and for each blade the pitch mechanism consists of a pitch link attached to the swash plate and a pitch horn attached to the blade.

(9) AXES THROUGH THE CENTRE OF THE HELICOPTER

Longitudinal axis or roll axis: A straight line through the centre of gravity (CG) of the helicopter from the nose to the tail about which the helicopter can roll left or right.

Lateral axis, transverse axis or pitch axis: A straight line through the CG of the helicopter about which the helicopter can pitch its nose up or down (this axis is also perpendicular to the reference plane of the aircraft, which is the plane either side of which the components that constitute the major part of the aircraft are symmetrically disposed in the port and starboard sense).

Normal axis or yaw axis: A straight line perpendicular to the plane defined by the longitudinal and lateral axes and about which the helicopter can yaw.

Note that the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
080 00 00 00		**PRINCIPLES OF FLIGHT**										
082 00 00 00		**PRINCIPLES OF FLIGHT — HELICOPTERS**										
082 01 00 00		**SUBSONIC AERODYNAMICS**										
082 01 01 00		**Basic concepts, laws and definitions**										
082 01 01 01		***International system of units of measurement (SI) and conversion of SI units***										
(01)	X	List the fundamental quantities and units in SI, such as mass (kg), length (m), time (s).			X	X	X					
(02)	X	Be able to convert imperial units to SI units and vice versa.			X	X	X					
082 01 01 02		***Definitions and basic concepts of air***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Describe air temperature and pressure as functions of height.			X	X	X					
(02)	X	Define the International Standard Atmosphere (ISA).			X	X	X					
(03)	X	Define air density, and explain the relationship between air density, pressure, and temperature.			X	X	X					
(04)	X	Explain the influence of moisture content on air density.			X	X	X					
(05)	X	Define pressure altitude and air density altitude.			X	X	X					
082 01 01 03		***Newton's laws***										
(01)	X	State and interpret Newton's three laws of motion.			X	X	X					
(02)	X	Distinguish between mass and weight, and their units.			X	X	X					
082 01 01 04		***Basic concepts of airflow***										
(01)	X	Describe steady and unsteady airflow.			X	X	X					
(02)	X	Define 'streamline' and 'stream tube'.			X	X	X					
(03)	X	Explain the principle of the continuity equation or the conservation of mass.			X	X	X					
(04)	X	Describe the mass flow rate through a stream tube section.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		State Bernoulli's equation and use it to explain and define the relationship between static, dynamic and total pressure.			X	X	X					
(06)		Define the stagnation point in the flow around an aerofoil, and explain the pressure obtained at the stagnation point.			X	X	X					
(07)		Use the pitot system to explain the measurement of airspeed (no compressibility effects).			X	X	X					
(08)		Define 'TAS', 'IAS', and 'CAS'.			X	X	X					
(09)	X	Define two-dimensional airflow and its relationship to an aerofoil of infinite span (i.e. no blade tip vortices and, therefore, no induced drag). Explain the difference between two- and three-dimensional airflows.			X	X	X					
(10)	X	Explain that viscosity is a feature of any fluid (gas or liquid).			X	X	X					
(11)		Explain the tangential friction between air and the surface of an aerofoil, and the development of a boundary layer.			X	X	X					
(12)		Describe laminar and turbulent boundary layers and the transition from laminar to turbulent. Show the influence of the roughness of the surface on the position of the transition point.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
082 01 02 00		**Two-dimensional airflow**										
082 01 02 01		***Aerofoil section geometry***										
(01)	X	Define the terms: 'aerofoil section', 'aerofoil element', 'chord line', 'chord', 'thickness', 'thickness-to-chord ratio, 'camber line', 'camber', and 'leading-edge radius'.			X	X	X					
(02)		Describe symmetrical and asymmetrical aerofoil sections.			X	X	X					
082 01 02 02		***Aerodynamic forces on aerofoil elements***										
(01)		Define the angle of attack (α).			X	X	X					
(02)		Describe: — the resultant force from the pressure distribution and the friction at the element; — the resultant force from the boundary layers and the velocities in the wake; and — the loss of momentum due to friction forces.			X	X	X					
(03)		Resolve the aerodynamic force into the components of lift (L) and drag (D).			X	X	X					
(04)		Define the lift coefficient (C_L) and the drag coefficient (C_D).			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(05)		Show that the C_L is a function of the α.			X	X	X					
(06)		Explain how drag is caused by pressure forces on the surfaces of an aerofoil and by friction in the boundary layers. Define the term ‘profile drag’.			X	X	X					
(07)		Define the L–D ratio.			X	X	X					
(08)		Use the lift and drag equations to show the influence of speed and density on lift and drag for a given α.			X	X	X					
(09)		Define the action line of the aerodynamic force and the CP.			X	X	X					
(10)		Know that symmetrical aerofoils have a CP that is approximately a quarter chord behind the leading edge.			X	X	X					
082 01 02 03		***Stall***										
(01)		Explain the boundary layer separation when α increases beyond the onset of stall and the decrease of lift and the increase of drag. Define the ‘separation point’.			X	X	X					
082 01 02 04		***Disturbances due to profile contamination***										
(01)		Explain ice contamination, the modification of the section profile and surfaces due to ice and snow, the influence on L and D and the L–D ratio, the influence on α (at stall onset), and the effect of the increase in weight.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the effect of erosion by heavy rain on the blade and subsequent increase in profile drag.			X	X	X					
082 01 03 00		**Three-dimensional airflow around a blade**										
082 01 03 01		***The blade***										
(01)		Describe the various blade planforms.			X	X	X					
(02)		Define aspect ratio and blade twist.			X	X	X					
082 01 03 02		***Airflow pattern and influence on lift (L)***										
(01)		Explain the spanwise flow around a blade and the appearance of blade tip vortices which are a loss of energy.			X	X	X					
(02)		Show that the strength of the vortices increases as α and L increase.			X	X	X					
(03)		Show that downwash causes vortices.			X	X	X					
(04)		Define the relative airflow as the resultant of the undisturbed air velocity and induced velocity, and define α.			X	X	X					
(05)		Explain the spanwise L distribution and the way in which it can be modified by twist (washout).			X	X	X					
082 01 03 03		***Induced drag***										
(01)		Explain induced drag and the influence of α and aspect ratio.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
082 01 03 04		***The airflow around the fuselage***										
(01)		Describe the fuselage and the external components that cause (parasite) drag, the airflow around the fuselage, and the influence of the pitch angle of the fuselage. Describe fuselage shapes that minimise drag.			X	X	X					
(02)		Define profile drag as the sum of pressure (form) drag and skin friction drag.			X	X	X					
(03)		Define 'interference drag'.			X	X	X					
(04)		Know the drag formula.			X	X	X					
082 02 00 00		**TRANSONIC AERODYNAMICS and COMPRESSIBILITY EFFECTS**										
082 02 01 00		**Airflow speeds and velocities**										
082 02 01 01		***Speeds and Mach number***										
(01)		Define the speed of sound in air.			X	X	X					
(02)		State that the speed of sound is proportional to the square root of the absolute temperature (in Kelvins).			X	X	X					
(03)		Explain the variation in the speed of sound with altitude.			X	X	X					
(04)		Define Mach number.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain the meaning of incompressibility and compressibility of air; relate this to the value of the Mach number.			X	X	X					
(06)		Define high subsonic, transonic and supersonic flows in relation to the value of the Mach number.			X	X	X					
082 02 01 02		***Shock waves***										
(01)		Describe shock waves in a supersonic flow and the changes in pressure and speed.			X	X	X					
(02)		Describe the appearance of local supersonic flows on the surfaces of a blade.			X	X	X					
082 02 01 03		***Influence of aerofoil section and blade planform***										
(01)		Explain the different shapes that allow higher Mach numbers without generating a shock wave on the upper surface, such as: – reducing the section thickness-to-chord ratio; – a planform with a sweep angle.			X	X	X					
082 03 00 00		**ROTORCRAFT TYPES**										
082 03 01 00		**Rotorcraft**										
082 03 01 01		***Rotorcraft types***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the difference between an autogyro and a helicopter.			X	X	X					
082 03 02 00		**Helicopters**										
082 03 02 01		***Helicopter configurations***										
(01)		Describe (briefly) the single-main-rotor helicopter and other configurations: tandem, coaxial, side-by-side, synchrocopter (with intermeshing blades), the compound helicopter and tilt rotor.			X	X	X					
082 03 02 02		***The helicopter, characteristics and associated terminology***										
(01)		Mention the tail rotor, the Fenestron, and the no tail rotor (NOTAR).			X	X	X					
(02)		Define the rotor disc area and the blade area.			X	X	X					
(03)		Describe the teetering rotor with its hinge axis on the shaft axis, and rotors with more than two blades with offset hinge axes.			X	X	X					
(04)		Define the fuselage centre line and the three axes: roll, pitch, and normal (yaw).			X	X	X					
(05)		Define gross weight and gross mass (and the units involved), disc and blade loading.			X	X	X					
082 04 00 00		**MAIN-ROTOR AERODYNAMICS**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
082 04 01 00		**Hover flight outside ground effect**										
082 04 01 01		***Airflow through the rotor disc and around the blades***										
(01)	X	Based on Newton's second law (momentum), explain that the upward vertical force from the disc, i.e. the rotor thrust, is the result of vertical downward velocities inside the rotor disc.			X	X	X					
(02)		Explain why the production of the induced flow requires power applied to the shaft, i.e. induced power. Induced power is least if the induced velocities have the same value on the whole disc (i.e. there is uniformity of flow over the disc).			X	X	X					
(03)		Explain why vertical rotor thrust must be higher than the weight of the helicopter because of the vertical drag on the fuselage.			X	X	X					
(04)		Define the pitch angle and the α of a blade element.			X	X	X					
(05)		Explain L and D relating to a blade element (including induced and profile drag).			X	X	X					
(06)		Explain the necessity for collective pitch angle changes, the influence on the α and rotor thrust, and the need for blade feathering.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Describe the different blade shapes (as viewed from above).			X	X	X					
(08)		Explain how profile drag on the blade elements generates a torque on the main shaft, and define the resulting rotor profile power.			X	X	X					
(09)		Explain the influence of air density on the required powers.			X	X	X					
082 04 01 02		***Anti-torque force and tail rotor***										
(01)		Using Newton’s third law (motion), explain the need for tail-rotor thrust, the required value being proportional to main-rotor torque. Show that tail-rotor power is proportional to tail-rotor thrust.			X	X	X					
(02)		Explain the necessity for feathering of the tail-rotor blades and their control by the yaw pedals, and the maximum and minimum values of the pitch angles of the blades.			X	X	X					
082 04 01 03		***Total power required and hover outside ground effect (HOGE)***										
(01)		Define ancillary equipment and its power requirement.			X	X	X					
(02)		Define the total power required.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)	X	Describe the influence of ambient pressure, temperature and moisture on the required power.			X	X	X					
082 04 02 00		**Vertical climb**										
082 04 02 01		***Relative airflow and angles of attack (α)***										
(01)	X	Describe the dependence of the vertical climb speed on the opposite vertical air velocity relative to the rotor disk.			X	X	X					
(02)		Explain how α is controlled by the collective pitch angle control.			X	X	X					
082 04 02 02		***Power and vertical speed***										
(01)		Define total main-rotor power as the sum of parasite power, induced power, climb power, and rotor profile power.			X	X	X					
(02)		Explain why the total main-rotor power required increases when the rate of climb increases.			X	X	X					
082 04 03 00		**Forward flight**										
082 04 03 01		***Airflow and forces in uniform inflow distribution***										
(01)		Explain the assumption of a uniform inflow distribution on the rotor disc.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Show the upstream air velocities relative to the blade elements and the different effects on the advancing and retreating blades. Define the area of reverse flow. Explain the influence of forward speed on the circumferential speed of the blade tip.			X	X	X					
(03)		Assuming constant pitch angles and rigid blade attachments, explain the roll moment from the asymmetric distribution of L.			X	X	X					
(04)		Show that through cyclic feathering this imbalance could be eliminated by a low α (accomplished by a low pitch angle) on the advancing blade, and a high α (accomplished by a high pitch angle) on the retreating blade.			X	X	X					
(05)		Describe the high air velocity at the advancing blade tip and the compressibility effects which limit maximum speed.			X	X	X					
(06)		Describe the low air velocity on the retreating blade tip resulting from the difference between the circumferential speed and forward speed, the need for high α, and the onset of stall.			X	X	X					
(07)		Define the blade tip speed ratio.			X	X	X					
(08)		Explain the total rotor thrust that is perpendicular to the rotor disc and the need for tilting the thrust vector forward.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(09)		Explain the conditions of equilibrium in steady straight and level flight.			X	X	X					
082 04 03 02		***The flare (powered flight)***										
(01)		Explain the flare in powered flight, the rearward tilt of the rotor disc and the thrust vector. Show the horizontal thrust component that is in the opposite direction to forward velocity.			X	X	X					
(02)		State the increase in thrust due to the upward inflow, and show the modifications in the α.			X	X	X					
(03)		Explain the increase in rotor rpm for a non-governed rotor.			X	X	X					
082 04 03 03		***Non-uniform inflow distribution in relation to inflow roll***										
(01)		Describe the inflow distribution which modifies α and L especially on the advancing and retreating blades.			X	X	X					
082 04 03 04		***Power and maximum speed***										
(01)		Explain that the induced velocities and power values decrease as the speed of the helicopter increases.			X	X	X					
(02)		Define profile drag and profile power, and the increase in their values with the speed of the helicopter.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Define parasite drag and parasite power, and the increase in their values with the speed of the helicopter.			X	X	X					
(04)		Define total drag and its increase with the speed of the helicopter.			X	X	X					
(05)		Describe the power required for the tail rotor and the power required by ancillary equipment.			X	X	X					
(06)		Define the total power requirement as a sum of the above partial powers, and explain how it varies with the speed of the helicopter.			X	X	X					
(07)		Explain the influence of helicopter mass, air density, and additional external equipment on the partial powers and the total power required.			X	X	X					
(08)		Describe translational lift and show the decrease in required total power as the helicopter increases its speed from the hover.			X	X	X					
082 04 04 00		**Hover and forward flight in ground effect**										
082 04 04 01		***Airflow in ground effect, downwash***										
(01)		Explain how the vicinity of the ground changes the downward flow pattern and the consequences on lift (thrust) at constant			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		rotor power. Show that ground effect depends on the height of the rotor above the ground and the rotor diameter. Show the required rotor power at constant all-up mass (AUM) as a function of height above the ground. Describe the influence of forward speed.										
082 04 05 00		**Vertical descent**										
082 04 05 01		***Vertical descent, power on***										
(01)		Describe the airflow around the rotor disc in a trouble-free vertical descent, power on, the airflow opposing the helicopter's velocity, the relative airflow, and α.			X	X	X					
(02)		Explain the vortex-ring state, also known as settling with power. State the approximate vertical descent speeds that allow the formation of vortex ring, related to the values of the induced velocities.			X	X	X					
(03)		Describe the airflow relative to the blades, the root stall, the loss of lift at the blade tip, and the turbulence. Show the effect of raising the lever and describe the effects on the controls.			X	X	X					
082 04 05 02		***Autorotation***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		State the need for early recognition and for a quick initiation of recovery. Describe the recovery actions.			X	X	X					
(02)		Explain that the collective lever must be lowered quickly enough to avoid a rapid decay of rotor rpm due to drag on the blades, and explain the influence of rotational inertia of the rotor on the rate of decay.			X	X	X					
(03)		Show the induced flow through the rotor disc, the rotational velocity and relative airflow, the inflow and inflow angles.			X	X	X					
(04)		Show how the aerodynamic forces on the blade elements vary from root to tip and distinguish three zones: the inner stalled region, the middle driving region, and the driven region.			X	X	X					
(05)		Explain the control of the rotor rpm with collective pitch.			X	X	X					
(06)		Show the need for negative tail-rotor thrust with yaw control.			X	X	X					
(07)		Explain the final increase in rotor thrust caused by raising the collective pitch to decrease the vertical descent speed and the decay in rotor rpm.			X	X	X					
082 04 06 00		**Forward flight — autorotation**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
082 04 06 01		***Airflow at the rotor disc***										
(01)		Explain the factors that affect inflow angle and α, the autorotative power distribution, and the dissymmetry over the rotor disc in forward flight.			X	X	X					
082 04 06 02		***Flight and landing***										
(01)		Show the effect of forward speed on the vertical descent speed.			X	X	X					
(02)		Explain the effects of gross weight, rotor rpm, and altitude (density) on endurance and range.			X	X	X					
(03)		Explain the manoeuvres for turning and touchdown.			X	X	X					
(04)		Explain the height–velocity curves.			X	X	X					
082 05 00 00		**MAIN-ROTOR MECHANICS**										
082 05 01 00		**Flapping of the blade in hover**										
082 05 01 01		***Intentionally left blank***										
082 05 01 02		***Centrifugal turning moment (CTM)***										
(01)		Describe the centrifugal forces on the mass elements of a blade with pitch applied and the components of those forces. Show how			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
		the forces generate a moment that tries to reduce the blade pitch angle.										
(02)		Explain the methods of counteracting CTM with hydraulics, bias springs, and balance masses.			X	X	X					
082 05 01 03		***Coning angle in the hover***										
(01)		Define the tip path plane and the coning angle.			X	X	X					
(02)		Show how the equilibrium of the moments about the flapping hinge of lift (thrust) and of the centrifugal force determine the coning angle of the blade (the blade mass being negligible).			X	X	X					
(03)		Justify the lower limit of rotor rpm.			X	X	X					
(04)		Explain the effect of the mass of a blade on the tip path and the tracking.			X	X	X					
082 05 02 00		**Flapping angles of the blade in forward flight**										
082 05 02 01		***Forces on the blade in forward flight without cyclic feathering***										
(01)		Assume rigid attachments of the blade to the hub and show the periodic lift, moment and stresses on the attachment, the ensuing metal fatigue, the roll moment on the helicopter, and justify the necessity for a flapping hinge.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Assume no cyclic pitch and describe the lift on the advancing and retreating blades.			X	X	X					
(03)		State the azimuthal phase lag (90° or less) between the input (applied pitch) and the output (flapping angle). Explain flapback (the rearward tilting of the tip path plane and total rotor thrust).			X	X	X					
082 05 02 02		***Cyclic pitch (feathering) in forward flight***										
(01)		Show that in order to assume and maintain forward flight, the total rotor thrust vector must obtain a forward component by tilting the tip path plane.			X	X	X					
(02)		Show how the applied cyclic pitch modifies the lift on the advancing and retreating blades and produces the required forward tilting of the tip path plane and the total rotor thrust.			X	X	X					
(03)		Show the cone described by the blades and define the virtual axis of rotation. Define the plane of rotation.			X	X	X					
(04)		Define the reference system in which the movements are defined: the shaft axis and the hub plane.			X	X	X					
(05)		Describe the swash plates, the pitch links and horns. Explain how the collective lever moves the non-rotating swash plate up or down the shaft axis.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe the mechanism by which the desired cyclic blade pitch can be produced by tilting the swash plate with the cyclic stick.			X	X	X					
(07)		Explain the translational lift effect when the speed increases.			X	X	X					
(08)	X	Justify the increase of the tilt angle of the thrust vector and of the disc in order to increase the speed.			X	X	X					
082 05 03 00		**Blade-lag motion in forward flight**										
082 05 03 01		***Forces on the blade in the disc plane (tip path plane) in forward flight***										
(01)		Explain the Coriolis force due to flapping, the resulting periodic moments in the hub plane, and the resulting periodic stresses which make lead-lag hinges necessary to avoid material fatigue.			X	X	X					
(02)		Describe the profile drag forces on the blade elements and the periodic variation of these forces.			X	X	X					
082 05 03 02		***Intentionally left blank***										
082 05 03 03		***Ground resonance***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the movement of the CG of the blades due to lead-lag movements in the multi-bladed rotor.			X	X	X					
(02)		Show the effect on the fuselage and the danger of resonance between this force and the fuselage and undercarriage when the gear touches the ground.			X	X	X					
082 05 04 00		**Rotor systems**										
082 05 04 01		***See-saw or teetering rotor***										
(01)		Explain that a teetering rotor is prone to mast bumping in low-G situations, and that it is difficult to counteract because there is no lift force to provide sideways movement.			X	X	X					
082 05 04 02		***Intentionally left blank***										
082 05 04 03		***Hingeless rotor, bearingless rotor***										
(01)		Show the forces on the flapping hinges with a large offset (virtual hinge) and the resulting moments, and compare them with other rotor systems.			X	X	X					
082 05 05 00		**Blade sailing**										
082 05 05 01		***Blade sailing and causes***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(01)		Define blade sailing, the influence of low rotor rpm and of a headwind.			X	X	X					
082 05 05 02		***Minimising the danger***										
(01)		Describe actions that minimise danger and the demonstrated wind envelope for engaging and disengaging rotors.			X	X	X					
082 05 05 03		***Droop stops***										
(01)		Explain the purpose of droop stops, and their retraction.			X	X	X					
082 05 06 00		**Vibrations due to main rotor**										
082 05 06 01		***Intentionally left blank***										
082 05 06 02		***Intentionally left blank***										
082 06 00 00		**TAIL ROTORS**										
082 06 01 00		**Conventional tail rotor**										
082 06 01 01		***Intentionally left blank***										
082 06 01 02		***Tail-rotor aerodynamics***										
(01)		Explain the airflow around the blades in the hover and in forward flight, and the effects			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		of the tip speeds on noise production and compressibility.										
(02)		Explain the effect of wind on tail-rotor aerodynamics and thrust in the hover, and any problems.			X	X	X					
(03)		Explain tail-rotor thrust and the control through pitch alterations (feathering).			X	X	X					
(04)		Explain tail-rotor flapback, and the effects of Delta 3.			X	X	X					
(05)		Describe the roll moment and drift as side effects of the tail rotor.			X	X	X					
(06)		Explain the effects of tail-rotor failure.			X	X	X					
(07)		Explain the loss of tail-rotor effectiveness (LTE), tail-rotor vortex-ring state, causes, crosswind, and yaw speed.			X	X	X					
082 06 01 03		***Strakes on the tail boom***										
(01)		Describe the strake and explain its function.			X	X	X					
082 07 00 00		**EQUILIBRIUM, STABILITY AND CONTROL**										
082 07 01 00		**Equilibrium and helicopter attitudes**										
082 07 01 01		***Hover***										
(01)		Explain why the vector sum of forces and moments must be zero in any acceleration-free situation.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Indicate the forces and the moments about the lateral axis in a steady hover.			X	X	X					
(03)		Indicate the forces and the moments about the longitudinal axis in a steady hover.			X	X	X					
(04)		Deduce how the roll angle in a steady hover without wind results from the moments about the longitudinal axis.			X	X	X					
(05)		Explain how the cyclic is used to equalise moments about the lateral axis in a steady hover.			X	X	X					
(06)		Explain the consequence of the cyclic stick reaching its forward or aft limit during an attempt to take off to the hover.			X	X	X					
(07)		Explain the influence of density altitude on the equilibrium of forces and moments in a steady hover.			X	X	X					
082 07 01 02		***Forward flight***										
(01)		Explain why the vector sum of forces and of moments must be zero in unaccelerated flight.			X	X	X					
(02)		Indicate the forces and the moments about the lateral axis in steady straight and level flight.			X	X	X					
(03)		Explain the influence of AUM on the forces and moments about the lateral axis in forward flight.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the influence of the CG position on the forces and moments about the lateral axis in forward flight.			X	X	X					
(05)		Explain the role of the cyclic stick position in creating equilibrium of forces and moments about the lateral axis in forward flight.			X	X	X					
(06)		Explain how forward speed influences the fuselage attitude.			X	X	X					
(07)		Describe and explain the inflow roll effect.			X	X	X					
082 07 02 00		**Stability**										
082 07 02 01		***Static longitudinal, roll and directional stability***										
(01)		Define static stability; give an example of static stability and of static instability.			X	X	X					
(02)		Explain the contribution of the main rotor to speed stability.			X	X	X					
(03)		Describe the influence of the horizontal stabiliser on static longitudinal stability.			X	X	X					
(04)		Explain the effect of hinge offset on static stability.			X	X	X					
(05)		Describe the influence of the tail rotor on static directional stability.			X	X	X					
(06)		Describe the influence of the vertical stabiliser on static directional stability.			X	X	X					
(07)		Explain the influence of the main rotor on static roll stability.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
(08)		Describe the influence of the longitudinal position of the CG on static longitudinal stability.			X	X	X					
082 07 02 02		***Static stability in the hover***										
(01)		Describe the initial movements of a hovering helicopter after the occurrence of a horizontal gust.			X	X	X					
082 07 02 03		***Dynamic stability***										
(01)		Define dynamic stability; give an example of dynamic stability and of dynamic instability.			X	X	X					
(02)		Explain why static stability is a precondition for dynamic stability.			X	X	X					
082 07 02 04		***Longitudinal stability***										
(01)		Explain the individual contributions of α and speed stability together with the stabiliser and fuselage to dynamic longitudinal stability.			X	X	X					
082 07 02 05		***Roll stability and directional stability***										
(01)		Know that a large static roll stability together with a small directional stability may lead to a Dutch roll.			X	X	X					
082 07 03 00		**Control**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
082 07 03 01		***Manoeuvre stability***										
(01)		Explain how helicopter control can be limited because of available stick travel.			X	X	X					
(02)		Explain how the CG position influences the remaining stick travel.			X	X	X					
082 07 03 02		***Control power***										
(01)		Explain the meaning of the control moment.			X	X	X					
(02)		Explain the importance of the CG position on the control moment.			X	X	X					
(03)		Explain the influence of hinge offset on controllability.			X	X	X					
082 07 03 03		***Static and dynamic rollover***										
(01)		Explain the mechanism which causes dynamic rollover.			X	X	X					
(02)		Explain the required pilot action when dynamic rollover is starting to develop.			X	X	X					
082 08 00 00		**HELICOPTER FLIGHT MECHANICS**										
082 08 01 00		**Flight limits**										
082 08 01 01		***Hover and vertical flight***										
(01)		Show the power required for HOGE and HIGE, and the power available.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the effects of AUM, ambient temperature and pressure, density altitude, and moisture.			X	X	X					
(03)		Describe the rate of climb in a vertical flight.			X	X	X					
082 08 01 02		***Forward flight***										
(01)		Compare the power required and the power available as a function of speed in straight and level flight.			X	X	X					
(02)		Define the maximum speed limited by power and the value relative to VNE and VNO.			X	X	X					
(03)		Use the power graph to determine the speeds of maximum rate of climb and the maximum angle of climb.			X	X	X					
(04)		Use the power graph to define true airspeed (TAS) for maximum range and maximum endurance, and consider the case of piston engine and turbine engine. Explain the effects of tailwind or headwind on the speed for maximum range.			X	X	X					
(05)		Explain the effects of AUM, pressure and temperature, density altitude, and humidity.			X	X	X					
082 08 01 03		***Manoeuvring***										
(01)		Define the load factor, the radius, and the rate of turn.			X	X	X					

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the relationship between the angle of bank, the airspeed and the radius of turn, and between the angle of bank and the load factor.			X	X	X					
(03)		Explain the influence of AUM, pressure and temperature, density altitude, and humidity.			X	X	X					
082 08 02 00		**Special conditions**										
082 08 02 01		***Operating with limited power***										
(01)		Explain operations with limited power, use the power graph to show the limitations on vertical and level flight, and describe power checks and procedures for take-off and landing.			X	X	X					
(02)		Describe manoeuvres with limited power.			X	X	X					
082 08 02 02		***Overpitch, overtorque***										
(01)		Describe overpitching and show the consequences.			X	X	X					
(02)		Describe situations likely to lead to overpitching.			X	X	X					
(03)		Describe overtorquing and show the consequences.			X	X	X					
(04)		Describe situations likely to lead to overtorquing.			X	X	X					

SUBJECT 090 – COMMUNICATIONS

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
090 00 00 00		**COMMUNICATIONS**										
090 01 00 00		**CONCEPTS**										
090 01 01 00		**Associated terms**										
090 01 01 01		***Meanings and significance***										
(01)		Define commonly used air traffic services (ATS) terms for stations.	X	X	X	X	X	X	X			
(02)		Define commonly used ATS terms for communication methods.	X	X	X	X	X	X	X			
(03)		Recognise the terms used in conjunction with the approach and holding procedures.	X	X	X	X	X	X	X	3		
090 01 01 02		***Air traffic services (ATS) abbreviations***										
(01)		Define commonly used ATS abbreviations: – flight conditions; – airspace; – services; – time; – VFR-related terms; – IFR-related terms; – miscellaneous.	X	X	X	X	X	X	X	3		
090 01 01 03		***Q-code groups commonly used in radiotelephony (RT) air-ground communications***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane ATPL	Aeroplane CPL	Helicopter ATPL/IR	Helicopter ATPL	Helicopter CPL	IR	CBIR(A)	BIR Exam	BIR BK	Remarks
(01)		Define Q-code groups commonly used in RT air-ground communications: – pressure settings; – directions and bearings.	X	X	X	X	X	X	X	3		
(02)		State the procedure for obtaining bearing information in flight.	X	X	X	X	X	X	X	3		
090 01 01 04		***Categories of messages***										
(01)		Identify to which category of messages a type of message belongs and identify the associated priority indicator.	X	X	X	X	X	X	X	3	2	
090 02 00 00		**GENERAL OPERATING PROCEDURES**										
090 02 01 00		**Transmission standards**										
090 02 01 01		***Transmission of letters***										
(01)		Know the phonetic alphabet used in RT.	X	X	X	X	X	X	X		3	
(02)		Identify the circumstances when words should be spelt out.	X	X	X	X	X	X	X		3	
090 02 01 02		***Transmission of numbers***										
(01)		Describe the method of transmission of numbers: – pronunciation; – single digits, whole hundreds and whole thousands; – state how numbers are transmitted in different circumstances.	X	X	X	X	X	X	X		3	
090 02 01 03		***Transmission of time***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the ways of transmitting time: – the standard time reference is the Coordinated Universal Time (UTC); – using only minutes, or minutes and hours, when required.	X	X	X	X	X	X	X		3	
(02)		Describe the different ways in which time is to be transmitted.	X	X	X	X	X	X	X			
090 02 01 04		***Transmission techniques***										
(01)	X	Explain the techniques used for making good RT transmissions.	X	X	X	X	X	X	X			
090 02 01 05		***Standard words and phrases***										
(01)		Define the meaning of standard words and phrases.	X	X	X	X	X	X	X		3	
(02)		Recognise, describe and use the correct standard phraseology for each phase of a VFR flight (consider communication with each type of aeronautical station): – before taxi; – taxi; – departure; – en route; – circuit; – final; – landing;	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		– after landing.										
(03)		Recognise, describe and use the correct standard phraseology for each phase of an IFR flight, including PBN operations (consider communication with each type of aeronautical station): – before pushback or taxi; – pushback; – taxi; – departure; – en route; – approach; – final approach; – landing; – after landing.	X	X	X	X	X	X	X	3		
(04)		Explain phraseology for the selective calling system (SELCAL) and aircraft communications addressing and reporting system (ACARS).	X	X	X	X	X	X	X			
(05)		Explain traffic alert and collision avoidance system (TCAS) phraseology.	X	X	X	X	X	X	X			
090 02 01 06		***RT call signs for aeronautical stations including use of abbreviated call signs***										
(01)		Name the two parts of the call sign of an aeronautical station.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Identify the call-sign suffixes for aeronautical stations.	X	X	X	X	X	X	X	3		
(03)		Explain when the call sign may be omitted or abbreviated to the use of suffix only.	X	X	X	X	X	X	X	3		
090 02 01 07		***RT call signs for aircraft including use of abbreviated call signs***										
(01)		Describe the three different ways to compose an aircraft call sign.	X	X	X	X	X	X	X			
(02)		Describe the abbreviated forms for aircraft call signs.	X	X	X	X	X	X	X			
(03)		Explain when aircraft call signs may be abbreviated.	X	X	X	X	X	X	X			
(04)		Explain when the suffix 'HEAVY' or 'SUPER' is used with an aircraft call sign.	X	X	X	X	X	X	X	3	2	
(05)		Explain the use of the phrase 'Change your call sign to…'.	X	X	X	X	X	X	X	3		
(06)		Explain the use of the phrase 'Revert to flight plan call sign'.	X	X	X	X	X	X	X	3		
090 02 01 08		***Transfer of communication***										
(01)		Describe the procedure for transfer of communication: – by ground station; – by aircraft.	X	X	X	X	X	X	X	3		
090 02 01 09		***Test procedures including readability scale***										
(01)		Explain how to test radio transmission and reception.	X	X	X	X	X	X	X	3	2	

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State the readability scale and explain its meaning.	X	X	X	X	X	X	X	3	2	
090 02 01 10		***Read-back and acknowledgement requirements***										
(01)		Describe the requirement to read back ATC route clearances.	X	X	X	X	X	X	X	3	2	
(02)		Describe the requirement to read back clearances related to the runway in use.	X	X	X	X	X	X	X	3	2	
(03)		Describe the requirement to read back other clearances including conditional clearances.	X	X	X	X	X	X	X	3	2	
(04)		Describe the requirement to read back other data such as runway, secondary surveillance radar (SSR) codes, etc.	X	X	X	X	X	X	X	3	2	
090 02 01 11		***Radar procedural phraseology***										
(01)		Use the correct phraseology for an aircraft receiving a radar service: – radar identification; – radar vectoring; – traffic information and avoidance; – SSR procedures.	X	X	X	X	X	X	X	3	2	
090 02 01 12		***Level changes and reports***										
(01)		Use the correct term to describe vertical position in relation to: – flight level (standard pressure setting); – altitude (metres/feet on QNH);	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		– height (metres/feet on QFE).										
090 02 01 13		***Data link messages***										
(01)		List the different types of messages of the controller–pilot data link communications (CPDLC) function and give examples of data link messages.	X	X	X	X	X	X	X			
(02)		Describe a notification phase (LOG ON) and state its purpose.	X	X	X	X	X	X	X			
(03)		Explain the phrases to be used: – when voice communication is used to correct a CPDLC message; – in case of single CPDLC message failure; – when CPDLC has failed; – when reverting from CPDLC to voice communication.	X	X	X	X	X	X	X			
090 03 00 00		**RELEVANT WEATHER INFORMATION**										
090 03 01 00		**Aerodrome weather**										
090 03 01 01		***Aerodrome weather terms***										
(01)		List the contents of aerodrome weather reports and state units of measurement used for each item: – wind direction and speed; – variation of wind direction and speed; – visibility;	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		– present weather; – cloud amount and type (including the definition of cloud and visibility OK (CAVOK); – air temperature and dew point; – pressure values (QNH, QFE); – supplementary information (aerodrome warnings, landing runway, runway conditions, restrictions, obstructions, wind-shear warnings, etc.).										
090 03 01 02		***Weather broadcast***										
(01)		List the sources (VOLMET and ATIS units) of weather information available for aircraft in flight, and describe situation(s) in which a pilot would normally obtain each.	X	X	X	X	X	X	X			
(02)	X	Explain the meaning of the acronyms ‘D-ATIS’, ‘ATIS’, and ‘VOLMET’.	X	X	X	X	X	X	X			
(03)		Explain and demonstrate how to decode ATIS messages.	X	X	X	X	X	X	X	3		
(04)		Explain and demonstrate how to decode D-ATIS messages.	X	X	X	X	X	X	X			
090 04 00 00		**VOICE COMMUNICATION FAILURE**										
090 04 01 00		**Required action**										
090 04 01 01		***Action required to be taken in case of communication failure***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the action to be taken in case of communication failure on a controlled VFR flight.	X	X	X	X	X	X	X			
(02)		Identify the frequencies to be used in an attempt to establish communication.	X	X	X	X	X	X	X			
(03)		State the additional information that should be transmitted in the event of receiver failure.	X	X	X	X	X	X	X			
(04)		Identify the SSR code that may be used to indicate communication failure.	X	X	X	X	X	X	X			
(05)		Explain the action to be taken by a pilot that experiences a communication failure in the aerodrome traffic pattern at controlled aerodromes.	X	X	X	X	X	X	X			
(06)		Describe the action to be taken in case of communication failure on an IFR flight.	X	X	X	X	X	X	X	3		
(07)		Describe the action to be taken in case of communication failure on an IFR flight when flying in visual meteorological conditions (VMC) and the flight will be terminated in VMC.	X	X	X	X	X	X	X	3		
(08)		Describe the action to be taken in case of communication failure on an IFR flight when flying in instrument meteorological conditions (IMC).	X	X	X	X	X	X	X	3		
(09)		Explain the causes and possible safety impacts of a blocked frequency.	X	X	X	X	X	X	X	3		
090 05 00 00		**DISTRESS AND URGENCY PROCEDURES**										
090 05 01 00		**Signals and procedures**										
090 05 01 01		***Distress***										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the DISTRESS signal(s) and DISTRESS procedure(s).	X	X	X	X	X	X	X		3	
(02)		Define 'DISTRESS'.	X	X	X	X	X	X	X		3	
(03)		Identify the frequencies that should be used by aircraft in DISTRESS.	X	X	X	X	X	X	X	3		
(04)		Specify the emergency SSR codes that may be used by aircraft, and the meaning of the codes.	X	X	X	X	X	X	X	3		
(05)		Describe the action to be taken by the station which receives a DISTRESS message.	X	X	X	X	X	X	X	3		
(06)		Describe the action to be taken by all other stations when a DISTRESS procedure is in progress.	X	X	X	X	X	X	X	3		
(07)		List the correctly sequenced elements of a DISTRESS signal/message and describe the message content.	X	X	X	X	X	X	X		3	
(08)		Describe the use of discrete frequencies (DEF) in case of distress or urgency.	X	X	X	X	X	X	X			
(09)		State that DISTRESS messages take priority over all other messages.	X	X	X	X	X	X	X	3		
090 05 01 02		***Urgency***										
(01)		State the URGENCY signal(s) and URGENCY procedure(s).	X	X	X	X	X	X	X		3	
(02)		Define 'URGENCY'.	X	X	X	X	X	X	X		3	
(03)		Identify the frequencies that should be used by aircraft in URGENCY.	X	X	X	X	X	X	X	3		
(04)		Describe the action to be taken by the station which receives an URGENCY message.	X	X	X	X	X	X	X	3		

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the action to be taken by all other stations when an URGENCY procedure is in progress.	X	X	X	X	X	X	X			
(06)		List the correctly sequenced elements of an URGENCY signal/message and describe the message content.	X	X	X	X	X	X	X		3	
(07)		State that URGENCY messages take priority over all other messages except DISTRESS.	X	X	X	X	X	X	X	3		
090 06 00 00		**VHF PROPAGATION AND ALLOCATION OF FREQUENCIES**										
090 06 01 00		**General principles**										
090 06 01 01		***Spectrum, bands, range***										
(01)		Describe the radio-frequency spectrum with particular reference to VHF.	X	X	X	X	X	X	X		3	
(02)		Describe the radio-frequency spectrum of the bands into which the radio-frequency spectrum is divided.	X	X	X	X	X	X	X		3	
(03)		Identify the frequency range of the VHF band.	X	X	X	X	X	X	X	3		
(04)		State the band normally used for aeronautical mobile service (AMS) voice communication.	X	X	X	X	X	X	X	3		
(05)		State the frequency separation allocated between consecutive VHF frequencies.	X	X	X	X	X	X	X	3		
(06)		List the factors which reduce the effective range and quality of VHF radio transmissions.	X	X	X	X	X	X	X	3		
090 07 00 00		**Other communications**										

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
090 07 01 00		**Weather observations, Morse code**										
090 07 01 01		***Meteorological observations***										
(01)		Explain when aircraft routine meteorological observations should be made.	X	X	X	X	X	X	X	3		
(02)		Explain when aircraft special meteorological observations should be made.	X	X	X	X	X	X	X	3		
090 07 01 02		***Use of Morse code***										
(01)	X	Describe and list Morse code.	X	X	X	X	X	X	X			
(02)		Find the Morse code identifiers of radio navigation aids (VHF omnidirectional radio range (VOR), distance-measuring equipment (DME), non-directional radio beacon (NDB), instrument landing system (ILS)) using aeronautical charts.	X	X	X	X	X	X	X	3		

SUBJECT AREA 100 – KNOWLEDGE, SKILLS AND ATTITUDES (KSA)

Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
100 00 00 00	**KNOWLEDGE, SKILLS AND ATTITUDES (KSA)**					
100 01 00 00	**ICAO CORE COMPETENCIES**					
(01)	Recognise the ICAO Core Competencies listed below and the associated competency descriptions (ICAO Doc 9995 ‘Manual of Evidence-based Training’):	X	X	X	X	X

Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
	– Application of Procedures; – Communication; – Aircraft Flight Path Management, automation; – Aircraft Flight Path Management, manual control; – Leadership and Teamwork; – Problem Solving and Decision Making; – Situation Awareness; – Workload Management.					
100 02 00 00	**CORE COMPETENCIES LEARNING OBJECTIVES**					
100 02 01 00	**Communication**					
(01)	Show the ability to identify whether the recipient is ready and able to receive the information.	X	X	X	X	X
(02)	Show the ability to appropriately select what, when, how and with whom to communicate.	X	X	X	X	X
(03)	Show the ability to communicate clearly, accurately and concisely.	X	X	X	X	X
(04)	Show the ability to confirm whether the recipient correctly understands important information.	X	X	X	X	X
(05)	Show the ability to listen actively and show you understand the information you receive.	X	X	X	X	X
(06)	Show the ability to ask relevant and effective questions.	X	X	X	X	X
(07)	Show the ability to adhere to standard radio-telephony phraseology.	X	X	X	X	X
(08)	Show the ability to accurately read, interpret, construct and respond to given documentation in English.	X	X	X	X	X
(09)	Show the ability to correctly interpret non-verbal communication.	X	X	X	X	X
(10)	Show the ability to use appropriate eye contact, body movement and gestures that are consistent with and support verbal messages.	X	X	X	X	X

Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
100 02 02 00	**Leadership and teamwork**					
(01)	Show the ability to create an atmosphere of open communication that encourages participation.	X	X	X	X	X
(02)	Show the initiative and the ability to give directions when required.	X	X	X	X	X
(03)	Show the ability to admit mistakes and take responsibility.	X	X	X	X	X
(04)	Show the ability to anticipate and respond appropriately to others’ needs.	X	X	X	X	X
(05)	Show the ability to carry out instructions when directed.	X	X	X	X	X
(06)	Show the ability to communicate relevant concerns and intentions.	X	X	X	X	X
(07)	Show the ability to give and receive feedback constructively.	X	X	X	X	X
(08)	Show empathy, respect and tolerance for others.	X	X	X	X	X
(09)	Show the ability to engage others in planning and to allocate activities fairly and appropriately according to others’ abilities.	X	X	X	X	X
(10)	Show the ability to address and resolve conflicts and disagreement in a constructive manner.	X	X	X	X	X
(11)	Show the ability to project self-control.	X	X	X	X	X
100 02 03 00	**Problem-solving and decision-making**					
(01)	Show the ability to seek accurate and adequate information from appropriate sources.	X	X	X	X	X
(02)	Show the ability to identify and verify what and why things have gone wrong.	X	X	X	X	X
(03)	Show the ability to employ proper problem-solving strategies.	X	X	X	X	X
(04)	Show the ability to persevere in working through problems.	X	X	X	X	X
(05)	Show the ability to use appropriate and timely decision-making processes.	X	X	X	X	X
(06)	Show the ability to set priorities appropriately.	X	X	X	X	X
(07)	Show the ability to identify and consider options effectively.	X	X	X	X	X
(08)	Show the ability to monitor, review and adapt decisions as required.	X	X	X	X	X
(09)	Show the ability to identify and manage risks.	X	X	X	X	X
100 02 04 00	**Situation awareness**					

Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
(01)	Demonstrate the ability to identify and assess accurately the general environment as it may affect the operation.	X	X	X	X	X
(02)	Demonstrate the ability to identify threats, errors and undesirable aircraft states.	X	X	X	X	X
(03)	Demonstrate the ability to manage threats, errors and undesirable aircraft states.	X	X	X	X	X
100 02 05 00	**Workload management**					
(01)	Show the ability to maintain self-control.	X	X	X	X	X
(02)	Show the ability to plan, prioritise and schedule tasks effectively.	X	X	X	X	X
(03)	Show the ability to manage time effectively when carrying out tasks.	X	X	X	X	X
(04)	Show the ability to offer and accept assistance, delegate when necessary and ask for help early.	X	X	X	X	X
(05)	Show the ability to manage interruptions, distractions, variations and failures effectively.	X	X	X	X	X
100 03 00 00	**ADDITIONAL THREAT AND ERROR MANAGEMENT (TEM) RELATED LEARNING OBJECTIVES**					
100 03 01 00	**Application of knowledge**					
(01)	Demonstrate the ability to complete pre-flight planning in practical exercises.	X	X	X	X	X
(02)	Demonstrate the KSA and TEM relating to phases of flight in the ground training environment.	X	X	X	X	X
100 03 02 00	**Upset prevention and recovery training (UPRT) and resilience**					
	Note: Resilience is defined as ‘the ability to recognise, absorb and adapt to disruptions’. It is supported by the pilot’s core competencies and improved by experience, which can be gained by training for unexpected events or situations.					
(01)	Recognise potential upset ‘threats’ and suggest effective ‘threat management’ in scenario situations.	X	X			
(02)	Recognise potential upset ‘errors’ and suggest effective ‘error management’ in scenario situations.	X	X			
(03)	Explain the causes of and contributing factors to upsets.	X	X			
(04)	Demonstrate resilience during scenario and/or other exercises.	X	X	X	X	X

Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
(05)	Show the ability to identify the signs and discuss the effects of stress, fatigue and aviation lifestyle on situation awareness, and how to cope with them in order to maintain situation awareness.	X	X	X	X	X
100 04 00 00	**MENTAL MATHS**					
	Note: Demonstrate, in non-calculator test scenarios or scenario exercises, the ability in a time-efficient manner to make correct mental calculation approximations for the following.					
(01)	Convert between volumes and masses of fuel using range of units.	X	X	X	X	X
(02)	Estimate time, distance and speed.	X	X	X	X	X
(03)	Estimate the rate of climb or rate of descent, distance and time.	X	X			
(04)	Add or subtract time, distance, and fuel mass.	X	X	X	X	X
(05)	Calculate fuel burn given time and fuel flow.	X	X	X	X	X
(06)	Calculate the time available (for decision-making) given relevant fuel information.	X	X	X	X	X
(07)	Determine the top of descent using a simple method that is described by the approved training organisation (ATO).	X	X			
(08)	Determine the values that vary by a percentage, e.g. dry-to-wet landing distance and fuel burn.	X	X	X	X	X
(09)	Estimate heights at distances on a 3-degree glideslope.	X	X	X	X	X
(10)	Estimate headings using the 1-in-60 rule.	X	X	X	X	X
(11)	Estimate headwind and crosswind components given wind speed and direction and runway in use.	X	X	X	X	X

(b) Airships

SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR

The applicable items for each licence or rating are marked with ‘x’. An ‘x’ on the main title of a subject means that all the subdivisions are applicable.

		CPL	IR
1.	**AIR LAW AND ATC PROCEDURES**	x	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		x
	RULES OF THE AIR		x
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		x
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		x
	AERONAUTICAL INFORMATION SERVICE		x
	AERODROMES		x
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		
2.	**AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT**	x	
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIRBAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
3.	**AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION**	x	
	SENSORS AND INSTRUMENTS		
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		
	GYROSCOPIC INSTRUMENTS		

		CPL	IR
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
4.	**FLIGHT PERFORMANCE AND PLANNING**	x	
4.1.	**MASS AND BALANCE: AIRSHIPS**	x	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
4.2.	**FLIGHT PLANNING AND FLIGHT MONITORING**		
	FLIGHT PLANNING FOR VFR FLIGHTS	x	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	x	x
	PRE-FLIGHT PREPARATION	x	x
	ATS FLIGHT PLAN	x	x
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x
4.3.	**PERFORMANCE: AIRSHIPS**	x	
	AIRWORTHINESS REQUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		
5.	**HUMAN PERFORMANCE**	x	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSYCHOLOGY		
6.	**METEOROLOGY**	x	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		
	FLIGHT HAZARDS		
	METEOROLOGICAL INFORMATION		
7.	**NAVIGATION**		

		CPL	IR
7.1.	**GENERAL NAVIGATION**	x	
	BASICS OF NAVIGATION		
	MAGNETISM AND COMPASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
7.2.	**RADIO NAVIGATION**		
	BASIC RADIO PROPAGATION THEORY	x	x
	RADIO AIDS	x	x
	RADAR	x	x
	INTENTIONALLY LEFT BLANK		
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	x	x
8.	**OPERATIONAL PROCEDURES AIRSHIP**	x	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
9.	**PRINCIPLES OF FLIGHT**	x	
9.1.	**PRINCIPLES OF FLIGHT: AIRSHIPS**	x	
	BASICS OF AEROSTATICS		
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
10.	**COMMUNICATIONS**		
10.1.	**VFR COMMUNICATIONS**	x	
	DEFINITIONS	x	
	GENERAL OPERATING PROCEDURES	x	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	x	
	DISTRESS AND URGENCY PROCEDURES	x	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	
10.2.	**IFR COMMUNICATIONS**		
	DEFINITIONS		x
	GENERAL OPERATING PROCEDURES		x
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x

		CPL	IR
	DISTRESS AND URGENCY PROCEDURES		x
	RELEVANT WEATHER INFORMATION TERMS (IFR)		x
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		x
	MORSE CODE		x

GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations

EXPLANATION OF THE VERBS USED IN THE BENJAMIN BLOOM TAXONOMY

(a) The depth or level of learning to be achieved during the training and the corresponding level of attainment to be examined or assessed is based on the following taxonomy. In each case, the level of knowledge or skill is signified by the learning objective (LO) verb.

(b) The majority of the LOs relate to the cognitive domain. The taxonomy described by B. Bloom (1956) and Anderson & Krathwohl (2001) has been used as the standard.

(c) The six sequential increasing levels of required cognitive learning are identified by the LO verb. Hence the lowest level 'remember' is signified by verbs such as 'state', 'list', 'define' and 'recall' whilst the next higher level of 'understand' is signified by verbs such as 'describe' and 'explain'. The third level of 'apply' is signified by the verbs 'calculate', 'interpret', 'relate' and 'solve'. However, the higher levels of 'analyse', which would be signified by the verbs 'plan' or 'discuss' and 'evaluate' and 'create' are less common due at least partially to questions presently possible in the ECQB examination.

(d) The LOs used in Area 100 KSA differ in that they require a combination of knowledge and skills. However, the 'skill' level does not relate to Bloom's psychomotor taxonomy but is more closely aligned to the higher taxonomy levels required in medicine, because knowledge and skills must be combined by the student pilot in a strategy.

(e) The verbs 'demonstrate' and 'show', with their meanings defined below, have therefore been used to supplement the cognitive LO verbs for the Area 100 KSA LOs.

   (1) 'Demonstrate' means the selection and use of the appropriate knowledge, skills and attitudes within a strategy to achieve an effective outcome. It signifies a high taxonomy level and would normally be assessed using multiple indicators from more than one core competency.

   (2) 'Show' means the attainment of knowledge, skill or attitude. It signifies a lower taxonomy level than 'demonstrate' and would normally be assessed by a single indicator.'

SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY – CPL(A)

Reserved

SUBPART E – MULTI-CREW PILOT LICENCE – MPL

Reserved

SUBPART F – AIRLINE TRANSPORT PILOT LICENCE – ATPL

SECTION 1 – COMMON REQUIREMENTS

AMC1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations

LEARNING OBJECTIVES FOR ATPL, CPL, IR, CB-IR(A) and BIR

(a) Aeroplanes and helicopters

GENERAL

In the tables of this AMC, the applicable LOs for each ATPL, CPL, IR, CB-IR(A) are marked with an 'X', and for the BIR exam and BIR BK with the number 1, 2 or 3 (corresponding to the modules as mentioned in FCL.835 'Basic instrument rating (BIR)'.

The LOs define the subject knowledge and applied knowledge, skills and attitudes that a student pilot should have assimilated during the theoretical knowledge course.

The LOs are intended to be used by an approved training organisation (ATO) when developing the Part-FCL theoretical knowledge elements of the appropriate course. It should be noted, however, that the LOs do not provide a ready-made ground training syllabus for individual ATOs, and should not be seen by organisations as a substitute for a thorough course design. Adherence to the LOs should become part of the ATO's compliance monitoring scheme as required by ORA.GEN.200(a)(6).

ATOs are required to produce a training plan for each of their courses based on the instructional systems design (ISD) methodology as specified in AMC2 ORA.ATO.230.

Additional guidance on the meaning and taxonomy of the verbs used in the LOs can be found in GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d).

TRAINING AIMS

After completion of the training, a student pilot should:

— be able to understand and apply the subject knowledge in order to be able to identify and manage threats and errors effectively;

— meet at least the Area 100 KSA minimum standard.

INTERPRETATION

The abbreviations used are ICAO abbreviations listed in ICAO Doc 8400 'ICAO Abbreviations and Codes', or those listed in GM1 FCL.010.

Where a LO refers to a definition, e.g. 'Define the following terms' or 'Define and understand' or 'Explain the definitions in ...', candidates are also expected to be able to recognise a given definition.

Below is a table showing the short references to applicable legislation and standards:

Reference	Legislation/Standard
The Basic Regulation	MCAR Aircrew- Essential Requirements of Aircrew
The Aircrew Regulation	MCAR Aircrew Regulations
Part-FCL	Annex I – Flight Crew Licensing
Part-MED	ANNEX IV- MEDICAL REQUIREMENTS FOR LICENSING
CS-23, AMC & GM to CS-23, CS-25, CS-27, CS-29, CS-E and CS-Definitions	Refer to the respective Certification Specifications / AMC & GM
NASA TM-85652	National Aeronautics and Space Administration — Technical Memorandum 85652

‘Applicable operational requirements’ refers to, for the ATPL(A), CPL(A), ATPL(H)/IR, ATPL(H)/VFR, CPL(H), IR and CBIR, AnnexesMCAR Air Operations and other Operations related regulations.

The General Student Pilot Route Manual (GSPRM) contains planning data plus aerodrome and approach charts that may be used in theoretical knowledge training courses. The guidelines on its content can be found in this AMC, before the LO table for Subject 033 ‘Flight planning and monitoring’.

Excerpts from any aircraft manuals including but not limited to CAP 696, 697 and 698 for aeroplanes, and CAP 758 for helicopters may be used in training. Where questions refer to excerpts from aircraft manuals, the associated aircraft data will be provided in the examinations.

Some numerical data (e.g. speeds, altitudes/levels and masses) used in questions for theoretical knowledge examinations may not be representative for helicopter operations, but the data is satisfactory for the calculations required.

Note: In all subject areas, the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LOs FOR ATPL, CPL, IR, CB-IR(A) and BIR

GENERAL

The detailed theoretical knowledge syllabus outlines the topics that should be taught and examined in order to meet the theoretical knowledge requirements appropriate to ATPL, MPL, CPL, IR, CB-IR(A) and BIR.

For each topic in the detailed theoretical knowledge syllabus, one or more LOs are set out in the appendices as shown below:

- Appendix 010 AIR LAW
- Appendix 021 AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT
- Appendix 022 AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION
- Appendix 031 FLIGHT PERFORMANCE AND PLANNING – MASS AND BALANCE
- Appendix 032 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES
- Appendix 033 FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING
- Appendix 034 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS
- Appendix 040 HUMAN PERFORMANCE AND LIMITATIONS
- Appendix 050 METEOROLOGY
- Appendix 061 NAVIGATION – GENERAL NAVIGATION
- Appendix 062 NAVIGATION – RADIO NAVIGATION
- Appendix 070 OPERATIONAL PROCEDURES
- Appendix 081 PRINCIPLES OF FLIGHT – AEROPLANES
- Appendix 082 PRINCIPLES OF FLIGHT – HELICOPTERS
- Appendix 090 RADIO COMMUNICATIONS
- Appendix AREA 100 KNOWLEGDE, SKILLS AND ATTITUDES (KSA)

(b) Airships

SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR

The applicable items for each licence or rating are marked with ‘x’. An ‘x’ on the main title of a subject means that all the subdivisions are applicable.'

		CPL	IR
1.	**AIR LAW AND ATC PROCEDURES**	x	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		x
	RULES OF THE AIR		x

		CPL	IR
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		x
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		x
	AERONAUTICAL INFORMATION SERVICE		x
	AERODROMES		x
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		
2.	**AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT**	x	
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIRBAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
3.	**AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION**	x	
	SENSORS AND INSTRUMENTS		

		CPL	IR
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		
	GYROSCOPIC INSTRUMENTS		
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
4.	**FLIGHT PERFORMANCE AND PLANNING**	x	
4.1.	**MASS AND BALANCE: AIRSHIPS**	x	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
4.2.	**FLIGHT PLANNING AND FLIGHT MONITORING**		
	FLIGHT PLANNING FOR VFR FLIGHTS	x	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	x	x
	PRE-FLIGHT PREPARATION	x	x
	ATS FLIGHT PLAN	x	x
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x
4.3.	**PERFORMANCE: AIRSHIPS**	x	

		CPL	IR
	AIRWORTHINESS REQUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		
5.	**HUMAN PERFORMANCE**	x	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSYCHOLOGY		
6.	**METEOROLOGY**	x	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		
	FLIGHT HAZARDS		
	METEOROLOGICAL INFORMATION		
7.	**NAVIGATION**		
7.1.	**GENERAL NAVIGATION**	x	
	BASICS OF NAVIGATION		
	MAGNETISM AND COMPASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
7.2.	**RADIO NAVIGATION**		
	BASIC RADIO PROPAGATION THEORY	x	x
	RADIO AIDS	x	x
	RADAR	x	x
	INTENTIONALLY LEFT BLANK		

		CPL	IR
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	x	x
8.	**OPERATIONAL PROCEDURES AIRSHIP**	x	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
9.	**PRINCIPLES OF FLIGHT**	x	
9.1.	**PRINCIPLES OF FLIGHT: AIRSHIPS**	x	
	BASICS OF AEROSTATICS		
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
10.	**COMMUNICATIONS**		
10.1.	**VFR COMMUNICATIONS**	x	
	DEFINITIONS	x	
	GENERAL OPERATING PROCEDURES	x	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	x	
	DISTRESS AND URGENCY PROCEDURES	x	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	
10.2.	**IFR COMMUNICATIONS**		
	DEFINITIONS		x

		CPL	IR
	GENERAL OPERATING PROCEDURES		x
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x
	DISTRESS AND URGENCY PROCEDURES		x
	RELEVANT WEATHER INFORMATION TERMS (IFR)		x
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		x
	MORSE CODE		x

GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations

EXPLANATION OF THE VERBS USED IN THE BENJAMIN BLOOM TAXONOMY

(a) The depth or level of learning to be achieved during the training and the corresponding level of attainment to be examined or assessed is based on the following taxonomy. In each case, the level of knowledge or skill is signified by the learning objective (LO) verb.

(b) The majority of the LOs relate to the cognitive domain. The taxonomy described by B. Bloom (1956) and Anderson & Krathwohl (2001) has been used as the standard.

(c) The six sequential increasing levels of required cognitive learning are identified by the LO verb. Hence the lowest level 'remember' is signified by verbs such as 'state', 'list', 'define' and 'recall' whilst the next higher level of 'understand' is signified by verbs such as 'describe' and 'explain'. The third level of 'apply' is signified by the verbs 'calculate', 'interpret', 'relate' and 'solve'. However, the higher levels of 'analyse', which would be signified by the verbs 'plan' or 'discuss' and 'evaluate' and 'create' are less common due at least partially to questions presently possible in the ECQB examination.

(d) The LOs used in Area 100 KSA differ in that they require a combination of knowledge and skills. However, the 'skill' level does not relate to Bloom's psychomotor taxonomy but is more closely aligned to the higher taxonomy levels required in medicine, because knowledge and skills must be combined by the student pilot in a strategy.

(e) The verbs 'demonstrate' and 'show', with their meanings defined below, have therefore been used to supplement the cognitive LO verbs for the Area 100 KSA LOs.

(1) 'Demonstrate' means the selection and use of the appropriate knowledge, skills and attitudes within a strategy to achieve an effective outcome. It signifies a high taxonomy level and would normally be assessed using multiple indicators from more than one core competency.

(2) 'Show' means the attainment of knowledge, skill or attitude. It signifies a lower taxonomy level than 'demonstrate' and would normally be assessed by a single indicator.'

SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY – ATPL(A)

AMC1 FCL.520.A; FCL.520.H

ATPL SKILL TEST

The ATPL skill test may serve at the same time as a skill test for the issue of the licence and a proficiency check for the revalidation of the type rating for the aircraft used in the test and may be combined with the skill test for the issue of a MP type rating.

GM1 FCL.520.A ATPL(A) — Skill test

ATPL SKILL TEST IN AN EBT MODULE

The skill test in accordance with Appendix 9 may be combined with an EBT module. It may follow the same process already described in mixed EBT for the LPC (e.g. EVAL + manoeuvres validation phase for the pilot performing the ATPL skill test). The same rationale can be applied to the regular skill test. Guidance can be found in the EASA EBT manual. The CAA may provide additional and further guidance.

SECTION 3 – SPECIFIC REQUIREMENTS FOR THE HELICOPTER CATEGORY – ATPL(H)

AMC1 FCL.510.H(f) ATPL(H) — Prerequisites, experience and crediting

MCC TRAINING WITH CREDITS FOR ATPL(H) — PILOTS THAT ARE EXPERIENCED IN MULTI-PILOT OPERATIONS

(a) General

MCC training in accordance with point FCL.510.H(f) is intended to be completed by applicants who are undergoing integrated ATPL(H) training.

(b) Training course

The training course should include theoretical training instruction and exercises, as well as practical MCC training using one of the following helicopter simulators:

(1) FNPT II or III qualified for MCC;

(2) an FTD 2/3;

(3) an FFS.

(c) Objectives

The training course should meet the objectives of AMC1 FCL.735.A; FCL.735.H; FCL.735.As. The head of training of the ATO should adapt the duration of training to the individual needs of the applicant, in order to achieve these objectives.

(d) Certificate of completion

On completion of the course, once the applicant has met the objectives defined in (c), the applicant should receive a certificate of completion of the training from the ATO. The form should be based on that defined in AMC1 FCL.735.A; FCL.735.H; FCL.735.As. The title of the form should read 'Training in accordance with FCL.510(f) — helicopters'.

AMC1 FCL.520.A; FCL.520.H

ATPL SKILL TEST

The ATPL skill test may serve at the same time as a skill test for the issue of the licence and a proficiency check for the revalidation of the type rating for the aircraft used in the test and may be combined with the skill test for the issue of a MP type rating.

SUBPART G – INSTRUMENT RATING – IR

SECTION 1 – COMMON REQUIREMENTS

AMC1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations

LEARNING OBJECTIVES FOR ATPL, CPL, IR, CB-IR(A) and BIR

(a) Aeroplanes and helicopters

GENERAL

In the tables of this AMC, the applicable LOs for each ATPL, CPL, IR, CB-IR(A) are marked with an 'X', and for the BIR exam and BIR BK with the number 1, 2 or 3 (corresponding to the modules as mentioned in FCL.835 'Basic instrument rating (BIR)'.

The LOs define the subject knowledge and applied knowledge, skills and attitudes that a student pilot should have assimilated during the theoretical knowledge course.

The LOs are intended to be used by an approved training organisation (ATO) when developing the Part-FCL theoretical knowledge elements of the appropriate course. It should be noted, however, that the LOs do not provide a ready-made ground training syllabus for individual ATOs, and should not be seen by organisations as a substitute for a thorough course design. Adherence to the LOs should become part of the ATO's compliance monitoring scheme as required by ORA.GEN.200(a)(6).

ATOs are required to produce a training plan for each of their courses based on the instructional systems design (ISD) methodology as specified in AMC2 ORA.ATO.230.

Additional guidance on the meaning and taxonomy of the verbs used in the LOs can be found in GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d).

TRAINING AIMS

After completion of the training, a student pilot should:

— be able to understand and apply the subject knowledge in order to be able to identify and manage threats and errors effectively;

— meet at least the Area 100 KSA minimum standard.

INTERPRETATION

The abbreviations used are ICAO abbreviations listed in ICAO Doc 8400 'ICAO Abbreviations and Codes', or those listed in GM1 FCL.010.

Where a LO refers to a definition, e.g. 'Define the following terms' or 'Define and understand' or 'Explain the definitions in …', candidates are also expected to be able to recognise a given definition.

Below is a table showing the short references to applicable legislation and standards:

Reference	Legislation/Standard
The Basic Regulation	MCAR Aircrew -Essential Requirements of Aircrew
The Aircrew Regulation	MCAR Aircrew Regulations
Part-FCL	Annex I – Flight Crew Licensing
Part-MED	ANNEX IV- MEDICAL REQUIREMENTS FOR LICENSING
CS-23, AMC & GM to CS-23, CS-25, CS-27, CS-29, CS-E and CS-Definitions	Refer to the respective Certification Specifications / AMC & GM
NASA TM-85652	National Aeronautics and Space Administration — Technical Memorandum 85652

'Applicable operational requirements' refers to, for the ATPL(A), CPL(A), ATPL(H)/IR, ATPL(H)/VFR, CPL(H), IR and CBIR, of MCAR Regulations and other operations regulations.

The General Student Pilot Route Manual (GSPRM) contains planning data plus aerodrome and approach charts that may be used in theoretical knowledge training courses. The guidelines on its content can be found in this AMC, before the LO table for Subject 033 'Flight planning and monitoring'.

Excerpts from any aircraft manuals including but not limited to CAP 696, 697 and 698 for aeroplanes, and CAP 758 for helicopters may be used in training. Where questions refer to excerpts from aircraft manuals, the associated aircraft data will be provided in the examinations.

Some numerical data (e.g. speeds, altitudes/levels and masses) used in questions for theoretical knowledge examinations may not be representative for helicopter operations, but the data is satisfactory for the calculations required.

Note: In all subject areas, the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LOs FOR ATPL, CPL, IR, CB-IR(A) and BIR

GENERAL

The detailed theoretical knowledge syllabus outlines the topics that should be taught and examined in order to meet the theoretical knowledge requirements appropriate to ATPL, MPL, CPL, IR, CB-IR(A) and BIR.

For each topic in the detailed theoretical knowledge syllabus, one or more LOs are set out in the appendices as shown below:

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— Appendix 021 AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT

— Appendix 022 AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION

— Appendix 031 FLIGHT PERFORMANCE AND PLANNING – MASS AND BALANCE

— Appendix 032 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES

— Appendix 033 FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING

— Appendix 034 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS

— Appendix 040 HUMAN PERFORMANCE AND LIMITATIONS

— Appendix 050 METEOROLOGY

— Appendix 061 NAVIGATION – GENERAL NAVIGATION

— Appendix 062 NAVIGATION – RADIO NAVIGATION

— Appendix 070 OPERATIONAL PROCEDURES

— Appendix 081 PRINCIPLES OF FLIGHT – AEROPLANES

— Appendix 082 PRINCIPLES OF FLIGHT – HELICOPTERS

— Appendix 090 RADIO COMMUNICATIONS

— Appendix AREA 100 KNOWLEGDE, SKILLS AND ATTITUDES (KSA)

(b) Airships

SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR

The applicable items for each licence or rating are marked with ‘x’. An ‘x’ on the main title of a subject means that all the subdivisions are applicable.'

		CPL	IR
1.	**AIR LAW AND ATC PROCEDURES**	x	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		x
	RULES OF THE AIR		x

		CPL	IR
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		x
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		x
	AERONAUTICAL INFORMATION SERVICE		x
	AERODROMES		x
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		
2.	**AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT**	x	
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIRBAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
3.	**AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION**	x	
	SENSORS AND INSTRUMENTS		

		CPL	IR
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		
	GYROSCOPIC INSTRUMENTS		
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
4.	**FLIGHT PERFORMANCE AND PLANNING**	x	
4.1.	**MASS AND BALANCE: AIRSHIPS**	x	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
4.2.	**FLIGHT PLANNING AND FLIGHT MONITORING**		
	FLIGHT PLANNING FOR VFR FLIGHTS	x	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	x	x
	PRE-FLIGHT PREPARATION	x	x
	ATS FLIGHT PLAN	x	x
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x
4.3.	**PERFORMANCE: AIRSHIPS**	x	

		CPL	IR
	AIRWORTHINESS REQUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		
5.	**HUMAN PERFORMANCE**	x	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSYCHOLOGY		
6.	**METEOROLOGY**	x	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		
	FLIGHT HAZARDS		
	METEOROLOGICAL INFORMATION		
7.	**NAVIGATION**		
7.1.	**GENERAL NAVIGATION**	x	
	BASICS OF NAVIGATION		
	MAGNETISM AND COMPASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
7.2.	**RADIO NAVIGATION**		
	BASIC RADIO PROPAGATION THEORY	x	x
	RADIO AIDS	x	x
	RADAR	x	x
	INTENTIONALLY LEFT BLANK		

		CPL	IR
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	x	x
8.	**OPERATIONAL PROCEDURES AIRSHIP**	x	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
9.	**PRINCIPLES OF FLIGHT**	x	
9.1.	**PRINCIPLES OF FLIGHT: AIRSHIPS**	x	
	BASICS OF AEROSTATICS		
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
10.	**COMMUNICATIONS**		
10.1.	**VFR COMMUNICATIONS**	x	
	DEFINITIONS	x	
	GENERAL OPERATING PROCEDURES	x	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	x	
	DISTRESS AND URGENCY PROCEDURES	x	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	
10.2.	**IFR COMMUNICATIONS**		
	DEFINITIONS		x

		CPL	IR
	GENERAL OPERATING PROCEDURES		x
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x
	DISTRESS AND URGENCY PROCEDURES		x
	RELEVANT WEATHER INFORMATION TERMS (IFR)		x
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		x
	MORSE CODE		x

GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations

EXPLANATION OF THE VERBS USED IN THE BENJAMIN BLOOM TAXONOMY

(a) The depth or level of learning to be achieved during the training and the corresponding level of attainment to be examined or assessed is based on the following taxonomy. In each case, the level of knowledge or skill is signified by the learning objective (LO) verb.

(b) The majority of the LOs relate to the cognitive domain. The taxonomy described by B. Bloom (1956) and Anderson & Krathwohl (2001) has been used as the standard.

(c) The six sequential increasing levels of required cognitive learning are identified by the LO verb. Hence the lowest level ‘remember’ is signified by verbs such as ‘state’, ‘list’, ‘define’ and ‘recall’ whilst the next higher level of ‘understand’ is signified by verbs such as ‘describe’ and ‘explain’. The third level of ‘apply’ is signified by the verbs ‘calculate’, ‘interpret’, ‘relate’ and ‘solve’. However, the higher levels of ‘analyse’, which would be signified by the verbs ‘plan’ or ‘discuss’ and ‘evaluate’ and ‘create’ are less common due at least partially to questions presently possible in the ECQB examination.

(d) The LOs used in Area 100 KSA differ in that they require a combination of knowledge and skills. However, the ‘skill’ level does not relate to Bloom’s psychomotor taxonomy but is more closely aligned to the higher taxonomy levels required in medicine, because knowledge and skills must be combined by the student pilot in a strategy.

(e) The verbs ‘demonstrate’ and ‘show’, with their meanings defined below, have therefore been used to supplement the cognitive LO verbs for the Area 100 KSA LOs.

(1) 'Demonstrate' means the selection and use of the appropriate knowledge, skills and attitudes within a strategy to achieve an effective outcome. It signifies a high taxonomy level and would normally be assessed using multiple indicators from more than one core competency.

(2) 'Show' means the attainment of knowledge, skill or attitude. It signifies a lower taxonomy level than 'demonstrate' and would normally be assessed by a single indicator.'

AMC1 FCL.615(b) IR – Theoretical knowledge and flight instruction

SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE IR FOLLOWING THE COMPETENCY-BASED MODULAR COURSE AND BIR

(a) The syllabus for the theoretical knowledge instruction and examination for the ATPL, MPL, CPL and IR in AMC1 FCL.310; FCL.515(b); FCL.615(b), FCL.835(d) should be used for the CB-IR(A) and the BIR respectively.

(b) Aspects related to threat and error management (TEM) should be included in an integrated manner, taking into account the particular risks associated to the licence and the activity.

(c) An applicant who has completed a modular IR(A) course according to Appendix 6 Section A and passed the IR(A) theoretical knowledge examination should be fully credited towards the requirements of theoretical knowledge instruction and examination for a competency-based IR(A) or EIR within the validity period of the examination. An applicant wishing to transfer to a competency-based IR(A) or BIR course during a modular IR(A) course should be credited towards the requirements of theoretical knowledge instruction and examination for a competency-based IR(A) or BIR for those subjects or theory items already completed.

AMC1 FCL.625(c) IR – Validity, revalidation and renewal

RENEWAL OF INSTRUMENT RATING AT AN APPROVED TRAINING ORGANISATION (ATO): REFRESHER TRAINING

(a) The objective of the refresher training at an ATO is to reach the level of proficiency needed to pass the instrument rating proficiency check, as described in Appendix 9, or the instrument rating skill test as described in Appendix 7 to Part-FCL, as applicable. The amount of refresher training needed should be determined by the ATO on a case-by-case basis, taking into account the following factors:

(1) the experience of the applicant;

(2) the amount of time elapsed since the privileges of the rating were last used;

(3) the complexity of the aircraft;

(4) whether the applicant has a current rating on another aircraft type or class; and

(5) where considered necessary, the performance of the applicant during a simulated proficiency check for the rating in a flight simulation training device (FSTD) or an aircraft of a relevant type or class.

The amount of training needed to reach the desired level of competency should increase with the time elapsed since the privileges of the rating were last used.

(b) Once the ATO has determined the needs of the applicant, it should develop an individual training programme based on the ATO's approved course for the rating and focusing on those aspects where the applicant has shown the greatest needs. Theoretical-knowledge instruction should be included, as necessary. The performance of the applicant should be reviewed during the training, and additional instruction should be provided where necessary to reach the standard required for the proficiency check.

(c) After successful completion of the training, the ATO should provide a training completion certificate to the applicant, which describes the evaluation of the factors listed under (a) above and the training received, and includes a statement that the training has been successfully completed. The training completion certificate should be presented to the examiner prior to the proficiency check. Following the successful renewal of the rating, the training completion certificate and examiner report form should be submitted to the CAA.

(d) Taking into account the factors listed in (a) above, an ATO may also decide that the applicant already possesses the required level of proficiency and that no refresher training is necessary. In such a case, the certificate or other documental evidence referred to in point (c) above should contain a respective statement including sufficient reasoning.

SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY

SECTION 3 – SPECIFIC REQUIREMENTS FOR THE HELICOPTER CATEGORY

AMC1 FCL.630.H IR(H) — Extension of the privileges of an IR(H) to further helicopter types

APPROPRIATE FFS OR FTD

The appropriate FSTD should be a FFS C/D or a FTD 2/3.

SECTION 4 – SPECIFIC REQUIREMENTS FOR THE AIRSHIP CATEGORY

Reserved

SUBPART H – CLASS AND TYPE RATINGS

SECTION 1 – COMMON REQUIREMENTS

AMC1 FCL.700 Circumstances in which class or type ratings are required

(a) A class or type rating and license endorsement should comply with the class and type ratings that are listed in one of the following publications, as applicable:

(1) 'List of Aeroplanes — Class and Type Ratings and Endorsement List'; and

(2) 'List of Helicopters — Type Ratings List'.

(b) Holders of Part-FCL licences should complete differences training or familiarisation training in accordance with the lists of point (a).

GM1 FCL.700 Circumstances in which class or type ratings are required

LIST OF CLASS OR TYPE RATINGS

The following tables contain lists of aeroplanes or TMG that are included in class ratings.

(a) Class ratings (aeroplane): SP and SEP or MEP aeroplane (land or sea):

Manufacturer	Aeroplanes		Licence Endorsement
All manufacturers	SEP (land)	**(D)**	**SEP (land)**
	SEP (land) with variable pitch propellers		
	SEP (land) with retractable undercarriage		
	SEP (land) with turbo or super charged engines		
	SEP (land) with cabin pressurisation		
	SEP (land) with tail wheels		
	SEP (land) with EFIS		
	SEP (land) with SLPC		
	SEP (sea)	**(D)**	**SEP (sea)**
	SEP (sea) with variable pitch propellers		
	SEP (sea) with turbo or super charged engines		
	SEP (sea) with cabin pressurisation		
	SEP (sea) with EFIS		
	SEP (sea) with SLPC		
All manufacturers	MEP (land)	**(D)**	**MEP (land)**
	MEP (sea)	**(D)**	**MEP (sea)**

(b) Class ratings (aeroplane): SP and SEP TMG (land):

Manufacturer	Aeroplanes		Licence Endorsement
All manufacturers	All TMGs having an integrally mounted, non-retractable engine and a non-retractable propeller		**TMG**

(c) Reserved.

(d) Whenever (D) is indicated in one of the lists mentioned in paragraphs (a) to (c), it indicates that differences training in accordance with FCL.710 is required.

GM1 FCL.710 Class and type ratings – variants

DIFFERENCES AND FAMILIARISATION TRAINING

(a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or the aircraft.

(b) Familiarisation training requires the acquisition of additional knowledge.

AMC1 FCL.725(a) Requirements for the issue of class and type ratings

SYLLABUS OF THEORETICAL KNOWLEDGE FOR CLASS OR TYPE RATINGS

I. SE AND ME AEROPLANES

(a) Detailed listing for aeroplane structure and equipment, normal operation of systems and malfunctions:

- (1) dimensions: minimum required runway width for 180 ° turn.
- (2) engine including auxiliary power unit:
  - (i) type of engine or engines;
  - (ii) in general, function of the following systems or components:
    - (A) engine;
    - (B) auxiliary power unit;
    - (C) oil system;
    - (D) fuel system;
    - (E) ignition system;
    - (F) starting system;
    - (G) fire warning and extinguishing system;
    - (H) generators and generator drives;
    - (I) power indication;

(J) reverse thrust;

(K) water injection.

(iii) on piston or turbine-propeller engines additionally:

(A) propeller system;

(B) feathering system.

(iv) engine controls (including starter), engine instruments and indications in the cockpit, their function, interrelation and interpretation;

(v) engine operation, including APU, during engine start, start and engine malfunctions, procedures for normal operation in the correct sequence.

(3) fuel system:

(i) location of the fuel tanks, fuel pumps, fuel lines to the engines, tank capacities, valves and measuring;

(ii) location of the following systems:

(A) filtering;

(B) heating;

(C) fuelling and defueling;

(D) dumping;

(E) venting.

(iii) in the cockpit:

(A) the monitors and indicators of the fuel system;

(B) quantity and flow indication, interpretation.

(iv) procedures:

(A) fuel procedures distribution into the various tanks;

(B) fuel supply, temperature control and fuel dumping.

(4) pressurisation and air conditioning:

(i) components of the system and protection devices;

(ii) cockpit monitors and indicators;

(iii) interpretation about the operational condition;

(iv) normal operation of the system during start, cruise, approach and landing, air conditioning airflow and temperature control.

(5) ice and rain protection, windshield wipers and rain repellent:

(i) ice protected components of the aeroplane including engines, heat sources, controls and indications;

(ii) operation of the anti-icing or de-icing system during take-off, climb, cruise and descent, conditions requiring the use of the protection systems;

(iii) controls and indications of the windshield wipers and rain repellent systems operation.

(6) hydraulic system:

(i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;

(ii) controls, monitors and indicators in the cockpit, function and interrelation and interpretation of indications.

(7) landing gear:

(i) main components of the:

(A) main landing gear;

(B) nose gear;

(C) gear steering;

(D) wheel brake system, including anti-skid.

(ii) gear retraction and extension (including changes in trim and drag caused by gear operation);

(iii) required tyre pressure, or location of the relevant placard;

(iv) controls and indicators including warning indicators in the cockpit in relation to the retraction or extension condition of the landing gear and brakes;

(v) components of the emergency extension system.

(8) flight controls and high lift devices:

(i) (A) aileron system;

(B) elevator system;

(C) rudder system;

(D) trim system;

(E) spoiler system;

(F) lift devices;

(G) stall warning system;

(H) take-off configuration warning system.

(ii) flight control system from the cockpit controls to the flight control or surfaces;

(iii) controls, monitors and indicators including warning indicators of the systems mentioned under (8)(i), interrelation and dependencies.

(9) electrical power supply:

(i) number, power, voltage, frequency and location of the main power system (AC or DC), auxiliary power system location and external power system;

(ii) location of the controls, monitors and indicators in the cockpit;

(iii) flight instruments, communication and navigation systems, main and back-up power sources;

(iv) location of vital circuit breakers;

(v) generator operation and monitoring procedures of the electrical power supply.

(10) flight instruments, communication, radar and navigation equipment, autoflight and flight data recorders:

(i) visible antennae;

(ii) controls and instruments of the following equipment in the cockpit during normal operation:

(A) flight instruments;

(B) flight management systems;

(C) radar equipment, including radio altimeter;

(D) communication and navigation systems;

(E) autopilot;

(F) flight data recorder, cockpit voice recorder and data-link communication recording function;

(G) TAWS;

(H) collision avoidance system;

(I) warning systems; and

(J) weather radar system, best practices for optimum use, interpretation of displayed information.

(11) cockpit, cabin and cargo compartment:

(i) operation of the exterior, cockpit, cabin and cargo compartment lighting and the emergency lighting;

(ii) operation of the cabin and cargo doors, stairs, windows and emergency exits;

(iii) main components of the oxygen system and their location, oxygen masks and operation of the oxygen systems for the crew and passengers, required amount of oxygen by means of a table or diagram.

(12) emergency equipment operation and correct application of the following emergency equipment in the aeroplane:

(i) portable fire extinguisher;

(ii) first-aid kits;

(iii) portable oxygen equipment;

(iv) emergency ropes;

(v) life-jacket;

(vi) life rafts;

(vii) emergency transmitters;

(viii) crash axes;

(ix) megaphones;

(x) emergency signals.

(13) pneumatic system:

(i) components of the pneumatic system, pressure source and actuated components;

(ii) controls, monitors and indicators in the cockpit and function of the system;

(iii) vacuum system.

(b) Limitations:

(1) general limitations:

(i) certification of the aeroplane, category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and aircraft systems:

(A) maximum tail and crosswind-components at take-off and landing;

(B) maximum speeds for flap extension v_{fo};

(C) at various flap settings v_{fe};

(D) for landing gear operation v_{lo}, M_{lo};

(E) for extended landing gear v_{le}, M_{le};

(F) for maximum rudder deflection v_a, M_a;

(G) for tyres;

(H) one propeller feathered.

(ii) (A) minimum control speed air v_{mca};

(B) minimum control speed ground v_{mcg};

(C) stall speed under various conditions v_{so}, v_{s1};

(D) maximum speed v_{ne}, M_{ne};

(E) maximum speed for normal operation v_{mo}, M_{mo};

(F) altitude and temperature limitations;

(G) stick shaker activation.

(iii) (A) maximum airport pressure altitude, runway slope;

(B) maximum taxi mass;

(C) maximum take-off mass;

(D) maximum lift off mass;

(E) maximum landing mass;

(F) zero fuel mass;

(G) maximum dumping speed v_{dco}, M_{dco}, v_{dce}, M_{dce};

(H) maximum load factor during operation;

(I) certificated range of centre of gravity.

(2) engine limitations:

(i) operating data of the engines:

(A) time limits and maximum temperatures;

(B) minimum RPMs and temperatures;

(C) torque;

(D) maximum power for take-off and go-around on pressure altitude or flight altitude and temperature;

(E) piston engines: certified range of mixture;

(F) minimum and maximum oil temperature and pressure;

(G) maximum starter time and required cooling;

(H) time between two start attempts for engines and auxiliary power unit;

(I) for propeller: maximum RPM of propeller triggering of automatic feathering device.

(ii) certified oil grades.

(3) systems limitations:

(i) operating data of the following systems:

(A) pressurisation, air conditioning maximum pressures;

(B) electrical power supply, maximum load of main power system (AC or DC);

(C) maximum time of power supply by battery in case of emergency;

(D) mach trim system and yaw damper speed limits;

(E) autopilot limitations of various modes;

(F) ice protection;

(G) speed and temperature limits of window heat;

(H) temperature limits of engine and wing anti-ice.

(ii) fuel system: certified fuel specifications, minimum and maximum pressures and temperature of the fuel.

(4) minimum equipment list.

(c) Performance, flight planning and monitoring:

(1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing according to the documentation available (for example for take-off v_1, v_{mbe}, v_r, v_{lof}, v_2, take-off distance, maximum take-off mass and the required stop distance) on the following factors:

(i) accelerate or stop distance;

(ii) take-off run and distance available (TORA, TODA);

(iii) ground temperature, pressure altitude, slope, wind;

(iv) maximum load and maximum mass (for example ZFM);

(v) minimum climb gradient after engine failure;

(vi) influence of snow, slush, moisture and standing water on the runway;

(vii) possible single or dual engine failure during cruise flight;

(viii) use of anti-icing systems;

(ix) failure of water injection system or antiskid system;

(x) speeds at reduced thrust, v_1, $v1_{red}$, v_{mbe}, v_{mu}, v_r, v_{lof}, v_2;

(xi) safe approach speed vr_{ef}, on v_{mca} and turbulent conditions;

(xii) effects of excessive approach speed and abnormal glideslope on the landing distance;

(xiii) minimum climb gradient during approach and landing;

(xiv) limiting values for a go-around with minimum fuel;

(xv) maximum allowable landing mass and the landing distance for the destination and alternate aerodrome on the following factors:

(A) available landing distance;

(B) ground temperature, pressure altitude, runway slope and wind;

(C) fuel consumption to destination or alternate aerodrome;

(D) influence of moisture on the runway, snow, slush and standing water;

(E) failure of the water injection system or the anti skid system;

(F) influence of thrust reverser and spoilers.

(2) flight planning for normal and abnormal conditions:

(i) optimum or maximum flight level;

(ii) minimum required flight altitude;

(iii) drift down procedure after an engine failure during cruise flight;

(iv) power setting of the engines during climb, cruise and holding under various circumstances, as well as the most economic cruising flight level;

(v) calculation of a short range or long range flight plan;

(vi) optimum and maximum flight level and power setting of the engines after engine failure.

(3) flight monitoring.

(d) Load and balance and servicing:

(1) load and balance:

(i) load and trim sheet on the maximum masses for take-off and landing;

(ii) centre of gravity limits;

(iii) influence of fuel consumption on the centre of gravity;

(iv) lashing points, load clamping, maximum ground load.

(2) servicing on ground, servicing connections for:

(i) fuel;

(ii) oil;

(iii) water;

(iv) hydraulic;

(v) oxygen;

(vi) nitrogen;

(vii) conditioned air;

(viii) electric power;

(ix) start air;

(x) toilet and safety regulations.

(e) Emergency procedures:

(1) recognition of the situation as well as immediate memory actions in correct sequence and for those conditions recognised as emergencies by the manufacturer and CAA for certification:

(i) engine failure during take-off before and after v_1, as well as in flight;

(ii) malfunctions of the propeller system;

(iii) engine overheat, engine fire on ground and in-flight;

(iv) wheel well fire;

(v) electrical smoke or fire;

(vi) rapid decompression and emergency descent;

(vii) air-conditioning overheat, anti-ice system overheat;

(viii) fuel pump failure;

(ix) fuel freezing overheat;

(x) electric power failure;

(xi) equipment cooling failure;

(xii) flight instrument failure;

(xiii) partial or total hydraulic failure;

(xiv) failures at the lift devices and flight controls including boosters

(xv) cargo compartment smoke or fire.

(2) actions according to the approved abnormal and emergency checklist:

(i) engine restart in-flight;

(ii) landing gear emergency extension;

(iii) application of the emergency brake system;

(iv) emergency extension of lift devices;

(v) fuel dumping;

(vi) emergency descent.

(f) Special requirements for 'glass cockpit' aeroplanes with EFIS additional learning objectives:

(1) general rules of aeroplanes computer hardware and software design;

(2) logic of all crew information and alerting systems and their limitations;

(3) interaction of the different aeroplane computer systems, their limitations, the possibilities of computer fault recognition and the actions to be performed on computer failures;

(4) normal procedures including all crew coordination duties;

(5) aeroplane operation with different computer degradations (basic flying).

(g) Flight management systems.

II. SE AND ME HELICOPTERS

(a) Detailed listing for helicopters structure, transmissions, rotors and equipment, normal and abnormal operation of systems:

(1) dimensions.

(2) engine including aux. power unit, rotor and transmissions; if an initial type rating for a turbine engine helicopter is applied for, the applicant should have received turbine engine instruction:

(i) type of engine or engines;

(ii) in general, the function of the following systems or components:

(A) engine;

(B) auxiliary power unit;

(C) oil system;

(D) fuel system;

(E) ignition system;

(F) starting system;

(G) fire warning and extinguishing system;

(H) generators and generator drive;

(I) power indication;

(J) water or methanol injection.

(iii) engine controls (including starter), engine instruments and indications in the cockpit, their function and interrelation and interpretation;

(iv) engine operation, including APU, during engine start and engine malfunctions, procedures for normal operation in the correct sequence;

(v) transmission system:

(A) lubrication;

(B) generators and generator drives;

(C) freewheeling units;

(D) hydraulic drives;

(E) indication and warning systems.

(vi) type of rotor systems: indication and warning systems.

(3) fuel system:

(i) location of the fuel tanks, fuel pumps, fuel lines to the engines tank capacities, valves and measuring;

(ii) the following systems:

(A) filtering;

(B) fuelling and defuelling heatings;

(C) dumping;

(D) transferring;

(E) venting.

(iii) in the cockpit: the monitors and indicators of the fuel system, quantity and flow indication, interpretation;

(iv) fuel procedures distribution into the various tanks fuel supply and fuel dumping.

(4) air conditioning:

(i) components of the system and protection devices;

(ii) cockpit monitors and indicators;

Note: interpretation about the operational condition: normal operation of the system during start, cruise approach and landing, air conditioning airflow and temperature control.

(5) ice and rain protection, windshield wipers and rain repellent:

(i) ice protected components of the helicopter, including engines and rotor systems, heat sources, controls and indications;

(ii) operation of the anti-icing or de-icing system during take-off, climb, cruise and descent, conditions requiring the use of the protection systems;

(iii) controls and indications of the windshield wipers and rain repellent system operation.

(6) hydraulic system:

(i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;

(ii) controls, monitors and indicators in the cockpit, function and interrelation and interpretation of indications.

(7) landing gear, skids fixed and floats:

(i) main components of the:

(A) main landing gear;

(B) nose gear;

(C) tail gear;

(D) gear steering;

(E) wheel brake system.

(ii) gear retraction and extension;

(iii) required tyre pressure, or location of the relevant placard;

(iv) controls and indicators including warning indicators in the cockpit in relation to the retraction or extension condition of the landing gear;

(v) components of the emergency extension system.

(8) flight controls, stab- and autopilot systems: controls, monitors and indicators including warning indicators of the systems, interrelation and dependencies.

(9) electrical power supply:

(i) number, power, voltage, frequency and if applicable phase and location of the main power system (AC or DC) auxiliary power system location and external power system;

(ii) location of the controls, monitors and indicators in the cockpit;

(iii) main and back-up power sources flight instruments, communication and navigation systems, main and back-up power sources;

(iv) location of vital circuit breakers;

(v) generator operation and monitoring procedures of the electrical power supply.

(10) flight instruments, communication, radar and navigation equipment, autoflight and flight data recorders:

(i) antennas;

(ii) controls and instruments of the following equipment in the cockpit:

(A) flight instruments (for example air speed indicator, pitot static system, compass system, flight director);

(B) flight management systems;

(C) radar equipmentt, including radio;

(D) communication and navigation system (for example HF, VHF, ADF, VOR/DME, ILS, marker beacon) and area navigation systems;

(E) stabilisation and autopilot system;

(F) flight data recorder, cockpit voice recorder, data-link communication recording function and radio altimeter;

(G) collision avoidance system;

(H) TAWS;

(I) HUMSS;

(J) weather radar system, best practices for optimum use, interpretation of displayed information.

(11) cockpit, cabin and cargo compartment:

(i) operation of the exterior, cockpit, cabin and cargo compartment lighting and the emergency lighting;

(ii) operation of the cabin doors and emergency exits.

(12) emergency equipment:

(i) operation and correct application of the following mobile emergency equipment in the helicopter:

(A) portable fire extinguisher;

(B) first-aid kits;

(C) portable oxygen equipment;

(D) emergency ropes;

(E) life-jacket;

(F) life rafts;

(G) emergency transmitters;

(H) crash axes;

(I) megaphones;

(J) emergency signals;

(K) torches.

(ii) operation and correct application of the fixed emergency equipment in the helicopter: emergency floats.

(b) Limitations:

(1) general limitations, according to the helicopter flight manual;

(2) minimum equipment list.

(c) Performance, flight planning and monitoring:

(1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing:

(i) take-off:

(A) hover performance in and out of ground effect;

(B) all approved profiles, cat A and B;

(C) HV diagram;

(D) take-off and rejected take-off distance;

(E) take-off decision point (TDP) or (DPATO);

(F) calculation of first and second segment distances;

(G) climb performance.

(ii) en-route:

(A) air speed indicator correction;

(B) service ceiling;

(C) optimum or economic cruising altitude;

(D) max endurance;

(E) max range;

(F) cruise climb performance.

(iii) landing:

(A) hovering in and out of ground effect;

(B) landing distance;

(C) landing decision point (LDP) or (DPBL).

(iv) knowledge or calculation of: V_{lo}, V_{le}, V_{mo}, V_x, V_y, V_{toss}, V_{ne}, $V_{max\ range}$, V_{mini}.

(2) flight planning for normal and abnormal conditions:

(i) optimum or maximum flight level;

(ii) minimum required flight altitude;

(iii) drift down procedure after an engine failure during cruise flight;

(iv) power setting of the engines during climb, cruise and holding under various circumstances as well as at the most economic cruising flight level;

(v) optimum and maximum flight level and power setting after an engine failure.

(3) effect of optional equipment on performance.

(d) Load, balance and servicing:

(1) load and balance:

(i) load and trim sheet on the maximum masses for take-off and landing;

(ii) centre of gravity limits;

(iii) influence of the fuel consumption on the centre of gravity;

(iv) lashing points, load clamping, max ground load.

(2) servicing on the ground, servicing connections for:

(i) fuel;

(ii) oil, etc.;

(iii) and safety regulations for servicing.

(e) Emergency procedures.

(f) Special requirements for helicopters with EFIS.

(g) Optional equipment.

III. AIRSHIPS

(a) Detailed listing for airship structure and equipment, normal operation of systems and malfunctions:

(1) dimensions;

(2) structure and envelope:

(i) internal structure;

(ii) envelope;

(iii) pressure system;

(iv) gondola;

(v) empennage.

(3) flight controls;

(4) systems:

(i) hydraulic;

(ii) pneumatic.

(5) landing gear;

(6) fuel system;

(7) fire warning and extinguishing system;

(8) emergency equipment;

(9) electrical systems;

(10) avionics, radio navigation and communication equipment;

(11) instrumentation;

(12) engines and propellers;

(13) heating, ventilation and air-condition;

(14) operational procedures during start, cruise, approach and landing:

(i) normal operations;

(ii) abnormal operations.

(b) Limitations:

(1) general limitations:

(i) certification of the airship, category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and aircraft systems;

(ii) speeds;

(iii) altitudes.

(2) engine limitations;

(3) systems limitations;

(4) minimum equipment list.

(c) Performance and flight planning:

(1) performance calculation;

(2) flight planning.

(d) Load and balance and servicing:

(1) load and balance;

(2) servicing.

(e) Emergency procedures:

(1) recognition of emergency situations;

(2) actions according

AMC2 FCL.725(a) Requirements for the issue of class and type ratings

TRAINING COURSE

FLIGHT INSTRUCTION FOR TYPE RATINGS: HELICOPTERS

(a) The amount of flight instruction depends on:

(i) complexity of the helicopter type, handling characteristics, level of technology;

(ii) category of helicopter (SEP or SE turbine helicopter, ME turbine and MP helicopter);

(iii) previous experience of the applicant;

(iv) the availibiliy of FSTDs.

(b) FSTDs

In accordance with Appendix 9 to Part-FCL Section A paragraph 1 third subparagraph, the level of qualification and the complexity of the type will determine the amount of practical training that may be accomplished in FSTDs, including completion of the skill test. Before undertaking the skill test, a student should demonstrate competency in the skill test items during the practical training.

(c) Initial issue

The flight instruction (excluding skill test) should comprise training time as specified in column 2 in the table below unless otherwise foreseen in the operational suitability data established in accordance with MCAR-21. If, in accordance with Appendix 9 to Part-FCL Section A paragraph 1 third subparagraph, training is conducted in a combination of FSTDs (other than FFS) and the helicopter, the in-aircraft training time will depend on the specificities of the FSTD used. In such a case, in-aircraft training time should comprise, as a minimum, the training time given in column 3 of the table below unless otherwise foreseen in the OSD.

(1)	(2)	(3)
Helicopter types	**Minimum training time**	**Minimum training time in the helicopter, when also using FSTDs other than FFS**
SEP (H)	5 hrs	4 hrs
SET(H) under 3175 kg MTOM	5 hrs	4 hrs
SET(H) at or over 3175 kg MTOM	8 hrs	4 hrs
SPH MET (H) CS and FAR 27 and 29	8 hrs	4 hrs
MPH, when the applicant has already completed: - MCC course; - 50 hours of flight time in multi-pilot operations in SPH	5 hrs	Using FTD2/3: At least 2 hrs in the helicopter
MPH	10 hrs	4 hrs

(d) Additional types

The flight instruction (excluding the skill test) should comprise training time as specified in column 2 in the table below unless otherwise foreseen in the OSD. If, in accordance with Appendix 9 to MCAR-FCL Section A paragraph 1 third subparagraph, training is conducted in a combination of FSTDs (other than FFS) and the helicopter, the in-aircraft training time will depend on the specificities of the FSTD used. In such a case, in-aircraft training time should comprise, as a minimum, the time given in column 3 of the table below unless otherwise foreseen in the OSD.

(1)	(2)	(3)
Helicopter types	**Minimum training time**	**Minimum training time in the helicopter, when also using FSTDs other than FFS**
SEP(H) to SEP(H) within AMC1 FCL.740.H(a)(3)	2 hrs	1 hr
SEP(H) to SEP(H) not included in AMC1 FCL.740.H(a)(3)	5 hrs	2 hrs
SET(H) to SET(H)	2 hrs	1 hr

SE difference training	1 hr	N/A
MET(H) to MET(H)	3 hrs	2 hrs
ME difference training	1 hr	N/A
MPH to MPH	5 hrs	2 hrs
Extend privileges on the same type rating from SPH to MPH (except for initial MP issue), or from MPH to SPH	2 hrs	N/A
Extend privileges on the same type rating from SPH to MPH (except for initial MP issue), when applicants have completed 50 hours of flight time in multi-pilot operations on that type	1 hr	Training in helicopter or FFS C/D

GM1 FCL.725(d)(4)(ii)(B)(2) Requirements for the issue of class and type ratings

MULTI-PILOT OPERATION IN SINGLE-PILOT HELICOPTERS IN ACCORDANCE WITH MCAR-ORO

Point FCL.725(d)(4)(ii)(B)(2) requires pilots to exercise their type rating privileges for multi-pilot operation in single-pilot helicopters only in accordance with the requirements of Part-ORO. Multi-pilot operations in single-pilot helicopters cannot be carried out under Part-NCO. The regulatory framework of Part-ORO applies in any case of commercial operations or operation of complex single-pilot helicopters. This means that an ATO that provides training for multi-pilot operation in single-pilot helicopters will need to base that training on the operational procedures of the operator for which the pilot is flying. That ATO will either be an operator itself or will have an arrangement with an operator on behalf of which the training will be carried out.

GM1 FCL.725(e) Requirements for the issue of class and type ratings

The hours gained during the instruction flights for category 1 or 2 flight tests are not considered as flight tests related to development, certification or production.

AMC1 FCL.740(b) Validity and renewal of class and type ratings

RENEWAL OF CLASS AND TYPE RATINGS: REFRESHER TRAINING AT AN ATO, A DTO OR WITH AN INSTRUCTOR

(a) The objective of the refresher training is for the applicant to reach the level of proficiency necessary to safely operate the relevant type or class of aircraft. The amount of refresher training needed should be determined on a case-by-case basis by the ATO, the DTO or the instructor, as applicable, taking into account the following factors:

(1) the experience of the applicant;

(2) the amount of time elapsed since the privileges of the rating were last used;

(3) the complexity of the aircraft;

(4) whether the applicant has a current rating on another aircraft type or class; and

(5) where considered necessary, the performance of the applicant during a simulated proficiency check for the rating in an FSTD or an aircraft of the relevant type or class.

It should be expected that the amount of training needed to reach the desired level of proficiency will increase analogously to the time elapsed since the privileges of the rating were last used.

(b) After having determined the needs of the applicant, the ATO, the DTO or the instructor, as applicable, should develop an individual training programme based on the initial training for the rating, focusing on the aspects where the applicant has shown the greatest needs.

(c) With the exception of refresher training for ratings for aircraft referred to in point FCL.740(b)(2)(i), refresher training should include theoretical knowledge instruction, as necessary, such as for type-specific system failures in complex aircraft. The performance of the applicant should be reviewed during the training and additional instruction should be provided to the applicant, where necessary, to reach the standard required for the proficiency check.

(d) After successful completion of the training, the ATO, the DTO or the instructor, as applicable, should issue the applicant with a training completion certificate or another document specified by the competent authority, describing the evaluation of the factors listed in (a), the training received, and a statement that the training has been successfully completed. The training completion certificate should be presented to the examiner prior to the proficiency check. Following the successful renewal of the rating, the training completion certificate or the other document specified by the competent authority and the examiner report form should be submitted to the competent authority.

(e) Taking into account the factors listed in (a) above, the ATO, the DTO or the instructor, as applicable, may also decide that the applicant already possesses the required level of proficiency and that no refresher training is necessary. In such a case, the certificate or other documental evidence referred to in (c) above should contain a respective statement including sufficient reasoning.

GM1 FCL.740(b) Validity and renewal of class and type ratings

RENEWAL OF CLASS AND TYPE RATINGS: REFRESHER TRAINING AT AN AOC HOLDER

It is recommended that an AOC holder approved for renewal of type ratings under Part-ORO may provide refresher training if the applicant is enrolled in the EBT programme; and if the rating has lapsed by no more than 1 year.

If the rating has lapsed by more than 1 year, it is recommended that the applicant consider to follow the training at an ATO and AMC1 FCL.740(b) applies.

SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY

AMC1 FCL.720.A(b)(2)(i) Experience requirements and prerequisites for the issue of class or type ratings – aeroplanes

ADDITIONAL THEORETICAL KNOWLEDGE FOR A CLASS OR TYPE RATING FOR HIGH-PERFORMANCE SINGLE-PILOT (SP) AEROPLANES

(a) A number of aeroplanes certificated for SP operation have similar performances, systems and navigation capabilities to those more usually associated with MP types of aeroplanes, and regularly operate within the same airspace. The level of knowledge required to operate safely in this environment is not part of, or not included to the necessary depth of knowledge in the training syllabi for the PPL, CPL or IR(A) but these licence holders may fly as PIC of such aeroplanes. The additional theoretical knowledge required to operate such aeroplanes safely is obtained by completion of a course at an ATO.

(b) The aim of the theoretical knowledge course is to provide the applicant with sufficient knowledge of those aspects of the operation of aeroplanes capable of operating at high speeds and altitudes, and the aircraft systems necessary for such operation.

COURSE SYLLABUS

(c) The course will be divided in a VFR and an IFR part, and should cover at least the following items of the aeroplane syllabus to the ATPL(A) level:

FOR VFR OPERATIONS:

Subject ref.:	Syllabus content:
021 00 00 00	**AIRCRAFT GENERAL KNOWLEGDE: AIRFRAME, SYSTEMS, AND POWER PLANT**

Subject ref.:	Syllabus content:
021 09 01 03 021 09 03 00 021 09 03 02 021 09 03 03 021 09 04 00 021 09 04 01 021 09 04 03 021 09 04 04	Alternating current Generation AC generation Constant speed drive (CSD) and integrated drive generator (IDG) systems Distribution General AC distribution Electrical load management and monitoring systems: automatic generators and bus switching during normal and failure operation, indications and warnings
021 06 01 01	Piston-engine air supply
021 06 01 02	Gas turbine engine: bleed-air supply
021 10 10 01 021 11 03 01 021 10 04 01 021 03 01 09	Performance Engine fuel system Carburettor: design, operation, degraded modes of operation, indications and warnings Mixture
021 11 00 00 to 021 11 01 04	Turbine engines
021 13 00 00	Oxygen systems
032 03 00 00	**Performance class B: ME aeroplanes**
032 03 03 01 032 03 03 02 032 03 03 04 032 01 03 00 032 01 04 00 032 01 05 00 032 02 04 00	Take-off Climb Landing Level flight, range and endurance Climbing Descending Climb, cruise and descent
040 00 00 00	**HUMAN PERFORMANCE**
040 02 01 00 to 040 02 01 03	Basic human physiology and High-altitude environment
050 00 00 00	**METEOROLOGY**
050 02 07 00 050 02 05 00	Jet streams Standing waves
050 09 01 00 to 050 09 04 05	Flight hazards Icing and turbulence Thunderstorms
062 03 00 00	**Basic radar principles**
062 03 00 01 to 062 03 04 00	Basic radar principles Airborne radar SSR
081 00 00 00	**PRINCIPLES OF FLIGHT: AEROPLANES**
081 02 01 00 081 02 02 00 081 02 03 00	Speeds Shock waves Effects of exceeding M_{CRIT}

FOR IFR OPERATIONS

Subject ref.:	Syllabus content:
010 00 00 00	**AIR LAW**
010 06 07 00	Simultaneous operation on parallel or near-parallel instrument runways
010 06 08 00	Secondary surveillance radar (transponder) operating procedures
022 00 00 00	**AIRCRAFT GENERAL KNOWLEDGE - INSTRUMENTATION**
022 01 02 00	Temperature sensing
022 03 04 00	Flux valve
022 12 00 00	**ALERTING SYSTEMS, PROXIMITY SYSTEMS**
022 12 07 00	Altitude alert system
022 12 08 00	Radio-altimeter
022 12 10 00	ACAS/TCAS principles and operation
022 13 03 01	Electronic flight instrument system (EFIS) — Design, operation
050 00 00 00	**METEOROLOGY**
050 02 06 03	Clear-air turbulence (CAT) - Description, cause and location
050 10 02 03	Upper-air charts
062 00 00 00	**RADIO NAVIGATION**
062 02 05 04	ILS — Errors and accuracy

(d) Demonstration of acquisition of this knowledge is undertaken by passing an examination set by an ATO. A successful pass of this examination results in the issue of a certificate indicating that the course and examination have been completed.

(e) The certificate represents a ‘once only’ qualification and satisfies the requirement for the addition of all future high performance aeroplanes to the holder’s licence. The certificate is valid indefinitely and is to be submitted with the application for the first HPA type or class rating.

(f) A pass in any theoretical knowledge subjects as part of the HPA course will not be credited against meeting future theoretical examination requirements for issue of a CPL(A), IR(A) or ATPL(A).

(g) The applicant who has completed a competency-based modular IR(A) course according to Appendix 6 Aa needs to complete both VFR and IFR parts of this course.

(h) The applicant who has completed a modular IR(A) course according to Appendix 6 A only needs to complete the VFR part of this course.

AMC2 FCL.720.A(b)(2)(i) Experience requirements and prerequisites for the issue of class or type ratings – aeroplanes

ADDITIONAL THEORETICAL KNOWLEDGE FOR A CLASS OR TYPE RATING FOR HIGH-PERFORMANCE SINGLE-PILOT (SP) AEROPLANES

An applicant for an additional class or type rating for a single-pilot aeroplane classified as a high performance aeroplane (HPA), who:

(a) has held a single-pilot HPA class or type rating prior to 2014; and

(b) has completed a competency-based modular IR(A) course according to Appendix 6 Aa; and

(c) does not fulfil the requirements of FCL.720.A (b)(2)(ii) or (iii); should pass the theoretical knowledge instruction and examination for the VFR and IFR parts of the course required in accordance with FCL.720.A.(b)(2)(i).

AMC1 FCL.725.A(b) Theoretical knowledge and flight instruction for the issue of class and type ratings – aeroplanes

CLASS RATING SEA

(a) The theoretical knowledge instruction should be conducted by an instructor having appropriate experience of class rating sea.

(b) Depending on the equipment and systems installed, the instruction should include, but not be limited to, the following content:

(1) theoretical knowledge:

(i) the aim of the training is to teach:

(A) the importance of preparation for flight and the safe planning taking into consideration all the factors for manoeuvring the aircraft on the wind, tidal currents, high and low water times and water movements at sea, river estuaries and lakes In addition, icing conditions, ice covered water and broken ice flows;

(B) the techniques about the most critical moments at take-off, landing, taxiing and mooring the aircraft;

(C) the construction methods and characteristics of floats and water rudders and the importance of checking for leaks in the floats;

(D) the necessary requirements for the compliance of the rules for the avoidance of collisions at sea, in regard to sea charts, buoys and lights and horns.

(ii) after completing the training, the student should be able to:

(A) describe the factors that have significance for planning and decision about initiation of seaplane flying and alternative measures for completion of flight;

(B) describe how the water level is affected by air pressure, wind, tide, regularisations and the flight safety depending on changes in the water level;

(C) describe the origin of different ice conditions in water areas;

(D) interpret nautical charts and maps about depths and shoals and risk for water currents, shifts of the wind, turbulence;

(E) decide what required equipment to bring during seaplane flying according to the operational requirements;

(F) describe the origin and extension of water waves, swells and water currents and their effect on the aeroplane;

(G) describe how water and air forces effect the aeroplane on water;

(H) describe the effect of water resistance on the aeroplanes' performance on glassy water and during different wave conditions;

(I) describe the consequences of taxiing with too high engine RPM;

(J) describe the effect of pressure and temperature on performance at take-off and climb from lakes located at higher altitude;

(K) describe the effect of wind, turbulence, and other meteorological conditions of special importance for flight over lakes, islands in mountain areas and other broken ground;

(L) describe the function of the water rudder and its handling, including the effect of lowered water rudder at take-off and landing;

(M) describe the parts of the float installation and their function;

(N) describe the effect of the floats on the aeroplanes' aerodynamics and performance in water and in air;

(O) describe the consequences of water in the floats and fouling of float bottoms;

(P) describe aviation requirements that apply specifically for the conduct of aircraft activity on water;

(Q) describe requirements about animal, nature and environment protection of significance for flight by seaplane, including flight in national parks;

(R) describe the meaning of navigation buoys;

(S) describe the organisation and working methods of the Sea Rescue Service;

(T) describe the requirements in ICAO Annex 2 as set out in paragraph 3.2.6 'Water operation', including relevant parts of the Convention on the International Regulations for Preventing Collisions at Sea.

(2) practical training:

(i) the aim of the practical training is to learn:

(A) the skills in manoeuvring aeroplanes on water and in mooring the aeroplane;

(B) the skills required for the reconnaissance of landing and mooring areas from the air, including the take-off area;

(C) the skills for assessing the effects of different water depths, shoals, wind, height of waves and swell;

(D) the skills for flying with floats about their effect on performance and flight characteristics;

(E) the skills for flying in broken ground during different wind and turbulence conditions;

(F) the skills for take-off and landing on glassy water, different ° of swell and water current conditions.

(ii) after the training, the student should be able to:

(A) handle the equipment that shall be brought during seaplane flying;

(B) perform pre-flight daily inspection on aeroplane, float installation and special seaplane equipment, including emptying of floats;

(C) sail, taxi and turn the aeroplane at swell with correct handling of the water rudder;

(D) taxi on the step and perform turns;

(E) establish the wind direction with the aeroplane;

(F) take necessary actions if loss of steering ability and person falling overboard;

(G) make land and moor aeroplane at bridge, buoy and beach with the use of appropriate knots to secure the aircraft;

(H) maintain given rate of descent by means of variometer only;

(I) perform take-off and landing on glassy water with and without outer references;

(J) perform take-off and landing under swell;

(K) perform power-off landing;

(L) from the air, reconnaissance of landing, mooring and takeoff areas, observing;

(M) wind direction and strength during landing and take-off;

(N) surrounding terrain;

(O) overhead wires and other obstacles above and under water;

(P) congested areas;

(Q) determine wind direction and assess wind strength from water level and when airborne;

(R) state, for the aeroplane type in question;

(a) maximum wave height allowed;

(b) maximum number of ERPM allowed during taxi;

(S) describe how flying with floats affects the performance and flight characteristics of the aeroplane;

(T) take corrective action at critical moments due to wind shear and turbulence;

(U) navigate on the water with reference to buoys markers, obstacles and other traffic on the water.

(c) For the initial issue of class rating sea for SP, SE and ME aeroplanes, the number of multi-choice questions in the written or computer-based examination should at least comprise thirty questions, and may be conducted by the training organisation. The pass mark should be 75 %.

AMC1 FCL.735.A; FCL.735.H; FCL.735.As Multi-crew cooperation (MCC) training course

(a) Competency is a combination of knowledge, skills and attitudes required to perform a task to the prescribed standard.

(b) The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multicrew aircraft.

(c) Training should comprise both theoretical and practical elements and be designed to achieve the competencies/training objectives (see Table 1 below).

Table 1 — Competencies/training objectives

Competency / objective	Performance indicators	Knowledge	Practical exercises
Communication	(a) Know what, how much and who to communicate to; (b) Ensure the recipient is ready and able to receive the information; (c) Pass messages and information clearly, accurately, timely and adequately; (d) Check if the other person has the correct understanding when passing important information; (e) Listen actively, patiently and demonstrate understanding when receiving information; (f) Ask relevant and effective questions, and offer suggestions;	(a) Human Factors, TEM and CRM; (b) Application of TEM and CRM principles to training.	In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following: (a) Pre-flight preparation: (1) FMS initialisation; (2) radio and navigation equipment preparation; (3) flight documentation; (4) computation of take-off performance data. (b) Take-off and climb: (1) before take-off checks; (2) normal take-offs; (3) rejected take-offs;

Table 1 — Competencies/training objectives

Competency / objective	Performance indicators	Knowledge	Practical exercises
	(g) Use appropriate body language, eye contact and tone; (h) Open and receptive to other people's view.		(4) take-offs with abnormal and emergency situations included. (c) Cruise: emergency descent.
Leadership and team working	(a) Friendly, enthusiastic, motivating and considerate of others; (b) Use initiative, give direction and take responsibility when required; (c) Open and honest about thoughts, concerns and intentions; (d) Give and receive criticism and praise well, and admit mistakes; (e) Confidently do and say what is important to him or her; (f) Demonstrate respect and tolerance towards other people; (g) Involve others in planning and share activities fairly.		(d) Descent and approach: (1) instrument flight procedures; (2) holding; (3) 3D Operations using raw data; (4) 3D Operations using flight director; (5) 3D Operations using autopilot; (6) one-engine-inoperative approach; (7) 2D Operations and circling; (8) computation of approach and landing data; (9) all engines go-around; (10) go-around with one engine inoperative;
Situational awareness	(a) Be aware of what the aircraft and its systems are doing; (b) Be aware of where the aircraft is and its environment; (c) Keep track of time and fuel; (d) Be aware of the condition of people involved in the operation including passengers; (e) Recognise what is likely to happen, plan and stay ahead of the game; (f) Develop what-if scenarios and make pre-decisions;		(11) wind shear during approach. (e) landing: transition from instrument to visual flight on reaching decision altitude or height or minimum descent altitude or height; (f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
	(g) Identify threats to the safety of the aircraft and of the people.		
Workload management	(a) Be calm, relaxed, careful and not impulsive; (b) Prepare, prioritise and schedule tasks effectively; (c) Use time efficiently when carrying out tasks; (d) Offer and accept assistance, delegate when necessary and ask for help early; (e) Review and monitor and cross-check actions conscientiously; (f) Follow procedures appropriately and consistently; (g) Concentrate on one thing at a time, ensure tasks are completed and does not become distracted; (h) Carry out instructions as directed.		
Problem-solving and decision-making	(a) Identify and verify why things have gone wrong and do not jump to conclusions or make assumptions; (b) Seek accurate and adequate information from appropriate resources; (c) Persevere in working through a problem; (d) Use and agree an appropriate decision making process; (e) Agree essential and desirable criteria and prioritises; (f) Consider as many options as practicable; (g) Make decisions when they need to, reviews and changes if required;		

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
	(h) Consider risks but do not take unnecessary risks.		
Monitoring and cross-checking	(a) Monitor and cross-checks all actions; (b) Monitor aircraft trajectory in critical flight phases; (c) Take appropriate actions in response to deviations from the flight path.	(a) SOPs; (b) Aircraft systems; (c) Undesired aircraft states.	
Task sharing	(a) Apply SOPs in both PF and pilot monitoring (PM) roles; (b) Makes and responds to standard call-outs.	(a) PF and PM roles; (b) SOPs.	
Use of checklists	Utilise checklists appropriately according to SOPs.	(a) SOPs; (b) Checklist philosophy.	
Briefings	Prepare and deliver appropriate briefings.	(a) SOPs; (b) Interpretation of FMS data and in-flight documentation.	
Flight management	(a) Maintain a constant awareness of the aircraft automation state; (b) Manage automation to achieve optimum trajectory and minimum workload; (c) Take effective recovery actions from automation anomalies; (d) Manage aircraft navigation, terrain clearance; (e) Manage aircraft fuel state and take appropriate actions.	(a) Understanding of aircraft performance and configuration; (b) Systems; (c) SOPs; (d) Interpretation of FMS data and in-flight documentation; (e) Minimum terrain clearance; (f) Fuel management IFR and VFR regulation.	
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs;	

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
		(c) Automation.	
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and emergency operations	(a) Perform and monitor abnormal systems operation in accordance with SOPs; (b) Utilise electronic and paper abnormal checklists in accordance with SOPs.	(a) Systems; (b) SOPs; (c) Emergency and abnormal procedures and checklists; (d) Recall items.	
Environment, weather and ATC	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	

CERTIFICATE OF COMPLETION FORM

CERTIFICATE OF COMPLETION OF MCC				
Applicant's last name(s):			First name(s):	
Type of licence:			Number:	State:
ME/IR training completed		**OR**	ME/IR validity date: ME/IR skill test date:	
Issued on:			passed on:	
	Signature of applicant:			

The satisfactory completion of MCC-Training according to requirements is certified below:

TRAINING			
Multi-crew co-operation training received during period:			
from:	to:	at:	ATO / operator*
Location and date:		Signature of head of ATO or authorised instructor*:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

** Delete as appropriate*

AMC2 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes

ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) COURSE

(a) The APS MCC training course should comprise both theoretical and practical elements and should be designed to achieve the training objectives, as set out in Table 1 below.

<table>
<tr><th colspan="4">Table 1 — Training objectives</th></tr>
<tr><th>Training objectives</th><th>Performance indicators</th><th>Knowledge</th><th>Practical exercises</th></tr>
<tr><td>Monitoring and cross-checking</td><td>(a) Monitor and cross-check all actions;
(b) Monitor aeroplane trajectory in critical flight phases;
(c) Take appropriate actions in response to deviations from the flight path.</td><td>(a) SOPs;
(b) Aeroplane systems;
(c) Undesired aeroplane states.</td><td rowspan="5">In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following:
(a) Pre-flight preparation:
(1) FMS initialisation;
(2) radio and navigation equipment preparation;
(3) flight documentation;
(4) computation of take-off performance data.
(b) Take-off and climb:
(1) before take-off checks;
(2) normal take-offs;
(3) rejected take-offs;
(4) take-offs with abnormal and emergency situations included.
(c) Cruise: emergency descent.
(d) Descent and approach:
(1) instrument flight procedures;
(2) holding;
(3) 3D Operations using raw data;</td></tr>
<tr><td>Task sharing</td><td>(a) Apply SOPs in both PF and PM roles;
(b) Make and respond to standard call-outs.</td><td>(a) PF and PM roles;
(b) SOPs.</td></tr>
<tr><td>Use of checklists</td><td>Utilise checklists appropriately according to SOPs.</td><td>(a) SOPs;
(b) Checklist philosophy.</td></tr>
<tr><td>Briefings</td><td>Prepare and deliver appropriate briefings.</td><td>(a) SOPs;
(b) Interpretation of FMS data and in-flight documentation.</td></tr>
<tr><td>Flight management</td><td>(a) Maintain a constant awareness of the aeroplane automation state;
(b) Manage automation to achieve optimum trajectory and minimum workload;
(c) Take effective recovery actions from automation anomalies;
(d) Manage aeroplane navigation, terrain clearance;
(e) Manage aeroplane fuel state and take appropriate actions.</td><td>(a) Understandin g of aeroplane performance and configuration;
(b) Systems;
(c) SOPs;
(d) Interpretation of FMS data and in-flight documentation;
(e) Minimum terrain clearance;
(f) Fuel management IFR and VFR regulation.</td></tr>
</table>

Table 1 — Training objectives			
Training objectives	**Performance indicators**	**Knowledge**	**Practical exercises**
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs; (c) Automation.	(4) 3D Operations using flight director; (5) 3D Operations using autopilot; (6) one-engine-inoperative approach; (7) 2D Operations and circling; (8) computation of approach and landing data; (9) all engines go-around; (10) go-around with one engine inoperative; (11) wind shear during approach. (e) landing: transition from instrument to visual flight on reaching decision altitude or height or minimum descent altitude or height; (f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and emergency operations	(a) Perform and monitor abnormal systems operation in accordance with SOPs; (b) Utilise electronic and paper abnormal checklists in accordance with SOPs.	(a) Systems; (b) SOPs; (c) Emergency and abnormal procedures and checklists; (d) Recall items.	
Environment, weather and air traffic control (ATC)	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	

(b) The APS MCC training course should include advanced swept-wing jet aeroplane training and airline operations scenario training to equip a pilot with the knowledge, skills, and attitudes required to commence initial type rating training to the standards generally required by a commercial air transport (CAT) operator certified pursuant to MCAR-Air Operations.

(c) The APS MCC course should consist of the following:

(1) the content of the MCC training course;

(2) advanced swept-wing jet aeroplane training;

(3) advanced airline operations scenario training; and

(4) a final assessment.

(d) The flight simulation training device (FSTD) time per crew during practical training should be a minimum of 40 hours, or 35 for an integrated airline transport pilot licence (ATPL) holders, as set out in Table 2 below.

Table 2 — Minimum hours	
Training element	**Minimum FSTD time per crew**
MCC TRAINING	20 hours/15 hours
ADVANCED SWEPT-WING JET AEROPLANE TRAINING	12 hours
ADVANCED AIRLINE OPERATIONS SCENARIO TRAINING	6 hours
FINAL ASSESSMENT	2 hours

The training elements may be ordered, split and combined, as determined by the approved training organisation (ATO)'s course design.

(e) The ATO should provide generic stand-alone or CAT-operator-specific APS MCC training, advanced swept-wing jet aeroplane training and advanced airline operations scenario training. In the case of generic stand-alone training, the ATO should establish appropriate documentation and manuals representative of a CAT operator, such as manuals for aeroplane original-equipment manufacturers (OEMs), standard operating procedures (SOPs), flight documentation, as well as reporting and documentation for management systems.

FSTDs

(f) The practical training in the APS MCC training course should be based on a multi-pilot, multi-engine aeroplane type capable of carrying at least 50 passengers or equivalent mass. The FSTD used should be type-specific and equipped with a visual system that provides at least 180° horizontal and 40° vertical field of view. However, an FNPT II MCC that has a similar visual cueing system to the above or is approved for MCC pursuant to FCL.735.A may also be acceptable provided that the device is representative of the same class of multi-pilot, multi-engine aeroplane specified in this paragraph in terms of passenger load, mass and performance, and equipped with equivalent aeroplane systems and avionics functionality.

(g) In the case of advanced swept-wing jet aeroplane practical training, an FSTD representing a swept-wing multi-engine jet aeroplane should be used.

INSTRUCTOR QUALIFICATION

(h) The minimum qualification level of an instructor to deliver the training course should be an MCCI(A). The ATO should ensure that:

(1) all the instructors, before delivering the training course content, have received training on the application of core competencies as well as competency-based training; and

(2) before the MCCI(A) delivers the advanced swept-wing jet handling or airline operations scenario training elements, they have satisfactorily completed relevant specific handling, systems and technical instructor training under the

supervision of an SFI or TRI with the privilege to instruct for multi-pilot aeroplanes.

(i) The final assessment should be completed by an instructor nominated by the head of training (HT) for this purpose.

COURSE DESIGN AND CORE COMPETENCIES

(j) The course should be designed using instructional systems design (ISD) methodology.

(k) Progress should be monitored throughout the course in accordance with the course design.

(l) A final progress assessment should be conducted at the end of the practical training.

PROGRESS ASSESSMENTS AND COURSE COMPLETION CERTIFICATE

(m) Practical training and progress assessments should be conducted to ensure that the student pilot has demonstrated the required level of competency (see Tables 1, 2, 3, 4 and 5 of this AMC).

(n) During progress assessments, the student's knowledge, skills and attitudes in both pilot flying and pilot monitoring roles should be assessed; those assessments should be integrated into the training sessions.

(o) All assessments should be graded. An example of a grading system for the APS MCC is provided in GM3 FCL.735.A.

(p) For the final assessment, the minimum standard for each competency should be at least 'satisfactory'. 'Satisfactory' is defined as demonstrating 75 % or greater of the relevant performance indicators/observable behaviours set out in the table of GM3 FCL.735.A.

(q) A student pilot who has reached a satisfactory or higher standard at the final assessment of the practical training should be awarded the APS MCC course completion certificate pursuant to AMC2 FCL.735.A.

(r) Alternatively, a student pilot who completes the APS MCC course but does not achieve the APS MCC standard should be awarded the MCC course completion certificate pursuant to AMC1 FCL.735.A; FCL.735.H; FCL.735.As.

APS MCC TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS

(s) The elements of AMC1 FCL.735.A(c) should be enhanced as a result of the additional training in an airline context.

(t) CRM training should be provided to an APS MCC standard.

Table 3 — APS MCC CRM TRAINING CONTENT AND PERFORMANCE INDICATORS			
Training	**Performance indicators**	**Knowledge**	**Practical exercises**
CRM training	(a) Display competency in the relevant CRM-related behaviours. (b) Successfully complete the final progress check.	Understand the CRM concepts set out in ORO.FC.115 of Annex III (Part-ORO) to the Air OPS Regulation.	Integrate CRM into all practical exercises of the APS MCC.

(1) The ATO should ensure that the student pilot understands how multi-crew coordination as well as the content and intent of CRM in ORO.FC.115 is applied in an airline context.

(2) In order to impart maximum learning to the student pilot, the ATO should ensure the following:

(i) CRM is integrated into all practical exercises of the APS MCC; and

(ii) Threat-and-error management (TEM) is central to the course instruction; the concepts of threat anticipation, threat recognition, recovery to safe flight, error management, and consequent avoidance of undesired aeroplanes states is emphasised at all times.

Table 4 — ADVANCED APS MCC FLYING TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS			
Training	**Performance indicators**	**Knowledge**	**Practical exercises**
Advanced swept-wing flying training	(a) Understand and apply combinations of thrust and attitude that ensure a stable, safe flight in various aeroplane configurations and altitudes. (b) Manage the (much) wider range of speed and thrust at both low level and high level. (c) Demonstrate good judgement and correct use of lift and drag devices during various phases of the flight. (d) Use displays along with all available aids to stay mentally ahead when piloting all profiles. (e) Understand and recognise the precursors of high-energy approaches.	Elements and components of jet orientation: (a) glass cockpit displays; (b) propulsion; (c) aerodynamics; (d) flight controls; (e) performance; (f) jet flight planning; (g) weight and balance; (h) basic jet flying; (i) pilot techniques for jet flying, advanced-handling-skills development; (j) flight path management;	(a) Take-off, approach, landing, go-around. (b) Flight deck management practices. (c) Complex problem-solving techniques. (d) Advanced handling. (e) Manual handling skills (no autopilot, no auto thrust, and where possible, no flight director). (f) Flight at different speeds, including slow flight and altitudes within the normal flight envelope. (g) Steep turns. (h) Aeroplane stability and stall awareness. (i) Upset prevention techniques and approach-to-stall recovery events (appropriate to FSTD

Table 4 — ADVANCED APS MCC FLYING TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS			
Training	**Performance indicators**	**Knowledge**	**Practical exercises**
	(f) Know angle-of-attack (AoA) versus attitude indications at low level as well as at high level. (g) Practice upset prevention as a priority, and clearly recognise when and how recovery is necessary, by using the required pilot skills to mitigate loss of control in-flight (LOC-I) events.	(k) auto flight; (l) high-altitude operations; (m) introduction into prevention and recovery of upsets.	limitations and capabilities). (j) High-energy approach prevention. (k) Go-around management of approach and landing configurations.

Table 4 — ADVANCED APS MCC FLYING TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS

Training	Performance indicators	Knowledge	Practical exercises
Advanced airline operations scenario training	(a) Execute pre-flight preparation in accordance with airline or OEM SOPs. (b) Conduct an effective crew briefing, including cabin crew managers (CCMs). (c) Display good airmanship and TEM skills in assessing aeroplane serviceability, weather planning, fuel planning, and destination facilities. (d) Conduct cockpit preparation and briefings in an effective and accurate manner. (e) Manage and execute engine start, taxi-out and pre-take-off checks safely and in accordance with airline or OEM SOPs. (f) Manage and execute runway line-up, take-off, climb, cruising, descent, approach, landing and taxi-in safely and in accordance with airline or OEM SOPs. (g) During non-normal operations, display good system knowledge, and apply non- normal procedures, communications, TEM, situational awareness (SA), decision-making and aeroplane handling.	(a) Knowledge of systems as set out in this AMC. (b) SOPs. (c) Normal-and non-normal operations' checklists and procedures.	(a) CHECK-IN PROCEDURES. (b) PRE-FLIGHT PREPARATION: (1) weather analysis; (2) flight planning; (3) fuel planning; (4) configuration deviation list (CDL), dispatch deviation procedures guide (DDPG), and minimum equipment list (MEL) analysis; and (5) cabin crew briefing. (c) NORMAL PROCEDURES: cockpit preparation, pushback, engine starting, taxiing, take-off, climb, cruising, descent, landing, shutdown, and disembarkation procedures. (d) ON TIME PERFORMANCE: (1) weather analysis; (2) flight planning; and (3) fuel planning. (e) NON-NORMAL PROCEDURES: (1) as per (c) above, in case of a technical or operational non-normal event; (2) TEM; (3) diversion decision-making; (4) communication; (5) diversion; (6) fuel SA; and (7) passenger and crew care.

Table 5 — ADVANCED APS MCC AIRLINE TRAINING CONTENT AND PERFORMANCE INDICATORS

Training	Performance Indicators	Knowledge	Practical Exercises
Airline-oriented training	(a) Understand the roles of airline departments. (b) Understand the challenges faced by airline departments. (c) Understand the relationships between airline departments. (d) Understand airline responsibilities. (e) Understand a pilot's responsibilities as a crew member.	Appropriate elements of the applicable Regulation 'Aircrew Regulation') and the Air OPS Regulation).	The exercise should provide the student pilot with a practical understanding of airline operations. This may be achieved through a visit to an airline or alternative means.

CERTIFICATE OF COMPLETION FORM

CERTIFICATE OF COMPLETION OF APS MCC-TRAINING				
Applicant's last name(s):			First name(s):	
Type of licence:			Number:	State:
ME/IR:		**OR**	ME/IR skill test:	
Issued on:			passed on:	
	Signature of applicant:			

The satisfactory completion of APS MCC training according to requirements is certified below:

TRAINING			
Multi-crew cooperation training to airline pilot standards received during period:			
from:	to:	at:	ATO/operator*
Location and date:		Signature of head of ATO or authorised instructor*:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

** Delete as appropriate*

GM1 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes

ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) COURSE

(a) The ATO should be responsible for the initial course design based on the instructional systems design (ISD) methodology, as well as for the integral evaluation and further development of the course.

(b) Technical-knowledge instruction

To maximise the benefit during the training in a flight simulation training device (FSTD), it is essential that the student pilot understands the aeroplane systems. Consequently, the approved training organisation (ATO) should provide sufficient systems training to ensure that student pilots are capable of effective situational awareness (SA) of the aeroplane systems when following normal and non-normal procedures and completing the related checklists. The standard of technical-knowledge training should be limited to this goal unless the course is part of a combined APS MCC/type rating course. ATOs providing APS MCC training in a combined APS MCC/type rating course may provide systems training up to type rating standard.

Aeroplane systems training may be delivered by any means provided that the training ensures knowledge transfer to a standard within the scope of the ATO's APS MCC training course approval. This training may be delivered either through distance learning or instructor-led classroom instruction or a combination thereof. If distance learning is utilised as an element of the course, it should be supplemented by instructor-led training.

Aeroplane systems knowledge at the required level should be confirmed by an assessment determined by the ATO's course design.

(c) Advanced swept-wing jet flying training (see Table 4 of AMC2 FCL.735.A)

The student pilot should develop a flight path management competency, including energy management, as pilot flying (PF), and associated active monitoring skills as pilot monitoring (PM). Aeroplane and airline procedures used during this training should develop the student pilot's understanding of the aeroplane flight envelope and inertia, as well as of the relationship between thrust and attitude. This phase should include an introduction to prevention and recovery of upsets, which builds confidence, skill, and resilience.

(d) Advanced airline operations scenario training (see Table 4 of AMC2 FCL.735.A)

(1) The student pilot should be trained to apply the core competencies to conduct a safe and efficient operation in realistic airline operations scenarios.

(2) The airline-representative scenarios should include normal and non-normal situations.

(3) Operations should be run in real time according to a typical schedule.

(4) The scenarios should be constructed in an airline context in order to emphasise the following:

(i) threat-and-error management (TEM);

(ii) crew resource management (CRM);

(iii) flight path management, including energy management; and

(iv) interaction with internal and external stakeholders in the resolution of scenarios.

(e) Airline-oriented training (see Table 5 of AMC2 FCL.735.A)

The training should provide an understanding of the regulatory framework that an airline must operate in. The student pilot should understand the context and operational environment that applies to airline employees. Subjects should include but are not limited to the following:

(1) regulation of operations and aircrew;

(2) safety management systems (SMSs) with emphasis on the pilot's reporting obligations and 'just culture';

(3) fatigue management and fatigue risk management system (FRMS) with emphasis on the airline's and pilot's obligations;

(4) flight time limitations (FTLs), including crew scheduling and crew control functions;

(5) flight operations planning and flight watch reporting systems;

(6) airline maintenance department and interaction with flight operations;

(7) ground operations and interaction with flight operations; and

(8) in-flight department and interaction with flight operations.

GM2 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes

ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) COURSE

The approved training organisation (ATO) should ensure that their course design develops the required core competencies through their training and assessment plan based on the competency framework provided in Table 1 below. An ATO may adapt this framework to include additional competencies and/or performance indicators/observable behaviours

Table 1 — COMPETENCIES

Competency	Description	Performance indicators/observable behaviours
Application of knowledge	Relates and applies relevant knowledge in the operational environment and in scenario settings.	– Demonstrates the acquisition and retention of required aviation knowledge; – Relates knowledge between subject areas; – Applies knowledge to the operational environment; – Correctly identifies threats and errors in a timely manner;

Table 1 — COMPETENCIES

Competency	Description	Performance indicators/observable behaviours
		– Uses knowledge to create valid options of managing threats, errors, and undesirable aeroplane states; – Mentally resolves basic-mathematics problems relating to operational situations, both under normal circumstances and under pressure; – Shares knowledge with others openly and constructively, as and when appropriate.
Application of regulations and procedures	Identifies and applies appropriate procedures in accordance with published operating instructions and pursuant to applicable regulations.	– Identifies where to find the information; – Follows standard operating procedures (SOPs) unless a higher degree of safety dictates an appropriate deviation therefrom; – Follows all operating instructions in a timely manner; – Correctly operates aeroplane systems and associated equipment; – Monitors the status of aeroplane systems; – Complies with applicable regulations; – Applies relevant procedural knowledge.
Communication	Communicates through appropriate means in normal and non-normal situations.	– Ensures that the recipient is ready and able to receive the information; – Shares appropriate information; – Selects appropriately what, when, how, and with whom to communicate; – Conveys messages clearly, accurately, and concisely; – Confirms that the recipient correctly understands important information; – Listens actively and demonstrates understanding when receiving information; – Asks relevant and effective questions; — Communicates in order to resolve deviations identified through monitoring; – Adheres to standard radiotelephony phraseology and procedures; – Accurately reads, interprets, drafts, and responds to data link messages in English; – Correctly uses and interprets non-verbal communication.
Aeroplane flight path management — automation	Controls the aeroplane flight path through automation.	– Uses appropriate flight management and guidance systems as well as automation, as installed and as appropriate to the conditions; – Monitors and detects deviations from the desired aeroplane trajectory and takes appropriate action; – Manages the flight path to optimise the operational performance;

Table 1 — COMPETENCIES		
Competency	**Description**	**Performance indicators/observable behaviours**
		– Maintains the desired flight path during flight using automation, whilst managing other tasks and distractions; – Effectively monitors automation, including engagement and automatic-mode transitions.
Aeroplane flight path management — manual control	Controls the aeroplane flight path through manual flight.	– Uses appropriate flight management and guidance systems and automation, as installed and appropriate to the conditions; – Manually controls the aeroplane using only the relationship between aeroplane attitude, speed and thrust, as well as navigation signals or visual information; – Monitors and detects deviations from the desired aeroplane trajectory and takes appropriate action; – Manages the flight path to optimise the operational performance; – Maintains the desired flight path during manual flight, whilst managing other tasks and distractions; – Effectively monitors flight guidance systems, including engagement and automatic-mode transitions.
Leadership and teamwork	Influences others so that they contribute to a shared purpose. Collaborates to accomplish the goals of the team.	– Creates an atmosphere of open communication and encourages team participation; – Displays initiative and gives directions when required; – Admits mistakes and takes responsibility; – Carries out instructions when directed; – Gives and receives feedback constructively; – Applies effective intervention strategies to resolve deviations identified whilst monitoring; – Takes into account cultural differences; – Engages others in planning; – Addresses and resolves conflicts and disagreements in a constructive manner; – Exercises decisive leadership.
Problem-solving and decision-making	Identifies problem precursors and resolves actual problems, using decision-making techniques, in a timely manner.	– Seeks accurate and appropriate information from appropriate sources; – Identifies and verifies what and why has failed; – Perseveres with resolving problems whilst prioritising safety; – Uses appropriate and timely decision-making techniques; – Sets priorities appropriately;

Table 1 — COMPETENCIES		
Competency	**Description**	**Performance indicators/observable behaviours**
		– Identifies and considers options, as appropriate; – Monitors, reviews, and adapts decisions, as required; – Identifies, assesses, and manages risks effectively; – Adapts when faced with situations where no guidance or procedure exists.
Situational awareness (SA) and information management	Perceives, comprehends, and manages information, as well as anticipates its effect on the operation.	– Monitors, identifies, and assesses accurately the aeroplane's state and systems; – Monitors, identifies, and assesses accurately the aeroplane's energy state and anticipated flight path; – Monitors, identifies, and assesses accurately the general environment as it may affect the operation; – Validates the accuracy of information and checks for gross errors; – Maintains the awareness of the people involved in or affected by the operation as well as their capacity to perform as expected; – Anticipates what could happen, plans, and stays ahead of the situation; – Develops effective contingency plans based upon potential threats; – Recognises and effectively responds to indications of reduced SA.
Workload management	Maintains available workload capacity through prioritisation and distribution of tasks, using resources.	– Exercises self-control in all situations; – Plans, prioritises, and schedules tasks effectively; – Manages time efficiently when carrying out tasks; – Offers and gives assistance, delegates when necessary; – Seeks and accepts assistance, when necessary; – Monitors, reviews, and cross-checks taken action conscientiously; – Verifies that tasks are completed as expected; – Manages and recovers from interruptions, distractions, variations, and failures effectively, while performing tasks.

GM3 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes

EXAMPLE OF AN ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) GRADING SYSTEM

EXAMPLE OF AN APS MCC GRADING SYSTEM					
Competency	**Unsatisfactory**	**Satisfactory**	**Good**	**Very Good**	**Exemplary**
General description of each competency level.	The pilot's performance in this competency was unsatisfactory with a negative effect on safety. The pilot did not demonstrate the majority of the relevant performance indicators.	The pilot's performance in this competency was satisfactory with a slightly positive effect on safety. The pilot demonstrated most of the relevant performance indicators in this competency to at least a satisfactory standard.	The pilot's performance in this competency was effective with a significant contribution to safety. The pilot consistently demonstrated most of the relevant performance indicators in this competency to a good standard.	The pilot's performance in this competency was very effective, which significantly enhanced safety. The pilot regularly demonstrated all of the relevant performance indicators in this competency to a very good standard.	The pilot's performance in this competency was exemplary with an outstanding effect on safety. The pilot always demonstrated all of the relevant performance indicators in this competency to an exemplary standard.
Notes			— Most: 75 % or greater. — Relevant performance indicator: a performance indicator/observable behaviour that is expected to be demonstrated during the assessment.		

GM4 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes

ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) TRAINING — SPECIFIC ARRANGEMENT

The specific arrangement, pursuant to ORA.GEN.205, between an approved training organisation (ATO) and an operator for the APS MCC course should cover at least the following points:

(1) pre-entry requirements (including screening and selection);

(2) provision of the relevant documentation (operations manuals (OMs) and training manuals);

(3) design of the training programme;

(4) content of the course, including criteria to ensure that the operator's documentation, manuals, standard operating procedures (SOPs), reporting structures, and management system are represented throughout the training course;

(5) training effectiveness;

(6) performance data feedback from the ATO to the operator;

(7) course evaluation and improvement;

(8) alignment of the grading and assessment criteria; and

(9) use of the operator's crew resource management (CRM) content and utilisation of a flight crew CRM trainer, standardised by the operator.

The ATO and the operator may use their OMs and training manuals to identify additional areas to be covered by the specific arrangement.

GM1 FCL.740.A Revalidation of class and type ratings — aeroplanes

COMPLETE EBT PRACTICAL ASSESSMENT IN ACCORDANCE WITH APPENDIX 10

(a) The completion of an EBT practical assessment includes:

(1) the assessment of pilot performance either in a simulated or an operational environment; and

(2) the administrative action which includes the completion of the Appendix 10 form.

(b) The assessment as per point (1) usually occurs during the entire validity period of the rating as the EBT programme includes several FSTD sessions, while the administrative action as per point (2) is completed within the 3 months immediately preceding the expiry date of the rating.

AMC1 FCL.740.A(b)(1)(ii) Revalidation of class and type ratings

CONTENT OF THE REFRESHER TRAINING

Training flight items should be based on the exercise items of the proficiency check, as deemed relevant by the instructor, and depending on the experience of the candidate. The briefing should include a discussion on TEM with special emphasis on decision-making when encountering adverse meteorological conditions or unintentional IMC, as well as on navigation flight capabilities.

AMC1 FCL.745.A Advanced UPRT course – aeroplanes

COURSE OBJECTIVE AND CONTENT

COURSE OBJECTIVE

(a) The objective of the course is for the pilot under training:

(1) to understand how to cope with the physiological and psychological aspects of dynamic upsets in aeroplanes; and

(2) to develop the necessary competence and resilience to be able to apply appropriate recovery techniques during upsets.

(b) In order to meet the objective as specified in point (a), the course should:

(1) emphasise physiological and psychological effects of an upset and develop strategies to mitigate those effects;

(2) be delivered in a suitable training aircraft in order to expose trainees to conditions that cannot be replicated in an FSTD; and

(3) employ recovery techniques that are suitable for the aircraft used for training in order to support the training objectives. In order to minimise the risk associated with potential negative transfer of training, the recovery techniques used during the course should be compatible with techniques typically used for transport category aeroplanes.

THEORETICAL KNOWLEDGE

(c) Theoretical knowledge instruction supports the objectives of the course and should include the following:

(1) a review of basic aerodynamics typically applicable to aeroplane upsets in transport category aeroplanes, including case studies of incidents involving potential or actual upsets.

(2) aerodynamics relevant to the aeroplane and exercises used in the practical training, including differences to aerodynamics as referred to in point (1);

(3) possible physiological and psychological effects of an upset, including surprise and startle effect;

(4) strategies to develop resilience and mitigate startle effect; and

(5) memorising the appropriate procedures and techniques for upset recovery.

FLIGHT INSTRUCTION

(d) Flight instruction should include:

(1) exercises to demonstrate:

(i) the relationship between speed, attitude and AoA;

(ii) the effect of g-load on aeroplane performance, including stall events at different attitudes and airspeeds;

(iii) aerodynamic indications of a stall including buffeting, loss of control authority and inability to arrest a descent;

(iv) the physiological effects of different g-loads between -1 and 2.5G; and

(v) surprise and the startle effect;

(2) training in techniques to recover from:

(i) nose high at various bank angles;

(ii) nose low at various bank angles;

(iii) spiral dives;

(iv) stall events; and

(v) incipient spin; and

(3) training to develop resilience and to employ strategies to mitigate the startle effect.

COURSE COMPLETION

(e) The course is considered to have been satisfactorily completed if the trainee is able to successfully:

(1) apply strategies to mitigate psychological and physical effects;

(2) recognise upsets;

(3) apply correct recovery techniques from upset scenarios as specified in point (d)(2).

GM1 FCL.745.A Advanced UPRT course – aeroplanes

UPSET RECOVERY TRAINING EXERCISES

GENERAL

(a) The objective of this GM is to provide instructors with further guidance on the conduct of the various upset recovery exercises, which requires instructor performance beyond that experienced in normal operations.

(b) Instructors should:

(1) ensure that the risk mitigation measures determined by the ATO are strictly adhered to;

(2) continuously assess the performance of the student to ensure that the training objectives of the upset recovery exercises are achieved;

(3) understand that all-attitude/on-aeroplane upset recovery exercises serve primarily as resilience-builder. In other words, the training serves mainly human-factor training objectives and not only flying skills training;

(4) understand the differences between all-attitude UPRT and aerobatics training;

(5) have knowledge and understanding of how:

(i) on-aeroplane and FSTD UPRT complement each other; and

(ii) to ensure that negative transfer of training from small aeroplanes to heavier transport category aeroplanes is avoided. This may be achieved by observing UPRT in an FSTD, especially in a type-specific FFS; and

(6) have knowledge and understanding of the upset prevention theoretical knowledge and flight instruction elements taught during the CPL(A) and ATPL(A) training courses to ensure continuity and consistency in delivering UPRT.

Note: Instructors should be aware that the safety and potential human factor implications of poor upset recovery instructional technique or misleading information are *more significant* than in any other areas of pilot training.

(c) In order to increase the applicant’s resilience related to the handling of aeroplane upsets, the advanced UPRT course needs to include the development of confidence and competence in recognising and recovering safely from upsets under the presence of the real human factors. Such confidence building is specifically addressed by:

(i) successfully overcoming natural stress response (startle and surprise); and

(ii) performing critically important counter-intuitive actions.

Advanced UPRT therefore considers pitch attitudes, bank angles, AOA/airspeeds, sideslip and g-loads, none of which are normally experienced during routine operations.

(d) Aeroplanes used in this course should be:

(1) appropriately certified and operated by the ATO in a manner that takes into account the effects of repeated training manoeuvres on airframe fatigue life; and

(2) provide sufficient safety margins to cater for student and instructor errors.

(e) This course complements UPRT in FSTDs by providing exposure to psycho-physiological conditions, which cannot be delivered by the motion systems of today’s qualified FSTDs. At completion of the course, the student should pilot to be able to:

(1) recognise and confirm the upset-situation;

(2) manage stress response;

(3) apply the correct recovery strategy timely and effectively;

(4) stay within the defined training envelope;

(5) stabilise the flight path after recovery; and

(6) become competent and confident in recovering from upsets.

SPECIFIC EXERCISES

(f) Exercise 1 — Nose HIGH recovery

Exercise 1 Recovery from **Nose HIGH** upsets at various bank angles	
(1) Training objectives	The student pilot should: (i) recognise and confirm the Nose HIGH situation (AOA, attitude, energy, trends); (ii) announce 'Nose High'; and (iii) apply the correct recovery strategy.
(2) Training tasks	The student pilot should: (i) regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) note natural and synthetic indications for AOA, attitude, and energy; (iv) manage human factors, stress response (startle and surprise, counter-intuitive actions); (v) take manual control; (vi) identify and apply the Nose HIGH recovery strategy; (vii) correct any out-of-trim condition; (viii) manage nose-down movement; (ix) manage g-load; (x) use the effects of power to assist nose-down movement; (xi) use bank to orient the lift vector as necessary; (xii) stabilise the flight path after recovery using basic pitch/power settings;
(3) Enabling objectives	The student pilot should: (i) decide if Stall Recovery or Nose HIGH recovery is applicable; (ii) perform control inputs deliberately; (iii) use up to full control deflections; (iv) avoid unnecessary low or high loads; (v) use secondary flight controls (trim/power) as necessary to support primary flight control inputs (i.e. nose-down movement); (vi) apply control inputs in the correct sequence (see Table 1, Nose-HIGH Recovery Strategy); (vii) apply counter-intuitive actions as necessary: (A) unloading; (B) power-reduction in Nose-HIGH attitude (depending on engine mounting); and (C) using bank to orient the lift vector downwards.

Note: Refer to GM1 to Appendix 9, Table 2: Recommended nose-high recovery strategy template.

(g) Exercise 2 — Nose LOW Recovery

Exercise 2 Recovery from **Nose LOW** upsets at various bank angles	
(1) Training objectives	The student pilot should: (i) recognise and confirm the situation (AOA, attitude, energy, trends); (ii) announce 'Nose LOW'; (iii) apply the correct recovery strategy.

(2) Training tasks	The student pilot should: (i) regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) note natural and synthetic indications for AOA, attitude and energy; (iv) manage human factors, stress response (startle and surprise, counter-intuitive actions); (v) take manual control; (vi) identify and apply the Nose LOW recovery strategy; (vii) correct out-of-trim condition; (viii) decide if aircraft is stalled; (ix) manage g-load; (x) identify the correct direction to roll; (xi) roll to wings level to orient the lift vector upwards; (xii) manage power and drag; and (xiii) stabilise the flight path after recovery using basic pitch/power settings.
(3) Enabling objectives	The student pilot should: (i) perform control inputs deliberately; (ii) use up to full control deflections; (iii) avoid unnecessary low or high loads; (iv) apply control inputs in the correct sequence (see Table 2, Nose-LOW Recovery Strategy); and (v) apply counter-intuitive actions as necessary: (A) apply Stall Recovery in nose low attitude first if needed; (B) unloading instead of pulling; (C) unloading to increase roll rate; (D) avoid 'rolling-pull'; and (E) accept the priority of rolling to wings level first, before reducing power and before pulling.

Note: Refer to GM1 to Appendix 9, Table 3: Recommended nose-low recovery strategy template.

(h) Exercise 3 — Recovery from spiral dive

Exercise 3 Recovery from **Spiral Dive**	
(1) Training objectives	The student pilot should: (i) recognise the spiral dive as a result of improper nose-up elevator input during a Nose LOW turning situation; and (i) apply the Nose LOW Recovery Strategy.
(2) Training tasks	The student pilot should: (i) maintain/regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) manage human factors, stress response (startle and surprise, counter-intuitive actions); (iv) take manual control; (v) identify and apply the Nose LOW recovery strategy; and (vi) stabilise the flight path after recovery using basic pitch/power settings.

(3) Enabling objectives	The student pilot should: (i) perform control inputs deliberately and in the correct sequence; (ii) use up to full control deflections, if required; and (iii) apply counter-intuitive actions as necessary: (A) unloading instead of pulling; (B) unloading to increase roll rate; (C) avoid 'rolling-pull'; and (D) accepting the priority of rolling to wings level first, before reducing power and before pulling.

(i) Exercise 4 — Stall Event Recovery

Exercise 4 Recovery from **Stall event**	
(1) Training objectives	The student pilot should: (i) recognise and confirm the situation (AOA, attitude, energy, trends); (ii) announce 'Stall'; (iii) apply the Stall Event Recovery Strategy.
(2) Training tasks	The student pilot should: (i) regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) note natural and synthetic indications for high AOA/stall; (iv) manage human factors, stress response (startle and surprise, counter-intuitive actions); (v) recover from: (A) approach to stall (B) full stall, wings level and during turn (C) slipping stall (D) skidding stall (E) accelerated stall (F) secondary stall (vi) take manual control; (vii) identify and apply the Stall Event Recovery Template or the aircraft manufacturer Stall Recovery SOP; (viii) apply nose-down elevator input to reduce AOA; (ix) manage trim; (x) consider power reduction (if engine mounting induces a nose-up effect); (xi) accept altitude loss; (xii) identify the correct direction to roll to wings level; (xiii) manage power and drag; (xiv) manage g-load and energy to avoid secondary stall; and (xv) stabilise the flight path after recovery using basic pitch/power settings.
(3) Enabling objectives	The student pilot should: (i) perform control inputs deliberately; (ii) use up to full control deflections; (iii) apply control inputs in the correct sequence (see Table 3, Stall Event Recovery Strategy Template); and

	(iv) apply counter-intuitive actions as necessary: (A) unloading to reduce AOA; (B) unloading before rolling; (C) power reduction if necessary; (D) accepting altitude loss; and (E) waiting for airspeed increase before loading again.

Note: Refer to GM1 to Appendix 9, Table 1: Recommended stall event recovery template

(j) Exercise 5 — Recovery from spin

Exercise 5 Recovery from incipient spin	
(1) Training objectives	The pilot should: (i) recognise and confirm the spin (AOA, yaw, attitude, energy, roll, trends); (ii) apply the OEM Incipient Spin Recovery procedure.
(2) Training tasks	The pilot should: (i) be aware of the aircraft response to all possible pitch and roll control inputs and to thrust/power changes during (incipient) spin; (ii) maintain/regain situation awareness; (iii) recognise and analyse AOA, attitude, energy, yaw, roll, trends); (iv) note natural and synthetic indications for high AOA, stall, spin; (v) manage human factors, stress response (startle and surprise, counter-intuitive actions); (vi) take manual control; (vii) identify and apply the OEM Incipient Spin Recovery Procedure; (viii) manage AOA, g-load and energy to avoid secondary stall; and (ix) stabilise the flight path after recovery using basic pitch/power settings.
(3) Enabling objectives	The pilot should: (i) perform control inputs deliberately and in the correct sequence; (ii) use up to full control deflections as required by the procedure; (iii) apply counter-intuitive actions as necessary; (iv) avoid unreflected control inputs; and (v) allow time for control inputs to show results.

(k) Assessment of student performance

By collecting evidence from observable behaviours, the instructor will continuously assess whether the student meets the required competency standards under the given conditions.

Pilot competencies and behavioural indicators in the context of the Advanced UPRT Course
(1) Application of procedures (i) Follows the recommended Nose HIGH or Nose LOW recovery strategy or the Stall Event Recovery Template / STALL RECOVERY SOP (ii) Identifies and follows operating instructions in a timely manner (iii) Correctly operates aircraft systems and equipment (iv) Applies relevant procedural knowledge

(2) Communication

(i) Adheres to callouts

(ii) Verbalises the essential steps during the recoveries

(3) Aeroplane flight path management — automation

Disconnects autopilot and autothrust/autothrottle before initiating the recovery (to be simulated if the training aeroplane is not fitted with autothrust/autothrottle)

(4) Aeroplane flight path management — manual control

(i) Detects deviations from the desired aircraft trajectory and takes appropriate action

(ii) Controls the aircraft using appropriate attitude and power settings

(iii) Contains the aircraft within the defined flight envelope

(5) Leadership and teamwork

(i) Understands and agrees with the crew's roles and objectives

(ii) Uses initiative and gives directions when required

(iii) Admits mistakes and takes responsibility

(iv) Communicates relevant concerns and intentions

(v) Gives and receives feedback constructively

(vi) Projects self-control in all situations

(6) Problem-solving and decision-making

(i) Seeks accurate and adequate information from appropriate sources

(ii) Identifies and verifies what and why things have gone wrong

(iii) Perseveres in working through the event safely

(iv) Sets priorities appropriately

(7) Situation awareness and information management

(i) Identifies and assesses accurately the state of the aircraft and its systems

(ii) Identifies and assesses accurately the aircraft's vertical and lateral position, and its anticipated flight path

(iii) Anticipates accurately what could happen, plans and stays ahead of the situation

(iv) Recognises and effectively responds to indications of reduced situation awareness.

(8) Workload management

(i) Maintains self-control in all situations Manages and recovers from stress response (startle surprise), interruptions, distractions, variations and errors effectively

(ii) Reviews, monitors and cross-checks actions conscientiously

(iii) Verifies that tasks are completed to the expected outcome

(iv) Offers and accepts assistance, delegates when necessary, and asks for help early

(v) Manages and recovers from interruptions, distractions, variations and failures effectively

SECTION 3 – SPECIFIC REQUIREMENTS FOR THE HELICOPTER CATEGORY

AMC1 FCL.735.A; FCL.735.H; FCL.735.As Multi-crew cooperation (MCC) training course

(a) Competency is a combination of knowledge, skills and attitudes required to perform a task to the prescribed standard.

(b) The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multicrew aircraft.

(c) Training should comprise both theoretical and practical elements and be designed to achieve the competencies/training objectives (see Table 1 below).

Table 1 — Competencies/training objectives

Competency / objective	Performance indicators	Knowledge	Practical exercises
Communication	(a) Know what, how much and who to communicate to; (b) Ensure the recipient is ready and able to receive the information; (c) Pass messages and information clearly, accurately, timely and adequately; (d) Check if the other person has the correct understanding when passing important information; (e) Listen actively, patiently and demonstrate understanding when receiving information; (f) Ask relevant and effective questions, and offer suggestions; (g) Use appropriate body language, eye contact and tone; (h) Open and receptive to other people's view.	(a) Human Factors, TEM and CRM; (b) Application of TEM and CRM principles to training.	In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following: (a) Pre-flight preparation: (1) FMS initialisation; (2) radio and navigation equipment preparation; (3) flight documentation; (4) computation of take-off performance data. (b) Take-off and climb: (1) before take-off checks; (2) normal take-offs; (3) rejected take-offs; (4) take-offs with abnormal and emergency situations included.

Table 1 — Competencies/training objectives

Competency / objective	Performance indicators	Knowledge	Practical exercises
Leadership and team working	(a) Friendly, enthusiastic, motivating and considerate of others; (b) Use initiative, give direction and take responsibility when required; (c) Open and honest about thoughts, concerns and intentions; (d) Give and receive criticism and praise well, and admit mistakes; (e) Confidently do and say what is important to him or her; (f) Demonstrate respect and tolerance towards other people; (g) Involve others in planning and share activities fairly.		(c) Cruise: emergency descent. (d) Descent and approach: (1) instrument flight procedures; (2) holding; (3) 3D Operations using raw data; (4) 3D Operations using flight director; (5) 3D Operations using autopilot; (6) one-engine-inoperative approach; (7) 2D Operations and circling; (8) computation of approach and landing data; (9) all engines go-around; (10) go-around with one engine inoperative; (11) wind shear during approach. (e) landing: transition from instrument to visual flight on reaching decision altitude or height or minimum descent altitude or height; (f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.
Situational awareness	(a) Be aware of what the aircraft and its systems are doing; (b) Be aware of where the aircraft is and its environment; (c) Keep track of time and fuel; (d) Be aware of the condition of people involved in the operation including passengers; (e) Recognise what is likely to happen, plan and stay ahead of the game; (f) Develop what-if scenarios and make pre-decisions; (g) Identify threats to the safety of the aircraft and of the people.		
Workload management	(a) Be calm, relaxed, careful and not impulsive; (b) Prepare, prioritise and schedule tasks effectively;		

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
	(c) Use time efficiently when carrying out tasks; (d) Offer and accept assistance, delegate when necessary and ask for help early; (e) Review and monitor and cross-check actions conscientiously; (f) Follow procedures appropriately and consistently; (g) Concentrate on one thing at a time, ensure tasks are completed and does not become distracted; (h) Carry out instructions as directed.		
Problem-solving and decision-making	(a) Identify and verify why things have gone wrong and do not jump to conclusions or make assumptions; (b) Seek accurate and adequate information from appropriate resources; (c) Persevere in working through a problem; (d) Use and agree an appropriate decision making process; (e) Agree essential and desirable criteria and prioritises; (f) Consider as many options as practicable; (g) Make decisions when they need to, reviews and changes if required; (h) Consider risks but do not take unnecessary risks.		
Monitoring and cross-checking	(a) Monitor and cross-checks all actions; (b) Monitor aircraft trajectory in critical flight phases;	(a) SOPs; (b) Aircraft systems; (c) Undesired aircraft states.	

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
	(c) Take appropriate actions in response to deviations from the flight path.		
Task sharing	(a) Apply SOPs in both PF and pilot monitoring (PM) roles; (b) Makes and responds to standard call-outs.	(a) PF and PM roles; (b) SOPs.	
Use of checklists	Utilise checklists appropriately according to SOPs.	(a) SOPs; (b) Checklist philosophy.	
Briefings	Prepare and deliver appropriate briefings.	(a) SOPs; (b) Interpretation of FMS data and in-flight documentation.	
Flight management	(a) Maintain a constant awareness of the aircraft automation state; (b) Manage automation to achieve optimum trajectory and minimum workload; (c) Take effective recovery actions from automation anomalies; (d) Manage aircraft navigation, terrain clearance; (e) Manage aircraft fuel state and take appropriate actions.	(a) Understanding of aircraft performance and configuration; (b) Systems; (c) SOPs; (d) Interpretation of FMS data and in-flight documentation; (e) Minimum terrain clearance; (f) Fuel management IFR and VFR regulation.	
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs; (c) Automation.	
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and	(a) Perform and monitor abnormal systems	(a) Systems; (b) SOPs;	

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
emergency operations	operation in accordance with SOPs; (b) Utilise electronic and paper abnormal checklists in accordance with SOPs.	(c) Emergency and abnormal procedures and checklists; (d) Recall items.	
Environment, weather and ATC	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	

CERTIFICATE OF COMPLETION FORM

CERTIFICATE OF COMPLETION OF MCC					
Applicant's last name(s):			First name(s):		
Type of licence:			Number:		State:
ME/IR training completed		**OR**	ME/IR validity date: ME/IR skill test date:		
Issued on:			passed on:		
	Signature of applicant:				

The satisfactory completion of MCC-Training according to requirements is certified below:

TRAINING			
Multi-crew co-operation training received during period:			
from:	to:	at:	ATO / operator*

Location and date:	Signature of head of ATO or authorised instructor*:
Type and number of licence and state of issue:	Name(s) in capital letters of authorised instructor:

** Delete as appropriate*

AMC1 FCL.740.H(a)(3) Revalidation of type ratings – helicopters

CREDITING OF THE PROFICIENCY CHECK TOWARDS SEP HELICOPTER TYPES

Only the following SEP helicopter types can be considered for crediting of the proficiency check. Other SEP helicopters (for example, R22) should not be given credit for.

Manufacturer	SEP Helicopter type
Agusta-Bell	Bell47
Bell Helicopters	Bell47
Westland	Bell47
Brantley	Brantley B2
Enstrom	ENF28
Hélicoptères Guimbal	Cabri G2
Hiller	UH12
Robinson	R44
Hughes or Schweizer	HU269
Breda Nardi	HU269

SECTION 4 – SPECIFIC REQUIREMENTS FOR THE POWERED-LIFT AIRCRAFT CATEGORY

GM1 FCL.720.PL Experience requirements and prerequisites for the issue of type ratings – powered-lift aircraft

The endorsement of a powered-lift type rating to an aeroplane or helicopter licence does not confer upon its holder the privileges to fly helicopters or aeroplanes, respectively.

SECTION 5 – SPECIFIC REQUIREMENTS FOR THE AIRSHIP CATEGORY

AMC1 FCL.735.A; FCL.735.H; FCL.735.As Multi-crew cooperation (MCC) training course

(a) Competency is a combination of knowledge, skills and attitudes required to perform a task to the prescribed standard.

(b) The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multicrew aircraft.

(c) Training should comprise both theoretical and practical elements and be designed to achieve the competencies/training objectives (see Table 1 below).

Table 1 — Competencies/training objectives

Competency / objective	Performance indicators	Knowledge	Practical exercises
Communication	(a) Know what, how much and who to communicate to; (b) Ensure the recipient is ready and able to receive the information; (c) Pass messages and information clearly, accurately, timely and adequately; (d) Check if the other person has the correct understanding when passing important information; (e) Listen actively, patiently and demonstrate understanding when receiving information; (f) Ask relevant and effective questions, and offer suggestions; (g) Use appropriate body language, eye contact and tone; (h) Open and receptive to other people's view.	(a) Human Factors, TEM and CRM; (b) Application of TEM and CRM principles to training.	In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following: (a) Pre-flight preparation: (1) FMS initialisation; (2) radio and navigation equipment preparation; (3) flight documentation; (4) computation of take-off performance data. (b) Take-off and climb: (1) before take-off checks; (2) normal take-offs; (3) rejected take-offs; (4) take-offs with abnormal and emergency situations included. (c) Cruise: emergency descent. (d) Descent and approach:
Leadership and team working	(a) Friendly, enthusiastic, motivating and considerate of others;		

Table 1 — Competencies/training objectives

Competency / objective	Performance indicators	Knowledge	Practical exercises
	(b) Use initiative, give direction and take responsibility when required; (c) Open and honest about thoughts, concerns and intentions; (d) Give and receive criticism and praise well, and admit mistakes; (e) Confidently do and say what is important to him or her; (f) Demonstrate respect and tolerance towards other people; (g) Involve others in planning and share activities fairly.		(1) instrument flight procedures; (2) holding; (3) 3D Operations using raw data; (4) 3D Operations using flight director; (5) 3D Operations using autopilot; (6) one-engine-inoperative approach; (7) 2D Operations and circling; (8) computation of approach and landing data; (9) all engines go-around; (10) go-around with one engine inoperative; (11) wind shear during approach. (e) landing: transition from instrument to visual flight on reaching decision altitude or height or minimum descent altitude or height; (f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.
Situational awareness	(a) Be aware of what the aircraft and its systems are doing; (b) Be aware of where the aircraft is and its environment; (c) Keep track of time and fuel; (d) Be aware of the condition of people involved in the operation including passengers; (e) Recognise what is likely to happen, plan and stay ahead of the game; (f) Develop what-if scenarios and make pre-decisions; (g) Identify threats to the safety of the aircraft and of the people.		
Workload management	(a) Be calm, relaxed, careful and not impulsive; (b) Prepare, prioritise and schedule tasks effectively; (c) Use time efficiently when carrying out tasks;		

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
	(d) Offer and accept assistance, delegate when necessary and ask for help early; (e) Review and monitor and cross-check actions conscientiously; (f) Follow procedures appropriately and consistently; (g) Concentrate on one thing at a time, ensure tasks are completed and does not become distracted; (h) Carry out instructions as directed.		
Problem-solving and decision-making	(a) Identify and verify why things have gone wrong and do not jump to conclusions or make assumptions; (b) Seek accurate and adequate information from appropriate resources; (c) Persevere in working through a problem; (d) Use and agree an appropriate decision making process; (e) Agree essential and desirable criteria and prioritises; (f) Consider as many options as practicable; (g) Make decisions when they need to, reviews and changes if required; (h) Consider risks but do not take unnecessary risks.		
Monitoring and cross-checking	(a) Monitor and cross-checks all actions; (b) Monitor aircraft trajectory in critical flight phases; (c) Take appropriate actions in response to	(a) SOPs; (b) Aircraft systems; (c) Undesired aircraft states.	

Table 1 — Competencies/training objectives

Competency / objective	Performance indicators	Knowledge	Practical exercises
	deviations from the flight path.		
Task sharing	(a) Apply SOPs in both PF and pilot monitoring (PM) roles; (b) Makes and responds to standard call-outs.	(a) PF and PM roles; (b) SOPs.	
Use of checklists	Utilise checklists appropriately according to SOPs.	(a) SOPs; (b) Checklist philosophy.	
Briefings	Prepare and deliver appropriate briefings.	(a) SOPs; (b) Interpretation of FMS data and in-flight documentation.	
Flight management	(a) Maintain a constant awareness of the aircraft automation state; (b) Manage automation to achieve optimum trajectory and minimum workload; (c) Take effective recovery actions from automation anomalies; (d) Manage aircraft navigation, terrain clearance; (e) Manage aircraft fuel state and take appropriate actions.	(a) Understanding of aircraft performance and configuration; (b) Systems; (c) SOPs; (d) Interpretation of FMS data and in-flight documentation; (e) Minimum terrain clearance; (f) Fuel management IFR and VFR regulation.	
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs; (c) Automation.	
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and emergency operations	(a) Perform and monitor abnormal systems operation in accordance with SOPs;	(a) Systems; (b) SOPs; (c) Emergency and abnormal	

Table 1 — Competencies/training objectives			
Competency / objective	**Performance indicators**	**Knowledge**	**Practical exercises**
	(b) Utilise electronic and paper abnormal checklists in accordance with SOPs.	procedures and checklists; (d) Recall items.	
Environment, weather and ATC	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	

CERTIFICATE OF COMPLETION FORM

CERTIFICATE OF COMPLETION OF MCC					
Applicant's last name(s):			First name(s):		
Type of licence:			Number:		State:
ME/IR training completed		**OR**	ME/IR validity date: ME/IR skill test date:		
Issued on:			passed on:		
	Signature of applicant:				

The satisfactory completion of MCC-Training according to requirements is certified below:

TRAINING			
Multi-crew co-operation training received during period:			
from:	to:	at:	ATO / operator*
Location and date:		Signature of head of ATO or authorised instructor*:	

Type and number of licence and state of issue:	Name(s) in capital letters of authorised instructor:

** Delete as appropriate*

AMC1 FCL.800 Aerobatic rating

THEORETICAL KNOWLEDGE AND FLYING TRAINING

(a) The aim of the aerobatic training is to qualify licence holders to perform aerobatic manoeuvres.

(b) The DTO or the ATO should issue a certificate of satisfactory completion of the instruction to licence endorsement.

(c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

(1) human factors and body limitation:

(i) spatial disorientation;

(ii) airsickness;

(iii) body stress and G-forces, positive and negative;

(iv) effects of grey- and blackouts.

(2) technical subjects:

(i) legislation affecting aerobatic flying to include environmental and noise subjects;

(ii) principles of aerodynamics to include slow flight, stalls and spins, flat and inverted;

(iii) general airframe and engine limitations (if applicable).

(3) limitations applicable to the specific aircraft category (and type):

(i) air speed limitations (aeroplane, TMG and sailplane, as applicable);

(ii) symmetric load factors (type-related, as applicable);

(iii) rolling Gs (type-related, as applicable).

(4) aerobatic manoeuvres and recovery:

(i) entry parameters;

(ii) planning systems and sequencing of manoeuvres;

(iii) rolling manœuvres;

(iv) looping manœuvres;

(v) combination manœuvres;

(vi) entry and recovery from developed spins, flat, accelerated and inverted.

(5) emergency procedures:

(i) recovery from unusual attitudes;

(ii) drills to include the use of parachutes (if worn) and aircraft abandonment.

(d) Flying training

The exercises of the aerobatic flying training syllabus should be repeated as necessary until the applicant achieves a safe and competent standard. Having completed the flight training, the student pilot should be able to perform a solo flight containing a sequence of aerobatic manoeuvres. The dual training and the supervised solo training flights should be tailored to the category of aircraft and limited to the permitted manoeuvres of that type of aircraft. The exercises should comprise at least the following practical training items:

(1) confidence manoeuvres and recoveries:

(i) slow flights and stalls;

(ii) steep turns;

(iii) side slips;

(iv) engine restart in-flight (if applicable);

(v) spins and recovery;

(vi) recovery from spiral dives;

(vii) recovery from unusual attitudes.

(2) aerobatic manoeuvres:

(i) Chandelle;

(ii) Lazy Eight;

(iii) rolls;

(iv) loops;

(v) inverted flight;

(vi) Hammerhead turn;

(vii) Immelmann.

AMC1 FCL.805 Sailplane towing and banner towing rating

THEORETICAL KNOWLEDGE AND FLYING TRAINING

(a) The aim of the towing instruction is to qualify licence holders to tow banners or sailplanes.

(b) The DTO or the ATO should issue a certificate of satisfactory completion of the instruction to licence endorsement.

(c) Theoretical knowledge: towing of sailplanes

The theoretical knowledge syllabus for towing of sailplanes should cover the revision or explanation of:

(1) regulations about towing flights;

(2) equipment for the towing activity;

(3) sailplane towing techniques, including:

(i) signals and communication procedures;

(ii) take-off (normal and crosswind);

(iii) in-flight launch procedures;

(iv) descending on tow;

(v) sailplane release procedure;

(vi) tow rope release procedure;

(vii) landing with tow rope connected (if applicable);

(viii) emergency procedures during tow, including equipment malfunctions;

(ix) safety procedures;

(x) flight performance of the applicable aircraft type when towing sailplanes;

(xi) look-out and collision avoidance;

(xii) performance data sailplanes, including:

(A) suitable speeds;

(B) stall characteristics in turns.

(d) Theoretical knowledge: banner towing

The theoretical knowledge syllabus for banner towing should cover the revision or explanation of:

(1) regulations about banner towing;

(2) equipment for the banner towing activity;

(3) ground crew coordination;

(4) pre-flight procedures;

(5) banner towing techniques, including:

(i) take-off launch;

(ii) banner pickup manoeuvres;

(iii) flying with a banner in tow;

(iv) release procedure;

(v) landing with a banner in tow (if applicable);

(vi) emergency procedures during tow, including equipment malfunctions;

(vii) safety procedures;

(viii) flight performance of the applicable aircraft type when towing a heavy or light banner;

(ix) prevention of stall during towing operations.

(e) Flying training: towing of sailplanes

The exercises of the towing training syllabus for towing sailplanes should be repeated as necessary until the student achieves a safe and competent standard and should comprise at least the following practical training items:

(1) take-off procedures (normal and crosswind take-offs);

(2) 360° circles on tow with a bank of 30° and more;

(3) descending on tow;

(4) release procedure of the sailplane;

(5) landing with the tow rope connected (if applicable);

(6) tow rope release procedure in-flight;

(7) emergency procedures (simulation);

(8) signals and communication during tow.

(f) Flying training: banner towing

The exercises of the towing training syllabus for banner towing should be repeated as necessary until the student achieves a safe and competent standard and should comprise at least the following practical training items:

(1) pickup manoeuvres;

(2) towing in-flight techniques;

(3) release procedures;

(4) flight at critically low air speeds;

(5) maximum performance manoeuvres;

(6) emergency manoeuvres to include equipment malfunctions (simulated);

(7) specific banner towing safety procedures;

(8) go-around with the banner connected;

(9) loss of engine power with the banner attached (simulated).

AMC1 FCL.810(a) Night rating

AEROPLANE NIGHT RATING COURSE

(a) The aim of the course is to qualify holders of Part-FCL licences with privileges to fly aeroplanes or TMGs to exercise their privileges at night.

(b) The ATO or DTO should issue a certificate of satisfactory completion of the instruction that can be used for licence endorsement.

(c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

(1) night VMC minima;

(2) rules about airspace control at night and facilities available;

(3) rules about aerodrome ground, runway, and obstruction lighting;

(4) aircraft navigation lights and collision avoidance rules;

(5) physiological aspects of night vision and orientation;

(6) dangers of disorientation at night;

(7) dangers of weather deterioration at night;

(8) instrument systems or functions and errors;

(9) instrument lighting and emergency cockpit lighting systems;

(10) map marking for use under cockpit lighting;

(11) practical navigation principles;

(12) radio navigation principles;

(13) planning and use of safety altitude; and

(14) danger from icing conditions, as well as from avoidance and escape manoeuvres.

(d) Flying training

The exercises of the night rating flight syllabus should be repeated as necessary until the student achieves a safe and competent standard.

(1) In all cases, exercises 4 to 7 of the night rating flight syllabus should be completed in an aeroplane or TMG.

(2) For exercises 1 to 3, up to 50 % of the required flight training may be completed in an FSTD(A). However, each item of exercises 1 to 3 should be completed in an aeroplane or TMG in flight.

(3) Starred items (*) should be completed in simulated IMC and may be completed in daylight.

(4) The flying exercises should comprise:

(i) exercise 1:

(A) revise basic manoeuvres when flying by sole reference to instruments*;

(B) explain and demonstrate transition from visual flight to instrument flight*; and

(C) explain and revise recovery from unusual attitudes by sole reference to instruments*;

(ii) exercise 2:

explain and demonstrate the use of radio navigation aids when flying by sole reference to instruments, to include position finding and tracking*;

(iii) exercise 3:

explain and demonstrate the use of radar assistance*;

(iv) exercise 4:

(A) explain and demonstrate night take-off techniques;

(B) explain and demonstrate night circuit techniques;

(C) explain and demonstrate night approaches with or without visual approach aids; and

(D) practise take-offs, circuits, as well as approaches and landings;

(v) exercise 5:

explain and demonstrate night emergency procedures including:

(A) simulated engine failure (to be terminated with recovery at a safe altitude);

(B) simulated engine failure at various phases of flight;

(C) simulated inadvertent entry to IMC (not on base leg or final approach);

(D) internal and external lighting failure; and

(E) other malfunctions and emergency procedures, as required by the AFM;

(vi) exercise 6:

solo night circuits; and

(vii) exercise 7:

(A) explain and demonstrate night cross-country techniques; and

(B) practise night cross-country dual flight and optionally supervised solo to a satisfactory standard.

AMC1 FCL.810(b) Night rating

HELICOPTER NIGHT RATING COURSE

(a) The aim of the course is to qualify helicopter licence holders to exercise the privileges of the licence at night.

(b) The DTO or the ATO should issue a certificate of satisfactory completion of the instruction to licence endorsement.

(c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

(1) night VMC minima;

(2) rules about airspace control at night and facilities available;

(3) rules about aerodrome ground, runway, landing site and obstruction lighting;

(4) aircraft navigation lights and collision avoidance rules;

(5) physiological aspects of night vision and orientation;

(6) dangers of disorientation at night;

(7) dangers of weather deterioration at night;

(8) instrument systems or functions and errors;

(9) instrument lighting and emergency cockpit lighting systems;

(10) map marking for use under cockpit lighting;

(11) practical navigation principles;

(12) radio navigation principles;

(13) planning and use of safety altitude;

(14) danger from icing conditions, avoidance and escape manoeuvres.

(d) Flying training

The exercises of the night rating flight syllabus should be repeated as necessary until the student achieves a safe and competent standard:

(1) In all cases, exercises 4 to 6 of the night rating flight syllabus should be completed in a helicopter in flight.

(2) For exercises 1 to 3, up to 50 % of the required flight training may be completed in an FSTD(H). However, each item of exercises 1 to 3 should be completed in a helicopter in-flight.

(3) Items marked (*) should be completed in simulated IMC and may be completed in daylight.

(4) The flying exercises should comprise:

(i) Exercise 1:

(A) revise basic manoeuvres when flying by sole reference to instruments*;

(B) explain and demonstrate transition to instrument flight from visual flight*;

(C) explain and revise recovery from unusual attitudes by sole reference to instruments*.

(ii) Exercise 2:

Explain and demonstrate the use of radio navigation aids when flying by sole reference to instruments, to include position finding and tracking*.

(iii) Exercise 3:

Explain and demonstrate the use of radar assistance*.

(iv) Exercise 4:

(A) explain and demonstrate the use and adjustment of landing light;

(B) explain and demonstrate night hovering:

(a) higher and slower than by day;

(b) avoidance of unintended sideways or backwards movements.

(C) explain and demonstrate night take-off techniques;

(D) explain and demonstrate night circuit technique;

(E) explain and demonstrate night approaches (constant angle) with or without visual approach aids to:

(a) heliports;

(b) illuminated touchdown areas.

(F) practise take-off's, circuits and approaches;

(G) explain and demonstrate night emergency procedures to include:

(a) simulated engine failure (to be terminated with power recovery at a safe altitude);

(b) simulated engine failure, including SE approach and landing (ME only);

(c) simulated inadvertent entry to IMC (not on base leg or final);

(d) simulated hydraulic control failure (to include landing);

(e) internal and external lighting failure;

(f) other malfunctions and emergency procedures as required by the aircraft flight manual.

(v) Exercise 5:

Solo night circuits.

(vi) Exercise 6:

(A) explain and demonstrate night cross-country techniques;

(B) practise night cross-country dual flight and either flight as SPIC or supervised solo to a satisfactory standard.

AMC1 FCL.815 Mountain rating

THEORETICAL KNOWLEDGE AND FLYING TRAINING

THEORETICAL KNOWLEDGE	
WHEEL	SKI
1. Equipment	
W.1.1 Personal equipment for the flight	S.1.1 Personal equipment for the flight
W.1.2 Aircraft equipment for the flight	S.1.2 Aircraft equipment for the flight
2. Take-off techniques	
W.2.1 Technique for approach and landing on a mountain surface	S.2.1 Technique for approach and landing on a mountain surface S.2.2 Landing technique on skis
W.2.2 Rolling techniques of the aircraft on various runway profiles	S.2.3 Rolling techniques of the aircraft on skis about the snow nature
W.2.3 Take-off technique	S.2.4 Take-off technique on surfaces covered with snow
W.2.4 Aircraft and engine performances about altitude	S.2.5. Aircraft and engine performances about altitude
3. Rules	
W.3.1 Mountain rating	S.3.1 Mountain rating
W.3.2 Overflight rules	S.3.2 Overflight rules
W.3.3 Surfaces classification	S.3.3 Surfaces classification
W.3.4 PIC responsibilities	S.3.4 PIC responsibilities
W.3.5 Responsibilities of the surface manager	S.3.5 Responsibilities of the surface manager
W.3.6 Flight plan	S.3.6 Flight plan S.3.7 Certification of the ski mounted aeroplanes
4. Meteorology	
W.4.1 Movements of the air mass	S.4.1 Movements of the air mass
W.4.2 Flight consequences	S.4.2 Flight consequences
W.4.3 Relief effect on the movement of the air masses	S.4.3 Relief effect on the movement of the air masses
W.4.4 Altimetry	S.4.4 Altimetry
5. Human Performance and Limitations	
W.5.1 The cold	S.5.1 The cold
W.5.2 The food	S.5.2 The food
W.5.3 The hypoxia	S.5.3 The hypoxia
W.5.4 The radiance	S.5.4 The radiance

THEORETICAL KNOWLEDGE	
W.5.5 The thirst	S.5.5 The thirst
W.5.6 The tiredness	S.5.6 The tiredness
W.5.7 Turbulence effects in altitude	S.5.7 Turbulence effects in altitude
6. Navigation	
W.6.1 Progress of the flight	S.6.1 Progress of the flight
W.6.2 Dead reckoning	S.6.2 Dead reckoning
W.6.3 The path over the relief	S.6.3 The path over the relief
W.6.4 Progress in the valleys	S.6.4 Progress in the valleys
W.6.5 Detection of obstacles (high voltage lines, chairlifts, cables, etc.).	S.6.5 Detection of obstacles (high voltage lines, chairlifts, cables, etc.)
7. Specific items	
	S.7.1 Knowledge of the snow and assessment of the snow nature in-flight S.7.2 Knowledge of the glacier S.7.3 Life of the glacier S.7.4 Formation of the cracks S.7.5 Snow bridges S.7.6 Avalanches
8. Survival	
	S.8.1 Ways of survival (psychological aspects) S.8.2 Use of the equipments S.8.3 Removal of snow from the aircraft S.8.4 Building of a shelter S.8.5 How to eat and feed
FLIGHT INSTRUCTION	
WHEEL	SKI
I.- Navigation	
W.I.1 Flight techniques in the valleys W.I.2 Flight over mountain passes and ridges. W.I.3 U-turn in narrow valleys W.I.4 Choice of the flight path of aerology W.I.5 W.I.5 Map reading	S.I.I Flight techniques in the valleys S.I.2 Flight over mountain passes and ridges S.I.3 U-turn in narrow valleys S.I.4 Choice of the flight path of aerology S.I.5 Map reading
II. – Arrival and reconnaissance	
W.II.1 Choice of the altitude of arrival	S.II.1 Choice of the arrival altitude
W.II.2 Choice of the arrival and overflight pattern	S.II.2 Choice of the arrival and overflight pattern
W.II.3 Choice of the landing pattern	S.II.3 Description of the circuit pattern
W.II.4 Aerology awareness	S.II.4 Aerology awareness
W.II.5 Evaluation of the length of the runway	S.II.5 Evaluation of the runway length
W.II.6 Evaluation of the runway profile (slope and banking)	S.II.6 Evaluation of the runway profile (slope and banking)
W.II.7 Collision avoidance.	S.II.7 Collision avoidance
W.II.8 Definition of the references for the landing (touchdown point)	S.II.8 Definition of the references for the landing (touchdown point)

THEORETICAL KNOWLEDGE	
W.II.9 Determination of the circuit pattern altitude	S.II.9 Determination of the circuit pattern altitude
W.II.10 Choice of the final speed depending on the runway profile	S.II.10 Choice of the final speed depending on the runway profile S.II.11 Choice of the take-off axis S.II.12. Choice of the landing axis S.II.13 Choice of the parking area S.II.14 Observation of the obstacles on the ground (cracks, snow bridges, avalanches) S.II.15 Estimation of the snow nature S.II.16 Observation of the way to reach a refuge from the landing area
III – Approach and landing	
W.III.1 Landing pattern altitude	S.III.1 Landing pattern altitude
W.III.2 Precision of flight along the landing path	S.III.2 Precision of flight along the landing path
W.III.3 Corrections on the landing path (accuracy and effectiveness)	S.III.3 Corrections on the landing path (accuracy and effectiveness)
W.III.4 Landing (precision of the flare and of the touchdown point)	S.III.4 Landing (precision of the flare and of the touchdown point)
W.III.5 Taxiing (use of the engine power) on various profiles	S.III.5 Taxi of the aircraft on various snows and various runway profiles
W.III.6 Parking of the aircraft (depending on the runway profile, the traffic, etc.)	S.III.6 Parking of the aircraft (depending on the snow nature and the profile of the apron) S.III.7 Turns on various snow nature and various ground profiles
IV. – Take-off	
W.IV.1 Safety checks before take-off	S. IV.1 Safety checks before take-off.
W.IV.2 Lining up on the runway	S.IV.2 Lining up on the runway
W.IV.3 Control of the runway axis during take-off	S.IV.3 Control of the runway axis during take-off
W.IV.4 Choice and use of the visual references of the take-off axis	S.IV.4 Choice and use of the visual references of the take-off axis S.IV.5 Acceleration depending on the nature of the snow S.IV.6 Short take-off S.IV.7 Take-off avoiding the skid of the skis
V. - Survival	
	S.V.1 Use of the snowshoes S.V.2 Use of the markings

AMC2 FCL.815 Mountain rating

SKILL TEST AND PROFICIENCY CHECK

The skill test for the issue or the proficiency check for the revalidation or renewal of a mountain rating should contain the following elements:

(a) oral examination

This part should be done before the flight and should cover all the relevant parts of the theoretical knowledge. At least one question for each of the following sections should be asked:

(1) specific equipment for a mountain flight (personal and aircraft);

(2) rules of the mountain flight.

If the oral examination reveals a lack in theoretical knowledge, the flight test should not be done and the skill test is failed.

(b) practical skill test

During the flight test, two sites different from the departure airport should be used for recognition, approach, landing and take-off. For the mountain rating ski or the extension from wheel to ski, one of the two different sites should be a glacier.

AMC1 FCL.820 Flight test rating

TRAINING COURSE

GENERAL

(a) Competency-based training:

(1) Training courses for the flight test rating should be competency-based. The training programme should follow as much as possible the syllabus outlined below, but may be adapted taking into account the previous experience, skill and theoretical knowledge level of the applicants.

(2) It should also be recognised that the syllabi below assume that suitable flight test experience will be gained subsequent to attendance at the course. Should the applicant be significantly experienced already, then consideration should be made of that experience and it is possible that course content might be reduced in areas where that experience has been obtained.

(3) Furthermore, it should be noted that flight test ratings are specific to both a certain category of aircraft (aeroplanes or helicopters) and to a certain category of flight test (category 1 or 2). Therefore, holders of a flight test rating wishing to extend their privileges to further categories of aircraft or to further categories of flight test (this is only relevant for holders of a category 2 flight test rating since the category one flight test rating includes the privileges for category 2 test flights) should not be requested to undertake the same course as an 'ab-initio' applicant. In these cases, the ATO should develop specific 'bridge courses' taking into account the same principles mentioned above.

(4) To allow proper consideration of the applicant's previous experience, a pre-entry assessment of the applicant's skills should be undertaken, on the basis

of which the ATO may evaluate the level of the applicant to better tailor the course. Thus, the syllabi listed below should be regarded as a list of individual demonstrable competencies and qualifications rather than a list of mandatory training objectives.

(b) Continuous evaluation

Training courses for the flight test rating should be built on a continuous evaluation model to guarantee that successful completion of the course ensures that the applicant has reached the level of competence (both theoretical and practical) to be issued a flight test rating.

CONTENT OF THE COURSE

(c) In addition, the content of the course should vary taking into account whether the applicant seeks privileges for a category 1 or 2 flight test rating, as well as the relevant category of aircraft, and their level of complexity. To better take these factors into account, training courses for the flight test rating have been divided into two conditions:

(1) condition 1 courses apply to category 1 flight test ratings on:

(i) helicopters certificated in accordance with the standards of CS-27 or CS-29 or equivalent airworthiness codes;

(ii) aeroplanes certificated in accordance with:

(A) the standards of CS-25 or equivalent airworthiness codes; or

(B) the standards of CS-23 or equivalent airworthiness codes, within the commuter category or having an M_D above 0.6 or a maximum ceiling above 25 000 ft.

(2) condition 2 training courses apply to:

(i) category 2 flight test ratings for:

(A) helicopters certificated in accordance with the standards of CS-27 or CS-29 or equivalent airworthiness codes;

(B) aeroplanes certificated in accordance with:

(a) the standards of CS-25 or equivalent airworthiness codes; or

(b) the standards of CS-23 or equivalent airworthiness codes (included those mentioned in (c)(1)(ii)(B)), except for aeroplanes with a maximum take-off mass of less than 2 000 kg.

(ii) category 1 flight tests for aeroplanes certificated in accordance with the standards of CS-23, with a maximum take-off mass of more than 2 000kg, with the exclusion of those mentioned in (c)(1)(ii)(B) (which are subject to condition 1 courses).

AEROPLANES

(d) Condition 1 courses for aeroplanes

(1) These courses should include approximately:

(i) 350 hours of ground training;

(ii) 100 hours of flight test training, during which at least 15 flights should be made without an instructor on board;

(iii) principles of test management and risk and safety managements should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.

(2) These courses should include instruction on at least 10 different aeroplane types, of which at least one should be certificated in accordance with CS-25 standards or equivalent airworthiness codes.

(3) During the course the student should be required to develop at least five substantial flight test reports.

(4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.

(5) Syllabus. The following subjects should be covered in the course:

<table>
<tr><th colspan="3">CONDITION 1 - AEROPLANES</th></tr>
<tr><td>Theoretical knowledge</td><td colspan="2">(a) aerodynamics;
(b) stability and control or handling qualities;
(c) engines and performance;
(d) measurements and flight test instrumentation (including telemetry).</td></tr>
<tr><td rowspan="3">Flight test techniques and flight training</td><td>(a) performance:

(at least one flight test report should be developed)</td><td>(1) air speed calibration;
(2) climb ME;
(3) take-off and landing, including turboprop or turbofan OEI.</td></tr>
<tr><td>(b) engines</td><td>Turboprop or turbofan limitations and relight envelope</td></tr>
<tr><td>(c) handling qualities

(at least two flight test reports should be developed)</td><td>(1) flight controls characteristics;
(2) longitudinal handling qualities;
(3) longitudinal manoeuvre stability;
(4) take-off and landing MET or ME turbofan, including v_{mcq} and v_{mu};
(5) lateral, directional handling qualities;
(6) handling qualities evaluation;
(7) variable stability demo flights including HOFCS;
(8) stalls;</td></tr>
</table>

CONDITION 1 - AEROPLANES		
		(9) spins; (10) v_{mca}.
	(d) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) autopilot or AFCS; (2) glass cockpit evaluation; (3) radio navigation, instruments qualification and integrated avionics; (4) TAWS; (5) ACAS.
	(e) high speed certification test	
	(f) final evaluation exercise (a flight test report should be developed)	

(e) Condition 2 courses for aeroplanes

(1) These courses should include approximately:

(i) 150 hours of ground training;

(ii) 50 hours of flight test training, during which at least eight flights should be made without an instructor on board.

Principles of test management and risk and safety managements should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.

(2) These courses should include instruction on at least seven different aeroplane types, of which at least one should be certificated in accordance with CS-25 standards or equivalent airworthiness codes.

(3) During the course the student should be required to develop at least three substantial flight test reports.

(4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.

(5) Syllabus. The following subjects should be covered in the course:

CONDITION 2 - AEROPLANES		
Theoretical knowledge	(a) aerodynamics; (b) stability and control or handling qualities; (c) engines and performance; (d) measurements and flight test instrumentation (including telemetry).	
Flight test techniques and flight training	(a) performance: (at least one flight test report should be developed)	(1) air speed calibration; (2) climb ME; (3) take-off and landing MET or ME turbofan.

CONDITION 2 - AEROPLANES		
	(b) handling qualities	(1) flight control characteristics; (2) longitudinal static, dynamic stability and control or handling qualities; (3) lateral, directional stability and control or handling qualities; (4) stalls; (5) spins.
	(c) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) autopilot or AFCS; (2) glass cockpit evaluation; (3) radio navigation, instruments qualification and integrated avionics; (4) TAWS; (5) ACAS.
	(d) final evaluation exercise (a) flight test report should be developed)	

HELICOPTERS

(f) Condition 1 courses for helicopters:

(1) These courses should include approximately:

(i) 350 hours of ground training;

(ii) 100 hours of flight test training, during which at least 20 flights should be made without an instructor on board.

Principles of test management and risk and safety managements should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.

(2) These courses should include instruction on at least eight different helicopter types, of which at least one should be certificated in accordance with CS-29 standards or equivalent airworthiness codes.

(3) During the course the student should be required to develop at least five substantial flight test reports.

(4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.

(5) Syllabus. The following subjects should be covered in the course:

CONDITION 1 - HELICOPTERS	
Theoretical knowledge	(a) aerodynamics; (b) stability and control or handling qualities; (c) engines and performance; (d) measurements and flight test instrumentation (including telemetry).

CONDITION 1 - HELICOPTERS		
Flight test techniques and flight training	(a) performance: (at least one flight test report should be developed)	(1) air speed calibration; (2) level flight, climb and descent, vertical and hover performance;
	(b) engines	(1) digital engine governing; (2) turbine or piston engine evaluation.
	(c) handling qualities (at least one flight test report should be developed)	(1) flight control characteristics; (2) longitudinal static, dynamic stability and control or handling qualities; (3) lateral, directional stability and control or handling qualities; (4) ADS 33; (5) teetering rotor assessment; (6) rigid rotor assessment; (7) variable stability demo flights including HOFCS.
	(d) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) navigation management systems; (2) autopilot or AFCS; (3) night vision goggles or electro-optics; (4) glass cockpit evaluation;
	(e) height and velocity envelope and EOL, including relights	
	(f) category A procedure	
	(g) vibrations and rotor adjustments	
	(h) auto rotations	
	(i) final evaluation exercise (a flight test report should be developed)	

(g) Condition 2 courses for helicopters

(1) These courses should include approximately:

(i) 150 hours of ground training;

(ii) 50 hours of flight test training, during which at least eight flights should be made without an instructor on board.

Principles of test management and risk and safety management should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.

(2) These courses should include instruction on at least four different helicopters types, of which at least one should be certificated in accordance with CS-29 standards or equivalent airworthiness codes.

(3) During the course the student should be required to develop at least three substantial flight test reports.

(4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.

(5) Syllabus. The following subjects should be covered in the course:

CONDITION 2 - HELICOPTERS		
Theoretical knowledge	(a) aerodynamics; (b) stability and control or handling qualities; (c) engines and performance; (d) measurements and flight test instrumentation (including telemetry).	
Flight test techniques and flight training	(a) performance: (at least one flight test report should be developed)	(1) air speed calibration; (2) level flight, climb and descent, vertical and hover performance.
	(b) engines	(1) digital engines governing; (2) turbine or piston engine evaluation.
	(c) handling qualities	(1) flight control characteristics; (2) longitudinal static, dynamic stability and control or handling qualities; (3) lateral, directional stability and control or handling qualities.
	(d) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) navigation management systems; (2) autopilot or AFCS; (3) night vision goggles or electro-optics; (4) glass cockpit evaluation.
	(e) vibration and rotor adjustments	
	(f) final evaluation exercise (a flight test report should be developed)	

AMC1 FCL.835 Basic instrument rating (BIR)

BASIC INSTRUMENT RATING (BIR) COMPETENCIES

This AMC provides the competency criteria required for the relevant training modules of the BIR.

(a) Modules

The following modules are applicable:

(1) Module 1: Pre-flight operations and general handling;

(2) Module 2: Departure, precision (3D) approach procedures and non-precision (2D) approach procedures;

(3) Module 3: En-route IFR procedures;

(4) Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only).

Upon completion of the training, an applicant for a BIR should have received instruction on the same class of aeroplane to be used in the test.

(b) Flight tolerances

The following limits should apply and it should be borne in mind that such tolerances are expected only at the end of the training. Due consideration should be given to make allowance for turbulent conditions and the handling qualities and performance of the aircraft used:

Height

Generally	± 100 feet
Starting a go-around at decision height or altitude	+ 50 feet/– 0 feet
Minimum descent height, MAP or altitude	+ 50 feet/– 0 feet

On radio aids	±5°
For ‘angular’ deviations	Half-scale deflection, azimuth and glide path (e.g. LPV, ILS, MLS, GLS)
2D (LNAV) and 3D (LNAV/VNAV) ‘linear’ lateral deviations	Cross-track error/deviation shall normally be limited to ± ½ the RNP value associated with the procedure. Brief deviations from this standard up to a maximum of one time the RNP value are allowable.
3D linear vertical deviations (e.g. RNP APCH (LNAV/VNAV) using Baro VNAV)	Not more than – 75 feet below the vertical profile at any time, and not more than + 75 feet above the vertical profile at or below 1 000 feet above aerodrome level.

Heading

All engines operating	± 5°
With simulated engine failure	± 10°

Speed

All engines operating	± 5 knots
With simulated engine failure	+ 10 knots/– 5 knots

Given that the intention of the training for the BIR is to be entirely competency-based, the student and instructor need detailed guidance on these competencies. The following information is intended to provide that guidance. Each element of the training modules is described in text followed by a table which gives guidance on the competencies required and how to assess them using the key competencies model of:

OBJECTIVE (of the training item), and **SKILL** — **KNOWLEDGE** — **ATTITUDE** (to achieve the objective)

(c) Sample table

The table is separated into four rows as follows:

Training element	
Title of assessed item taken from training module	
OBJECTIVE	This cell describes the applicant's proficiency to be assessed by the training organisation or instructor.
SKILL	This cell describes the competency criteria that involve the applicant demonstrating: — manual aircraft control; — effective flight path management through proper use of flight management system guidance and automation; and — application of procedures.
KNOWLEDGE	This cell describes the knowledge needed to meet the objective's proficiency requirements.
ATTITUDE	This cell describes the competency criteria encapsulated by airmanship, crew resource management (CRM), and threat and error management (TEM), such as: — situation awareness; — effective communication; — leadership and teamwork; — effective workload management; — effective problem-solving and decision-making.
General	
In most phases of flight there are competencies that apply to a group of manoeuvres, e.g. turns, or even to the whole phase of flight. In order to avoid repetition, the common competencies are grouped under the 'General' item heading.	

(d) Content of the training

(1) Module 1: Pre-flight operations and general handling

Use of flight manual (or equivalent), especially for aircraft performance calculation, and mass and balance

Module 1: Pre-flight operations and general handling	
Use of flight manual (or equivalent), especially for aircraft performance, and mass and balance	
OBJECTIVE	(A) Proficient in the use of the flight manual (or equivalent). (B) Proficient in the mass and balance schedule. (C) Proficient in the aircraft performance calculation.
SKILL	(A) Use proficiently performance charts, tables, graphs or other data, when available, relating to items such as: (1) accelerate-stop distance available; (2) landing distance available; (3) take-off performance; (4) one engine inoperative; (5) climb performance; (6) cruise performance; (7) fuel consumption, range, and endurance; (8) go-around from rejected landing; (9) operational factors affecting aircraft performance; (10) other performance data appropriate to the test aircraft; (11) airspeeds used during specific phases of flight; (12) effects of meteorological conditions upon performance characteristics and correctly application of these factors to a specific chart, table, graph or other performance data; (13) impact of relevant NOTAMs on the conduct of the flight; (14) aircraft documentation.
KNOWLEDGE	(A) Part-NCO (non-commercial air operations) (B) Pilot operating manual (POM) or flight manual chapters dedicated to: (15) limitations;[1] (16) performance calculation in general; (17) performance calculation and associated procedures when specific conditions exist.
ATTITUDE	(A) Situation awareness: Understand the responsibilities of proper pre-departure planning and preparations. (B) Effective communication: Ensure appropriate and clear communication with all ground service personnel (ATC, dispatch, MET). (C) Leadership and teamwork: Manage passengers and ground personnel, as applicable.

[1] The numbering of (15)-(17) under point (B) is an editorial error and should read (1)-(3). This will be corrected with the next update of AMC & GM to Part-FCL.

	(D) Effective workload management: Provide sufficient time and manage the workload for pre-flight procedures (including documentation) to be completed in an efficient manner. (E) Effective problem-solving and decision-making: (1) Make appropriate decisions on all identified threats; (2) Plan and implement suitable mitigation actions.

Pre-flight inspection

Module 1: Pre-flight operations and general handling	
Pre-flight inspection	
OBJECTIVE	Full initial pre-flight inspection in accordance with the approved checklist assuming the risk to IFR flights such as icing conditions, database, etc.
SKILL	(A) Perform all elements of the aeroplane pre-flight inspections. (B) Confirm that the aeroplane is in a serviceable and safe condition for IFR flight.
KNOWLEDGE	(A) Confirm the validity of database and receiver autonomous integrity monitoring (RAIM) prediction, if applicable. (B) Be aware of the possible effects of equipment defects or unserviceability.
ATTITUDE	(A) Situation awareness: (1) Note the position of the aircraft, any surrounding hazards, and location of emergency equipment, and take appropriate action to minimise potential risks; (2) Note effects of engine start on the surrounding environment; (3) Note the limitations of software and equipment such as flight director (FD), autopilot (AP), etc. (B) Effective communication: (1) Demonstrate correct communication; (2) Make a correct passenger and departure briefing. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: (1) Confirm from the checklist that all pre-flight requirements have been fulfilled; (2) Demonstrate an organised approach to performing inspection of aircraft and equipment. (E) Effective problem-solving and decision-making: (1) Identify possible defects and threats; (2) Take corrective action.

Taxiing

Module 1: Pre-flight operations and general handling	
Taxiing	
OBJECTIVE	(A) Be proficient in all recommended taxiing checks and procedures. (B) Comply with ATC instructions, airport markings and signals.
SKILL	(A) Obtain appropriate clearance before taxiing and before crossing or entering active runways. (B) Comply with instructions issued by ATC. (C) Maintain correct and positive aircraft control. (D) Take due consideration of environmental conditions (e.g. surface wind, contamination, surface condition, etc.). (E) Maintain adequate separation from other aircraft, obstructions, and persons. (F) Accomplish the applicable briefing or checklist items, and follow the recommended procedures.
KNOWLEDGE	(A) The need to correctly perform taxiing checks. (B) Understanding the following: (1) runway hold lines and stop bar lighting as applicable; (2) localiser and glide slope sensitive and critical areas; (3) beacons, as well as other surface control markings and lighting; (4) taxiing speeds; (5) rules and procedures in the event of loss of communication (priority, lighting signals); (6) rules for manoeuvring in reduced meteorological conditions.
ATTITUDE	(A) Situation awareness: (1) Maintain constant vigilance and lookout during the taxiing operation; (2) Use headings in poor visibility conditions to confirm the path; (3) Maintain awareness of taxiing speeds appropriate to the conditions and limitations. (B) Effective communication: Demonstrate correct ATC communication (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Divide attention properly inside and outside the cockpit. (E) Effective problem-solving and decision-making: (1) Stop the aircraft to check position when in doubt; (2) Assess major risks: collision with other aircraft, obstacles, and aircraft security.

Transition to instrument flight

Module 1: Pre-flight operations and general handling	
Transition to instrument flight (must be performed by sole reference to instruments)	
OBJECTIVE	Establish the climb, complete a smooth transition to instrument flight, and complete post-take-off checks and drills.
SKILL	Following the initial take-off procedure: (A) Compare the visual attitude achieved with the attitude indicator display; (B) Assess the performance instrument information to confirm that the aircraft has achieved the desired climb parameters; (C) Commence appropriate instrument scanning techniques.
KNOWLEDGE	(A) Demonstrate the required technical knowledge of the function of the instruments in order to safely fly the aircraft by sole reference to instruments. (B) Understand the need to compare the attitude indicator with the real world. (C) Understand the need to verify that the expected performance has been achieved.
ATTITUDE	(A) Situation awareness: Monitor aircraft flight path at all stages of the transition to instrument flight. (B) Effective communication: Demonstrate effective communication (as applicable). (C) Leadership and teamwork: Demonstrate effective coordination (as applicable). (D) Effective problem-solving and decision-making: (1) Correctly assess take-off and climb hazards, particularly those related to other aircraft, aerodrome infrastructure, obstacles, and weather; (2) Have a strategy to mitigate the threats.

ATC liaison — compliance, radio-telephony (RTF) procedures

Module 1: Pre-flight operations and general handling		
ATC liaison — compliance, radio-telephony (RTF) procedures (must be performed by sole reference to instruments)		
OBJECTIVE	(A)	Ability to communicate clearly with ATC using appropriate RTF phraseology in order to perform the flight as planned in compliance with ATC instructions.
	(B)	In the event of changes to the plan, such changes should be negotiated with ATC to ensure continued compliance.
SKILL	(A)	ICAO language proficiency level 4 or greater.
	(B)	The ability to use standard and, where applicable, non-standard RTF procedures.
	(C)	Understand the implications of the received clearance, and be able to action the same safely and effectively.
	(D)	Interpretation of charts and maps.
KNOWLEDGE	(A)	Specific ATC phrases, e.g. ETA vs EAT.
	(B)	Aircraft category for instrument approaches.
	(C)	Performance of the aircraft and its ability to meet the ATC clearance.
	(D)	ICAO standard phraseology and national differences.
	(E)	Pilot or controller responsibilities including tower, en-route, and appropriate clearances.
	(F)	Adequate knowledge of RTF failure procedures.
ATTITUDE	(A)	Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times.
	(B)	Effective communication: Read back correctly, in a timely manner, the ATC clearance in the sequence received.
	(C)	Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).
	(D)	Effective workload management: Copy correctly, in a timely manner, the ATC clearance as issued.
	(E)	Effective problem-solving and decision-making: Interpret correctly the ATC clearance received and, when necessary, request clarification, verification, or change.

Control of the aeroplane by reference solely to instruments, including: level flight at various speeds, level turns at rate 1 and up to 30 degrees angle of bank, trim

Module 1: Pre-flight operations and general handling (must be performed by sole reference to instruments)	
Control of the aeroplane by reference solely to instruments, including: level flight at various speeds, level turns at rate 1 and up to 30 degrees angle of bank, trim	
OBJECTIVE	(A) Smooth control of heading, altitude, speed, power, trim and ancillary controls. (B) Correct use of autopilot, where appropriate. (C) Demonstrate correct technique for instrument flight manoeuvring within specified limits. (D) Maintain balanced and trimmed flight.
SKILL	(A) Maintain altitude, heading and balance, by sole reference to instruments, using correct instrument confirmation, and coordinated control application. (B) Maintain altitude, heading and balance, whilst accelerating or decelerating to specific speeds, as determined by the aircraft flight manual, or as specified by the examiner. (C) Complete coordinated level turns at rate 1 and maintain entry speed onto specified headings. (D) Complete coordinated level turns at up to 30 degrees bank whilst maintaining entry speed onto specified headings. (E) Demonstrate correct procedure for pre-flight functional check of autopilot or flight director. (F) Demonstrate correct operating procedure for autopilot or flight director in all modes.
KNOWLEDGE	(A) Procedures for controlling the aircraft in accordance with the POM, aircraft flight manual and operations manual, as appropriate. (B) Autopilot system fitted to the aircraft. (C) Procedures for controlling the aircraft with automatic flight control systems, in accordance with the POM, aircraft flight manual and operations manual, as appropriate.
ATTITUDE	(A) Situation awareness: (1) Maintain awareness of the autopilot modes selected, where applicable; (2) Understand the need for trimmed, in-balance flight when manually flying the aircraft. (B) Effective communication: As applicable to the specific situation. (C) Leadership and teamwork: Aas applicable to the specific situation. (D) Effective workload management: Use an appropriate ‘division of attention’ when completing flight log, etc., whilst manually controlling the aircraft. (E) Effective problem-solving and decision-making: Prioritise activities to allow maintenance of correct instrument scan.

Climbing and descending turns with sustained rate-1 turn

Module 1: Pre-flight operations and general handling (must be performed by sole reference to instruments)	
Climbing and descending turns with sustained rate-1 turn	
OBJECTIVE	Complete a coordinated climb or descent and turn at rate 1 using: (A) the recommended climbing speed; or (B) descent speed and nominated rates of descent for the aircraft.
SKILL	(A) Establish the recommended entry airspeed in straight and level flight. (B) Roll into a coordinated climbing or descending turn with a bank angle commensurate with the speed to produce a rate-1 turn. Maintain the bank angle in a stable, balanced turn. (C) Apply smooth, coordinated pitch, bank, and power adjustments to maintain the specified attitude and airspeed. (D) Roll out of the turn and stabilise the aircraft in straight and level flight. (E) Recover accurately onto the desired heading and at the desired airspeed for straight and level flight.
KNOWLEDGE	(A) Speed and bank angle relationship to establish a rate-1 turn. (B) Recommended climb speed and power settings. (C) Recommended speed and power settings for descent at nominated descent rates.
ATTITUDE	(A) Effective workload management: Demonstrate orientation throughout the manoeuvre. (B) Effective problem-solving and decision-making: React to departure from stabilised steep turn attitude.

Recovery from unusual attitudes, including sustained 45° bank turns and steep descending turns

Module 1: Pre-flight operations and general handling (must be performed by sole reference to instruments)	
Recovery from unusual attitudes, including sustained 45° bank turns and steep descending turns	
OBJECTIVE	Recover from unusual attitudes, including sustained 45° bank turns and steep descending turns using the correct technique to minimise height loss.
SKILL	(A) Interpretation of the instrument displays to identify the reason behind the unusual attitude. (B) Application of the correct recovery technique. (C) Avoid any indication of an approaching stall, abnormal flight attitude, or exceeding any structural or operating limitation during any part of the manoeuvre.
KNOWLEDGE	Correct recovery technique using ‘full’ panel instruments, as appropriate.
ATTITUDE	(A) Situation awareness: (1) recognition of unusual attitude; (2) after recovery: why did the aircraft enter the unusual attitude, e.g. distraction, instrument failure, mishandling, hypoxia? (3) after recovery: is the aircraft above safety altitude? (4) which is a safe direction to fly whilst assessing the situation? (B) Effective workload management: Address the situation to recover situation awareness. (C) Effective communication: (1) Advise other crew members of the situation; (2) Advise ATC if appropriate. (D) Leadership and teamwork: Communicate and coordinate, as appropriate, during the recovery manoeuvre. (E) Effective problem-solving and decision-making: React promptly to departure from controlled flight.

Recovery from approach to stall in level flight, climbing/descending turns and in landing configuration

Module 1: Pre-flight operations and general handling (must be performed by sole reference to instruments)		
Recovery from approach to stall in level flight, climbing/descending turns and in landing configuration (may be performed in an FSTD, if approved for this procedure)		
OBJECTIVE	(A)	Demonstrate how to conduct appropriate safety checks before stalling.
	(B)	Establish the required aircraft configuration and stall entry, as appropriate, from straight and level or manoeuvring flight.
	(C)	Maintain heading (or 10–30° bank angle, as required) to stall entry.
	(D)	Recognise the symptoms of stall or approaching stall, and initiate the correct recovery action.
	(E)	Recover, using the correct techniques, to return to a clean configuration best rate climb, or as otherwise directed by the examiner.
	(F)	Complete all the necessary checks and drills.
SKILL	(A)	Select an entry altitude in accordance with safety requirements. When accomplished in an FSTD, the entry altitude may be at low, intermediate or high altitude as appropriate for the aircraft and the configuration.
	(B)	Slowly establish the pitch attitude (using trim, elevator or stabiliser), bank angle, and power setting that will induce stall at the desired target airspeed. Normal trim should be used as the aircraft speed reduces, with trim at different, or as stated in the flight manual restrictions.
	(C)	Recognise and announce the first indication of a stall appropriate to the specific aircraft design and initiate recovery.
	(D)	Recover to a reference airspeed, altitude and heading, allowing only the acceptable altitude or airspeed loss and heading deviation using the procedures described in the aircraft flight manual or operator safety manual, as applicable.
	(E)	Demonstrate smooth, positive control during entry, approach to a stall, and recovery.
KNOWLEDGE	(A)	Academic knowledge.
	(B)	Limitations.
	(C)	Safety procedures before starting with stall exercises.
	(D)	Stall recovery procedures and techniques.
	(E)	Flight manual.
	(F)	Operator safety manual.
ATTITUDE	(A)	Situation awareness: Ensure the aircraft is in a safe area and clear of hazards prior to accomplishing an approach to a stall.
	(B)	Effective communication: Communicate and coordinate.
	(C)	Leadership and teamwork: Coordinate to ensure that there is adequate separation from other aircraft before initiating the stall.
	(D)	Effective workload management: As applicable to the specific situation.
	(E)	Effective problem-solving and decision-making: As applicable to the specific situation.

Limited panel instrument flight: stabilised climb or descent, level turns at rate 1 onto given headings, recovery from unusual attitudes

Module 1: Pre-flight operations and general handling (must be performed by sole reference to instruments)	
Limited panel instrument flight: stabilised climb or descent, level turns at rate 1 onto given headings, recovery from unusual attitudes — only applicable to aeroplanes **NB: Most modern light aircraft are now fitted with a 'standby' horizon in addition to or instead of turn rate gyros. Where this is the case, the pilot under training is to be taught these exercises using the 'standby' horizon.**	
OBJECTIVE	Demonstrate continued control of the aircraft by interpreting aircraft attitude from aircraft standby instruments.
SKILL	(A) Complete flight in straight and level, and climbing and descending, at nominated speeds. Fly turns at rate 1 onto nominated headings using the correct technique and demonstrating correct instrument scan and interpretation. (B) Recover from unusual attitudes including sustained 45° bank turns and steep descending and climbing turns using the correct technique to minimise height loss.
KNOWLEDGE	(A) Demonstrate the theoretical knowledge and understand the dangers of 'looping error'. (B) Variation of techniques. (C) Limitations of the use of direct-reading compass systems.
ATTITUDE	(A) Situation awareness: (1) recognition of the reason behind the unusual attitude; (2) after recovery: why did the aircraft enter the unusual attitude, e.g. distraction, instrument failure, mishandling, etc.? (3) after recovery: is the aircraft above safety altitude? (4) which is a safe direction to fly whilst assessing the situation? (B) Effective workload management: Address the situation to recover situation awareness. (C) Effective communication: Advise ATC if appropriate. (D) Leadership and teamwork: Communicate and coordinate as appropriate. (E) Effective problem-solving and decision-making: React promptly to departure from controlled flight.

(2) Module 2: Departure, precision (3D) approach procedures and non-precision (2D) approach procedures

Weather minima

Module 2: Departure and arrivals, 3D approach and 2D approach	
Weather minima	
OBJECTIVE	Confirmation of weather affecting departure, route, destination and diversion; acceptability for the flight. Determination of the expected instrument approach minimum heights/altitudes in accordance with NCO requirements.
SKILL	Ability to interpret published weather charts such as synoptic charts and coded messages (TAF, METAR, SNOWTAM, etc.).
KNOWLEDGE	(A) Air masses and local weather effects. (B) Weather codes. (C) NCO requirements.
ATTITUDE	(A) Situation awareness: (1) Be able to interpret and understand the weather factors and all the associated potential hazards likely to affect the planned flight; (2) Assess correctly whether the weather minima required at destination and diversion airfields are satisfactory for the conduct of the flight. (B) Effective communication: As applicable to the specific situation. (C) Leadership and teamwork: As applicable to the specific situation. (D) Effective workload management: As applicable to the specific situation. (E) Effective problem-solving and decision-making: Make appropriate decisions based on available weather information.

Pre-take-off briefing, take-off

Module 2: Departure and arrivals, 3D approach and 2D approach	
Pre-take-off briefing, take-off	
OBJECTIVE	(A) Perform a safe take-off in compliance with ATC clearance, procedure margins and within the flight manual limits taking into account environmental conditions. (B) Obtain ATC clearance for departure, flight deck preparation, confirmation of departure, and passenger emergency briefing. Actions to be taken with regard to the aeroplane if an emergency occurs during departure should be covered in the pre-flight main briefing.
SKILL	(A) Obtain appropriate take-off clearance using standard RTF phraseology, and perform all required pre-take-off checks (including visually scanning for other aircraft). (B) Position the aircraft correctly for take-off taking into account any crosswind condition. (C) Apply the controls correctly to maintain longitudinal alignment on the centre line of the runway prior to initiating and during the take-off. (D) Set the throttle(s) to take-off power with appropriate checks (e.g. verify the expected engine performance, monitor engine controls, settings and instruments during take-off to ensure all predetermined parameters are maintained). (E) Use the correct take-off technique by applying recommended speeds for rotation, lift-off and initial climb. (F) Adjust the controls to attain the desired pitch attitude at the predetermined airspeed to obtain the desired performance. (G) Ensure a safe climb and departure in accordance with clearance and with due regard for other air traffic, noise abatement and wake turbulence avoidance procedures, adjusting power and aircraft configuration, and maintain desired path (or heading) as appropriate. (H) Complete all necessary post-take-off checks. (I) Perform or call for and verify the accomplishment of landing gear and flap retractions, power adjustments, and other required pilot-related activities at the required airspeeds within the tolerances established in the flight manual.
KNOWLEDGE	(A) Limitations, procedure margins. (B) Normal procedures (understand the different techniques dependent on varying flap settings and environmental conditions). (C) Abnormal and emergency procedures. (D) Performance. (E) Applicable rules on wake turbulence separation.
ATTITUDE	(A) Situation awareness: (1) Monitor engine parameters for any deviations; (2) Monitor aircraft acceleration during take-off; (3) Monitor aircraft ground and flight path at all stages of the take-off procedure. (B) Effective communication: Demonstrate effective communication with ATC (as applicable). (C) Leadership and teamwork: Demonstrate effective coordination with ATC (as applicable). (D) Effective problem-solving and decision-making: Correctly assess take-off and climb hazards, particularly those related to other aircraft, aerodrome infrastructure, obstacles and weather, and have a strategy to mitigate the threats.

Instrument departure procedures, altimeter setting

Module 2: Departure and arrivals, 3D approach and 2D approach	
Instrument departure procedures, altimeter setting (must be performed by sole reference to instruments)	
OBJECTIVE	Complete the standard instrument departure (SID) procedure or follow the ATC departure instructions; use the correct altimeter-setting procedure; maintain aeroplane control, speed, heading and level.
SKILL	(A) Identify any navigation aids used. (B) Follow any noise routing or departure procedures and ATC clearances. (C) Take appropriate anti-icing/de-icing actions. (D) Use the current and appropriate navigation publications for the proposed departure. (E) Make correct use of instruments, flight director, autopilot, navigation equipment and communication equipment appropriate to the performance of the departure. (F) Intercept and follow, in a timely manner, all courses, radials and bearings (QDM/QDRs) appropriate to the departure route and ATC clearance. (G) Comply, in a timely manner, with all ATC clearances, instructions and restrictions. (H) Perform the aircraft briefing or checklist items appropriate to the departure. (I) Adhere to airspeed restrictions and adjustments required by regulations, ATC and the flight manual. (J) Maintain the appropriate airspeed, altitude, headings and accurately track radials, courses, and bearing. (K) Complete the appropriate checklist.
KNOWLEDGE	(A) Weather phenomena, particularly the conditions favouring the formation of ice on the airframe and engines. (B) Limitations of the use of ground-based navigation aids. (C) Limitations of the use of RNAV (GNSS) derived navigational information. (D) Division of airspace and altimeter-setting procedures associated with the current airspace environment. (E) The departure procedure in use and the safety implications of not adhering to the procedure. (F) Altimetry procedures in accordance with the applicable regulations.
ATTITUDE	(A) Situation awareness: (1) Understanding of any clearance limits or variations to SID/initial departure clearance instructed by ATC; (2) Awareness of the aircraft performance and the ability to conform to ATC clearances (speed, height, time limits, etc.). (B) Effective communication: Demonstrate correct communication with ATC (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Prioritise attention properly between aircraft control, navigation and communication tasks. (E) Effective problem-solving and decision-making: Make the necessary decisions to mitigate the effect of changing conditions that may affect aircraft (weather, navigation aid serviceability, ATC, etc.).

Holding procedure

Common to both 3D and 2D procedures (must be performed by sole reference to instruments)	
Holding procedure	
OBJECTIVE	Complete the appropriate entry procedure followed by a standard ICAO holding fix, using information in order to maintain the protected area.
SKILL	(A) Make appropriate adjustments in order to arrive over the holding fix as close as possible to the 'expected approach time', if required. (B) Recognise arrival at the clearance limit or holding fix. (C) Comply with ATC reporting requirements. (D) Change to the recommended holding airspeed appropriate for the aircraft and holding altitude, so as to cross the holding fix at or below the maximum holding airspeed. (E) Follow the appropriate entry procedures in accordance with standard operational procedures or as required by ATC. (F) Use the correct timing criteria where required by the holding procedure or ATC. (G) Use wind-drift correction techniques accurately to maintain the appropriate joining and holding pattern and to establish and maintain the correct tracks and bearings. (H) Maintain the appropriate airspeed, altitude and headings accurately to establish and maintain the correct tracks and bearings. (I) Make appropriate adjustments to the procedure timing to allow for the effects of known wind.
KNOWLEDGE	(A) Holding endurance, including but not necessarily limited to fuel on board. (B) Fuel flow while holding. (C) Fuel required to alternate, etc.
ATTITUDE	(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the cleared holding pattern. (E) Effective problem-solving and decision-making: React to navigation errors or unexpected systems malfunctions.

Setting and checking of navigation aids, identification of facilities

Module 2: 3D approach procedures (must be performed by sole reference to instruments)	
Setting and checking of navigation aids, identification of facilities	
OBJECTIVE	(A) Use of navigation aids with regard to promulgated range, identification and interpretation. (B) Use the RAIM prediction, if applicable. (C) Use the correct RNP approach specifications (LPV, LNAV/VNAV).
SKILL	(A) Set and identify relevant navigation aids. (B) Confirm the availability and serviceability of selected navigation equipment.
KNOWLEDGE	(A) Systems: communication, navigation and auto-flight systems. (B) RNP approach specifications (LPV, LNAV/VNAV).
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Select radio aids appropriate to the intended approach; (3) PBN limitations; (4) Temperature limitations (LNAV/VNAV). (B) Effective workload management: Monitor to ensure safe flight profile whilst selecting and checking radio aids. (C) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (D) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

Arrival procedures, altimeter checks

Module 2: 3D approach procedures (must be performed by sole reference to instruments)	
Arrival procedures, altimeter checks	
OBJECTIVE	Descent planning and consideration of minimum sector altitude (MSA) or terminal arrival altitude (TAA). Completion of the published arrival procedure or as instructed by ATC, including altimeter setting or protected area, ATC liaison and RTF procedures.
SKILL	(A) Set and cross-check the appropriate altimeter settings. (B) Use the correct RTF procedures and terminology and comply with all ATC instructions and clearances. (C) Establish the appropriate aircraft configuration and airspeed for the phase of the approach. (D) Comply with the published arrival procedure or as required by ATC. (E) Interpretation of arrival charts.
KNOWLEDGE	(A) Altimetry procedures in accordance with the applicable regulations. (B) Knowledge of legends used in the approach charts. (C) Understanding of ATC procedures and RTF phraseology for the type of approach to be completed. (D) Knowledge of RNP arrival procedure.
ATTITUDE	(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC, as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: react to deviation errors or unexpected systems malfunctions.

Approach and landing briefing, including descent, approach, landing checks and missed approach

Module 2: 3D approach procedures (must be performed by sole reference to instruments)	
Approach and landing briefing, including descent, approach, landing checks and missed approach	
OBJECTIVE	The approach briefing including weather and confirmation of instrument approach procedure minima, and applicable procedures.
SKILL	(A) Complete the checks for landing and configure the aircraft appropriately. (B) Complete a short self-briefing with regard to arrival, holding, approach, minima, weather conditions, associated performances, taxiing and missed approach procedure.
KNOWLEDGE	(A) Use of checklist as appropriate. (B) Determination of approach minima. (C) Make the necessary adjustments to the published approach minima criteria for the aircraft approach category, and with due regard for: (1) NOTAMs; (2) inoperative navigation equipment; (3) inoperative visual aids associated with the landing environment; (4) reported weather conditions; (5) aircraft status (effects of any inoperative systems).
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Aircraft technical status. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

Compliance with published approach procedure

Module 2: 3D approach procedures (must be performed by sole reference to instruments)	
Compliance with published approach procedure	
OBJECTIVE	(A) Compliance with the published 3D approach procedure. (B) Vertical and horizontal profile to the nominated minima in accordance with protected areas.
SKILL	(A) Manage the appropriate source of navigation system. (B) Complete the manoeuvring pattern as required to establish the final approach segment within the specified flight tolerances. (C) Establish a predetermined rate of descent at the point where the glide path begins, in order to follow the glide path. (D) Intercept and track within the prescribed limits. (E) Interpretation of approach chart.
KNOWLEDGE	(A) Systems: communication, navigation and auto-flight systems. (B) Correctly interpret and understand the procedure to be flown from the approach chart for runway and procedure in use. (C) Autopilot and flight director limitations. (D) Software and capacity system.
ATTITUDE	(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times; (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the cleared procedure. (E) Effective problem-solving and decision-making: React to navigation errors or unexpected systems malfunctions.

Altitude, speed, heading control (stabilised approach)

Module 2: 3D approach procedures (must be performed by sole reference to instruments)	
Altitude, speed, heading control (stabilised approach)	
OBJECTIVE	(A) Establish a stabilised approach, in trim for the aeroplane configuration and speed, using the correct techniques for attitude, heading and power control. (B) Correct assessment of track and vertical path.
SKILL	(A) Establish the final approach and maintain the approach path in horizontal and vertical profile to minima. (B) Control the aircraft as necessary to achieve a stable approach path. (C) Arrive at the minima on a stabilised approach in order to make a correct decision to perform a landing, go-around or circling approach safely. (D) Prepare backup radio aids for continued approach in the event of radio aid or display equipment failure. (E) Use correct RTF procedures and terminology and comply with all ATC instructions and clearances.
KNOWLEDGE	(A) Horizontal and vertical tolerances. (B) Actions to be taken in the event of radio aid or display equipment failure. (C) Procedure in the event of loss of communication with ATC. (D) Procedure in the event of loss of integrity.
ATTITUDE	(A) Situation awareness: Confirm that approach is stabilised. (B) Effective communication: Advise ATC if appropriate. (C) Leadership and teamwork: (1) Demonstrate correct coordination with ATC (where applicable); (2) Procedures for loss of approach capability. (D) Effective workload management: Monitor to ensure that the flight profile remains safe. (E) Effective problem-solving and decision-making: Make appropriate decision to abandon approach if required.

Setting and checking of navigation aids, identification of facilities

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Setting and checking of navigation aids, identification of facilities	
OBJECTIVE	(A) Use of navigation aids with regard to promulgated range, identification and interpretation. (B) Use the RAIM prediction, if applicable. (C) Use the correct RNP approach specifications. (D) Calculate the true altitude as required.
SKILL	(A) Set and identify relevant navigation aids. (B) Confirm the availability and serviceability of selected navigation equipment.
KNOWLEDGE	(A) Systems: communication, navigation and auto-flight systems. (B) RNP approach specifications (LNAV). (C) True altitude corrections for temperature.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Select radio aids appropriate to the intended approach. (B) Effective workload management: Monitor to ensure safe flight profile whilst selecting and checking radio aids. (C) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (D) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

Arrival procedures, altimeter checks

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Arrival procedures, altimeter checks	
OBJECTIVE	(A) Descent planning and consideration of MSA or TAA. (B) Completion of the published arrival procedure or as instructed by ATC, including altimeter setting or protected area, ATC liaison and RTF procedures.
SKILL	(A) Set and cross-check the appropriate altimeter settings. (B) Use the correct RTF procedures and terminology and comply with all ATC instructions and clearances. (C) Establish the appropriate aircraft configuration and airspeed for the phase of the approach. (D) Comply with the published arrival procedure or as required by ATC. (E) Interpretation of arrival charts.
KNOWLEDGE	(A) Altimetry procedures, in accordance with the applicable regulations. (B) Knowledge of the legends used in the approach charts. (C) Understanding of ATC procedures and RTF phraseology for the type of approach to be completed. (D) Knowledge of RNP arrival procedure.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) PBN protected area. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

Approach and landing briefing, including descent, approach, landing checks and missed approach

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Approach and landing briefing, including descent, approach, landing checks and missed approach	
OBJECTIVE	The approach briefing including weather and confirmation of instrument approach procedure minima, and applicable procedures.
SKILL	(A) Complete the landing and configure the aircraft as appropriate. (B) Complete a short self-briefing with regard to arrival, holding, approach, minima, weather conditions, associated performances, taxiing and missed approach procedure.
KNOWLEDGE	(A) Use of checklist as appropriate. (B) Determination of approach minima. (C) Adjustments necessary to the published approach minima criteria for the aircraft approach category, and with due regard for: (1) NOTAMs; (2) inoperative navigation equipment; (3) inoperative visual aids associated with the landing environment; (4) reported weather conditions.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Aircraft technical status. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

Compliance with published approach procedure

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Compliance with published 2D approach procedure	
OBJECTIVE	(A) Compliance with the published approach procedure. (B) Vertical and horizontal profile to the nominated minima in accordance with protected areas. (C) Use of the CDFA technique where appropriate.
SKILL	(A) Manage the appropriate source of navigation system. (B) Select and comply with the appropriate 2D instrument approach procedure. (C) Complete the manoeuvring pattern as required to establish the final approach segment within the specified flight tolerances and protected area. (D) Establish a predetermined rate of descent in order to follow the published path. (E) Intercept and track the final approach track within the prescribed limits. (F) Interpretation of approach chart. (G) Ability to interpret deviation. (H) Correct selection of navigation input to the display.
KNOWLEDGE	(A) Systems: communication, navigation and auto-flight systems. (B) Correctly interpret and understand the procedure to be flown from the approach chart for runway and procedure in use. (C) CDFA technique where appropriate. (D) Autopilot and flight director limitations.
ATTITUDE	(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times; (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the cleared procedure. (E) Effective problem-solving and decision-making; React to navigation errors or unexpected systems malfunctions.

Altitude, speed and heading control (stabilised approach)

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Altitude, speed and heading control (stabilised approach)	
OBJECTIVE	(A) Establish a stabilised approach, in trim for the aeroplane configuration and speed, using the correct techniques for attitude, heading and power control. (B) Correct assessment of track and rate of descent or vertical path angle.
SKILL	(A) Establish the final approach and maintain the approach path in horizontal and vertical profile to minima. (B) Control the aircraft as necessary to achieve a stable final approach. (C) Arrive at the minima on a stabilised approach in order to make a correct decision to perform a landing, go-around or circling approach safely. (D) Prepare backup radio aids for continued approach in the event of radio aid or display equipment failure. (E) Use correct RTF procedures and terminology, and comply with all ATC instructions and clearances.
KNOWLEDGE	(A) Horizontal and vertical tolerances. (B) Actions to be taken in the event of radio aid/display equipment failure. (C) Procedure in the event of loss of communication with ATC. (D) Procedure in the event of loss of integrity.
ATTITUDE	(A) Situation awareness: Confirm that the approach is stabilised. (B) Effective communication: Advise ATC if appropriate. (C) Leadership and teamwork: (1) Demonstrate correct coordination with ATC (where applicable); (2) Procedures for loss-of-approach capability. (D) Effective workload management: Monitor to ensure that the flight profile remains safe. (E) Effective problem-solving and decision-making: Make appropriate decision to abandon approach if required.

Approach timing

Module 2: Specificities of conventional 2D approach procedures (must be performed by sole reference to instruments)	
Approach timing	
OBJECTIVE	Monitor or control the approach procedure using timing as necessary.
SKILL	Where DME information from ground-based beacons (VOR or NDB) or marker is not available, the applicant makes appropriate adjustments to the procedure timing to allow for the effects of known wind.
KNOWLEDGE	(A) Use of wind-effect correction techniques. (B) Use of wind-drift correction techniques to maintain the correct tracks, bearings and approximate distances.
ATTITUDE	(A) Situation awareness: (1) Understand when approach timing techniques are required; (2) Understand the impact required on the descent technique for the intermediate approach phase. (B) Effective workload management: Use an appropriate ‘division of attention’ whilst controlling the aircraft in order to apply wind-corrected timing. (C) Effective communication: As applicable to the specific situation. (D) Leadership and teamwork: As applicable to the specific situation. (E) Effective problem-solving and decision-making: As applicable to the specific situation.

Go-around and missed approach action

Module 2: Common to both 3D and 2D procedures (must be performed by sole reference to instruments)	
Go-around and missed approach action	
OBJECTIVE	Make a smooth transition to a climb at the correct speed and complete the checks when: (1) reaching the minima; (2) directed by ATC; (3) being in an unstabilised approach; (4) experiencing a loss of integrity; or (5) any other reasons affecting safety approach.
SKILL	(A) Initiate go-around action in case of unstabilised approach or loss of integrity. (B) Initiate go-around action at or above minima if safe landing is not possible. (C) Control the aircraft as necessary to achieve a stable and trimmed initial climb profile. (D) Ensure a safe climb and departure in accordance with ATC clearance and with due regard for other air traffic, noise abatement and wake turbulence avoidance procedures adjusting power and aircraft configuration, and maintain desired path (or heading) as appropriate. (E) Complete all necessary procedures and checks. (F) Select the missed approach if available.
KNOWLEDGE	(A) Go-around procedure. (B) Aircraft limitations for landing gear retraction, flap retraction and power plant. (C) Necessary RTF procedures. (D) Performance limitation. (E) Climb gradient. (F) Protected areas. (G) RNP approach specifications.
ATTITUDE	(A) Situation awareness: Monitor aircraft flight path at all stages of the go-around. (B) Effective communication: (1) Demonstrate effective communication (as applicable); (2) Communicate with ATC when safe to do so. (C) Leadership and teamwork: Demonstrate effective coordination with ATC (as applicable). (D) Effective problem-solving and decision-making: Correctly assess go-around and climb hazards, particularly those related to other aircraft, aerodrome infrastructure, obstacles and weather, and have a strategy to mitigate the threats.

Landing

Module 2: Common to both 3D and 2D procedures (must be performed by sole reference to instruments)	
Landing	
OBJECTIVE	(A) Visual landing or circle for landing, as appropriate, in a safe and controlled manner. (B) Define a strategy for track management in case of missed approach or go-around in the circle to land.
SKILL	Landing: (A) acquire the required visual references and continue to land the aircraft; (B) make a smooth transition from instrument to visual flight; (C) join smoothly, if necessary, the visual approach flight path; (D) maintain a stable (speed, power, heading) approach until the flare; (E) complete post-landing checklist.
KNOWLEDGE	(A) Flight manual. (B) Limitations. (C) Normal procedures: Demonstrate adequate judgement and knowledge of the aircraft performance and systems in order to comply with published approach procedures for the equipment used for the approach.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Controlled flight into terrain (CFIT); (3) Balked landing. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

ATC liaison — compliance, RTF procedures

Module 2: Common to both 3D and 2D procedures (must be performed by sole reference to instruments)		
ATC liaison — compliance, RTF procedures		
OBJECTIVE	(A)	Use correct and standard RTF phraseology throughout.
	(B)	Where appropriate, obtain ATC clearances and appropriate level of service.
	(C)	Where required, comply with ATC clearances and instructions.
SKILL	(A)	Comply with all ATC instructions and clearances.
	(B)	Use correct RTF for ILS reporting procedure.
KNOWLEDGE	(A)	ICAO standard phraseology.
	(B)	Pilot/controller responsibilities to include tower en-route control and clearance.
	(C)	Demonstrate adequate knowledge of two-way communications failure procedures.
ATTITUDE	(A)	Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times.
	(B)	Effective communication: Read back correctly, in a timely manner, the ATC clearance in the sequence received.
	(C)	Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).
	(D)	Effective workload management: Copy correctly, in a timely manner, the ATC clearance as issued.
	(E)	Effective problem-solving and decision-making: Interpret correctly the ATC clearance received and, when necessary, request clarification, verification, or change.

(3) Module 3: En-route IFR procedures

Use of air traffic services document and weather document

Module 3: En-route IFR procedures	
Use of air traffic services document and weather document	
OBJECTIVE	(A) Use of the correct documents, including maps. (B) Use of charts and approach procedure plates to prepare flight plan and flight log. (C) Collating and interpreting weather documents to determine the route weather.
SKILL	(A) Ensure all required paperwork is correctly completed prior to the flight. (B) Interpretation of weather charts and coded messages (TAF, METAR, etc.).
KNOWLEDGE	(A) Weather factors that may affect the safe conduct of the flight (thunderstorms, fog, strong winds, gust factor, crosswinds at departure and destination aerodromes, snow, icing, etc.). (B) Type of approach to be flown, how to calculate approach minima from charts, operational limitations of ground-based aids when planning route, ability to interpret SID and STAR charts. (C) Coordination with ATC when submitting flight plan, implications of 'calculated take-off time', etc.
ATTITUDE	(A) Situation awareness: Note potential weather hazards and act accordingly, submit flight plan in good time for planned departure. (B) Effective communication: Communicate with ATC and ground crew to ensure timely start. (C) Leadership and teamwork: Demonstrate correct crew coordination with ATC (where applicable). (D) Effective workload management: Prioritise tasks to produce a safe and effective plan for the conduct of the flight. (E) Effective problem-solving and decision-making: (1) Identify possible defects and threats; (2) Take corrective action.

Preparation of ATC flight plan and IFR flight plan or log

Module 3: En-route IFR procedures	
Preparation of ATC flight plan and IFR flight plan or log	
OBJECTIVE	Preparation of the ATC IFR flight plan for the route, including any off-airway sectors, and preparation of a full navigation and RTF flight log.
SKILL	(A) Prepare the flight navigation log, update maps and charts, flight plan, and fuel plan. (B) Obtain and assess all elements of the prevailing and forecast weather conditions for the route and evaluate threats (e.g. icing conditions, convection, wind conditions, potential deterioration below minima). (C) Complete an appropriate flight navigation log. (D) Complete the required ATC flight plan(s) and ensure that all required airfields are addressed. (E) Determine that the aeroplane is correctly fuelled, loaded and legal for the flight. (F) Confirm any aeroplane performance criteria and limitations applicable in relation to runway and weather conditions.
KNOWLEDGE	Demonstrate sufficient knowledge of the regulatory requirements relating to instrument flight.
ATTITUDE	(A) Situation awareness: (1) Understand the responsibilities of proper pre-departure planning and preparations; (2) Appropriate threat and error management for the flight (B) Effective communication: Ensure appropriate and clear communication with all ground service personnel (ATC, dispatch, MET). (C) Leadership and teamwork. (D) Effective workload management: Provide sufficient time, and manage the workload for departure procedures (including documentation) to be completed in an efficient manner. (E) Effective problem-solving and decision-making: Make appropriate decisions on all identified threats, and plan and implement suitable mitigation actions.

Tracking, including interception, e.g. NDB, VOR, RNAV

Module 3: En-route IFR procedures	
Tracking, including interception, e.g. NDB, VOR, RNAV	
OBJECTIVE	(A) Intercept and maintain the route or amended route, including tracking to and from a position derived from NDB or VOR or RNAV (GNSS) using aircraft display. (B) Follow the flight-planned route or any other ATC route requirements within the specified limits. (C) Identify and use navigation systems correctly. (D) Use the correct altimeter setting procedures and show awareness of protected areas.
SKILL	(A) Use the current and appropriate navigation publications for the proposed flight. (B) Intercept, in a timely manner, all courses, radials and bearings appropriate to the procedure, route, and ATC clearance. (C) Comply, in a timely manner, with all ATC clearances, instructions and restrictions. (D) Perform the aircraft briefing or checklist items appropriate to the arrival. (E) Adhere to airspeed restrictions and adjustments required by regulations, ATC and aircraft flight manual. (F) Maintain the appropriate airspeed, altitude and heading, and accurately track radials, courses and bearing (QDM/QDRs).
KNOWLEDGE	(A) Basic instrument rating knowledge. (B) Proper ATC phraseology. (C) Demonstrate adequate knowledge of: (1) flight manual; (2) limitations; (3) instrument patterns; (4) two-way communications failure procedures. (D) Systems: communication, navigation and auto-flight systems. (E) PBN specifications.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Awareness of aircraft position in space. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the cleared en-route routing. (E) Effective problem-solving and decision-making: React to navigation errors or unexpected systems malfunctions.

Use of radio aids

Module 3: En-route IFR procedures (must be performed by sole reference to instruments)	
Use of radio aids	
OBJECTIVE	(A) Correct use of RNAV system and radio aids with regard to promulgated range, identification and interpretation. (B) Use of ATIS/VOLMET where available.
SKILL	(A) Use the current and appropriate navigation publications for the proposed flight. (B) Select a combination of radio aids that allow the aircraft position to be correctly determined. (C) Manage the display of such aids so that the navigational information is readily available. (D) Correctly identify the chosen radio aids using Morse code where appropriate, i.e. when there is no 'auto-ident'. (E) Correctly assess the functionality of radio aids, including RNAV, before using them for navigation. (F) Correctly check receiver autonomous integrity monitoring (RAIM) of GNSS systems, if applicable. (G) Correctly input navigation planning data into the GNSS system where appropriate.
KNOWLEDGE	(A) Demonstrate the theoretical knowledge and understanding of: (1) the limitations and errors of VOR and NDB, the limitations and errors of VOR and NDB receivers in the aircraft, and the resulting potential navigational error; (2) information pertinent to radio aids or RNAV operations contained in NOTAMs; (3) correct identification of ground-based radio aids; (4) the radio aid equipment and associated displays fitted to the aircraft. (B) Identify when a ground-based radio aid is radiating but the signal is not available for navigation.
ATTITUDE	(A) Situation awareness: (1) Monitor flight progress and select the appropriate navigation systems to enable successful completion of the planned route; (2) Awareness of aircraft position in space. (B) Effective communication: As applicable to the specific situation. (C) Leadership and teamwork: As applicable to the specific situation. (D) Effective workload management: Use an appropriate 'division of attention' appropriately whilst controlling the aircraft and reset navigation aids. (E) Effective problem-solving and decision-making: React to navigation errors or unexpected systems malfunctions.

Level flight, control of heading, attitude and airspeed, power-setting, trim technique

Module 3: En-route IFR procedures	
Level flight, control of heading, attitude and airspeed, power-setting, trim technique	
OBJECTIVE	(A) Smooth control of heading, attitude and airspeed, power, trim and ancillary controls. (B) Correct use of autopilot where appropriate. (C) Demonstrate correct technique for instrument flight manoeuvring within specified limits. (D) Maintain balanced and trimmed flight.
SKILL	(A) Maintain altitude, heading and balance, by sole reference to instruments, using correct instrument confirmation, and coordinated control application. (B) Maintain altitude, heading and balance, whilst accelerating or decelerating to specific speeds, as determined by the aircraft flight manual. (C) Demonstrate correct procedure for pre-flight functional check of autopilot, flight director and aircraft navigation system, as applicable. (D) Demonstrate correct operating procedure for aircraft navigation systems, autopilot or flight director in all modes.
KNOWLEDGE	(A) Procedures for controlling the aircraft in accordance with the aircraft flight manual and flight manual, as appropriate. (B) Autopilot, flight director and navigation system fitted to the aircraft.
ATTITUDE	(A) Situation awareness: (1) Maintain awareness of the autopilot modes selected, where applicable; (2) Understand the need for trimmed, in-balance flight when manually flying the aircraft; (3) Maintain adequate scan rate before, during and after execution of any manoeuvre by reference to instruments and autopilot performance. (B) Effective communication: As applicable to the specific situation. (C) Leadership and teamwork: As applicable to the specific situation. (D) Effective workload management: Use an appropriate ‘division of attention’ when completing flight log, etc., whilst manually controlling the aircraft. (E) Effective problem-solving and decision-making: Prioritise activities to allow maintenance of correct instrument scan.

Altimeter setting

Module 3: En-route IFR procedures	
Altimeter setting	
OBJECTIVE	Follow the altimeter-setting procedure, and cross-check and monitor en-route protected areas.
SKILL	(A) Correct use and interpretation of altimeter subscale setting. (B) Cross-check against a second altimeter.
KNOWLEDGE	(A) National procedures, if different, regarding altimeter settings for the airspace the aircraft is occupying. (B) Effects of extremely low temperatures on altimeter indications. (C) Limitations and errors in altimeters due to construction or systems installed in the aircraft, etc.
ATTITUDE	(A) Situation awareness: (1) Understand the airspace structure and make appropriate altimeter settings; (2) Be aware of minimum safe altitude, sector safe altitude, etc. (B) Effective workload management: As applicable to the specific situation. (C) Effective communication: Use appropriate RTF procedures to update pressure settings. (D) Leadership and teamwork: As applicable to the specific situation. (E) Effective problem-solving and decision-making: Where necessary, identify and make appropriate decisions when confronted with system failures.

Timing and revision of estimated time of arrival (ETA) (en-route hold, if required)

Module 3: En-route IFR procedures	
Timing and revision of estimated time of arrival (ETA) (en-route hold, if required)	
OBJECTIVE	Understand the flight plan, and that the clearance is to be completed correctly.
SKILL	(A) Use appropriate and up-to-date aeronautical charts. (B) Extract and record pertinent information from NOTAMs, the aerodrome or facility directory, and other flight publications. (C) Plot a course for the intended route of flight. (D) Select the most favourable altitudes. (E) Compute headings, flight time, and fuel requirements.
KNOWLEDGE	(A) Weather reports and forecasts. (B) Pilot and radar reports. (C) Winds and temperatures aloft. (D) ATC procedures related to timing, e.g. update of ETA if changed by ± 3 minutes, clearance limit, etc.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Identify airspace, obstructions, and terrain features. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Demonstrate correct communication with ATC (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Select the appropriate navigation systems or facilities and communication frequencies. (E) Effective problem-solving and decision-making: Deal with unexpected navigation errors or systems malfunctions.

Monitoring of flight progress, flight log, fuel usage and management, systems management

Module 3: En-route IFR procedures	
Monitoring of flight progress, flight log, fuel usage and management, systems management	
OBJECTIVE	(A) Maintain a flight log by recording sufficient information. (B) Monitor the engine and aircraft systems throughout the flight. (C) Monitor fuel consumption versus fuel available and fuel required throughout the flight.
SKILL	(A) Follow the flight plan route in accordance with ATC. (B) Navigate by means of an appropriate navigation system for the cleared route. (C) Use the correct altimetry procedures. (D) Verify the aircraft's position in relation to the flight-planned route. (E) Correctly assess track error and make suitable adjustments to heading. (F) Correct and record the differences between pre-flight fuel, ground speed, and heading and time calculations and those determined en-route. (G) Complete all appropriate checklists. (H) Manage the flight in accordance with minimum altitude.
KNOWLEDGE	(A) Part-SERA requirements and national rules regarding use of aerodromes procedures. (B) Policy concerning IFR flights (e.g. national procedures in the AIP). (C) Services expected in different classes of airspace. (D) Danger restricted, and prohibited areas. (E) Minimum altitude and protected areas.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Identify airspace and minimum altitudes. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Demonstrate correct communication (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Select appropriate navigation systems or facilities and communication frequencies. (E) Effective problem-solving and decision-making: Deal with unexpected navigation errors or systems malfunctions.

Ice protection procedures, simulated if necessary

Module 3: En-route IFR procedures	
Ice protection procedures, simulated if necessary	
OBJECTIVE	(A) Monitoring of outside air temperature (OAT), icing risk and ice accretion rate (on FSTD if necessary); correct use of anti-icing and de-icing procedures. (B) Manage flight in icing conditions.
SKILL	(A) Assessment of ice accretion on aircraft. (B) Appropriate selection of anti-icing or de-icing systems. (C) Adapt the aircraft speed to stay within the flight manual limitations, if any. (D) Adapt the performance within the icing conditions. (E) Decision-making to avoid icing conditions.
KNOWLEDGE	(A) Weather reports and forecasts. (B) ATC, pilot and radar reports. (C) Surface analysis charts. (D) Ground radar summary charts. (E) Significant weather prognostics. (F) Forecast upper wind and temperature for aviation (WINTEM). (G) Freezing level. (H) SIGMETs. (I) ATIS and VOLMET reports. (J) Aircraft anti-icing and de-icing system limitations. (K) Significant weather chart (TEMSI).
ATTITUDE	(A) Situation awareness: (1) Understand the environmental conditions which can lead to the formation of ice on the aircraft; (2) Assess when ice accretion is outside the capability of the aircraft systems. (B) Effective communication: (1) Liaise with ATC to avoid known icing conditions; (2) Request change of route or level to avoid icing conditions. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Select appropriate navigation systems or facilities and communication frequencies. (E) Effective problem-solving and decision-making: (1) Deal with unexpected encounters with icing conditions or systems malfunctions; (2) Seek reroute or change of level in a timely manner.

ATC liaison — compliance, RTF procedures

Module 3: En-route IFR procedures	
ATC liaison — compliance, RTF procedures	
OBJECTIVE	ATC liaison using the correct RTF procedures and phraseology, and compliance with ATC procedures and clearances.
SKILL	(A) Follow the flight-planned route or any other ATC route requirements within the specified operating limits. (B) Identify and use navigation systems correctly. (C) Monitor whether ATC clearance is in accordance with a safe flight. (D) Use the correct RTF procedures and phraseology.
KNOWLEDGE	ICAO (language proficiency level 4, as a minimum) and national RTF procedures.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Identify airspace, and understand ATC clearances. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Demonstrate correct communication with ATC (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Select the appropriate navigation systems or facilities and communication frequencies. (E) Effective problem-solving and decision-making: Deal with unexpected navigation errors or systems malfunctions.

(4) Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only)

Simulated engine failure after take-off or during go-around

Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only) (must be performed by sole reference to instruments) (Multi-engine aeroplanes only)	
Simulated engine failure after take-off or during go-around (at a safe altitude unless conducted in an adapted FSTD)	
OBJECTIVE	(A) Maintain the flight path after take-off or during go-around with one engine inoperative. (B) Comply with ATC instructions.
SKILL	(A) Maintain control following engine failure with sole reference to instruments. (B) Prepare a strategy in case of engine failure or go-around. (C) Calculate one-engine-inoperative performance. (D) Adapt minima on take-off or in approach in accordance with the performance. (E) Carry out the recommended emergency procedures.
KNOWLEDGE	(A) Operating manual: (1) all systems; (2) limitations; (3) abnormal procedures; (4) Part-NCO; (5) performance; (6) CS-23. (B) Operator policy dedicated to failure during take-off: in particular, operator engine-out path during take-off.
ATTITUDE	(A) Situation awareness: (1) Recognise engine failure, and confirm correct engine; (2) Performance limitations; (3) Strategy threats. (B) Effective communication: Communicate appropriately with ATC. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: (1) Apply appropriate abnormal or emergency procedures, time permitting, to resolve reason for engine failure; (2) Management of flight path close to the ground. (E) Effective problem-solving and decision-making: Identify critical situation and make timely decision on suitable actions to carry out a safe asymmetric flight path.

Approach, go-around and procedural missed approach with one engine inoperative

Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only) (must be performed by sole reference to instruments) (Multi-engine aeroplanes only)	
Approach, go-around and procedural missed approach with one engine inoperative	
OBJECTIVE	(A) Manage IFR approach path during engine failure. (B) Maintain a stable approach in the correct configuration. (C) Make a clear decision to land or go around no later than the appropriate committal height or minima. (D) Complete asymmetric approach and go-around into visual circuit, circling approach or further instrument approach, maintaining control and correct speeds. (E) Initiate go-around action in case of destabilised approach. (F) Complete procedures and checks.
SKILL	(A) Apply the appropriate power setting for the flight condition and establish a pitch attitude necessary to achieve the desired performance. (B) Retract the wing flaps or drag devices and landing gear, if appropriate, in the correct sequence. (C) Accomplish the appropriate procedures or checklist items in a timely manner in accordance with the flight manual.
KNOWLEDGE	(A) Flight manual: (1) all systems; (2) limitations; (3) abnormal procedures; (4) patterns; (5) Part-NCO; (6) performance; (7) CS-23. (B) Operator policy dedicated to approach stabilisation criteria.
ATTITUDE	(A) Situation awareness: Recognise whether the approach profile is stabilised. (B) Effective communication: Communicate appropriately with ATC. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Apply appropriate abnormal procedures for asymmetric approach and go-around. (E) Effective problem-solving and decision-making: (1) Identify whether a critical situation is occurring due to inappropriate approach profile; (2) Make a timely decision to execute a go-around.

Approach and landing with one engine inoperative

Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only) (must be performed by sole reference to instruments) (Multi-engine aeroplanes only)	
Approach and landing with one engine inoperative	
OBJECTIVE	(A) Establish the approach and landing configuration appropriate for the selected runway and prevailing meteorological conditions, and adjust the engine controls as required. (B) Complete the applicable pre-landing checklist. (C) Maintain a stabilised approach at the desired airspeed. (D) Maintain the operating engine(s) within acceptable operating limits. (E) Accomplish a smooth, positively controlled transition from instrument reference to visual reference. (F) Join smoothly, if necessary, the visual approach flight path. (G) Complete the applicable post-landing briefing or checklist items in a timely manner, after clearing the runway, and as recommended by the manufacturer.
SKILL	(A) Consider the actual weather and wind conditions, landing surface and obstructions. (B) Maintain a stable approach in the correct configuration. (C) Plan and follow suitable approach pattern and orientation with the landing runway. (D) Establish the correct approach configuration, adjusting speed and rate of descent to maintain a stabilised approach path. (E) Make a clear decision to land or go around no later than the appropriate committal height or minima. (F) Select and achieve the appropriate touchdown area at the required speed.
KNOWLEDGE	(A) Flight manual: (1) all systems; (2) limitations; (3) abnormal procedures; (4) patterns; (5) Part-NCO; (6) performance; (7) CS-23. (B) Understand the factors affecting asymmetric committal height/altitude (ACH/A).
ATTITUDE	(A) Situation awareness: Recognise whether the approach profile is stabilised, leading to a safe asymmetric landing. (B) Effective communication: Liaise with ATC. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Apply appropriate abnormal procedures for asymmetric approach and landing. (E) Effective problem-solving and decision-making: Make appropriate decision at asymmetric committal height (ACH) to commit to final flap selection and landing.

ATC liaison — compliance, RTF procedures

Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only) (must be performed by sole reference to instruments) (Multi-engine aeroplanes only)	
ATC liaison — compliance, RTF procedures	
OBJECTIVE	(A) Inform ATC of abnormal flight condition and any assistance required. (B) Comply with ATC procedures and instructions.
SKILL	(A) Use standard RTF phraseology as far as possible and plain language as required when declaring an emergency. (B) Seek assistance as appropriate.
KNOWLEDGE	ICAO (language proficiency level 4 or higher) standard phraseology.
ATTITUDE	(A) Situation awareness: Communicate with ATC that an emergency has occurred. (B) Effective communication: Read back correctly, in a timely manner, the ATC clearance in the sequence received. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Copy correctly, in a timely manner, the ATC clearance as issued. (E) Effective problem-solving and decision-making: Interpret correctly the ATC clearance received and ensure that it is compliant with aircraft in an asymmetric configuration.

SUBPART J – INSTRUCTORS

SECTION 1 – COMMON REQUIREMENTS

GM1 FCL.900 Instructor certificates

GENERAL

(a) Nine instructor categories are recognised:

(1) FI certificate: aeroplane (FI(A)), helicopter (FI(H)), airship (FI(As)), sailplane (FI(S)) and balloon (FI(B));

(2) TRI certificate: aeroplane (TRI(A)), helicopter (TRI(H)), powered-lift aircraft (TRI(PL));

(3) CRI certificate: aeroplane (CRI(A));

(4) IRI certificate: aeroplane (IRI(A)), helicopter (IRI(H)) and airship (IRI(As));

(5) SFI certificate: aeroplane (SFI(A)), helicopter (SFI(H)) and poweredlift aircraft (SFI(PL));

(6) MCCI certificate: aeroplanes (MCCI(A)), helicopters (MCCI(H)), powered-lift aircraft(MCCI(PL)) and airships (MCCI(As));

(7) STI certificate: aeroplane (STI(A)) and helicopter (STI(H));

(8) MI certificate: (MI);

(9) FTI certificate: (FTI).

(b) For categories (1) to (4) and for (8) and (9) the applicant needs to hold a pilot licence. For categories (5) to (7) no licence is needed, only an instructor certificate.

(c) A person may hold more than one instructor certificate.

SPECIAL CONDITIONS

(a) When new aircraft are introduced, requirements such as to hold a licence and rating equivalent to the one for which instruction is being given, or to have adequate flight experience, may not be possible to comply with. In this case, to allow for the first instruction courses to be given to applicants for licences or ratings for these aircraft, competent authorities need the possibility to issue a specific certificate that does not have to comply with the requirements established in this Subpart.

(b) The competent authority should only give these certificates to holders of other instruction qualifications. As far as possible, preference should be given to persons with at least 100 hours of experience in similar types or classes of aircraft.

(c) When the new aircraft type introduced in an operator’s fleet, the CAA should only give the specific certificate to an applicant that is qualified as PIC on that aircraft.

(d) The certificate should ideally be limited in validity to the time needed to qualify the first instructors for the new aircraft in accordance with this Subpart, but in any case it should not exceed the 1 year established in the rule.

GM1 FCL.900(c); FCL.1000(c) Instruction or examination outside the territory of the state

Instruction or examination outside the territory of the state is possible within the scope of:

— ATOs that have their principal place of business outside the territory of the state; or

— ATOs that have their principal place of business in the state and one or more additional training sites outside the territory of the state.

GM1 FCL.900(c)(1) Instructor certificates

INSTRUCTION OUTSIDE THE TERRITORY OF THE STATE

The competent authority may issue an unrestricted flight instructor (FI) certificate (FI(A) for aeroplanes or FI(H) for helicopters) to an applicant that has at least 100 hours of experience in flight instruction and 25 hours in solo-flight supervision.

AMC1 FCL.915(e) General prerequisites and requirements for instructors

ADDITIONAL REQUIREMENTS FOR INSTRUCTING IN A TRAINING COURSE IN ACCORDANCE WITH FCL.745.A — GENERAL

(a) The objective of the course required by point FCL.915(e)(1) is to train instructors to deliver training on the advanced UPRT course according to point FCL.745.A using the train-to-proficiency concept.

(b) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching upset recovery techniques and strategies, whilst exploring the associated physiological and psychological aspects.

(c) Within 6 months preceding the start of the course, the instructor should have completed a pre-course assessment with an instructor holding the privilege in accordance with FCL.915(e)(1) to assess their ability to undertake the course.

(d) The training course should comprise:

  (1) theoretical knowledge instruction on the theoretical knowledge elements presented in the advanced UPRT course and the additional elements required for an instructor to deliver effective training;

  (2) flight instruction on the exercises used in the advanced UPRT course; and

(3) flight instruction on recovery from upsets that could result from students mis-handling the aircraft during the advanced UPRT course including spin recovery.

(e) The content of the theoretical knowledge and flight instruction should be tailored to the competence of the applicant as demonstrated during both pre-course and continuous assessment.

(f) Successful completion of the course requires that the instructor:

(1) demonstrates the resilience to be able to recover from any feasible upset in the aircraft to be used for training;

(2) demonstrates the ability to provide instruction to achieve the objectives of the advanced UPRT course to a wide range of trainees; and

(3) manages the physiological and psychological well-being of students during training.

(g) The instructor should be issued with a certificate following successful completion of the course.

AMC2 FCL.915(e) General prerequisites and requirements for instructors

ADDITIONAL REQUIREMENTS FOR INSTRUCTING IN A TRAINING COURSE IN ACCORDANCE WITH FCL.745.A – SYLLABUS

The following tables contain theoretical knowledge (Table 1) and practical training exercises (Table 2) that should be taught in the context of the advanced UPRT course as per point FCL.745.A.

TABLE 1: THEORETICAL KNOWLEDGE	
1.	Completion of a flight risk assessment
2.	Resilience-building strategies, managing startle and surprise
3	The limitations and type-specific characteristics of the aeroplane used for training
4	The importance of adhering to the scenarios that have been validated by the training programme developer
5.	Instructor techniques to induce and manage startle and surprise
6.	Upset recognition and recovery strategies
7.	Disorientation
8.	Distraction
9.	Immediate recognition of student pilot errors
10.	Intervention strategies
11.	Delivery of the theoretical knowledge instruction of the advanced UPRT course

TABLE 2: PRACTICAL TRAINING EXERCISES	
SECTION 1 — PRE-FLIGHT PREPARATION	
1.1	Correct completion of a flight risk assessment (such as weather, terrain, traffic density, student's experience level and capabilities)

1.2	Safety briefing
SECTION 2 — FLIGHT	
2.1	Selection of suitable airspace for the conduct of recovery exercises
2.2	Accurate execution of all of the manoeuvres required for the advanced UPRT course
2.3.	Recovery from upsets that could result from the student or instructor mishandling the aeroplane including: – timely and appropriate intervention; – accelerated stall; – secondary stall; – incipient spin; – fully developed spin; and – Spiral dive.
2.4	Delivery of all of the training exercises in the advanced UPRT course
2.5	Anticipating and immediately recognising incorrect student inputs which might exceed aeroplane limitations and acting swiftly and appropriately to maintain the necessary margins of safety
2.6	Exercises to surprise the student
2.7	Adapt the training programme to take account of the physiological and psychological state of the student
2.8	Ensure the safety of the operation during training by maintaining awareness of the operating environment
2.9	Assess the competence of the student
SECTION 3 — POST-FLIGHT	
3.1	Provide effective instructor feedback to the student and plan subsequent training details
3.2	Avoid negative transfer of training

GM1 FCL.915(e) General prerequisites and requirements for instructors

TRAINING ON SPIN AVOIDANCE AND SPIN RECOVERY

(a) While the purpose of advanced UPRT course is to expose students to psychological and physiological effects, students' responses and actions on controls may take any conceivable variations, including some which can initiate spin entry or, most importantly, can highly aggravate the upset or loss-of-control they are supposed to recover from.

(b) The advanced UPRT course in accordance with point FCL.745.A is not aerobatic training and only requires training for the incipient spin as well as uncoordinated side slipped stalls which are prone to initiating spins. Full spin training or the development of spin recovery proficiency is reserved for the training course in accordance with point FCL.915(e).

(c) Even though most flights will go exactly as planned without an unanticipated departure from controlled flight, the instructor is responsible for the safety of flight despite anomalies or unexpected student inputs.

(d) Even in a case where an aeroplane is not certified for intentional flat or aggravated or inverted spins, it does not mean that mishandled student recovery avoids placing the aeroplane in such a situation. Some student inputs will take the aeroplane uncontrolled far beyond the normal scope of the aerobatic rating as defined in point FCL.800. Those situations might also have the potential to draw the aeroplane outside its certified flight envelope (e.g. overloads, snap-roll departures above limit speed, spin or inverted spin when not certified for, flat spins, etc.). Most importantly, those resulting situations could startle the instructor.

(e) For the reasons specified in point (d), instructors should:

- (1) be trained to the extent of proficiency on the specific type of aircraft they use to deliver the course;
- (2) have academic understanding of the factors assisting or deterring spin recoveries (upright and inverted spins), altitude requirements for safe recovery margins, and other operational considerations;
- (3) demonstrate that they have the ability to early recognise abnormal situations, timely take action, and safely recover from all the conditions that they may encounter in the delivery of training; and
- (4) demonstrate their ability to recover from all spin types, not only from spins entered intentionally, but from spins of unannounced direction of autorotation, and from all potential spin variations, including:
  - (i) normal (non-aggravated) spins;
  - (ii) flat spins;
  - (iii) accelerated spins; and
  - (iv) transition spins (incorrect recovery resulting in reversal of rotation).

(f) In the context of points (d) and (e), it is recommended that candidates either hold an aerobatic rating for aeroplanes or have equivalent experience.

AMC1 FCL.915(e)(2) General prerequisites and requirements for instructors

CONTENT OF THE REFRESHER TRAINING FOR UPRT INSTRUCTIONAL PRIVILEGES

(a) The objective of the refresher training is for the instructor to maintain or to re-obtain, as applicable, the level of competence required for instructing on a training course as per point FCL.745.A.

(b) The content of the refresher training should:

- (1) consist of elements from the initial UPRT instructor training course as per point FCL.915(e)(1)(ii); and
- (2) be determined by the ATO on a case-by-case basis, considering the needs of the individual instructor and taking into account the following factors:
  - (i) the experience of the instructor;

(ii) the amount of time elapsed since the instructor provided instruction on a training course as per point FCL.745.A for the last time; and

(iii) the performance of the instructor during a simulated UPRT training session comprising exercises from the advanced UPRT course as per point FCL.745.A. During this simulated training session, another instructor qualified in accordance with point FCL.915(e) should play the role of the student on the advanced UPRT course.

(c) Taking into account the factors listed in (b)(2) above, the ATO may also count the simulated training session as per point (b)(2)(iii) as refresher training without the need for further refresher training sessions, provided that the instructor demonstrates that he or she already possesses the required level of competence.

(d) The completion of the refresher training should be entered in the logbook of the instructor and should be signed by the head of training of the ATO.

AMC1 FCL.920 Instructor competencies and assessment

(a) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching and assessing threat and error management and CRM.

(b) The training and assessment of instructors should be made against the following performance standards:

Competence	Performance	Knowledge
Prepare resources	(a) ensures adequate facilities; (b) prepares briefing material; (c) manages available tools; (d) plans training within the training envelope of the training platform, as determined by the ATO (Note: See GM1 ORA.ATO.125 point (f)).	(a) understand objectives; (b) available tools; (c) competency-based training methods; (d) understands the training envelope of the training platform, as determined by the ATO (Note: See GM1 ORA.ATO.125 point (f)) and avoids training beyond the boundaries of this envelope.
Create a climate conducive to learning	(a) establishes credentials, role models appropriate behaviour; (b) clarifies roles; (c) states objectives; (d) ascertains and supports student pilot's needs.	(a) barriers to learning; (b) learning styles.
Present knowledge	(a) communicates clearly; (b) creates and sustains realism; (c) looks for training opportunities.	teaching methods
Integrate TEM and CRM	(a) makes TEM and CRM links with technical training;	(a) TEM and CRM; (b) Causes and countermeasures against undesired aircraft states

Competence	Performance	Knowledge
	(b) for aeroplanes: makes upset prevention links with technical training.	
Manage time to achieve training objectives	Allocates the appropriate time to achieve competency objective.	syllabus time allocation
Facilitate learning	(a) encourages trainee participation; (b) shows motivating, patient, confident and assertive manner; (c) conducts one-to-one coaching; (d) encourages mutual support.	(a) facilitation; (b) how to give constructive feedback; (c) how to encourage trainees to ask questions and seek advice.
Assesses trainee performance	(a) assesses and encourages trainee self-assessment of performance against competency standards; (b) makes assessment decision and provides clear feedback; (c) observes CRM behaviour.	(a) observation techniques; (b) methods for recording observations.
Monitor and review progress	(a) compares individual outcomes to defined objectives; (b) identifies individual differences in learning rates; (c) applies appropriate corrective action.	(a) learning styles; (b) strategies for training adaptation to meet individual needs.
Evaluate training sessions	(a) elicits feedback from student pilots; (b) tracks training session processes against competence criteria; (c) keeps appropriate records.	(a) competency unit and associated elements; (b) performance criteria.
Report outcome	Reports accurately using only observed actions and events.	(a) phase training objectives; (b) individual versus systemic weaknesses.

AMC1 FCL.925 Additional requirements for instructors for the MPL

MPL INSTRUCTOR COURSE

(a) The objectives of the MPL instructors training course are to train applicants to deliver training in accordance with the features of a competency-based approach to training and assessment.

(b) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching and assessing threat and error management and CRM in the multicrew environment.

(c) The course is intended to adapt instructors to conduct competency-based MPL training. It should cover the items specified below:

THEORETICAL KNOWLEDGE

(d) Integration of operators and organisations providing MPL training:

(1) reasons for development of the MPL;

(2) MPL training course objective;

(3) adoption of harmonised training and procedures;

(4) feedback process.

(e) The philosophy of a competency-based approach to training: principles of competency-based training.

(f) Regulatory framework, instructor qualifications and competencies:

(1) source documentation;

(2) instructor qualifications;

(3) syllabus structure.

(g) Introduction to Instructional systems design methodologies (see ICAO PANSTRG Doc):

(1) analysis;

(2) design and production;

(3) evaluation and revision.

(h) Introduction to the MPL training scheme:

(1) training phases and content;

(2) training media;

(3) competency units, elements and performance criteria.

(i) Introduction to human performance limitations, including the principles of threat and error management and appropriate countermeasures developed in CRM:

(1) definitions;

(2) appropriate behaviours categories;

(3) assessment system.

(j) Application of the principles of threat and error management and CRM principles to training:

(1) application and practical uses;

(2) assessment methods;

(3) individual corrective actions;

(4) debriefing techniques.

(k) The purpose and conduct of assessments and evaluations:

(1) basis for continuous assessment against a defined competency standard;

(2) individual assessment;

(3) collection and analysis of data;

(4) training system evaluation.

PRACTICAL TRAINING

(l) Practical training may be conducted by interactive group classroom modules, or by the use of training devices. The objective is to enable instructors to:

(1) identify behaviours based on observable actions in the following areas:

(i) communications;

(ii) team working;

(iii) situation awareness;

(iv) workload management;

(v) problem solving and decision making.

(2) analyse the root causes of undesirable behaviours;

(3) debrief students using appropriate techniques, in particular:

(i) use of facilitative techniques;

(ii) encouragement of student self-analysis.

(4) agree corrective actions with the students;

(5) determine achievement of the required competency.

AMC2 FCL.925(d)(1) Additional requirements for instructors for the MPL

RENEWAL OF PRIVILEGES: REFRESHER TRAINING

(a) Paragraph (d) of FCL.925 determines that if the applicant has not complied with the requirements to maintain his/her privileges to conduct competency-based approach training, he or she shall receive refresher training at an ATO to reach the level of competence necessary to pass the assessment of instructor competencies. The amount of refresher training needed should be determined on a case-by-case basis by the ATO, taking into account the following factors:

(1) the experience of the applicant;

(2) the amount of time lapsed since the last time the applicant has conducted training in an MPL course. The amount of training needed to reach the desired level of competence should increase with the time lapsed. In some cases, after evaluating the instructor, and when the time lapsed is very limited, the ATO may even determine that no further refresher training is necessary.

(b) Once the ATO has determined the needs of the applicant, it should develop an individual training programme, which should be based on the MPL instructor course and focus on the aspects where the applicant has shown the greatest needs.

GM1 FCL.925 Additional requirements for instructors for the MPL

MPL INSTRUCTORS

The following table summarises the instructor qualifications for each phase of MPL integrated training course:

Phase of training	Qualification
Line flying under supervision according to operational requirements	Line training captain or TRI(A)
Phase 4: Advanced base training	TRI(A)
Phase 4: Advanced skill test	TRE(A)
Phase 4: Advanced	SFI(A) or TRI(A)
Phase 3: Intermediate	SFI(A) or TRI(A)
Phase 2: Basic	(a) FI(A) or IRI(A) and IR(A)/ME/MCC and 1500 hours multi-crew environment and IR(A) instructional privileges, or (b) FI(A) and MCCI(A), or (c) FI(A) and SFI(A), or (d) FI(A) and TRI(A)
Phase 1: Core flying skills	FI(A) and 500 hours, including 200 hours of instruction Instructor qualifications and privileges should be in accordance with the training items within the phase. STI for appropriate exercises conducted in an FNPT or BITD.

AMC1 FCL.935 Assessment of competence

GENERAL

(a) The format and application form for the assessment of competence are determined by the CAA.

(b) When an aircraft is used for the assessment, it should meet the requirements for training aircraft.

(c) If an aircraft is used for the test or check, the examiner acts as the PIC, except in circumstances agreed upon by the examiner when another instructor is designated as PIC for the flight.

(d) During the assessment of competence the applicant occupies the seat normally occupied by the instructor (instructors seat if in an FSTD, or pilot seat if in an aircraft), except in the case of balloons. The examiner, another instructor or, for MPA in an FFS, a real crew member under instruction, functions as the 'student'. The applicant is required to explain the relevant exercises and to demonstrate their conduct to the 'student', where appropriate. Thereafter, the 'student' executes the same manoeuvres (if the 'student' is the examiner or another instructor, this can include typical mistakes of inexperienced students). The applicant is expected to correct mistakes orally or, if necessary, by intervening physically.

(e) The assessment of competence should also include additional demonstration exercises, as decided by the examiner and agreed upon with the applicant before the assessment. These additional exercises should be related to the training requirements for the applicable instructor certificate.

(f) All relevant exercises should be completed within a period of 6 months. However, all exercises should, where possible, be completed on the same day. In principle, failure in any exercise requires a retest covering all exercises, with the exception of those that may be retaken separately. The examiner may terminate the assessment at any stage if they consider that a retest is required.

AMC2 FCL.935 Assessment of competence

MCCI, STI AND MI

In the case of the MCCI, STI and MI, the instructor competencies are assessed continuously during the training course.

AMC3 FCL.935 Assessment of competence

CONTENT OF THE ASSESSMENT FOR THE FI

(a) In the case of the FI, the content of the assessment of competence should be the following:

SECTION 1 THEORETICAL KNOWLEDGE ORAL	
1.1	Air law
1.2	Aircraft general knowledge
1.3	Flight performance and planning
1.4	Human performance and limitations
1.5	Meteorology
1.6	Navigation
1.7	Operational procedures
1.8	Principles of flight
1.9	Training administration

Sections 2 and 3 selected main exercises:

SECTION 2 PRE-FLIGHT BRIEFING	
2.1	Visual presentation
2.3	Technical accuracy
2.4	Clarity of explanation
2.5	Clarity of speech
2.6	Instructional technique
2.7	Use of models and aids
2.8	Student participation

SECTION 3 FLIGHT	
3.1	Arrangement of demo
3.2	Synchronisation of speech with demo
3.3	Correction of faults
3.4	Aircraft handling
3.5	Instructional technique
3.6	General airmanship and safety
3.7	Positioning and use of airspace

SECTION 4 ME EXERCISES	
4.1	Actions following an engine failure shortly after take-off[1]
4.2	SE approach and go-around[1]
4.3	SE approach and landing[1]

SECTION 5 POST-FLIGHT DE-BRIEFING	
5.1	Visual presentation
5.2	Technical accuracy
5.3	Clarity of explanation
5.4	Clarity of speech
5.5	Instructional technique
5.6	Use of models and aids
5.7	Student participation

(b) Section 1, the oral theoretical knowledge examination part of the assessment of competence, is for all FI and is subdivided into two parts:

(1) The applicant is required to give a lecture under test conditions to other ‘student(s)’, one of whom will be the examiner. The test lecture is to be selected from items of section 1. The amount of time for preparation of

[1] These exercises are to be demonstrated at the assessment of competence for FI for ME aircraft.

the test lecture is agreed upon beforehand with the examiner. Appropriate literature may be used by the applicant. The test lecture should not exceed 45 minutes;

(2) The applicant is tested orally by an examiner for knowledge of items of section 1 and the 'core instructor competencies: teaching and learning' content given in the instructor courses.

(c) Sections 2, 3 and 5 are for all FIs. These sections comprise exercises to demonstrate the ability to be an FI (for example instructor demonstration exercises) chosen by the examiner from the flight syllabus of the FI training courses. The applicant is required to demonstrate FI abilities, including briefing, flight instruction and de-briefing.

(d) Section 4 comprises additional instructor demonstration exercises for an FI for ME aircraft. This section, if applicable, is done in an ME aircraft, or an FFS or FNPT II simulating an ME aircraft. This section is completed in addition to sections 2, 3 and 5.

AMC4 FCL.935 Assessment of competence

CONTENT OF THE ASSESSMENT FOR THE SFI

The assessment should consist of at least 3 hours of flight instruction related to the duties of an SFI on the applicable FFS or FTD 2/3.

AMC5 FCL.935 Assessment of competence

REPORT FORMS FOR THE INSTRUCTOR CERTIFICATES

(a) Assessment of competence form for the FI, IRI and CRI certificates:

APPLICATION AND REPORT FORM FOR THE INSTRUCTOR ASSESSMENT OF COMPETENCE			
1 Applicants personal particulars:			
Applicant's last name(s):		First name(s):	
Date of birth:		Tel (home):	Tel (work):
Address:		Country:	
2 Licence details			
Licence type:		Number:	
Class ratings included in the licence:		Exp. Date:	
Type ratings included in the licence:	1.		
	2.		

	3.
	4.
	5.
Other ratings included in the licence:	1.
	2.
	3.
	4.
	5.

3	**Pre-course flying experience**			
Total flying hours	PIC SEP or TMG hours	SEP preceding 6 months	Instrument flight instruction	Cross-country hours
4	**Pre-entry flight test**			
I recommend ....for the FI course.				

Name of ATO:			Date of flight test:		
Name(s) of FI conducting the test (capital letters):					
Licence number:					
Signature:					
5	**Declaration by the applicant**				
I have received a course of training in accordance with the syllabus for the: (tick as applicable)					
FI certificate FI(A)/(H)/(As)		IRI certificate IRI(A)/(H)/(As)		CRI certificate CRI(A)	
Applicant's name(s): (capital letters)			Signature:		
6	**Declaration by the CFI**				
I certify that .... has satisfactorily completed an approved course of training for the					
FI certificate FI(A)/(H)/(As)		IRI certificate IRI(A)/(H)/(As)		CRI certificate CRI(A)	
in accordance with the relevant syllabus.					
Flying hours during the course:					
Aircraft or FSTDs used :					
Name(s) of CFI:					
Signature:					
Name of ATO:					
7	**Flight instructor examiner's certificate**				
I have tested the applicant according to to Part-FCL					
A. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT (in case of partial pass):					
Theoretical oral examination:			Skill test:		
Passed	***Failed***		***Passed***	***Failed***	
	I recommend further flight or ground training with an instructor before re-test				
	I do not consider further flight or theoretical instruction necessary before re-test (tick as applicable)				
B. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT:					
	FI certificate				
	IRI certificate				
	CRI certificate *(tick as applicable)*				
Name(s) of FIE (capital letters):					
Signature:					
Licence number:			Date:		

(b) Report form for the FI for sailplanes

APPLICATION AND REPORT FORM FOR THE FI(S) ASSESSMENT OF COMPETENCE

1	**Applicants personal particulars:**			
Applicant's last name(s):		First name(s):		
Date of birth:		Tel (home):	Tel (work):	
Address:		Country:		

2	**Licence details**		
Licence type:		Number:	
TMG extension:			

3	**Pre-course flying experience**			
Total flying hours	PIC hours	Sailplane (PIC hours and take-offs)	TMG (PIC hours and take-offs)	

4	**Pre-entry flight test**
I recommend ....for the FI course.	
Name of ATO:	Date of flight test:
Name(s) of FI conducting the test (capital letters):	
Licence number:	
Signature:	

5	**Declaration by the applicant**				
I have received a course of training in accordance with the syllabus for the:					
FI certificate FI(S)					
Applicant's name(s): (capital letters)			Signature:		

6	**Declaration by the chief flight instructor**				
I certify that .... has satisfactorily completed an approved course of training for the					
FI certificate FI(S)					
in accordance with the relevant syllabus.					
Flying hours during the course:			Take-offs during the course:		

Sailplanes, powered sailplanes or TMGs used :			
Name(s) of CFI:			
Signature:			
Name of DTO or ATO:			
7	**Flight instructor examiner's certificate**		
I have tested the applicant according to Part-FCL			
A. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT (in case of partial pass):			
Theoretical oral examination:		Skill test:	
Passed	***Failed***	***Passed***	***Failed***
	I recommend further flight or ground training with an instructor before re-test		
	I do not consider further flight or theoretical instruction necessary before re-test (tick as applicable)		
B. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT:			
	FI certificate		
	Date:		
Name(s) of FIE (capital letters):			
Signature:			
Licence number:		Date:	

(c) Report form for the FI for balloons:

APPLICATION AND REPORT FORM FOR THE FI(B) ASSESSMENT OF COMPETENCE				
1	**Applicants personal particulars:**			
Applicant's last name(s):		First name(s):		
Date of birth:		Tel (home):	Tel (work):	
Address:		Country:		
2	**Licence details**			
Licence type:		Number:		
Class extension:	1.	Groups:		
	2.	Groups:		
	3.	Groups:		
3	**Pre-course flying experience**			
Total flying hours in different groups	PIC hours	Hot-air balloon	Gas balloon	Hot-air airship

4	**Pre-entry flight test**
I recommend ………………………………for the FI course.	
Name of ATO:	Date of flight test:
Name(s) of FI conducting the test (capital letters):	
Licence number:	
Signature:	
5	**Declaration by the applicant**
I have received a course of training in accordance with the syllabus for the:	

FI certificate FI(B)					

Applicant's name(s): (capital letters)	Signature:
6	**Declaration by the chief flight instructor**
I certify that …………………………………. has satisfactorily completed an approved course of training for the	

FI certificate FI(B)					

in accordance with the relevant syllabus.	
Flying hours during the course:	Take-offs during the course:
Balloons, hot-air airships used:	
Name(s) of CFI:	
Signature:	
Name of DTO or ATO:	
7	**Flight instructor examiner's certificate**
I have tested the applicant according to Part-FCL	
A. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT (in case of partial pass):	

Theoretical oral examination:		Skill test:	
Passed	***Failed***	***Passed***	***Failed***

	I recommend further flight or ground training with an FI before re-test
	I do not consider further flight or theoretical instruction necessary before re-test (tick as applicable)
B. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT:	
	FI certificate
Name(s) of FIE (capital letters):	
Signature:	
Licence number:	Date:

SECTION 2 – SPECIFIC REQUIREMENTS FOR THE FLIGHT INSTRUCTOR – FI

GM1 FCL.905.FI(h)(2) Privileges and conditions

FSTDs should not be used to pass an assessment of competence on the class or type of aircraft.

AMC1 FCL.930.FI FI Training course

FI(A), FI(H) AND FI(AS) TRAINING COURSE

GENERAL

(a) The aim of the FI training course is to train aircraft licence holders to the level of competence defined in FCL.920.

(b) The training course should develop safety awareness throughout by teaching the knowledge, skills and attitudes relevant to the FI task including at least the following:

(1) refresh the technical knowledge of the student instructor;

(2) train the student instructor to teach the ground subjects and air exercises;

(3) ensure that the student instructor's flying is of a sufficiently high standard;

(4) teach the student instructor the principles of basic instruction and to apply them at the PPL level.

FLIGHT INSTRUCTION

(c) The remaining 5 hours in FCL.930.FI(b)(3) may be mutual flying (that is, two applicants flying together to practice flight demonstrations).

(d) The tassessment of competence is additional to the course training time.

CONTENT

(e) The training course consists of two parts:

(1) Part 1, theoretical knowledge, including the teaching and learning instruction that should comply with AMC1 FCL.920;

(2) Part 2, flight instruction.

Part 1

TEACHING AND LEARNING

(a) The course should include at least 125 hours of theoretical knowledge instruction, including at least 25 hours teaching and learning instruction.

CONTENT OF THE TEACHING AND LEARNING INSTRUCTIONS (INSTRUCTIONAL TECHNIQUES):

(b) The learning process:

(1) motivation;

(2) perception and understanding;

(3) memory and its application;

(4) habits and transfer;

(5) obstacles to learning;

(6) incentives to learning;

(7) learning methods;

(8) rates of learning.

(c) The teaching process:

(1) elements of effective teaching;

(2) planning of instructional activity;

(3) teaching methods;

(4) teaching from the ‘known’ to the ‘unknown’;

(5) use of ‘lesson plans’.

(d) Training philosophies:

(1) value of a structured (approved) course of training;

(2) importance of a planned syllabus;

(3) integration of theoretical knowledge and flight instruction.

(e) Techniques of applied instruction:

(1) theoretical knowledge: classroom instruction techniques:

(i) use of training aids;

(ii) group lectures;

(iii) individual briefings;

(iv) student participation or discussion.

(2) flight: airborne instruction techniques:

(i) the flight or cockpit environment;

(ii) techniques of applied instruction;

(iii) post-flight and in-flight judgement and decision making.

(f) Student evaluation and testing:

(1) assessment of student performance:

(i) the function of progress tests;

(ii) recall of knowledge;

(iii) translation of knowledge into understanding;

(iv) development of understanding into actions;

(v) the need to evaluate rate of progress.

(2) analysis of student errors:

(i) establish the reason for errors;

(ii) tackle major faults first, minor faults second;

(iii) avoidance of over criticism;

(iv) the need for clear concise communication.

(g) Training programme development:

(1) lesson planning;

(2) preparation;

(3) explanation and demonstration;

(4) student participation and practice;

(5) evaluation.

(h) Human performance and limitations relevant to flight instruction:

(1) physiological factors:

(i) psychological factors;

(ii) human information processing;

(iii) behavioural attitudes;

(iv) development of judgement and decision making.

(2) threat and error management.

(i) Specific hazards involved in simulating systems failures and malfunctions in the aircraft during flight:

(i) importance of 'touch drills';

(ii) situational awareness;

(iii) adherence to correct procedures.

(j) Training administration:

(1) flight or theoretical knowledge instruction records;

(2) pilot's personal flying logbook;

(3) the flight or ground curriculum;

(4) study material;

(5) official forms;

(6) flight manual or equivalent document (for example owner's manual or pilot's operating handbook);

(7) flight authorisation papers;

(8) aircraft documents;

(9) the private pilot's licence regulations.

A. Aeroplanes

Part 2

AIR EXERCISES

(a) The air exercises are similar to those used for the training of PPL(A) but with additional items designed to cover the needs of an FI.

(b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(1) the applicant's progress and ability;

(2) the weather conditions affecting the flight;

(3) the flight time available;

(4) instructional technique considerations;

(5) the local operating environment.

(c) It follows that student instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

(d) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include information on how the flight will be conducted, who is to fly the aeroplane and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.

(e) The four basic components of the briefing will be:

(1) the aim;

(2) principles of flight (briefest reference only);

(3) the air exercise(s) (what, and how and by whom);

(4) airmanship (weather, flight safety etc.).

PLANNING OF FLIGHT LESSONS

(f) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

(g) The student instructor should complete flight training to practise the principles of basic instruction at the PPL(A) level.

(h) During this training, except when acting as a student pilot for mutual flights, the student instructor occupies the seat normally occupied by the FI(A).

(i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.

(j) If the privileges of the FI(A) certificate are to include instruction for night flying, exercises 19 and 20 of the flight instruction syllabus should be undertaken at night in addition to by day either as part of the course or subsequent to certification issue.

(k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

SYLLABUS OF FLIGHT INSTRUCTION CONTENTS

LONG BRIEFINGS AND AIR EXERCISES

Note: though exercise 11b is not required for the PPL(A) course, it is a requirement for the FI course.

EXERCISE 1: FAMILIARISATION WITH tHE AEROPLANE

(a) Long briefing objectives:

   (1) introduction to the aeroplane;

   (2) explanation of the cockpit layout;

   (3) aeroplane and engine systems;

   (4) checklists, drills and controls;

   (5) propeller safety;

      (i) precautions general;

      (ii) precautions before and during hand turning;

      (iii) hand swinging technique for starting (if applicable to type).

   (6) differences when occupying the instructor’s seat;

   (7) emergency drills:

      (i) action if fire in the air and on the ground: engine, cock or cabin and electrical fire;

(ii) system failure as applicable to type;

(iii) escape drills: location and use of emergency equipment and exits.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(a) Long briefing objectives:

(1) flight authorisation and aeroplane acceptance, including technical log (if applicable) and certificate of maintenance;

(2) equipment required for flight (maps, etc.);

(3) external checks;

(4) internal checks;

(5) student comfort, harness, seat or rudder pedal adjustment;

(6) starting and warming up checks;

(7) power checks;

(8) running down, system checks and switching off the engine;

(9) leaving the aeroplane, parking, security and picketing;

(10) completion of authorisation sheet and aeroplane serviceability documents.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 3: AIR EXPERIENCE

(a) Long briefing objectives:

Note: there is no requirement for a long briefing for this exercise.

(b) Air exercise:

(1) air experience;

(2) cockpit layout, ergonomics and controls;

(3) cockpit procedures: stability and control.

EXERCISE 4: EFFECTS OF CONTROLS

(a) Long briefing objectives:

(1) function of primary flying controls: when laterally level and banked;

(2) further effect of ailerons and rudder;

(3) effect of inertia;

(4) effect of air speed;

(5) effect of slipstream;

(6) effect of power;

(7) effect of trimming controls;

(8) effect of flaps;

(9) operation of mixture control;

(10) operation of carburettor heat control;

(11) operation of cabin heat or ventilation systems;

(b) Air exercise:

(1) primary effects of flying controls: when laterally level and banked;

(2) further effects of ailerons and rudder;

(3) effect of air speed;

(4) effect of slipstream;

(5) effect of power;

(6) effect of trimming controls;

(7) effect of flaps;

(8) operation of mixture control;

(9) operation of carburettor heat control;

(10) operation of cabin heat or ventilation systems;

(11) effect of other controls as applicable.

EXERCISE 5: TAXIING

(a) Long briefing objectives:

(1) pre-taxiing checks;

(2) starting, control of speed and stopping;

(3) engine handling;

(4) control of direction and turning (including manoeuvring in confined spaces);

(5) parking area procedures and precautions;

(6) effect of wind and use of flying controls;

(7) effect of ground surface;

(8) freedom of Rudder movement;

(9) marshalling signals;

(10) instrument checks;

(11) ATC procedures;

(12) emergencies: steering failure and brake failure.

(b) Air exercise:

(1) pre-taxiing checks;

(2) starting, control of speed and stopping;

(3) engine handling;

(4) control of direction and turning;

(5) turning in confined spaces;

(6) parking area procedures and precautions;

(7) effect of wind and use of flying control;

(8) effect of ground surface;

(9) freedom of Rudder movement;

(10) marshalling signals;

(11) instrument checks;

(12) ATC procedures;

(13) emergencies: steering failure and brake failure.

EXERCISE 6: STRAIGHT AND LEVEL FLIGHT

(a) Long briefing objectives:

(1) the forces;

(2) longitudinal stability and control in pitch;

(3) relationship of CG to control in pitch;

(4) lateral and directional stability (control of lateral level and balance);

(5) attitude and balance control;

(6) trimming;

(7) power settings and air speeds;

(8) drag and power curves;

(9) range and endurance.

(b) Air exercise:

(1) at normal cruising power;

(2) attaining and maintaining straight and level flight;

(3) demonstration of inherent stability;

(4) control in pitch, including use of elevator trim control;

(5) lateral level, direction and balance, use of rudder trim controls as applicable at selected air speeds (use of power):

(i) effect of drag and use of power (two air speeds for one power setting);

(ii) straight and level in different aeroplane configurations (flaps and landing gear);

(iii) use of instruments to achieve precision flight.

EXERCISE 7: CLIMBING

(a) Long briefing objectives:

(1) the forces;

(2) relationship between power or air speed and rate of climb (power curves maximum rate of climb (vy));

(3) effect of mass;

(4) effect of flaps;

(5) engine considerations;

(6) effect of density altitude;

(7) the cruise climb;

(8) maximum angle of climb (vx).

(b) Air exercise:

(1) entry and maintaining the normal maximum rate climb;

(2) levelling off;

(3) levelling off at selected altitudes;

(4) climbing with flaps down;

(5) recovery to normal climb;

(6) en-route climb (cruise climb);

(7) maximum angle of climb;

(8) use of instruments to achieve precision flight.

EXERCISE 8: DESCENDING

(a) Long briefing objectives:

(1) the forces;

(2) glide descent: angle, air speed and rate of descent;

(3) effect of flaps;

(4) effect of wind;

(5) effect of mass;

(6) engine considerations;

(7) power assisted descent: power or air speed and rate of descent;

(8) cruise descent;

(9) sideslip.

(b) Air exercise:

(1) entry and maintaining the glide;

(2) levelling off;

(3) levelling off at selected altitudes;

(4) descending with flaps down;

(5) powered descent: cruise descent (including effect of power and air speed);

(6) side-slipping (on suitable types);

(7) use of instrument to achieve precision flight.

EXERCISE 9: TURNING

(a) Long briefing objectives:

(1) the forces;

(2) use of controls;

(3) use of power;

(4) maintenance of attitude and balance;

(5) medium level turns;

(6) climbing and descending turns;

(7) slipping turns;

(8) turning onto selected headings: use of gyro heading indicator and magnetic compass.

(b) Air exercise:

(1) entry and maintaining medium level turns;

(2) resuming straight flight;

(3) faults in the turn (incorrect pitch, bank and balance);

(4) climbing turns;

(5) descending turns;

(6) slipping turns (on suitable types);

(7) turns to selected headings: use of gyro heading indicator and magnetic compass

(8) use of instruments to achieve precision flight;

Note: stall or spin awareness and avoidance training consists of exercises 10a, 10b and 11a.

EXERCISE 10a: SLOW FLIGHT

(a) Long briefing objectives:

(1) aeroplane handling characteristics during slow flight at:

(i) v_{s1} & v_{so} + 10 knots;

(ii) v_{s1} & v_{so} + 5 knots.

(2) slow flight during instructor induced distractions;

(3) effect of overshooting in configurations where application of engine power causes a strong ‘nose-up’ trim change.

(b) Air exercise:

(1) safety checks;

(2) introduction to slow flight;

(3) controlled slow flight in the clean configuration at:

(i) v_{s1} + 10 knots and with flaps down;

(ii) v_{so} + 10 knots;

(iii) straight and level flight;

(iv) level turns;

(v) climbing and descending;

(vi) climbing and descending turns.

(4) controlled slow flight in the clean configuration at:

(i) v_{s1} + 5 knots and with flaps down;

(ii) v_{so} + 5 knots;

(iii) straight and level flight;

(iv) level turns;

(v) climbing and descending;

(vi) climbing and descending turns;

(vii) descending ‘unbalanced’ turns at low air speed: the need to maintain balanced flight.

(5) ‘instructor induced distractions’ during flight at low air speed: the need to maintain balanced flight and a safe air speed;

(6) effect of going around in configurations where application of engine power causes a strong ‘nose up’ trim change.

EXERCISE 10b: STALLING

(a) Long briefing objectives:

(1) characteristics of the stall;

(2) angle of attack;

(3) effectiveness of the controls at the stall;

(4) factors affecting the stalling speed:

(i) effect of flaps, slats and slots;

(ii) effect of power, mass, CG and load factor.

(5) effects of unbalance at the stall;

(6) symptoms of the stall;

(7) stall recognition and recovery;

(8) stalling and recovery:

(i) without power;

(ii) with power on;

(iii) with flaps down;

(iv) maximum power climb (straight and turning flight to the point of stall with uncompensated yaw);

(v) stalling and recovery during manoeuvres involving more than 1 G (accelerated stalls, including secondary stalls and recoveries);

(vi) recovering from incipient stalls in the landing and other configurations and conditions;

(vii) recovering at the incipient stage during change of configuration;

(viii) stalling and recovery at the incipient stage with ‘instructor induced’ distractions.

Note: consideration is to be given to manoeuvre limitations and references to the flight manual or equivalent document (for example owner’s manual or pilot’s operating handbook) in relation to mass and balance limitations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner’s manual or pilot’s operating handbook), they have to be taken into consideration. These factors are also covered in the next exercise spinning.

(b) Air exercise:

(1) safety checks;

(2) symptoms of the stall;

(3) stall recognition and recovery:

(i) without power;

(ii) with power on;

(iii) recovery when a wing drops at the stall;

(iv) stalling with power 'on' and recovery;

(v) stalling with flap 'down' and recovery;

(vi) maximum power climb (straight and turning flight) to the point of stall with uncompensated yaw: effect of unbalance at the stall when climbing power is being used;

(vii) stalling and recovery during manoeuvres involving more than 1 G (accelerated stalls, including secondary stalls and recoveries);

(viii) recoveries from incipient stalls in the landing and other configurations and conditions;

(ix) recoveries at the incipient stage during change of configuration;

(x) instructor induced distractions during stalling.

Note: consideration of manoeuvre limitations and the need to refer to the aeroplane manual and weight (mass) and balance calculations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner's manual or pilot's operating handbook), they have to be taken into consideration. These factors are to be covered in the next exercise: spinning.

EXERCISE 11a: SPIN RECOVERY AT THE INCIPIENT STAGE

(a) Long briefing objectives:

(1) causes, stages, autorotation and characteristics of the spin;

(2) recognition and recovery at the incipient stage: entered from various flight attitudes;

(3) aeroplane limitations.

(b) Air exercise:

(1) aeroplane limitations;

(2) safety checks;

(3) recognition at the incipient stage of a spin;

(4) recoveries from incipient spins entered from various attitudes with the aeroplane in the clean configuration, including instructor induced distractions.

EXERCISE 11b: SPIN RECOVERY AT THE DEVELOPED STAGE

(a) Long briefing objectives:

(1) spin entry;

(2) recognition and identification of spin direction;

(3) spin recovery;

(4) use of controls;

(5) effects of power or flaps (flap restriction applicable to type);

(6) effect of the CG upon spinning characteristics;

(7) spinning from various flight attitudes;

(8) aeroplane limitation;

(9) safety checks.

(b) Air exercise:

(1) aeroplane limitations;

(2) safety checks;

(3) spin entry;

(4) recognition and identification of the spin direction;

(5) spin recovery (reference to flight manual);

(6) use of controls;

(7) effects of power or flaps (restrictions applicable to aeroplane type);

(8) spinning and recovery from various flight attitudes.

EXERCISE 12: TAKE-OFF AND CLIMB TO DOWNWIND POSITION

(a) Long briefing objectives:

(1) handling: factors affecting the length of take-off run and initial climb;

(2) correct lift off speed, use of elevators (safeguarding the nose wheel), rudder and power;

(3) effect of wind (including crosswind component);

(4) effect of flaps (including the decision to use and the amount permitted);

(5) effect of ground surface and gradient upon the take-off run;

(6) effect of mass, altitude and temperature on take-off and climb performance;

(7) pre take-off checks;

(8) ATC procedure before take-off;

(9) drills, during and after take-off;

(10) noise abatement procedures;

(11) tail wheel considerations (as applicable);

(12) short or soft field take-off considerations or procedures;

(13) emergencies:

(i) aborted take-off;

(ii) engine failure after take-off.

(14) ATC procedures.

(b) Air exercise:

(1) take-off and climb to downwind position;

(2) pre take-off checks;

(3) into wind take-off;

(4) safeguarding the nose wheel;

(5) crosswind take-off;

(6) drills during and after take-off;

(7) short take-off and soft field procedure or techniques (including performance calculations);

(8) noise abatement procedures.

EXERCISE 13: CIRCUIT, APPROACH AND LANDING

(a) Long briefing objectives:

(1) downwind leg, base leg and approach: position and drills;

(2) factors affecting the final approach and the landing run;

(3) effect of mass;

(4) effects of altitude and temperature;

(5) effect of wind;

(6) effect of flap;

(7) landing;

(8) effect of ground surface and gradient upon the landing run;

(9) types of approach and landing:

(i) powered;

(ii) crosswind;

(iii) flapless (at an appropriate stage of the course);

(iv) glide;

(v) short field;

(vi) soft field.

(10) tail wheel aeroplane considerations (as applicable);

(11) missed approach;

(12) engine handling;

(13) wake turbulence awareness;

(14) windshear awareness;

(15) ATC procedures;

(16) mislanding and go-around;

(17) special emphasis on look-out.

(b) Air exercise:

(1) circuit approach and landing;

(2) circuit procedures: downwind and base leg;

(3) powered approach and landing;

(4) safeguarding the nose wheel;

(5) effect of wind on approach and touchdown speeds and use of flaps;

(6) crosswind approach and landing;

(7) glide approach and landing;

(8) flapless approach and landing (short and soft field);

(9) short field and soft field procedures;

(10) wheel landing (tail wheel aircraft);

(11) missed approach and go-around;

(12) mislanding and go-around;

(13) noise abatement procedures.

EXERCISE 14: FIRST SOLO AND CONSOLIDATION

Note: a summary of points to be covered before sending the student on first solo.

(a) Long briefing objectives:

During the flights immediately following the solo circuit consolidation period the following should be covered:

(1) procedures for leaving and rejoining the circuit;

(2) local area (restrictions, controlled airspace, etc.);

(3) compass turns;

(4) QDM meaning and use.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 15: ADVANCED TURNING

(a) Long briefing objectives:

(1) the forces;

(2) use of power;

(3) effect of load factor:

(i) structural considerations

(ii) increased stalling speed.

(4) physiological effects;

(5) rate and radius of turn;

(6) steep, level, descending and climbing turns;

(7) stalling in the turn and how to avoid it;

(8) spinning from the turn: recovery at the incipient stage;

(9) spiral dive;

(10) unusual attitudes and recoveries.

Note: considerations are to be given to manoeuvre limitations and reference to the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) in relation to mass and balance, and any other restrictions for practice entries to the spin.

(b) Air exercise:

(1) level, descending and climbing steep turns;

(2) stalling in the turn;

(3) spiral dive;

(4) spinning from the turn;

(5) recovery from unusual attitudes;

(6) maximum rate turns.

EXERCISE 16: FORCED LANDING WITHOUT POWER

(a) Long briefing objectives:

(1) selection of forced landing areas;

(2) provision for change of plan;

(3) gliding distance: consideration;

(4) planning the descent;

(5) key positions;

(6) engine failure checks;

(7) use of radio: R/T 'distress' procedure;

(8) base leg;

(9) final approach;

(10) go-around;

(11) landing considerations;

(12) actions after landing: aeroplane security;

(13) causes of engine failure.

(b) Air exercise:

(1) forced landing procedures;

(2) selection of landing area:

(i) provision for change of plan;

(ii) gliding distance considerations.

(3) planning the descent;

(4) key positions;

(5) engine failure checks;

(6) engine cooling precautions;

(7) use of radio;

(8) base leg;

(9) final approach;

(10) landing;

(11) actions after landing: when the exercise is conducted at an aerodrome;

(12) aeroplane security.

EXERCISE 17: PRECAUTIONARY LANDING

(a) Long briefing objectives:

(1) occasions when necessary (in-flight conditions);

(2) landing area selection and communication (R/T procedure);

(3) overhead inspection;

(4) simulated approach;

(5) climb away;

(6) landing area selection:

(i) normal aerodrome;

(ii) disused aerodrome;

(iii) ordinary field;

(7) circuit and approach;

(8) actions after landing; aeroplane security.

(b) Air exercise:

(1) occasions when necessary (in-flight conditions):

(2) landing area selection

(3) overhead inspection

(4) simulated approach

(5) climb away

(6) landing area selection:

(i) normal aerodrome;

(ii) disused aerodrome;

(iii) ordinary field;

(7) circuit and approach;

(8) actions after landing; aeroplane security;

EXERCISE 18a: NAVIGATION

(a) Long briefing objectives:

(1) flight planning;

(i) weather forecast and actual(s);

(ii) map selection, orientation, preparation and use:

(A) choice of route;

(B) regulated or controlled airspace;

(C) danger, prohibited and restricted areas;

(D) safety altitude.

(iii) calculations:

(A) magnetic heading(s) and time(s) en-route;

(B) fuel consumption;

(C) mass and balance;

(D) mass and performance.

(iv) flight information:

(A) NOTAMs etc.;

(B) noting of required radio frequencies;

(C) selection of alternate aerodrome(s).

(v) aeroplane documentation.

(vi) notification of the flight:

(A) pre-flight administration procedures;

(B) flight plan form (where appropriate).

(2) departure;

(i) organisation of cockpit workload;

(ii) departure procedures:

(A) altimeter settings;

(B) setting heading procedures;

(C) noting of ETA(s).

(iii) en-route map reading: identification of ground features;

(iv) maintenance of altitudes and headings;

(v) revisions to ETA and heading, wind effect, drift angle and groundspeed checks;

(vi) log keeping;

(vii) use of radio (including VDF if applicable);

(viii) minimum weather conditions for continuance of flight;

(ix) ‘in-flight’ decisions;

(x) diversion procedures;

(xi) operations in regulated or controlled airspace;

(xii) procedures for entry, transit and departure;

(xiii) navigation at minimum level;

(xiv) uncertainty of position procedure, including R/T procedure;

(xv) lost procedure;

(xvi) use of radio navaids.

(3) arrival procedures and aerodrome circuit joining procedures:

(i) ATC liaison, R/T procedure, etc.;

(ii) altimeter setting,

(iii) entering the traffic pattern (controlled or uncontrolled aerodromes);

(iv) circuit procedures;

(v) parking procedures;

(vi) security of aircraft;

(vii) refuelling;

(viii) booking in.

(b) Air exercise:

(1) flight planning:

(i) weather forecast and actual(s);

(ii) map selection and preparation:

(A) choice of route;

(B) regulated or controlled airspace;

(C) danger, prohibited and restricted areas;

(D) safety altitude.

(iii) calculations:

(A) magnetic heading(s) and time(s) en-route;

(B) fuel consumption;

(C) mass and balance;

(D) mass and performance.

(iv) flight information:

(A) NOTAMs etc.;

(B) noting of required radio frequencies;

(C) selection of alternate aerodromes.

(v) aircraft documentation;

(vi) notification of the flight:

(A) flight clearance procedures (as applicable);

(B) flight plans.

(2) aerodrome departure;

(i) organisation of cockpit workload;

(ii) departure procedures:

(A) altimeter settings;

(B) en-route;

(C) noting of ETA(s).

(iii) wind effect, drift angle and ground speed checks;

(iv) maintenance of altitudes and headings;

(v) revisions to ETA and heading;

(vi) log keeping;

(vii) use of radio (including VDF if applicable);

(viii) minimum weather conditions for continuance of flight;

(ix) 'in-flight' decisions;

(x) diversion procedure;

(xi) operations in regulated or controlled airspace;

(xii) procedures for entry, transit and departure;

(xiii) uncertainty of position procedure;

(xiv) lost procedure;

(xv) use of radio navaids.

(3) arrival procedures and aerodrome joining procedures:

(i) ATC liaison, R/T procedure etc.;

(ii) altimeter setting,

(iii) entering the traffic pattern;

(iv) circuit procedures;

(v) parking procedures

(vi) security of aircraft;

(vii) refuelling;

(viii) booking in.

EXERCISE 18b: NAVIGATION AT LOWER LEVELS AND IN REDUCED VISIBILITY

(a) Long briefing objectives:

(1) general considerations:

(i) planning requirements before flight in entry or exit lanes;

(ii) ATC rules, pilot qualifications and aircraft equipment;

(iii) entry or exit lanes and areas where specific local rules apply.

(2) low level familiarisation:

(i) actions before descending;

(ii) visual impressions and height keeping at low altitude;

(iii) effects of speed and inertia during turns;

(iv) effects of wind and turbulence;

(3) low level operation:

(i) weather considerations;

(ii) low cloud and good visibility;

(iii) low cloud and poor visibility;

(iv) avoidance of moderate to heavy rain showers;

(v) effects of precipitation;

(vi) joining a circuit;

(vii) bad weather circuit, approach and landing.

(b) Air exercise:

(1) general considerations: entry or exit lanes and areas where specific local rules apply;

(2) low level familiarisation:

(i) actions before descending;

(ii) visual impressions and height keeping at low altitude;

(iii) effects of speed and inertia during turns;

(iv) effects of wind and turbulence;

(v) hazards of operating at low levels;

(3) low level operation:

(i) weather considerations;

(ii) low cloud and good visibility;

(iii) low cloud and poor visibility;

(iv) avoidance of moderate to heavy rain showers;

(v) effects of precipitation (forward visibility);

(vi) joining a circuit;

(vii) bad weather circuit, approach and landing.

EXERCISE 18c: USE OF RADIO NAVIGATION AIDS UNDER VFR

(a) Long briefing objectives:

(1) use of VOR:

(i) availability, AIP and frequencies;

(ii) signal reception range;

(iii) selection and identification;

(iv) radials and method of numbering;

(v) use of OBS;

(vi) to or from indication and station passage;

(vii) selection, interception and maintaining a radial;

(viii) use of two stations to determine position.

(2) use of ADF equipment:

(i) availability of NDB stations, AIP and frequencies;

(ii) signal reception range;

(iii) selection and identification;

(iv) orientation in relation to NDP;

(v) homing to an NDP.

(3) use of VHF/DF:

(i) availability. AIP and frequencies;

(ii) R/T procedures;

(iii) obtaining QDMs and QTEs.

(4) use of radar facilities:

(i) availability and provision of service and AIS;

(ii) types of service;

(iii) R/T procedures and use of transponder:

(A) mode selection;

(B) emergency codes.

(5) use of distance DME:

(i) availability and AIP;

(ii) operating modes;

(iii) slant range.

(6) use of GNSS (RNAV – SATNAV):

(i) availability;

(ii) operating modes;

(iii) limitations.

(b) Air exercise:

(1) use of VOR:

(i) availability, AIP and frequencies;

(ii) selection and identification;

(iii) use of OBS;

(iv) to or from indications: orientation;

(v) use of CDI;

(vi) determination of radial;

(vii) intercepting and maintaining a radial;

(viii) VOR passage;

(ix) obtaining a fix from two VORs.

(2) use of ADF equipment;

(i) availability of NDB stations, AIP and frequencies;

(ii) selection and identification;

(iii) orientation relative to the beacon;

(iv) homing.

(3) use of VHF/DF:

(i) availability, AIP and frequencies;

(ii) R/T procedures and ATC liaison;

(iii) obtaining a QDM and homing.

(4) use of en-route or terminal radar:

(i) availability and AIP;

(ii) procedures and ATC liaison;

(iii) pilot’s responsibilities;

(iv) secondary surveillance radar;

(v) transponders;

(vi) code selection;

(vii) interrogation and reply.

(5) use of DME:

(i) station selection and identification;

(ii) modes of operation.

(6) use of GNSS (RNAV – SATNAV):

(i) setting up;

(ii) operation;

(iii) interpretation.

EXERCISE 19: BASIC INSTRUMENT FLIGHT

(a) Long briefing objectives:

(1) flight instruments;

(i) physiological sensations;

(ii) instrument appreciation;

(iii) attitude instrument flight;

(iv) pitch indications;

(v) bank indications;

(vi) different dial presentations;

(vii) introduction to the use of the attitude indicator;

(viii) pitch attitude;

(ix) bank attitude;

(x) maintenance of heading and balanced flight;

(xi) instrument limitations (inclusive system failures).

(2) attitude, power and performance;

(i) attitude instrument flight:

(ii) control instruments;

(iii) performance instruments;

(iv) effect of changing power and configuration;

(v) cross-checking the instrument indications;

(vi) instrument interpretation;

(vii) direct and indirect indications (performance instruments);

(viii) instrument lag;

(ix) selective radial scan;

(3) basic flight manoeuvres (full panel);

(i) straight and level flight at various air speeds and aeroplane configurations;

(ii) climbing;

(iii) descending;

(iv) standard rate turns onto pre-selected headings:

(A) level;

(B) climbing;

(C) Descending.

(b) Air exercise:

(1) Introduction to instrument flying

(i) flight instruments;

(ii) physiological sensations;

(iii) instrument appreciation;

(iv) attitude instrument flight;

(v) pitch attitude;

(vi) bank attitude;

(vii) maintenance of heading and balanced flight;

(2) attitude, power and performance;

(i) attitude instrument flight;

(ii) effect of changing power and configuration;

(iii) cross-checking the instruments;

(iv) selective radial scan;

(3) basic flight manoeuvres (full panel);

(i) straight and level flight at various air speeds and aeroplane configurations;

(ii) climbing;

(iii) descending;

(iv) standard rate turns onto pre-selected headings:

(A) level;

(B) climbing;

(C) Descending

EXERCISE 20: NIGHT FLYING (if night instructional qualification required)

(a) Long briefing objectives:

(1) start up procedures;

(2) local procedures: including ATC liaison;

(3) taxiing:

(i) parking area and taxiway lighting;

(ii) judgement of speed and distances;

(iii) use of taxiway lights;

(iv) avoidance of hazards: obstruction lighting;

(v) instrument checks;

(vi) holding point: lighting procedure;

(vii) initial familiarisation at night;

(viii) local area orientation;

(ix) significance of lights on other aircraft;

(x) ground obstruction lights;

(xi) division of piloting effort: external or instrument reference;

(xii) rejoining procedure;

(xiii) aerodrome lighting: approach and runway lighting (including VASI and PAPI):

(A) threshold lights;

(B) approach lighting;

(C) visual approach slope indicator systems.

(4) night circuits;

(i) take-off and climb:

(A) line up;

(B) visual references during the take-off run;

(C) transfer to instruments;

(D) establishing the initial climb;

(E) use of flight instruments;

(F) instrument climb and initial turn.

(ii) circuit:

(A) aeroplane positioning: reference to runway lighting;

(B) the traffic pattern and look-out;

(C) initial approach and runway lighting demonstration;

(D) aeroplane positioning;

(E) changing aspect of runway lights and VASI (or PAPI);

(F) intercepting the correct approach path;

(G) the climb away.

(iii) approach and landing:

(A) positioning, base leg and final approach;

(B) diurnal wind effect;

(C) use of landing lights;

(D) the flare and touchdown;

(E) the roll out;

(F) turning off the runway: control of speed.

(iv) missed approach:

(A) use of instruments;

(B) re-positioning in the circuit pattern;

(5) night navigation:

(i) particular emphasis on flight planning;

(ii) selection of ground features visible at night:

(A) air light beacons;

(B) effect of cockpit lighting on map colours;

(C) use of radio aids;

(D) effect of moonlight upon visibility at night;

(iii) emphasis on maintaining a ‘minimum safe altitude’;

(iv) alternate aerodromes: restricted availability;

(v) restricted recognition of weather deterioration;

(vi) lost procedures;

(6) night emergencies;

(i) radio failure;

(ii) failure of runway lighting;

(iii) failure of aeroplane landing lights;

(iv) failure of aeroplane internal lighting;

(v) failure of aeroplane navigation lights;

(vi) total electrical failure;

(vii) abandoned take-off;

(viii) engine failure;

(ix) obstructed runway procedure.

(b) Air exercise: during the air exercise all long briefing objectives mentioned above should also be trained on site and the student instructor should demonstrate the following items:

(1) how to plan and to perform a flight at night;

(2) how to advise the student pilot to plan and prepare a flight at night;

(3) how to advise the student pilot to perform a flight at night;

(4) how to analyse and correct errors as necessary.

B. Helicopters

GROUND INSTRUCTION

Note: During ground instruction the student instructor should pay specific attention to the teaching of enhanced ground instruction in weather interpretation, planning and route assessment, decision making on encountering DVE including reversing course or conduction a precautionary landing.

Part 2

AIR EXERCISES

(a) The air exercises are similar to those used for the training of PPL(H) but with additional items designed to cover the needs of an FI.

(b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(1) the applicant's progress and ability;

(2) the weather conditions affecting the flight;

(3) the flight time available;

(4) instructional technique considerations;

(5) the local operating environment;

(6) applicability of the exercises to the helicopter type.

(c) It follows that student instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

(d) The briefing normally includes a statement of the objectives and a brief reference to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include how the flight will be conducted about who is to fly the helicopter and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.

(e) The four basic components of the briefing will be:

(1) the aim;

(2) principles of flight (briefest reference only);

(3) the air exercise(s) (what, and how and by whom);

(4) airmanship (weather, flight safety etc.).

PLANNING OF FLIGHT LESSONS

(f) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

(g) The student instructor should complete flight training to practise the principles of basic instruction at the PPL(H) level.

(h) During this training, except when acting as a student pilot for mutual flights, the student instructor occupies the seat normally occupied by the FI(H).

(i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.

(j) If the privileges of the FI(H) certificate are to include instruction for night flying, exercise 28 should be undertaken either as part of the course or subsequent to certificate issue.

(k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

(l) The student instructor should be trained to keep in mind that wherever possible, flight simulation should be used to demonstrate to student pilots the effects of flight into DVE and to enhance their understanding and need for avoidance of this potentially fatal flight regime.

SYLLABUS OF FLIGHT INSTRUCTION CONTENTS

LONG BRIEFINGS AND AIR EXERCISES

EXERCISE 1: FAMILIARISATION WITH THE HELICOPTER

(a) Long briefing objectives:

(1) introduction to the helicopter;

(2) explanation of the cockpit layout;

(3) helicopter and engine systems;

(4) checklist(s) and procedures;

(5) familiarisation with the helicopter controls;

(6) differences when occupying the instructor's seat;

(7) emergency drills:

(i) action if fire in the air and on the ground: engine, cockpit or cabin and electrical fire;

(ii) system failure drills as applicable to type;

(iii) escape drills: location and use of emergency equipment and exits.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(a) Long briefing objectives:

(1) flight authorisation and helicopter acceptance, including technical log (if applicable) and certificate of maintenance:

(2) equipment required for flight (maps, etc.);

(3) external checks;

(4) internal checks;

(5) student comfort, harness, seat and rudder pedal adjustment;

(6) starting and after starting checks;

(7) system, power or serviceability checks (as applicable);

(8) closing down or shutting down the helicopter (including system checks).

(9) parking and leaving the helicopter (including safety or security as applicable);

(10) completion of authorisation sheet and helicopter serviceability documents.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 3: AIR EXPERIENCE

(a) Long briefing objectives:

Note: there is no requirement for a long briefing for this exercise.

(b) Air exercise:

(1) air experience;

(2) cockpit layout, ergonomics and controls;

(3) cockpit procedures: stability and control.

EXERCISE 4: EFFECTS OF CONTROLS

(a) Long briefing objectives:

(1) function of the flying controls (primary and secondary effect);

(2) effect of air speed;

(3) effect of power changes (torque);

(4) effect of yaw (sideslip);

(5) effect of disc loading (bank and flare);

(6) effect on controls of selecting hydraulics on/off;

(7) effect of control friction;

(8) use of instruments;

(9) operation of carburettor heat or anti-icing control.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 5: POWER AND ATTITUDE CHANGES

(a) Long briefing objectives:

(1) relationship between cyclic control position, disc attitude, fuselage attitude and air speed flap back;

(2) power required diagram in relation to air speed;

(3) power and air speed changes in level flight;

(4) use of the instruments for precision;

(5) engine and air speed limitations;

(b) Air exercise:

(1) relationship between cyclic control position, disc attitude, fuselage attitude and air speed flap back;

(2) power and air speed changes in level flight;

(3) use of instruments for precision (including instrument scan and lookout).

EXERCISE 6: LEVEL FLIGHT, CLIMBING, DESCENDING AND TURNING

Note: for ease of training this exercise is divided into four separate parts in the PPL(H) syllabus but may be taught complete or in convenient parts.

(a) Long briefing objectives:

(1) basic factors involved in level flight;

(2) normal power settings;

(3) use of control friction or trim;

(4) importance of maintaining direction and balance;

(5) power required or power available diagram;

(6) optimum climb and descent speeds, angles or rates;

(7) importance of balance, attitude and co-ordination in the turn;

(8) effects of turning on rate of climb or descent;

(9) use of the gyro direction or heading indicator and compass;

(10) use of instruments for precision.

(b) Air exercises:

(1) maintaining straight and level flight at normal cruise power;

(2) control in pitch, including use of control friction or trim;

(3) use of the ball or yaw string to maintain direction and balance;

(4) setting and use of power for selected air speeds and speed changes;

(5) entry to climb;

(6) normal and maximum rate of climb;

(7) levelling off from climb at selected altitudes or heights;

(8) entry to descent;

(9) effect of power and air speed on rate of descent;

(10) levelling off from descent at selected altitudes or heights;

(11) entry to medium rate turns;

(12) importance of balance, attitude and co-ordination to maintain level turn;

(13) resuming straight and level flight;

(14) turns onto selected headings, use of direction indicator and compass;

(15) turns whilst climbing and descending;

(16) effect of turn on rate of climb or descent;

(17) use of instruments for precision (including instrument scan and lookout).

EXERCISE 7: AUTOROTATION

(a) Long briefing objectives:

(1) characteristics of autorotation;

(2) safety checks (including look-out and verbal warning);

(3) entry and development of autorotation;

(4) effect of AUM, IAS, disc loading, G forces and density altitude on RRPM and rate of descent;

(5) rotor and engine limitations;

(6) control of air speed and RRPM;

(7) recovery to powered flight;

(8) throttle override and control of ERPM or RRPM during re-engagement (as applicable);

(9) danger of vortex condition during recovery.

(b) Air exercise:

(1) safety checks (including verbal warning and look-out);

(2) entry to and establishing in autorotation;

(3) effect of IAS and disc loading on RRPM and rate of descent;

(4) control of air speed and RRPM;

(5) recovery to powered flight;

(6) medium turns in autorotation;

(7) simulated engine off landing (as appropriate).

EXERCISE 8: HOVERING AND HOVER TAXIING

(a) Long briefing objectives:

(1) ground effect and power required;

(2) effect of wind, attitude and surface;

(3) stability in hover and effects of over controlling;

(4) effect of control in hover;

(5) control and co-ordination during spot turns;

(6) requirement for slow hover speed to maintain ground effect;

(7) effect of hydraulic failure in hover;

(8) specific hazards, for example snow, dust, etc.

(b) Air exercise:

(1) ground effect and power or height relationship;

(2) effect of wind, attitude and surface;

(3) stability in hover and effects of over controlling;

(4) effect of control and hover technique;

(5) gentle forward running touchdown;

(6) control and co-ordination during spot (90 ° clearing) turns;

(7) control and co-ordination during hover taxi;

(8) dangers of mishandling and over pitching;

(9) (where applicable) effect of hydraulics failure in hover;

(10) simulated engine failure in the hover and hover taxi.

EXERCISE 9: TAKE-OFF AND LANDING

(a) Long briefing objectives:

(1) pre take-off checks or drills;

(2) importance of good look-out;

(3) technique for lifting to hover;

(4) after take-off checks;

(5) danger of horizontal movement near ground;

(6) dangers of mishandling and over pitching;

(7) technique for landing;

(8) after landing checks;

(9) take-off and landing crosswind and downwind.

(b) Air exercise:

(1) pre take-off checks or drills:

(2) pre take-off look-out technique;

(3) lifting to hover;

(4) after take-off checks;

(5) landing;

(6) after landing checks or drills;

(7) take-off and landing crosswind and downwind.

EXERCISE 10: TRANSITIONS FROM HOVER TO CLIMB AND APPROACH TO HOVER

(a) Long briefing objectives:

(1) revision of ground effect;

(2) translational lift and its effects;

(3) inflow roll and its effects;

(4) revision of flap back and its effects;

(5) avoidance of curve diagram and associated dangers;

(6) effect or dangers of wind speed and direction during transitions;

(7) transition to climb technique;

(8) constant angle approach;

(9) transition to hover technique.

(b) Air exercise:

(1) revision of take-off and landing;

(2) transition from hover to climb;

(3) effect of translational lift, inflow roll and flap back;

(4) constant angle approach;

(5) technique for transition from descent to hover;

(6) a variable flare simulated engine off landing.

EXERCISE 11: CIRCUIT, APPROACH AND LANDING

(a) Long briefing objectives:

(1) circuit and associated procedures;

(2) take-off and climb (including checks or speeds);

(3) crosswind leg (including checks, speeds or angles of bank in turns);

(4) downwind leg (including pre-landing checks);

(5) base leg (including checks, speeds or angles of bank in turns);

(6) final approach (including checks or speeds);

(7) effect of wind on approach and hover IGE;

(8) crosswind approach and landing technique;

(9) missed approach and go-around technique (as applicable);

(10) steep approach technique (including danger of high sink rate);

(11) limited power approach technique (including danger of high speed at touchdown);

(12) use of the ground effect;

(13) abandoned take-off technique;

(14) hydraulic failure drills and hydraulics off landing technique (where applicable);

(15) drills or technique for tail rotor control or tail rotor drive failure;

(16) engine failure drills in the circuit to include;

(17) engine failure

(18) on take-off:

(i) crosswind;

(ii) downwind;

(iii) base leg;

(iv) on final approach.

(19) noise abatement procedures (as applicable).

(b) Air exercise:

(1) revision of transitions and constant angle approach;

(2) basic training circuit, including checks;

(3) crosswind approach and landing technique;

(4) missed approach and go-around technique (as applicable);

(5) steep approach technique;

(6) basic limited power approach or run on technique;

(7) use of ground effect;

(8) hydraulic failure and approach to touchdown with hydraulics off and to recover at safe height (as applicable);

(9) simulated engine failure on take-off, crosswind, downwind, base leg and finals;

(10) variable flare simulated engine off landing.

EXERCISE 12: FIRST SOLO

(a) Long briefing objectives:

(1) warning of change of attitude due to reduced and laterally displaced weight;

(2) low tail, low skid or wheel during hover or landing;

(3) dangers of loss of RRPM and over pitching;

(4) pre take-off checks;

(5) into wind take-off;

(6) drills during and after take-off;

(7) normal circuit, approach and landing;

(8) action if an emergency.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 13: SIDEWAYS AND BACKWARDS HOVER MANOEUVRING

(a) Long briefing objectives:

(1) revision of hovering;

(2) directional stability and weather cocking effect;

(3) danger of pitching nose down on recovery from backwards manoeuvring;

(4) helicopter limitations for sideways and backwards manoeuvring;

(5) effect of CG position.

(b) Air exercise:

(1) revision of hovering and 90 ° clearing turns;

(2) manoeuvring sideways heading into wind;

(3) manoeuvring backwards heading into wind;

(4) manoeuvring sideways and backwards heading out of wind;

(5) manoeuvring backwards too fast and recovery action.

EXERCISE 14: SPOT TURNS

(a) Long briefing objectives:

(1) revision of ground effect and effect of wind;

(2) weather cocking and control actions;

(3) control of RRPM;

(4) torque effect;

(5) cyclic limiting stops due to CG position (where applicable);

(6) rate of turn limitations;

(7) spot turn about pilot position;

(8) spot turn about tail rotor position;

(9) spot turn about helicopter geometric centre;

(10) square (safe visibility) and clearing turn.

(b) Air exercise:

(1) weather cocking, torque effect and control actions;

(2) rate of turn;

(3) spot turn about pilot position;

(4) spot turn about tail rotor position;

(5) spot turn about helicopter geometric centre;

(6) square and clearing turn.

EXERCISE 15: HOVER OUT OF GROUND EFFECT AND VORTEX RING

(a) Long briefing objectives:

(1) revision of ground effect and power required diagram;

(2) drift, height and power control, look-out or scan;

(3) vortex ring, (including dangers, recognition and recovery actions);

(4) loss of tail rotor effectiveness.

(b) Air exercise:

(1) to demonstrate hover OGE;

(2) drift, height, power control and look-out, and instrument scan technique;

(3) recognition of incipient stage of vortex ring and settling with power;

(4) recovery action from incipient stage of vortex ring;

(5) recognition of loss of tail rotor effectiveness and recovery actions.

EXERCISE 16: SIMULATED ENGINE OFF LANDINGS

(a) Long briefing objectives:

(1) revision of basic autorotation;

(2) effect of AUM, disc loading, density altitude and RRPM decay;

(3) use of cyclic and collective to control speed or RRPM;

(4) torque effect;

(5) use of flare or turn to restore RRPM;

(6) technique for variable flare simulated EOL;

(7) technique for constant attitude simulated EOL;

(8) revision of technique for hover or hover taxi simulated EOL;

(9) emergency technique for engine failure during transition;

(10) technique for low level simulated EOL.

(b) Air exercise

(1) revision of entry to and control in autorotation;

(2) variable flare simulated EOL

(3) constant attitude simulated EOL;

(4) hover simulated EOL;

(5) hover taxi simulated EOL;

(6) low level simulated EOL.

EXERCISE 17: ADVANCED AUTOROTATIONS

(a) Long briefing objectives:

(1) effect of air speed or AUM on angles or rates of descent

(2) effect of RRPM setting on angle or rate of descent;

(3) reason and technique for range autorotation;

(4) reason and technique for constant attitude autorotation;

(5) reason and technique for low speed and 'S' turns in autorotation;

(6) speed or bank limitations in turns in autorotation;

(7) revision of re-engagement or go-around procedures.

(b) Air exercise:

(1) selection of ground marker and standard datum height to determine distance covered during various autorotation techniques;

(2) revision of basic autorotation;

(3) technique for range autorotation;

(4) technique for constant attitude autorotation;

(5) technique for low speed autorotation, including need for timely speed recovery;

(6) technique for 'S' turn in autorotation;

(7) 180 and 360 ° turns in autorotation;

(8) revision of re-engagement and go-around technique.

EXERCISE 18: PRACTICE FORCED LANDINGS

(a) Long briefing objectives:

(1) types of terrain or surface options for choice of best landing area;

(2) practice forced landing procedure;

(3) forced landing checks and crash actions;

(4) rules or height for recovery and go-around.

(b) Air exercise:

(1) recognition of types of terrain from normal cruise height or altitude;

(2) practice forced landing technique;

(3) revision of recovery or go-around technique.

EXERCISE 19: STEEP TURNS

(a) Long briefing objectives:

(1) air speed or angle of bank limitations;

(2) technique for co-ordination to hold bank or attitude;

(3) revision of speed or bank limitations in autorotation including RRPM control;

(4) significance of disc loading, vibration and control feedback;

(5) effect of wind in turns at low level.

(b) Air exercise:

(1) technique for turning at 30 ° of bank;

(2) technique for turning at 45 ° of bank (where possible);

(3) steep autorotative turns;

(4) explanation of faults in the turn: balance, attitude, bank and coordination;

(5) effect of wind at low level.

EXERCISE 20: TRANSITIONS

(a) Long briefing objectives:

(1) revision of effect of ground cushion, translational lift and flap back;

(2) training requirement for precision exercise;

(3) technique for transition to forward flight and back to hover as precision exercise;

(4) effect of wind.

(b) Air exercise:

(1) transition from hover to minimum 50 knots IAS and back to hover;

Note: select constant height (20 - 30 ft) and maintain.

(2) effect of wind.

EXERCISE 21: QUICK STOPS

(a) Long briefing objectives:

(1) power control co-ordination;

(2) revision of effect of wind;

(3) technique for quick stop into wind;

(4) technique for quick stop from crosswind;

(5) revision of air speed and angles of bank limitations;

(6) technique for emergency turn from downwind;

(7) technique for quick stop from downwind from high speed: flare and turn;

(8) technique for quick stop from downwind from low speed: turn and flare;

Note: use reasonable datum speed for example high speed, low speed.

(9) danger of holding flare when downwind, (vortex ring) - (minimum speed 70 knots);

(10) to revise danger of high disc loading.

(b) Air exercise:

(1) technique for quick stop into wind;

(2) technique for quick stop from crosswind;

(3) danger of vortex ring and disc loading;

(4) technique for quick stop from downwind with low speed;

(5) technique for quick stop from downwind with high speed;

(6) emergency turns from downwind.

EXERCISE 22: NAVIGATION

(a) Long briefing objectives:

Note: to be broken down into manageable parts at discretion of instructor.

(1) flight planning:

(i) weather forecasts and actuals;

(ii) map selection, orientation, preparation and use:

(A) choice of route;

(B) regulated or controlled airspace;

(C) danger, prohibited and restricted areas;

(D) safety altitude.

(iii) calculations:

(A) magnetic heading(s), time(s) en route;

(B) fuel consumption;

(C) mass and balance.

(iv) flight information:

(A) NOTAMs etc;

(B) noting of required radio frequencies;

(C) selection of alternate landing sites.

(v) helicopter documentation;

(vi) notification of the flight:

(A) pre-flight administration procedures;

(B) flight plan form (where appropriate).

(2) departure:

(i) organisation of cockpit workload;

(ii) departure procedures:

(A) altimeter settings;

(B) ATC liaison in controlled or regulated airspace;

(C) setting heading procedure;

(D) noting of ETA(s);

(E) maintenance of height or altitude and heading.

(iii) procedure for revisions of ETA and headings to include:

(A) 10° line, double track, track error and closing angle;

(B) 1 in 60 rule;

(iv) amending an ETA;

(v) log keeping;

(vi) use of radio;

(vii) use of navaids;

(viii) weather monitoring and minimum weather conditions for continuation of flight;

(ix) significance of in-flight decision making;

(x) technique for transiting controlled or regulated airspace;

(xi) uncertainty of position procedure;

(xii) lost procedure.

(3) arrival:

(i) aerodrome joining procedure, in particular ATC liaison in controlled or regulated airspace:

(A) altimeter setting;

(B) entering traffic pattern;

(C) circuit procedures.

(ii) parking procedures, in particular:

(A) security of helicopter;

(B) refuelling;

(C) closing of flight plan, (if appropriate);

(D) post flight administrative procedures.

(4) navigation problems at low heights and reduced visibility:

(i) actions before descending;

(ii) significance of hazards, (for example obstacles and other traffic);

(iii) difficulties of map reading;

(iv) effects of wind and turbulence;

(v) significance of avoiding noise sensitive areas;

(vi) procedures for joining a circuit from low level;

(vii) procedures for a bad weather circuit and landing;

(viii) actions in the event of encountering DVE;

(ix) appropriate procedures and choice of landing area for precautionary landings;

(x) decision to divert or conduct precautionary landing;

(xi) precautionary landing.

(5) radio navigation:

(i) use of VOR:

(A) availability, AIP and frequencies;

(B) selection and identification;

(C) use of OBS;

(D) to or from indications: orientation;

(E) use of CDI;

(F) determination of radial;

(G) intercepting and maintaining a radial;

(H) VOR passage;

(I) obtaining a fix from two VORs.

(ii) use of ADF equipment:

(A) availability of NDB stations, AIP and frequencies;

(B) selection and identification;

(C) orientation relative to beacon;

(D) homing.

(iii) use of VHF/DF

(A) availability, AIP and frequencies;

(B) R/T procedures and ATC liaison;

(C) obtaining a QDM and homing.

(iv) use of en-route or terminal radar:

(A) availability and AIP;

(B) procedures and ATC liaison;

(C) pilots responsibilities;

(D) secondary surveillance radar:

(a) transponders;

(b) code selection;

(E) interrogation and reply.

(v) use of DME:

(A) station selection and identification;

(B) modes of operation: distance, groundspeed and time to run.

(vi) use of GNSS:

(A) selection of waypoints;

(B) to or from indications and orientation;

(C) error messages;

(D) hazards of over-reliance in the continuation of flight in DVE.

(b) Air exercise:

(1) navigation procedures as necessary;

(2) to advise student and correct errors as necessary;

(3) map reading techniques;

(4) the significance of calculations;

(5) revision of headings and ETA's;

(6) use of radio;

(7) use of navaids: ADF/NDB, VOR, VHF/DF, DME and transponder;

(8) cross-country flying by using visual reference, DR, GNNS and, where available, radio navigation aids; simulation of deteriorating weather conditions and actions to divert or conduct precautionary landing;

(8) log keeping;

(9) importance of decision making;

(10) procedure to deal with uncertainty of position;

(11) lost procedure;

(12) appropriate procedures and choice of landing area for precautionary landings;

(13) aerodrome joining procedure;

(14) parking and shut-down procedures;

(15) post-flight administration procedures.

EXERCISE 23: ADVANCED TAKE-OFF, LANDINGS AND TRANSITIONS

(a) Long briefing objectives:

(1) revision of landing and take-off out of wind (performance reduction);

(2) revision of wind limitations;

(3) revision of directional stability variation when out of wind;

(4) revision of power required diagram;

(5) technique for downwind transitions;

(6) technique for vertical take-off over obstacles;

(7) reconnaissance technique for landing site;

(8) power checks;

(9) technique for running landing;

(10) technique for zero speed landing;

(11) technique for crosswind and downwind landings;

(12) steep approach, including dangers;

(13) revision of go-around procedures.

(b) Air exercise

(1) technique for downwind transition;

(2) technique for vertical take-off over obstacles;

(3) reconnaissance technique for landing site;

(4) power check and assessment;

(5) technique for running landing;

(6) technique for zero speed landing;

(7) technique for crosswind and downwind landings;

(8) technique for steep approach;

(9) go-around procedures.

EXERCISE 24: SLOPING GROUND

(a) Long briefing objectives:

(1) limitations;

(2) wind and slope relationship, including blade and control stops;

(3) effect of CG when on slope;

(4) ground effect and power required when on slope;

(5) landing technique when on slope, left, right and nose-up;

(6) avoidance of dynamic rollover, dangers of soft ground and sideways movement;

(7) dangers of over controlling near ground on slope;

(8) danger of striking main or tail rotor on up slope.

(b) Air exercise

(1) technique for assessing slope angle;

(2) technique for landing and take-off left skid up slope;

(3) technique for landing and take-off right skid up slope;

(4) technique for landing nose up slope;

(5) dangers of over controlling near ground.

EXERCISE 25: LIMITED POWER

(a) Long briefing objectives:

(1) use of appropriate helicopter performance graphs;

(2) selection of technique according to available power;

(3) effect of wind on available power.

(b) Air exercise: to revise and refine techniques demonstrated in exercise 23.

EXERCISE 26: CONFINED AREAS

(a) Long briefing objectives:

(1) revision of use of helicopter performance graphs;

(2) procedure for locating landing site and selecting site marker;

(3) procedures for assessing wind speed and direction;

(4) landing site reconnaissance techniques;

(5) reason for selecting landing markers;

(6) procedure for selecting direction and type of approach;

(7) dangers of out of wind approach;

(8) circuit procedures;

(9) reason for approach to committal point and go-around, (practice approach);

(10) approach technique;

(11) revision of clearing turn and landing (sloping ground technique);

(12) hover power check or performance assessment IGE and OGE (if necessary);

(13) take-off procedures.

(b) Air exercise

(1) procedures for locating landing site and selecting site marker;

(2) procedures for assessing wind speed and direction;

(3) landing site reconnaissance techniques;

(4) selecting landing markers, direction and type of approach;

(5) circuit procedure;

(6) practice approach, go-around and approach technique;

(7) revision of clearing turn and landing (sloping ground technique);

(8) hover power check or performance assessment IGE and OGE (if necessary);

(9) take-off procedures.

EXERCISE 27: BASIC INSTRUMENT FLIGHT

(a) Long briefing objectives:

(1) physiological sensations;

(2) instrument appreciation;

(3) attitude instrument flight;

(4) instrument scan;

(5) instrument limitations;

(6) basic manoeuvres by sole reference to instruments:

(i) straight and level flight at various air speeds and configurations;

(ii) climbing and descending;

(iii) standard rate turns, climbing and descending, onto selected headings;

(iv) recoveries from climbing and descending turns (unusual attitudes).

(b) Air exercise:

(1) attitude instrument flight and instrument scan;

(2) basic manoeuvres by sole reference to instruments:

(i) straight and level flight at various air speeds and configurations;

(ii) climbing and descending;

(iii) standard rate turns, climbing and descending, onto selected headings;

(iv) recoveries from climbing and descending turns (unusual attitudes).

EXERCISE 28: NIGHT FLYING (if night instructional qualification required)

(a) Long briefing objectives:

(1) medical or physiological aspects of night vision;

(2) requirement for torch to be carried (pre-flight inspection, etc.);

(3) use of the landing light;

(4) take-off and hover taxi procedures at night;

(5) night take-off procedure;

(6) cockpit procedures at night;

(7) approach techniques;

(8) night landing techniques;

(9) night autorotation techniques (power recovery at safe height);

(10) technique for practice forced landing at night (using appropriate illumination);

(11) emergency procedures at night;

(12) navigation principles at night;

(13) map marking for night use (highlighting built up or lit areas with thicker lines, etc.).

(b) Air exercise:

(1) use of torch for pre-flight inspection;

(2) use of landing light;

(3) night take-off to hover (no sideways or backwards movement);

(4) night hover taxi (higher and slower than by day);

(5) night transition procedure;

(6) night circuit;

(7) night approach and landing (including use of landing light);

(8) night autorotation (power recovery at safe height);

(9) practice forced landing at night (using appropriate illumination);

(10) night emergency procedures;

(11) night cross country techniques, as appropriate.

C. Airships

Part 2

AIR EXERCISES

(a) The air exercises are similar to those used for the training of PPL(As) but with additional items designed to cover the needs of an FI.

(b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(1) the applicant’s progress and ability;

(2) the weather conditions affecting the flight;

(3) the flight time available;

(4) instructional technique considerations;

(5) the local operating environment.

(c) It follows that student instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

(d) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include how the flight will be conducted about who is to fly the airship and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.

(e) The four basic components of the briefing will be:

(1) the aim;

(2) principles of flight (briefest reference only);

(3) the air exercise(s) (what, and how and by whom);

(4) airmanship (weather, flight safety etc.).

PLANNING OF FLIGHT LESSONS

(f) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

(g) The student instructor should complete flight training to practise the principles of basic instruction at the PPL(As) level.

(h) During this training, except when acting as a student pilot for mutual flights, the student instructor occupies the seat normally occupied by the FI(As).

(i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.

(j) The exercises 15 and 16 of the flight instruction syllabus should be undertaken at night in addition to by day as part of the course.

(k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

SYLLABUS OF FLIGHT INSTRUCTION CONTENTS

LONG BRIEFINGS AND AIR EXERCISES

Note: although exercise 16 is not required for the PPL(As) course it is a requirement for the FI(As) course.

EXERCISE 1: FAMILIARISATION WITH THE AIRSHIP

(a) Long briefing objectives:

(1) introduction to the airship;

(2) characteristics of the airship;

(3) cockpit layout;

(4) airship and engine systems;

(5) use of the checklist(s) and procedures;

(6) to familiarise the student with the airship controls;

(7) differences when occupying the instructor's seat;

(8) emergency drills:

(i) action if fire in the air or on the ground: engine, cockpit or cabin and electrical fire;

(ii) system failure drills as applicable to type;

(iii) escape drills: location and use of emergency equipment and exits.

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT

(a) Long briefing objectives:

(1) flight authorisation and airship acceptance including tech log (if applicable) and certificate of maintenance;

(2) equipment required for flight (maps, etc.);

(3) external checks;

(4) internal checks;

(5) student comfort, harness, seat and rudder pedal adjustment;

(6) starting and after starting checks;

(7) system, power or serviceability checks (as applicable);

(8) closing down or shutting down the airship (including system checks);

(9) parking, masting and unmasting, leaving the airship (including safety or security as applicable);

(10) completion of the authorisation sheet and airship serviceability documents;

(b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

EXERCISE 3: AIR EXPERIENCE

(a) Long briefing objectives:

Note: there is no requirement for a long briefing for this exercise.

(b) Air exercise:

(1) air experience;

(2) cockpit layout, ergonomics and controls;

(3) cockpit procedures: stability and control.

EXERCISE 4: EFFECTS OF CONTROLS

(a) Long briefing objectives:

(1) function of the flying controls (primary and secondary effect);

(2) effect of air speed;

(3) effect of power changes;

(4) effect of trimming and other controls;

(5) use of instruments;

(6) use of carburettor heat.

(b) Air exercise:

(1) function of the flying controls;

(2) effect of air speed;

(3) effect of power changes;

(4) effect of trimming and other controls;

(5) use of instruments (including instrument scan);

(6) use of carburettor heat.

EXERCISE 5: GROUND MANOEUVERING

(a) Long briefing objectives:

(1) pre-taxi checks;

(2) starting, control of speed and stopping;

(3) engine handling;

(4) masting procedures;

(5) control of direction and turning;

(6) effects of wind;

(7) effects of ground surface;

(8) marshalling signals;

(9) instrument checks;

(10) ATC procedures;

(11) emergencies.

(b) Air exercise:

(1) starting, control of speed and stopping;

(2) engine handling;

(3) masting procedures;

(4) control of direction and turning;

(5) effect of wind.

EXERCISE 6: TAKE-OFF PROCEDURES

(a) Long briefing objectives:

(1) pre take-off checks;

(2) take-off with different static heaviness;

(3) drills during and after take-off;

(4) noise abatement procedures.

(b) Air exercise:

(1) take-off with different static heaviness;

(2) drills during and after take-off.

EXERCISE 6e: EMERGENCIES

(a) Long briefing objectives:

(1) abandoned take-off;

(2) engine failures and actions after take-off;

(3) malfunctions of thrust vector control;

(4) aerodynamic control failures;

(5) electrical and system failures.

(b) Air exercise:

(1) how to abandon a take-off;

(2) engine failure and suitable action;

(3) malfunctions of thrust vector control;

(4) aerodynamic control failures.

EXERCISE 7: CLIMBING

(a) Long briefing objectives:

(1) entry and how to maintain the normal and max rate of climb;

(2) levelling off procedure;

(3) how to level off at selected altitudes;

(4) maximum angle of climb;

(5) maximum rate of climb.

(b) Air exercise:

(1) how to level off at selected altitudes;

(2) maximum angle of climb.

EXERCISE 8: STRAIGHT AND LEVEL FLIGHT

(a) Long briefing objectives:

(1) how to attain and maintain straight and level flight;

(2) flight at or close to pressure height;

(3) control in pitch, including use of trim;

(4) at selected air speeds (use of power);

(5) during speed changes;

(6) use of instruments for precision.

(b) Air exercise:

(1) how to attain and maintain straight and level flight;

(2) flight at or close to pressure height;

(3) control in pitch, including use of trim;

(4) at selected air speeds (use of power);

(5) during speed changes.

EXERCISE 9: DESCENDING

(a) Long briefing objectives:

(1) entry, maintaining and levelling off techniques;

(2) levelling off at selected altitudes;

(3) maximum rate of descent;

(4) maximum angle of descent;

(5) use of instruments for precision flight.

(b) Air exercise:

(1) levelling off at selected altitudes;

(2) maximum rate of descent;

(3) maximum angle of descent.

EXERCISE 10: TURNING

(a) Long briefing objectives:

(1) entry and maintaining level turns;

(2) resuming straight flight;

(3) faults in the turn;

(4) climbing turns;

(5) descending turns;

(6) turns to selected headings: use of gyro heading indicator and compass;

(7) use of instruments for precision.

(b) Air exercise

(1) faults in the turn and correction techniques;

(2) climbing turns;

(3) descending turns.

EXERCISE 11: HOVERING

(a) Long briefing objectives: hovering manoeuvres (as applicable).

(b) Air exercise: hovering manoeuvres (as applicable).

EXERCISE 12: APPROACH AND LANDING

(a) Long briefing objectives:

(1) effect of wind on approach and touchdown speeds;

(2) landing with different static heaviness;

(3) missed approach and go-around procedures;

(4) noise abatement procedures.

(b) Air exercise

(1) a landing with different static heaviness;

(2) missed approach and go-around procedures.

EXERCISE 12e: EMERGENCIES

(a) Long briefing objectives:

(1) aborted approach or go-around;

(2) malfunction of thrust vector control;

(3) envelope emergencies;

(4) fire emergencies;

(5) aerodynamic control failures;

(6) electrical and system failures.

(b) Air exercise: emergency drills and actions.

EXERCISE 13: PRECAUTIONARY LANDING

(a) Long briefing objectives:

(1) occasions necessitating a precautionary landing;

(2) in-flight conditions;

(3) landing area selection;

(4) circuit and approach.

(b) Air exercise:

(1) how to perform the landing area selection;

(2) circuit and approach.

EXERCISE 14a: NAVIGATION

(a) Long briefing objectives:

(1) how to do the flight planning;

(2) departure for a navigation flight;

(3) in-flight navigational techniques;

(4) arrival and aerodrome joining procedures;

(b) Air exercise:

(1) complete flight planning of a navigation flight;

(2) departure for a navigation flight;

(3) in-flight navigational techniques;

(4) arrival and aerodrome joining procedures.

EXERCISE 14b: NAVIGATION AT LOWER LEVELS AND IN REDUCED VISIBILITY

(a) Long briefing objectives:

(1) actions before descending;

(2) possible hazards (for example obstacles and terrain) and actions;

(3) student difficulties of map reading;

(4) effects of winds, turbulence and precipitation;

(5) vertical situational awareness;

(6) avoidance of noise sensitive areas;

(7) joining the circuit;

(8) bad weather circuit and landing.

(b) Air exercise:

(1) actions before descending;

(2) map reading techniques;

(3) vertical situational awareness;

(4) avoidance of noise sensitive areas;

(5) joining the circuit;

(6) bad weather circuit and landing.

EXERCISE 14c: RADIO NAVIGATION

(a) Long briefing objectives:

(1) use of VOR;

(2) use of ADF equipment;

(3) use of NDB stations;

(4) use of VHF/DF;

(5) use of en-route or terminal radar;

(6) use of DME equipment.

(b) Air exercise

(1) use of navaids;

(2) procedure to deal with uncertainty of position.

EXERCISE 15: BASIC INSTRUMENT FLIGHT

(a) Long briefing objectives:

(1) physiological sensations;

(2) instrument appreciation;

(3) attitude instrument flight;

(4) instrument scan;

(5) instrument limitations;

(6) basic manoeuvres by sole reference to the instruments:

(i) straight and level;

(ii) climbing and descending;

(iii) turns, climbing and descending, onto selected headings;

(iv) recoveries from climbing and descending turns.

(b) Air exercise:

(1) attitude instrument flight and instrument scan;

(2) the basic manoeuvres:

(i) straight and level;

(ii) climbing and descending;

(iii) turns, climbing and descending, onto selected headings;

(iv) recoveries from climbing and descending turns.

EXERCISE 16: NIGHT FLYING (if night instructional qualification required)

(a) Long briefing objectives:

(1) medical and physiological aspects of night vision;

(2) requirement for torch to be carried (pre-flight inspection, etc.);

(3) use of the landing light;

(4) ground manoeuvring procedures at night;

(5) night take-off procedure;

(6) cockpit procedures at night;

(7) approach techniques;

(8) night landing techniques

(9) emergency procedures at night;

(10) navigation principles at night.

(b) Air exercise:

(1) use of landing light;

(2) night ground manoeuvring;

(3) night take-off, circuit or approach and landing (including use of landing light).

AMC2 FCL.930.FI FI – Training course

FI(S) AND FI(B) TRAINING COURSE

GENERAL

(a) The aim of the FI(S) and FI(B) training course at a DTO or an ATO is to train SPL and BPL holders to the level of competence defined in FCL.920 as instructor competencies.

(b) The training course should develop safety awareness throughout by teaching the knowledge, skills and attitudes relevant to the FI task including at least the following:

(1) refresh the technical knowledge of the student instructor;

(2) train the student instructor to teach the ground subjects and air exercises;

(3) ensure that the student instructor's flying is of a sufficiently high standard; and

(4) teach the student instructor the principles of basic instruction and to apply them at all training levels.

(c) With the exception of the section on teaching and learning, all the subject detail contained in the ground and flight training syllabus is complementary to the SPL and BPL course syllabus.

(d) The FI training course should give particular stress to the role of the individual in relation to the importance of human factors in the man-machine and theoretical knowledge environment interaction. Special attention should be paid to the applicant's maturity and judgement including an understanding of adults, their behavioural attitudes and variable levels of education.

(e) During the training course, the applicants should be made aware of their own attitudes to the importance of flight safety. Improving safety awareness should be a fundamental objective throughout the training course. It will be of major importance for the training course to aim at giving applicants the knowledge, skills and attitudes relevant to a flight instructor's task.

(f) On successful completion of the training course and final test the applicant may be issued with an FI certificate.

CONTENT

(g) The training course consists of two parts:

(1) Part 1, theoretical knowledge including the teaching and learning instruction that should comply with AMC1 FCL.920;

(2) Part 2, flight instruction.

Part 1

The content of the teaching and learning part of the FI course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

The course should include at least 55 hours of theoretical knowledge including at least 25 hours teaching and learning instructions for the FI (S) and FI(B) certificate.

Part 2

FLIGHT INSTRUCTION SYLLABUS

An approved FI training course should comprise at least the minimum hours of flight instruction as defined in FCL.930.FI.

AIR EXERCISES

(a) The air exercises are similar to those used for the training of SPL or BPL but with additional items designed to cover the needs of a flight instructor.

(b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

(1) the applicant's progress and ability;

(2) the weather conditions affecting the flight;

(3) the flight time available;

(4) instructional technique considerations;

(5) the local operating environment;

(6) Applicability of the exercises to the aircraft type.

(c) At the discretion of the instructors some of the exercises may be combined whereas some other exercises may be done in several flights.

(d) It follows that student instructors will eventually be faced with similar inter-related factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

GENERAL

(e) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include how the flight will be conducted with regard to who is to fly the aircraft and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.

(f) The five basic components of the briefing will be:

(1) the aim;

(2) the air exercise(s) (what, and how and by whom);

(3) flight briefing;

(4) check of understanding;

(5) airmanship.

PLANNING OF FLIGHT LESSONS

(g) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

GENERAL CONSIDERATIONS

(h) The student instructor should complete flight training in order to practise the principles of basic instruction at the SPL or BPL level. During this training the student instructor occupies the seat normally occupied by the FI.

(i) The instructor providing this instructor training is normally taking over the role of the student pilot. In the case of the course for the FI(B) an additional person holding a BPL or LAPL(B) licence or a student pilot for these licences may be on board in order to function as a student pilot under the supervision of the instructor.

(j) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.

(k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

SYLLABUS OF FLIGHT INSTRUCTION CONTENTS

A. SAILPLANES

LONG BRIEFINGS AND AIR EXERCISES

Note: although the fully developed spin in exercise 10 is not required for the LAPL course, it is a requirement for the FI course.

EXERCISE 1: FAMILIARISATION WITH THE SAILPLANE

(a) Objective:

To advise the student instructor on how to familiarise the student with the sailplane which will be used for the training and to test his/her position in the sailplane for comfort, visibility, and ability to use all controls and equipment.

(b) Briefing and exercise:

The student Instructor has to:

(1) present the type of sailplane which will be used;

(2) explain the cockpit layout: instruments and equipment;

(3) explain the flight controls: stick, pedals, airbrakes, flaps, cable release, undercarriage;

(4) check the position of the student on the seat for comfort, visibility, ability to use all controls;

(5) explain the use of the harness;

(6) demonstrate how to adjust the rudder pedal;

(7) explain the differences when occupying the instructor's position;

(8) explain all checklists, drills, controls.

EXERCISE 2: PROCEDURE IN THE EVENT OF EMERGENCIES

(a) Objective:

To advise the student instructor on how to familiarise the student with the use of the parachute and how to explain the bail out procedure in case of emergency.

(b) Briefing and exercise:

The student instructor has to:

(1) explain how to handle the parachute with care (transport, storage and drying after use);

(2) demonstrate the adjustment of the parachute harness;

(3) explain the bail out procedure (especially from a sailplane in unusual attitude);

(4) explain the procedure for landing with a parachute in normal conditions and with a strong wind.

EXERCISE 3: PREPARATION FOR FLIGHT

(a) Objective:

To advise the student instructor on how to explain all the operations to be completed prior to flight. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the need for a pre-flight briefing;

(2) the structure and the content of this briefing;

(3) which documents are required on board;

(4) which equipment are required for a flight;

(5) how to handle the sailplane on the ground, how to move it, how to tow it out and how to park it;

(6) how to do the pre-flight external and internal checks;

(7) the procedure for verifying in-limits mass and balance;

(8) the pre-launch checks (checklist).

(c) Air exercise:

The student instructor has to demonstrate:

(1) the need for a pre-flight briefing;

(2) that the required documents are on board;

(3) that the equipment required for the intended flight is on board;

(4) how to handle the sailplane on the ground, move it to the start position, tow it out and park it;

(5) how to perform a pre-flight external and internal check;

(6) how to verify in-limits mass and balance;

(7) how to adjust harness as well as seat or rudder pedals;

(8) the pre-launch checks;

(9) how to advise the student pilot in performing the pre-flight preparation;

(10) how to analyse and correct pre-flight preparation errors as necessary.

EXERCISE 4: INITIAL AIR EXPERIENCE

(a) Objective:

To advise the student instructor on how to familiarise the student with being in the air, with the area around the airfield, to note his/her reactions in this situation, and to draw his/her attention to safety and look-out procedures.

(b) Briefing:

The student instructor has to explain:

(1) the area around the airfield;

(2) the need for looking out;

(3) the change of aircraft control.

(c) Air exercise:

The student instructor has to:

(1) show the noteworthy references on the ground;

(2) analyse the reactions of the student;

(3) check that the student looks out (safety).

EXERCISE 5: PRIMARY EFECTS OF CONTROLS

(a) Objective:

To advise the student instructor on how to:

(1) demonstrate the primary effects of each control with the help of visual references;

(2) train the student pilot to recognise when the sailplane is no longer in a normal attitude along one of the axes and to return to the normal attitude;

(3) train continuous and efficient look-out during these exercises;

(4) analyse and correct errors and student pilot mistakes as necessary.

(b) Briefing:

The student instructor has to explain:

(1) define the axes of a sailplane;

(2) the look-out procedures;

(3) the visual references along each axis;

(4) the primary effects of controls when laterally level;

(5) the relationship between attitude and speed;

(6) the use of flaps;

(7) the use of airbrakes.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the visual references in flight;

(2) the primary effect of the elevator;

(3) the relationship between attitude and speed (inertia);

(4) the primary effect of rudder on the rotation of the sailplane around the vertical axis;

(5) the primary effect of ailerons on banking;

(6) the effect of airbrakes (including changes in pitch when airbrakes are extended or retracted);

(7) the effects of flaps (provided the sailplane has flaps);

(8) the look-out procedures during all the exercises;

(9) how to advise the student pilot to recognise the primary effects of each control;

(10) how to analyse and correct errors as necessary.

EXERCISE 6: CO-ORDINATED ROLLING TO AND FROM MODERATE ANGLES OF BANK

(a) Objective:

To advise the student instructor on secondary effects of controls and on how to teach the student to coordinate ailerons and rudder in order to compensate for the adverse yaw effect. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the secondary effects of controls;

(2) the adverse yaw effect;

(3) how to compensate for the adverse yaw;

(4) the further effect of the rudder (roll).

(c) Air exercise:

The student instructor has to demonstrate:

(1) the adverse yaw effect with a reference on ground;

(2) the further effect of the rudder (roll);

(3) the coordination of ruder and aileron controls to compensate for the adverse yaw effects;

(4) rolling to and from moderate angles of bank (20 to 30 °) and returning to the straight flight;

(5) how to advise the student pilot to coordinate ailerons and rudder;

(6) how to analyse and correct errors as necessary.

EXERCISE 7: STRAIGHT FLYING

(a) Objective:

To advise the student instructor on how to train the student to maintain straight flight with a constant heading without slipping and skidding. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to:

(1) explain how to maintain straight flight;

(2) explain different air speed limitations;

(3) explain the pitch stability of the sailplane;

(4) explain the effect of trimming.

(c) Air exercise:

The instructor student has to demonstrate:

(1) maintaining straight flight;

(2) inherent pitch stability;

(3) the control of the sailplane in pitch, including use of trim with visual references and speed;

(4) how to perform the instrument monitoring;

(5) the control of level attitude with visual references;

(6) the control of the heading with a visual reference on the ground;

(7) the look-out procedures during all the exercises;

(8) how to advise the student pilot to maintain straight flight;

(9) how to analyse and correct errors as necessary.

EXERCISE 8: TURNING

(a) Objective:

To advise the student instructor on how to teach students to fly turns and circles with a moderate constant bank of about 30 ° with constant attitude (speed) and coordinated flight. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the forces on the sailplane during a turn;

(2) the need to look out before turning;

(3) the sequences of a turn (entry, stabilizing and exiting);

(4) the common faults during a turn;

(5) how to turn on to selected headings, use of compass;

(6) the use of instruments (ball indicator or slip string) for precision.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the look-out procedure before turning;

(2) entering a turn (correction of adverse yaw);

(3) the stabilisation of a turn (keeping the attitude and compensating the induced roll);

(4) the exit from a turn;

(5) the most common faults in a turn;

(6) turns on to selected headings (use landmarks as reference);

(7) use of instruments (ball indicator or slip string) for precision:

(8) how to advise the student pilot to fly a turn or circle with a moderate bank;

(9) how to analyse and correct errors as necessary.

EXERCISE 9a: SLOW FLIGHT

(a) Objective:

To advise the student instructor on how to improve the student's ability to recognise inadvertent flight at critically low speeds (high angle of attack) and to provide practice in maintaining the sailplane in balance while returning to normal attitude (speed). Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the characteristics of slow flight;

(2) the risks of stalling.

(c) Air Exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft before starting the exercise.

The student instructor has to demonstrate:

(1) a controlled flight down to critically high angle of attack (slow air speed), and draw the attention of the student to the nose up attitude, reduction of noise, reduction of speed;

(2) a return to the normal attitude (speed);

(3) how to advise the student pilot to recognise inadvertent flight at critically low speeds;

(4) how to provide practice in maintaining the sailplane in balance while returning to normal attitude;

(5) how to analyse and correct errors as necessary.

EXERCISE 9b: STALLING

(a) Objective:

To advise the student Instructor on how to improve the student's ability to recognize a stall and to recover from it. This includes stall from a level flight and stalls when a wing drops. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the mechanism of a stall;

(2) the effectiveness of the controls at the stall;

(3) pre-stall symptoms, recognition and recovery;

(4) factors affecting the stall (importance of the angle of attack and high speed stall);

(5) effect of flaps if any on the sailplane;

(6) the effects of unbalance at the stall safety checks;

(7) stall symptoms, recognition and recovery;

(8) recovery when a wing drops; approach to stall in the approach and in the landing configurations: recognition and recovery from accelerated stalls.

(c) Air Exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft or traffic before starting the exercise.

The student instructor has to demonstrate:

(1) stall from a level flight;

(2) pre-stall symptoms, recognition and recovery;

(3) stall symptoms, recognition and recovery;

(4) recovery when a wing drops;

(5) approach to stall in the approach and in the landing configurations;

(6) recognition and recovery from accelerated stalls;

(7) stalling and recovery at the incipient stage with 'instructor induced' distractions;

(8) how to improve the student pilot's ability to recognise a stall and to recover from it;

(9) how to analyse and correct errors as necessary.

Note: consideration is to be given to manoeuvre limitations and references to the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) in relation to mass and balance limitations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner's manual or pilot's operating handbook), they have to be taken into consideration. These factors are also covered in the next exercise.

EXERCISE 10a: SPIN RECOGNITION AND AVOIDANCE

(a) Objective:

To advise the student Instructor on how to improve the student's ability to recognize a spin at the incipient stage and to recover from it. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) why a sailplane spins;

(2) how to recognise the symptoms of a spin (not to be confused with spiral dive);

(3) what are the parameters influencing the spin;

(4) how to recover from a spin.

(c) Air exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft or traffic before starting the exercise.

The student instructor has to:

(1) demonstrate stalling and recovery at the incipient spin stage (stall with excessive wing drop, about 45 °);

(2) make sure that the student recognises the spin entry;

(3) make sure that the student pilot is able to recover from the spin;

(4) check if the student still reacts properly if the instructor induces distractions during the spin entry;

(5) demonstrate how to analyse and correct errors as necessary.

Note: consideration of manoeuvre limitations and the need to refer to the sailplane manual and mass and balance calculations.

EXERCISE 10b: DEVELOPED SPINS: ENTRY AND RECOVERY

(a) Objective:

To advise the student instructor on how to recognize a developed spin and to recover from it. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the spin entry;

(2) the symptoms of a real spin and the recognition and identification of spin direction;

(3) the spin recovery;

(4) use of controls;

(5) effects of flaps (flap restriction applicable to type);

(6) the effect of the CG upon spinning characteristics;

(7) the spinning from various flight attitudes;

(8) the sailplane limitations;

(9) safety checks;

(10) common errors during recovery.

(c) Air exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft or traffic before starting the exercise.

The student instructor has to demonstrate:

(1) safety checks;

(2) the spin entry;

(3) the recognition and identification of the spin direction;

(4) the spin recovery (reference to flight manual);

(5) the use of controls;

(6) the effects of flaps (restrictions applicable to sailplane type);

(7) spinning and recovery from various flight attitudes;

(8) how to improve the student pilot’s ability to recognise a spin and how to recover from it;

(9) how to analyse and correct errors as necessary.

EXERCISE 11: TAKE OFF OR LAUNCH METHODS

Note: the student instructor has to teach at least one of the following launch methods: winch launch, aero tow, self-launch. At least three launch failure exercises should be completed. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

EXERCISE 11a: WINCH LAUNCH

(a) Objective:

To advise the student instructor on how to teach winch launches and on how to make sure that their student will manage an aborted launch. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the signals or communication before and during launch;

(2) the use of the launching equipment;

(3) the pre-take-off checks;

(4) the procedure for into wind take-off;

(5) the procedure for crosswind take-off;

(6) the optimum profile of winch launch and limitations;

(7) the launch failure procedures.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the use of the launching equipment;

(2) the pre-take-off checks;

(3) the into wind take-off;

(4) the crosswind take-off;

(5) the optimum profile of winch launch and limitations;

(6) the procedure in case of cable break or aborted launch, launch failure procedures;

(7) how to teach the student pilot to perform safe winch launches;

(8) how to teach the student pilot to manage an aborted launch (different altitudes);

(9) how to analyse and correct errors as necessary.

EXERCISE 11b: AERO TOW

(a) Objective:

To advise the student instructor on how to teach aero towing and on how to make sure that their student will manage an aborted launch. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the signals or communication before and during launch;

(2) the use of the launch equipment;

(3) the pre-take-off checks;

(4) the procedure for into wind take-off;

(5) the procedure for crosswind take-off;

(6) the procedure on tow: straight flight, turning and slip stream;

(7) the recovery from out-of-position on tow;

(8) the procedures in case of launch failure and abandonment;

(9) the descending procedure on tow (towing aircraft and sailplane);

(10) the reasons for launch failures and abandonment or procedures.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the signals before and during launch;

(2) the use of the launch equipment;

(3) the pre-take-off checks;

(4) the procedure for into wind take-off;

(5) the procedure for a crosswind take-off;

(6) the procedures on tow: straight flight, turning and slip stream;

(7) the recovery from out-of-position on tow;

(8) the procedure in case of launch failure and abandonment;

(9) the descending procedure on tow;

(10) how to teach the student pilot to perform safe aero tow launches;

(11) how to teach the student pilot to manage an aborted launch;

(12) how to analyse and correct errors as necessary.

EXERCISE 11c: SELF LAUNCH

(a) Objective:

To advise the student instructor on how to teach launching with a self launching sailplane and on how to make sure that his/her student will manage an aborted launch. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the engine extending and retraction procedures;

(2) the engine starting and safety precautions;

(3) the pre-take-off checks;

(4) the noise abatement procedures;

(5) the checks during and after take-off;

(6) the into wind take-off;

(7) the crosswind take-off;

(8) the procedure in case of power failure;

(9) the procedure in case of abandoned take-off;

(10) the maximum performance (short field and obstacle clearance) take-off;

(11) the short take-off and soft field procedure or techniques and performance calculations.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the engine extending and retraction procedures;

(2) the engine starting and safety precautions;

(3) the pre-take-off checks;

(4) the noise abatement procedures;

(5) the checks during and after take off;

(6) the into wind take-off;

(7) the crosswind take-off;

(8) the power failures and procedures;

(9) the procedure in case of abandoned take-off;

(10) the maximum performance (short field and obstacle clearance) take-off;

(11) the short take-off and soft field procedure or techniques and performance calculations;

(12) how to teach the student pilot to perform safe self launches;

(13) how to teach the student pilot to manage an aborted launch (different altitudes);

(14) how to analyse and correct errors as necessary.

EXERCISE 12: CIRCUIT APPROACH AND LANDING

(a) Objective:

To advise the student instructor on how to teach their students to fly a safe circuit approach and to land the sailplane. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the procedures for rejoining the circuit;

(2) the procedures for collision avoidance and the lookout techniques;

(3) the pre-landing check;

(4) the normal circuit procedures, downwind, base leg;

(5) the effect of wind on approach and touchdown speeds ;

(6) the visualisation of a reference point;

(7) the approach control and use of airbrakes;

(8) the use of flaps (if applicable);

(9) the procedures for normal and crosswind approach and landing.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the procedures for rejoining the circuit;

(2) the procedures for collision avoidance and the look-out techniques;

(3) the pre-landing check;

(4) the standard circuit and contingency planning (for example running out of height);

(5) the effect of wind on approach and touchdown speeds;

(6) the visualisation of an aiming point;

(7) the approach control and use of airbrakes;

(8) the use of flaps (if applicable);

(9) the procedures for normal and crosswind approaches and landings;

(10) how to teach the student pilot to fly a safe circuit approach;

(11) how to improve the student pilot's ability to perform a safe landing;

(12) how to analyse and correct errors as necessary.

EXERCISE 13: FIRST SOLO

(a) Objective:

To advise the student instructor on how to prepare their students for the first solo flight.

(b) Briefing:

The student instructor has to explain:

(1) the limitations of the flight (awareness of local area and restrictions);

(2) the use of required equipment.

(c) Air exercise:

The student instructor has to;

(1) check with another or more senior instructor if the student can fly solo;

(2) monitor the flight;

(3) debrief the flight with the student.

EXERCISE 14 : ADVANCED TURNING

(a) Objective:

To advise the student instructor on how to fly steep turns or circles (45 ° banking) at constant attitude (speed) and with the yaw string centred. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain;

(1) the relationship between banking and speed;

(2) how to master steep turns or circles;

(3) the unusual attitudes which can occur (stalling or spinning and spiral dive);

(4) how to recover from these unusual attitudes.

(c) Air exercise:

The student has to demonstrate:

(1) steep turns (45 °) at constant speed and with the yaw string centred;

(2) common errors (slipping and skidding);

(3) unusual attitudes and how to recover from them;

(4) how to teach the student pilot to fly steep turns or circles;

(5) how to analyse and correct errors as necessary.

EXERCISE 15: SOARING TECHNIQUES

Note: if the weather conditions during the instructor training do not allow the practical training of soaring techniques, all items of the air exercises have to be discussed and explained during a long briefing exercise only.

EXERCISE 15a: THERMALLING

(a) Objective:

To advise the student instructor on how to teach their students to recognise and detect thermals, on how to join a thermal and on how to look out, in order to avoid mid-air collisions. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain;

(1) the look-out procedures;

(2) the detection and recognition of thermals;

(3) the use of audio soaring instruments;

(4) the procedure for joining a thermal and giving way;

(5) how to fly in close proximity to other sailplanes;

(6) how to centre in thermals;

(7) how to leave thermals.

(c) Air exercise:

The student instructor has to demonstrate;

(1) the look-out procedures;

(2) the detection and recognition of thermals;

(3) the use of audio soaring instruments;

(4) the procedure for joining a thermal and giving way;

(5) the procedure for flying in close proximity to other sailplanes;

(6) the centering in thermals;

(7) the procedure for leaving thermals;

(8) how to improve the student pilot’s ability to recognise and detect thermals;

(9) how to improve the student pilot’s ability to join a thermal and how to look out;

(10) how to analyse and correct errors as necessary.

EXERCISE 15b: RIDGE FLYING

(a) Objective:

To advise the student instructor on how to teach his/her students to fly safely on ridges, to control their speed, and to apply the rules in order to avoid midair collisions. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the look-out procedures;

(2) the ridge flying rules;

(3) the recognition of optimum flight path;

(4) speed control.

(c) Air exercise: (if applicable during training and, if possible, at training site)

The student instructor has to demonstrate:

(1) the look-out procedures;

(2) the practical application of ridge flying rules;

(3) the recognition of optimum flight path;

(4) speed control;

(5) how to teach the student pilot to fly safely on ridges;

(6) how to analyse and correct errors as necessary.

EXERCISE 15c: WAVE FLYING

(a) Objective:

To advise the student instructor on how to introduce students to wave flying and to teach them to fly safely at high altitude. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the look-out procedures;

(2) the techniques to be used to accede to a wave;

(3) the speed limitations with increasing height;

(4) the risks of hypoxia and the use of oxygen.

(c) Air exercise: (if applicable during training and if possible at training site) The student instructor has to demonstrate:

(1) the look-out procedures;

(2) the wave access techniques;

(3) the speed limitations with increasing height;

(4) the use of oxygen (if available);

(5) how to improve the student pilot's ability to recognise and detect waves;

(6) how to teach the student pilot to fly safely in a wave;

(7) how to analyse and correct errors as necessary.

EXERCISE 16: OUT-LANDINGS

Note: if the weather conditions during the instructor training do not allow the practical training of out-landing procedures (a touring motor glider may be used) all items of the air exercise have to be discussed and explained during a long briefing exercise only. Instructors may only teach the safe out-landing exercise after they have demonstrated the practical ability to do so.

(a) Objective:

To advise the student instructor on how to teach students to select an outlanding field, to fly the circuit and how to master the unusual landing situation. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the gliding range at max L/D;

(2) the engine re-start procedures (only for self-launching and selfsustaining sailplanes);

(3) the selection of a landing area;

(4) the circuit judgement and key positions;

(5) the circuit and approach procedures;

(6) the actions to be done after landing.

(c) Air exercise:

The student instructor has to demonstrate:

(1) precision landings on the airfield;

(2) the gliding range;

(3) the procedures for joining, arrival and circuit at a remote aerodrome;

(4) the selection of an out-landing area;

(5) the procedures for circuit and approach on an out-landing field;

(6) the actions to be done after landing;

The student instructor also has to be trained:

(7) how to advise the student pilot to do perform a safe out-landing;

(8) how to master an unusual landing situation;

(9) how to analyse and correct errors as necessary.

EXERCISE 17: CROSS COUNTRY FLYING

Note: if the weather conditions during the instructor training do not allow a cross country training flight the items of the air exercise have to be discussed and explained during a long briefing exercise only.

EXERCISE 17a: FLIGHT PLANNING

(a) Objective:

To advise the student instructor on how plan and prepare a cross-country flight.

(b) Briefing:

The student instructor has to explain:

(1) the weather forecast and current situation;

(2) the selection of the amount of water to be carried as a function of the weather forecast;

(3) the method for selecting a task, taking into account the average speed to be expected;

(4) the map selection and preparation;

(5) the NOTAMs and airspace considerations;

(6) the radio frequencies (if applicable);

(7) the pre-flight administrative procedures;

(8) the procedure for filing a flight plan where required;

(9) alternate aerodromes and landing areas.

EXERCISE 17b: IN-FLIGHT NAVIGATION

(a) Objective:

To advise the student instructor on how to teach performing a cross-country flight.

(b) Briefing:

The student instructor has to explain:

(1) how to maintain track and re-route if necessary;

(2) the altimeter settings;

(3) the use of radio and phraseology;

(4) the in-flight planning;

(5) the procedures for transiting regulated airspace or ATC liaison where required;

(6) the procedure in case of uncertainty of position;

(7) the procedure in case of becoming lost;

(c) Air exercise:

The student instructor has to demonstrate:

(1) maintaining track and re-routing if necessary;

(2) altimeter settings;

(3) the use of radio and phraseology;

(4) in-flight planning;

(5) procedures for transiting regulated airspace or ATC liaison where required;

(6) uncertainty of position procedure;

(7) lost procedure;

(8) use of additional equipment where required;

(9) joining, arrival and circuit procedures at remote aerodrome;

(10) how to teach the student pilot to perform a cross-country flight;

(11) how to analyse and correct errors as necessary.

EXERCISE 17c: CROSS-COUNTRY SOARING TECHNIQUES

(a) Objective:

To advise the student instructor on the techniques for an efficient cross country flight.

(b) Briefing:

The student instructor has to explain:

(1) the speed to fly at maximal L/D ratio;

(2) the speed to fly to maximise the cruise speed (Mc Cready theory);

(3) how to select the optimal track (efficient use of cloud streets etc.);

(4) how to calculate the final glide;

(5) how to perform a safe out-landing.

(c) Air exercise:

The student instructor has to demonstrate:

(1) a cross-country flight;

(2) the selection of the optimal track (efficient use of cloud streets, etc) ;

(3) the use of the Mc Cready ring;

(4) use of final glide computers;

(5) how to reduce risk and to react to potential dangers;

(6) how to plan and perform an out-landing;

(7) how to teach the student pilot techniques for an efficient crosscountry flight;

(8) how to analyse and correct errors as necessary.

B. BALLOONS

LONG BRIEFINGS AND AIR EXERCISES

EXERCISE 1: FAMILIARISATION WITH THE BALLOON

(a) Objective:

To advise the student Instructor on how to familiarise the student with the balloon which will be used for the training and to test his position in the basket for comfort, visibility, and ability to use all controls and equipment. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing and exercise:

The student instructor has to:

(1) present the type of balloon which will be used;

(2) explain the characteristics of the balloon;

(3) explain the components, instruments and equipment;

(4) explain the re-fuelling procedures (in the case of hot air balloons);

(5) to familiarise the student with the balloon controls;

(6) explain the differences when occupying the instructor’s position;

(7) explain all checklists, drills and controls.

EXERCISE 2: PREPARATION FOR FLIGHT

(a) Objective:

To advise the student instructor on how to explain all the operations and necessary preparation to be completed before the flight. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing

The student instructor has to explain:

(1) the need for a pre-flight briefing;

(2) the structure and the content of this briefing;

(3) which documents are required on board;

(4) which equipment are required for a flight;

(5) the use of weather forecasts or actuals;

(6) the flight planning with particular regard to NOTAMs, airspace structure, sensitive areas, expected track and distance, pre-flight picture and possible landing fields;

(7) the use of load calculation chart;

(8) the selection of launch field with particular regard to permission, behaviour and adjacent fields.

(c) Air exercise:

The student instructor has to prepare and give a pre-flight briefing.

The student instructor has to demonstrate:

(1) that the required documents are on board;

(2) that the equipment required for the intended flight is on board;

(3) how to advice the student to do the pre-planning procedures for each flight;

(4) how to perform a pre-launch check;

(5) how to select a launch field with particular regard to permission, behaviour and adjacent fields;

(6) how to teach the student pilot to perform the preparation to be completed prior to flight;

(7) how to analyse and correct errors of the student pilot as necessary.

EXERCISE 3: CREW AND PASSENGER BRIEFING

(a) Objective:

To advise the student instructor on how to explain all the importance of correct clothing for pilot, passengers and crew and how to perform the briefing of ground- and retrieve crew and the briefing of passengers. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the correct clothing for passengers and crew;

(2) the briefings for ground- and retrieve crew and passengers.

(c) Air exercise:

The student instructor has to demonstrate:

(1) how to advise the passengers and crew about the correct clothing;

(2) the briefing of ground- and retrieve crew;

(3) the briefing of passengers;

(4) how to familiarise the student pilot with the different type of briefings;

(5) how to analyse and correct errors of the student pilot.

EXERCISE 4: ASSEMBLY AND LAYOUT

(a) Objective:

To advise the student instructor on how to familiarise the student pilot with the control of the crowd and how to perform the securing of launch site. Furthermore the student instructor has to demonstrate how to familiarise the student pilot with the correct rigging of envelope and basket, the burner test procedure (hot air balloons) and the pre-inflation checks. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the control of the crowd;

(2) the securing of the launch site;

(3) the correct rigging procedure;

(4) the use of the restraint line;

(5) the pre-inflation checks.

(c) Air exercise:

The student instructor has to demonstrate:

(1) how to control the crowd and securing of launch site;

(2) the correct rigging of envelope and basket;

(3) the correct use of the restraint line;

(4) the burner test procedure (hot air balloons);

(5) the pre-inflation checks;

(6) how to teach the student pilot to perform the correct rigging;

(7) how to analyse and correct assembly errors of the student pilot as necessary.

EXERCISE 5: INFLATION

(a) Objective:

To advise the student instructor on how to familiarise the student pilot with the different phases of the inflation procedure, the use of restraint line and inflation fan (hot air balloons) and the avoidance of electrostatic discharge (gas balloons). Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the different phases of the inflation procedure;

(2) the crowd control and securing procedures during inflation;

(3) the use of the inflation fan (hot air balloons);

(4) how to avoid electronic discharge (gas balloons).

(c) Air exercise:

The student instructor has to demonstrate:

(1) how to control of crowd and securing of launch site during inflation procedure; the cold inflation procedure and use of restraint line and inflation fan (hot air balloons);

(2) the hot inflation procedure (hot air balloons);

(3) the avoidance of electrostatic discharge (gas balloons);

(4) the inflation procedure (gas balloons);

(5) how to teach the student pilot to perform the inflation procedures;

(6) how to analyse and correct errors of the student pilot during the inflation procedure as necessary.

EXERCISE 6: TAKE OFF IN DIFFERENT WIND CONDITIONS

(a) Objective:

To advise the student instructor how to explain the pre take-off checks and briefings, the preparation for controlled climb and the use of restraint equipment. Furthermore the student instructor should be able to demonstrate the assessment of wind and obstacles, the preparation for false lift and the take off techniques in different wind conditions. In addition to this the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the pre take-off checks and briefings;

(2) the preparation for controlled climb;

(3) the 'hands off and hands on' procedure for ground crew;

(4) the assessment of lift;

(5) the use of the restraint equipment ;

(6) the assessment of wind and obstacles;

(7) the preparation for false lift;

(8) the take off techniques from sheltered and non sheltered launch fields.

(c) Air exercise:

The student instructor has to demonstrate:

(1) how to perform the pre take-off checks and briefings;

(2) how to prepare for controlled climb;

(3) how to perform the 'hands off and hands on' procedure for ground crew;

(4) how to perform the assessment of lift without endangering the ground crew;

(5) how to use the restraint equipment;

(6) how to perform the assessment of wind and obstacles;

(7) how to prepare for false lift;

(8) how to teach the student pilot the correct take off techniques from sheltered and non sheltered launch fields;

(9) how to analyse and correct errors of the student pilot as necessary.

EXERCISE 7: CLIMB TO LEVEL FLIGHT

(a) Objective:

To advise the student instructor on how to explain and demonstrate the climb to flight level. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the climbing with a predetermined rate of climb;

(2) the effect on envelope temperature (hot air balloons);

(3) the maximum rate of climb according to manufacturer's flight manual;

(4) how to level off at selected altitude.

(c) Air exercise:

The student instructor has to demonstrate:

(1) how to climb with a predetermined rate of climb;

(2) how to perform look out techniques;

(3) the effect on envelope temperature (hot air balloons);

(4) the maximum rate of climb according to manufacturer's flight manual;

(5) the levelling off techniques at selected altitude;

(6) how to advise the student pilot to perform the climb to level flight;

(7) how to analyse and correct faults or errors of the student pilot during the climb.

EXERCISE 8: LEVEL FLIGHT

(a) Objective:

To advise the student instructor on how to explain and demonstrate level flight. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) how to maintain level flight by use of instruments;

(2) how to maintain level flight by use of visual references;

(3) how to maintain level flight by use of all available means;

(4) the use of parachute;

(5) the use of turning vents if installed (hot air balloons).

(c) Air exercise:

The student instructor has to demonstrate:

(1) how to maintain level flight by use of instruments;

(2) how to maintain level flight by use of visual references;

(3) how to maintain level flight by use of all available means;

(4) the use of parachute;

(5) the use of turning vents if installed (hot air balloons);

(6) how to advise the student pilot to perform the level flight;

(7) how to analyse and correct faults or errors of the student pilot during the level flight.

EXERCISE 9: DESCENT TO LEVEL FLIGHT

(a) Objective:

To advise the student instructor on how to explain and demonstrate the descent to a certain flight level. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) how to descent with a predetermined rate of descent;

(2) a fast descent;

(3) the maximum rate of descent according to manufacturer’s flight manual;

(4) the use of parachute;

(5) a parachute stall and cold descent (hot air balloons);

(6) the levelling off technique at selected altitude.

(c) Air exercise:

The student instructor has to demonstrate:

(1) a descent with a predetermined rate of descent;

(2) how to perform look out techniques;

(3) a fast descent;

(4) the maximum rate of descent according to manufacturer's flight manual;

(5) the use of parachute;

(6) how to level off at selected altitudes;

(7) how to advise the student pilot to perform a descent to a certain flight level;

(8) how to analyse and correct faults or errors of the student pilot during the descent.

EXERCISE 10: EMERGENCIES

(a) Objective:

To advise the student instructor on how to explain and demonstrate the different emergency situations and how to react. Furthermore the student instructor should learn how to identify student errors during the simulated emergency exercises and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the pilot light failure (hot air balloons);

(2) burner failures, valve leaks, flame out and re-light (hot air balloons);

(3) gas leaks;

(4) closed appendix during take-off and climb (gas balloons);

(5) the envelope over temperature (hot air balloons);

(6) envelope damage in flight;

(7) the parachute or rapid deflation system failure;

(8) fire on ground and in the air;

(9) how to avoid an obstacle contact including contact with electrical power lines;

(10) escape drills, location and use of emergency equipment.

(c) Air exercise:

The student instructor has to demonstrate:

(1) a pilot light failure (hot air balloons);

(2) a burner failure, valve leaks, flame out and re-light (hot air balloons);

(3) gas leaks;

(4) a closed appendix during take-off and climb (gas balloons);

(5) envelope over temperature (hot air balloons);

(6) envelope damage in flight;

(7) parachute or rapid deflation system failure;

(8) a fire on ground and in the air;

(9) the escape drills, location and use of emergency equipment;

(10) how to advise the student pilot in performing the different emergency drills;

(11) how to analyse and correct faults or errors of the student pilot.

EXERCISE 11: NAVIGATION

(a) Objective:

To advise the student instructor on how to explain and demonstrate the advanced navigational flight preparation. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the maps selection;

(2) the plotting of the expected track;

(3) the marking of positions and time;

(4) the calculation of distance and speed;

(5) the calculation of fuel consumption (hot air balloons);

(6) the calculation of ballast consumption (gas balloons);

(7) the ceiling limitations (ATC or weather);

(8) how to plan ahead;

(9) the monitoring of weather development;

(10) the monitoring of fuel or ballast consumption;

(11) ATC liaison (if applicable);

(12) the communication with retrieve crew;

(13) the use of GNSS.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the use of selected maps;

(2) the plotting of the expected track;

(3) the marking of positions and time;

(4) how to monitor of distance and speed;

(5) how to monitor the fuel or ballast consumption;

(6) the observance of ceiling limitations (ATC or weather);

(7) the planning ahead;

(8) the monitoring of weather development;

(9) the monitoring of envelope temperature (hot air balloons);

(10) ATC liaison (if applicable);

(11) communication with retrieve crew;

(12) use of GNSS;

(13) how to advise the student pilot in performing the navigational preparation;

(14) how to advise the student pilot in performing the different navigational in-flight tasks;

(15) how to analyse and correct faults or errors of the student pilot.

EXERCISE 12a: FUEL MANAGEMENT HOT AIR BALLOONS

(a) Objective:

To advise the student instructor on how to explain and demonstrate the fuel management techniques. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the cylinder arrangement and the burner systems;

(2) the function of the pilot light supply (vapour or liquid);

(3) the use of master cylinders (if applicable);

(4) the fuel requirement and expected fuel consumption;

(5) the fuel state and pressure;

(6) the minimum fuel reserves;

(7) cylinder contents gauge and change procedure;

(8) the use of cylinder manifolds.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the cylinder arrangement and burner systems;

(2) the pilot light supply (vapour or liquid);

(3) the use of master cylinders (if applicable);

(4) how to monitor of fuel requirement and expected fuel consumption;

(5) the monitoring of fuel state and pressure;

(6) the monitoring of fuel reserves;

(7) the use of cylinder contents gauge and change procedure;

(8) the use of cylinder manifolds;

(9) how to advise the student pilot to perform the fuel management;

(10) how to analyse and correct faults or errors of the student pilot.

EXERCISE 12b: BALLAST MANAGEMENT GAS BALLOONS

(a) Objective:

To advise the student instructor on how to explain and demonstrate the ballast management. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the minimum ballast;

(2) the arrangement and securing of ballast;

(3) the ballast requirement and expected ballast consumption;

(4) the ballast reserves.

(c) Air exercise:

The student instructor also has to demonstrate:

(1) the arrangement of minimum ballast;

(2) the arrangement and securing of ballast;

(3) the ballast requirement calculation and expected ballast consumption;

(4) how to secure ballast reserves;

(5) how to advise the student pilot to perform the ballast management;

(6) how to analyse and correct faults or errors of the student pilot.

EXERCISE 13: APPROACH FROM LOW LEVEL

(a) Objective:

To advise the student instructor on how to explain and demonstrate the approach from level. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the pre landing checks;

(2) passenger pre-landing briefing;

(3) the selection of field;

(4) the use of burner and parachute (hot air balloons);

(5) the use of ballast or parachute and valve (gas balloons);

(6) the use of trail rope (if applicable) (gas balloons);

(7) the look-out;

(8) missed approach and fly on procedures.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the use of the pre landing checks;

(2) the selection of fields;

(3) the use of burner and parachute (hot air balloons);

(4) the use of ballast or parachute and valve (gas balloons);

(5) the use of trail rope (if applicable) (gas balloons);

(6) the look out procedures and how to avoid possible distractions;

(7) the missed approach and fly on techniques;

(8) how to advise the student pilot to perform an approach from low level;

(9) how to analyse and correct faults or errors of the student pilot.

EXERCISE 14: APPROACH FROM HIGH LEVEL

(a) Objective:

To advise the student instructor on how to explain and demonstrate the approach from high level. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the pre-landing checks;

(2) passenger pre-landing briefing;

(3) the selection of field;

(4) the rate of descent;

(5) the use of burner and parachute (hot air balloons);

(6) the use of ballast and parachute (gas balloons);

(7) the use of trail rope (if applicable) (gas balloons);

(8) the look-out;

(9) the missed approach and fly on procedures.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the pre-landing checks;

(2) the selection of field;

(3) the rate of descent;

(4) the use of burner and parachute (hot air balloons);

(5) the use of ballast and parachute (gas balloons);

(6) the use of trail rope (if applicable) (gas balloons);

(7) the look out procedures and how to avoid potential distraction;

(8) the missed approach and fly on techniques;

(9) how to advise the student pilot to perform an approach from a higher level;

(10) how to analyse and correct faults or errors of the student pilot.

EXERCISE 15: OPERATING AT LOW LEVEL

(a) Objective:

To advise the student instructor on how to explain and demonstrate the operation at a low height. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the use of burner and parachute (hot air balloons);

(2) the use of ballast and parachute (gas balloons);

(3) the look out;

(4) how to avoid a contact with low level obstacles;

(5) how to avoid sensitive areas (for example nature protection areas);

(6) landowner relations.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the use of burner and parachute (hot air balloons);

(2) the use of ballast and parachute (gas balloons);

(3) the look out procedures and how to avoid potential distraction;

(4) how to avoid low level obstacles;

(5) good landowner relations;

(6) how to advise the student pilot to operate the balloon at a low level;

(7) how to analyse and correct faults or errors of the student pilot.

EXERCISE 16: LANDING IN DIFFERENT WIND CONDITIONS

(a) Objective:

To advise the student instructor on how to explain and demonstrate landings in different wind conditions. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the correct actions for turbulences during the approach or landing;

(2) the passenger pre-landing briefing;

(3) the use of burner and pilot lights (hot air balloons);

(4) the use of ballast, parachute, valve and rip panel (gas balloons);

(5) the use of parachute and turning vents (if applicable);

(6) the look out;

(7) the landing, dragging and deflation;

(8) landowner relations.

(c) Air exercise:

The student instructor has to demonstrate:

(1) the pre-landing checks;

(2) the passenger briefing;

(3) the selection of field;

(4) the effect of turbulence;

(5) the use of burner and pilot lights (hot air balloons);

(6) the use of ballast, parachute, valve and rip panel (gas balloons);

(7) the use of parachute and turning vents (if applicable);

(8) the look out procedures and how to avoid potential distraction;

(9) the landing, dragging and deflation procedures;

(11) how to advise the student pilot to perform a safe landing in different wind conditions;

(12) how to analyse and correct faults or errors of the student pilot.

EXERCISE 17: FIRST SOLO

(a) Objective:

To advise the student instructor on how to prepare their students for the first solo flight.

(b) Briefing:

The student instructor has to explain:

(1) the limitations of the flight;

(2) the use of required equipment.

(c) Air exercise:

The student instructor has to:

(1) check with another or more senior instructor if the student can fly solo;

(2) monitor the pre-flight preparation;

(3) brief the student (expected flight time or emergency actions);

(4) monitor the flight as far as possible;

(5) debrief the flight with the student.

EXERCISE 18: TETHERED FLIGHT HOT AIR BALLOONS (if tethered flight instructional qualification is required)

(a) Objective:

To advise the student instructor on how to explain and demonstrate the tethering techniques. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the ground preparations;

(2) the weather suitability;

(3) the tethering techniques and equipment;

(4) the maximum all-up-weight limitation;

(5) the crowd control;

(6) the pre take-off checks and briefings;

(7) the heating for controlled lift off;

(8) the ‘hands off and hands on’ procedure for ground crew;

(9) the assessment of wind and obstacles;

(10) the controlled climb to a pre-defined altitude (at least 60 ft).

(c) Air exercise:

The student instructor has to demonstrate:

(1) the ground preparations;

(2) the tethering techniques;

(3) the reason for maximum all-up-weight limitation;

(4) how to perform the crowd control;

(5) the pre take-off checks and briefings;

(6) the heating for controlled lift off;

(7) the 'hands off and hands on' procedure for ground crew;

(8) the assessment of wind and obstacles;

(9) the controlled climb;

(10) the landing techniques;

(11) how to advise the student pilot to perform a tethered flight;

(12) how to analyse and correct faults or errors of the student pilot.

EXERCISE 19: NIGHT FLYING (if night instructional qualification required)

(a) Objective:

To advise the student instructor on how to explain and demonstrate the night flying techniques. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

(1) the medical or physiological aspects of night vision;

(2) the use of lights for assembly, layout and inflation;

(3) the requirement for torch to be carried, (pre-flight inspection, etc.);

(4) the use of the external- and instrument lights;

(5) the night take-off procedure;

(6) the checklist procedures at night;

(7) the emergency procedures at night;

(8) the navigation principles at night;

(9) map marking for night use (highlighting built up or lit areas with thicker lines, etc.).

(c) Air exercise:

The student instructor has to demonstrate:

(1) the use of lights for assembly, layout and inflation;

(2) the use of torch for pre-flight inspection;

(3) the use of external- and instrument lights;

(4) the night take-off procedure;

(5) how to perform the checklist procedures at night;

(6) simulated night emergency procedures;

(7) night cross country techniques, as appropriate;

(8) how to advise the student pilot to perform a flight at night;

(9) how to analyse and correct faults or errors of the student pilot.

AMC1 FCL.940.FI; FCL.940.IRI Revalidation and renewal

(a) The instructor refresher training for the revalidation of the FI and IRI certificates should be provided as a seminar by either an ATO, DTO, or CAA.

(1) FI or IRI refresher seminars made available in the state should have due regard to geographical location, numbers attending, and periodicity.

(2) Such seminars should run for at least 2 days (1 day = 6 hours), and attendance from participants will be required for the whole duration of the seminar including breakout groups and workshops. Different aspects, such as inclusion of participants holding certificates in other categories of aircraft, should be considered.

(3) Appropriately experienced FIs or IRIs currently involved with flying training and with a practical understanding of the revalidation requirements and current instructional techniques should be included as speakers at these seminars.

(4) The attendance form will be completed and signed by the organiser of the seminar as approved by the CAA, following attendance and satisfactory participation by the FI or IRI.

(5) The content of the FI or IRI refresher seminar should be selected from the following:

(i) new or current rules or regulations, with emphasis on knowledge of Part-FCL and operational requirements;

(ii) teaching and learning;

(iii) instructional techniques;

(iv) the role of the instructor;

(v) national regulations (as applicable);

(vi) human factors;

(vii) flight safety, incident and accident prevention;

(viii) airmanship;

(ix) legal aspects and enforcement procedures;

(x) navigational skills including new or current radio navigation aids;

(xi) teaching instrument flying;

(xii) weather-related topics including methods of distribution;

(xiii) any additional topic selected by the competent authority.

(6) Formal sessions should allow time for presentations and related questions. The use of visual aids is recommended, with interactive videos and other teaching aids (where available) for breakout groups and workshops.

(b) If the instructor certificate lapsed, the ATO, DTO, or CAA, whichever is appropriate to the category of aircraft, should consider all the above as well as the following, when assessing the refresher training programme:

(1) the ATO, DTO, or CAA should determine on a case-by-case basis the amount of refresher training needed, following an assessment of the candidate taking into account the following factors:

(i) the experience of the applicant;

(ii) the amount of time elapsed since the expiry of the FI or IRI certificate; and

(iii) the technical elements of the FI or IRI training course, as determined by the assessment of the candidate by the ATO, DTO, or CAA; and

(2) the individual training programme should be based on the content of the FI or IRI training course and focus on the aspects where the applicant showed the greatest needs.

(c) After successful completion of the seminar or refresher training, as applicable, the ATO, DTO, or CAA should:

(1) in case of a seminar, in accordance with point (a), issue the applicant with a seminar completion certificate or another document specified by the CAA, which describes the content of the seminar as in point (a), as well as a statement that the seminar was successfully completed; and

(2) in case of refresher training, in accordance with point (b), issue the applicant with a training completion certificate or another document specified by the CAA, which describes the evaluation of the factors listed in point (b)(1) and the training received, as well as a statement that the training was successfully completed; the training completion certificate should be presented to the examiner prior to the assessment of competence.

Upon successful completion of the refresher seminar or refresher training, as applicable, the ATO or DTO should submit the seminar or training completion certificate, or the other document specified by the CAA, to the CAA.

(d) Taking into account the factors listed in point (b)(1), the ATO, DTO, or CAA, as applicable, may also decide that it is sufficient for the candidate to complete a seminar in accordance with point (a). In such a case, the completion certificate or the other document that is referred to in point (c) should contain a related statement with sufficient reasoning.

FI — Revalidation and renewal

FI CERTIFICATE: REVALIDATION AND RENEWAL FORM

A. AEROPLANES

<table>
<tr><td colspan="5">INSTRUCTIONAL FLYING EXPERIENCE</td></tr>
<tr><td colspan="5">Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.</td></tr>
<tr><td colspan="2">SINGLE-ENGINE</td><td colspan="2">MULTI-ENGINE</td><td>INSTRUMENT</td></tr>
<tr><td>DAY</td><td>NIGHT</td><td>DAY</td><td>NIGHT</td><td></td></tr>
<tr><td colspan="5">Total instructional hours (preceding 36 months):</td></tr>
<tr><td colspan="5">Total instructional hours (preceding 12 months):</td></tr>
</table>

<table>
<tr><td colspan="3">FI REFRESHER SEMINAR</td></tr>
<tr><td>1</td><td colspan="2">This is to certify that the undersigned attended an FI seminar</td></tr>
<tr><td>2</td><td colspan="2">Attendee’s personal particulars:</td></tr>
<tr><td colspan="2">Name(s):</td><td>Address:</td></tr>
<tr><td colspan="2">Licence number:</td><td>Expiration date of FI(A) certificate</td></tr>
<tr><td>3</td><td colspan="2">Seminar particulars:</td></tr>
<tr><td colspan="2">Date(s) of seminar:</td><td>Place:</td></tr>
<tr><td>4</td><td colspan="2">Declaration by the responsible organiser:</td></tr>
<tr><td colspan="3">I certify that the above data are correct and that the FI seminar was carried out.</td></tr>
<tr><td colspan="2">Date of approval:</td><td>Name(s) of organiser:
(capital letters)</td></tr>
<tr><td colspan="2">Date and place:</td><td>Signature:</td></tr>
<tr><td>5</td><td colspan="2">Declaration by the attendee:</td></tr>
<tr><td colspan="3">I confirm the data under 1 through 3</td></tr>
<tr><td colspan="3">Attendee’s signature:</td></tr>
<tr><td colspan="3">PROFICIENCY CHECK</td></tr>
<tr><td colspan="3">(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.</td></tr>
</table>

Flying time:	Aeroplane or FFS used:
Main exercise:	
Name(s) of FIE:	Licence number:
Date and place:	Signature:

B. HELICOPTERS

INSTRUCTIONAL FLYING EXPERIENCE			
Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.			
Instrument:			
Total instructional hours (preceding 36 months):			
Total instructional hours (preceding 12 months):			
FI REFRESHER SEMINAR			
1	This is to certify that the undersigned attended an FI seminar		
2	Attendees personal particulars:		
Name(s):		Address:	
Licence number:		Expiration date of FI(H) certificate:	
3	Seminar particulars:		
Date(s) of seminar:		Place:	
4	Declaration by the responsible organiser:		
I certify that the above data are correct and that the FI seminar was carried out.			
Date of approval:		Name(s) of organiser: (capital letters)	
Date and place:		Signature:	
5	Declaration by the attendee:		

I confirm the data under 1 through 3	
Attendee's signature:	
PROFICIENCY CHECK	
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.	
Flying time:	Helicopter or FFS used:
Main exercise:	
Name(s) of FIE:	Licence number:
Date and place: Signature:	

C. AIRSHIPS

INSTRUCTIONAL FLYING EXPERIENCE				
Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.				
SINGLE-ENGINE		MULTI-ENGINE		INSTRUMENT
DAY	NIGHT	DAY	NIGHT	
Total instructional hours (preceding 36 months):				
Total instructional hours (preceding 12 months):				

FLIGHT INSTRUCTOR REFRESHER SEMINAR	
1	This is to certify that the undersigned attended an FI seminar
2	Attendee's personal particulars:
Name(s):	Address:
Licence number:	Expiration date of FI(As) certificate:
3	Seminar particulars:
Date(s) of seminar:	Place:
4	Declaration by the responsible organiser:
I certify that the above data are correct and that the FI seminar was carried out.	
Date of approval:	Name(s) of organiser: (capital letters)

Date and place:	Signature:
5 Declaration by the attendee:	
I confirm the data under 1 through 3	
Attendee's signature:	
PROFICIENCY CHECK	
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.	
Flying time:	Airship or FFS used:
Main exercise:	
Name(s) of FIE:	Licence number:
Date and place:	Signature:

D. SAILPLANES INSTRUCTIONAL FLYING EXPERIENCE

INSTRUCTIONAL FLYING EXPERIENCE			
Instructors applying for revalidation of the FI certificate should enter the instructional hours and take-offs flown during the preceding 36 months.			
SAILPLANE (hours and take-offs)		TMG (hours and take-offs)	
DAY	NIGHT	DAY	NIGHT
Total instructional hours (preceding 36 months):			
Total instructional hours (preceding 12 months):			
Total amount of take-offs (preceding 36 months):			
Total amount of take-offs (preceding 12 months):			
FI REFRESHER SEMINAR			
1 This is to certify that the undersigned attended an FI seminar			
2 Attendee's personal particulars:			
Name(s):		Address:	
Licence number:		Expiration date of FI(S) certificate:	

3 Seminar particulars:	
Date(s) of seminar:	Place:
4 Declaration by the responsible organiser:	
I certify that the above data are correct and that the FI seminar was carried out.	
Date of approval:	Name(s) of organiser: (capital letters)
Date and place:	Signature:
5 Declaration by the attendee:	
I confirm the data under 1 through 3	
Attendee's signature:	
PROFICIENCY CHECK	
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.	
Flying time:	Sailplane or TMG used:
Main exercise:	
Name(s) of FIE:	Licence number:
Date and place:	Signature:

E. BALLOONS

INSTRUCTIONAL FLYING EXPERIENCE					
Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.					
Balloons (gas)		Balloons (hot-air)		Hot-air airships	
DAY	NIGHT	DAY	NIGHT	DAY	NIGHT
Total instructional hours (preceding 36 months):					
Total instructional hours (preceding 12 months):					
FI REFRESHER SEMINAR					
1 This is to certify that the undersigned attended an FI seminar					
2 Attendee's personal particulars:					
Name(s):			Address:		

Licence number:	Expiration date of FI(B) certificate:
3 Seminar particulars:	
Date(s) of seminar:	Place:
4 Declaration by the responsible organiser:	
I certify that the above data are correct and that the FI seminar was carried out.	
Date of approval:	Name(s) of organiser: (capital letters)
Date and place:	Signature:
5 Declaration by the attendee:	
I confirm the data under 1 through 3	
Attendee's signature:	
PROFICIENCY CHECK	
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.	
Flying time:	Balloon or hot-air airship used:
Main exercise:	
Name(s) of FIE:	Licence number:
Date and place:	Signature:

SECTION 4 – SPECIFIC REQUIREMENTS FOR THE TYPE RATING INSTRUCTOR – TRI

GM1 FCL.905.TRI(b) Privileges and conditions

INSTRUCTORS INSTRUCTING FOR THE ISSUE OF A TRI OR SFI CERTIFICATE

Training in an aeroplane is not a requirement for the issue of an SFI or a TRI certificate. In order to deliver effective UPRT, it is beneficial for the instructor to have first-hand experience of the critical psychological and physiological human factors, which might be present during recoveries from developed upsets. These human factors (effects of unusual acceleration, such as variations from normal 1G flight, the difficulty to perform counter-intuitive actions, and the management of the associated stress response) can only be experienced during training in an aeroplane because FFSs are not capable of reproducing sustained accelerations. Completion of the advanced UPRT course in accordance with FCL.745.A would provide such experience and is therefore useful for instructors providing instruction for the issue of a TRI or an SFI certificate.

GM1 FCL.910.TRI TRI Restricted privileges

(a) The restrictions of the TRI privileges are annotated on the license under 'Remarks and Restrictions' against the appropriate TRI certificate, along with the following endorsements:

(1) if the training is carried out in an FSTD: 'TRI/r' (r=restricted);

(2) if the TRI training, as specified in point FCL.910.TRI(a)(1), includes the LIFUS training: endorsement as per point (a) and 'LIFUS'; and

(3) if the landing training, as specified in point FCL.910.TRI(a)(2), is included in the TRI training course: endorsement as per point (a) and 'LT' (LT = landing training).

(b) For example a TRI restricted with LIFUS and landing training privileges will have on their license the following endorsement: 'TRI/r LIFUS LT'.

GM1 FCL.910.TRI(b)(2) TRI training for type extension

'Relevant parts of the technical training and the flight instruction parts of the applicable TRI training course' means that the training should be relevant to its purpose, taking into consideration the experience of the individual TRI on other aircraft types that are similar to the one for which the extension of TRI privileges is applied for.

AMC1 FCL.930.TRI TRI Training course

TRI TRAINING COURSE — AEROPLANES

(a) General

(1) The training course should develop safety awareness throughout by imparting knowledge, skills, and attitudes relevant to the TRI task, and should be designed to adequately train the candidate instructor in theoretical-knowledge instruction, flight instruction, and FSTD instruction to enable the candidate instructor to instruct others on an aeroplane type rating for which the candidate instructor is qualified.

(2) The TRI(A) training course should place particular emphasis on the role of the individual, human factors in the man–machine environment, and CRM.

(3) Special attention should be given to the candidate instructor's maturity and judgment including their understanding of adults, behavioural attitudes, and variable levels of learning ability. During the training course, the candidate

instructor should be made aware of their own attitude towards the importance of flight safety.

(4) For a TRI(A), the amount of time for flight training should vary depending on the complexity of the aeroplane type. A similar number of hours should be allotted to the instruction on, and practice of, both preflight and postflight briefing for each exercise.

(5) The flight instruction should ensure that the candidate instructor is able to teach the air exercises safely and efficiently and should be related to the type of aeroplane on which the candidate instructor wishes to instruct. The content of the training programme should cover training exercises applicable to the aeroplane type, which are set out in the applicable type rating training courses.

(6) Airmanship is a vital element of all flight operations. Therefore, in the following exercises, the relevant aspects of airmanship should be stressed at the appropriate times during each flight.

(7) The candidate instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

(b) Content

The training course consists of three parts:

— Part 1: teaching and learning instruction in accordance with AMC1 FCL.920;

— Part 2: technical theoretical-knowledge instruction (technical training); and

— Part 3: flight instruction.

(1) Part 1 — Teaching and learning The content of the teaching and learning part of the FI training course as described in AMC1 FCL.930.FI should be used as guidance to develop the course syllabus.

(2) Part 2 — Technical theoretical-knowledge instruction syllabus

(i) If a TRI(A) certificate for MP aeroplanes is sought, particular attention should be given to MCC. If a TRI(A) certificate for SP aeroplanes is sought, particular attention should be given to the duties in SP operations.

(ii) The technical theoretical-knowledge instruction should comprise at least 10 hours of training to refresh Part-1 theoretical topics, as necessary, and aircraft technical knowledge. It should include preparation of lesson plans and development of briefing-room instructional skills. A proportion of the allotted 10 hours could be integrated into the practical flight instruction lessons of Part 3, using expanded preflight and postflight briefing sessions. Consequently, for practical purposes, Part 2 and Part 3 could be considered complementary to each other.

(iii) The type rating theoretical syllabus should be used to develop the TRI(A)’s teaching skills in relation to the type technical course syllabus. The course instructor should deliver example lectures from the applicable type technical syllabus and the candidate instructor should prepare and deliver lectures on topics that are selected by the course instructor from the type rating course.

(3) Part 3 — Flight instruction

(i) General

(A) The course should be related to the type of aeroplane on which the applicant wishes to instruct. It should consist of at least 5 hours of flight instruction for SP aeroplanes that are operated in SP operations, and at least 10 hours for MP aeroplanes or SP-certified aeroplanes that are operated in MP operations, per candidate instructor.

(B) TEM, CRM, and the appropriate use of behavioural markers should be integrated throughout.

(C) Training courses should be developed to help the candidate instructor gain experience in the training of a variety of exercises, covering both normal and abnormal operations.

(D) The syllabus should be tailored and appropriate to the aeroplane type, and the exercises used should be more demanding for each individual student.

(E) The course should cover the whole range of instructor skills to enable the candidate instructor to plan sessions, brief, train and debrief using all relevant training techniques that are appropriate to pilot training.

(ii) Use of FSTDs

(A) The applicant for a TRI(A) certificate should be instructed in using the device and made familiar with its limitations, capabilities, and safety features, including emergency evacuation.

(B) The applicant for a TRI(A) certificate should be instructed in providing and evaluating training from the instructor station and from all pilot operating positions, including demonstrations of handling exercises.

(C) The syllabus should include engine-out handling and engine-out operations in addition to representative exercises from the type rating course.

(D) Where no FSTD exists for the type of aeroplane for which the certificate is sought, or if the FSTD is not suitable to complete all the elements of the training programme for the TRI certificate, the entire course or a part of it should be conducted in the applicable aeroplane type, and the synthetic-device elements should be replaced with appropriate exercises in the aeroplane.

The assessment of competence should be performed:

— when no FSTD exists, in the aeroplane; and

— when not all elements of the training are completed in the FSTD, in both the aeroplane and the FSTD; this combined use of aeroplane and FSTD in the assessment of competence should reflect and be similar to the combined use of aeroplane and FSTD during the training course.

(F) In general, TRI training is designed to develop the competencies of a pilot to become an instructor. From this perspective, the training may be provided in several arrangements:

— the candidate instructor is seating in either pilot seat;

— the candidate instructor is seating at the IOS; or

— the candidate instructor is observing (seating as an observer).

The combination of the above-mentioned training arrangements and the allocation of time to each one of them depends on an analysis of several elements, including but not limited to the following:

— previous experience and curriculum of each candidate (e.g. previous instructor experience, experience on aeroplane type, total flight experience, etc.) in isolation and as part of the course group(s);

— specific requirements for aeroplane type and related training exercises;

— overall maturity and experience of the ATO in providing TRI training courses; and

— type, fidelity level, and reliability of the available devices.

Subject to particular training arrangements that are determined by the ATO and approved by the competent authority, a TRI may instruct in parallel two TRI candidate instructors under the following scenarios:

— one candidate is sitting at the controls (supported by a suitable pilot), while the second candidate is sitting at the IOS; this scenario may be used for demonstration of flight manoeuvres or engine out exercises; or

— both candidates receive instruction (general introduction and handling) at the IOS.

In this way, both candidates can independently develop specific competencies.

Additional TRI candidate instructors may be present as observers during such an instruction given in parallel, with no credit of hours for their TRI training.

For an initial TRI training course, such ‘in parallel’ instruction should be given only for a reasonable part of the overall TRI training course duration. For a TRI type extension, the amount of hours required forsuch an instruction may be increased.

In any case, the way of instruction largely depends on the experience of the TRI trainer in the various training arrangements and on the general experience of the candidate instructor.

(iii) SP MET aeroplane training for asymmetric power flight

During this part of the training, particular emphasis should be placed on:

(A) the circumstances under which the actual feathering and unfeathering is practised, e.g. safe altitude, compliance with regulations regarding minimum altitude or height for feathering, weather conditions, distance from the nearest available aerodrome;

(B) the procedure that should be used for cooperation between instructor and student, e.g. the correct use of touch drills and the prevention of misunderstandings, especially during feathering and unfeathering and when zero thrust is used for asymmetric circuits; this procedure should include a positive agreement on which engine should be shut down or restarted or set at zero thrust, as well as on identifying each control and the engine it will affect;

(C) avoiding overworking the operating engine and preventing degraded performance when operating the aeroplane in asymmetric flight; and

(D) the need to use the specific checklist for the given aeroplane type.

(iv) Long briefings on SP MET aeroplanes

Long briefings provide an essential link between academic principles and air exercises. They introduce aeronautical theory and the practical application of aeronautical principles to the student.

The instructor should ensure that the candidate instructor is able to teach all the following subjects:

(A) Asymmetric power flight:

(a) introduction to asymmetric flight;

(b) feathering the propeller: method of operation;

(c) effects on aeroplane handling at cruising speed;

(d) introduction to the effects upon aeroplane performance;

(e) identification of the foot load to maintain a constant heading (no rudder trim);

(f) feathering the propeller: regaining normal flight;

(g) finding the zero-thrust setting: comparison of foot load when the propeller is feathered and thrust is set to zero;

(h) effects and recognition of engine failure in level flight;

(i) forces and effects of yaw;

(j) types of failure:

(1) sudden or gradual, and

(2) complete or partial;

(k) yaw direction and further effects of yaw;

(l) flight instrument indications;

(m) identification of failed engine;

(n) couples and residual out-of-balance forces: resultant flight attitude;

(o) use of rudder to counteract yaw;

(p) use of aileron: dangers of misuse;

(q) use of elevator to maintain level flight;

(r) use of power to maintain safe airspeed and altitude;

(s) supplementary recovery to straight and level flight: simultaneous increase in speed and reduction in power;

(t) identification of failed engine: idle engine;

(u) use of engine instruments for identification:

(1) fuel pressure or flow;

(2) RPM gauge response effect of constant speed unit (CSU) action at lower and higher airspeed; and

(3) engine temperature gauges;

(v) confirmation of identification: closing the throttle of the identified failed engine;

(w) effects and recognition of engine failure in turns;

(x) identification and control; and

(y) side forces and effects of yaw.

(B) Turning flight:

(a) effect of ‘inside’ engine failure: sudden and pronounced effect;

(b) effect of ‘outside’ engine failure: less sudden and pronounced effect;

(c) possible confusion in identification (particularly at low power):

(1) correct use of rudder; and

(2) possible need to return to lateral level flight to confirm correct identification;

(d) visual and flight instrument indications;

(e) effect of varying speed and power;

(f) speed and thrust relationship;

(g) at normal cruising speed and cruising power: engine failure clearly recognised;

(h) at low safe speed and climb power: engine failure most likely recognised; and

(i) at high-speed descent and low power: asymmetry (engine failure) possibly not recognised.

(C) Minimum control speeds:

(a) Air speed indicator (ASI) colour coding: red radial line. Note: this exercise is intended to explore the ultimate boundaries of controllability of the aeroplane aircraft in an asymmetric state in various conditions with a steady power setting. A steady power setting is achieved by using a fixed power setting and adjusting the aircraft attitude to obtain a gradual speed reduction. The failure exercise should not be performed as a sudden and complete failure at the VMCA given in the AFM. The purpose of the exercise is to continue the gradual introduction of a student to the control of an aeroplane in asymmetric power flight in extreme or critical situations, and not to demonstrate VMCA.

(b) Techniques for assessing critical speeds at wings level, and recovery from those speeds; dangers involved when minimum control speed and stalling speed are very close: use of safe single-engine speed (Vsse).

(c) Establishing a minimum control speed for each asymmetrically disposed engine: establishing the critical engine (if applicable).

(d) Effects on minimum control speeds of:

(i) bank;

(ii) zero-thrust setting; and

(iii) take-off configuration:

(A) landing gear down and take-off flap set; and

(B) landing gear up and take-off flap set.

Note: the use of 5 ° of bank towards the operating engine results in a better climb performance than that obtained with wings level held. Manufacturers may use these conditions when determining the asymmetric climb performance of the aircraft.

Thus, the VMCA quoted in the AFM may be different from the speeds that are determined during this exercise.

(D) Feathering and unfeathering:

(a) minimum heights for practising feathering and unfeathering drills; and

(b) engine-handling precautions (overheating, icing conditions, priming, warm-up, method of simulating an engine failure: refer to the aircraft engine manual, service instructions, and bulletins).

(E) Engine failure procedure:

(a) once control is maintained, the phase of operation and the aircraft type determine in which order the procedures should be followed; and

(b) the flight phase should be:

(1) in cruising flight; or

(2) a critical phase, e.g. immediately after take-off or during approach to landing or during a go-around.

(F) Aircraft type:

Variations in the order of certain drills and checks inevitably occur due to differences between aeroplane types and perhaps between models of the same aeroplane type. The AFM should be consulted to establish the exact order of the related procedures.

For example, one AFM may call for the raising of flaps and landing gear before feathering, whereas another AFM may recommend feathering as a first step. The reason for this latter procedure may be that some engines cannot be feathered if RPM drop below a certain figure.

However, in some aeroplanes, the raising of the landing gear may create more drag during retraction due to the transient position of the landing gear doors, and as a result, retraction should be avoided until feathering is completed and propeller drag reduced.

Therefore, the order in which the drills and checks are presented under immediate and subsequent actions in this syllabus should be considered as general guidance only; the exact order of precedence is determined by reference to the AFM for the specific aeroplane type used in the course.

(G) In-flight engine failure during cruising or other flight phase not including take-off or landing:

(a) immediate actions:

(1) control of the aircraft;

(2) recognition of asymmetric condition;

(3) identification and confirmation of failed engine:

(i) idle leg = idle engine; and

(ii) closing of throttle or pulling back of power lever, as appropriate, for confirmation;

(4) identification of failure cause and fire check:

(i) typical reasons for failure; and

(ii) methods of rectification; and

(5) feathering decision and procedure:

(i) reduction of other drag;

(ii) need for speed but not haste; and

(iii) use of rudder trim;

(b) subsequent actions:

(1) operating engine:

(i) temperature, pressure, and power;

(ii) remaining services;

(iii) electrical load: assess and reduce, as necessary;

(iv) effect on power source for air-driven instruments;

(v) landing gear; and (vi) flaps and other services;

(2) replanning of the flight:

(i) ATC and weather;

(ii) terrain clearance, SE cruising speed; and

(iii) decision to divert or continue;

(3) fuel management: best use of remaining fuel;

(4) dangers of restarting damaged engine;

(5) action if unable to maintain altitude: effect of altitude on available power;

(6) effects on performance;

(7) effects on available power and required power;

(8) effects on various airframe configurations and propeller settings;

(9) use of AFM:

(i) cruising;

(ii) climbing: ASI colour coding (blue line);

(iii) descending; and (iv) turning;

(10) limitations and handling of operating engine; and

(11) control and performance of take-off and approach.

(H) Significant factors:

(a) significance of take-off safety speed:

(1) effect on aeroplane performance of landing gear, flap, feathering, take-off, trim setting, and systems for operating landing gear and flaps; and

(2) effect on aeroplane performance of mass, altitude, and temperature;

(b) significance of best SE climb speed (Vyse):

(1) accelerating to Vyse and establishing a positive climb;

(2) relationship between Vyse and normal climb speed; and

(3) action, if unable to climb; and

(c) significance of asymmetric committal height and speed: action, if baulked below asymmetric committal height.

(I) Engine failure during take-off:

(a) below VMCA or unstick speed:

(1) use AFM data, if available ; and

(2) accelerate or stop distance considerations;

(b) above VMCA or unstick speed and below safety speed;

(c) immediate relanding or use of remaining power for forced landing; and

(d) considerations:

(1) degree of engine failure;

(2) speed at the time;

(3) mass, altitude, temperature performance;

(4) configuration;

(5) length of remaining runway; and

(6) position of any obstacles ahead.

(J) Engine failure after take-off:

(a) simulated at a safe height and at or above take-off safety speed;

(b) considerations:

(1) need to maintain control;

(2) use of bank technique towards operating engine;

(3) use of available power to reach Vyse;

(4) mass, altitude, temperature performance; and

(5) effect of prevailing conditions and circumstances;

(c) immediate actions:

(1) maintaining control, including airspeed and use of power;

(2) recognition of asymmetric condition;

(3) identification and confirmation of failed engine;

(4) feathering and removal of drag (procedure for specific type); and

(5) reaching and maintaining Vyse; and

(d) subsequent actions, whilst carrying out an asymmetric power climb to the downwind position at Vyse:

(1) identification of failure and fire check;

(2) handling considerations for operating engine;

(3) remaining services;

(4) liaison with ATC; and

(5) fuel management.

Note: these procedures are dependent upon the aeroplane type concerned and actual flight situation.

(K) Asymmetric committal height

(a) Asymmetric committal height is the minimum height needed to put the aircraft into a positive climb, whilst maintaining an adequate speed to control the aircraft and reduce drag during an approach to landing.

(b) Due to the significantly reduced performance of many CS-23 aeroplanes when operating with one engine, a minimum height should be considered from which it would be safe to attempt a go-around procedure during an approach when the aeroplane must change from descent to climb in a high-drag configuration.

(c) Due to the height loss that occurs when the operating engine is turned to full power, with landing gear and flap retracted, and the aeroplane is put into a climb at Vyse, a minimum height (often referred to as 'asymmetric committal height') should be selected below which the pilot should not attempt to fly another circuit. This height should be compatible with the aeroplane type, all-up weight, altitude of the aerodrome used, air temperature, wind, height of obstructions along the climb-out path, and the pilot's competence.

(d) Circuit approach and landing with asymmetric power:

(1) definition and use of asymmetric committal height;

(2) use of standard pattern and normal procedures;

(3) action, if unable to maintain circuit height;

(4) speed and power settings required; and

(5) decision to land or execute a go-around at asymmetric committal height: factors to be considered.

(e) Undershooting: importance of maintaining an appropriate airspeed.

(L) Speed and heading control:

(a) relationship between height, speed, and power: need for minimum possible drag; and

(b) reaching a positive climb at Vyse:

(1) effect of availability of systems, and power for the flap and landing gear; and

(2) operation and rapid clean-up.

Note 1: the airspeed at which the decision is made to make a landing or execute a go-around should normally be Vyse and not lower than the safety speed.

Note 2: instrument approach 'decision height' and its associated procedures should not be confused with the selection of minimum height for initiating a go-around in asymmetric power flight.

(M) Engine failure during an all-engine approach or missed approach:

(a) use of asymmetric committal height, and speed considerations; and

(b) speed and heading control: decision to attempt a landing, go-around or forced landing depending on circumstances. Note: at least one demonstration and practice of engine failure in this situation should be performed during the course.

(N) Instrument flying with asymmetric power:

(a) considerations relating to aircraft performance during:

(1) straight and level flight;

(2) climb and descent;

(3) standard rate turns; and

(4) level, climbing, and descending turns including turns to preselected headings;

(b) availability of vacuum-operated instruments; and

(c) electrical power source.

(v) Specific trainings: LIFUS training and landing training

The applicant for a TRI(A) certificate should receive instruction in an FSTD in accordance with FCL.930.TRI(a)(4).

(A) LIFUS training: content

(a) Training in an FSTD:

(1) familiarisation as PF on both seats, as applicable, which should include at least the following:

(i) pre-flight preparation and use of checklists;

(ii) taxiing;

(iii) take-off;

(iv) rejected take-off;

(v) engine failure during take-off, after take-off decision speed (V1);

(vi) one-engine-inoperative approach and go-around;

(vii) one-engine-inoperative (critical, simulated) landing;

(viii) other emergency and abnormal operating procedures (as necessary);

(ix) emergency evacuations; and

(x) task sharing and decision-making; and

(2) aeroplane training techniques:

(i) methods of providing appropriate commentary; and

(ii) intervention strategies developed from situations that are role-played by a TRI training course instructor, taken from but not limited to:

(A) take-off:

— tail strike awareness and avoidance,

— rejected take-off,

— actual engine failure,

— take-off configuration warning, and

— overcontrolling;

(B) approach and landing:

— normal approach,

— high flare, long float, no flare,

— immediate go-around after touchdown,

— baulked landing,

— rejected landing,

— crosswind, and

— overcontrolling; and

(C) flight management:

— task sharing and handover of controls,

— effect of ATC-delaying actions on endurance,

— alternate management and diversion, and

— traffic awareness when flying in pattern.

(b) Training in aeroplane (in flight)

This training should consist of at least one route sector where the candidate instructor:

(1) either observes a TRI(A) who conducts line flying under supervision, or

(2) conducts role play line flying under supervision for a TRI(A) who is qualified for line flying under supervision.

Upon completion of the above-mentioned training, the candidate instructor should complete a route sector under the supervision and to the satisfaction of a TRI(A) who is nominated for that purpose by the ATO.

(B) Landing training: content

(a) Training in an FSTD

The training in an FSTD should be tailored and appropriate to the aeroplane type, and the exercises should be more demanding for each candidate instructor. In addition to the LIFUS training items in the FSTD (listed under (a)(1) and (a)(2) above), the landing training should comprise a variety of exercises that cover both normal and abnormal operations including the following:

(1) consideration of threats during touch-and-go:

— operating at low altitude;

— General Aviation (GA) traffic;

— increased fuel consumption;

— bird strikes;

— decision to continue touch-and-go or make a full-stop landing; and

— aspects of performance and associated risks;

(2) incorrect rudder inputs;

(3) failure of a critical engine;

(4) approach and full-stop landing in simulated engine-out flight; and

(5) go-around in simulated engine-out flight. The applicant needs to be additionally trained in other abnormal items during the training course, if required.

(b) Training in an aeroplane

(1) Upon completion of the FSTD training, the applicant should perform role-play flying for landing training under the supervision and to the satisfaction of a TRI(A) who is nominated for that purpose by the ATO.

The training should cover at least the following elements:

— take-off,

— traffic pattern,

— touch-and-go,

— go-around, and

— full-stop landing with different flap settings.

(2) In exceptional circumstances, it may be necessary to perform simulated engine-out handling and engine-out operations in an aeroplane in addition to representative exercises from the type rating course.

(vi) UPRT

Instructors should have the specific competence to provide UPRT during the type rating training course, including the ability to demonstrate knowledge and understanding of the type-specific upset recovery procedures and of the recommendations that are developed by the original equipment manufacturers (OEMs). Therefore, during the TRI training course, the student instructor should:

(A) be able to apply the correct upset recovery techniques for the specific aeroplane type;

(B) understand the importance of applying type-specific OEM procedures for recovery manoeuvres;

(C) be able to distinguish between the applicable SOPs and OEM recommendations (if available);

(D) understand the capabilities and limitations of the FSTDs that are used for UPRT;

(E) ensure that the training remains within the FSTD training envelope to avoid the risk of negative transfer of training;

(F) understand and be able to use the IOS of the FSTD in the context of providing effective UPRT;

(G) understand and be able to use the available FSTD instructor tools to provide accurate feedback on pilot performance;

(H) understand the importance of adhering to the FSTD UPRT scenarios that are validated by the training programme developer; and

(I) understand the missing critical human factor aspects due to the limitations of the FSTD, and convey this to the student pilot(s) receiving the training.

AMC2 FCL.930.TRI TRI Training course

HELICOPTERS

GENERAL

(a) The aim of the TRI(H) course is to train helicopter licence holders to the level of competence defined in FCL.920 and adequate for a TRI.

(b) The training course should develop safety awareness throughout by teaching the knowledge, skills and attitudes relevant to the TRI(H) task, and should be designed to give adequate training to the applicant in theoretical knowledge instruction, flight instruction and FSTD instruction to instruct for a helicopter type rating for which the applicant is qualified.

(c) The TRI(H) training course should give particular emphasis to the role of the individual in relation to the importance of human factors in the man-machine environment and the role of CRM.

(d) Special attention should be given to the applicant's maturity and judgment including an understanding of adults, their behavioural attitudes and variable levels of learning ability. During the training course the applicants should be made aware of their own attitudes to the importance of flight safety. It will be important during the course of training to aim at giving the applicant the knowledge, skills and attitudes relevant to the role of the TRI.

(e) For a TRI(H) certificate the amount of flight training will vary depending on the complexity of the helicopter type.

(f) A similar number of hours should be used for the instruction and practice of pre-flight and post flight briefing for each exercise. The flight instruction should aim to ensure that the applicant is able to teach the air exercises safely and efficiently and should be related to the type of helicopter on which the applicant wishes to instruct. The content of the training program should cover training exercises applicable to the helicopter type as set out in the applicable type rating course syllabus.

(g) A TRI(H) may instruct in a TRI(H) course once he or she has conducted a minimum of four type rating instruction courses.

CONTENT

(h) The training course consists of three parts:

(1) Part 1: teaching and learning, that should comply with AMC1 FCL.920;

(2) Part 2: technical theoretical knowledge instruction (technical training);

(3) Part 3: flight instruction.

Part 1

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

Part 2

TECHNICAL THEORETICAL KNOWLEDGE INSTRUCTION SYLLABUS

(a) The technical theoretical knowledge instruction should comprise of not less than 10 hours training to include the revision of technical knowledge, the preparation of lesson plans and the development of classroom instructional skills to enable the TRI(H) to instruct the technical theoretical knowledge syllabus.

(b) If a TRI(H) certificate for MP helicopters is sought, particular attention should be given to multi-crew cooperation.

(c) The type rating theoretical syllabus should be used to develop the TRI(H)'s teaching skills in relation to the type technical course syllabus. The course instructor should deliver example lectures from the applicable type technical syllabus and the candidate instructor should prepare and deliver lectures on topics selected by the course instructor from the subject list below:

(1) helicopter structure, transmissions, rotor and equipment, normal and abnormal operation of systems:

(i) dimensions;

(ii) engine including aux. power unit, rotors and transmissions;

(iii) fuel system;

(iv) air-conditioning;

(v) ice protection, windshield wipers and rain repellent;

(vi) hydraulic system;

(vii) landing gear;

(viii) flight controls, stability augmentation and autopilot systems;

(ix) electrical power supply;

(x) flight instruments, communication, radar and navigation equipment;

(xi) cockpit, cabin and cargo compartment;

(xii) emergency equipment.

(2) limitations:

(i) general limitations, according to the helicopter flight manual;

(ii) minimum equipment list.

(3) performance, flight planning and monitoring:

(i) performance;

(ii) light planning.

(4) load and balance and servicing:

(i) load and balance;

(ii) servicing on ground;

(5) emergency procedures;

(6) special requirements for helicopters with EFIS;

(7) optional equipment.

Part 3

FLIGHT INSTRUCTION SYLLABUS

(a) The amount of flight training will vary depending on the complexity of the helicopter type. At least 5 hours flight instruction for a SP helicopter and at least 10 hours for a MP ME helicopter should be counted. A similar number of hours should be used for the instruction and practice of pre-flight and post flight briefing for each exercise. The flight instruction should aim to ensure that the applicant is able to teach the air exercises safely and efficiently and related to the type of helicopter on which the applicant wishes to instruct. The content of the training programme should only cover training exercises applicable to the helicopter type as set out in Appendix 9 to Part-FCL.

(b) If a TRI(H) certificate for MP helicopters is sought, particular attention should be given to MCC.

(c) If a TRI(H) certificate for revalidation of instrument ratings is sought, then the applicant should hold a valid instrument rating.

FLIGHT OR FSTD TRAINING

(d) The training course should be related to the type of helicopter on which the applicant wishes to instruct.

(e) For MP helicopter type ratings MCC, CRM and the appropriate use of behavioural markers should be integrated throughout.

(f) The content of the training programme should cover identified and significant exercises applicable to the helicopter type.

FSTD TRAINING

(g) The applicant for a TRI(H) certificate should be taught and made familiar with the device, its limitations, capabilities and safety features, and the instructor station.

(h) The applicant for a TRI(H) certificate should be taught and made familiar with giving instruction from the instructor station seat as well as the pilot's seats, including demonstrations of appropriate handling exercises.

(i) Training courses should be developed to give the applicant experience in training a variety of exercises, covering both normal and abnormal operations. The syllabus should be tailored appropriate to the helicopter type, using exercises considered more demanding for the student. This should include engine-out handling and engine-out operations in addition to representative exercises from the type transition course.

(j) The applicant should be required to plan, brief, train and debrief sessions using all relevant training techniques.

HELICOPTER TRAINING

(k) The applicant for a TRI(H) certificate should receive instruction in an FSTD to a satisfactory level in:

(1) left hand seat familiarisation, and in addition right hand seat familiarisation where instruction is to be given to co-pilots operating in the left hand seat, which should include at least the following as pilot flying:

(i) pre-flight preparation and use of checklists;

(ii) taxiing: ground and air;

(iii) take-off and landings;

(iv) engine failure during take-off, before DPATO;

(v) engine failure during take-off, after DPATO;

(vi) engine inoperative approach and go-around;

(vii) one engine simulated inoperative landing;

(viii) autorotation to landing or power recovery;

(ix) other emergency and abnormal operating procedures (as necessary);

(x) instrument departure, approach and go-around with one engine simulated inoperative should be covered where TRI(H) privileges include giving instrument instruction for the extension of an IR(H) to additional types.

(2) helicopter training techniques:

(i) methods for giving appropriate commentary;

(ii) instructor demonstrations of critical manoeuvres with commentary;

(iii) particularities and safety considerations associated with handling the helicopter in critical manoeuvres such as one-engine-inoperative and autorotation exercises;

(iv) where relevant, the conduct of instrument training with particular emphasis on weather restrictions, dangers of icing and limitations on the conduct of critical manoeuvres in instrument meteorological conditions;

(v) intervention strategies developed from situations role-played by a TRI(H) course instructor, taken from but not limited to:

(A) incorrect helicopter configuration;

(B) over controlling;

(C) incorrect control inputs;

(D) excessive flare close to the ground;

(E) one-engine-inoperative take-off and landings;

(F) incorrect handling of autorotation;

(G) static or dynamic rollover on take-off or landing;

(H) too high on approach with associated danger of vortex ring or settling with power;

(I) incapacitation;

(L) abnormal and emergency procedures and appropriate methods and minimum altitudes for simulating failures in the helicopter;

(M) failure of the driving engine during OEI manoeuvres.

(l) Upon successful completion of the training above, the applicant should receive sufficient training in an helicopter in-flight under the supervision of a TRI(H) to a level where the applicant is able to conduct the critical items of the type rating course to a safe standard. Of the minimum course requirements of 5 hours flight training for a SP helicopter or 10 hours for a MP helicopter, up to 3 hours of this may be conducted in an FSTD.

TRAINING WHERE NO FSTD EXISTS

(m) Where no FSTD exists for the type for which the TRI(H) certificate is sought, a similar course of training should be conducted in the applicable helicopter type. This includes all elements listed under sub paragraphs (k)(1) and (2) of this AMC, the FSTD elements being replaced with appropriate exercises in a helicopter of the applicable type, subject to any restrictions placed on the conduct of critical exercises associated with helicopter flight manual limitations and safety considerations.

AMC1 FCL.940.TRI(a)(1)(ii), (a)(2)(ii), (b)(1)(ii), (b)(2)(ii); FCL.940.SFI(a)(2), (e)(1)

(a) The refresher training for revalidation of the TRI and SFI certificates should be provided as a seminar. The seminar should consist of 6 hours of learning and may be held in the form of either one or more of the following: e-learning, two-way online meetings, face-to-face seminars. The content of the refresher seminar for revalidation should be selected from the following items:

(1) relevant changes to national regulations;

(2) the role of the instructor;

(3) teaching and learning styles;

(4) observational skills;

(5) instructional techniques;

(6) briefing and debriefing skills;

(7) TEM;

(8) human performance and limitations;

(9) flight safety, prevention of incidents and accidents, including those specific to the ATO;

(10) significant changes in the content of the relevant part of the aviation system;

(11) legal aspects and enforcement procedures;

(12) developments in competency-based instruction;

(13) report writing; and

(14) any additional topics proposed by the CAA.

(b) For the refresher training for renewal of the TRI and SFI certificates:

(1) the ATO should determine on a case-by-case basis the amount of refresher training needed, through an assessment of the candidate, taking into account the following factors:

(i) the experience of the applicant;

(ii) the amount of time elapsed since the expiry of the TRI or SFI certificate; and

(iii) the technical elements of the TRI or SFI training course, as determined by the assessment of the candidate by the ATO;

(2) the ATO should also consider the elements defined in point (a) above to determine the refresher training needed; and

(3) once the ATO has determined the needs of the applicant, it should develop an individual training programme that should be based on the content of the TRI or SFI training course and focus on the aspects where the applicant has the greatest needs.

(c) After successful completion of the seminar or refresher training, as applicable, the ATO should:

(1) in case of a seminar, in accordance with point (a), issue the applicant with a seminar completion certificate or another document specified by the CAA, which describes the content of the seminar as in point (a), as well as a statement that the seminar was successfully completed; and

(2) in case of refresher training, in accordance with point (b), issue the applicant with a training completion certificate or another document specified by the CAA, which describes the evaluation of the factors listed in point (b)(1) and the training received, as well as a statement that the training was successfully completed; the training completion certificate should be presented to the examiner prior to the assessment of competence.

(d) Upon successful completion of the seminar or refresher training, as applicable, the ATO should submit the seminar or training completion certificate, or the other document specified by the CAA, to the CAA.

SECTION 5 – SPECIFIC REQUIREMENTS FOR THE CLASS RATING INSTRUCTOR – CRI

AMC1 FCL.930.CRI CRI Training course

GENERAL

(a) The aim of the CRI training course is to train aircraft licence holders to the level of competence defined in FCL.920 and adequate to a CRI.

(b) The training course should be designed to give adequate training to the applicant in theoretical knowledge instruction, flight instruction and FSTD instruction to instruct for any class or type rating, except for single-pilot high-performance complex aeroplanes, for which the applicant is qualified.

(c) The flight training should be aimed at ensuring that the applicant is able to teach the air exercises safely and efficiently to students undergoing a course of training for the issue of a class or type rating, except for single-pilot high-performance complex aeroplanes.

(d) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.

(e) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

CONTENT

(f) The training course consists of three parts:

(1) Part 1: teaching and learning that should be in accordance with AMC1 FCL.920;

(2) Part 2: technical theoretical knowledge instruction (technical training);

(3) Part 3: flight instruction.

Part 1

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

Part 2

(a) The technical theoretical-knowledge instruction should comprise at least 10 hours of training to include the revision of technical knowledge, preparation of lesson plans, and development of classroom instructional skills to enable the CRI to teach the technical theoretical-knowledge syllabus.

(b) The type or class rating theoretical syllabus should be used to develop the CRI teaching skills in relation to the type or class technical course syllabus. The course instructor should deliver example lectures from the applicable type or class technical syllabus. The candidate instructor should prepare and deliver lectures on topics that are selected by the course instructor from the type/class rating course and the generic topics listed further below.

(c) The 10 hours of technical theoretical-knowledge instruction should develop the applicant's ability to teach a student the knowledge and understanding that are required for the relevant air exercises for either SE or ME aeroplanes, depending on the privileges sought by the candidate.

(d) If CRI privileges for both SE and ME aeroplanes are sought, the applicant should complete 10 hours of technical theoretical-knowledge instruction related to SE and ME aeroplanes each.

(e) This following syllabus of general subjects concerns training only on ME aeroplanes.

GENERAL SUBJECTS

(a) Air legislation:

- (1) aeroplane performance group definitions;
- (2) methods of factoring gross performance.

(b) Asymmetric power flight;

(c) Principles of flight;

(d) The problems:

- (1) asymmetry;
- (2) control;
- (3) performance;

(e) The forces and couples:

- (1) offset thrust line;
- (2) asymmetric blade effect;
- (3) offset drag line;
- (4) failed engine propeller drag;
- (5) total drag increase;
- (6) asymmetry of lift;
- (7) uneven propeller slipstream effect;
- (8) effect of yaw in level and turning flight;
- (9) thrust and rudder side force couples;
- (10) effect on moment arms.

(f) Control in asymmetric power flight:

- (1) use, misuse and limits of:
  - (i) rudder;
  - (ii) aileron;
  - (iii) elevators.
- (2) effect of bank or sideslip and balance;
- (3) decrease of aileron and rudder effectiveness;
- (4) fin stall possibility;
- (5) effect of IAS and thrust relationship;

(6) effect of residual unbalanced forces;

(7) foot loads and trimming.

(g) Minimum control and safety speeds:

(1) minimum control speed (v_{mc});

(2) definition;

(3) origin;

(4) factors affecting (v_{mc}):

(i) thrust;

(ii) mass and centre of gravity position;

(iii) altitude;

(iv) landing gear;

(v) flaps;

(vi) cowl flaps or cooling gills;

(vii) turbulence or gusts;

(viii) pilot reaction or competence;

(ix) banking towards the operating engine;

(x) drag;

(xi) feathering;

(xii) critical engine.

(5) take-off safety speed;

(6) definition or origin of $v_{2;}$

(7) other relevant v codes;

(h) Aeroplane performance: one engine inoperative:

(1) effect on excess power available;

(2) SE ceiling;

(3) cruising, range and endurance;

(4) acceleration and deceleration;

(5) zero thrust, definition and purpose;

(i) Propellers:

(1) variable pitch: general principles;

(2) feathering and un-feathering mechanism and limitations (for example minimum RPM);

(j) Specific aeroplane type;

(k) Aeroplane and engine systems:

(1) operation normal;

(2) operation abnormal;

(3) emergency procedures.

(l) Limitations: airframe:

(1) load factors;

(2) landing gear and flap limiting speeds (v_{lo} and v_{fe});

(3) rough air speed (v_{ra});

(4) maximum speeds (v_{no} and v_{ne}).

(m) Limitations: engine:

(1) RPM and manifold pressure;

(2) oil temperature and pressure;

(3) emergency procedures.

(n) Mass and balance:

(to be covered in conjunction with the flight manual or equivalent document (for example owner's manual or pilot's operating handbook))

(1) mass and balance documentation for aeroplane type;

(2) revision of basic principles;

(3) calculations for specific aeroplane type.

(o) Mass and performance:

(to be covered in conjunction with the flight manual or equivalent document (for example owner's manual or pilot's operating handbook))

(1) calculations for specific aeroplane type (all engines operating);

(2) take-off run;

(3) take-off distance;

(4) accelerate and stop distance;

(5) landing distance;

(6) landing run;

(7) take-off or climb out flight path;

(8) calculations for specific aeroplane type (one engine operating);

(9) climb out flight path;

(10) landing distance;

(11) landing run.

Part 3

FLIGHT INSTRUCTION SYLLABUS: NORMAL FLIGHT

(a) This part is similar to the air exercise sections of the SE FI course, including 'Introduction to instrument flying' except that the objectives, airmanship considerations and common errors are related to the operation of an ME aeroplane.

(b) The purpose of this part is to acquaint the applicant with the teaching aspects of the operational procedures and handling of an ME aeroplane with all engines functioning.

(c) The following items should be covered:

- (1) aeroplane familiarisation;
- (2) pre-flight preparation and aeroplane inspection;
- (3) engine starting procedures;
- (4) taxiing;
- (5) pre take-off procedures;
- (6) the take-off and initial climb:
  - (i) into wind;
  - (ii) crosswind;
  - (iii) short field.
- (7) climbing;
- (8) straight and level flight;
- (9) descending (including emergency descent procedures);
- (10) turning;
- (11) slow flight;
- (12) stalling and recoveries;
- (13) instrument flight: basic;
- (14) emergency drills (not including engine failure);
- (15) circuit, approach and landing:
  - (i) into wind;
  - (ii) croswind;
  - (iii) short field;
- (16) mislanding and going round again;
- (17) actions after flight.

AIR EXERCISES

(d) The syllabus for CRI SE and ME training courses should comprise air exercises 1 to 4 and should not last less than 3 hours. In addition, the syllabus for a CRI ME training course should also include air exercise 5 to address asymmetric power flight and should not last less than 2 hours.

EXERCISE 1: FAMILIARISATION WITH THE AEROPLANE

(a) Long briefing objectives:

(1) introduction to the aeroplane;

(2) explanation of the cockpit layout;

(3) systems and controls;

(4) aeroplane power plant;

(5) checklists and drills;

(6) differences when occupying the instructor’s seat;

(7) emergency drills:

(i) action in event of fire in the air and on the ground;

(ii) escape drills: location of exits and use of emergency equipment (for example fire extinguishers, etc.).

(8) pre-flight preparation and aeroplane inspection:

(i) aeroplane documentation;

(ii) external checks;

(iii) internal checks;

(iv) harness, seat or rudder pedal adjustment;

(9) engine starting procedures:

(i) use of checklists;

(ii) checks before starting;

(iii) checks after starting.

(b) Air exercise:

(1) external features;

(2) cockpit layout;

(3) aeroplane systems;

(4) checklists and drills;

(5) action if fire in the air and on the ground;

(i) engine;

(ii) cabin;

(iii) electrical.

(6) systems failure (as applicable to type);

(7) escape drills (location and use of emergency equipment and exits);

(8) preparation for and action after flight:

(i) flight authorisation and aeroplane acceptance;

(ii) technical log or certificate of maintenance release;

(iii) mass and balance and performance considerations;

(iv) external checks;

(v) internal checks, adjustment of harness or rudder pedals;

(vi) starting and warming up engines;

(vii) checks after starting;

(viii) radio navigation and communication checks;

(ix) altimeter checks and setting procedures;

(x) power checks;

(xi) running down and switching off engines;

(xii) completion of authorisation sheet and aeroplane serviceability documents.

EXERCISE 2: TAXIING

(a) Long briefing objectives:

(1) pre-taxiing area precautions (greater mass: greater inertia);

(2) effect of differential power;

(3) precautions on narrow taxiways;

(4) pre take-off procedures:

(i) use of checklist;

(ii) engine power checks;

(iii) pre take-off checks;

(iv) instructor's briefing to cover the procedure to be followed should an emergency occur during take-off, for example engine failure.

(5) the take-off and initial climb:

(i) ATC considerations;

(ii) factors affecting the length of the take-off run or distance;

(iii) correct lift-off speed;

(iv) importance of safety speed;

(v) crosswind take-off, considerations and procedures;

(vi) short field take-off, considerations and procedures;

(vii) engine handling after take-off: throttle, pitch and engine synchronisation.

(6) climbing:

(i) pre-climbing checks;

(ii) engine considerations (use of throttle or pitch controls);

(iii) maximum rate of climb speed;

(iv) maximum angle of climb speed;

(v) synchronising the engines.

(b) Air exercise

(1) pre-taxing checks;

(2) starting, control of speed and stopping;

(3) control of direction and turning;

(4) turning in confined spaces;

(5) leaving the parking area;

(6) freedom of rudder movement (importance of pilot ability to use full rudder travel);

(7) instrument checks;

(8) emergencies (brake or steering failure);

(9) pre take-off procedures:

(i) use of checklist;

(ii) engine power and system checks;

(iii) pre take-off checks;

(iv) instructor’s briefing if emergencies during take-off.

(10) the take-off and initial climb:

(i) ATC considerations;

(ii) directional control and use of power;

(iii) lift-off speed;

(iv) crosswind effects and procedure;

(v) short field take-off and procedure.

(vi) procedures after take-off (at an appropriate stage of the course):

(A) landing gear retraction;

(B) flap retraction (as applicable);

(C) selection of manifold pressure and RPM;

(D) engine synchronisation;

(E) other procedures (as applicable).

(11) climbing:

(i) pre-climbing checks;

(ii) power selection for normal and maximum rate climb;

(iii) engine and RPM limitations;

(iv) effect of altitude on manifold pressure, full throttle;

(v) levelling off: power selection;

(vi) climbing with flaps down;

(vii) recovery to normal climb;

(viii) en-route climb (cruise climb);

(ix) maximum angle of climb;

(x) altimeter setting procedures;

(xi) prolonged climb and use of cowl flaps or cooling gills;

(xii) instrument appreciation.

EXERCISE 3: STRAIGHT AND LEVEL FLIGHT

(a) Long briefing objectives:

(1) selection of power: throttle or pitch controls;

(2) engine synchronisation;

(3) fuel consumption aspects;

(4) use of trimming controls: elevator and rudder (aileron as applicable);

(5) operation of flaps:

(i) effect on pitch attitude;

(ii) effect on air speed.

(6) operation of landing gear:

(i) effect on pitch attitude;

(ii) effect on air speed.

(7) use of mixture controls;

(8) use of alternate air or carburettor heat controls;

(9) operation of cowl flaps or cooling gills;

(10) use of cabin ventilation and heating systems;

(11) operation and use of the other systems (as applicable to type);

(12) descending:

(i) pre-descent checks;

(ii) normal descent;

(iii) selection of throttle or pitch controls;

(iv) engine cooling considerations;

(v) emergency descent procedure.

(13) turning:

(i) medium turns;

(ii) climbing and descending turns;

(iii) steep turns (45 ° of bank or more).

(b) Air exercise:

(1) at normal cruising power:

(i) selection of cruise power;

(ii) manifold pressure or RPM;

(iii) engine synchronisation;

(iv) use of trimming controls;

(v) performance considerations: range or endurance.

(2) instrument appreciation;

(3) operation of flaps (in stages):

(i) air speed below v_{fe};

(ii) effect on pitch attitude;

(iii) effect on air speed.

(4) operation of landing gear:

(i) air speed below v_{lo} / v_{le};

(ii) effect on pitch attitude;

(iii) effect on air speed.

(5) use of mixture controls;

(6) use of alternate air or carburettor control;

(7) operation of cowl flaps or cooling gills;

(8) operation of cabin ventilation or heating systems;

(9) operation and use of other systems (as applicable to type);

(10) descending;

(i) pre-descent checks;

(ii) power selection: manifold pressure or RPM;

(iii) powered descent (cruise descent);

(iv) engine cooling considerations: use of cowl flaps or cooling gills;

(v) levelling off;

(vi) descending with flaps down;

(vii) descending with landing gear down;

(viii) altimeter setting procedure;

(ix) instrument appreciation;

(x) emergency descent:

(A) as applicable to type;

(B) limitations in turbulence v_{no}.

(11) turning:

(i) medium turns;

(ii) climbing and descending turns;

(iii) steep turns: 45 ° of ban;

(iv) instrument appreciation.

EXERCISE 4: SLOW FLIGHT

(a) Long briefing objectives:

(1) aeroplane handling characteristics during slow flight: flight at v_{s1} and v_{so} +5 knots;

(2) simulated go-around from slow flight:

(i) at V_{sse} with flaps down;

(ii) note pitch trim change.

(3) stalling:

(i) power selection;

(ii) symptoms approaching the stall;

(iii) full stall characteristics;

(iv) recovery from the full stall;

(v) recovery at the incipient stall;

(vi) stalling and recovery in the landing configuration;

(vii) recovery at the incipient stage in the landing configuration.

(4) instrument flight (basic):

(i) straight and level;

(ii) climbing;

(iii) turning;

(iv) descending.

(5) emergency drills (not including engine failure), as applicable to type;

(6) circuit approach and landing:

(i) downwind leg:

(A) air speed below v_{fe};

(B) use of flaps (as applicable);

(C) pre-landing checks;

(D) position to turn onto base leg.

(ii) base leg:

(A) selection of power (throttle or pitch), flaps and trimming controls;

(B) maintenance of correct air speed.

(iii) final approach:

(A) power adjustments (early reaction to undershooting);

(B) use of additional flaps (as required);

(C) confirmation of landing gear down;

(D) selection ‘touch down’ point;

(E) air speed reduction to V_{at};

(F) maintenance of approach path.

(iv) landing:

(A) greater sink rate;

(B) longer landing distance and run;

(C) crosswind approach and landing;

(D) crosswind considerations;

(E) short field approach and landing;

(F) short field procedure: considerations.

(b) Air exercise

(1) safety checks;

(2) setting up and maintaining (flaps up);

(i) v_{s1} + 5 knots;

(ii) note aeroplane handling characteristics.

(3) setting up and maintaining (flaps down):

(i) v_{so} + 5 knots;

(ii) note aeroplane handling characteristics.

(4) simulated go-around from a slow flight with flaps:

(i) down and air speed not below V_{sse}, for example air speed at V_{sse} or v_{mca} + 10 knots;

(ii) increase to full power and enter a climb;

(iii) note pitch change.

(5) resume normal flight.

(6) stalling;

(i) selection of RPM;

(ii) stall symptoms;

(iii) full stall characteristics;

(iv) recovery from the full stall: care in application of power;

(v) recovery at the incipient stage;

(vi) stalling and recovery in landing configuration;

(vii) stall recovery at the incipient stage in the landing configuration.

(7) instrument flight (basic):

(i) straight and level;

(ii) climbing;

(iii) turning;

(iv) descending.

(8) emergency drills (not including engine failure), as applicable to type;

(9) circuit, approach and landing:

(i) downwind leg:

(A) control of speed (below v_{fe});

(B) flaps as applicable;

(C) pre-landing checks;

(D) control of speed and height;

(E) base leg turn.

(ii) base leg:

(A) power selection;

(B) use of flap and trimming controls;

(C) maintenance of correct air speed.

(iii) final approach:

(A) use of additional flap (as required);

(B) confirmation of landing gear down;

(C) selection of touchdown point;

(D) air speed reduction to V_{at};

(E) maintaining correct approach path: use of power.

(iv) landing:

(A) control of sink rate during flare;

(B) crosswind considerations;

(C) longer landing roll;

(D) short or soft field approach and landing;

(E) considerations and precautions.

(10) Asymmetric power flight.

During this part, special emphasis is to be placed on the:

(i) circumstances in which actual feathering and un-feathering practice will be done, for example safe altitude; compliance with regulations about minimum altitude or height for feathering practice, weather conditions, distance from nearest available aerodrome;

(ii) procedure to use for instructor and student co-operation, for example the correct use of touch drills and the prevention of misunderstandings, especially during feathering and unfeathering practice and when zero thrust is being used for asymmetric circuits. This procedure is to include positive agreement as to which engine is being shut down or re-started or set at zero thrust and identifying each control and naming the engine it is going to affect;

(iii) consideration to be given to avoid over-working the operating engine, and the degraded performance when operating the aeroplane during asymmetric flight;

(iv) need to use the specific checklist for the aeroplane type.

EXERCISE 5: FLIGHT ON ASYMMETRIC POWER

(a) Long briefing objectives:

(1) introduction to asymmetric flight:

(2) feathering the propeller: method of operation;

(3) effects on aeroplane handling at cruising speed;

(4) introduction to effects upon aeroplane performance;

(5) note foot load to maintain a constant heading (no rudder trim);

(6) un-feathering the propeller;

(7) return to normal flight finding the zero thrust setting;

(8) comparison of foot load when feathered and with zero thrust set.

(9) effects and recognition of engine failure in level flight;

(10) forces and the effects of yaw;

(11) types of failure:

   (i) sudden or gradual;

   (ii) complete or partial.

(12) yaw, direction and further effects of yaw;

(13) flight instrument indications;

(14) identification of failed engine;

(15) the couples and residual out of balance forces: resultant flight attitude;

(16) use of rudder to counteract yaw;

(17) use of aileron: dangers of misuse;

(18) use of elevator to maintain level flight;

(19) use of power to maintain a safe air speed and altitude;

(20) supplementary recovery to straight and level flight: simultaneous increase of speed and reduction in power;

(21) identification of failed engine: idle leg = idle engine;

(22) use of engine instruments for identification:

   (i) fuel pressure or flow;

   (ii) RPM gauge response effect of CSU action at lower and higher air speed;

   (iii) engine temperature gauges.

(23) confirmation of identification: close the throttle of identified failed engine;

(24) effects and recognition of engine failure in turns;

(25) identification and control;

(26) side forces and effects of yaw.

(27) During turning flight:

(i) effect of 'inside' engine failure: effect sudden and pronounced;

(ii) effect of 'outside' engine failure: effect less sudden and pronounced;

(iii) the possibility of confusion in identification (particularly at low power):

(A) correct use of rudder;

(B) possible need to return to lateral level flight to confirm correct identification.

(iv) visual and flight instrument indications;

(v) effect of varying speed and power;

(vi) speed and thrust relationship;

(vii) at normal cruising speed and cruising power: engine failure clearly recognised;

(viii) at low safe speed and climb power: engine failure most positively recognised;

(ix) high speed descent and low power: possible failure to notice asymmetry (engine failure).

(28) Minimum control speeds:

(i) ASI colour coding: red radial line.

Note: this exercise is concerned with the ultimate boundaries of controllability in various conditions that a student can reach in a steady asymmetric power state, approached by a gradual speed reduction. Sudden and complete failure should not be given at the Flight Manual v_{mca}. The purpose of the exercise is to continue the gradual introduction of a student to control an aeroplane in asymmetric power flight during extreme or critical situations. It is not a demonstration of v_{mca}.

(ii) Techniques for assessing critical speeds with wings level and recovery: dangers involved when minimum control speed and the stalling speed are very close: use of $V_{sse;}$

(iii) Establish a minimum control speed for each asymmetrically disposed engine to establish critical engine (if applicable);

(iv) Effects on minimum control speeds of:

(A) bank;

(B) zero thrust setting;

(C) take-off configuration:

(a) landing gear down and take-off flap set;

(b) landing gear up and take-off flap set.

Note: it is important to appreciate that the use of 5 ° of bank towards the operating engine produces a lower v_{mca} and also a better performance than that obtained with the wings held level. It is now normal for manufacturers to use 5 ° of bank in this manner when determining the v_{mca} for the specific type. Thus, the v_{mca} quoted in the aeroplane manual will have been obtained using the technique.

(29) Feathering and un-feathering:

(i) minimum heights for practising feathering or un-feathering drills;

(ii) engine handling: precautions (overheating, icing conditions, priming, warm-up, method of simulating engine failure: reference to aircraft engine manual and service instructions and bulletins).

(30) Engine failure procedure:

(i) once the maintenance of control has been achieved, the order in which the procedures are carried out will be determined by the phase of operation and the aircraft type.

(ii) flight phase:

(A) in cruising flight;

(B) critical phase such as immediately after take-off or during the approach to landing or during a go-around.

(31) Aircraft type:

Variations will inevitably occur in the order of certain drills and checks due to differences between aeroplane types and perhaps between models of the same type, and the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) is to be consulted to establish the exact order of these procedures.

For example, one flight manual or equivalent document (for example owner's manual or pilot's operating handbook) may call for the raising of flaps and landing gear before feathering, whilst another may recommend feathering as a first step. The reason for this latter procedure could be due to the fact that some engines cannot be feathered if the RPM drops below a certain figure.

Again, in some aeroplanes, the raising of the landing gear may create more drag during retraction due to the transient position of the landing gear doors and as a result of this retraction would best be left until feathering has been accomplished and propeller drag reduced.

Therefore, the order in which the drills and checks are shown in this syllabus under 'immediate actions' and 'subsequent actions' are to be used as a general guide only and the exact order of precedence is determined by reference to the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) for the specific aeroplane type being used on the course.

(32) In-flight engine failure in cruise or other flight phase not including take-off or landing:

(i) immediate actions:

(A) recognition of asymmetric condition and control of the aircraft;

(B) identification and confirmation of failed engine:

(a) idle leg = idle engine;

(b) closing of throttle for confirmation.

(C) cause and fire check:

(a) typical reasons for failure;

(b) methods of rectification.

(D) feathering decision and procedure:

(a) reduction of other drag;

(b) need for speed but not haste;

(c) use of rudder trim.

(ii) subsequent actions;

(A) live engine:

(a) temperature, pressures and power;

(b) remaining services;

(c) electrical load: assess and reduce as necessary;

(d) effect on power source for air driven instruments;

(e) landing gear;

(f) flaps and other services.

(B) re-plan flight:

(a) ATC and weather;

(b) terrain clearance, SE cruise speed;

(c) decision to divert or continue.

(C) fuel management: best use of remaining fuel;

(D) dangers of re-starting damaged engine;

(E) action if unable to maintain altitude: effect of altitude on power available;

(F) effects on performance;

(G) effects on power available and power required;

(H) effects on various airframe configuration and propeller settings;

(I) use of flight manual or equivalent document (for example owner's manual or pilot's operating handbook):

(a) cruising;

(b) climbing: ASI colour coding (blue line);

(c) descending;

(d) turning.

(J) 'live' engine limitations and handling;

(K) take-off and approach: control and performance.

(33) Significant factors:

(i) significance of take-off safety speed:

(A) effect of landing gear, flap, feathering, take-off, trim setting, systems for operating landing gear and flaps;

(B) effect on mass, altitude and temperature (performance).

(ii) significance of best SE climb speed (V_{yse}):

(A) acceleration to best engine climb speed and establishing a positive climb;

(B) relationship of SE climb speed to normal climb speed;

(C) action if unable to climb.

(iii) significance of asymmetric committal height and speed: action if baulked below asymmetric committal height.

(34) Engine failure during take-off:

(i) below v_{mca} or unstick speed:

(A) accelerate or stop distance considerations;

(B) prior use of flight manual data if available.

(ii) above v_{mca} or unstick speed and below safety speed;

(iii) immediate re-landing or use of remaining power to achieve forced landing;

(iv) considerations:

(A) degree of engine failure;

(B) speed at the time;

(C) mass, altitude and temperature (performance);

(D) configuration;

(E) length of runway remaining;

(F) position of any obstacles ahead.

(35) Engine failure after take-off:

(i) simulated at a safe height and at or above take-off safety speed;

(ii) considerations:

(A) need to maintain control;

(B) use of bank towards operating engine;

(C) use of available power achieving best SE climb speed;

(D) mass, altitude, temperature (performance);

(E) effect of prevailing conditions and circumstances.

(36) Immediate actions: maintenance of control, including air speed and use of power:

(i) recognition of asymmetric condition;

(ii) identification and confirmation of failed engine;

(iii) feathering and removal of drag (procedure for type);

(iv) establishing best SE climb speed.

(37) Subsequent actions: whilst carrying out an asymmetric power climb to the downwind position at SE best rate of climb speed:

(i) cause and fire check;

(ii) live engine, handling considerations;

(iii) remaining services;

(iv) ATC liaison;

(v) fuel management.

Note: these procedures are applicable to aeroplane type and flight situation.

(38) Significance of asymmetric committal height:

(i) Asymmetric committal height is the minimum height needed to establish a positive climb whilst maintaining adequate speed for control and removal of drag during an approach to a landing.

Because of the significantly reduced performance of many CS/JAR/FAR 23 aeroplanes when operating on one engine, consideration is to be given to a minimum height from which it would be safely possible to attempt a go-around procedure, during an approach when the flight path will have to be changed from a descent to a climb with the aeroplane in a high drag configuration.

Due to the height loss which will occur during the time that the operating engine is brought up to full power, landing gear and flap retracted, and the aeroplane established in a climb at v_{yse} a minimum height (often referred to as 'Asymmetric committal height') is to be selected, below which the pilot should not attempt to take the aeroplane round again for another circuit. This height will be compatible with the aeroplane type, all up weight, altitude of the aerodrome being used, air temperature, wind, the height of obstructions along the climb out path, and pilot competence.

(ii) circuit approach and landing on asymmetric power:

(A) definition and use of asymmetric committal height;

(B) use of standard pattern and normal procedures;

(C) action if unable to maintain circuit height;

(D) speed and power settings required;

(E) decision to land or go-around at asymmetric committal height: factors to be considered.

(iii) undershooting importance of maintaining correct air speed (not below v_{yse}).

(39) Speed and heading control:

(i) height, speed and power relationship: need for minimum possible drag;

(ii) establishing positive climb at best SE rate of climb speed:

(A) effect of availability of systems, power for flap and landing gear;

(B) operation and rapid clean up.

Note 1: The air speed at which the decision is made to commit the aeroplane to a landing or to go-around should normally be the best SE rate of climb speed and in any case not less than the safety speed.

Note 2: On no account should instrument approach 'decision height' and its associated procedures be confused with the selection of minimum height for initiating a go-around in asymmetric power flight.

(40) Engine failure during an all engines approach or missed approach:

(i) use of asymmetric committal height and speed considerations;

(ii) speed and heading control;

(iii) decision to attempt a landing, go-around or force land as circumstances dictate.

Note: at least one demonstration and practice of engine failure in this situation should be performed during the course.

(41) Instrument flying on asymmetric power:

(i) considerations relating to aircraft performance during:

(A) straight and level flight;

(B) climbing and descending;

(C) standard rate turns;

(D) level, climbing and descending turns including turns onto preselected headings.

(ii) availability of vacuum operated instruments;

(iii) availability of electrical power source.

(b) Air exercise

This section covers the operation of a SP ME aeroplane when one engine has failed and it is applicable to all such light piston aeroplanes. Checklists should be used as applicable.

(1) introduction to asymmetric flight:

(2) close the throttle of one engine;

(3) feather its propeller;

(4) effects on aeroplane handling at cruising speed;

(5) effects on aeroplane performance for example cruising speed and rate of climb;

(6) note foot load to maintain a constant heading;

(7) un-feather the propeller;

(8) return to normal flight finding the zero thrust throttle setting;

(9) comparison of foot load when feathered and with zero thrust set.

(10) effects and recognition of engine failure in level flight with the aeroplane straight and level at cruise speed:

(i) slowly close the throttle of one engine;

(ii) note yaw, roll and spiral descent.

(11) return to normal flight:

(i) close throttle of other engine;

(ii) note same effects in opposite direction.

(12) methods of control and identification of failed engine close one throttle and maintain heading and level flight by use of:

(i) rudder to control yaw;

(ii) aileron to hold wings level;

(iii) elevators to maintain level flight;

(iv) power (as required) to maintain air speed and altitude.

(13) alternative or supplementary method of control:

(i) simultaneously;

(ii) lower aeroplane nose to increase air speed;

(iii) reduce power;

(iv) loss of altitude: inevitable.

(14) identification of failed engine: idle foot = idle engine;

(15) use of instruments for identification:

(i) fuel pressure or fuel flow;

(ii) RPM gauge or CSU action may mask identification;

(iii) engine temperature gauges.

(16) confirmation of identification: close the throttle of the identified failed engine;

(17) effects and recognition of engine failure in turns and effects of 'inside' engine failure:

(i) more pronounced yaw;

(ii) more pronounced roll;

(iii) more pronounced pitch down.

(18) effects of 'outside' engine failure:

(i) less pronounced yaw;

(ii) less pronounced roll;

(iii) less pronounced pitch down.

(19) possibility of confusion in identification:

(i) use of correct rudder application;

(ii) return to lateral level flight if necessary.

(20) flight instrument indications;

(21) effect of varying speed and power;

(22) failure of one engine at cruise speed and power: engine failure clearly recognised;

(23) failure of one engine at low speed and high power (not below v_{sse}): engine failure most positively recognised;

(24) failure of one engine at higher speeds and low power: possible failure to recognise engine failure;

(25) minimum control speeds;

(26) establish the v_{yse}:

(i) select maximum permitted manifold pressure and RPM;

(ii) close the throttle on one engine;

(iii) raise the aeroplane nose and reduce the air speed;

(iv) note the air speed when maximum rudder deflection is being applied and when directional control can no longer be maintained;

(v) lower the aeroplane nose and reduce power until full directional control is regained;

(vi) the lowest air speed achieved before the loss of directional control will be the Vmc for the flight condition;

(vii) repeat the procedure closing the throttle of the other engine;

(viii) the higher of these two air speeds will identify the most critical engine to fail.

Note: warning - in the above situations the recovery is to be initiated immediately before directional control is lost with full rudder applied, or when a safe margin above the stall remains, for example when the stall warning device operates, for the particular aeroplane configuration and flight conditions. On no account should the aeroplane be allowed to decelerate to a lower air speed.

(27) establish the effect of using 5° of bank at v_{mc}:

(i) close the throttle of one engine;

(ii) increase to full power on the operating engine;

(iii) using 5° of bank towards the operating engine reduce speed to the $V_{mc;}$

(iv) note lower V_{mc} when 5 ° of bank is used.

(28) ‘in-flight’ engine failure procedure;

(29) in cruise and other flight circumstances not including take-off and landing.

(30) Immediate actions: maintenance of control including air speed and use of power:

(i) identification and confirmation of failed engine;

(ii) failure cause and fire check;

(iii) feathering decision and implementation;

(iv) reduction of any other drag, for example flaps, cowl flaps etc.;

(v) retrim and maintain altitude.

(31) Subsequent actions:

(i) live engine:

(A) oil temperature, pressure, fuel flow and power;

(B) remaining services;

(C) electrical load: assess and reduce as necessary;

(D) effect on power source for air driven instruments;

(E) landing gear;

(F) flaps and other services.

(ii) re-plan flight:

(A) ATC and weather;

(B) terrain clearance;

(C) SE cruise speed;

(D) decision to divert or continue;

(iii) fuel management: best use of

(iv) dangers of re-starting damaged engine;

(v) action if unable to maintain altitude:

(A) adopt V_{yse};

(B) effect of altitude on power available.

(vi) effects on performance;

(vii) effects on power available and power required;

(viii) effects on various airframe configurations and propeller settings;

(ix) use of flight manual or equivalent document (for example owner's manual or pilot's operating handbook):

(A) cruising;

(B) climbing: ASI colour coding (blue line);

(C) descending;

(D) turning.

(x) 'live' engine limitations and handling;

(xi) take-off and approach: control and handling;

Note: to be done at a safe height away from the circuit;

(xii) take-off case with landing gear down and take-off flap set (if applicable);

(xiii) significance of take-off at or above safety speed (at safety speed. The ability to maintain control and to accelerate to SE climb speed with aeroplane clean and zero thrust set. Thereafter to achieve a positive climb);

(xiv) significance of flight below safety speed (below safety speed and above v_{mca}. A greater difficulty to maintain control, a possible loss of height whilst maintaining speed, cleaning up, accelerating to SE climb speed and establishing a positive climb);

(xv) significance of best SE climb speed (the ability to achieve the best rate of climb on one engine with minimum delay).

(32) Significance of asymmetric committal height:

(i) the ability to maintain or accelerate to the best SE rate of climb speed and to maintain heading whilst cleaning up with perhaps a slight height loss before climbing away;

(ii) below this height, the aeroplane is committed to continue the approach to a landing.

(33) Engine failure during take-off run and below safety speed briefing only;

(34) Engine failure after take-off;

Note: to be initiated at a safe height and at not less than take-off safety speed with due regard to the problems of a prolonged SE climb in the prevailing conditions.

(i) immediate actions:

(A) control of direction and use of bank;

(B) control of air speed and use of power;

(C) recognition of asymmetric condition;

(D) identification and confirmation of failed engine feathering and reduction of drag (procedure for type);

(E) re-trim;

(ii) subsequent actions: whilst carrying out an asymmetric power climb to the downwind position at SE best rate of climb speed:

(A) cause and fire check;

(B) live engine, handling considerations;

(C) drills and procedures applicable to aeroplane type and flight situation;

(D) ATC liaison;

(E) fuel management.

(35) Asymmetric circuit, approach and landing;

(i) downwind and base legs:

(A) use of standard pattern;

(B) normal procedures;

(C) landing gear and flap lowering considerations;

(D) position for base leg;

(E) live engine handling;

(F) air speed and power settings;

(G) maintenance of height.

(ii) final approach:

(A) asymmetric committal height drill;

(B) control of air speed and descent rate;

(C) flap considerations.

(iii) going round again on asymmetric power (missed approach):

(A) not below asymmetric committal height;

(B) speed and heading control;

(C) reduction of drag, landing gear retraction;

(D) maintaining V_{yse};

(E) establish positive rate of climb.

(36) Engine failure during all engines approach or missed approach:

Note: to be started at not less than asymmetric committal height and speed and not more than part flap set:

(i) speed and heading control;

(ii) reduction of drag flap;

(iii) decision to attempt landing or go-around;

(iv) control of descent rate if approach is continued;

(v) if go-around is initiated, maintain vyse, flaps and landing gear retracted and establish positive rate of climb.

Note: at least one demonstration and practice of engine failure in this situation should be performed during the course.

(37) Instrument flying on asymmetric power;

(38) Flight instrument checks and services available:

(i) straight and level flight;

(ii) climbing and descending;

(iii) standard rate turns;

(iv) level, climbing and descending turns including turns onto preselected headings.

EXERCISE 5: UPRT

Instructors should have the specific competence to provide UPRT during the type rating course, including the ability to demonstrate knowledge and understanding of the type-specific upset recovery procedures and of the recommendations that are developed by the OEMs. Therefore, during the CRI training course, the student instructor should:

(a) be able to apply the correct upset recovery techniques for the specific aeroplane type;

(b) understand the importance of applying type-specific OEM procedures for recovery manoeuvres;

(c) be able to distinguish between the applicable SOPs and OEM recommendations (if available);

(d) understand the capabilities and limitations of the FSTDs that are used for UPRT;

(e) ensure that the training remains within the FSTD training envelope to avoid the risk of negative transfer of training;

(f) understand and be able to use the IOS of the FSTD in the context of providing effective UPRT;

(g) understand and be able to use the available FSTD instructor tools to provide accurate feedback on pilot performance;

(h) understand the importance of adhering to the FSTD UPRT scenarios that are validated by the training programme developer; and

(i) understand the missing critical human factor aspects due to the limitations of the FSTD, and convey this to the student pilot(s) receiving the training.

AMC1 FCL.940.CRI CRI Revalidation and renewal

REFRESHER TRAINING

(a) Paragraph (c)(1) of FCL.940.CRI determine that an applicant for renewal of a CRI certificate shall complete refresher training as a CRI at an ATO or CAA. Paragraph (a)(2) also establishes that an applicant for revalidation of the CRI certificate that has not completed a minimum amount of instruction hours (established in paragraph (a)(1)) during the validity period of the certificate shall undertake refresher training at an ATO or CAA for the revalidation of the certificate. The amount of refresher training needed should be determined on a case by case basis by the ATO or CAA, taking into account the following factors:

  (1) the experience of the applicant;

  (2) whether the training is for revalidation or renewal;

  (3) the amount of time elapsed since the last time the applicant has conducted training, in the case of revalidation, or since the certificate has lapsed, in the case of renewal. The amount of training needed to reach the desired level of competence should increase with the time elapsed.

(b) Once the ATO or CAA has determined the needs of the applicant, it should develop an individual training programme that should be based on the CRI training course and focus on the aspects where the applicant has shown the greatest needs.

(c) After successful completion of the refresher training, as applicable, the ATO or CAA, should, in accordance with point (b), issue the applicant with a training completion certificate or another document specified by the CAA, which describes the evaluation of the factors listed in point (a)(1) (the experience of the applicant) and the training received, as well as a statement that the training was successfully completed. The training completion certificate should be presented to the examiner prior to the assessment of competence.

Upon successful completion of the refresher training, as applicable, the ATO should submit the training completion certificate, or the other document specified by the CAA, to the CAA.

SECTION 6 – SPECIFIC REQUIREMENTS FOR THE INSTRUMENT RATING INSTRUCTOR – IRI

AMC1 FCL.930.IRI IRI – Training course

GENERAL

(a) The aim of the IRI training course is to train aircraft licence holders to the level of competence defined in FCL.920, and adequate for an IRI.

(b) The IRI training course should give particular stress to the role of the individual in relation to the importance of human factors in the manmachine environment.

(c) Special attention should be paid to the applicant's levels of maturity and judgement including an understanding of adults, their behavioural attitudes and variable levels of education.

(d) With the exception of the section on 'teaching and learning', all the subject detail contained in the theoretical and flight training syllabus is complementary to the instrument rating pilot course syllabus which should already be known by the applicant. Therefore, the objective of the course is to:

   (1) refresh and bring up to date the technical knowledge of the student instructor;

   (2) train pilots in accordance with the requirements of the modular instrument flying training course;

   (3) enable the applicant to develop the necessary instructional techniques required for teaching of instrument flying, radio navigation and instrument procedures to the level required for the issue of an instrument rating;

   (4) ensure that the student instrument rating instructor's flying is of a sufficiently high standard.

(e) In part 3 some of the air exercises of the flight instruction syllabus of this AMC may be combined in the same flight.

(f) During the training course the applicants should be made aware of their own attitudes to the important aspects of flight safety. Improving safety awareness should be a fundamental objective throughout the training course. It will be of major importance for the training course to aim at giving applicants the knowledge, skills and attitudes relevant to an instructor's task. To achieve this, the course curriculum, in terms of objectives, should comprise at least the following areas.

(g) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.

(h) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

CONTENT

(i) The training course consists of three parts:

  (1) Part 1: teaching and learning that should follow the content of AMC1 FCL.920.

  (2) Part 2: instrument technical theoretical knowledge instruction (technical training).

  (3) Part 3: flight instruction.

Part 1

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

Part 2

THEORETICAL KNOWLEDGE INSTRUCTION SYLLABUS

(a) The instrument theoretical knowledge instruction should comprise not less than 10 hours training to include the revision of instrument theoretical knowledge, the preparation of lesson plans and the development of classroom instructional skills to enable the IRI to instruct the instrument theoretical knowledge syllabus.

(b) All the subject detail contained in the instrument theoretical knowledge instruction syllabus and flight instruction syllabus is complementary to the instrument rating pilot course syllabus which should already be known by the applicant. Therefore, the objective of the course is to:

  (1) refresh and bring up to date the technical knowledge of the student instructor;

  (2) train pilots in accordance with the requirements of the modular instrument flying training course;

  (3) enable the applicant to develop the necessary instructional techniques required for teaching of instrument flying, radio navigation and instrument procedures to the level required for the issue of an instrument rating; and

  (4) ensure that the student instrument rating instructor's flying is of a sufficiently high standard.

(c) The theoretical subjects covered below should be used to develop the instructor's teaching skills. The items selected should relate to the student's background and should be applied to training for an IR.

GENERAL SUBJECTS

(d) Physiological and psychological factors:

  (1) the senses;

(2) spatial disorientation;

(3) sensory illusions;

(4) stress.

(e) Flight instruments:

(1) air speed indicator;

(2) altimeter;

(3) vertical speed indicator;

(4) attitude indicator;

(5) heading indicator;

(6) turn and slip indicator;

(7) magnetic compass;

(8) in relation to the above instruments the following items should be covered:

(i) principles of operation;

(ii) errors and in-flight serviceability checks;

(iii) system failures.

(f) Radio navigation aids:

(1) basic radio principles;

(2) use of VHF RTF channels;

(3) the Morse code;

(4) basic principles of radio aids;

(5) use of VOR;

(6) ground and aeroplane equipment;

(7) use of NDB/ADF;

(8) ground and aeroplane equipment;

(9) use of VHF/DF;

(10) radio detection and ranging (radar);

(11) ground equipment;

(12) primary radar;

(13) secondary surveillance radar;

(14) aeroplane equipment;

(15) transponders;

(16) precision approach system;

(17) other navigational systems (as applicable) in current operational use;

(18) ground and aeroplane equipment;

(19) use of DME;

(20) ground and aeroplane equipment;

(21) marker beacons;

(22) ground and aeroplane equipment;

(23) pre-flight serviceability checks;

(24) range, accuracy and limitations of equipment.

(g) Flight planning considerations;

(h) Aeronautical information publications:

(1) the training course should cover the items listed below, but the applicant's aptitude and previous aviation experience should be taken into account when determining the amount of instructional time allotted. Although a number of items contained under this heading are complementary to those contained in the PPL/CPL/IR syllabi, the instructor should ensure that they have been covered during the applicant's training and due allowance should be made for the time needed to revise these items as necessary.

(2) AIP

(3) NOTAM class 1 and 2;

(4) AIC;

(5) information of an operational nature;

(6) the rules of the air and ATS;

(7) visual flight rules and instrument flight rules;

(8) flight plans and ATS messages;

(9) use of radar in ATS;

(10) radio failure;

(11) classification of airspace;

(12) airspace restrictions and hazards;

(13) holding and approach to land procedures;

(14) precision approaches and non precision approaches;

(15) radar approach procedures;

(16) missed approach procedures;

(17) visual manoeuvring after an instrument approach;

(18) conflict hazards in uncontrolled airspace;

(19) communications;

(20) types of services;

(21) extraction of AIP data relating to radio aids;

(22) charts available;

(23) en-route;

(24) departure and arrival;

(25) instrument approach and landing;

(26) amendments, corrections and revision service.

(i) flight planning general:

(1) the objectives of flight planning;

(2) factors affecting aeroplane and engine performance;

(3) selection of alternate(s);

(4) obtaining meteorological information;

(5) services available;

(6) meteorology briefing;

(7) telephone or electronic data processing;

(8) actual weather reports (TAFs, METARs and SIGMET messages);

(9) the route forecast;

(10) the operational significance of the meteorological information obtained (including icing, turbulence and visibility);

(11) altimeter considerations;

(12) definitions of:

(i) transition altitude;

(ii) transition level;

(iii) flight level;

(iv) QNH;

(v) regional QNH;

(vi) standard pressure setting;

(vii) QFE.

(13) altimeter setting procedures;

(14) pre-flight altimeter checks;

(15) take-off and climb;

(16) en-route;

(17) approach and landing;

(18) missed approach;

(19) terrain clearance;

(20) selection of a minimum safe en-route altitude;

(21) IFR;

(22) preparation of charts;

(23) choice of routes and flight levels;

(24) compilation of flight plan or log sheet;

(25) log sheet entries;

(26) navigation ground aids to be used;

(27) frequencies and identification;

(28) radials and bearings;

(29) tracks and fixes;

(30) safety altitude(s);

(31) fuel calculations;

(32) ATC frequencies (VHF);

(33) tower, approach, en-route, radar, FIS, ATIS, and weather reports;

(34) minimum sector altitudes at destination and alternate aerodromes;

(35) determination of minimum safe descent heights or altitudes (decision heights) at destination and alternate aerodromes.

(j) The privileges of the instrument rating:

(1) outside controlled airspace;

(2) within controlled airspace;

(3) period of validity and renewal procedures.

Part 3

FLIGHT INSTRUCTION SYLLABUS

(a) An approved IRI course should comprise of at least 10 hours of flight instruction, of which a maximum of 8 hours may be conducted in an FSTD. A similar number of hours should be used for the instruction and practice of preflight and post-flight briefing for each exercise.

(b) The flight instruction should aim to ensure that the applicant is able to teach the air exercises safely and efficiently.

A. AEROPLANES

LONG BRIEFINGS AND AIR EXERCISES

EXERCISE 1: INTRUMENT FLYING (Basic)

(for revision, as deemed necessary by the instructor)

(a) Long briefing objectives:

(1) flight instruments;

(2) physiological considerations;

(3) instrument appreciation:

(i) attitude instrument flight;

(ii) pitch indications;

(iii) bank indications;

(iv) different instrument presentations;

(v) introduction to the use of the attitude indicator;

(vi) pitch attitude;

(vii) bank attitude;

(viii) maintenance of heading and balanced flight;

(ix) instrument limitations (inclusive system failures).

(4) attitude, power and performance:

(i) attitude instrument flight;

(ii) control instruments;

(iii) performance instruments;

(iii) effect of changing power and configuration;

(iv) cross-checking the instrument indications;

(v) instrument interpretation;

(vi) direct and indirect indications (performance instruments);

(vii) instrument lag;

(viii) selective radial scan.

(5) the basic flight manoeuvres (full panel):

(i) straight and level flight at various air speeds and aeroplane configurations;

(ii) climbing;

(iii) descending;

(iv) standard rate turns;

(v) level, climbing and descending on to pre-selected headings.

(b) Air exercise:

(1) instrument flying (basic);

(i) physiological sensations;

(ii) instrument appreciation;

(iii) attitude instrument flight;

(iv) pitch attitude;

(v) bank attitude;

(vi) maintenance of heading and balanced flight;

(vii) attitude instrument flight;

(viii) effect of changing power and configuration;

(ix) cross-checking the instruments;

(x) selective radial scan;

(2) the basic flight manoeuvres (full panel):

(i) straight and level flight at various air speeds and aeroplane configurations;

(ii) climbing;

(iii) descending;

(iv) standard rate turns;

(v) level, climbing and descending on to pre-selected headings.

EXERCISE 2: INTRUMENT FLYING (Advanced)

(a) Long briefing objectives:

(1) full panel;

(2) 30 ° level turns;

(3) unusual attitudes: recoveries;

(4) transference to instruments after take-off;

(5) limited panel;

(6) basic flight manoeuvres;

(7) unusual attitudes: recoveries.

(b) Air exercise:

(1) full panel;

(2) 30 ° level turns;

(3) unusual attitudes: recoveries;

(4) limited panel;

(5) repeat of the above exercises.

EXERCISE 3: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VOR

(a) Long briefing objectives:

(1) availability of VOR stations en-route;

(2) station frequencies and identification;

(3) signal reception range;

(4) effect of altitude;

(5) VOR radials;

(6) use of OBS;

(7) to or from indicator;

(8) orientation;

(9) selecting radials;

(10) intercepting a pre-selected radial;

(11) assessment of distance to interception;

(12) effects of wind;

(13) maintaining a radial;

(14) tracking to and from a VOR station;

(15) procedure turns;

(16) station passage;

(17) use of two stations for obtaining a fix;

(18) pre-selecting fixes along a track;

(19) assessment of ground speed and timing;

(20) holding procedures;

(21) various entries;

(22) communication (R/T procedures and ATC liaison).

(b) Air exercise:

(1) station selection and identification;

(2) orientation;

(3) intercepting a pre-selected radial;

(4) R/T procedures and ATC liaison;

(5) maintaining a radial inbound;

(6) recognition of station passage;

(7) maintaining a radial outbound;

(8) procedure turn;

(9) use of two stations to obtain a fix along the track;

(10) assessment of ground speed and timing;

(11) holding procedures and entries;

(12) holding at a pre-selected fix;

(13) holding at a VOR station.

EXERCISE 4: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF NDB

(a) Long briefing objectives:

(1) availability of an NDB facilities en-route;

(2) location, frequencies, tuning (as applicable) and identification codes;

(3) signal reception range;

(4) static interference;

(5) night effect;

(6) station interference;

(7) mountain effect;

(8) coastal refraction;

(9) orientation in relation to an NDB;

(10) homing;

(11) intercepting a pre-selected magnetic bearing and tracking inbound;

(12) station passage;

(13) tracking outbound;

(14) time and distance checks;

(15) use of two NDBs to obtain a fix or alternatively use of one NDB and one other navaid;

(16) holding procedures and various approved entries;

(17) communication (R/T procedures and ATC liaison).

(b) Air exercise:

(1) selecting, tuning and identifying an NDB;

(2) ADF orientation;

(3) communication (R/T procedures and ATC liaison);

(4) homing;

(5) tracking inbound;

(6) station passage;

(7) tracking outbound;

(8) time and distance checks;

(9) intercepting a pre-selected magnetic bearing;

(10) determining the aeroplane's position from two NDBs or alternatively from one NDB and one other navaid;

(11) ADF holding procedures and various approved entries.

EXERCISE 5: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VHF/DF

(a) Long briefing objectives:

(1) availability of VHF/DF facilities en-route;

(2) location, frequencies, station call signs and hours of operation;

(3) signal and reception range;

(4) effect of altitude;

(5) communication (R/T procedures and ATC liaison);

(6) obtaining and using types of bearings, for example QTE, QDM and QDR;

(7) homing to a station;

(8) effect of wind;

(9) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);

(10) assessment of groundspeed and timing.

(b) Air exercise:

(1) establishing contact with a VHF/DF station;

(2) R/T Procedures and ATC liaison;

(3) obtaining and using a QDR and QTE;

(4) homing to a station;

(5) effect of wind;

(6) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);

(7) assessment of groundspeed and timing.

EXERCISE 6: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF DME

(a) Long briefing objectives:

(1) availability of DME facilities;

(2) location, frequencies and identification codes;

(3) signal reception range;

(4) slant range;

(5) use of DME to obtain distance, groundspeed and timing;

(6) use of DME to obtain a fix.

(b) Air exercise:

(1) station selection and identification;

(2) use of equipment functions;

(3) distance;

(4) groundspeed;

(5) timing;

(6) DME arc approach;

(7) DME holding.

EXERCISE 7: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF TRANSPONDERS (SSR)

(a) Long briefing objectives:

(1) operation of transponders;

(2) code selection procedure;

(3) emergency codes;

(4) precautions when using airborne equipment.

(b) Air exercise:

(1) operation of transponders;

(2) types of transponders;

(3) code selection procedure;

(4) emergency codes;

(5) precautions when selecting the required code.

EXERCISE 8: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ENROUTE RADAR

(a) Long briefing objectives:

(1) availability of radar services;

(2) location, station frequencies, call signs and hours of operation;

(3) AIP and NOTAMs;

(4) provision of service;

(5) communication (R/T, procedures and ATC liaison);

(6) airspace radar advisory service;

(7) emergency service;

(8) aircraft separation standards.

(b) Air exercise:

(1) communication (R/T procedures and ATC liaison);

(2) establishing the service required and position reporting;

(3) method of reporting conflicting traffic;

(4) terrain clearance.

EXERCISE 9: PRE-FLIGHT AND AERODROME DEPARTURE AND ARRIVAL PROCEDURES

(a) Long briefing objectives:

(1) determining the serviceability of the aeroplane radio;

(2) navigation equipment;

(3) obtaining the departure clearance;

(4) setting up radio navaids before take-off for example VOR frequencies, required radials, etc.;

(5) aerodrome departure procedures, frequency changes;

(6) altitude and position reporting as required;

(7) SID procedures;

(8) obstacle clearance considerations.

(b) Air exercise:

(1) radio equipment serviceability checks;

(2) departure clearance;

(3) navaid selection;

(4) frequencies, radials, etc.;

(5) aerodrome departure checks, frequency changes, altitude and position reports;

(6) SID procedures.

EXERCISE 10: INSTRUMENT APPORACH: ILS APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURE

(a) Long briefing objectives:

(1) precision approach charts;

(2) approach to the initial approach fix and minimum sector altitude;

(3) navaid requirements, for example radar, ADF, etc.;

(4) communication (ATC liaison and R/T phraseology);

(5) holding procedure;

(6) the final approach track;

(7) forming a mental picture of the approach;

(8) completion of aerodrome approach checks;

(9) initial approach procedure;

(10) selection of the ILS frequency and identification;

(11) obstacle clearance altitude or height;

(12) operating minima;

(13) achieving the horizontal and vertical patterns;

(14) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;

(15) use of DME (as applicable);

(16) go-around and missed approach procedure;

(17) review of the published instructions;

(18) transition from instrument to visual flight (sensory illusions);

(19) visual manoeuvring after an instrument approach:

(i) circling approach;

(ii) visual approach to landing.

(b) Air exercise:

(1) initial approach to the ILS;

(2) completion of approach planning;

(3) holding procedure;

(4) frequency selection and identification of ILS;

(5) review of the published procedure and minimum sector altitude;

(6) communication (ATC liaison and R/T phraseology);

(7) determination of operating minima and altimeter setting;

(8) weather consideration, for example cloud base and visibility;

(9) availability of runway lighting;

(10) ILS entry methods;

(11) radar vectors;

(12) procedural method;

(13) assessment of approach time from the final approach fix to the aerodrome;

(14) determination of:

(i) the descent rate on final approach;

(ii) the wind velocity at the surface and the length of the landing runway;

(iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;

(15) circling approach;

(16) the approach:

(i) at the final approach fix;

(ii) use of DME (as applicable);

(iii) ATC liaison;

(iv) note time and establish air speed and descent rate;

(v) maintaining the localiser and glide path;

(vi) anticipation in change of wind velocity and its effect on drift;

(vii) decision height;

(17) runway direction;

(18) overshoot and missed approach procedure;

(19) transition from instrument to visual flight;

(20) circling approach;

(21) visual approach to landing.

EXERCISE 11: INSTRUMENTS APPROACH: NDB APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURES

(a) Long briefing objectives:

(1) non-precision approach charts;

(2) initial approach to the initial approach fix and minimum sector altitude;

(3) ATC liaison;

(4) communication (ATC procedures and R/T phraseology);

(5) approach planning;

(6) holding procedure;

(7) the approach track;

(8) forming a mental picture of the approach;

(9) initial approach procedure;

(10) operating minima;

(11) completion of approach planning;

(12) achieving the horizontal and vertical patterns;

(13) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;

(14) use of DME (as applicable);

(15) go-around and missed approach procedure;

(16) review of the published instructions;

(17) transition from instrument to visual flight (sensory illusions);

(18) visual manoeuvring after an instrument approach;

(19) circling approach

(20) visual approach to landing.

(b) Air exercise:

(1) completion of approach planning including determination of:

(i) descent rate from the final approach fix;

(ii) the wind velocity at the surface and length of the landing runway;

(iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;

(2) circling approach;

(3) go-around and missed approach procedure;

(4) initial approach;

(5) frequency selection and identification;

(6) review of the published procedure and minimum safe sector altitude;

(7) ATC liaison and R/T phraseology;

(8) determination of decision height and altimeter setting;

(9) weather considerations, for example cloud base and visibility;

(10) availability of runway lighting;

(11) determination of inbound track;

(12) assessment of time from final approach fix to the missed approach point;

(13) ATC liaison;

(14) the outbound procedure (inclusive completion of pre-landing checks);

(15) the inbound procedure;

(16) re-check of identification code;

(17) altimeter setting re-checked;

(18) the final approach;

(19) note time and establish air speed and descent rate

(20) maintaining the final approach track;

(21) anticipation of change in wind velocity and its effect on the drift;

(22) minimum descent altitude or height;

(23) runway direction;

(24) go-around and missed approach procedure;

(25) transition from instrument to visual flight (sensory illusions);

(26) visual approach.

EXERCISE 12: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF GNSS (to be developed)

(a) Long briefing objectives: use of GNSS.

(b) Air exercise: use of GNSS.

B. HELICOPTERS

LONG BRIEFINGS AND AIR EXERCISES

EXERCISE 1: INSTRUMENT FLYING (Basic)

(for revision as deemed necessary by the instructor)

(a) Long briefing objectives:

(1) flight instruments;

(2) physiological considerations;

(3) instrument appreciation:

(i) attitude instrument flight;

(ii) pitch indications;

(iii) bank indications;

(iv) different instrument presentations;

(v) introduction to the use of the attitude indicator;

(vi) pitch attitude;

(vii) bank attitude;

(viii) maintenance of heading and balanced flight;

(ix) instrument limitations (inc. system failures);

(4) attitude, power and performance:

(i) attitude instrument flight;

(ii) control instruments;

(iii) performance instruments;

(iv) effect of changing power;

(v) cross-checking the instrument indications;

(vi) instrument interpretation;

(vii) direct and indirect indications (performance instruments);

(viii) instrument lag;

(ix) selective radial scan;

(5) the basic flight manoeuvres (full panel):

(i) straight and level flight at various air speeds;

(ii) climbing;

(iii) descending;

(iv) standard rate turns;

(v) level, climbing and descending on to pre-selected headings.

(b) Air exercise:

(1) physiological sensations;

(2) instrument appreciation;

(3) attitude instrument flight;

(4) pitch attitude;

(5) bank attitude;

(6) maintenance of heading and balanced flight;

(7) attitude instrument flight;

(8) effect of changing power;

(9) cross-checking the instruments;

(10) selective radial scan;

(11) the basic flight manoeuvres (full panel):

(i) straight and level flight at various air speeds and helicopter configurations;

(ii) climbing;

(iii) descending;

(iv) standard rate turns;

(v) level, climbing and descending on to pre-selected headings; (vi) manoeuvring at minimum and maximum IMC speed.

EXERCISE 2: INSTRUMENT FLYING (Advanced)

(a) Long briefing objectives:

(1) full panel;

(2) 30° level turns;

(3) unusual attitudes: recoveries;

(4) transition to instruments after take-off;

(5) limited panel;

(6) basic flight manoeuvres;

(7) unusual attitudes: recoveries.

(b) Air exercise:

(1) full panel;

(2) 30° level turns;

(3) unusual attitudes: recoveries;

(4) identification and recovery from low pitch steep bank and high pitch steep bank attitudes (at low and high power settings);

(5) limited panel;

(6) repeat of the above exercises.

EXERCISE 3: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VOR

(a) Long briefing objectives:

(1) availability of VOR stations en-route;

(2) station frequencies and identification;

(3) signal reception range;

(4) effect of altitude;

(5) VOR radials;

(6) use of OBS;

(7) to and from indicator;

(8) orientation;

(9) selecting radials;

(10) intercepting a pre-selected radial;

(11) assessment of distance to interception;

(12) effects of wind;

(13) maintaining a radial;

(14) tracking to and from a VOR station;

(15) procedure turns;

(16) station passage;

(17) use of two stations for obtaining a fix;

(18) pre-selecting fixes along a track;

(19) assessment of ground speed and timing;

(20) holding procedures;

(21) various entries;

(22) communication (R/T procedures and ATC liaison).

(b) Air exercise:

(1) station selection and identification;

(2) orientation;

(3) intercepting a pre-selected radial;

(4) R/T procedures and ATC liaison;

(5) maintaining a radial inbound;

(6) recognition of station passage;

(7) maintaining a radial outbound;

(8) procedure turns;

(9) use of two stations to obtain a fix along the track;

(10) assessment of ground speed and timing;

(11) holding procedures and entries;

(12) holding at a pre-selected fix;

(13) holding at a VOR station.

EXERCISE 4: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF NDB

(a) Long briefing objectives:

(1) availability of NDB facilities en-route;

(2) location, frequencies, tuning (as applicable) and identification codes;

(3) signal reception range;

(4) static interference;

(5) night effect;

(6) station interference;

(7) mountain effect;

(8) coastal refraction;

(9) orientation in relation to an NDB;

(10) homing;

(11) intercepting a pre-selected magnetic bearing and tracking inbound;

(12) station passage;

(13) tracking outbound;

(14) time and distance checks;

(15) use of two NDBs to obtain a fix or alternatively use of one NDB and one other navaid;

(16) holding procedures;

(17) communication (R/T procedures and ATC liaison).

(b) Air exercise:

(1) selecting, tuning and identifying an NDB;

(2) ADF orientation;

(3) communication (R/T procedures and ATC liaison);

(4) homing;

(5) tracking inbound;

(6) station passage;

(7) tracking outbound;

(8) time and distance checks;

(9) intercepting a pre-selected magnetic bearing;

(10) determining the helicopter's position from two NDBs or alternatively from one NDB and one other navaid;

(11) ADF holding procedures.

EXERCISE 5: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VHF/DF

(a) Long briefing objectives:

(1) availability of VHF/DF facilities en-route;

(2) location, frequencies, station call signs and hours of operation;

(3) signal and reception range;

(4) effect of altitude;

(5) communication (R/T procedures and ATC liaison);

(6) obtaining and using types of bearings, for example QTE, QDM, QDR;

(7) homing to a station;

(8) effect of wind;

(9) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);

(10) assessment of groundspeed and timing.

(b) Air exercise:

(1) establishing contact with a VHF/DF station;

(2) R/T procedures and ATC liaison;

(3) obtaining and using a QDR and QTE;

(4) homing to a station;

(5) effect of wind;

(6) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);

(7) assessment of groundspeed and timing.

EXERCISE 6: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF DME

(a) Long briefing objectives:

(1) availability of DME facilities;

(2) location, frequencies and identification codes;

(3) signal reception range;

(4) slant range;

(5) use of DME to obtain distance, groundspeed and timing;

(6) use of DME to obtain a fix;

(b) Air exercise:

(1) station selection and identification;

(2) use of equipment functions;

(3) distance;

(4) groundspeed;

(5) timing;

(6) DME arc approach;

(7) DME holding.

EXERCISE 7: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF TRANSPONDERS

(a) Long briefing objectives:

(1) operation of transponders;

(2) code selection procedure;

(3) emergency codes;

(4) precautions when using airborne equipment.

(b) Air exercise:

(1) operation of transponders;

(2) types of transponders;

(3) code selection procedure;

(4) emergency codes;

(5) precautions when selecting the required code.

EXERCISE 8: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ENROUTE RADAR SERVICES

(a) Long briefing objectives:

(1) availability of radar services;

(2) location, station frequencies, call signs and hours of operation;

(3) AIP and NOTAMS;

(4) provision of service;

(5) communication (R/T procedures and ATC liaison);

(6) airspace radar advisory service;

(7) emergency service

(8) aircraft separation standards.

(b) Air exercise:

(1) communication (R/T procedures and ATC liaison);

(2) establishing the service required and position reporting;

(3) method of reporting conflicting traffic;

(4) terrain clearance.

EXERCISE 9: PRE-FLIGHT AND AERODROME DEPARTURE AND ARRIVAL POOCEDURES

(a) Long briefing objectives:

(1) determining the serviceability of the radio equipment;

(2) navigation equipment;

(3) obtaining the departure clearance;

(4) setting up radio navaids before take-off for example VOR frequencies, required radials, etc.;

(5) aerodrome departure procedures, frequency changes;

(6) altitude and position reporting as required;

(7) SID procedures;

(8) obstacle clearance considerations.

(b) Air exercise:

(1) radio equipment serviceability checks;

(2) departure clearance;

(3) navaid selection;

(4) frequencies, radials, etc.;

(5) aerodrome departure checks, frequency changes, altitude and position reports;

(6) SID procedures.

EXERCISE 10: INSTRUMENT APPROACH: PRECISION APPROACH AID TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURES

(a) Long briefing objectives:

(1) precision approach charts;

(2) approach to the initial approach fix and minimum sector altitude;

(3) navaid requirements, for example radar, ADF, etc.;

(4) communication (ATC liaison and R/T phraseology);

(5) holding procedure;

(6) the final approach track;

(7) forming a mental picture of the approach;

(8) completion of aerodrome approach checks;

(9) initial approach procedure;

(10) selection of the ILS frequency and identification;

(11) obstacle clearance altitude or height;

(12) operating minima;

(13) achieving the horizontal and vertical patterns;

(14) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;

(15) use of DME (as applicable);

(16) go-around and missed approach procedure;

(17) review of the published instructions;

(18) transition from instrument to visual flight (sensory illusions);

(19) visual manoeuvring after an instrument approach;

(i) circling approach;

(ii) visual approach to landing.

(b) Air exercise:

(1) initial approach to the ILS;

(2) completion of approach planning;

(3) holding procedure;

(4) frequency selection and identification of ILS;

(5) review of the published procedure and minimum sector altitude;

(6) communication (ATC liaison and R/T phraseology);

(7) determination of operating minima and altimeter setting;

(8) weather consideration, for example cloud base and visibility;

(9) availability of landing site lighting;

(10) ILS entry methods;

(11) radar vectors;

(12) procedural method;

(13) assessment of approach time from the final approach fix to the aerodrome;

(14) determination of:

(i) the descent rate on final approach;

(ii) the wind velocity at the surface and the length of the landing site;

(iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;

(15) circling approach;

(16) the approach:

(i) at the final approach fix;

(ii) use of DME (as applicable);

(iii) ATC liaison;

(iv) note time and establish air speed and descent rate;

(v) maintaining the localizer and glide path;

(vi) anticipation in change of wind velocity and its effect on drift;

(vii) decision height.

(17) landing direction;

(18) go-around and missed approach procedure;

(19) transition from instrument to visual flight;

(20) circling approach;

(21) visual approach to landing.

EXERCISE 11: INSTRUMENT APPROACH: NON-PRECISION APPROACH TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURES

(a) Long briefing objectives:

(1) non-precision approach charts;

(2) initial approach to the initial approach fix and minimum sector altitude;

(3) ATC liaison;

(4) communication (ATC procedures and R/T phraseology);

(5) approach planning;

(6) holding procedure;

(7) the approach track;

(8) forming a mental picture of the approach;

(9) initial approach procedure;

(10) operating minima;

(11) completion of approach planning;

(12) achieving the horizontal and vertical patterns;

(13) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;

(14) use of DME (as applicable);

(15) go-around and missed approach procedure;

(16) review of the published instructions;

(17) transition from instrument to visual flight (sensory illusions);

(18) visual manoeuvring after an instrument approach;

(19) circling approach;

(20) visual approach to landing.

(b) Air exercise:

(1) completion of approach planning, including determination of:

(i) descent rate from the final approach fix;

(ii) the wind velocity at the surface and length of the landing site;

(iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach.

(2) circling approach;

(3) go-around and missed approach procedure;

(4) initial approach;

(5) frequency selection and identification;

(6) review of the published procedure and minimum safe sector altitude;

(7) ATC liaison and R/T phraseology;

(8) determination of decision height and altimeter setting;

(9) weather considerations, for example cloud base and visibility;

(10) availability of landing site lighting;

(11) determination of inbound track;

(12) assessment of time from final approach fix to the missed approach point;

(13) ATC liaison;

(14) the outbound procedure (incl. completion of pre-landing checks);

(15) the inbound procedure;

(16) re-check of identification code;

(17) altimeter setting re-checked;

(18) the final approach;

(19) note time and establish air speed and descent rate;

(20) maintaining the final approach track;

(21) anticipation of change in wind velocity and its effect on the drift;

(22) minimum descent altitude or height;

(23) landing site direction;

(24) go-around and missed approach procedure;

(25) transition from instrument to visual flight (sensory illusions);

(26) visual approach.

EXERCISE 12: USE OF GNSS (to be developed)

(a) Long briefing objectives: use of GNSS.

(b) Air exercise: use of GNSS.

C. AIRSHIPS

LONG BRIEFINGS AND AIR EXERCISES

EXERCISE 1: INSTRUMENT FLYING (Basic)

(for revision as deemed necessary by the instructor)

(a) Long briefing objectives:

- (1) flight instruments;
- (2) physiological considerations;
- (3) instrument appreciation:
  - (i) attitude instrument flight;
  - (ii) pitch indications;
  - (iii) different instrument presentations;
  - (iv) introduction to the use of the attitude indicator;
  - (v) pitch attitude;
  - (vi) maintenance of heading and balanced flight;
  - (vii) instrument limitations (inclusive system failures).
- (4) attitude, power and performance:
  - (i) attitude instrument flight;
  - (ii) control instruments;
  - (iii) performance instruments;
  - (iii) effect of changing power, trim and configuration;
  - (iv) cross-checking the instrument indications;
  - (v) instrument interpretation;
  - (vi) direct and indirect indications (performance instruments);
  - (vii) instrument lag;
  - (viii) selective radial scan.
- (5) the basic flight manoeuvres (full panel):
  - (i) straight and level flight at various air speeds and airship configurations;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns;
  - (v) level, climbing and descending on to pre-selected headings.

(b) Air exercise:

- (1) physiological sensations;

(2) instrument appreciation;

(3) attitude instrument flight;

(4) pitch attitude;

(5) bank attitude;

(6) maintenance of heading and balanced flight;

(7) attitude instrument flight;

(8) effect of changing power and configuration;

(9) cross-checking the instruments;

(10) selective radial scan;

(11) the basic flight manoeuvres (full panel):

(i) straight and level flight at various air speeds and airship configurations;

(ii) climbing;

(iii) descending;

(iv) standard rate turns;

(v) level, climbing and descending on to pre-selected headings.

EXERCISE 2: INSTRUMENT FLYING (Advanced)

(a) Long briefing objectives:

(1) full panel;

(2) unusual attitudes: recoveries;

(3) transference to instruments after take-off;

(4) limited panel;

(5) basic flight manoeuvres;

(6) unusual attitudes: recoveries.

(b) Air exercise:

(1) full panel;

(2) unusual attitudes: recoveries;

(3) limited panel;

(4) repeat of the above exercises.

EXERCISE 3: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VOR

(a) Long briefing objectives:

(1) availability of VOR stations en-route;

(2) station frequencies and identification;

(3) signal reception range;

(4) effect of altitude;

(5) VOR radials;

(6) use of OBS;

(7) to or from indicator;

(8) orientation;

(9) selecting radials;

(10) intercepting a pre-selected radial;

(11) assessment of distance to interception;

(12) effects of wind;

(13) maintaining a radial;

(14) tracking to and from a VOR station;

(15) procedure turns;

(16) station passage;

(17) use of two stations for obtaining a fix;

(18) pre-selecting fixes along a track;

(19) assessment of ground speed and timing;

(20) holding procedures;

(21) various entries;

(22) communication (R/T procedures and ATC liaison).

(b) Air exercise:

(1) station selection and identification;

(2) orientation;

(3) intercepting a pre-selected radial;

(4) R/T procedures and ATC liaison;

(5) maintaining a radial inbound;

(6) recognition of station passage;

(7) maintaining a radial outbound;

(8) procedure turns;

(9) use of two stations to obtain a fix along the track;

(10) assessment of ground speed and timing;

(11) holding procedures and entries;

(12) holding at a pre-selected fix;

(13) holding at a VOR station.

EXERCISE 4: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ADF

(Automatic DF equipment)

(a) Long briefing objectives:

(1) availability of NDB facilities en-route;

(2) location, frequencies, tuning (as applicable) and identification codes;

(3) signal reception range;

(4) static interference;

(5) night effect;

(6) station interference;

(7) mountain effect;

(8) coastal refraction;

(9) orientation in relation to an NDB;

(10) homing;

(11) intercepting a pre-selected magnetic bearing and tracking inbound;

(12) station passage;

(13) tracking outbound;

(14) time and distance checks;

(15) use of two NDBs to obtain a fix or alternatively use of one NDB and one other navaid;

(16) holding procedures and various approved entries;

(17) communication (R/T procedures and ATC liaison).

(b) Air exercise:

(1) selecting, tuning and identifying an NDB;

(2) ADF orientation;

(3) communication (R/T procedures and ATC liaison);

(4) homing;

(5) tracking inbound;

(6) station passage;

(7) tracking outbound;

(8) time and distance checks;

(9) intercepting a pre-selected magnetic bearing;

(10) determining the airship's position from two NDBs or alternatively from one NDB and one other navaid;

(11) ADF holding procedures and various approved entries.

EXERCISE 5: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VHF/DF

(a) Long briefing objectives:

(1) availability of VHF/DF facilities en-route;

(2) location, frequencies, station call signs and hours of operation;

(3) signal and reception range;

(4) effect of altitude;

(5) communication (R/T procedures and ATC liaison);

(6) obtaining and using types of bearings, for example QTE, QDM, QDR;

(7) homing to a station;

(8) effect of wind;

(9) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);

(10) assessment of groundspeed and timing.

(b) Air exercise:

(1) establishing contact with a VHF/DF station;

(2) R/T procedures and ATC liaison;

(3) obtaining and using a QDR and QTE;

(4) homing to a station;

(5) effect of wind;

(6) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);

(7) assessment of groundspeed and timing.

EXERCISE 6: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF DME

(a) Long briefing objectives:

(1) availability of DME facilities;

(2) location, frequencies and identification codes;

(3) signal reception range;

(4) slant range;

(5) use of DME to obtain distance, groundspeed and timing;

(6) use of DME to obtain a fix.

(b) Air exercise:

(1) station selection and identification;

(2) use of equipment functions;

(3) distance;

(4) groundspeed;

(5) timing;

(6) DME arc approach;

(7) DME holding.

EXERCISE 7: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF TRANSPONDERS

(a) Long briefing objectives:

(1) operation of transponders;

(2) code selection procedure;

(3) emergency codes;

(4) precautions when using airborne equipment.

(b) Air exercise:

(1) operation of transponders;

(2) types of transponders;

(3) code selection procedure;

(4) emergency codes;

(5) precautions when selecting the required code.

EXERCISE 8: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ENROUTE RADAR SERVICES

(a) Long briefing objectives:

(1) availability of radar services;

(2) location, station frequencies, call signs and hours of operation;

(3) AIP and NOTAMS;

(4) provision of service;

(5) communication (R/T, procedures and ATC liaison);

(6) airspace radar advisory service;

(7) emergency service;

(8) aircraft separation standards.

(b) Air exercise:

(1) communication (R/T procedures and ATC liaison);

(2) establishing the service required and position reporting;

(3) method of reporting conflicting traffic;

(4) terrain clearance.

EXERCISE 9: PRE-FLIGHT AND AERODROME DEPARTURE AND ARRIVAL PROCEDURES

(a) Long briefing objectives:

(1) determining the serviceability of the airship radio;

(2) navigation equipment;

(3) obtaining the departure clearance;

(4) setting up radio navaids before take-off for example VOR frequencies, required radials, etc.;

(5) aerodrome departure procedures, frequency changes;

(6) altitude and position reporting as required;

(7) SID procedures;

(8) obstacle clearance considerations.

(b) Air exercise:

(1) radio equipment serviceability checks;

(2) departure clearance;

(3) navaid selection;

(4) frequencies, radials, etc.;

(5) aerodrome departure checks, frequency changes, altitude and position reports;

(6) SID procedures.

EXERCISE 10: INSTRUMENT APPROACHES: ILS APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACHES PROCEDURES

(a) Long briefing objectives:

(1) precision approach charts;

(2) approach to the initial approach fix and minimum sector altitude;

(3) navaid requirements, for example radar, ADF, etc.;

(4) communication (ATC liaison and R/T phraseology);

(5) review;

(6) holding procedure;

(7) the final approach track;

(8) forming a mental picture of the approach;

(9) completion of aerodrome approach checks;

(10) initial approach procedure;

(11) selection of the ILS frequency and identification;

(12) obstacle clearance altitude or height;

(13) operating minima;

(14) achieving the horizontal and vertical patterns;

(15) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;

(16) use of DME (as applicable);

(17) go-around and missed approach procedure;

(18) review of the published instructions;

(19) transition from instrument to visual flight (sensory illusions);

(20) visual manoeuvring after an instrument approach;

(i) circling approach;

(ii) visual approach to landing.

(b) Air exercise:

(1) initial approach to the ILS;

(2) completion of approach planning;

(3) holding procedure;

(4) frequency selection and identification of ILS;

(5) review of the published procedure and minimum sector altitude;

(6) communication (ATC liaison and R/T phraseology);

(7) determination of operating minima and altimeter setting;

(8) weather consideration, for example cloud base and visibility;

(9) availability of runway lighting;

(10) ILS entry methods;

(11) radar vectors;

(12) procedural method;

(13) assessment of approach time from the final approach fix to the aerodrome;

(14) determination of:

(i) the descent rate on final approach;

(ii) the wind velocity at the surface (and the length of the landing runway);

(iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;

(15) circling approach;

(16) the approach:

(i) at the final approach fix;

(ii) use of DME (as applicable);

(iii) ATC liaison;

(iv) note time and establish air speed and descent rate;

(v) maintaining the localiser and glide path;

(vi) anticipation in change of wind velocity and its effect on drift;

(vii) decision height;

(viii) runway direction.

(17) missed approach procedure;

(18) transition from instrument to visual flight;

(19) circling approach;

(20) visual approach to landing.

EXERCISE 11: INSTRUMENT APPROACHES: NDB APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACHES PROCEDURE

(a) Long briefing objectives:

(1) non-precision approach charts;

(2) initial approach to the initial approach fix and minimum sector altitude;

(3) ATC liaison;

(4) communication (ATC procedures and R/T phraseology);

(5) approach planning:

(i) holding procedure;

(ii) the approach track;

(iii) forming a mental picture of the approach;

(iv) initial approach procedure;

(v) operating minima;

(vi) completion of approach planning.

(6) achieving the horizontal and vertical patterns;

(7) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;

(8) use of DME (as applicable);

(9) go-around and missed approach procedure;

(10) review of the published instructions;

(11) transition from instrument to visual flight (sensory illusions);

(12) visual manoeuvring after an instrument approach;

(13) circling approach;

(14) visual approach to landing.

(b) Air exercise:

(1) completion of approach planning including;

(2) determination of:

(i) descent rate from the final approach fix;

(ii) the wind velocity at the surface and length of the landing runway;

(iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach.

(3) circling approach;

(4) go-around and missed approach procedure;

(5) initial approach;

(6) frequency selection and identification;

(7) review of the published procedure and minimum safe sector altitude;

(8) ATC liaison and R/T phraseology;

(9) determination of decision height and altimeter setting;

(10) weather considerations, for example cloud base and visibility;

(11) availability of runway lighting;

(12) determination of inbound track;

(13) assessment of time from final approach fix to the missed approach point;

(14) ATC liaison;

(15) the outbound procedure (inclusive completion of pre-landing checks);

(16) the inbound procedure;

(17) re-check of identification code;

(18) altimeter setting re-checked;

(19) the final approach;

(20) note time and descent rate;

(21) maintaining the final approach track;

(22) anticipation of change in wind velocity and its effect on the drift;

(23) minimum descent altitude or height;

(24) runway direction;

(25) go-around and missed approach procedure;

(26) transition from instrument to visual flight (sensory illusions);

(27) visual approach.

EXERCISE 12: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF GNNS (to be developed)

(a) Long briefing objectives: use of GNSS.

(b) Air exercise: use of GNSS.

SECTION 7 – SPECIFIC REQUIREMENTS FOR THE SYNTHETIC FLIGHT INSTRUCTOR – SFI

SECTION 8 – SPECIFIC REQUIREMENTS FOR THE MULTI-CREW COOPERATION INSTRUCTOR – MCCI

AMC1 FCL.930.MCCI MCCI — Training course

AEROPLANES

GENERAL

(a) The objective of the technical training is to apply the core instructor competencies acquired during the teaching and learning training to MCC training.

(b) During the practical training the applicant should demonstrate the ability to instruct a pilot in MCC.

(c) To supervise applicants for MCCI certificates, the adequate experience should include at least three type rating or MCC courses.

(d) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.

(e) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

COURSE OBJECTIVE

(f) The course should be designed to give adequate training to the applicant in theoretical knowledge instruction and FSTD instruction to instruct those aspects of MCC required by an applicant for a type rating on a first MP aeroplane.

(g) Confirmation of competency of the applicant to be authorised as an MCCI(A) will be determined by the applicant conducting at least 3 hours MCC instruction to a satisfactory standard on the relevant FNPT or FFS under the supervision of a TRI(A), SFI(A) or MCCI(A) nominated by the ATO for this purpose.

(h) The course consists of three parts:

(1) Part 1: teaching and learning that should follow the content of AMC1 FCL.920;

(2) Part 2: technical theoretical knowledge instruction (technical training);

(3) Part 3: flight instruction.

Part 1

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

Part 2

TECHNICAL THEORETICAL KNOWLEDGE INSTRUCTION SYLLABUS

(a) The FSTD training consists of the application of core instructor competencies to MCC training in a commercial air transport environment, including principles of threat and error management and CRM.

The content of the training programme should cover MCC course exercises in sufficient depth to meet the standard required for issue of the MCCI(A) certificate.

(b) The course should be related to the type of FSTD on which the applicant wishes to instruct. A training programme should give details of all theoretical knowledge instruction.

(c) Identification and application of human factors (as set in the ATPL syllabus 040) related to MCC aspects of the training.

Part 3

FLIGHT INSTRUCTION SYLLABUS

(a) The content of the instruction programme should cover training exercises as applicable to the MCC requirements of an applicant for a MP type rating.

(b) Training exercises:

The exercises should be accomplished as far as possible in a simulated commercial air transport environment. The instruction should cover the following areas:

(1) pre-flight preparation, including documentation, and computation of take-off performance data;

(2) pre-flight checks, including radio and navigation equipment checks and setting;

(3) before take-off checks, including powerplant checks, and take-off briefing by the PF;

(4) normal take-offs with different flap settings, tasks of PF and PNF, callouts;

(5) rejected take-offs; crosswind take-offs; take-offs at maximum takeoff mass; engine failure after v1;

(6) normal and abnormal operation of aircraft systems, use of checklists;

(7) selected emergency procedures to include engine failure and fire, smoke control and removal, windshear during take-off and landing, emergency descent, incapacitation of a flight crew member;

(8) early recognition of and reaction on approaching stall in differing aircraft configurations;

(9) instrument flight procedures, including holding procedures; precision approaches using raw navigation data, flight director and automatic pilot, one engine simulated inoperative approaches, non-precision and circling approaches, approach briefing by the PF, setting of navigation equipment, call-out procedures during approaches; computation of approach and landing data;

(10) go-arounds; normal and with one engine simulated inoperative, transition from instrument to visual flight on reaching decision height or minimum descent height or altitude;

(11) landings, normal, crosswind and with one engine simulated inoperative, transition from instrument to visual flight on reaching decision height or minimum descent height or altitude.

SECTION 9 – SPECIFIC REQUIREMENTS FOR THE SYNTHETIC TRAINING INSTRUCTOR – STI

SECTION 10 – MOUNTAIN RATING INSTRUCTOR – MI

Reserved

SECTION 11 – SPECIFIC REQUIREMENTS FOR THE FLIGHT TEST INSTRUCTOR – FTI

SUBPART K – EXAMINERS

SECTION 1 – COMMON REQUIREMENTS

GM1 FCL.1000 Examiner certificates

SPECIAL CONDITIONS

When new aircraft are introduced, requirements such as to hold a licence and rating equivalent to the one for which the skill test is being conducted, or to have adequate flight experience, may not be possible to comply with. In this case, to allow for the first ratings for these aircraft to be issued to applicants, competent authorities need the possibility to issue a specific certificate that does not have to comply with the requirements established in this Subpart.

The competent authority should only give these certificates to holders of other examiner certificates. As far as possible, preference should be given to persons with experience in similar types or classes of aircraft, for example, in aircraft having the same kind and number of engines or rotors and of the same order of mass or technology.

The certificate should be limited in validity to the time needed to qualify the first examiners for the new aircraft in accordance with this Subpart, but in any case, it should not exceed the 1 year established in the rule.

GM2 FCL.1000 Examiner certificates

When examiners conduct a skill test, proficiency check or assessment of competence, in addition to a licence for the relevant aircraft category, they are required to hold the rating or certificate equivalent to the one for which they conduct the skill test, proficiency check or assessment of competence.

For example, a candidate who holds a CPL(A) may make a class rating proficiency check on an SE piston aeroplane with an examiner who holds a PPL(A) with an SE piston class rating and related examiner privileges.

GM1 FCL.1005(b) Limitation of privileges in case of vested interests

Examples of a situation where the examiner should consider if their objectivity is affected are when the applicant is a relative or a friend of the examiner, or when they are linked by economic interests or political affiliations, etc.

AMC1 FCL.1010 Prerequisites for examiners

When evaluating the applicant’s background, the competent authority should evaluate the personality and character of the applicant, and his/her cooperation with the competent authority.

The competent authority may also take into account whether the applicant has been convicted of any relevant criminal or other offenses, taking into account national law and principles of non-discrimination.

AMC1 FCL.1015 Examiner standardisation

GENERAL

(a) The competent authority may provide the course itself or through an arrangement with an ATO or, in the case of examiners for sailplanes and balloons, with a DTO.

This arrangement should clearly state that the ATO or the DTO is acting under the management system of the competent authority.

(b) The course should last:

(1) for the FE and FIE, at least 1 day, divided into theoretical and practical training;

(2) for other examiners, at least 3 days, divided into theoretical training (1 day) and practical training in an FFS conducting real or role-played proficiency checks, skill tests or assessments of competence (at least 2 days).

(c) The competent authority, the ATO or the DTO should determine any further training required before presenting the candidate for the examiner assessment of competence.

CONTENT

(d) The training should comprise:

(1) Theoretical training covering at least:

(i) the contents of AMC2 FCL.1015 and the FEM;

(ii) Part-FCL and related AMCs and GM relevant to their duties;

(iii) operational requirements and related AMCs and GM relevant to their duties;

(iv) national requirements relevant to their examination duties;

(v) fundamentals of human performance and limitations relevant to flight examination;

(vi) fundamentals of evaluation relevant to applicant's performance;

(vii) the management system of ATOs and the organisational structure of DTOs;

(viii) MCC, human performance and limitations, if applicable.

(2) Examiners should also be briefed on the protection requirements for personal data, liability, accident insurance and fees, as applicable in the member state concerned.

(3) All items above are the core knowledge requirements for an examiner and are recommended as the core course material. This core course may be studied

before recommended examiner training is commenced. The core course may utilise any suitable training format.

(4) Practical training consisting of at least:

(i) knowledge and management of the test for which the certificate is to be sought. These are described in the relevant modules in the FEM;

(ii) knowledge of the administrative procedures pertaining to that test or check.

(5) For an initial examiner certificate, practical training should include the examination of the test profile sought, consisting of the conduct of at least two test or check profiles in the role of examiner (these two tests or checks profiles can be performed in the same simulator session), including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an examiner of the appropriate category on the applicable type. This training is conducted in the aircraft if approval for testing or checking in the aircraft is required. If examiner privileges in FSTD's are required, practical instruction in the use of FSTD(s) for testing or checking should also be completed.

(6) If examiner privileges are to include the conduct of proficiency checks for the revalidation or renewal of an instrument rating, practical instruction should include the conduct of at least four instrument check profiles in the role of examiner, including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an examiner of the appropriate category on the applicable type. This training is conducted in the aircraft if approval for testing or checking in the aircraft is required. If examiner privileges in both FSTD and aircraft are required, at least one of the instrument check profiles should be conducted in an FSTD.

(7) For extension of an examiner certificate to further types (as required for TRE), further practical training on the new type may be required, consisting of the conduct of at least one test or check profile in the role of examiner on the new type, including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an examiner of the appropriate category on the applicable type. A further examiner check on the new type may be required, which may be supervised by an inspector of the competent authority or a suitably authorised senior examiner.

AMC2 FCL.1015 Examiner standardisation

STANDARDISATION ARRANGEMENTS FOR EXAMINERS

LIMITATIONS

(a) An examiner should allow an applicant adequate time to prepare for a test or check, normally not more than 1 hour.

(b) An examiner should plan a test or check flight so that all required exercises can be performed while allowing sufficient time for each of the exercises and with due regard to the weather conditions, traffic situation, ATC requirements and local procedures.

PURPOSE OF A TEST OR CHECK

(c) Determine through practical demonstration during a test or check that an applicant has acquired or maintained the required level of knowledge and skill or proficiency.

(d) Improve training and flight instruction in ATOs or DTOs by feedback of information from examiners about items or sections of tests or checks that are most frequently failed.

(e) Assist in maintaining and, where possible, improving air safety standards by having examiners display good airmanship and flight discipline during tests or checks.

CONDUCT OF TEST OR CHECK

(f) An examiner will ensure that an applicant completes a test or check in accordance with Part-FCL requirements and is assessed against the required test or check standards.

(g) Each item within a test or check section should be completed and assessed separately. The test or check schedule, as briefed, should not normally be altered by an examiner. A failed item is not always a failed section, for example type rating skill test where a failure of an item in a section does not fail the entire section, only the failed item is taken again.

(h) Marginal or questionable performance of a test or check item should not influence an examiner's assessment of any subsequent items.

(i) An examiner should verify the requirements and limitations of a test or check with an applicant during the pre-flight briefing.

(j) When a test or check is completed or discontinued, an examiner should debrief the applicant and give reasons for items or sections failed. In case of a failed or discontinued skill test and proficiency check, the examiner should provide appropriate advice to assist the applicant in re-tests or re-checks.

(k) Any comment on, or disagreement with, an examiner's test or check evaluation or assessment made during a debriefing will be recorded by the examiner on the test or check report, and will be signed by the examiner and countersigned by the applicant.

EXAMINER PREPARATION

(l) An examiner should supervise all aspects of the test or check flight preparation, including, where necessary, obtaining or assuring an ATC 'slot' time.

(m) An examiner will plan a test or check in accordance with Part-FCL requirements. Only the manoeuvres and procedures set out in the appropriate test or check form will be undertaken. The same examiner should not reexamine a failed applicant without the agreement of the applicant.

EXAMINER APPROACH

(n) An examiner should encourage a friendly and relaxed atmosphere to develop both before and during a test or check flight. A negative or hostile approach should not be used. During the test or check flight, the examiner should avoid negative comments or criticisms and all assessments should be reserved for the debriefing.

ASSESSMENT SYSTEM

(o) Although test or checks may specify flight test tolerances, an applicant should not be expected to achieve these at the expense of smoothness or stable flight. An examiner should make due allowance for unavoidable deviations due to turbulence, ATC instructions, etc. An examiner should terminate a test or check only when it is clear that the applicant has not been able to demonstrate the required level of knowledge, skill or proficiency and that a full re-test will be necessary or for safety reasons. An examiner will use one of the following terms for assessment:

(1) a 'pass', provided that the applicant demonstrates the required level of knowledge, skill or proficiency and, where applicable, remains within the flight test tolerances for the licence or rating;

(2) a 'fail' provided that any of the following apply:

(i) the flight test tolerances have been exceeded after the examiner has made due allowance for turbulence or ATC instructions;

(ii) the aim of the test or check is not completed;

(iii) the aim of exercise is completed but at the expense of safe flight, violation of a rule or regulation, poor airmanship or rough handling;

(iv) an acceptable level of knowledge is not demonstrated;

(v) an acceptable level of flight management is not demonstrated;

(vi) the intervention of the examiner or safety pilot is required in the interest of safety.

(3) a 'partial pass' in accordance with the criteria shown in the relevant skill test appendix of Part-FCL.

METHOD AND CONTENTS OF THE TEST OR CHECK

(p) Before undertaking a test or check, an examiner will verify that the aircraft or FSTD intended to be used is suitable and appropriately equipped for the test or check. Aircraft that fall under points (a), (b), (c), or (d) of Annex I to the Basic Regulation can be used provided that they are subject to an authorisation as per point ORA.ATO.135 or point DTO.GEN.240.

(q) A test or check flight will be conducted in accordance with the AFM and, if applicable, the AOM.

(r) A test or check flight will be conducted within the limitations contained in the operations manual of an ATO or the operator for which the applicant is flying, as applicable, or, if available, within the limitations placed by the DTO.

(s) Contents:

(1) a test or check is comprised of:

(i) oral examination on the ground (where applicable);

(ii) pre-flight briefing;

(iii) in-flight exercises;

(iv) post-flight debriefing.

(2) oral examination on the ground should include:

(i) aircraft general knowledge and performance;

(ii) planning and operational procedures;

(iii) other relevant items or sections of the test or check.

(3) pre-flight briefing should include:

(i) test or check sequence;

(ii) power setting, speeds and approach minima, if applicable;

(iii) safety considerations.

(4) in-flight exercises will include each relevant item or section of the test or check;

(5) post-flight debriefing should include:

(i) assessment or evaluation of the applicant;

(ii) documentation of the test or check with the applicant's FI present, if possible.

(t) A test or check is intended to simulate a practical flight. Thus, an examiner may set practical scenarios for an applicant while ensuring that the applicant is not confused and air safety is not compromised.

(u) When manoeuvres are to be flown by sole reference to instruments, the examiner should ensure that a suitable method of screening is used to simulate IMC.

(v) An examiner should maintain a flight log and assessment record during the test or check for reference during the post or flight debriefing.

(w) An examiner should be flexible to the possibility of changes arising to preflight briefings due to ATC instructions, or other circumstances affecting the test or check.

(x) Where changes arise to a planned test or check an examiner should be satisfied that the applicant understands and accepts the changes. Otherwise, the test or check flight should be terminated.

(y) Should an applicant choose not to continue a test or check for reasons considered inadequate by an examiner, the applicant will be assessed as having failed those items or sections not attempted. If the test or check is terminated for reasons considered adequate by the examiner, only these items or sections not completed will be tested during a subsequent test or check.

(z) An examiner may terminate a test or check at any stage, if it is considered that the applicant's competency requires a complete re-test or re-check.

GM1 FCL.1015 Examiner standardisation

(a) An examiner should plan per day not more than:

(1) three tests or checks relating to PPL, CPL, IR or class ratings;

(2) four tests or checks relating to LAPL, SPL or BPL;

(3) two tests or checks related to MPL or ATPL;

(4) two assessments of competence related to instructor certificates;

(5) four tests or checks relating to SP type ratings.

(b) An examiner should plan at least 2 hours for a LAPL, SPL or BPL, 3 hours for a PPL, CPL, IR or class rating test or checks, and at least 4 hours for instructor certificates, MPL, ATPL or MP type rating tests or checks, including preflight briefing and preparation, conduct of the test, check or assessment of competence, de-briefing, evaluation of the applicant and documentation.

(c) For the conduct of the test, check or assessment of competence, without additional activities specified in point (b), the following values may be used as guidance:

(1) 45 minutes for a LAPL(B) or BPL and SP class ratings VFR only;

(2) 60 minutes for extension of BPL commercial privileges;

(3) 90 minutes for LAPL(A) or (H), PPL(A) or (H), and CPL(A) or (H), including the navigation section;

(4) 60 minutes for PPL(As) and CPL(As);

(5) 60 minutes for IR, EIR, instructor certificates, and SP type or class ratings; and

(6) 120 minutes for MPL, ATPL, and MP type ratings.

(d) For the LAPL(S) and SPL test or check flight the flight time must be sufficient to allow that all the items in each test or check section can be fully completed. If not all the items can be completed in one flight, additional flights have to be done.

GM1 FCL.1015(a); FCL.1025(b)(2)

EXAMINER STANDARDISATION COURSES AT AN ATO OR A DTO

In point FCL.1015(a) (second sentence) and in point FCL.1025(b)(2) (second sentence), the word 'may' is used to indicate that completing an examiner standardisation course or an examiner refresher course at a DTO is an option which can be used by examiners for sailplanes and balloons as an alternative to completing such courses provided by the competent authority or an ATO (first sentence in both point FCL.1015(a) and point FCL.1025(b)(2)).

AMC1 FCL.1020 Examiners assessment of competence

GENERAL

(a) The competent authority may nominate either one of its inspectors or a senior examiner to assess the competence of applicants for an examiner certificate.

DEFINITIONS

(b) Definitions:

(1) 'Inspector': the inspector of the competent authority conducting the examiner competence assessment;

(2) 'Examiner applicant': the person seeking certification as an examiner;

(3) 'Candidate': the person being tested or checked by the examiner applicant. This person may be a pilot for whom the test or check would be required, or the inspector of the competent authority who is conducting the examiner certification acceptance test.

CONDUCT OF THE ASSESSMENT

(c) An inspector of the competent authority or a senior examiner will observe all examiner applicants conducting a test on a 'candidate' in an aircraft for which examiner certificate is sought. Items from the related training course and test or check schedule will be selected by the inspector for examination of the 'candidate' by the examiner applicant. Having agreed with the inspector the content of the test, the examiner applicant will be expected to manage the entire test. This will include briefing, the conduct of the flight, assessment and debriefing of the 'candidate'. The inspector will discuss the assessment with the examiner applicant before the 'candidate' is debriefed and informed of the result.

BRIEFING THE 'CANDIDATE'

(d) The 'candidate' should be given time and facilities to prepare for the test flight. The briefing should cover the following:

(1) the objective of the flight;

(2) licensing checks, as necessary;

(3) freedom for the 'candidate' to ask questions;

(4) operating procedures to be followed (for example operators manual);

(5) weather assessment;

(6) operating capacity of 'candidate' and examiner;

(7) aims to be identified by 'candidate';

(8) simulated weather assumptions (for example icing and cloud base);

(9) use of screens (if applicable);

(10) contents of exercise to be performed;

(11) agreed speed and handling parameters (for example V-speeds, bank angle, approach minima);

(12) use of R/T;

(13) respective roles of 'candidate' and examiner (for example during emergency);

(14) administrative procedures (for example submission of flight plan).

(e) The examiner applicant should maintain the necessary level of communication with the 'candidate'. The following check details should be followed by the examiner applicant:

(1) involvement of examiner in a MP operating environment;

(2) the need to give the 'candidate' precise instructions;

(3) responsibility for safe conduct of the flight;

(4) intervention by examiner, when necessary;

(5) use of screens;

(6) liaison with ATC and the need for concise, easily understood intentions;

(7) prompting the 'candidate' about required sequence of events (for example following a go-around);

(8) keeping brief, factual and unobtrusive notes.

ASSESSMENT

(f) The examiner applicant should refer to the flight test tolerances given in the relevant skill test. Attention should be paid to the following points:

(1) questions from the 'candidate';

(2) give results of the test and any sections failed;

(3) give reasons for failure.

DEBRIEFING

(g) The examiner applicant should demonstrate to the inspector the ability to conduct a fair, unbiased debriefing of the 'candidate' based on identifiable factual items. A balance between friendliness and firmness should be evident. The following points should be discussed with the 'candidate', at the applicant's discretion:

(1) advise the candidate on how to avoid or correct mistakes;

(2) mention any other points of criticism noted;

(3) give any advice considered helpful.

RECORDING OR DOCUMENTATION

(h) The examiner applicant should demonstrate to the inspector the ability to complete the relevant records correctly. These records may be:

(1) the relevant test or check form;

(2) licence entry;

(3) notification of failure form;

(4) relevant company forms where the examiner has privileges of conducting operator proficiency checks.

DEMONSTRATION OF THEORETICAL KNOWLEDGE

(i) The examiner applicant should demonstrate to the inspector a satisfactory knowledge of the regulatory requirements associated with the function of an examiner.

AMC1 FCL.1020; FCL.1025

QUALIFICATION OF SENIOR EXAMINERS

(a) A senior examiner specifically tasked by the competent authority to observe skill tests or proficiency checks for the revalidation of examiner certificates should:

(1) hold a valid or current examiner certificate appropriate to the privileges being given;

(2) have examiner experience level acceptable to the competent authority;

(3) have conducted a number of skill tests or proficiency checks as a Part-FCL examiner.

(b) The competent authority may conduct a pre-assessment of the applicant or candidate carrying out a skill test and proficiency check under supervision of an inspector of the competent authority.

(c) Applicants should be required to attend a senior examiner briefing, course or seminar arranged by the competent authority. Content and duration will be determined by the competent authority and should include:

(1) pre-course self-study;

(2) legislation;

(3) the role of the senior examiner;

(4) an examiner assessment;

(5) national administrative requirements.

(d) The validity of the authorisation should not exceed the validity of the examiners certificate, and in any case should not exceed 3 years. The authorisation may be revalidated in accordance with procedures established by the competent authority.

AMC1 FCL.1025 Validity, revalidation and renewal of examiner certificates

EXAMINER REFRESHER COURSE

The examiner refresher course should follow the content of the examiner standardisation course, included in AMC1 FCL.1015, and take into account specific contents adequate to the category of examiner affected.

GM1 FCL.1015(a); FCL.1025(b)(2)

EXAMINER STANDARDISATION COURSES AT AN ATO OR A DTO

In point FCL.1015(a) (second sentence) and in point FCL.1025(b)(2) (second sentence), the word 'may' is used to indicate that completing an examiner standardisation course or an examiner refresher course at a DTO is an option which can be used by examiners for sailplanes and balloons as an alternative to completing such courses provided by the competent authority or an ATO (first sentence in both point FCL.1015(a) and point FCL.1025(b)(2)).

AMC1 FCL.1030(b)(3) Conduct of skill tests, proficiency checks and assessments of competence

OBLIGATIONS FOR EXAMINERS APPLICATION AND REPORT FORMS

Common application and report forms can be found:

(a) For skill tests or proficiency checks for issue, revalidation or renewal of LAPL, BPL, SPL, PPL, CPL and IR in AMC1 to Appendix 7;

(b) For training, skill tests or proficiency checks for ATPL, MPL or class and type ratings, in AMC1 to Appendix 9;

(c) For EBT practical assessment, in AMC1 to Appendix 10;

(d) For assessments of competence for instructors, in AMC5 FCL.935.

GM1 FCL.1030(b)(3)(ii) Conduct of skill tests, proficiency checks and assessments of competence

REVALIDATION OF CLASS AND TYPE RATINGS — AEROPLANES — REQUIRED MANOEUVRES AND EXERCISES IN THE CONTEXT OF APPENDIX 10 (EBT PRACTICAL ASSESSMENT)

The confirmation that all the required manoeuvres and exercises have been completed means that during the period of validity of the type rating, the applicant has completed the operator's EBT programme applicable to that period.

SECTION 2 – SPECIFIC REQUIREMENTS FOR FLIGHT EXAMINERS – FE

Reserved

SECTION 3 – SPECIFIC REQUIREMENTS FOR TYPE RATING EXAMINERS – TRE

SECTION 4 – SPECIFIC REQUIREMENTS FOR CLASS RATING EXAMINER – CRE

SECTION 5 – SPECIFIC REQUIREMENTS FOR INSTRUMENT RATING EXAMINER – IRE

SECTION 6 – SPECIFIC REQUIREMENTS FOR SYNTHETIC FLIGHT EXAMINER – SFE

SECTION 7 – SPECIFIC REQUIREMENTS FOR THE FLIGHT INSTRUCTOR EXAMINER – FIE

APPENDICES TO ANNEX I

AMC1 to Appendix 3 Training courses for the issue of a CPL and an ATPL

GENERAL

(a) When ensuring that the applicant complies with the prerequisites for the course, in accordance with ORA.ATO.145, the ATO should check that the applicant has enough knowledge of mathematics, physics and English to facilitate the understanding of the theoretical knowledge instruction content of the course.

(b) Whenever reference is made to a certain amount of hours of training, this means a full hour. Time not directly assigned to training (such as breaks, etc.) is not to be counted towards the total amount of time that is required.

(c) The UPRT elements and components specified in AMC2 to Appendix 3; AMC1 to Appendix 5 point (a) should be integrated into the flying training phases or modules.

(d) The flight instruction syllabus should take into account the principles of TEM.

A. ATP integrated course: aeroplanes

(a) The ATP integrated course should last between 12 and 36 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

CREDITING

(b) Credit for previous experience given to an applicant who already holds a PPL should be entered into the applicant's training record. In the case of a student pilot who does not hold a pilot licence and with the approval of the competent authority, an ATO may designate certain dual exercises to be flown in a helicopter or a TMG up to a maximum of 20 hours.

THEORETICAL KNOWLEDGE

(c) The 750 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

The 750 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	35 hours
(2)	Aircraft general knowledge	100 hours
(3)	Flight performance and planning	120 hours
(4)	Human performance and limitations	35 hours
(5)	Meteorology	60 hours
(6)	Navigation	90 hours
(7)	Operational procedures	25 hours
(8)	Principles of flight	55 hours
(9)	Communications	20 hours

Other subdivisions of hours may be agreed upon between the competent authority and the ATO.

FLYING TRAINING

(d) The flying instruction is divided into six phases:

(1) Phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including:

(i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and precautions;

(iii) control of the aeroplane by external visual references;

(iv) normal take-offs and landings;

(v) the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;

(vi) simulated engine failure.

(2) Phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

(i) maximum performance (short field and obstacle clearance) takeoffs and short-field landings;

(ii) flight by reference solely to instruments, including the completion of a 180 ° turn;

(iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;

(iv) aerodrome and traffic pattern operations at different aerodromes;

(v) crosswind take-offs and landings;

(vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions;

(vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) Phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC.

The dual instruction and testing up to the VFR navigation progress test should comprise:

(i) repetition of exercises of phases 1 and 2;

(ii) VFR navigation progress test conducted by an FI not connected with the applicant’s training;

(iii) dual night flight instruction.

(4) Phase 4:

Exercises up to the instrument rating skill test comprise:

(i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which should be conducted by an FI or an authorised SFI;

(ii) 20 hours instrument time flown as SPIC;

(iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;

(iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

(A) transition from visual to instrument flight on take-off;

(B) SIDs and arrivals;

(C) en-route IFR procedures;

(D) holding procedures;

(E) instrument approaches to specified minima;

(F) missed approach procedures;

(G) landings from instrument approaches, including circling;

(v) in-flight manoeuvres and specific flight characteristics and the basic UPRT exercises as specified in Sections A, B, C and D of Table 2 in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;

(vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training should be conducted at a safe altitude unless carried out in an FSTD);

(vii) after completion of instrument training that is equivalent to the basic instrument flight module set out in AMC2 to Appendix 6, take-offs and landings as PIC at night.

(5) Phase 5: Advanced UPRT in accordance with point FCL.745.A;

(6) Phase 6:

(i) instruction and testing in MCC comprising the relevant training requirements;

(ii) if a type rating for single-pilot aeroplanes in multi-pilot operations, or multi-pilot aeroplanes is not required on completion of this phase, the applicant should be issued with a certificate of course completion for MCC training.

B. ATP modular theoretical knowledge course: aeroplanes

(a) The aim of this course is to train pilots who have not received the theoretical knowledge instruction during an integrated course to the level of theoretical knowledge required for the ATPL.

(b) An approved course may contain in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

(c) The ATP modular course should be completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

C. CPL/IR integrated course: aeroplanes

(a) The CPL/IR integrated course should last between 9 and 30 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

CREDITING

(b) Credit for previous experience given to an applicant who already holds a PPL should be entered into the applicant's training record. In the case of a student pilot who does not hold a pilot licence and with the approval of the competent authority, an ATO may designate certain dual exercises to be flown in a helicopter or a TMG up to a maximum of 20 hours.

THEORETICAL KNOWLEDGE

(c) The 500 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

The 500 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	25 hours
(2)	Aircraft general knowledge	75 hours
(3)	Flight performance and planning	80 hours
(4)	Human performance and limitations	20 hours
(5)	Meteorology	40 hours
(6)	Navigation	55 hours
(7)	Operational procedures	15 hours
(8)	Principles of flight	35 hours
(9)	Communications	15 hours

Other subdivisions of hours may be agreed upon between the competent authority and the ATO.

FLYING TRAINING

(d) The flying instruction is divided into four phases:

(1) Phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane, including:

(i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and precautions;

(iii) control of the aeroplane by external visual references;

(iv) normal take-offs and landings;

(v) the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;

(vi) simulated engine failure.

(2) Phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

(i) maximum performance (short field and obstacle clearance) take-offs and short-field landings;

(ii) flight by reference solely to instruments, including the completion of a 180° turn;

(iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;

(iv) aerodrome and traffic pattern operations at different aerodromes;

(v) crosswind take-offs and landings;

(vi) abnormal and emergency operations and manoeuvres, including simulated aeroplane equipment malfunctions;

(vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) Phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of instruction and at least 40 hours as PIC.

The dual instruction and testing up to the VFR navigation progress test and the skill test should contain the following:

(i) repetition of exercises of phases 1 and 2;

(ii) VFR navigation progress test conducted by an FI not connected with the applicant's training;

(iii) dual night flight instruction.

(4) Phase 4:

Exercises up to the instrument rating skill test comprise:

(i) at least 55 hours instrument time, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which should be conducted by an FI or SFI;

(ii) 20 hours instrument time flown as SPIC;

(iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;

(iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

(A) transition from visual to instrument flight on take-off;

(B) SIDs and arrivals;

(C) en-route IFR procedures;

(D) holding procedures;

(E) instrument approaches to specified minima;

(F) missed approach procedures;

(G) landings from instrument approaches, including circling.

(v) in-flight manoeuvres and particular flight characteristics and the basic UPRT exercises as specified in Sections A, B, C and D of Table 2 in paragraph (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;

(vi) operation of either an SE or an ME aeroplane in the exercises of (iv), including in the case of an ME aeroplane operation of the aeroplane solely by reference to instruments with one engine simulated inoperative and engine shut-down and restart. The latter exercise is to be conducted at a safe altitude unless carried out in an FSTD;

(vii) after completion of instrument training that is equivalent to the basic instrument flight module set out in AMC2 to Appendix 6, take-offs and landings as PIC at night.

D. CPL integrated course: aeroplanes

(a) The CPL integrated course should last between 9 and 24 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

CREDITING

(b) Credit for the hours flown should be entered into the applicant's training record. In the case of a student pilot who does not hold a pilot licence and with the approval of the competent authority, an ATO may designate certain dual exercises to be flown in a helicopter or a TMG up to a maximum of 20 hours.

THEORETICAL KNOWLEDGE

(c) The 350 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

FLYING TRAINING

(d) The flying instruction is divided into four phases:

(1) Phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane, including:

(i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and precautions;

(iii) control of the aeroplane by external visual references;

(iv) normal take-offs and landings;

(v) the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;

(vi) simulated engine failure.

(2) Phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

(i) maximum performance (short field and obstacle clearance) take-offs and short-field landings;

(ii) flight by reference solely to instruments, including the completion of a 180° turn;

(iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;

(iv) aerodrome and traffic pattern operations at different aerodromes;

(v) crosswind take-offs and landings;

(vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions;

(vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) Phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 30 hours instruction and at least 58 hours as PIC, including:

(i) at least 10 hours instrument time, which may contain 5 hours of instrument ground time in an FNPT or an FFS and should be conducted by an FI or SFI;

(ii) repetition of exercises of phases 1 and 2, which should include at least 5 hours in an aeroplane certificated for the carriage of at least four persons and have a variable pitch propeller and retractable landing gear;

(iii) night flight time including, g, after completion of instrument training that is equivalent to the basic instrument flight module set out in AMC2 to Appendix 6, take-offs and landings as PIC.

(4) Phase 4:

The dual instruction and testing up to the CPL(A) skill test contain the following:

(i) up to 30 hours instruction which may be allocated to specialised aerial work training;

(ii) repetition of exercises in Phase 3, as required;

(iii) in-flight manoeuvres and particular flight characteristics including the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;

(iv) ME training.

If required, operation of an ME aeroplane including operation of the aeroplane with one engine simulated inoperative, and engine shutdown and restart (the latter exercise at a safe altitude unless carried out in an FSTD).

E. CPL modular course: aeroplanes

(a) The CPL modular course should tbe completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

CREDITING

Applicants with prior experience as PIC may be credited with an amount of hours to meet the requirement of 150 hours of flight time of Appendix 3, Part E, point (3)(a). The amount of credited hours should be decided by the ATO where the applicant takes the training course on the basis of a pre-entry flight test, but in any case, should have been completed only in one aircraft category other than aeroplane.

THEORETICAL KNOWLEDGE

(b) The 250 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodromes or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

FLYING TRAINING

(c) The following flight time is suggested for the flying training:

(1) visual flight training:		suggested flight time
(i) Exercise 1: pre-flight operations: mass and balance determination, aeroplane inspection and servicing.		
(ii) Exercise 2: take-off, traffic pattern, approach and landing, use of checklist, collision avoidance and checking procedures.		0:45 hours

(iii) Exercise 3:

traffic patterns: simulated 0:45 hours
engine failure during and after take-off.

(iv) Exercise 4:

maximum performance 1:00 hours
(short field and obstacle clearance)
take-offs and short-field landings.

(v) Exercise 5:

crosswind take-offs, 1:00 hours
landings and go-arounds.

(vi) Exercise 6:

Arresting divergence of the aeroplane 0:45 hours
from intended flight path, Preventing flight
at airspeeds inappropriate for the (intended flight)
conditions, High airspeed (including flight at
relatively high airspeed), Steep turns Nose-low
attitudes at various bank angles (including spiral dive).

(vii) Exercise 7:

Arresting divergence of the aeroplane 0:45 hours
from intended flight path, Preventing flight
at airspeeds inappropriate for the (intended flight)
conditions, slow flight, nose-high attitudes
at various bank angles, spin avoidance, stall events
in the following configurations:

— take-off configuration,
— clean configuration, and
— landing configuration.

(viii) Exercise 8:

cross-country flying 10:00 hours
using DR and radio navigation aids; flight
planning by the applicant; filing of ATC flight plan;
evaluation of weather briefing documentation,
NOTAM, etc.; R/T procedures and phraseology;

positioning by radio navigation aids;
operation to, from and transiting controlled
aerodromes, compliance with ATS procedures
for VFR flights, simulated radio communication
failure, weather deterioration, diversion procedures;
simulated engine failure during cruise flight;
selection of an emergency landing strip.

(2) instrument flight training:

(i) This module's content is identical to that of the 10-hour basic instrument flight module as set out in AMC2 to Appendix 6. This module is focused on the basics of flying by sole reference to instruments, including limited panel and basic UPRT exercises as specified in Sections A, B and C of Table 2 in point (b) of AMC2 Appendix 3; AMC1 Appendix 5.

(ii) All exercises may be performed in an FNPT I or II or an FFS. If instrument flight training is in VMC, a suitable means of simulating IMC for the student should be used.

(iii) A BITD may be used for the following exercises: (9), (10), (11) and (14).

(iv) The use of the BITD is subject to the following:

(A) the training is complemented by exercises in an aeroplane;

(B) the record of the parameters of the flight is available;

(C) an FI(A) or IRI(A) conducts the instruction.

(v) Exercise 9:

Basic instrument flying without external visual cues; horizontal flight; power changes for acceleration or deceleration, maintaining straight and level flight; turns in level flight with 15° and 25° bank, left and right; roll-out onto predetermined headings. — 0:30 hours

(vi) Exercise 10:

Repetition of exercise 9; additionally climbing and descending, maintaining heading and speed, transition to horizontal flight; climbing and descending turns. — 0:45 hours

(vii) Exercise 11:

Instrument pattern: 0:45 hours

(1) start exercise, decelerate to approach speed, flaps into approach configuration;

(2) initiate standard turn (left or right);

(3) roll out on opposite heading, maintain new heading for 1 minute;

(4) standard turn, gear down, descend 500 ft/min;

(5) roll out on initial heading, maintain descent (500 ft/min) and new heading for 1 minute;

(6) transition to horizontal flight, 1.000 ft below initial flight level;

(7) initiate go-around;

(8) climb at best rate of climb speed.

(viii) Exercise 12:

Repetition of exercise 9 and steep turns with 45° bank; recovery from unusual attitudes. 0:45 hours

(ix) Exercise 13:

Repetition of exercise 12 0:45 hours

(x) Exercise 14:

Radio navigation using VOR, NDB or, if available, VDF; interception of predetermined QDM and QDR. 0:45 hours

(xi) Exercise 15:

Repetition of exercise 9 and recovery from nose-high attitudes at various bank angles, recovery from nose-low attitudes at various bank angles 0:45 hours

(xii) Exercise 16:

Repetition of exercise 9, turns and level change and recovery from nose-high attitudes at various bank angles, recovery from nose-low attitudes at various bank angles with simulated failure of the artificial horizon or directional gyro. 0:45 hours

(xiii) Exercise 17:

Basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5, excluding those manoeuvres which have already been completed during exercises 15 and 16	0:45 hours

(xiv) Exercise 18:

Repetition of exercises (14), (16) and (17).	3:00 hours

(3) ME training

If required, operation of an ME aeroplane in the exercises 1 through 17, including operation of the aeroplane with one engine simulated inoperative, and engine shutdown and restart. Before commencing training, the applicant should have complied with the type and class ratings requirements as appropriate to the aeroplane used for the test.

(4) Applicants who need to complete night training in accordance with point 10(b) of Section E of Appendix 3 to Part-FCL should perform take-offs and landings as PIC at night only after having completed the instrument flight training specified in point (2)(i) of 'FLYING TRAINING' of Section E of this AMC.

F. ATP/IR integrated course: helicopters

(a) The ATP/IR integrated course should last between 12 and 36 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

CREDITING

(b) Credit for the hours flown should be entered into the applicant's training record. In case of a student pilot who does not hold a pilot licence and with the approval of the competent authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

THEORETICAL KNOWLEDGE

(c) The 750 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress test, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

The 750 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	35 hours
(2)	Aircraft general knowledge	100 hours
(3)	Flight performance and planning	120 hours
(4)	Human performance and limitations	35 hours
(5)	Meteorology	60 hours
(6)	Navigation	90 hours
(7)	Operational procedures	25 hours
(8)	Principles of flight	55 hours
(9)	Communications	20 hours

Other subdivisions of hours may be agreed upon between the competent authority and the ATO.

(d) The flight instruction is divided into four phases:

(1) phase 1:

Flight exercises up to the first solo flight comprise a total of not less than 12 hours dual flight instruction on a helicopter, including:

(1) pre-flight operations, mass and balance determination, helicopter inspection and servicing;

(2) aerodrome and traffic pattern operations, collision avoidance and procedures;

(3) control of the helicopter by external visual reference;

(4) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;

(5) emergency procedures, basic auto-rotations, simulated engine failure, ground resonance recovery if relevant to type.

(2) phase 2:

Flight exercises until general handling and day VFR navigation progress check, and basic instrument flying progress check. This phase comprises a total flight time of not less than 128 hours including 73 hours of dual flight instruction flight time and including at least 5 hours VFR conversion training on an ME helicopter, 15 hours of solo flight and 40 hours flown as student PIC. The instruction and testing contain the following:

(i) sideways and backwards flight, turns on the spot;

(ii) incipient vortex ring recovery;

(iii) advanced/touchdown auto-rotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;

(iv) steep turns;

(v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;

(vi) limited power and confined area operations, including low level operations to and from unprepared sites;

(vii) flight by sole reference to basic flight instruments, including completion of a 180 ° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;

(viii) cross-country flying by external visual reference, DR and radio navigation aids, diversion procedures;

(ix) aerodrome and traffic pattern operations at different aerodromes;

(x) operations to, from and transiting controlled aerodromes; compliance with ATS procedures, R/T procedures and phraseology;

(xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;

(xii) night flight, including take-offs and landings as PIC;

(xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to Part-FCL, conducted by an FI not connected with the applicant's training.

(3) phase 3:

Flight exercises up to IR skill test. This part comprises a total of 40 hours dual instrument flight time, including 10 hours of an ME IFR certificated helicopter.

The instruction and testing should contain the following:

(i) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;

(ii) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

(A) transition from visual to instrument flight on take-off;

(B) SIDs and arrivals;

(C) en-route IFR procedures;

(D) holding procedures;

(E) instrument approaches to specified minima;

(F) missed approach procedure;

(G) landings from instrument approaches;

(H) in-flight manoeuvres and particular flight characteristics;

(I) instrument exercises with one engine simulated inoperative.

(4) phase 4:

Instruction in MCC should comprise the relevant training set out in FCL.735.H and AMC1 FCL.735.A, FCL.735.H and FCL.735.As.

If a type rating for MP helicopter is not required on completion of this part, the applicant should be provided with a certificate of course completion for MCC training.

G. ATP integrated course: helicopters

(a) The ATP integrated course should last between 12 and 36 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

CREDITING

(b) Credit for the hours flown should be entered into the applicant's training record. In case of a student pilot who does not hold a pilot licence and with the approval of the competent authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

THEORETICAL KNOWLEDGE

(c) The 650 hours of instruction, which also cover the area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

The 650 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	30 hours
(2)	Aircraft general knowledge	90 hours
(3)	Flight performance and planning	90 hours
(4)	Human performance and limitations	30 hours
(5)	Meteorology	50 hours
(6)	Navigation	70 hours
(7)	Operational procedures	20 hours
(8)	Principles of flight	45 hours
(9)	Communications	15 hours

Other subdivisions of hours may be agreed upon between the competent authority and the ATO.

(d) The flight instruction is divided into three phases:

(1) phase 1:

Flight exercises up to the first solo flight comprise a total of not less than 12 hours dual flight instruction on a helicopter, including:

(i) pre-flight operations, mass and balance determination, helicopter inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and procedures;

(iii) control of the helicopter by external visual reference;

(iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;

(v) emergency procedures, basic auto-rotations, simulated engine failure, ground resonance recovery if relevant to type.

(2) phase 2:

Flight exercises until general handling and day VFR navigation progress and basic instrument flying progress check conducted by an FI not connected with the applicant's training. This phase comprises a total flight time of not less than 128 hours, including 73 hours of dual instruction flight time and including at least 5 hours VFR conversion training on an ME helicopter, 15 hours of solo flight and 40 hours flown as student PIC. The instruction and testing contain the following:

(i) sideways and backwards flight, turns on the spot;

(ii) incipient vortex ring recovery;

(iii) touchdown or advanced auto-rotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;

(iv) steep turns;

(v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;

(vi) limited power and confined area operations, including low level operations to and from unprepared sites;

(vii) 10 hours flight by sole reference to basic flight instruments, including completion of a 180 ° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;

(viii) cross-country flying by external visual reference, DR and radio navigation aids, diversion procedures;

(ix) aerodrome and traffic pattern operations at different aerodromes;

(x) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;

(xii) night flight, including take-offs and landings as PIC;

(xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to Part-FCL, conducted by an FI not connected with the applicant’s training.

(3) phase 3:

Instruction in MCC comprises the relevant training set out in FCL.735.H and AMC1 FCL.735.A, FCL.735.H and FCL.735.As.

If a type rating for MP helicopter is not required on completion of this part, the applicant should be provided with a certificate of course completion for MCC training.

H. ATP modular theoretical knowledge course: helicopters

(a) The aim of this course is to train pilots who have not received the theoretical knowledge instruction during an integrated course to the level of theoretical knowledge required for the ATPL.

(b) An approved course, which also covers the area 100 KSA, may contain in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

(c) The ATP modular course should be completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

I. CPL/IR integrated course: helicopters

(a) The CPL/IR integrated course should last between 9 and 30 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

CREDITING

(b) Credit for the hours flown should be entered into the applicant's training record. In case of a student pilot who does not hold a pilot licence and with the approval of the competent authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

THEORETICAL KNOWLEDGE

(c) The 500 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

The 500 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	25 hours
(2)	Aircraft general knowledge	75 hours
(3)	Flight performance and planning	80 hours
(4)	Human performance and limitations	20 hours
(5)	Meteorology	40 hours
(6)	Navigation	55 hours
(7)	Operational procedures	15 hours
(8)	Principles of flight	35 hours
(9)	Communications	15 hours

Other subdivision of hours may be agreed upon between the competent authority and the ATO.

FLYING TRAINING

(d) The flight instruction is divided into three phases:

(1) phase 1:

Flight exercises up to the first solo flight. This part comprises a total of at least 12 hours dual flight instruction on a helicopter including:

(i) pre-flight operations: mass and balance determination, helicopter inspection and servicing;

(ii) aerodrome and traffic pattern operations, collision avoidance and procedures;

(iii) control of the helicopter by external visual reference;

(iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;

(v) emergency procedures, basic auto-rotation, simulated engine failure, ground resonance recovery if relevant to type.

(2) phase 2:

Flight exercises until general handling and day VFR navigation progress check conducted by an FI not connected with the applicant’s training, and basic instrument progress check. This part comprises a total flight time of not less than 128 hours, including 73 hours of dual instruction flight time and including at least 5 hours VFR conversion training on an ME helicopter, 15 hours of solo flight and 40 hours flown as SPIC. The instruction and testing contain the following:

(i) sideways and backwards flight, turns on the spot;

(ii) incipient vortex ring recovery;

(iii) touchdown or advanced auto-rotation and simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;

(iv) steep turns;

(v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;

(vi) limited power and confined area operations, including selection of and low level operations to and from unprepared sites;

(vii) flight by sole reference to basic flight instruments, including completion of 180 degree turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;

(viii) cross-country flying by external visual reference, DR and radio navigation aids and diversion procedures;

(ix) aerodrome and traffic pattern operations at different aerodromes;

(x) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;

(xii) night flight, including take-offs and landings as PIC;

(xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to Part-FCL, conducted by an FI not connected with the applicant’s training.

(3) phase 3:

Flight exercises up to IR skill test. This part comprises a total of 40 hours dual instrument flight time, including 10 hours of an ME IFR certificated helicopter.

The instruction and testing should contain the following:

(i) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;

(ii) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

(A) transition from visual to instrument flight on take-off;

(B) SIDs and arrivals;

(C) en-route IFR procedures;

(D) holding procedures;

(E) instrument approaches to specified minima;

(F) missed approach procedure;

(G) landings from instrument approaches;

(H) in-flight manoeuvres and particular flight characteristics;

(I) instrument exercises with one engine simulated inoperative.

J. CPL integrated course: helicopters

(a) The CPL integrated course should last between 9 and 24 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

CREDITING

(b) Credit for the hours flown should be entered into the applicant’s training record. In case of a student pilot who does not hold a pilot licence and with the approval of the competent authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

THEORETICAL KNOWLEDGE

(c) The 350 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

The 350 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	15 hours
(2)	Aircraft general knowledge	40 hours
(3)	Flight performance and planning	35 hours
(4)	Human performance and limitations	10 hours
(5)	Meteorology	30 hours
(6)	Navigation	35 hours
(7)	Operational procedures	10 hours
(8)	Principles of flight	30 hours
(9)	Communications	10 hours

Other subdivisions of hours may be agreed upon between the competent authority and the ATO.

FLYING TRAINING

(d) The flight instruction is divided into two phases:

(1) phase 1:

Flight exercises up to the first solo flight. This part comprises a total of not less than 12 hours dual flight instruction on a helicopter, including:

(1) pre-flight operations: mass and balance determination, helicopter inspection and servicing;

(2) aerodrome and traffic pattern operations, collision avoidance and procedures;

(3) control of the helicopter by external visual reference;

(4) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;

(5) emergency procedures, basic auto-rotations, simulated engine failure, ground resonance recovery if relevant to type.

(2) phase 2:

Flight exercises until general handling and day VFR navigation progress check conducted by an FI not connected with the applicant's training, and basic instrument progress check. This part comprises a total flight time of not less than 123 hours, including 73 hours of dual instruction flight time, 15 hours of solo flight and 35 hours flown as SPIC. The instruction and testing contain the following:

(i) sideways and backwards flight, turns on the spot;

(ii) incipient vortex ring recovery;

(iii) touchdown or advanced auto-rotations and simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;

(iv) steep turns;

(v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;

(vi) limited power and confined area operations, including selection of and low level operations to and from unprepared sites;

(vii) flight by sole reference to basic flight instruments, including completion of a 180° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;

(viii) cross-country flying by external visual reference, DR and radio navigation aids, diversion procedures;

(ix) aerodrome and traffic pattern operations at different aerodromes;

(x) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

(xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;

(xii) night flight, including take-offs and landings as PIC;

(xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to Part-FCL, conducted by an FI not connected with the applicant's training.

K. CPL modular course: helicopters

(a) The CPL modular course should be completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

CREDITING

Applicants with prior experience as PIC may be credited with an amount of hours to meet the requirement of 150 hours of flight time of Appendix 3, Part K, point (3)(a).

The amount of credited hours should be decided by the ATO where the applicant takes the training course on the basis of a pre-entry flight test, but in any case, should have been completed only in one aircraft category other than helicopter, and not be a combination of hours in more than two different aircraft categories.

THEORETICAL KNOWLEDGE

(b) The 250 hours of instruction, which also covers the Area 100 KSA may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

FLYING TRAINING

(c) The flying instruction comprises the following items. The flight time allocated to each exercise is at the discretion of the FI, provided that at least 5 hours flight time is allocated to cross-country flying.

VISUAL INSTRUCTION

(d) Within the total of dual flight instruction time, the applicant may have completed during the visual phase up to 5 hours in a helicopter FFS or FTD 2, 3 or FNPT II, III.

(1) pre-flight operations: mass and balance calculations, helicopter inspection and servicing;

(2) level flight speed changes, climbing, descending, turns, basic autorotations, use of checklist, collision avoidance and checking procedures;

(3) take-offs and landings, traffic pattern, approach, simulated engine failures in the traffic pattern. Sideways and backwards flight and spot turns in the hover;

(4) recovery from incipient vortex ring condition;

(5) advanced auto-rotations covering the speed range from low speed to maximum range and manoeuvre in auto-rotations (180°, 360° and`'S' turns) and simulated engine-off landings;

(6) selection of emergency landing areas, auto-rotations following simulated emergencies to given areas and steep turns at 30° and 45° bank;

(7) manoeuvres at low level and quick-stops;

(8) landings, take-offs and transitions to and from the hover when heading out of wind;

(9) landings and take-offs from sloping or uneven ground;

(10) landings and take-offs with limited power;

(11) low level operations into and out of confined landing sites;

(12) cross-country flying using dead reckoning and radio navigation aids, flight planning by the applicant, filing of ATC flight plan, evaluation of weather briefing documentation, NOTAM, etc., R/T procedures and phraseology, positioning by radio navigation aids; operation to, from and transiting controlled aerodromes, compliance with ATS procedures for VFR flights, simulated radio communication failure, weather deterioration, diversion procedures; location of an off airfield landing site and simulated approach.

BASIC INSTRUMENT INSTRUCTION

(e) A maximum of 5 hours of the following exercises may be performed in an FFS or FTD or FNPT. Flight training should be carried out in VMC using a suitable means of simulating IMC for the student.

(1) Exercise 1:

Instrument flying without external visual cues. Level flight performing speed changes, maintaining flight altitude (level, heading) turns in level flight at rate 1 and 30° bank, left and right; roll-out on predetermined headings;

(2) Exercise 2:

repetition of exercise 1; additionally climbing and descending, maintaining heading and speed, transition to horizontal flight; climbing and descending turns;

(3) Exercise 3:

repetition of exercise 1; and recovery from unusual attitudes;

(4) Exercise 4:

radio navigation;

(5) Exercise 5:

repetition of exercise 1; and turns using standby magnetic compass and standby artificial horizon (if fitted).

AMC2 to Appendix 3; AMC1 to Appendix 5

BASIC UPRT FOR AEROPLANE ATP INTEGRATED, CPL/IR INTEGRATED, CPL INTEGRATED AND CPL MODULAR COURSES AS WELL AS MPL COURSE PHASES 1 TO 3

(a) BASIC UPRT ELEMENTS AND COMPONENTS

In order for student pilots to develop the competencies to prevent and recover from aeroplane upsets, the basic UPRT elements and respective components in the following Table 1 should be integrated into the flying training modules and phases, such that all the elements are covered.

Table 1: Basic UPRT elements and components		Pre-flight briefing	Flying training
A.	**Aerodynamics**		
1.	General aerodynamic characteristics	•	•
2.	Aeroplane certification and limitations	•	•
4.	Aerodynamics (high and low altitude)	•	
5.	Aeroplane performance (high and low altitude)	•	
6.	AoA and stall awareness	•	•
7.	Aeroplane stability	•	•
8.	Control surface fundamentals	•	•
9.	Use of trim	•	•
10.	Icing and contamination effects	•	•
11.	Propeller slipstream (as applicable)	•	•
B.	**Causes of and contributing factors to upsets**		
1.	Environmental	•	
2.	Pilot-induced	•	
3.	Mechanical (aeroplane systems)	•	
C.	**Safety review of accidents and incidents relating to aeroplane upsets**		
1.	Safety review of accidents and incidents relating to aeroplane upsets	•	
D.	**G-load awareness and management**		
1.	Positive/negative/increasing/decreasing G-loads	•	•
2.	Lateral G awareness (sideslip)	•	•
3.	G-load management	•	•
E.	**Energy management**		
1.	Kinetic energy vs potential energy vs chemical energy (power)	•	•
F.	**Flight path management**		
1.	Relationship between pitch, power and performance	•	•
2.	Performance and effects of differing power plants	•	•

Table 1: Basic UPRT elements and components		Pre-flight briefing	Flying training
3.	Manual and automation inputs for guidance and control (if applicable)	•	•
4.	Class-specific characteristics of flight path management	•	•
5.	Management of go-arounds from various stages during the approach	•	•
6.	Automation management (if applicable)	•	•
7.	Proper use of rudder	•	•
G.	**Recognition**		
1.	Class-specific examples of physiological, visual and instrument clues during developing and developed upset	•	•
2.	Pitch/power/roll/yaw	•	•
3.	Effective scanning (effective monitoring)	•	•
4.	Stall protection systems and cues	•	•
5.	Criteria for identifying stalls and upsets	•	•
H.	**System malfunction** (including immediate handling and subsequent operational considerations, as applicable)		
1.	Flight control defects	•	•
2.	Engine failure (partial or full)	•	•
3.	Instrument failures	•	•
4.	Loss of reliable airspeed (training elements as per point (lb) of AMC2 ORA.ATO.125).	•	•
5.	Automation failures	•	•
6.	Stall protection system failures, including icing alerting systems	•	•

(b) MANOEUVRE-BASED UPRT EXERCISES

The following Table 2 contains manoeuvre-based basic UPRT exercises.

Table 2: Manoeuvre-based basic UPRT exercises		Pre-flight briefing	Flying training
A.	**Timely and appropriate intervention**		
1.	Arresting divergence of the aeroplane from intended flight path	•	•
2.	Preventing flight at airspeeds inappropriate for the (intended flight) condition	•	•
3.	Avoiding spins	•	•
B.	**Flight path management**		
1.	Steep turns	•	•
2.	Slow flight (including flight at critically low airspeed)	•	•

3.	High airspeed (including flight at relatively high airspeed)	•	•
C.	**Application of OEM recommendations (if applicable) during developing upsets**		
1.	Nose-high attitudes at various bank angles	•	•
2.	Nose-low attitudes at various bank angles (including spiral dive)	•	•
D.	**Stall events in the following configurations**		
1.	Take-off configuration	•	•
2.	Clean configuration	•	•
3.	Landing configuration	•	•

(c) INTEGRATION OF TEM, PILOT CORE COMPETENCIES, AND HUMAN FACTORS

Threat and Error Management (TEM), pilot competencies and human factors, as shown in the following Table 3 below, should be integrated into the flying training modules and phases as appropriate.

Table 3: Core elements and components of TEM, pilot competencies and human factors		Pre-flight briefing	Flying training
A.	**TEM**		
1.	TEM framework	•	•
2.	Recognition of threats and errors	•	•
3.	Management of threats and errors	•	•
4.	Countermeasures against threats and errors to prevent undesired aircraft states, including early intervention and, when necessary to prevent upsets, timely application of countermeasures to manage undesired aircraft states	•	•
B.	**Pilot Competencies, including CRM**		
1.	All elements listed in Table 1 of GM2 FCL.735.A	•	•
C.	**Human factors**		
1.	Instrument interpretation, active monitoring, checking	•	•
2.	Distraction, inattention, fixation, fatigue	•	•
3.	Human information processing, cognitive effects	•	•
4.	Perceptual illusions (visual or physiological) and spatial disorientation, effects of G-loads	•	•
5.	Stress, startle and surprise effect	•	•
6.	Intuitive and counter-intuitive behaviour	•	•

GM1 to Appendix 3; Appendix 5

BASIC UPRT EXERCISES

(a) GENERAL

The training objective of the basic UPRT exercises is for the student to achieve competence in applying prevention and recovery techniques. In order to meet the training objectives, some UPRT exercises will involve operation at altitudes, speeds and g-loadings that are not required for other parts of the training course. When designing training courses, ATOs should ensure that the aircraft used for these exercises will allow the training objectives to be achieved while maintaining a margin of safety to aircraft limitations in accordance with the training envelope, as determined by the ATO (see GM1 ORA.ATO.125 point (f)).

(b) UPRT WITH REFERENCE TO INSTRUMENTS

Basic UPRT exercises completed by reference to instruments (i.e. in simulated instrument meteorological conditions (IMC)) should involve only moderate excursions from the speeds and attitudes used in normal instrument flight. Exercises conducted in IMC should not be planned to involve ‘unusual attitudes’.

(c) INSTRUCTORS DELIVERING BASIC UPRT

Instructors conducting basic UPRT training during the CPL or ATP course do not require any additional qualifications. It is the responsibility of the ATO to ensure that instructors are competent to deliver effective training on all parts of the course and also that they are competent to recover the aircraft in the event that a student erroneously conducts any UPRT exercise.

(d) APPLICATION OF OEM RECOMMENDATIONS DURING DEVELOPING UPSETS

Stall recovery training exercises as well as nose-high and nose-low prevention training exercises use the recovery strategies recommended by the OEMs contained in Tables 1, 2 and 3 below.

Note: As OEM procedures always take precedence over the general strategies as recommended by the OEMs, ATOs should consult the OEM on whether any approved specific procedures are available prior to using the templates.

Refer to revision 3 of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA) for a detailed explanation and rationale of nose-high and nose-low recovery strategies as recommended by the OEMs.

Table 1: Stall event recovery template		
Pilot Flying (PF) Immediately do the following at first indication of a stall (aerodynamic buffeting, reduced roll stability and aileron effectiveness, visual or aural cues and warnings, reduced elevator (pitch) authority, inability to maintain altitude or arrest rate of descent, stick shaker activation (if installed)) during any flight phases except at lift-off.		
1.	**AUTOPILOT — DISCONNECT (IF APPLICABLE)**	

	(A large out-of-trim condition could be encountered when the autopilot is disconnected)	
2.	**AUTOTHROTTLE — OFF (IF APPLICABLE)**	
3.	**(a) NOSE-DOWN PITCH CONTROL** apply until stall warning is eliminated **(b) NOSE-DOWN PITCH TRIM** (as needed) (Reduce the AoA whilst accepting the resulting altitude loss.)	
4.	**BANK — WINGS LEVEL**	
5.	**POWER — ADJUST** (as needed) (Thrust reduction for aeroplanes with underwing-mounted engines may be needed)	
6.	**SPEEDBRAKES/SPOILERS — RETRACT**	
7.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary	

Table 2: Nose-high recovery strategy template		
Recognise and confirm the developing situation by announcing **'nose high'**		
Pilot Flying (PF)		
1.	**AUTOPILOT — DISCONNECT (if applicable)** (A large out-of-trim condition could be encountered when the autopilot is disconnected)	
2.	**AUTOTHROTTLE — OFF** (if applicable)	
3.	**APPLY** as much nose-down control input as required to obtain a nose-down pitch rate	
4.	**POWER — ADJUST** (if required)	
5.	**ROLL — ADJUST** (if required) (Avoid exceeding 60-degree bank)	
6.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	
NOTE: (1) Recovery to level flight may require use of pitch trim. (2) WARNING: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.		

Table 3: Nose-low recovery strategy template		
Recognise and confirm the developing situation by announcing **'nose low'** (If the autopilot or autothrottle is responding correctly, it may not be appropriate to decrease the level of automation while assessing if the divergence is being stopped)		
Pilot Flying (PF)		
1.	**AUTOPILOT — DISCONNECT (if applicable)** (A large out-of-trim condition could be encountered when the autopilot is disconnected)	
2.	**AUTOTHROTTLE — OFF** (if applicable)	
3.	**RECOVERY** from stall (if required)	

4.	**ROLL** in the shortest direction to wings level (It may be necessary to reduce the G-loading by applying forward control pressure to improve roll effectiveness)	
5.	**POWER** and **DRAG — ADJUST** (if required)	
6.	**RECOVER** to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	
NOTE: (1) Recovery to level flight may require use of pitch trim. (2) WARNING: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.		

ADDITIONAL GUIDANCE

(e) Specific guidance on UPRT is available in the latest revision of ICAO Doc 10011 ‘Manual on Aeroplane Upset Prevention and Recovery Training’.

GM1 to Appendix 3; Appendix 6; FCL.735.H

OVERVIEW OF FSTD TRAINING CREDITS FOR DUAL INSTRUCTION IN HELICOPTER FLYING TRAINING COURSES

		ATPL(H)/IR integrated			FSTD credits
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual, including ME T/R training	75 hrs	15 hrs	40 hrs	130 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	20 hrs FFS or FTD 2, 3 or FNPT II/III or 10 hrs in at least an FNPT I
Instrument rating training	40 hrs	-		40 hrs	
MCC	15 hrs	-	-	15 hrs	15 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
Total	140 hrs	55 hrs		195 hrs	Note 2

		ATPL(H)/VFR integrated			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual including ME T/R training	75 hrs	15 hrs	40 hrs	130 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	5 hrs in at least an FNPT I
MCC / VFR	10 hrs	-	-	10 hrs	10 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
Total	95 hrs	55 hrs		150 hrs	Note 2

		CPL(H)/IR integrated			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual including ME T/R training	75 hrs	15 hrs	40hrs	130 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	20 hrs FFS or FTD 2, 3 or FNPT II/III or 10 hrs in at least an FNPT I
Instrument rating training	40 hrs	-		40 hrs	
Total	125 hrs	55 hrs		180 hrs	Note 2

		CPL(H) Integrated			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual	75 hrs	15 hrs	35 hrs	125 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	5 hrs in at least an FNPT I
Total	85 hrs	50 hrs		135 hrs	Note 2

		CPL(H) modular			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual	20 hrs	-	-	20 hrs	5 hrs FFS or FTD 2, 3 or FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	5 hrs in at least an FNPT I
Total	30 hrs	-	-	30 hrs	Note 2

		IR(H) modular			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
SE	50 hrs	-	-	50 hrs	35 hrs FFS or FTD 2, 3 or FNPT II/III or 20 hrs FNPT I (H) or (A)
ME	55 hrs	-	-	55 hrs	40 hrs FFS; FTD 2, 3 FNPT II/III or 20 hrs FNPT I (H) or (A)

		MCC(H)			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT

MCC / IR	20 hrs	-	-	20 hrs	20 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
MCC / VFR	15 hrs	-	-	15 hrs	15 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
MCC / IR for MCC/VFR holders	5 hrs	-	-	5 hrs	5 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)

Note 1: In this matrix, FSTD credits refer to helicopter FSTDs, if not mentioned otherwise.

Note 2: Total credits for the FSTDs used in the course are not provided in the tables as the FSTDs may be used in various combinations. The FSTD credits provided in the tables for the separate phases of the course are the maximum FSTD credits available for each phase.

GM1 to Appendix 3 Example of a grading system for practical flight training during ATP, CPL and MPL courses grading system

An ATPL/CPL/MPL grading system may be developed by using the grading system in GM3 FCL.735.A.

GM1 to Appendix 5 Integrated MPL training course

GENERAL

(a) In broad terms, the MPL holder is expected to be able to complete the airline operators' conversion course with a high probability of success and within the time frame normally allowed for this phase. The standard is equivalent to what is currently expected from graduates of the ATP(A) integrated course who have completed type rating training.

(b) The general approach is to use the existing ATP(A) integrated training course as a reference and to implement progressively the MPL integrated training course and specifically the transfer from actual flight to simulated flight.

(c) This transfer should be organised in a way that is similar to the approach used for ETOPS. Successive evolutions of the training syllabus introduce progressively a higher level of simulated flight and a reduction of actual flight. Change from one version to the next should only take place after enough experience has been gained and once its results, including those of airline operator conversion courses, have been analysed and taken into account.

MPL TRAINING SCHEME

(d) The specific arrangement, pursuant to ORA.GEN.205, between an approved training organisation (ATO) and an operator for the multi-pilot licence (MPL) training should cover at least the following points:

(1) pre-entry requirements (including screening and selection);

(2) provision of the relevant documentation (operations manuals (OMs) and training manuals);

(3) design of the training programme;

(4) content of the operator conversion course;

(5) training effectiveness (e.g. continuous monitoring system, progress checks, etc.);

(6) provision of base training;

(7) graduate performance data feedback from the operator to the ATO;

(8) course evaluation and improvement; and

(9) alignment of the grading and assessment criteria.

The ATO and operator may use their OMs and training manuals to identify additional areas to be covered by the specific arrangement.

The following scheme should be applied:

MPL Training Scheme

Adapted competency model	Phases of training	Training items	Flight and simulated flight training media - Minimum level requirement -		Ground training media
	Phase 4 — advanced Type rating training covering the training content of Appendix 9 to Part-FCL within an airline-oriented environment	• TEM and CRM • Landing training • All weather • LOFT • Abnormal procedures • Normal procedures • Type-specific UPRT	Aeroplane: ME Multi-crew certified FSTD FS level D or C + ATC simulation	6 to 12 take-offs and landings as PF (in accordance with point 11 of Appendix 5) One go-around with all engines operating (refer to GM1 to Appendix 9 (d). PF / PM	• E-learning • Part-task trainer • Class-room
	Phase 3 — intermediate Application of multi-crew operations in a high-performance ME turbine aeroplane	• TEM and CRM • LOFT • Abnormal procedures • Normal procedures • Multi-crew • Instrument flight • Non-type-specific UPRT	FSTD: *representing an ME turbine-powered aeroplane to be operated with a co-pilot and qualified to an equivalent standard to level B + ATC simulation*	PF / PM	
	Phase 2 — basic Introduction of multi-crew operations and instrument flight	• TEM and CRM • PF / PM complement • IFR cross-country • Instrument flight • Night flight	Aeroplane: SE or ME FSTD: FNPT II + MCC	PF / PM	
	Phase 1 — core flying skills Specific basic SP training	• TEM and CRM • VFR cross-country • Solo flight • Basic instrument flight • Principles of flight • Cockpit procedures • Upset recovery in an aeroplane • Night flight	Aeroplane: SE or ME FSTD: FNPT I / BITD	PF	

THEORETICAL KNOWLEDGE INSTRUCTION

(e) The 750 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:

(1) classroom work;

(2) lessons;

(3) tutorials;

(4) demonstrations, including those supported by demonstration equipment;

(5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(6) exercises that use demonstration equipment or training devices;

(7) directed study including workbook exercises or assignments;

(8) aerodrome or aviation industry field trips;

(9) computer-based training and e-learning elements;

(10) progress tests, Area 100 KSA assessments and mental maths test(s); and

(11) other training methods, media and tools approved by the competent authority.

COMPETENCY UNITS, COMPETENCY ELEMENTS AND PERFORMANCE CRITERIA

(f) Apply human performance principles, including principles of threat and error management:

(1) cooperation;

(2) leadership and managerial skills;

(3) situation awareness;

(4) decision making.

These behaviour categories are intended to help in the effective utilisation of all available resources to achieve safe and efficient operations.

These behaviour categories may be adapted and extended to incorporate issues like communication and use of automation if it is considered to be relevant to the development of the curriculum.

(g) Perform Aircraft Ground and Pre-Flight Operations

List of competency elements and performance criteria:

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

Duty Observation and assessment

Satisfactory (S)

Unsatisfactory (U)

(2) perform dispatch duties: (S) or (U)

(i) verifies technical condition of the a/c, including adequate use of MEL; PF/PNF

(ii) checks technical bulletins and notices; PF/PNF

(iii) determines operational environment and pertinent weather; PF/PNF

(iv) determines impact of weather on aircraft performance;PF/PNF

(v) applies flight planning and load procedures; PF/PNF

(vi) determines fuel requirement; PF/PNF

(vii) files an ATS flight plan (if required) PF/PNF

(3) provide flight crew and cabin crew briefings; (S) or (U)

(i) briefed flight crew in all relevant matters; PF

(ii) briefed cabin crew in all relevant matters. PF

(4) perform pre-flight checks and cockpit preparation: (S) or (U)

(i) ensures the airworthiness of the aircraft; PF

(ii) performs the cockpit preparation and briefings; PF/PNF

(iii) performs FMS initialisation, data insertion and confirmation; PF/PNF

(iv) optimises and checks take-off performance and take-off data calculation. PF/PNF

(5) perform engine start: (S) or (U)

(i) asks for, receives acknowledges and checks ATC clearance; PNF

(ii) performs engine start procedure; PF/PNF

(iii) uses standard communication procedures with ground crew and ATC. PF/PNF

(6) perform taxi out: (S) or (U)

(i) receives, checks and adheres to taxi clearance; PNF

(ii) taxis the aircraft, including use of exterior lighting; PF

(iii) complies to taxi clearance; PF/PNF

(iv) maintains look-out for conflicting traffic and obstacles; PF/PNF

(v) operates thrust, brakes and steering; PF

(vi) conducts relevant briefings; PF

(vii) uses standard communication procedures with crew and ATC; PNF

(viii) completes standard operating procedures and checklists; PF/PNF

(ix) updates and confirms FMS data; PF/PNF

(x) manages changes in performance and departure route; PF/PNF

(xi) completes de or anti-ice procedures. PF/PNF

(7) manage abnormal and emergency situations: (S) or (U)

(i) identifies the abnormal condition; PF/PNF

(ii) interprets the abnormal condition; PF/PNF

(iii) performs the procedure for the abnormal condition. PF/PNF

(8) communicate with cabin crew, passengers and company: (S) or (U)

(i) communicates relevant information with cabin crew; PF

(ii) communicates relevant information with company; PF/PNF

(iii) makes passenger announcements when appropriate. PF/PNF

(h) Perform take-off

List of competency elements and performance criteria:

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of including recognising flight, and managing potential

(2) perform pre threats and errors. -take-off and predeparture preparation: (S) or (U)

(i) checks and acknowledges line up clearance; PF/PNF

(ii) checks correct runway selection; PF/PNF

(iii) confirms validity of performance data; PF/PNF

(iv) checks approach sector and runway are clear; PF/PNF

(v) confirms all checklists and take-off preparations completed; PF/PNF

(vi) lines up the aircraft on centreline without losing distance; PF

(vii) checks weather on departure sector; PF/PNF

(viii) checks runway status and wind. PF/PNF

(3) perform take-off roll: (S) or (U)

(i) applies take-off thrust; PF

(ii) checks engine parameters; PNF

(iii) checks air speed indicators; PF/PNF

(iv) stays on runway centreline. PF

(4) perform transition to instrument flight rules: (S) or (U)

(i) applies v1 procedures; PF/PNF

(ii) rotates at vr to initial pitch attitude; PF

(iii) establishes initial wings level attitude; PF

(iv) retracts landing gear; PNF

(v) maintains climb out speed. PF

(5) perform initial climb to flap retraction altitude: (S) or (U)

(i) sets climb power; PF

(ii) adjusts attitude for acceleration; PF

(iii) selects flaps according flap speed schedule; PF/PNF

(iv) observes speed restrictions; PF

(v) completes relevant checklists. PF/PNF

(6) perform rejected take-off: (S) or (U)

(i) recognises the requirement to abort the take-off; PF

(ii) applies the rejected take-off procedure; PF

(iii) assesses the need to evacuate the aircraft. PF/PNF

(7) perform navigation: (S) or (U)

(i) complies to departure clearance; PF

(ii) complies with published departure procedures, for example speeds; PF

(iii) monitors navigation accuracy; PF/PNF

(iv) communicates and coordinates with ATC. PNF

(8) manage abnormal and emergency situations: (S) or (U)

(i) identifies the abnormal condition; PF/PNF

(ii) interprets the abnormal condition; PF/PNF

(iii) performs the procedure for the abnormal condition. PF/PNF

(i) Perform climb

List of competency elements and performance criteria:

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

(2) perform SID or en-route navigation: (S) or (U)

(i) complies with departure clearance and procedures; PF

(ii) demonstrates terrain awareness; PF/PNF

(iii) monitors navigation accuracy; PF/PNF

(iv) adjusts flight to weather and traffic conditions; PF

(v) communicates and coordinates with ATC; PNF

(vi) observes minimum altitudes; PF/PNF

(vii) selects appropriate level of automation; PF

(viii) complies with altimeter setting procedures. PF/PNF

(3) complete climb procedures and checklists: (S) or (U)

(i) performs the after take-off items; PF/PNF

(ii) confirms and checks according checklists. PF/PNF

(4) modify climb speeds, rate of climb and cruise altitude: (S) or (U)

(i) recognises the need to change speed, Rate of climb or cruise altitude; PF

(ii) selects and maintains the appropriate climb speed or rate of climb; PF

(iii) selects optimum cruise flight level. PF/PNF

(5) perform systems operations and procedures: (S) or (U)

(i) monitors operation of all systems; PF/PNF

(ii) operates systems as required. PF/PNF

6) manage abnormal and emergency situations: (S) or (U)

(i) identifies the abnormal condition; PF/PNF

(ii) interprets the abnormal condition; PF/PNF

(iii) performs the procedure for the abnormal condition. PF/PNF

(7) communicate with cabin crew, passengers and company: (S) or (U)

(i) communicates relevant information with cabin crew; PF

(ii) communicates relevant information with company; PF/PNF

(iii) makes passenger announcements when appropriate. PF

(j) Perform cruise

List of competency elements and performance criteria.

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

(2) monitor navigation accuracy: (S) or (U)

(i) demonstrates adequate area knowledge; PF/PNF

(ii) demonstrates adequate route knowledge; PF/PNF

(iii) navigates according to flight plan and clearance; PF

(iv) adjusts flight to weather and traffic conditions; PF

(v) communicates and coordinates with ATC; PNF

(vi) observes minimum altitudes; PF/PNF

(vii) uses all means of automation. PF

(3) monitor flight progress: (S) or (U)

(i) selects optimum speed; PF

(ii) selects optimum cruise flight level; PF

(iii) monitors and controls fuel status; PF/PNF

(iv) recognises the need for a possible diversion; PF/PNF

(v) creates a diversion contingency plan if required. PF/PNF

(4) perform descent and approach planning: (S) or (U)

(i) checks weather of destination and alternate airport; PF/PNF

(ii) checks runway in use and approach procedure; PF/PNF

(iii) sets the FMS accordingly; PNF

(iv) checks landing weight and landing distance required; PNF

(v) checks MEA, MGA and MSA; PF/PNF

(vi) identifies top of descent point. PF

(5) perform systems operations and procedures: (S) or (U)

(i) monitors operation of all systems; PF/PNF

(ii) operates systems as required. PNF

(6) manage abnormal and emergency situations: (S) or (U)

(i) identifies the abnormal condition; PF/PNF

(ii) interprets the abnormal condition; PF/PNF

(iii) performs the procedure for the abnormal condition. PF/PNF

(7) communicate with cabin crew, passengers and company: (S) or (U)

(i) communicates relevant information with cabin crew; PF

(ii) communicates relevant information with company; PF/PNF

(iii) makes passenger announcements when appropriate. PF

(k) Perform descent

List of competency elements and performance criteria:

(1) Demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

(2) initiate and manage descent: (S) or (U)

(i) starts descent according to ATC clearance or optimum descent point; PF

(ii) selects optimum speed and descent rate; PF

(iii) adjusts speed to existing environmental conditions; PF

(iv) recognises the need to adjust the descent path; PF

(v) adjusts the flight path as required; PF

(vi) utilises all means of FMS descent information. PF

(3) monitor and perform en route and descent navigation: (S) or (U)

(i) complies with arrival clearance and procedures; PF

(ii) demonstrates terrain awareness; PF/PNF

(iii) monitors navigation accuracy; PF/PNF

(iv) adjusts flight to weather and traffic conditions; PF

(v) communicates and coordinates with ATC; PNF

(vi) observes minimum altitudes; PF/PNF

(vii) selects appropriate level or mode of automation; PF

(viii) complies with altimeter setting procedures. PF/PNF

(4) re-planning and update of approach briefing: (S) or (U)

(i) re-checks destination weather and runway in use; PNF

(ii) briefs or re-briefs about instrument approach and landing as required; PF

(iii) reprograms the FMS as required; PNF

(iv) re-checks fuel status. PF/PNF

(5) perform holding: (S) or (U)

(i) identifies holding requirement; PF/PNF

(ii) programs FMS for holding pattern; PNF

(iii) enters and monitors holding pattern; PF

(iv) assesses fuel requirements and determines max holding time; PF/PNF

(v) reviews the need for a diversion; PF/PNF

(vi) initiates diversion. PF

(6) perform systems operations and procedures: (S) or (U)

(i) monitors operation of all systems; PF/PNF

(ii) operates systems as required. PF/PNF

(7) manage abnormal and emergency situations:

(i) identifies the abnormal condition; PF/PNF

(ii) interprets the abnormal condition; PF/PNF

(iii) performs the procedure for the abnormal condition. PF/PNF

(8) communicate with cabin crew, passengers and company: (S) or (U)

(i) communicates relevant information with cabin crew; PF

(ii) communicates relevant information with company; PF/PNF

(iii) makes passenger announcements when appropriate; PF

(l) Perform approach

List of competency elements and performance criteria:

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

(2) perform approach in general: (S) or (U)

(i) executes approach according to procedures and situation; PF

(ii) selects appropriate level or mode of automation; PF

(iii) selects optimum approach path; PF

(iv) operates controls smooth and coordinated; PF

(v) performs speed reduction and flap extension; PF/PNF

(vi) performs relevant checklists; PF/PNF

(vii) initiates final descent; PF

(viii) achieves stabilised approach criteria; PF

	(ix)	ensures adherence to minima;	PF/PNF	
	(x)	initiates go-around if required;	PF	
	(xi)	masters transition to visual segment.	PF	
(3)		perform precision approach:		(S) or (U)
	(i)	performs ILS approach;	PF	
	(ii)	performs MLS approach.	PF	
(4)		perform non-precision approach:		(S) or (U)
	(i)	performs VOR approach;	PF	
	(ii)	performs NDB approach;	PF	
	(iii)	performs SRE approach;	PF	
	(iv)	performs GNSS approach;	PF	
	(v)	performs ILS loc approach;	PF	
	(vi)	performs ILS back beam approach.	PF	
(5)		perform approach with visual reference to ground:		(S) or (U)
	(i)	performs standard visual approach;	PF	
	(ii)	performs circling approach.	PF	
(6)		monitor the flight progress:		(S) or (U)
	(i)	insures navigation accuracy;	PF/PNF	
	(ii)	communicates with ATC and crew members;	PNF	
	(iii)	monitors fuel status.	PF/PNF	
(7)		perform systems operations and procedures:		
	(i)	monitors operation of all systems;	PF	
	(ii)	operates systems as required.	PF	
(8)		manage abnormal and emergency situations:		(S) or (U)
	(i)	identifies the abnormal condition;	PF/PNF	
	(ii)	interprets the abnormal condition;	PF/PNF	
	(iii)	performs the procedure for the abnormal condition.	PF/PNF	
(9)		perform missed approach and goaround:		(S) or (U)
	(i)	initiates go-around procedure;	PF	

(ii) navigates according to missed approach procedure; PF

(iii) completes the relevant checklists; PF/PNF

(iv) initiates approach or diversion after the go-around; PF

(v) communicates with ATC and crew members. PNF

(10) communicate with cabin crew, passengers and company: (S) or (U)

(i) communicates relevant information with cabin crew; PF

(ii) communicates relevant information with company; PF/PNF

(iii) makes passenger announcements when appropriate; PF

(iv) initiates go-around procedure. PF

(m) Perform landing

List of competency elements and performance criteria:

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

(2) land the aircraft; (S) or (U)

(i) maintains a stabilised approach path during visual segment; PF

(ii) recognises and acts on changing conditions for windshift or wind shear segment; PF

(iii) initiates flare; PF

(iv) controls thrust; PF

(v) achieves touchdown in touchdown zone on centreline; PF

(vi) lowers nose wheel; PF

(vii) maintains centreline; PF

(viii) performs after-touchdown procedures; PF

(ix) makes use of appropriate braking and reverse thrust; PF

(x) vacates runway with taxi speed. PF

(3) perform systems operations and procedures: (S) or (U)

(i) monitors operation of all systems; PF

(ii) operates systems as required. PF

(4) manage abnormal and emergency situations: (S) or (U)

(i) identifies the abnormal condition; PF/PNF

(ii) interprets the abnormal condition; PF/PNF

(iii) performs the procedure for the abnormal condition. PF/PNF

(n) Perform after landing and post flight operations

List of competency elements and performance criteria:

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

(2) perform taxiing and parking: (S) or (U)

(i) receives, checks and adheres to taxi clearance; PNF

(ii) taxies the aircraft including use of exterior lighting; PF

(iii) controls taxi speed; PF/PNF

(iv) maintains centreline; PF

(v) maintains look-out for conflicting traffic and obstacles; PF

(vi) identifies parking position; PF/PNF

(vii) complies with marshalling or stand guidance; PF/PNF

(viii) applies parking and engine shut down procedures; PF

(ix) completes with relevant checklists. PF/PNF

(3) perform aircraft post-flight operations: (S) or (U)

(i) communicates to ground personnel and crew; PF

(ii) completes all required flight documentation; PF/PNF

(iii) ensures securing of the aircraft; PF

(iv) conducts the debriefings. PF

(4) perform systems operations and procedures: (S) or (U)

(i) monitors operation of all systems; PF/PNF

(ii) operates systems as required. PF/PNF

(5) manage abnormal and emergency situations: (S) or (U)

(i) identifies the abnormal condition; PF/PNF

(ii) interprets the abnormal condition; PF/PNF

(iii) performs the procedure for the abnormal condition. PF/PNF

(6) communicate with cabin crew, passengers and company: (S) or (U)

(i) communicates relevant information with cabin crew; PF

(ii) communicates relevant information with company; PF/PNF

(iii) makes passenger announcements when appropriate. PF

PRINCIPLES OF THREAT AND ERROR MANAGEMENT

(o) One model that explains the principles of threat and error management is the TEM model.

(1) The components of the TEM model:

There are three basic components in the TEM model, from the perspective of flight crews: threats, errors and undesired aircraft states. The model proposes that threats and errors are part of everyday aviation operations that must be managed by flight crews, since both threats and errors carry the potential to generate undesired aircraft states. Flight crews must also manage undesired aircraft states, since they carry the potential for unsafe outcomes. Undesired state management is an essential component of the TEM model, as important as threat and error management. Undesired aircraft state management largely represents the last opportunity to avoid an unsafe outcome and thus maintain safety margins in flight operations.

(2) Threats:

(i) Threats are defined as events or errors that occur beyond the influence of the flight crew, increase operational complexity, and which must be managed to maintain the margins of safety. During typical flight operations, flight crews have to manage various contextual complexities. Such complexities would include, for example, dealing with adverse meteorological conditions, airports surrounded by high mountains, congested airspace, aircraft malfunctions, errors committed by other people outside of the cockpit, such as air traffic controllers, flight attendants or maintenance workers, and so forth. The TEM model considers these complexities as threats because they all have the potential to negatively affect flight operations by reducing margins of safety;

(ii) Some threats can be anticipated, since they are expected or known to the flight crew. For example, flight crews can anticipate the consequences of a thunderstorm by briefing their response in advance, or prepare for a congested airport by making sure they keep a watchful eye on other aircraft as they execute the approach;

(iii) Some threats can occur unexpectedly, such as an in-flight aircraft malfunction that happens suddenly and without warning. In this case, flight crews must apply skills and knowledge acquired through training and operational experience;

(iv) Lastly, some threats may not be directly obvious to, or observable by, flight crews immersed in the operational context, and may need to be uncovered by safety analysis. These are considered latent threats. Examples of latent threats include equipment design issues, optical illusions, or shortened turnaround schedules;

(v) Regardless of whether threats are expected, unexpected, or latent, one measure of the effectiveness of a flight crew's ability to manage threats is whether threats are detected with the necessary anticipation to enable the flight crew to respond to them through deployment of appropriate countermeasures;

(vi) Threat management is a building block to error management and undesired aircraft state management. Although the threat-error linkage is not necessarily straightforward, and although it may not be always possible to establish a linear relationship, or one-to-one mapping between threats, errors and undesired states, archival data demonstrates that mismanaged threats are normally linked to flight crew errors, which in turn are often linked to undesired aircraft states. Threat management provides the most proactive option to maintain margins of safety in flight operations, by voiding safety-compromising situations at their roots. As threat managers, flight crews are the last line of defence to keep threats from impacting flight operations;

(vii) Table 1 presents examples of threats, grouped under two basic categories derived from the TEM Model. Environmental threats occur due to the environment in which flight operations take place. Some environmental threats can be planned for and some will arise spontaneously, but they all have to be managed by flight crews in real time. Organisational threats, on the other hand, can be controlled (for example removed or, at least, minimised) at source by aviation organisations. Organisational threats are usually latent in nature. Flight crews still remain the last line of defence, but there are earlier opportunities for these threats to be mitigated by aviation organisations themselves.

Environmental threats	Organisational threats
(A) weather: thunderstorms, turbulence, icing, wind shear, cross or tailwind, very low or high temperatures; (B) ATC: traffic congestion, ACAS RA/TA, ATC command, ATC error, ATC language difficulty, ATC non-standard phraseology, ATC runway change, ATIS communication or units of measurement (QFE/meters); (C) airport: contaminated or short runway; contaminated taxiway, lack of, confusing, faded signage, markings, birds, aids unserviceable, complex surface navigation procedures or airport constructions;	(A) operational pressure: delays, late arrivals or equipment changes; (B) aircraft: aircraft malfunction, automation event or anomaly, MEL/CDL; (C) cabin: flight attendant error, cabin event distraction, interruption, cabin door security; (D) maintenance: maintenance event or error; (E) ground: ground-handling event, de-icing or ground crew error; (F) dispatch: dispatch paperwork event or error;

(D) terrain: high ground, slope, lack of references or 'black hole'; (E) other: similar call-signs.	(G) documentation: manual error or chart error; (H) other: crew scheduling event.

Table 1. Examples of threats (list is not exhaustive)

(3) Errors:

(i) Errors are defined actions or inactions by the flight crew that lead to deviations from organisational or flight crew intentions or expectations. Unmanaged or mismanaged errors frequently lead to undesired aircraft states. Errors in the operational context thus tend to reduce the margins of safety and increase the probability of adverse events;

(ii) Errors can be spontaneous (for example without direct linkage to specific, obvious threats), linked to threats, or part of an error chain. Examples of errors would include the inability to maintain stabilised approach parameters, executing a wrong automation mode, failing to give a required callout, or misinterpreting an ATC clearance;

(iii) Regardless of the type of error, an error's effect on safety depends on whether the flight crew detects and responds to the error before it leads to an undesired aircraft state and to a potential unsafe outcome. This is why one of the objectives of TEM is to understand error management (for example detection and response), rather than to solely focus on error causality (for example causation and commission). From the safety perspective, operational errors that are timely detected and promptly responded to (for example properly managed), errors that do not lead to undesired aircraft states, do not reduce margins of safety in flight operations, and thus become operationally inconsequential. In addition to its safety value, proper error management represents an example of successful human performance, presenting both learning and training value;

(iv) Capturing how errors are managed is then as important, if not more, as capturing the prevalence of different types of error. It is of interest to capture if and when errors are detected and by whom, the response(s) upon detecting errors, and the outcome of errors. Some errors are quickly detected and resolved, thus becoming operationally inconsequential, while others go undetected or are mismanaged. A mismanaged error is defined as an error that is linked to or induces an additional error or undesired aircraft state;

(v) Table 2 presents examples of errors, grouped under three basic categories derived from the TEM model. In the TEM concept, errors have to be 'observable' and therefore, the TEM model uses the 'primary interaction' as the point of reference for defining the error categories;

(vi) The TEM model classifies errors based upon the primary interaction of the pilot or flight crew at the moment the error is committed. Thus, in order to be classified as aircraft handling error, the pilot or flight crew must be interacting with the aircraft (for example through its controls, automation or systems). In order to be classified as procedural error, the pilot or flight crew must be interacting with a procedure (for example checklists; SOPs; etc.). In order to be classified as communication error, the pilot or flight crew must be interacting with people (ATC, ground crew, other crewmembers, etc.);

(vii) Aircraft handling errors, procedural errors and communication errors may be unintentional or involve intentional non-compliance. Similarly, proficiency considerations (for example skill or knowledge deficiencies, training system deficiencies) may underlie all three categories of error. In order to keep the approach simple and avoid confusion, the TEM model does not consider intentional noncompliance and proficiency as separate categories of error, but rather as sub-sets of the three major categories of error.

Aircraft handling errors	(A) manual handling, flight controls: vertical, lateral or speed deviations, incorrect flaps or speed brakes, thrust reverser or power settings; (B) automation: incorrect altitude, speed, heading, auto throttle settings, incorrect mode executed or incorrect entries; (C) systems, radio, instruments: incorrect packs, incorrect anti-icing, incorrect altimeter, incorrect fuel switches settings, incorrect speed bug or incorrect radio frequency dialled; (D) ground navigation: attempting to turn down wrong taxiway or runway, taxi too fast, failure to hold short or missed taxiway or runway.
Procedural errors	(A) SOPs: failure to cross-verify automation inputs; (B) checklists: wrong challenge and response; items missed, checklist performed late or at the wrong time; (C) callouts: omitted or incorrect callouts; (D) briefings: omitted briefings; items missed; (E) documentation: wrong weight and balance, fuel information, ATIS, or clearance information recorded, misinterpreted items on paperwork; incorrect logbook entries or incorrect application of MEL procedures.

Communication errors	(A)	crew to external: missed calls, misinterpretations of instructions, incorrect read-back, wrong clearance, taxiway, gate or runway communicated;
	(B)	pilot to pilot: within crew miscommunication or mis-interpretation.

Table 2. Examples of errors (list is not exhaustive)

(4) Undesired aircraft states:

(i) Undesired aircraft states are flight crew-induced aircraft position or speed deviations, misapplication of flight controls, or incorrect systems configuration, associated with a reduction in margins of safety. Undesired aircraft states that result from ineffective threat or error management may lead to compromising situations and reduce margins of safety in flight operations. Often considered at the cusp of becoming an incident or accident, undesired aircraft states must be managed by flight crews;

(ii) Examples of undesired aircraft states would include lining up for the incorrect runway during approach to landing, exceeding ATC speed restrictions during an approach, or landing long on a short runway requiring maximum braking. Events such as equipment malfunctions or ATC controller errors can also reduce margins of safety in flight operations, but these would be considered threats;

(iii) Undesired states can be managed effectively, restoring margins of safety, or flight crew response(s) can induce an additional error, incident, or accident;

(iv) Table 3 presents examples of undesired aircraft states, grouped under three basic categories derived from the TEM model;

Aircraft handling	(A)	aircraft control (attitude);
	(B)	vertical, lateral or speed deviations;
	(C)	unnecessary weather penetration;
	(D)	unauthorised airspace penetration;
	(E)	operation outside aircraft limitations;
	(F)	unstable approach;
	(G)	continued landing after unstable approach;
	(H)	long, floated, firm or off-centreline landing.
Ground navigation	(A)	proceeding towards wrong taxiway or runway;
	(B)	Wrong taxiway, ramp, gate or hold spot.
Incorrect aircraft configurations	(A)	incorrect systems configuration;
	(B)	incorrect flight controls configuration;
	(C)	incorrect automation configuration;
	(D)	incorrect engine configuration;
	(E)	incorrect weight and balance configuration.

Table 3. Examples of undesired aircraft states (list is not exhaustive)

(v) An important learning and training point for flight crews is the timely switching from error management to undesired aircraft state management. An example would be as follows: a flight crew selects a wrong approach in the FMC. The flight crew subsequently identifies the error during a cross-check prior to the FAF. However, instead of using a basic mode (for example heading) or manually flying the desired track, both flight crew members become involved in attempting to reprogram the correct approach prior to reaching the FAF. As a result, the aircraft 'stitches' through the localiser, descends late, and goes into an unstable approach. This would be an example of the flight crew getting 'locked in' to error management, rather than switching to undesired aircraft state management. The use of the TEM model assists in educating flight crews that, when the aircraft is in an undesired state, the basic task of the flight crew is undesired aircraft state management instead of error management. It also illustrates how easy it is to get locked in to the error management phase;

(vi) Also from a learning and training perspective, it is important to establish a clear differentiation between undesired aircraft states and outcomes. Undesired aircraft states are transitional states between a normal operational state (for example a stabilised approach) and an outcome. Outcomes, on the other hand, are end states, most notably, reportable occurrences (for example incidents and accidents). An example would be as follows: a stabilised approach (normal operational state) turns into an unstabilised approach (undesired aircraft state) that results in a runway excursion (outcome);

(vii) The training and remedial implications of this differentiation are of significance. While at the undesired aircraft state stage, the flight crew has the possibility, through appropriate TEM, of recovering the situation, returning to a normal operational state, thus restoring margins of safety. Once the undesired aircraft state becomes an outcome, recovery of the situation, return to a normal operational state, and restoration of margins of safety is not possible.

(5) Countermeasures:

(i) Flight crews must, as part of the normal discharge of their operational duties, employ countermeasures to keep threats, errors and undesired aircraft states from reducing margins of safety in flight operations. Examples of countermeasures would include checklists, briefings, call-outs and SOPs, as well as personal strategies and tactics. Flight crews dedicate significant amounts of time and energies to the application of countermeasures to ensure margins of safety during flight operations. Empirical observations during training and checking suggest that as much as 70 % of flight crew activities may be countermeasures-related activities.

(ii) All countermeasures are necessarily flight crew actions. However, some countermeasures to threats, errors and undesired aircraft states that flight crews employ build upon 'hard' resources provided by the aviation system. These resources are already in place in the system before flight crews report for duty, and are therefore considered as systemic-based countermeasures. The following would be examples of 'hard' resources that flight crews employ as systemic-based countermeasures:

(A) ACAS;

(B) TAWS;

(C) SOPs;

(D) checklists;

(E) briefings;

(F) training;

(G) etc.

(iii) Other countermeasures are more directly related to the human contribution to the safety of flight operations. These are personal strategies and tactics, individual and team countermeasures that typically include canvassed skills, knowledge and attitudes developed by human performance training, most notably, by CRM training. There are basically three categories of individual and team countermeasures:

(A) planning countermeasures: essential for managing anticipated and unexpected threats;

(B) execution countermeasures: essential for error detection and error response;

(C) review countermeasures: essential for managing the changing conditions of a flight.

(iv) Enhanced TEM is the product of the combined use of systemic based and individual and team countermeasures. Table 4 presents detailed examples of individual and team countermeasures. Further guidance on countermeasures can be found in the sample assessment guides for terminal training objectives (PANS-TRG, Chapter 3, Attachment B) as well as in the ICAO manual, Line Operations Safety Audit (LOSA) (Doc 9803).

Planning countermeasures		
SOP briefing	The required briefing was interactive and operationally thorough	(A) Concise, not rushed, and met SOP requirements; (B) Bottom lines were established
Plans stated	Operational plans and decisions were communicated and acknowledged	Shared understanding about plans: ‘Everybody on the same page’
Workload assignment	Roles and responsibilities were defined for normal and non-normal situations	Workload assignments were communicated and acknowledged
Contingency management	Crew members developed effective strategies to manage threats to safety	(A) Threats and their consequences were anticipated; (B) Used all available resources to manage threats
Execution countermeasures		
Monitor and cross-check	Crew members actively monitored and cross-checked	Aircraft position, settings, and crew actions were verified

	systems and other crew members	
Workload management	Operational tasks were prioritised and properly managed to handle primary flight duties	(A) Avoided task fixation; (B) Did not allow work overload
Automation management	Automation was properly managed to balance situational and workload requirements	(A) Automation setup was briefed to other members (B) Effective recovery techniques from automation anomalies
Review countermeasures		
Evaluation and modification of plans	Existing plans were reviewed and modified when necessary	Crew decisions and actions were openly analysed to make sure the existing plan was the best plan
Inquiry	Crew members asked questions to investigate and/or clarify current plans of action	Crew members not afraid to express a lack of knowledge: 'Nothing taken for granted' attitude
Assertiveness	Crew members stated critical information or solutions with appropriate persistence	Crew members spoke up without hesitation

Table 4. Examples of individual and team countermeasures

GM1 FCL.015(a) Application and issue, revalidation and renewal of licences, ratings and certificates

The required level of competency of a student pilot is assessed by observing the following:

(a) application of knowledge;

(b) application of regulations and procedures;

(c) communication;

(d) aeroplane flight path management – automation;

(e) aeroplane flight path management – manual control;

(f) leadership and teamwork;

(g) problem-solving and decision-making;

(h) situational awareness (SA) and information management; and

(i) workload management.

The competencies referred to in points (b) and (e) are particularly relevant during the training. This means that the focus is on observing the student pilot performing take-offs and landings in accordance with the standard operating procedures (SOPs) and recommended techniques of the original equipment manufacturer (OEM).

The competency elements and sub-elements stipulated in GM1 to Appendix 5 for take-off and landing provide additional guidance for instructors and student pilots.

Consistency and repeatability of all the competencies above is achieved if the student pilot is able to perform at least three successive take-offs and landings demonstrating the required observable behaviours.

The take-off and landing training in an aeroplane should include at least one go-around. Due consideration should be given to environmental conditions when evaluating competency.

AMC1 to Appendix 6 'Modular training course for the IR'

ALL MODULAR FLYING TRAINING COURSES FOR THE IR, EXCEPT COMPETENCYBASED MODULAR FLYING TRAINING COURSE

(a) The theoretical knowledge instruction may be given at an ATO conducting theoretical knowledge instruction only, in which case the head of training (HT) of that organisation should supervise that part of the course.

(b) The 150 hours of instruction, which include the application of threat and error management (TEM), may include in suitable proportions:

  (1) classroom work;

  (2) lessons;

  (3) tutorials;

  (4) demonstrations, including those supported by demonstration equipment;

  (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

  (6) exercises that use demonstration equipment or training devices;

  (7) directed study including workbook exercises or assignments;

  (8) aerodrome or aviation industry field trips;

  (9) computer-based training and e-learning elements;

  (10) progress tests; and

  (11) other training methods, media and tools approved by the competent authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

AMC2 to Appendix 6 Modular training course for the IR

SECTION A IR(A) - MODULAR FLYING TRAINING COURSE

Basic Instrument Flight Module Training Course

(a) This 10 hours module is focused on the basics of flying by sole reference to instruments, including limited panel and unusual attitude recovery.

(b) All exercises may be performed in an FNPT I or II or an FFS, for a maximum of 5 hours. If instrument flight training is in VMC, a suitable means of simulating IMC for the student should be used.

(c) A BITD may be used for the exercises 1, 2, 3, 4, 6, and 8.

(d) The use of the BITD is subject to the following:

(1) the training should be complemented by exercises on an aeroplane;

(2) the record of the parameters of the flight must be available;

(3) an FI(A) or IRI(A) should conduct the instruction.

EXERCISES

(e) Exercise 1:

(1) basic instrument flying without external visual cues; 0:30 hours

(2) horizontal flight; power changes for acceleration or deceleration;

(3) maintaining straight and level flight;

(4) turns in level flight with 15 ° and 25 ° bank, left and right;

(5) roll-out onto predetermined headings.

(f) Exercise 2:

(1) repetition of exercise 1; 0:45 hours

(2) additionally climbing, descending, maintaining heading and speed, transition to horizontal flight;

(3) climbing and descending turns.

(g) Exercise 3:

Instrument pattern: 0:45 hours

(1) start exercise, decelerate to approach speed, flaps into approach configuration;

(2) initiate standard turn (left or right);

(3) roll out on opposite heading, maintain new heading for 1 minute

(4) standard turn, gear down, descend 500 ft/min;

(5) roll out on initial heading, maintain descent (500 ft/min) and new heading for 1 minute;

(6) transition to horizontal flight, 1000 ft below initial flight level;

(7) initiate go-around;

(8) climb at best rate of climb speed.

(h) Exercise 4:

Repetition of exercise 1 and 0:45 hours

steep turns with 45° bank;

recovery from unusual attitudes.

(i) Exercise 5:

Repetition of exercise 4. 0:45 hours

(j) Exercise 6:

(1) radio navigation using VOR, NDB 0:45 hours
or, if available, VDF;

(2) interception of predetermined QDM, QDR.

(k) Exercise 7:

Repetition of exercise 1 and 0:45hours

recovery from unusual attitudes.

(l) Exercise 8:

(1) Repetition of exercise 1; 0:45 hours

(2) turns, level change and recovery from unusual attitudes with simulated failure of the artificial horizon or directional gyro.

(m) Exercise 9:

Recognition of, and recovery from, 0:45 hours

incipient and full stalls.

(n) Exercise 10: Repetition of exercises 6, 8 3:30 hours and 9.

CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE

<table>
<tr><td colspan="6">CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE</td></tr>
<tr><td>Pilot’s last name(s):</td><td colspan="2"></td><td colspan="2">First name(s):</td><td></td></tr>
<tr><td>Type of licence:</td><td colspan="2"></td><td colspan="2">Number:</td><td>State:</td></tr>
<tr><td>Flight training hours performed on SE aeroplane:</td><td></td><td colspan="2">OR</td><td>Flight training hours performed on ME aeroplane:</td><td></td></tr>
<tr><td>Flight training hours performed in an FSTD (maximum 5 hours):</td><td colspan="4"></td><td></td></tr>
<tr><td></td><td colspan="4">Signature of applicant:</td><td></td></tr>
</table>

The satisfactory completion of basic instrument flight module according to requirements is certified below:

TRAINING			
Basic instrument flight module training received during period:			
from:	to:	at:	ATO
Location and date:		Signature of head of training:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

AMC3 to Appendix 6 'Modular training courses for the IR'

SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE

(a) THEORETICAL KNOWLEDGE INSTRUCTION

(1) The theoretical knowledge instruction may be given at an ATO conducting theoretical knowledge instruction only, in which case the HT of that ATO should supervise that part of the course.

(2) The hours required for the theoretical knowledge instruction for the IR following the competency-based training route should be divided between the subjects and include the application of threat and error management (TEM) as based on the ATO's systems course design and agreed upon between the competent authority and the ATO.

An approved course, which includes the application of threat and error management, may contain in suitable proportions:

(i) classroom work;

(ii) lessons;

(iii) tutorials;

(iv) demonstrations, including those supported by demonstration equipment;

(v) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

(vi) exercises that use demonstration equipment or training devices;

(vii) directed study including workbook exercises or assignments;

(viii) aerodrome or aviation industry field trips;

(ix) computer-based training and e-learning elements;

(x) progress tests; and

(xi) other training methods, media and tools approved by the competent authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (a)(2)(ix).'

(b) THEORETICAL KNOWLEDGE EXAMINATION

The applicant for the IR following the competency-based training route should pass an examination to demonstrate a level of theoretical knowledge appropriate to the privileges granted in the subjects further detailed in FCL.615(b). The number of questions per subject, the distribution of questions and the time allocated to each subject is detailed in AMC1 ARA.FCL.300(b).

AMC4 to Appendix 6 Modular training courses for the IR

SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE FLYING TRAINING

(a) The instrument flight instruction outside an ATO provided by an IRI(A) or an FI(A) holding the privilege to provide training for the IR in accordance with Appendix 6 Section Aa (6)(a)(i)(A) may consist of instrument flight time under instruction or instrument ground time or a combination thereof.

TRAINING AIRCRAFT

(b) The aeroplane used for the instrument flight training provided outside an ATO by an IRI(A) or FI(A) should be:

(1) fitted with primary flight controls that are instantly accessible by both the student and the instructor (for example dual flight controls or a centre control stick). Swing-over flight controls should not be used; and

(2) suitably equipped to simulate instrument meteorological conditions (IMC) and for the instrument flight training required.

(c) The FSTD used for the instrument flight instruction provided outside an ATO by an IRI(A) or FI(A) should be suitably equipped to simulate instrument meteorological conditions (IMC) and for the instrument flight training required

AMC5 to Appendix 6 Modular training courses for the IR

SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE (6)(a)(i)(B); (6)(b)(i)(B)

PRIOR EXPERIENCE OF FLIGHT TIME UNDER IFR AS PIC

A rating giving privileges to fly under IFR and in IMC referred to in (6)(a)(i)(B) and (6)(b)(i)(B) may be any of the following:

(a) an EIR rating issued by another ICAO Member State; or

(b) Reserved; or

(c) an instrument rating issued in compliance with the requirements of Annex 1 to the Chicago Convention by a third country; or

(d) Reserved.

The amount of credit given should not exceed the amount of hours completed as instrument flight time.

AMC6 to Appendix 6 Modular training courses for the IR

SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE (6)(a)(ii); (6)(b)(ii)

PRIOR INSTRUMENT FLIGHT TIME UNDER INSTRUCTION

Prior instrument flight time under instruction on aeroplanes, as referred in (6)(a)(ii) and (6)(b)(ii), may be instrument flight time completed for the issue of:

(a) an EIR rating issued by a competent authority of a ICAO Member State; or

(b) Reserve; or

(c) an instrument rating in compliance with the requirements of Annex 1 to the Chicago Convention by a third country; or

(d) Reserve.

AMC7 to Appendix 6 Modular training courses for the IR

SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE (6)(c); (6)(d)

PRE-ENTRY ASSESSMENT AND TRAINING RECORD

(a) PRE-ENTRY ASSESSMENT

The assessment to establish the amount of training to be credited and to identify the training needs should be based on the training syllabus established in Appendix 6 Aa.

(b) TRAINING RECORD

(1) Before initiating the assessment the applicant should provide to an ATO a training record containing the details of the previous flight instruction provided by the IRI(A) or the FI(A). This training record should at least specify

the aircraft type and registration used for the training, the number of flights and the total amount of instrument time under instruction. It should also specify all the exercises completed during the training by using the syllabus contained in Appendix 6 Aa.

(2) The instructor having provided the training should keep the training records containing all the details of the flight training given for a period of at least 5 years after the completion of the training.

AMC8 to Appendix 6 Modular training courses for the IR

SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE
(8)

In order to be credited in full towards the multi-engine IR(A) training course requirements, the applicant should

(a) hold a multi-engine IR(A), issued in accordance with the requirements of Annex 1 to the Chicago Convention by a third country;

(b) have the minimum experience required in Appendix 6 Aa paragraph 8(c), of which at least 15 hours should be completed in a multi-engine aeroplane.

AMC9 to Appendix 6 Modular training courses for the IR

AIRSHIPS

Basic Instrument Flight Module Training Course

(a) This 10 hours module is focused on the basics of flying by sole reference to instruments, including limited panel and unusual attitude recovery.

(b) All exercises may be performed in an FNPT I or II or an FFS, for a maximum of 5 hours. If instrument flight training is in VMC, a suitable means of simulating IMC for the student should be used.

(c) A BITD may be used for the exercises 1, 2, 3, 4, 6 and 8.

(d) The use of the BITD is subject to the following:

(1) the training should be complemented by exercises on an airship;

(2) the record of the parameters of the flight must be available;

(3) an FI(As) or IRI(As) should conduct the instruction.

EXERCISES

(e) Exercise 1:

(1) basic instrument flying without external visual cues; 0:30 hours

(2) horizontal flight;

(3) maintaining straight and level flight;

(4) turns in level flight, left and right;

(5) rollout onto predetermined headings.

(f) Exercise 2:

(1) Repetition of exercise 1; 0:45 hours

additionally climbing and descending

(2) maintaining heading and speed;

(3) transition to horizontal flight;

(4) climbing and descending turns.

(g) Exercise 3:

Instrument pattern: 0:45 hours

(1) start exercise, decelerate to approach speed, approach configuration;

(2) initiate standard turn (left or right);

(3) rollout on opposite heading, maintain new heading for 1 minute;

(4) standard turn, descend with given rate (for example 500 ft/min);

(5) rollout on initial heading, maintain descent (for example 500 ft/min) and new heading for 1 minute;

(6) transition to horizontal flight (for example 1 000 ft below initial level);

(7) initiate go-around;

(8) climb at best rate of climb speed.

(h) Exercise 4:

(1) repetition of exercise 1; 0:45 hours

(2) recovery from unusual attitudes.

(i) Exercise 5

Repetition of exercise 4. 0:45 hours

(j) Exercise 6

(1) radio navigation using VOR, NDB 0:45 hours or, if available, VDF;

(2) interception of predetermined QDM, QDR.

(k) Exercise 7

(1) repetition of exercise 1; 0:45 hours

(2) recovery from unusual attitudes.

(l) Exercise 8

(1) repetition of exercise 1; 0:45 hours

(2) turns, level change and recovery from unusual attitudes with simulated failure of the artificial horizon or directional gyro.

(m) Exercise 9

Repetition of exercises (6) and (8). 4:15 hours

CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE

CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE			
Pilot's last name(s):		First name(s):	
Type of licence:		Number:	State:
Flight training hours performed on airship:			
Flight training hours performed in an FSTD (maximum 5 hours):			
	Signature of applicant:		

The satisfactory completion of basic instrument flight module according to requirements is certified below:

TRAINING			
Basic instrument flight module training received during period:			
from:	to:	at:	ATO
Location and date:		Signature of head of training:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

GM1 to Appendix 6 Modular training courses for the IR

Aa. IR(A)(8)

The following elements may be used by the examiner for the applicant's verbal demonstration of knowledge:

(a) AIR LAW:

(1) explain the requirements for plus validity and privileges of instrument ratings;

(2) explain why a time check has to be completed before flight;

(3) describe the necessary action when an aircraft experiences a failure in communications;

(4) state the responsibility of the operator when unable to utilise the published departure procedures;

(5) explain when the omnidirectional method is used for departure;

(6) describe the solutions when omnidirectional procedures are not possible;

(7) justify the establishment of aircraft categories for the approach;

(8) state the minimum obstacle clearance provided by the minimum sector altitudes (MSAs) established for an aerodrome;

(9) describe the point of origin, shape, size, and subdivisions of the area used for MSAs;

(10) explain why a pilot should not descend below obstacle clearance altitude/height (OCA/H) without visual reference, which is established for precision approach procedures, non-precision approach procedures and visual (circling) procedures;

(11) translate the following acronyms into plain language: decision altitude (DA), decision height (DH), obstacle clearance altitude (OCA), obstacle clearance height (OCH), minimum decision altitude (MDA), minimum decision height (MDH), minimum obstacle clearance (MOC), decision altitude/height (DA/H), obstacle clearance altitude/height (OCA/H) and minimum decision altitude/height (MDA/H);

(12) explain the relationship between the following: DA, DH, OCA, OCH, MDA, MDH, MOC, DA/H, OCA/H and MDA/H;

(13) define the following terms: initial approach fix (IAF), intermediate fix (IF), final approach fix (FAF), missed approach point (MAPt) and turning point;

(14) state the accuracy of facilities providing track (omnidirectional radio range (VOR), instrument landing system (ILS), non-directional beacon (NDB));

(15) state the optimum descent gradient (preferred for a precision approach) in degrees and per cent;

(16) name the five standard segments of an instrument approach procedure and state the beginning and end for each of them;

(17) describe where an arrival (ARR) route normally ends;

(18) state whether or not omnidirectional or sector ARRs are possible to be made;

(19) explain the main task of the initial approach segment;

(20) describe the main task of the intermediate approach segment;

(21) state the main task of the final approach segment;

(22) name the two possible aims of a final approach;

(23) explain the term 'final approach point' in case of an ILS approach;

(24) state what happens if an ILS glide path (GP) becomes inoperative during approach;

(25) describe the main task of a missed approach procedure;

(26) define 'MAPt';

(27) state the pilot's reaction if upon reaching the MAPt, the required visual reference is not established;

(28) describe what a pilot is expected to do in the event that a missed approach is initiated prior to arriving at the MAPt (a missed approach, after an approach flown as CDFA, should be made when reaching the MAPt or DA/H, whichever occurs first);

(29) state whether the pilot is obliged to cross the MAPt at the A/H required by the procedure or whether they are allowed to cross the MAPt at an A/H greater than that required by the procedure;

(30) describe what is meant by 'visual manoeuvring (circling)';

(31) state the conditions to be fulfilled before descending below MDA/H in a visual manoeuvring (circling) approach;

(32) state how the pilot is expected to behave after initial visual contact during a visual manoeuvring (circling);

(33) describe what the pilot is expected to do if visual reference is lost while circling to land from an instrument approach;

(34) describe the shape and terminology associated with the holding pattern;

(35) state the bank angle and rate of turn to be used whilst flying in a holding pattern;

(36) explain why pilots in a holding pattern should attempt to maintain tracks and how this is achieved;

(37) describe where outbound timing begins in a holding pattern;

(38) state where the outbound leg in a holding pattern terminates if the outbound leg is based on distance-measuring equipment (DME);

(39) describe the three entry headings for entries into a holding pattern;

(40) define the terms 'parallel entry', 'offset entry', and 'direct entry';

(41) determine the correct entry procedure for a given holding pattern;

(42) state the still-air time for flying on the outbound entry heading with or without DME;

(43) define the following Q codes: 'QNH' and 'QFE';

(44) define 'flight level' (FL);

(45) state the intervals by which consecutive FLs should be separated;

(46) describe how FLs are numbered;

(47) define the term 'transition altitude';

(48) define the term 'transition level';

(49) state how the vertical position of the aircraft should be expressed at or below the transition altitude and transition level;

(50) define the term 'transition layer';

(51) state when the QNH altimeter setting should be made available to departing aircraft;

(52) state how a QNH altimeter setting should be made available to aircraft approaching a controlled aerodrome for landing;

(53) state where during the climb, the altimeter setting should be changed from QNH to 1013.2 hPa;

(54) describe when a pilot of an aircraft intending to land at an aerodrome should obtain the transition level;

(55) describe when a pilot of an aircraft intending to land at an aerodrome should obtain the actual QNH altimeter setting;

(56) state where the altimeter settings should be changed from 1013.2 hPa to QNH during descent for landing;

(57) state the modes and codes that the pilot should operate in the absence of any air traffic control (ATC) directions or regional air navigation agreements;

(58) state when the pilot should 'squawk ident';

(59) state the transponder mode and code to indicate: a state of emergency, a failure in communications, an unlawful interference;

(60) describe the consequences of an in-flight transponder failure;

(61) state the primary action of the pilot in the case of an unserviceable transponder before departure when no repair or replacement at that aerodrome is possible;

(62) understand the various rules and services that apply to the various classes of airspace;

(63) describe the aim of clearances issued by the ATC with regard to instrument flight rules (IFR), visual flight rules (VFR) or special VFR flights, and refer to the different airspaces;

(64) explain what is meant by the expression ‘clearance limit’;

(65) explain the meaning of the phrases ‘cleared via flight planned route’, ‘cleared via (designation) departure’ and ‘cleared via (designation) ARR’ in an ATC clearance;

(66) list which items of an ATC clearance should always be read back by the flight crew;

(67) justify the speed control by the ATC;

(68) explain how the change from IFR to VFR may be initiated by the pilot in command (PIC);

(69) define the following terms: ‘transition level’, ‘transition layer’, and ‘transition altitude’;

(70) indicate how the vertical position of an aircraft in the vicinity of an aerodrome should be expressed at or below the transition altitude, at or above the transition level, and while climbing or descending through the transition layer;

(71) list the six items that are normally included in a voice position report;

(72) name the item of a position report which must be forwarded to the ATC with the initial call after changing to a new frequency;

(73) understand the difference among the types of separation within the various classes of airspace and among the various types of flight;

(74) state who is responsible for the avoidance of collision with other aircraft when operating in visual meteorological conditions (VMC);

(75) explain the term ‘expected approach time’ and the procedures for its use;

(76) state the reasons which may probably lead to the decision to use another take-off or landing direction than the one into the wind;

(77) define the term ‘radar vectoring’;

(78) explain the procedures for the conduct of surveillance radar approaches (SRAs);

(79) state the mode and code of secondary surveillance radar (SSR) equipment that a pilot may operate in a (general) state of emergency, or (specifically) in case the aircraft is subject to unlawful interference;

(80) describe the expected action of the aircraft after receiving a broadcast from air traffic services (ATS) concerning the emergency descent of another aircraft;

(81) name the colours used for the various markings (runway (RWY), taxiway (TWY), aircraft stands, apron safety lines);

(82) describe the application and characteristics of RWY centre line markings and threshold markings;

(83) describe the wing bars of a precision approach path indicator (PAPI) and an abbreviated precision approach path indicator (A-PAPI); and

(84) interpret what the pilot sees during approach, using a PAPI, an APAPI, a T visual approach slope indicating system (TVASIS), and an abbreviated T visual approach slope indicator system (ATVASIS);

(b) FLIGHT PLANNING AND FLIGHT MONITORING:

(1) select the preferred airway(s) or route(s) considering:

(i) altitudes and FLs,

(ii) standard routes,

(iii) ATC restrictions,

(iv) the shortest distance,

(v) obstacles, and

(vi) any other relevant data;

(2) determine courses and distances from en route charts;

(3) determine bearings and distances of waypoints based on radio navigation aids on en route charts;

(4) define the following altitudes:

(i) minimum en route altitude (MEA),

(ii) minimum obstacle clearance altitude (MOCA),

(iii) minimum off-route altitude (MORA),

(iv) grid minimum off-route altitude (Grid MORA),

(v) maximum authorised altitude (MAA),

(vi) minimum crossing altitude (MCA), and

(vii) minimum holding altitude (MHA);

(5) extract the following altitudes from the chart(s):

(i) MEA,

(ii) MOCA,

(iii) MORA,

(iv) Grid MORA,

(v) MAA,

(vi) MCA, and

(vii) MHA;

(6) explain the reasons for studying standard instrument departure (SID) and standard ARR (STAR) charts;

(7) state the reasons why the SID and STAR charts show procedures only in a pictorial presentation style which is not to scale;

(8) interpret all data and information represented on SID and STAR charts, particularly:

(i) routings,

(ii) distances,

(iii) courses,

(iv) radials,

(v) altitudes/levels,

(vi) frequencies, and

(vii) restrictions;

(9) identify SIDs and STARs which may be relevant to a planned flight;

(10) state the reasons why it is imperative to be familiar with instrument approach procedures and appropriate data for departure, destination, and alternate airfields prior to departure;

(11) select instrument approach procedures appropriate for departure, destination, and alternate airfields;

(12) interpret all procedures, data and information represented on instrument approach charts, particularly:

(i) courses and radials,

(ii) distances,

(iii) altitudes, levels or heights,

(iv) restrictions,

(v) obstructions,

(vi) frequencies,

(vii) speeds and times,

(viii) DA/Hs and MDA/H,

(ix) visibility and runway visual ranges (RVRs), and

(x) approach light systems;

(13) find communications (COM) frequencies and call signs for the following:

(i) control agencies, service facilities, and flight information services (FISs),

(ii) weather information stations, and

(iii) automatic terminal information service (ATIS);

(14) find the frequency and/or identifiers of radio navigation aids;

(15) complete the navigation plan with the courses, distances, and frequencies taken from charts;

(16) find standard instrument departure and ARR routes to be flown or to be expected;

(17) determine the position of top of climb (TOC) and top of descent (TOD), considering appropriate data;

(18) determine variation and calculate magnetic/true courses;

(19) calculate true airspeed (TAS) according to given aircraft performance data, altitude, and outside air temperature (OAT);

(20) calculate wind correction angles (WCA)/drift and ground speeds (GSs);

(21) determine all relevant altitudes/levels, particularly MEA, MOCA, MORA, MAA, MCA, MRA, and MSA;

(22) calculate individual and accumulated times for each leg until destination and alternate airfields;

(23) convert between volume, mass, and density given in different units commonly used in aviation;

(24) determine relevant data from the flight manual, such as fuel capacity, fuel flow/consumption at different power/thrust settings, altitudes, and atmospheric conditions;

(25) calculate attainable flight time/range considering fuel flow/consumption and available amount of fuel;

(26) calculate the required fuel considering fuel flow/consumption and required time/range to be flown;

(27) calculate the required fuel for an IFR flight considering expected meteorological conditions and expected delays under defined conditions;

(28) find and analyse the latest state at the departure, destination, and alternate aerodromes, in particular with regard to:

   (i) opening hours,

   (ii) work in progress (WIP),

   (iii) special procedures due to WIP,

   (iv) obstructions, and

   (v) changes of frequencies for COM, navigation aids, and facilities;

(29) find and analyse the latest en route state with regard to:

   (i) airway(s) or route(s),

   (ii) restricted, dangerous, and prohibited areas, and

   (iii) changes of frequencies for COM, navigation aids, and facilities;

(30) state the reasons for a fixed format of an International Civil Aviation Organization (ICAO) air traffic services flight plan (ATS FPL);

(31) determine the correct entries to complete an FPL, as well as decode and interpret the entries in a completed FPL, particularly as regards the following:

(i) aircraft identification (Item 7),

(ii) flight rules and type of flight (Item 8),

(iii) number and type of aircraft and wake turbulence category (Item 9),

(iv) equipment (Item 10),

(v) departure aerodrome and time (Item 13),

(vi) route (Item 15),

(vii) destination aerodrome, total estimated elapsed time, and alternate aerodrome (Item 16),

(viii) other information (Item 18), and

(ix) supplementary information (Item 19);

(32) complete the FPL using information from the following:

(i) navigation plan,

(ii) fuel plan, and

(iii) operator's records on basic aircraft information;

(33) explain the requirements for the submission of an ATS FPL;

(34) explain the action to be taken in case of FPL changes;

(35) state the action to be taken in case of inadvertent changes to track, TAS, and time estimate, affecting the current FPL; and

(36) explain the procedures for closing an FPL;

(c) METEOROLOGY:

(1) describe qualitatively and quantitatively the temperature lapse rates of the troposphere (mean value of 0.65 °C/100 m or 2 °C/1 000 ft and actual values);

(2) explain the characteristics of inversions and of an isothermal layer;

(3) explain the cooling and warming of the air on the earth or sea surfaces;

(4) describe qualitatively the influence of the clouds on the cooling and warming of the earth or sea surfaces as well as of the air near those surfaces;

(5) explain the influence of the wind on the cooling and warming of the air near the earth or sea surfaces;

(6) define 'atmospheric pressure';

(7) list the units of measurement of atmospheric pressure used in aviation (hPa, in.);

(8) describe isobars on the surface weather charts;

(9) explain the pressure variation with height;

(10) describe qualitatively the variation of the barometric lapse rate (note: the average value for the barometric lapse rate near mean sea level is 27 ft (8 m) per 1 hPa, whereas at about 5 500 m above mean sea level (AMSL) is 50 ft (15 m) per 1 hPa;

(11) describe and interpret contour lines (isohypses) on a constant pressure chart;

(12) describe the relationship between pressure, temperature, and density;

(13) describe the vertical variation of the air density in the atmosphere;

(14) describe the effect of humidity changes on the air density;

(15) explain the use of standardised values for the international standard atmosphere (ISA);

(16) list the main values of ISA (mean sea level pressure, mean sea level temperature, a vertical temperature lapse rate up to 20 km, as well as height and temperature of the tropopause);

(17) calculate the standard temperature in Celsius degrees for a given FL;

(18) determine a standard temperature deviation based on the difference between the given OAT and the standard temperature;

(19) define the following terms and acronyms and explain how they are related to each other: H, A, pressure A, FL, pressure level, true A, true H, elevation, QNH, QFE, and standard altimeter setting;

(20) describe the following terms: transition A, transition level, transition layer, terrain clearance, and lowest usable FL;

(21) calculate the different readings on the altimeter when the pilot changes the altimeter setting;

(22) illustrate with a numbered example the changes of the altimeter setting and the associated changes in reading when the pilot climbs through the transition altitude or descends through the transition level;

(23) derive the reading of the altimeter of an aircraft on the ground when the pilot uses different settings;

(24) explain the influence of the air temperature on the distance between the ground and the level reading on the altimeter as well as between two FLs;

(25) explain the influence of pressure areas on the true altitude;

(26) determine the true A/H for a given A/H and a given ISA temperature deviation;

(27) describe why and how the wind changes direction and speed with H in the friction layer in the northern and southern hemisphere (rule of thumb);

(28) describe and explain the origin and formation of mountain waves;

(29) explain how mountain waves may be identified through their associated meteorological phenomena;

(30) describe turbulence and gustiness;

(31) list common types of turbulence (convective, mechanical, orographic, frontal, and clear-air turbulence);

(32) indicate the sources of atmospheric humidity;

(33) define 'dew point';

(34) define 'relative humidity';

(35) describe the relationship between temperature and dew point;

(36) estimate the relative humidity of the air based on the difference between dew point and temperature;

(37) explain the influence of relative humidity on the H of the cloud base;

(38) list cloud types typical for stable and unstable air conditions;

(39) identify by shape cirriform, cumuliform, and stratiform clouds;

(40) explain the influence of inversions on vertical movements in the atmosphere;

(41) name the factors contributing in general to the formation of fog and mist;

(42) name the factors contributing to the formation of haze;

(43) describe significant characteristics of orographic fog;

(44) summarise the conditions for the dissipation of orographic fog;

(45) list and describe the types of precipitation given in the aerodrome forecast (TAF) and aerodrome routine meteorological report (METAR) codes (drizzle, rain, snow, snow grains, ice pellets, hail, small hail, snow pellets, ice crystals, freezing drizzle, and freezing rain);

(46) assign typical precipitation types and intensities to different clouds;

(47) describe the boundaries between air masses (fronts);

(48) define 'front' and 'frontal surface' ('frontal zone');

(49) define 'warm front';

(50) describe the cloud, weather, ground visibility, and aviation hazards at a warm front depending on the stability of the warm air;

(51) explain the seasonal differences in the weather at warm fronts;

(52) describe the structure, slope, and dimensions of a warm front;

(53) define 'cold front';

(54) explain the seasonal differences in the weather at cold fronts;

(55) describe the structure, slope, and dimensions of a cold front;

(56) describe the cloud, weather, ground visibility, and aviation hazards in a warm sector;

(57) describe the cloud, weather, ground visibility, and aviation hazards behind the cold front;

(58) define the term 'occlusion';

(59) identify the typical flat pressure pattern on a surface weather chart;

(60) describe the weather associated with a flat pressure pattern;

(61) explain the general weather conditions under which ice accretion on airframe occurs;

(62) indicate in which circumstances ice may form on an aircraft on the ground: air temperature, humidity, precipitation;

(63) explain in which circumstances ice may form on an aircraft in flight: inside clouds, in precipitation, outside clouds, and in the absence of precipitation;

(64) describe the different factors influencing the intensity of icing: air temperature, amount of supercooled water in a cloud or in precipitation, amount of ice crystals in the air, speed of the aircraft, shape (thickness) of the airframe parts (wings, antennas, etc.);

(65) define 'clear ice';

(66) define 'rime ice';

(67) define 'hoar frost';

(68) state the ICAO qualifying terms for the intensity of icing;

(69) describe in general the hazards of icing;

(70) assess the dangers of the different types of ice accretion;

(71) state the ICAO qualifying terms for the intensity of turbulence;

(72) describe the effects of turbulence on an aircraft in flight;

(73) indicate the possibilities of avoiding turbulence

(i) in the flight planning: weather briefing, choice of track, and altitude, and

(ii) during flight: choice of appropriate track and altitude;

(74) define 'wind shear' (vertical and horizontal);

(75) describe the conditions in which wind shear forms and how it forms (e.g. thunderstorms, squall lines, fronts, inversions, land and sea breeze, friction layer, and relief);

(76) describe the effects of wind shear on flight;

(77) indicate the possibilities of avoiding wind shear in flight:

(i) in the flight planning, and

(ii) during flight;

(78) name the cloud types which indicate the development of thunderstorms;

(79) describe the different types of thunderstorms, their location, the conditions for and the process of their development, and list their properties (air mass thunderstorms, frontal thunderstorms, squall lines, supercell storms, orographic thunderstorms);

(80) assess the average duration of thunderstorms and their different stages;

(81) summarise the flight hazards of a fully developed thunderstorm;

(82) describe and assess 'St. Elmo's fire';

(83) describe the effect of lightning strike on aircraft and flight execution;

(84) describe practical examples of flight techniques used to avoid the hazards of thunderstorms;

(85) describe the influence of a mountainous terrain on cloud and precipitation;

(86) describe the effects of the foehn;

(87) describe the influence of a mountainous area on a frontal passage;

(88) indicate the turbulent zones (mountain waves, rotors) on a sketch of a mountain chain;

(89) describe the reduction of visibility caused by precipitation (drizzle, rain, and snow);

(90) describe the differences between ground visibility, flight visibility, slant visibility, and vertical visibility when an aircraft is above or within a layer of haze or fog;

(91) define 'ground visibility';

(92) list the units used for visibility (m, km);

(93) define 'RVR';

(94) list the units used for RVR (m);

(95) compare visibility and RVR;

(96) define 'ceiling';

(97) name the unit and the reference level used for information about the cloud base (ft);

(98) define 'vertical visibility';

(99) name the unit used for vertical visibility (ft);

(100) interpret ground-weather radar images;

(101) describe the basic principle of airborne weather radars as well as the type of information they provide;

(102) describe the limits and errors of airborne weather radar information;

(103) interpret typical airborne weather radar images;

(104) decode and interpret significant weather charts (low-, medium-, and high-level charts);

(105) describe the flight conditions at designated locations or along a defined flight route at a given FL, based on a significant weather chart;

(106) describe, decode (by using a code table), and interpret the following aviation weather messages (given in written or graphical format):

(i) METAR;

(ii) aerodrome special meteorological reports (SPECI);

(iii) trend forecast (TREND);

(iv) TAF;

(v) information concerning en route weather phenomena which may affect the safety of aircraft operations (SIGMET);

(vi) information concerning en route weather phenomena which may affect the safety of low-level aircraft operations (AIRMET);

(vii) area forecast for low-level flights (GAMET);

(viii) automatic terminal information service (ATIS);

(ix) meteorological information for aircraft in flight (VOLMET);

(x) special air-report, and

(xi) volcanic-ash advisory information;

(107) list in general the cases where a SIGMET and an AIRMET are issued; and

(108) describe, decode (by using a code table), and interpret the following messages: runway state message (as written in a METAR) and general aviation forecast (GAFOR).

AMC1 to Appendix 7 IR skill test

LAPL, BPL, SPL, PPL, CPL, IR SKILL TEST AND PROFICIENCY CHECK APPLICATION AND REPORT FORM

APPLICATION AND REPORT FORM **LAPL, BPL, SPL, PPL, CPL, IR SKILL TEST AND PROFICIENCY CHECK**	
Applicant's last name(s):	
Applicant's first name(s):	LAPL: A☐ H☐ B ☐ S☐
Signature of applicant:	BPL: ☐ SPL: ☐
Type of licence*:	PPL: A☐ ☐ H As ☐
Licence number*:	CPL: A☐ ☐ H As ☐
State:	IR: A☐ H☐ As ☐
1 **Details of the flight**	

Group, class, type of aircraft:		Registration:	
Aerodrome or site:	Take-off time:	Landing time:	Flight time:
			Total flight time:
2	**Result of the test**		
Skill test details:			
Pass ☐	Fail ☐	Partial pass ☐	
3	**Remarks**		
Location and date:			
Examiner's certificate number *:		Type and number of licence:	
Signature of examiner:		Name(s) in capital letters:	

** if applicable*

AMC1 to Appendix 9 Training, skill test and proficiency check for MPL, ATPL, type and class ratings, and proficiency check for IRs

APPLICATION AND REPORT FORM

If applicable, this form is also the certificate of completion of the type rating course for ZFTT.

APPLICATION AND REPORT FORM ATPL, MPL, TYPE RATING, TRAINING, SKILL TEST AND PROFICIENCY CHECK AEROPLANES (A) AND HELICOPTERS (H)			
Applicant's last name(s):	**Aircraft:**	**SE-SP: A** ☐ **H**☐	**ME-SP: A**☐ **H**☐
Applicant's first name(s):		**SE-MP: A** ☐ **H**☐	**ME-MP: A**☐ **H**☐
Signature of applicant:	**Operations:**	**SP**☐	**MP**☐

Type of licence held:	**Checklist:**	**Training record:** ☐	**Type rating:** ☐	
Licence number:		**Skill test:** ☐	**Class rating:** ☐	
		IR: ☐		
State of licence issue:		**Proficiency check:** ☐	**ATPL:** ☐	**MPL:** ☐

1	**Theoretical training for the issue of a type or class rating performed during period**			
From:	**To:**	**At:**		
Mark obtained:	**% (Pass mark 75%):**	**Type and number of licence:**		
Signature of HT:		**Name(s) in capital letters:**		
2	**FSTD**			
FSTD (aircraft type):	**Three or more axes: Yes No** ☐		**Ready for service and used:**	
FSTD manufacturer:	**Motion or system:**		**Visual aid: Yes** ☐ **No** ☐	
FSTD operator:			**FSTD ID code:**	
Total training time at the controls:		**Instrument approaches at aerodromes to a decision altitude or height of:**		
Location, date and time:		**Type and number of licence:**		
Type rating instructor ☐	**Class rating instructor** ☐	**............................ instructor** ☐		
Signature of instructor:		**Name(s) in capital letters:**		
3	**Flight training: in the aircraft**		**in the FSTD (for ZFTT)**	
Type of aircraft:	**Registration:**	**Flight time at the controls:**		
Take-offs:	**Landings:**	**Training aerodromes or sites (take-offs, approaches and landings):**		
Take-off time:		**Landing time:**		
Location and date:		**Type and number of licence held:**		
Type rating instructor ☐	**Class rating instructor** ☐			
Signature of instructor:		**Name(s) in capital letters:**		
4	**Skill test**		**Proficiency check**	
Skill test and proficiency check details:				
Aerodrome or site:		**Total flight time:**		
Take-off time:		**Landing time:**		

Pass ☐	**Fail** ☐		**Reason(s) why, if failed:**
Location and date:			**SIM or aircraft registration:**
Examiner's certificate number (if applicable):			**Type and number of licence:**
Signature of examiner:			**Name(s) in capital letters:**

AMC2 to Appendix 9 Training, skill test and proficiency check for MPL, ATPL, type and class ratings, and proficiency check for IRs

TRAINING, SKILL TEST AND PROFICIENCY CHECK: SP AEROPLANES

Section 3.B of the training and skill test and proficiency check content for SP aeroplanes included in Appendix 9.B should include training on a circling approach, after an IFR approach.

GM1 to Appendix 9 Training, skill test and proficiency check for MPL, ATPL, type and class ratings, and proficiency check for IRs

TYPE SPECIFIC UPRT AND GO-AROUND TRAINING IN FSTD

(a) General

(1) The upset recovery training exercises should be mainly manoeuvre-based but may include some scenario-based training elements. The manoeuvre-based training enables type rating applicants to apply their handling skills and recovery strategy whilst leveraging CRM principles to return the aeroplane from an upset condition to a stabilised flight path.

(2) If training is conducted in an FSTD, it is important that applicants understand the limitations of the FSTD in replicating the physiological and psychological aspects of upset recovery exercises.

Note: In order to avoid negative training and negative transfer of training, the ATO should ensure that the selected upset recovery exercises take into consideration the limitations of the FFS.

(b) Stall event recovery in FSTD (Appendix 9, Section B(5) exercise 7.2.1; Section B(6) exercise 3.7.1)

(1) It is of utmost importance that stall event recovery training takes into account the capabilities of the FFS used. To deliver stall event recovery training, the FFS should be qualified against the relevant UPRT elements of CS-FSTD Issue 2. Stall event recovery training should include training up to the stall (approach-to-stall). Post-stall training may be delivered provided the device has been qualified against the relevant optional elements of CS-FSTD Issue 2 and the operator demonstrates that negative training or negative transfer of training is avoided. A 'stall event' is defined as an occurrence whereby the aeroplane

experiences one or more conditions associated with an approach-to-stall or a post stall.

(2) Stall event recovery training should emphasise the requirement to reduce the AoA whilst accepting the resulting altitude loss. High-altitude stall event training should be included so that flight crew experience the aeroplane control response, the significant altitude loss during the recovery, and the increased time required to recover. The training should also emphasise the risk of triggering a secondary stall event during the recovery.

(3) Recovery from a stall event should always be conducted in accordance with the stall event recovery procedures of the OEMs.

Note: If an OEM-approved recovery procedure does not exist, ATOs should develop and train the aeroplane-specific stall recovery procedure based on the template in Table 1 below. Refer to Revision 3 of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA) for a detailed explanation and rationale of the stall event recovery template as recommended by the OEMs.

Table 1: Recommended stall event recovery template

Stall event recovery template		
Pilot Flying (PF) Immediately do the following at first indication of a stall (aerodynamic buffeting, reduced roll stability and aileron effectiveness, visual or aural cues and warnings, reduced elevator (pitch) authority, inability to maintain altitude or arrest rate of descent, stick shaker activation (if installed)) during any flight phases *except at lift-off.*		**Pilot Monitoring (PM)**
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the autopilot is disconnected)	**MONITOR** airspeed and attitude throughout the recovery and **ANNOUNCE** any continued divergence
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF**	
3.	**(a) NOSE-DOWN PITCH CONTROL** apply until stall warning is eliminated **(b) NOSE-DOWN PITCH TRIM** (as needed) (Reduce the AoA whilst accepting the resulting altitude loss.)	
4.	**BANK — WINGS LEVEL**	
5.	**THRUST — ADJUST** (as needed) (Thrust reduction for aeroplanes with underwing-mounted engines may be needed)	
6.	**SPEEDBRAKES/SPOILERS — RETRACT**	
7.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	

(c) Nose-high and nose-low recovery exercises (Appendix 9, Section B(5) exercise 7.2.2; B(6) exercise 3.7.2)

Nose-high and nose-low recovery exercises should be conducted in accordance with the strategies recommended by the OEMs contained in Tables 2 and 3 below.

Note: As the OEM procedures always take precedence over the recommendations, ATOs should consult the OEM on whether any approved type-specific recovery procedures are available prior to using the templates.

Refer to Revision 3 of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA) for a detailed explanation and rationale of nose-high and nose-low recovery strategies as recommended by the OEMs.

Table 2: Recommended nose-high recovery strategy template

Nose-high recovery strategy template		
Either pilot — Recognise and confirm the developing situation by announcing **'nose high'**		
	PF	**PM**
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the autopilot is disconnected)	**MONITOR** airspeed and attitude throughout the recovery and **ANNOUNCE** any continued divergence
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF**	
3.	APPLY as much nose-down control input as required to obtain a nose-down pitch rate	
4.	**THRUST — ADJUST** (if required) (Thrust reduction for aeroplanes with underwing-mounted engines may be needed)	
5.	**ROLL — ADJUST** (if required) (Avoid exceeding 60-degree bank)	
6.	When airspeed is sufficiently increasing — **RECOVER** to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	
NOTE: (1) Recovery to level flight may require use of pitch trim. (2) If necessary, consider reducing thrust in aeroplanes with underwing-mounted engines to aid in achieving nose-down pitch rate. (3) **WARNING**: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.		

Table 3: Recommended nose-low recovery strategy template

Nose-low recovery strategy template		
Either pilot — Recognise and confirm the developing situation by announcing **'nose low'** (If the autopilot or autothrust/autothrottle is responding correctly, it may not be appropriate to decrease the level of automation while assessing if the divergence is being stopped)		
	PF	**PM**
1.	**AUTOPILOT — DISCONNECT** (A large out-of-trim condition could be encountered when the autopilot is disconnected)	**MONITOR** airspeed and attitude throughout
2.	**AUTOTHRUST/AUTOTHROTTLE — OFF**	

3.	**RECOVERY** from stall if required	the recovery and **ANNOUNCE** any continued divergence
4.	**ROLL** in the shortest direction to wings level (It may be necessary to reduce the G-loading by applying forward control pressure to improve roll effectiveness)	
5.	**THRUST** and **DRAG — ADJUST** (if required)	
6.	**RECOVER** to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading.)	
NOTE: (1) Recovery to level flight may require use of pitch trim. (2) **WARNING**: Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.		

(d) Go-around with all engines operating from various stages during an instrument approach (Appendix 9, Section B(5) exercise 7.3; B(6) exercise 4.1.)

(1) The objective of the go-around exercises is to expose the student pilot to the physiological effects caused by a go-around. The instructor should ensure that student pilots understand the objective of the exercises and provide students with appropriate coping strategies, including TEM. Due consideration should be given to environmental conditions when evaluating the demonstration of task proficiency and related criteria.

(2) A go-around may be commenced at any time during an approach, including before the aeroplane is in the landing configuration. Historically, most go-around training has been conducted when the aeroplane is in the landing configuration prior to commencing the go-around. Students must be prepared to adapt the go-around manoeuvre if the go-around is commenced prior to the point where the aeroplane is fully configured for landing. Situation awareness in relation to flap and gear configuration, aeroplane speed and missed approach altitude is important.

(3) Unanticipated go-arounds may startle the students (e.g. unexpected ATC constraints, automation malfunction, adverse weather, etc.). Students may find themselves faced with a situation where they have to perform a large number of critical actions under a high workload (e.g. setting thrust, landing gear retraction, flight path management). The instructor should explain that there is also a possibility of disorientation during a go-around because of the somatogravic effect produced by large longitudinal acceleration felt by the inner-ear as the aeroplane speed increases. This effect cannot be reproduced in an FSTD.

(4) It is vital that the correct pitch attitude is selected and maintained, while the aeroplane is kept in trim as it accelerates (depending on the aeroplane type). On some aeroplane types with under-slung engines the pitch response with all engines functioning may be amplified due to the relatively low gross weight towards the end of a flight and the high thrust available from modern aeroplane engines. It is particularly important that trim changes are anticipated on such aeroplanes.

(5) ATOs should develop scenarios for go-around training containing different take-off and approach stall situations that also involve surprise and startle effects and include:

(i) a go-around from the non-landing configuration;

(ii) a go-around at low gross weight using maximum go-around thrust;

(iii) a go-around from the outer marker or equivalent point;

(iv) a go-around below 500 ft using, as applicable/permitted, reduced go-around thrust;

(v) a go-around initiated above the published missed approach altitude; and

(vi) a normal go-around from the landing configuration using reduced go-around thrust (if available / type-specific).

(6) Training should also incorporate topics such as flight path management (manual and automatic), application of procedures, startle factors, communication, workload management and situation awareness. The objective of this training is to highlight:

(i) differences to procedures when the aircraft is in the non-landing configuration;

(ii) differences in handling characteristics at low gross weights and high thrust settings;

(iii) the threat associated with go-arounds close to the published missed approach altitudes;

(iv) startle and surprise associated with an unplanned go-around (ATC, blocked runway, etc.);

(v) the importance of effective communication between flight crew;

(vi) the requirement to be aware of the aircraft energy state during a go-around; and

(vii) the importance of engaging the autopilot or flight director in the correct modes during a go-around.

(7) Go-around training should not be limited to addressing the somatogravic effects caused by a go-around. Training should also cover topics such as flight path management (manual and automatic), application of procedures, startle factor, communication, workload management and situation awareness. Flight path management training should address:

(i) the handling differences of a lighter than normal aircraft which may differ to handling experienced during take-off when the aircraft is much heavier;

(ii) the different reaction of the aeroplane (pitch and vertical speed) comparing a go-around performed with reduced G/A thrust (if the function is available) and a go-around performed with full G/A thrust (a different weight).

(8) The importance of correct selection of TO/GA modes by the PF should also be emphasised (pushing TO/GA, selected the correct thrust lever detent, etc.)

(9) The importance of the PM role in the go-around manoeuvre should also be highlighted. The PM usually has higher workload as they need to reconfigure the aircraft, engage FMA modes, communicate with ATC and monitor the actions of the PF. This excessive workload for the PM may lead him or her to prioritise actions to the detriment of monitoring activities. The phenomenon of attentional tunnelling may also need to be addressed. This happens when one pilot, or both, focus exclusively on a problem at the expense of general monitoring of the flight parameters.

Appendix 10 – Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings – EBT practical assessment

AMC1 to Appendix 10 Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings – EBT practical assessment

APPLICATION AND REPORT FORM — ADMINISTRATIVE PROCEDURES RELATED TO TYPE RATINGS

(a) Minimum information provided in the form for Appendix 10.

Applicant's last name(s):		Applicant's first name(s):
Signature of applicant:		State of licence issue:
Type of licence held:		Licence number:
Type rating:		FSTD (aircraft type):
EBT module 1	Session 1........Name of the instructor: ____________ Type and number of licence: ____________ Location, date and time: ____________ FSTD ID code:____________	
EBT module 1	Session 2........Name of the instructor:____________ Type and number of licence:____________ Location, date and time:____________ FSTD ID code:____________	
EBT module 1	Session X......Name of the instructor:____________ Type and number of licence:____________ Location, date and time:____________ FSTD ID code:____________	
EBT module 1	Completion of the module: ☐	____________ date / signature (EBT manager)
EBT module 2	Session 1........Name of the instructor: ____________ Type and number of licence: ____________ Location, date and time: ____________ FSTD ID code:____________	

	Session 2........Name of the instructor:____________ Type and number of licence:____________ Location, date and time:____________ FSTD ID code:____________	
	Session X......Name of the instructor:____________ Type and number of licence:____________ Location, date and time:____________ FSTD ID code:____________	
	Completion of the module: ☐	____________ date / signature (EBT manager)
	(...)	
EBT module X	Session 1........Name of the instructor: ____________ Type and number of licence: ____________ Location, date and time: ____________ FSTD ID code:____________	
	Session 2........Name of the instructor:____________ Type and number of licence:____________ Location, date and time:____________ FSTD ID code:____________	
	Session X......Name of the instructor:____________ Type and number of licence:____________ Location, date and time:____________ FSTD ID code:____________	
	Completion of the module: ☐	____________ date / signature (EBT manager)
Completion of the operator's EBT programme from____(date) to ____(date) ☐		____________ date / signature (EBT manager)
Name(s) in capital letters: Type and number of licence: Examiner certificate number:		Signature of examiner (EBT manager) ____________ Date of applicant's licence endorsement: ____________
Delegation of signature for licence endorsement (instructor)		
Name: Position in the operator: Date:		Signature

(b) AOC declaration for revalidation and renewal under the EBT programme for the purpose of AMC1 ARA.GEN.315(a) point (d) and for the purpose of point 1(a) of Appendix 10.

I confirm all of the following:

The EBT manager holds a current type rating examiner certificate in the type rating filled in in Appendix 10 (copy to be attached);	YES ☐
The instructor(s) that conducted the training to the applicant has (have) been standardised.	YES ☐
The EBT operator has performed a verification of the grading system at least once in the last 3 years.	YES ☐
The integrity of the applicant training data is ensured.	YES ☐

Signature of the training manager or EBT manager________________________

(c) In order for the EBT manager to delegate their signature in accordance with point 4(c)(2) of Appendix 10 to another person to endorse the licence of the applicant, the following should apply:

  (1) the person signing the licence should be nominated,

  (2) the person signing the licence should hold or have held an instructor certificate,

  (3) the approved procedure for delegation of signature should include procedures to prevent the person who received the delegation from signing the licence when the EBT programme applicable to the validity period has not been completed.

(d) The authority may customise the form above by requesting additional information or changing the order of the elements of the form.

GM1 to Appendix 10 — Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings — EBT practical assessment

REVALIDATION AND RENEWAL OF TYPE RATING — ADMINISTRATIVE PROCEDURES

(a) The operator may nominate several deputy EBT managers to ensure the availability of at least one examiner for each fleet, in the context of workload to manage the EBT programme, several locations of the training facilities, or bases, etc.

(b) For the first revalidation of type rating after the transition from mixed EBT, the examiner may use mixed EBT module(s) in addition to the other EBT module(s) as a means to revalidate the type rating.

(c) In accordance with the approved procedure in Appendix 10, 4. (c)(2), and as provided in AMC1 to Appendix 10 point (c), the EBT manager may nominate the EBT instructor who completed the EBT module as the person to whom the signature of the examiner is delegated. A stamp or electronic signature may exclusively be given from the EBT manager to the EBT instructor, in order to document the delegation in a transparent and secure manner. Following that process, EBT instructors on behalf of the EBT manager can endorse an applicant's licence.

(d) The EBT programme is included in the operations manual and, in accordance with ORO.FC.145 of MCAR.ORO, for CAT it is subject to prior approval including any changes, its syllabi and the use of individual FSTD.

(e) The requirements for completion of the operator's EBT programme (see the form set out in AMC1 to Appendix 10) can be found in point ORO.FC.231(a)(3) of MCAR-ORO) and include, as a minimum, the completion of:

  (1) a minimum of two EBT modules;

(2) line evaluation(s) of competence. In the case of renewal of a type rating, the line evaluation of competence can be performed only when the pilot has their type rating renewed; and

(3) ground training.

(f) The EBT programme includes equivalencies of approaches (point ORO.FC.231(g)) and determines the necessary training frequency for particular approaches. Therefore, pilots can maintain their PBN privileges when completing an EBT programme. Additionally, in the case of specific approaches related to PBN which require a specific approval in accordance with Subpart B of MCAR-SPA, the requirements of that Subpart (SPA.PBN) apply.

GM2 to Appendix 10 — Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings – EBT practical assessment

EBT PRACTICAL ASSESSMENT — PROFICIENCY CHECK

EBT practical assessment (or **Practical assessment)** is defined in FCL.010. More information can be found in ICAO Doc 9868 'PANS-TRG'.

(a) The demonstration of skills to revalidate or renew referred to in the definition of 'proficiency check' in point FCL.010 is equivalent to the EBT practical assessments conducted in the EBT programme and the final review of the examiner. In fact, one single EBT practical assessment demonstrates the necessary skills performed in legacy training; however, EBT goes one step further — to revalidate or renew, the pilot performs at least two demonstrations, corresponding to at least two EBT modules within the validity period of the type rating.

(b) A proficiency check is equivalent to the combination of the evaluation phase (EVAL) and manoeuvres training phase (MT). However, EBT also requires a scenario-based training phase (SBT) following the EVAL to complete the module.

ANNEX IV (PART-MED)

SUBPART A – GENERAL REQUIREMENTS

SECTION 1 – GENERAL

GM1 MED.A.020 Decrease in medical fitness

MEDICATION – GUIDANCE FOR PILOTS AND CABIN CREW MEMBERS

(a) Any medication can cause side effects, some of which may impair the safe performance of flying duties. Equally, symptoms of colds, sore throats, diarrhoea and other abdominal upsets may cause little or no problem whilst on the ground but may distract the pilot or cabin crew member and degrade their performance whilst on duty. The in-flight environment may also increase the severity of symptoms which may only be minor whilst on the ground. Therefore, one issue with medication and flying is the underlying condition and, in addition, the symptoms may be compounded by the side effects of the medication prescribed or bought over the counter for treatment. This guidance material provides some help to pilots and cabin crew in deciding whether expert aero-medical advice by an AME, AeMC, GMP, OHMP or medical assessor is needed.

(b) Before taking any medication and acting as a pilot or cabin crew member, the following three basic questions should be satisfactorily answered:

(1) Do I feel fit to fly?

(2) Do I really need to take medication at all?

(3) Have I given this particular medication a personal trial on the ground to ensure that it will not have any adverse effects on my ability to fly?

(c) Confirming the absence of adverse effects may well need expert aero-medical advice.

(d) The following are some widely used medicines with a description of their compatibility with flying duties:

(1) Antibiotics. Antibiotics may have short-term or delayed side effects which can affect pilot or cabin crew performance. More significantly, however, their use usually indicates that an infection is present and, thus, the effects of this infection may mean that a pilot or cabin crew member is not fit to fly and should obtain expert aero-medical advice.

(2) Anti-malaria drugs. The decision on the need for anti-malaria drugs depends on the geographical areas to be visited, and the risk that the pilot or cabin crew member has of being exposed to mosquitoes and of developing malaria. An expert medical opinion should be obtained to establish whether anti-malaria drugs are needed and what kind of drugs should be used. Most of the

anti-malaria drugs (atovaquone plus proguanil, chloroquine, doxycycline) are compatible with flying duties. However, adverse effects associated with mefloquine include insomnia, strange dreams, mood changes, nausea, diarrhoea and headaches. In addition, mefloquine may cause spatial disorientation and lack of fine coordination and is, therefore, not compatible with flying duties.

(3) Antihistamines. Antihistamines can cause drowsiness. They are widely used in 'cold cures' and in treatment of hay fever, asthma and allergic rashes. They may be in tablet form or a constituent of nose drops or sprays. In many cases, the condition itself may preclude flying, so that, if treatment is necessary, expert aero-medical advice should be sought so that so-called non-sedative antihistamines, which do not degrade human performance, can be prescribed.

(4) Cough medicines. Antitussives often contain codeine, dextromethorfan or pseudo-ephedrine which are not compatible with flying duties. However, mucolytic agents (e.g. carbocysteine) are well-tolerated and are compatible with flying duties.

(5) Decongestants. Nasal decongestants with no effect on alertness may be compatible with flying duties. However, as the underlying condition requiring the use of decongestants may be incompatible with flying duties, expert aero-medical advice should be sought. For example, oedema of the mucosal membranes causes difficulties in equalising the pressure in the ears or sinuses.

(6) Nasal corticosteroids are commonly used to treat hay fever, and they are compatible with flying duties.

(7) (i) Common pain killers and antifebrile drugs. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and paracetamol, commonly used to treat pain, fever or headaches, may be compatible with flying duties. However, the pilot or cabin crew member should give affirmative answers to the three basic questions listed in (b) before using the medication and carrying out flying duties.

(ii) Strong analgesics. The more potent analgesics including codeine are opiate derivatives, and may produce a significant decrement in human performance and, therefore, are not compatible with flying duties.

(8) Anti-ulcer medicines. Gastric secretion inhibitors such as H2 antagonists (e.g. ranitidine, cimetidine) or proton pump inhibitors (e.g. omeprazole) may be acceptable after diagnosis of the pathological condition. It is important to seek for the medical diagnosis and not to only treat the dyspeptic symptoms.

(9) Anti-diarrhoeal drugs. Loperamide is one of the more common anti-diarrhoeal drugs and is usually safe to take whilst flying. However, the diarrhoea itself often makes the pilot and cabin crew member unfit for flying duties.

(10) Hormonal contraceptives and hormone replacement therapy usually have no adverse effects and are compatible with flying duties.

(11) Erectile dysfunction medication. This medication may cause disturbances in colour vision and dizziness. There should be at least 6 hours between taking sildenafil and flying duty; and 36 hours between taking vardenafil or tadalafil and flying duty.

(12) Smoking cessation. Nicotine replacement therapy may be acceptable. However, other medication affecting the central nervous system (buproprion, varenicline) is not acceptable for pilots.

(13) High blood pressure medication. Most anti-hypertensive drugs are compatible with flying duties However, if the level of blood pressure is such that drug therapy is required, the pilot or cabin crew member should be monitored for any side effects before carrying out flying duties. Therefore, consultation with the AME, AeMC, GMP, OHMP or medical assessor as applicable, is needed.

(14) Asthma medication. Asthma has to be clinically stable before a pilot or cabin crew member can return to flying duties. The use of respiratory aerosols or powders, such as corticosteroids, beta-2-agonists or chromoglycic acid may be compatible with flying duties. However, the use of oral steroids or theophylline derivatives is incompatible with flying duty. Pilots or cabin crew members using medication for asthma should consult the AME, AeMC, GMP, OHMP or medical assessor, as applicable.

(15) Tranquillisers and sedatives. The inability to react, due to the use of this group of medicines, has been a contributory cause to fatal aircraft accidents. In addition, the underlying condition for which these medications have been prescribed will almost certainly mean that the mental state of a pilot or cabin crew member is not compatible with flying duties.

(16) Sleeping tablets. Sleeping tablets dull the senses, may cause confusion and slow reaction times. The duration of effect may vary from individual to individual and may be unduly prolonged. Expert aero-medical advice should be obtained before using sleeping tablets.

(17) Melatonin. Melatonin is a hormone that is involved with the regulation of the circadian rhythm. In some countries it is a prescription medicine, whereas in most other countries it is regarded as a ‘dietary supplement’ and can be bought without any prescription. The results from the efficiency of melatonin in treatment of jet lag or sleep disorders have been contradictory. Expert aero-medical advice should be obtained.

(18) Coffee and other caffeinated drinks may be acceptable, but excessive coffee drinking may have harmful effects, including disturbance of the heart’s rhythm. Other stimulants including caffeine pills, amphetamines, etc. (often known as ‘pep’ pills) used to maintain wakefulness or suppress appetite can be habit forming. Susceptibility to different stimulants varies from one individual to another, and all may cause dangerous overconfidence.

Overdosage causes headaches, dizziness and mental disturbance. These other stimulants should not be used.

(19) Anaesthetics. Following local, general, dental and other anaesthetics, a period of time should elapse before returning to flying. The period will vary considerably from individual to individual, but a pilot or cabin crew member should not fly for at least 12 hours after a local anaesthetic, and for at least 48 hours after a general, spinal or epidural anaesthetic (see MED.A.020).

(e) Many preparations on the market nowadays contain a combination of medicines. It is, therefore, essential that if there is any new medication or dosage, however slight, the effect should be observed by the pilot or the cabin crew member on the ground prior to flying. It should be noted that medication which would not normally affect pilot or cabin crew performance may do so in individuals who are 'oversensitive' to a particular preparation. Individuals are, therefore, advised not to take any medicines before or during flight unless they are completely familiar with their effects on their own bodies. In cases of doubt, pilots and cabin crew members should consult an AME, AeMC, GMP, OHMP or medical assessor, as applicable.

(f) Other treatments

Alternative or complementary medicine, such as acupuncture, homeopathy, hypnotherapy and several other disciplines, is developing and gaining greater credibility. Such treatments are more acceptable in some States than others. There is a need to ensure that 'other treatments', as well as the underlying condition, are declared and considered by the AME, AeMC, GMP, OHMP or medical assessor, as applicable, for assessing fitness.

AMC1 MED.A.025 Obligations of the AeMC, AME, GMP and OHMP

(a) If the medical examination is carried out by two or more AMEs or GMPs, only one of them should be responsible for coordinating the results of the examination, evaluating the findings with regard to medical fitness, and signing the report.

(b) The applicant should be made aware that the associated medical certificate or cabin crew report may be suspended or revoked if the applicant provides incomplete, inaccurate or false statements on their medical history to the AeMC, AME, GMP or OHMP.

(c) In cases where the AeMC or AME is required to assess the fitness of an applicant for a class 2 medical certificate in consultation with the medical assessor of the licensing authority, they should document the consultation in accordance with the procedure established by the competent authority.

(d) The AeMC, AME, GMP or OHMP should give advice to the applicant on treatment and preventive measures if, during the course of the examination, medical conditions or risk factors are identified which may endanger the medical fitness of the applicant in the future.

(e) When data is not being properly recorded in the national aero-medical data repository (if available) due to unserviceability of the system, the AeMCs and AMEs should ensure that all required data is entered or corrected without undue delay once the system is restored. In the absence of such a system, AeMCs and AMEs should maintain complete and accurate local records and submit reports to the CAA as required.

(f) In case of denial or referral to the licensing authority, the AeMC, AME, GMP or OHMP should inform the applicant in writing regarding the result of the assessment in a form and manner established by the competent authority.

GM1 MED.A.025 Obligations of the AeMC, AME, GMP and OHMP

GUIDELINES FOR THE AeMC, AME OR GMP CONDUCTING THE MEDICAL EXAMINATIONS AND ASSESSMENTS FOR MEDICAL CERTIFICATION OF PILOTS

(a) Before performing the medical examination, the AeMC, AME or GMP should:

(1) verify the applicant’s identity by checking their identity card, passport, driving licence or other official document containing a photograph of the applicant;

(2) obtain details of the applicant’s flight crew licence from the applicant’s licensing authority if they do not have their licence with them;

(3) except for initial applicants, obtain details of the applicant’s most recent medical certificate from the medical assessor of the applicant’s licensing authority if they do not have their certificate with them;

(4) in the case of a specific medical examination(s) (SIC) limitation on the existing medical certificate, obtain details of the specific medical condition and any associated instructions from the medical assessor of the applicant’s licensing authority. This could include, for example, a requirement to undergo a specific examination or test;

(5) except for initial applicants, ascertain, from the previous medical certificate, which routine medical test(s) should be conducted, for example electrocardiography (ECG);

(6) provide the applicant with the application form for a medical certificate and the instructions for completion and ask the applicant to complete the form but not to sign it yet;

(7) go through the form with the applicant and give information to help the applicant understand the significance of the entries and ask any questions which might help the applicant to recall important historical medical data;

(8) verify that the form is complete and legible, ask the applicant to sign and date the form and then sign it as well. If the applicant declines to complete the application form fully, inform the applicant that it may not be possible to issue a medical certificate regardless of the outcome of the clinical examination and assessment.

(b) Once all the items in (a) have been addressed, the AeMC, AME or GMP should:

(1) perform the medical examination of the applicant in accordance with the applicable rules;

(2) arrange for additional specialist medical examinations, such as otorhinolaryngology (ENT) or ophthalmology, to be conducted as applicable and obtain the associated report forms or reports;

(3) complete the medical examination report form in accordance with the associated instructions for completion;

(4) ensure that all of the report forms are complete, accurate and legible.

(c) Once all the actions in (b) have been carried out, the AeMC, AME or GMP should review the report forms and:

(1) if satisfied that the applicant meets the applicable medical requirements as set out in Part-MED, issue a medical certificate for the appropriate class, with limitations if necessary. The applicant should sign the certificate once signed by the AeMC, AME or GMP; or

(2) if the applicant does not meet the applicable medical requirements, or if the fitness of the applicant for the class of medical certificate applied for is in doubt:

(i) refer the decision on medical fitness to, or consult the decision on medical fitness with, the medical assessor of the licensing authority or AME in compliance with MED.B.001; or

(ii) deny issuance of a medical certificate, explain the reason(s) for denial to the applicant and inform them of their right of a review according to the procedures of the competent authority.

(d) The AeMC, AME or GMP should send the documents as required by MED.A.025(b) to the medical assessor of the applicant's licensing authority within 5 days from the date of the medical examination. If a medical certificate has been denied or the decision has been referred, the documents should be sent to the medical assessor of the licensing authority on the same day that the denial or referral decision is reached.

SECTION 2 - REQUIREMENTS FOR MEDICAL CERTIFICATES

AMC1 MED.A.030 Medical certificates

(a) A class 1 medical certificate includes the privileges and validities of class 2 and LAPL medical certificates.

(b) A class 2 medical certificate includes the privileges and validities of a LAPL medical certificate.

AMC1 MED.A.035 Application for a medical certificate

Except for initial applicants, the AeMC, AME or GMP should not start the aero-medical examination for the issue of the medical certificate where applicants do not present the most recent medical certificate, unless relevant information is received from the medical assessor of the licensing authority.

SUBPART B – REQUIREMENTS FOR PILOT MEDICAL CERTIFICATES

SECTION 1 – GENERAL

AMC1 MED.B.001 Limitations to medical certificates

GENERAL

(a) An AeMC or AME may refer the decision on fitness of an applicant to the medical assessor of the licensing authority in borderline cases or where fitness is in doubt.

(b) In cases where a fit assessment may only be considered with a limitation, the AeMC, AME, GMP or the medical assessor of the licensing authority should evaluate the medical condition of the applicant in consultation with flight operations and other experts, if necessary.

(c) Initial application of limitations

(1) The limitations TML, VDL, VML, VNL and VCL, as listed in AMC2 MED.B.001(a), may be imposed by an AME or an AeMC for class 1, class 2, and LAPL medical certificates, or a GMP for LAPL medical certificates.

(2) All other limitations listed in AMC2 MED.B.001(a) should only be imposed:

(i) for class 1 medical certificates, by the medical assessor of the licensing authority where a referral is required according to MED.B.001;

(ii) for class 2 medical certificates, by the AME or AeMC in consultation with the medical assessor of the licensing authority where consultation is required according to MED.B.001;

(iii) for LAPL medical certificates, by an AME or AeMC.

(d) Removal of limitations

(1) For class 1 medical certificates, all limitations should only be removed by the medical assessor of the licensing authority.

(2) For class 2 medical certificates, limitations may be removed by the medical assessor of the licensing authority or by an AeMC or AME in consultation with the medical assessor of the licensing authority.

(3) For LAPL medical certificates, limitations may be removed by an AeMC or AME.

AMC2 MED.B.001 Limitations to medical certificates

LIMITATION CODES

(a) The following abbreviations for limitations codes should be used on the medical certificates as applicable:

Code	Limitation
TML	Limited period of validity of the medical certificate
VDL	Valid only with correction for defective distant vision
VML	Valid only with correction for defective distant, intermediate and near vision
VNL	Valid only with correction for defective near vision
CCL	Correction by means of contact lenses
VCL	Valid by day only
RXO	Specialist ophthalmological examination(s)
SIC	Specific medical examination(s)
HAL	Valid only when hearing aids are worn
APL	Valid only with approved prosthesis
AHL	Valid only with approved hand controls
OML	Valid only as, or with, a qualified co-pilot
OCL	Valid only as a qualified co-pilot
OSL	Valid only with a safety pilot and in aircraft with dual controls
OPL	Valid only without passengers
ORL	Valid only with a safety pilot if passengers are carried
OAL	Restricted to demonstrated aircraft type
SSL	Special restriction(s) as specified

(b) The abbreviations for the limitation codes should be explained to the holder of a medical certificate as follows:

(1) TML Time limitation

The period of validity of the medical certificate is limited to the duration as shown on the medical certificate. This period of validity commences on the date of the medical examination. Any period of validity remaining on the previous medical certificate is no longer valid. The holder of the medical certificate should present themselves for re-examination when advised and should follow any medical recommendations.

(2) VDL Wear corrective lenses and carry a spare set of spectacles

Correction for defective distant vision: whilst exercising the privileges of the licence, the holder of the medical certificate should wear spectacles or contact lenses that correct for defective distant vision as examined and approved by the AeMC, AME or GMP. Contact lenses may not be worn until cleared to do so by the AeMC, AME or GMP. A spare set of spectacles, approved by the AeMC, AME or GMP, should be readily available.

(3) VML Wear multifocal spectacles and carry a spare set of spectacles

Correction for defective distant, intermediate and near vision: whilst exercising the privileges of the licence, the holder of the medical certificate should wear spectacles that correct for defective distant, intermediate and near vision as examined and approved by the AeMC, AME or GMP. Contact lenses or full frame spectacles, when either correct for near vision only, may not be worn. A spare set of spectacles, approved by the AeMC, AME or GMP, should be readily available.

(4) VNL Have available corrective spectacles and carry a spare set of spectacles

Correction for defective near vision: whilst exercising the privileges of the licence, the holder of the medical certificate should have readily available spectacles that correct for defective near vision as examined and approved by the AeMC, AME or GMP. Contact lenses or full frame spectacles, when either correct for near vision only, may not be worn. A spare set of spectacles, approved by the AeMC, AME or GMP, should be readily available.

(5) CCL Wear contact lenses that correct for defective distant vision

Correction for defective distant vision: whilst exercising the privileges of the licence, the holder of a medical certificate should wear contact lenses that correct for defective distant vision, as examined and approved by the AeMC, AME or GMP. A spare set of similarly correcting spectacles, approved by the AeMC, AME or GMP, should be readily available for immediate use whilst exercising the privileges of the licence.

(6) VCL Valid by day only

This limitation allows holders of a class 2 or LAPL medical certificate with varying degrees of colour deficiency, to exercise the privileges of their licence by daytime only.

(7) RXO Specialist ophthalmological examination(s)

Specialist ophthalmological examination(s), other than the examinations stipulated in Part-MED, are required for a significant reason.

(8) SIC Specific regular medical examination(s) contact the medical assessor of the licensing authority

This limitation requires the AeMC, or AME to contact the medical assessor of the licensing authority before embarking upon a revalidation or renewal aero-medical assessment. The limitation is likely to concern a medical history or additional examination(s) which the AeMC or AME should be aware of prior to undertaking the assessment.

(9) HAL Wear hearing aid(s)

Whilst exercising the privileges of the licence, the holder of the medical certificate should use hearing aid(s) that compensate for defective hearing as examined and approved by the AeMC or AME. A spare set of batteries should be readily available.

(10) APL Valid only with approved prosthesis

This limitation applies to the holder of a medical certificate with a musculoskeletal condition when a medical flight test or a flight simulator test has shown that the use of a prosthesis is required to safely exercise the privileges of the licence. The prosthesis to be used should be approved.

(11) AHL Valid only with approved hand controls

This limitation applies to the holder of a medical certificate who has a limb deficiency or other anatomical problem which had been shown by a medical flight test or flight simulator testing to be acceptable but to require the aircraft to be equipped with suitable, approved hand controls.

(12) OML Valid only as or with a qualified co-pilot

This limitation applies to holders of a class 1 medical certificate who do not fully meet the aero-medical requirements for single-pilot operations, but are fit for multi-pilot operations. Refer to MED.B.001(d)(1).

(13) OCL Valid only as a qualified co-pilot

This limitation is an extension of the OML and are restricted to the role of co-pilot.

(14) OSL Valid only with a safety pilot and in aircraft with dual controls

This limitation applies to holders of a class 2 or a LAPL medical certificate only. The safety pilot should be made aware of the type(s) of possible incapacity that the pilot whose medical certificate has been issued with this limitation may suffer and should be prepared to take over the aircraft controls during flight. Refer to MED.B.001(d)(2).

(15) OPL Valid only without passengers

This limitation applies to holders of a class 2 or LAPL medical certificate with a medical condition that may lead to an increased level of risk to flight safety when exercising the privileges of the licence. This limitation is to be applied when this risk is not acceptable for the carriage of passengers. Refer to MED.B.001(d)(3).

(16) ORL Valid only with a safety pilot if passengers are carried and in aircraft with dual controls

This limitation applies to holders of a class 2 or LAPL medical certificate with a medical condition that may lead to an increased level of risk to flight safety when exercising the privileges of the licence. The safety pilot, if carried, should be made aware of the type(s) of possible incapacity that the pilot whose medical certificate has been issued with this limitation may suffer and should be prepared to take over the aircraft controls during flight. Refer to MED.B.001(d)(4).

(17) OAL Restricted to demonstrated aircraft type

This limitation applies to a the holder of a medical certificate who has a limb deficiency or other medical problem which had been shown by a medical flight test or flight simulator testing to be acceptable but to require a restriction to a specific class and type of aircraft.

(18) SSL Special restriction(s) as specified

This limitation may be considered when an individually specified limitation, not defined in this AMC, is appropriate to mitigate an increased level of risk to flight safety. The description of the SSL should be entered on the medical certificate or in a separate document to be carried with the medical certificate.

SECTION 2 – MEDICAL REQUIREMENTS FOR CLASS 1 AND CLASS 2 MEDICAL CERTIFICATES

AMC1 MED.B.010 Cardiovascular system

(a) Examination

Exercise electrocardiography

An exercise ECG when required as part of a cardiovascular assessment should be symptom limited and completed to a minimum of Bruce Stage IV or equivalent.

(b) General

(1) Cardiovascular risk factor assessment

(i) Serum lipid estimation is case finding and significant abnormalities should be reviewed, investigated and supervised by the AeMC or AME in consultation with the medical assessor of the licensing authority.

(ii) Applicants with an accumulation of risk factors (smoking, family history, lipid abnormalities, hypertension, etc.) should undergo a cardiovascular evaluation by the AeMC or AME, if necessary in consultation with the medical assessor of the licensing authority.

(2) Cardiovascular assessment

(i) Reporting of resting and exercise electrocardiograms should be by the AME or an accredited specialist.

(ii) The extended cardiovascular assessment should be undertaken at an AeMC or may be delegated to a cardiologist.

(c) Peripheral arterial disease

If there is no significant functional impairment, a fit assessment may be considered provided:

(1) applicants without symptoms of coronary artery disease have reduced any vascular risk factors to an appropriate level;

(2) applicants should be on appropriate secondary prevention treatment;

(3) exercise electrocardiography is satisfactory. Further tests may be required which should show no evidence of myocardial ischaemia or significant coronary artery stenosis.

(d) Aortic aneurysm

(1) Applicants with an aneurysm of the infra-renal abdominal aorta of less than 5 cm in diameter may be assessed as fit before surgery, with an OML subject to satisfactory evaluation by a cardiologist. Follow-up by ultra-sound scans or other imaging techniques, as necessary, should be determined by the medical assessor of the licensing authority.

(2) Applicants may be assessed as fit with an OML after surgery for an aneurysm of the thoracic or abdominal aorta if the blood pressure and cardiovascular evaluation is satisfactory. Regular evaluations by a cardiologist should be carried out.

(e) Cardiac valvular abnormalities

(1) Applicants with previously unrecognised cardiac murmurs should undergo evaluation by a cardiologist and assessment by the medical assessor of the licensing authority. If considered significant, further investigation should include at least 2D Doppler echocardiography or equivalent imaging.

(2) Applicants with minor cardiac valvular abnormalities may be assessed as fit. Applicants with significant abnormality of any of the heart valves should be assessed as unfit.

(3) Aortic valve disease

(i) Applicants with a bicuspid aortic valve may be assessed as fit if no other cardiac or aortic abnormality is demonstrated. Follow-up with echocardiography, as necessary, should be determined by the medical assessor of the licensing authority.

(ii) Applicants with aortic stenosis may be assessed as fit provided the left ventricular function is intact and the mean pressure gradient is less than 20 mmHg. Applicants with an aortic valve orifice with indexation on the body surface of more than 0.6 cm^2/m^2 and a mean pressure gradient above 20 mmHg, but not greater than 50 mmHg, may be assessed as fit with an OML. Follow-up with 2D Doppler echocardiography, as necessary, should be determined by the medical assessor of the licensing authority in all cases. Alternative measurement techniques with equivalent ranges may be used. Regular evaluation by a cardiologist should be considered. Applicants with a history of systemic embolism or significant dilatation of the thoracic aorta should be assessed as unfit.

(iii) Applicants with trivial aortic regurgitation may be assessed as fit. A greater degree of aortic regurgitation should require an OML. There should be no demonstrable abnormality of the ascending aorta on 2D Doppler echocardiography. Follow-up, as necessary, should be determined by the medical assessor of the licensing authority.

(4) Mitral valve disease

(i) Asymptomatic applicants with an isolated mid-systolic click due to mitral leaflet prolapse may be assessed as fit.

(ii) Applicants with rheumatic mitral stenosis should normally be assessed as unfit.

(iii) Applicants with minor regurgitation may be assessed as fit. Periodic cardiological review should be determined by the medical assessor of the licensing authority.

(iv) Applicants with moderate mitral regurgitation may be considered as fit with an OML if the 2D Doppler echocardiogram demonstrates satisfactory left ventricular dimensions and satisfactory myocardial function is confirmed by exercise electrocardiography. Periodic cardiological review should be required, as determined by the medical assessor of the licensing authority.

(v) Applicants with evidence of volume overloading of the left ventricle demonstrated by increased left ventricular end-diastolic diameter or evidence of systolic impairment should be assessed as unfit.

(f) Valvular surgery

Applicants who have undergone cardiac valve replacement or repair should be assessed as unfit. A fit assessment may be considered in the following cases:

(1) Mitral leaflet repair for prolapse is compatible with a fit assessment, provided post-operative investigations reveal satisfactory left ventricular function without systolic or diastolic dilation and no more than minor mitral regurgitation.

(2) Asymptomatic applicants with a tissue valve or with a mechanical valve who, at least 6 months following surgery, are taking no cardioactive medication may be considered for a fit assessment with an OML. Investigations which demonstrate normal valvular and ventricular configuration and function should have been completed as demonstrated by:

(i) a satisfactory symptom limited exercise ECG. Myocardial perfusion imaging/stress echocardiography should be required if the exercise ECG is abnormal or any coronary artery disease is suspected;

(ii) a 2D Doppler echocardiogram showing no significant selective chamber enlargement, a tissue valve with minimal structural alteration and a normal Doppler blood flow, and no structural or functional abnormality of the other heart valves. Left ventricular fractional shortening should be normal.

Follow-up with exercise ECG and 2D echocardiography, as necessary, should be determined by the medical assessor of the licensing authority.

(3) Where anticoagulation is needed after valvular surgery, a fit assessment with an OML may be considered if the haemorrhagic risk is acceptable and the

anticoagulation is stable. Anticoagulation should be considered stable if, within the last 6 months, at least 5 international normalised ratio (INR) values are documented, of which at least 4 are within the INR target range. The INR target range should be determined by the type of surgery performed.

(g) Thromboembolic disorders

Applicants with arterial or venous thrombosis or pulmonary embolism should be assessed as unfit. A fit assessment with an OML may be considered after a period of stable anticoagulation as prophylaxis, after review by the medical assessor of the licensing authority. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range and the haemorrhagic risk is acceptable. In cases of anticoagulation medication not requiring INR monitoring, a fit assessment with an OML may be considered after review by the medical assessor of the licensing authority after a stabilisation period of 3 months. Applicants with pulmonary embolism should also be evaluated by a cardiologist. Following cessation of anticoagulant therapy, for any indication, applicants should undergo a re-assessment by the medical assessor of the licensing authority.

(h) Other cardiac disorders

(1) Applicants with a primary or secondary abnormality of the pericardium, myocardium or endocardium should be assessed as unfit. A fit assessment may be considered following complete resolution and satisfactory cardiological evaluation which may include 2D Doppler echocardiography, exercise ECG and/or myocardial perfusion imaging/stress echocardiography and 24-hour ambulatory ECG. Coronary angiography may be indicated. Frequent review and an OML may be required after fit assessment.

(2) Applicants with a congenital abnormality of the heart should be assessed as unfit. Applicants following surgical correction or with minor abnormalities that are functionally unimportant may be assessed as fit following cardiological evaluation. No cardioactive medication is acceptable. Investigations may include 2D Doppler echocardiography, exercise ECG and 24-hour ambulatory ECG. The potential hazard of any medication should be considered as part of the assessment. Particular attention should be paid to the potential for the medication to mask the effects of the congenital abnormality before or after surgery. Regular cardiological evaluations should be carried out.

(i) Syncope

(1) In the case of a single episode of vasovagal syncope which can be explained and is compatible with flight safety, a fit assessment may be considered.

(2) Applicants with a history of recurrent vasovagal syncope should be assessed as unfit. A fit assessment may be considered after a 6-month period without recurrence, provided cardiological evaluation is satisfactory. Such evaluation should include:

(i) a satisfactory symptom limited 12 lead exercise ECG to Bruce Stage IV, or equivalent. If the exercise ECG is abnormal, myocardial perfusion imaging/stress echocardiography or equivalent test should be carried out;

(ii) a 2D Doppler echocardiogram showing neither significant selective chamber enlargement nor structural or functional abnormality of the heart, valves or myocardium;

(iii) a 24-hour ambulatory ECG recording showing no conduction disturbance, complex or sustained rhythm disturbance or evidence of myocardial ischaemia.

(3) A tilt test, or equivalent, carried out to a standard protocol showing no evidence of vasomotor instability may be required.

(4) Neurological review should be required.

(5) An OML should be required until a period of 5 years has elapsed without recurrence. The medical assessor of the licensing authority may determine a shorter or longer period of OML according to the individual circumstances of the case.

(6) Applicants who experienced loss of consciousness without significant warning should be assessed as unfit.

(j) Blood pressure

(1) The diagnosis of hypertension should require cardiovascular evaluation to include potential vascular risk factors.

(2) Anti-hypertensive treatment should be agreed by the medical assessor of the licensing authority. Acceptable medication may include:

(i) non-loop diuretic agents;

(ii) ACE inhibitors;

(iii) angiotensin II receptor blocking agents (sartans);

(iv) channel calcium blocking agents;

(v) certain (generally hydrophilic) beta-blocking agents.

(3) Following initiation of medication for the control of blood pressure, applicants should be re-assessed to verify that satisfactory control has been achieved and the treatment is compatible with the safe exercise of the privileges of the applicable licence(s).

(k) Coronary artery disease

(1) Chest pain of uncertain cause should require full investigation. Applicants with angina pectoris should be assessed as unfit, whether or not it is alleviated by medication.

(2) In suspected asymptomatic coronary artery disease, exercise electrocardiography should be required. Further tests may be required, which

should show no evidence of myocardial ischaemia or significant coronary artery stenosis.

(3) Applicants with evidence of exercise-induced myocardial ischaemia should be assessed as unfit.

(4) After an ischaemic cardiac event or revascularisation procedure, applicants should have reduced cardiovascular risk factors to an appropriate level. Medication, when used to control cardiac symptoms, is not acceptable. All applicants should be on appropriate secondary prevention treatment.

(i) A coronary angiogram obtained around the time of, or during, the ischaemic myocardial event or revasculisation procedure and a complete, detailed clinical report of the ischaemic event and of any operative procedures should be made available to the medical assessor of the licensing authority:

(A) there should be no stenosis more than 50 % in any major untreated vessel, in any vein or artery graft or at the site of an angioplasty/stent, except in a vessel subtending a myocardial infarction;

(B) the whole coronary vascular tree should be assessed as satisfactory by a cardiologist, and particular attention should be paid to multiple stenoses and/or multiple revascularisations;

(C) Applicants with an untreated stenosis greater than 30 % in the left main or proximal left anterior descending coronary artery should be assessed as unfit.

(ii) At least 6 months from the ischaemic myocardial event or revascularisation procedure, the following investigations should be completed (equivalent tests may be substituted):

(A) an exercise ECG showing neither evidence of myocardial ischaemia nor rhythm or conduction disturbance;

(B) an echocardiogram showing satisfactory left ventricular function with no important abnormality of wall motion (such as dyskinesia or akinesia) and a left ventricular ejection fraction of 50 % or more;

(C) in cases of angioplasty/stenting, a myocardial perfusion scan or stress echocardiogram, or equivalent test, which should show no evidence of reversible myocardial ischaemia. If there is any doubt about myocardial perfusion in other cases (infarction or bypass grafting) a perfusion scan, or equivalent test, should also be carried out;

(D) further investigations, such as a 24-hour ECG, may be necessary to assess the risk of any significant rhythm disturbance.

(iii) Follow-up should be annual (or more frequently, if necessary) to ensure that there is no deterioration of the cardiovascular status. It should include a review by a cardiologist, exercise ECG and cardiovascular risk assessment. Additional investigations may be required by the medical assessor of the licensing authority.

(A) After coronary artery bypass grafting, a myocardial perfusion scan, or equivalent test, should be performed if there is any indication, and in all cases within 5 years from the procedure.

(B) In all cases, coronary angiography should be considered at any time if symptoms, signs or non-invasive tests indicate myocardial ischaemia.

(iv) Successful completion of the 6-month or subsequent review will allow a fit assessment with an OML.

(l) Rhythm and conduction disturbances

(1) Applicants with significant rhythm or conduction disturbance should undergo evaluation by a cardiologist before a fit assessment with an OML, as necessary, may be considered. Appropriate follow-up should be carried out at regular intervals. Such evaluation should include:

(i) exercise ECG to the Bruce protocol or equivalent. Bruce stage 4 should be achieved and no significant abnormality of rhythm or conduction, or evidence of myocardial ischaemia should be demonstrated. Withdrawal of cardioactive medication prior to the test should normally be required;

(ii) 24-hour ambulatory ECG which should demonstrate no significant rhythm or conduction disturbance;

(iii) 2D Doppler echocardiogram which should show no significant selective chamber enlargement or significant structural or functional abnormality, and a left ventricular ejection fraction of at least 50 %.

Further evaluation may include (equivalent tests may be substituted):

(iv) 24-hour ECG recording repeated as necessary;

(v) electrophysiological study;

(vi) myocardial perfusion imaging;

(vii) cardiac magnetic resonance imaging (MRI);

(viii) coronary angiogram.

(2) Applicants with frequent or complex forms of supra ventricular or ventricular ectopic complexes require full cardiological evaluation.

(3) Where anticoagulation is needed for a rhythm disturbance, a fit assessment with an OML may be considered if the haemorrhagic risk is acceptable and the anticoagulation is stable. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. In cases of anticoagulation medication not requiring INR monitoring, a fit assessment with an OML may be

considered after review by the medical assessor of the licensing authority after a stabilisation period of 3 months.

(4) Ablation

Applicants who have undergone ablation therapy should be assessed as unfit. A fit assessment may be considered following successful catheter ablation and should require an OML for at least one year, unless an electrophysiological study, undertaken at a minimum of 2 months after the ablation, demonstrates satisfactory results. For those whose long-term outcome cannot be assured by invasive or non-invasive testing, an additional period with an OML and/or observation may be necessary.

(5) Supraventricular arrhythmias

Applicants with significant disturbance of supraventricular rhythm, including sinoatrial dysfunction, whether intermittent or established, should be assessed as unfit. A fit assessment may be considered if cardiological evaluation is satisfactory.

(i) Atrial fibrillation/flutter

(A) For initial applicants, a fit assessment should be limited to those with a single episode of arrhythmia which is considered by the medical assessor of the licensing authority to be unlikely to recur.

(B) For revalidation, applicants may be assessed as fit if cardiological evaluation is satisfactory and the stroke risk is sufficiently low. A fit assessment with an OML may be considered after a period of stable anticoagulation as prophylaxis, after review by the medical assessor of the licensing authority. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. In cases of anticoagulation medication not requiring INR monitoring, a fit assessment with an OML may be considered after review by the medical assessor of the licensing authority after a stabilisation period of 3 months.

(ii) Applicants with asymptomatic sinus pauses up to 2.5 seconds on resting electrocardiography may be assessed as fit if exercise electrocardiography, echocardiography and 24-hour ambulatory ECG are satisfactory.

(iii) Applicants with symptomatic sino-atrial disease should be assessed as unfit.

(6) Mobitz type 2 atrio-ventricular block

Applicants with Mobitz type 2 AV block should require full cardiological evaluation and may be assessed as fit in the absence of distal conducting tissue disease.

(7) Complete right bundle branch block

(i) Applicants with complete right bundle branch block should undergo a cardiological evaluation on first presentation. A fit assessment may be considered if there is no underlying pathology.

(ii) Applicants with bifascicular block may be assessed as fit with an OML after a satisfactory cardiological evaluation. The OML may be considered for removal if an electrophysiological study demonstrates no infra-Hissian block, or a 3-year period of satisfactory surveillance has been completed.

(8) Complete left bundle branch block

(i) A fit assessment may be considered subject to satisfactory cardiological evaluation and a 3-year period with an OML, and without an OML after 3 years of surveillance and satisfactory cardiological evaluation.

(ii) Investigation of the coronary arteries is necessary for applicants over age 40.

(9) Ventricular pre-excitation

(i) Asymptomatic initial applicants with pre-excitation may be assessed as fit if an electrophysiological study, including adequate drug-induced autonomic stimulation reveals no inducible re-entry tachycardia and the existence of multiple pathways is excluded.

(ii) Asymptomatic applicants with pre-excitation may be assessed as fit at revalidation with limitation(s) as appropriate. Limitations may not be necessary if an electrophysiological study, including adequate drug-induced autonomic stimulation, reveals no inducible re-entry tachycardia and the existence of multiple accessory pathways is excluded.

(10) Pacemaker

Applicants with a subendocardial pacemaker should be assessed as unfit. A fit assessment with an OML may be considered at revalidation no sooner than 3 months after insertion provided:

(i) there is no other disqualifying condition;

(ii) a bipolar lead system, programmed in bipolar mode without automatic mode change has been used;

(iii) the applicant is not pacemaker dependent; and

(iv) the applicant has a follow-up at least every 12 months, including a pacemaker check.

(11) QT prolongation

Applicants with asymptomatic QT prolongation may be assessed as fit with an OML subject to satisfactory cardiological evaluation.

(12) Brugada pattern on electrocardiography

Applicants with a Brugada pattern Type 1 should be assessed as unfit. Applicants with Type 2 or Type 3 may be assessed as fit, with limitations as appropriate, subject to satisfactory cardiological evaluation.

AMC2 MED.B.010 Cardiovascular system

(a) Examination

Exercise electrocardiography

An exercise ECG when required as part of a cardiovascular assessment should be symptom-limited and completed to a minimum of Bruce Stage IV or equivalent.

(b) General

(1) Cardiovascular risk factor assessment

Applicants with an accumulation of risk factors (smoking, family history, lipid abnormalities, hypertension, etc.) should undergo a cardiovascular evaluation by the AeMC or AME.

(2) Cardiovascular assessment

Reporting of resting and exercise electrocardiograms should be by the AME or an accredited specialist.

(c) Peripheral arterial disease

A fit assessment may be considered for an applicant with peripheral arterial disease, or after surgery for peripheral arterial disease, provided there is no significant functional impairment, any vascular risk factors have been reduced to an appropriate level, the applicant is receiving acceptable secondary prevention treatment, and there is no evidence of myocardial ischaemia.

(d) Aortic aneurysm

(1) Applicants with an aneurysm of the infra-renal abdominal aorta of less than 5 cm in diameter may be assessed as fit, subject to satisfactory cardiological evaluation. Regular cardiological evaluations should be carried out.

(2) Applicants with an aneurysm of the thoracic or supra-renal abdominal aorta of less than 5 cm in diameter may be assessed as fit with an ORL or OSL, subject to satisfactory cardiological evaluation. Regular follow-up should be carried out.

(3) Applicants may be assessed as fit after surgery for an infra-renal abdominal aortic aneurysm, subject to satisfactory cardiological evaluation. Regular cardiological evaluations should be carried out.

(4) Applicants may be assessed as fit with an ORL or OSL after surgery for a thoracic or supra-renal abdominal aortic aneurysm, subject to satisfactory cardiological evaluation. Regular cardiological evaluations should be carried out.

(e) Cardiac valvular abnormalities

(1) Applicants with previously unrecognised cardiac murmurs should undergo further cardiological evaluation.

(2) Applicants with minor cardiac valvular abnormalities may be assessed as fit.

(3) Aortic valve disease

(i) Applicants with a bicuspid aortic valve may be assessed as fit if no other cardiac or aortic abnormality is demonstrated. Follow-up with echocardiography, as necessary, should be determined in consultation with the medical assessor of the licensing authority.

(ii) Applicants with aortic stenosis may be assessed as fit provided the left ventricular function is intact and the mean pressure gradient is less than 20 mmHg. Applicants with an aortic valve orifice of more than 1 cm^2 and a mean pressure gradient above 20 mmHg, but not greater than 50 mmHg, may be assessed as fit with an ORL or OSL. Follow-up with 2D Doppler echocardiography, as necessary, should be determined in consultation with the medical assessor of the licensing authority in all cases. Alternative measurement techniques with equivalent ranges may be used. Regular cardiological evaluation should be considered. Applicants with a history of systemic embolism or significant dilatation of the thoracic aorta should be assessed as unfit.

(iii) Applicants with trivial aortic regurgitation may be assessed as fit. Applicants with a greater degree of aortic regurgitation may be assessed as fit with an OSL. There should be no demonstrable abnormality of the ascending aorta on 2D Doppler echocardiography. Follow-up, as necessary, should be determined in consultation with the medical assessor of the licensing authority.

(4) Mitral valve disease

(i) Asymptomatic applicants with an isolated mid-systolic click due to mitral leaflet prolapse may be assessed as fit.

(ii) Applicants with rheumatic mitral stenosis should be assessed as unfit.

(iii) Applicants with minor regurgitation may be assessed as fit. Periodic cardiological review should be determined in consultation with the medical assessor of the licensing authority.

(iv) Applicants with moderate mitral regurgitation may be considered as fit with an ORL or OSL if the 2D Doppler echocardiogram demonstrates satisfactory left ventricular dimensions and satisfactory myocardial function is confirmed by exercise electrocardiography. Periodic cardiological review should be determined in consultation with the medical assessor of the licensing authority.

(v) Applicants with evidence of volume overloading of the left ventricle demonstrated by increased left ventricular end-diastolic diameter or evidence of systolic impairment should be assessed as unfit.

(f) Valvular surgery

(1) Applicants who have undergone cardiac valve replacement or repair may be assessed as fit without limitations subject to satisfactory post-operative cardiological evaluation and if no anticoagulants are needed.

(2) Where anticoagulation is needed after valvular surgery, a fit assessment with an ORL or OSL may be considered after cardiological evaluation if the haemorrhagic risk is acceptable. The review should show that the anticoagulation is stable. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. The INR target range should be determined by the type of surgery performed. Applicants who measure their INR on a 'near patient' testing system within 12 hours prior to flight and only exercise the privileges of their licence(s) if the INR is within the target range, may be assessed as fit without the above-mentioned limitation. The INR results should be recorded and the results should be reviewed at each aero-medical assessment. Applicants taking anticoagulation medication not requiring INR monitoring, may be assessed as fit without the above-mentioned limitation in consultation with the medical assessor of the licensing authority after a stabilisation period of 3 months.

(g) Thromboembolic disorders

Applicants with arterial or venous thrombosis or pulmonary embolism should be assessed as unfit. A fit assessment with an ORL or OSL may be considered after a period of stable anticoagulation as prophylaxis in consultation with the medical assessor of the licensing authority. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range and the haemorrhagic risk is acceptable. Applicants who measure their INR on a 'near patient' testing system within 12 hours prior to flight and only exercise the privileges of their licence(s) if the INR is within the target range may be assessed as fit without the above-mentioned limitation. The INR results should be recorded and the results should be reviewed at each aero-medical assessment. Applicants taking anticoagulation medication not requiring INR monitoring, may be assessed as fit without the above-mentioned limitation in consultation with the medical assessor of the licensing authority after a stabilisation period of 3 months. Applicants with pulmonary embolism should also undergo a cardiological evaluation. Following cessation of anticoagulant therapy for any indication, applicants should undergo a re-assessment in consultation with the medical assessor of the licensing authority.

(h) Other cardiac disorders

(1) Applicants with a primary or secondary abnormality of the pericardium, myocardium or endocardium may be assessed as fit subject to satisfactory cardiological evaluation.

(2) Applicants with a congenital abnormality of the heart, including those who have undergone surgical correction, may be assessed as fit subject to

satisfactory cardiological evaluation. Cardiological follow-up may be necessary and should be determined in consultation with the medical assessor of the licensing authority.

(i) Syncope

(1) In the case of a single episode of vasovagal syncope which can be explained and is compatible with flight safety, a fit assessment may be considered.

(2) Applicants with a history of recurrent vasovagal syncope should be assessed as unfit. A fit assessment may be considered after a 6-month period without recurrence, providing cardiological evaluation is satisfactory. Neurological review may be indicated.

(j) Blood pressure

(1) When the blood pressure at examination consistently exceeds 160 mmHg systolic and/or 95 mmHg diastolic, with or without treatment, the applicant should be assessed as unfit.

(2) The diagnosis of hypertension requires review of other potential vascular risk factors.

(3) Applicants with symptomatic hypotension should be assessed as unfit.

(4) Anti-hypertensive treatment should be compatible with flight safety.

(5) Following initiation of medication for the control of blood pressure, applicants should be re-assessed to verify that satisfactory control has been achieved and that the treatment is compatible with the safe exercise of the privileges of the applicable licence(s).

(k) Coronary artery disease

(1) Chest pain of uncertain cause requires full investigation.

(2) Applicants with suspected asymptomatic coronary artery disease should undergo cardiological evaluation which should show no evidence of myocardial ischaemia or significant coronary artery stenosis.

(3) Applicants with evidence of exercise-induced myocardial ischaemia should be assessed as unfit.

(4) After an ischaemic cardiac event, or revascularisation, applicants without symptoms should have reduced cardiovascular risk factors to an appropriate level. Medication, when used to control angina pectoris, is not acceptable. All applicants should be on appropriate secondary prevention treatment.

(i) A coronary angiogram obtained around the time of, or during, the ischaemic myocardial event and a complete, detailed clinical report of the ischaemic event and of any operative procedures should be available to the AME.

(A) There should be no stenosis more than 50 % in any major untreated vessel, in any vein or artery graft or at the site of an angioplasty/stent, except in a vessel subtending a myocardial infarction.

(B) The whole coronary vascular tree should be assessed as satisfactory by a cardiologist and particular attention should be paid to multiple stenoses and/or multiple revascularisations.

(C) Applicants with an untreated stenosis greater than 30 % in the left main or proximal left anterior descending coronary artery should be assessed as unfit.

(ii) At least 6 months from the ischaemic myocardial event, including revascularisation, the following investigations should be completed (equivalent tests may be substituted):

(A) an exercise ECG showing neither evidence of myocardial ischaemia nor rhythm disturbance;

(B) an echocardiogram showing satisfactory left ventricular function with no important abnormality of wall motion and a satisfactory left ventricular ejection fraction of 50 % or more;

(C) in cases of angioplasty/stenting, a myocardial perfusion scan or stress echocardiogram, or equivalent test, which should show no evidence of reversible myocardial ischaemia. If there is doubt about revascularisation in myocardial infarction or bypass grafting, a perfusion scan, or equivalent test, should also be carried out;

(D) further investigations, such as a 24-hour ECG, may be necessary to assess the risk of any significant rhythm disturbance.

(iii) Periodic follow-up should include a cardiological evaluation.

(A) After coronary artery bypass grafting, a myocardial perfusion scan (or equivalent test) should be performed if there is any indication, and in all cases within five years from the procedure for a fit assessment without an OSL, OPL or ORL.

(B) In all cases, coronary angiography should be considered at any time if symptoms, signs or non-invasive tests indicate myocardial ischaemia.

(iv) Successful completion of the six-month or subsequent review will allow a fit assessment. Applicants may be assessed as fit with an ORL or OSL having successfully completed only an exercise ECG.

(5) Applicants with angina pectoris should be assessed as unfit, whether or not it is alleviated by medication.

(l) Rhythm and conduction disturbances

(1) Applicants with significant rhythm or conduction disturbance should undergo cardiological evaluation before a fit assessment may be considered with an ORL or OSL, as appropriate. Such evaluation should include:

(i) exercise ECG to the Bruce protocol or equivalent. Bruce stage 4 should be achieved and no significant abnormality of rhythm or conduction, or evidence of myocardial ischaemia should be demonstrated. Withdrawal of cardioactive medication prior to the test should normally be required;

(ii) 24-hour ambulatory ECG which should demonstrate no significant rhythm or conduction disturbance;

(iii) 2D Doppler echocardiogram which should show no significant selective chamber enlargement or significant structural or functional abnormality, and a left ventricular ejection fraction of at least 50 %.

Further evaluation may include (equivalent tests may be substituted):

(iv) 24-hour ECG recording repeated as necessary;

(v) electrophysiological study;

(vi) myocardial perfusion imaging;

(vii) cardiac magnetic resonance imaging (MRI);

(viii) coronary angiogram.

(2) Where anticoagulation is needed for a rhythm disturbance, a fit assessment with an ORL or OSL may be considered, if the haemorrhagic risk is acceptable and the anticoagulation is stable. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. Applicants who measure their INR on a ‘near patient’ testing system within 12 hours prior to flight and only exercise the privileges of their licence(s) if the INR is within the target range may be assessed as fit without the above-mentioned limitation. The INR results should be recorded and the results should be reviewed at each aero-medical assessment. Applicants taking anticoagulation medication not requiring INR monitoring, may be assessed as fit without the above-mentioned limitation in consultation with the medical assessor of the licensing authority after a stabilisation period of 3 months.

(3) Ablation

A fit assessment may be considered following successful catheter ablation subject to satisfactory cardiological review undertaken at a minimum of 2 months after the ablation.

(4) Supraventricular arrhythmias

(i) Applicants with significant disturbance of supraventricular rhythm, including sinoatrial dysfunction, whether intermittent or established, may be assessed as fit if cardiological evaluation is satisfactory.

(ii) Applicants with atrial fibrillation/flutter may be assessed as fit if cardiological evaluation is satisfactory and the stroke risk is sufficiently low. Where anticoagulation is needed, a fit assessment with an ORL or OSL may be considered after a period of stable anticoagulation as prophylaxis, in consultation with the medical assessor of the licensing authority. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. Applicants who measure their INR on a 'near patient' testing system within 12 hours prior to flight and only exercise the privileges of their licence(s) if the INR is within the target range may be assessed as fit without the above-mentioned limitation. The INR results should be recorded and the results should be reviewed at each aero-medical assessment. Applicants taking anticoagulation medication not requiring INR monitoring, may be assessed as fit without the above-mentioned limitation in consultation with the medical assessor of the licensing authority after a stabilisation period of 3 months.

(iii) Applicants with asymptomatic sinus pauses up to 2.5 seconds on resting electrocardiography may be assessed as fit if cardiological evaluation is satisfactory.

(5) Heart block

(i) Applicants with first degree and Mobitz type 1 AV block may be assessed as fit.

(ii) Applicants with Mobitz type 2 AV block may be assessed as fit in the absence of distal conducting tissue disease.

(6) Complete right bundle branch block

Applicants with complete right bundle branch block may be assessed as fit with appropriate limitations, such as an ORL, and subject to satisfactory cardiological evaluation.

(7) Complete left bundle branch block

Applicants with complete left bundle branch block may be assessed as fit with appropriate limitations, such as an ORL, and subject to satisfactory cardiological evaluation.

(8) Ventricular pre-excitation

Asymptomatic applicants with ventricular pre-excitation may be assessed as fit with limitation(s) as appropriate, subject to satisfactory cardiological evaluation. Limitations may not be necessary if an electrophysiological study is conducted and the results are satisfactory.

(9) Pacemaker

Applicants with a subendocardial pacemaker should be assessed as unfit. A fit assessment may be considered no sooner than 3 months after insertion, providing:

(i) there is no other disqualifying condition;

(ii) a bipolar lead system, programmed in bipolar mode without automatic mode change, has been used;

(iii) the applicant is not pacemaker dependent; and

(iv) the applicant has a follow-up at least every 12 months, including a pacemaker check.

(10) QT prolongation

Applicants with asymptomatic QT prolongation may be assessed as fit with an ORL or OSL subject to satisfactory cardiological evaluation.

(11) Brugada pattern on electrocardiography

Applicants with a Brugada pattern Type 1 should be assessed as unfit. Applicants with Type 2 or Type 3 may be assessed as fit, with limitation(s) as appropriate, subject to satisfactory cardiological evaluation.

(m) Heart or heart/lung transplantation

(1) Applicants who have undergone heart or heart/lung transplantation may be assessed as fit, with appropriate limitation(s) such as an ORL , no sooner than 12 months after transplantation, provided that cardiological evaluation is satisfactory with:

(i) no rejection in the first year following transplantation;

(ii) no significant arrhythmias;

(iii) a left ventricular ejection fraction ≥ 50%;

(iv) a symptom limited exercise ECG; and

(v) a coronary angiogram if indicated;

(2) Regular cardiological evaluations should be carried out.

GM1 MED.B.010 Cardiovascular system

MITRAL VALVE DISEASE

(a) Minor regurgitation should have evidence of no thickened leaflets or flail chordae and left atrial internal diameter of less than or equal to 4.0 cm.

(b) The following may indicate severe regurgitation:

(1) LV internal diameter (diastole) > 6.0 cm; or

(2) LV internal diameter (systole) > 4.1 cm; or

(3) Left atrial internal diameter > 4.5 cm.

(c) Doppler indices, such as width of jet, backwards extension and whether there is flow reversal in the pulmonary veins may be helpful in assessing severity of regurgitation.

GM2 MED.B.010 Cardiovascular system

VENTRICULAR PRE-EXCITATION

Asymptomatic applicants with pre-excitation may be assessed as fit if they meet the following criteria, which may also indicate a satisfactory electrophysiological evaluation:

(a) refractory period > 300 ms;

(b) no induced atrial fibrillation.

GM3 MED.B.010 Cardiovascular system

ANTICOAGULATION

Applicants taking anticoagulant medication which requires monitoring with INR testing, should measure their INR on a 'near patient' testing system within 12 hours prior to flight and the privileges of the applicable licence(s) should only be exercised if the INR is within the target range. The INR result should be recorded and the results should be reviewed at each aero-medical assessment.

GM4 MED.B.010 Cardiovascular system

MITRAL VALVE DISEASE

(a) Minor regurgitation should have evidence of no thickened leaflets or flail chordae and left atrial internal diameter of less than or equal to 4.0 cm.

(b) The following may indicate severe regurgitation:

(1) LV internal diameter (diastole) > 6.0 cm; or

(2) LV internal diameter (systole) > 4.1 cm; or

(3) Left atrial internal diameter > 4.5 cm.

(c) Doppler indices, such as width of jet, backwards extension and whether there is flow reversal in the pulmonary veins may be helpful in assessing severity of regurgitation.

GM5 MED.B.010 Cardiovascular system

VENTRICULAR PRE-EXCITATION

Asymptomatic applicants with pre-excitation may be assessed as fit if they meet the following criteria:

(a) no inducible re-entry tachycardia;

(b) refractory period > 300 ms;

(c) no induced atrial fibrillation;

(d) no evidence of multiple accessory pathways.

AMC1 MED.B.015 Respiratory system

(a) Examination

(1) Spirometry

A spirometric examination is required for initial examination and on clinical indication. Applicants with an FEV1/FVC ratio of less than 70 % should be evaluated by a specialist in respiratory disease.

(2) Chest radiography

Posterior/anterior chest radiography may be required at initial, revalidation or renewal examinations if clinically or epidemiologically indicated

(b) Chronic obstructive pulmonary disease

Applicants with chronic obstructive pulmonary disease should be assessed as unfit. Applicants with only minor impairment of pulmonary function may be assessed as fit.

(c) Asthma

Applicants with asthma requiring medication or experiencing recurrent attacks of asthma may be assessed as fit if the asthma is considered stable with satisfactory pulmonary function tests and medication is compatible with flight safety. Applicants requiring systemic steroids should be assessed as unfit.

(d) Inflammatory disease

For applicants with active inflammatory disease of the respiratory system a fit assessment may be considered when the condition has resolved without sequelae and no medication is required.

(e) Sarcoidosis

(1) Applicants with active sarcoidosis should be assessed as unfit. Investigation should be undertaken with respect to the possibility of systemic, particularly cardiac, involvement. A fit assessment may be considered if no medication is required, and the disease is investigated and shown to be limited to hilar lymphadenopathy and inactive.

(2) Applicants with cardiac or neurological sarcoid should be assessed as unfit.

(f) Pneumothorax

(1) Applicants with a spontaneous pneumothorax should be assessed as unfit. A fit assessment may be considered if respiratory evaluation is satisfactory:

(i) 1 year following full recovery from a single spontaneous pneumothorax;

(ii) at revalidation, 6 weeks following full recovery from a single spontaneous pneumothorax, with an OML for at least a year after full recovery;

(iii) following surgical intervention in the case of a recurrent pneumothorax provided there is satisfactory recovery.

(2) Applicants with a recurrent spontaneous pneumothorax that has not been surgically should be assessed as unfit.

(3) A fit assessment following full recovery from a traumatic pneumothorax as a result of an accident or injury may be acceptable once full absorption of the pneumothorax is demonstrated.

(g) Thoracic surgery

(1) Applicants requiring major thoracic surgery should be assessed as unfit until recovery is complete, the applicant is asymptomatic, and the risk of secondary complication is minimal.

(2) A fit assessment following lesser chest surgery may be considered after satisfactory recovery and full respiratory evaluation.

(h) Sleep apnoea syndrome/sleep disorder

Applicants with unsatisfactorily treated sleep apnoea syndrome should be assessed as unfit.

AMC2 MED.B.015 Respiratory system

(a) Examination

(1) A spirometric examination should be performed on clinical indication. Applicants with a forced expiratory volume in the first one second (FEV1)/forced vital capacity(FVC)ratio of less than 70 % should be evaluated by a specialist in respiratory disease.

(2) Posterior/anterior chest radiography may be required if clinically or epidemiologically indicated.

(b) Chronic obstructive pulmonary disease

Applicants with only minor impairment of pulmonary function may be assessed as fit.

(c) Asthma

Applicants with asthma may be assessed as fit if the asthma is considered stable with satisfactory pulmonary function tests and medication is compatible with flight safety. Applicants requiring systemic steroids should be assessed as unfit.

(d) Inflammatory disease

Applicants with active inflammatory disease of the respiratory system should be assessed as unfit pending resolution of the condition.

(e) Sarcoidosis

(1) Applicants with active sarcoidosis should be assessed as unfit. Investigation should be undertaken with respect to the possibility of systemic involvement. A fit assessment may be considered once the disease is inactive.

(2) Applicants with cardiac sarcoid should be assessed as unfit.

(f) Pneumothorax

(1) Applicants with spontaneous pneumothorax should be assessed as unfit. A fit assessment may be considered if respiratory evaluation is satisfactory:

(i) six weeks following full recovery from a single spontaneous pneumothorax;

(ii) following surgical intervention in the case of a recurrent pneumothorax, provided there is satisfactory recovery.

(2) A fit assessment following full recovery from a traumatic pneumothorax as a result of an accident or injury may be acceptable once full absorption of the pneumothorax is demonstrated.

(g) Thoracic surgery

Applicants requiring major thoracic surgery should be assessed as unfit until recovery is complete, the applicant is asymptomatic, and the risk of secondary complication is minimal.

(h) Sleep apnoea syndrome

Applicants with unsatisfactorily treated sleep apnoea syndrome should be assessed as unfit.

AMC1 MED.B.020 Digestive system

(a) Oesophageal varices

Applicants with oesophageal varices should be assessed as unfit.

(b) Pancreatitis

Applicants with pancreatitis should be assessed as unfit pending assessment. A fit assessment may be considered if the cause is removed.

(c) Gallstones

(1) Applicants with a single asymptomatic large gallstone discovered incidentally may be assessed as fit if not likely to cause incapacitation in flight.

(2) Applicants with asymptomatic multiple gallstones may be assessed as fit with an OML.

(d) Inflammatory bowel disease

Applicants with an established diagnosis or history of chronic inflammatory bowel disease should be assessed as fit if the inflammatory bowel disease is in established remission and stable and if systemic steroids are not required for its control.

(e) Peptic ulceration

Applicants with peptic ulceration should be assessed as unfit pending full recovery and demonstrated healing.

(f) Digestive tract and abdominal surgery

Applicants who have undergone a surgical operation for medical conditions of the digestive tract or its adnexa, including a total or partial excision or a diversion of any of these organs or herniae should be assessed as unfit. A fit assessment may be considered if recovery is complete, the applicant is asymptomatic, and there is only a minimal risk of secondary complication or recurrence.

(g) Liver disease

Applicants with morphological or functional liver disease, or after surgery, including liver transplantation, may be assessed as fit subject to satisfactory gastroenterological evaluation.

AMC2 MED.B.020 Digestive system

(a) Oesophageal varices

Applicants with oesophageal varices should be assessed as unfit.

(b) Pancreatitis

Applicants with pancreatitis should be assessed as unfit pending satisfactory recovery.

(c) Gallstones

(1) Applicants with a single asymptomatic large gallstone or asymptomatic multiple gallstones may be assessed as fit.

(2) Applicants with symptomatic single or multiple gallstones should be assessed as unfit. A fit assessment may be considered following gallstone removal.

(d) Inflammatory bowel disease

Applicants with an established diagnosis or history of chronic inflammatory bowel disease may be assessed as fit provided that the disease is stable and not likely to interfere with the safe exercise of the privileges of the applicable licence(s).

(e) Peptic ulceration

Applicants with peptic ulceration should be assessed as unfit pending full recovery.

(f) Digestive tract and abdominal surgery

Applicants who have undergone a surgical operation:

(1) for herniae; or

(2) on the digestive tract or its adnexa, including a total or partial excision or diversion of any of these organs

should be assessed as unfit. A fit assessment may be considered if recovery is complete, the applicant is asymptomatic, and there is only a minimal risk of secondary complication or recurrence.

(g) Liver disease

Applicants with morphological or functional liver disease, or after surgery, including liver transplantation, may be assessed as fit subject to satisfactory gastroenterological evaluation.

AMC1 MED.B.025 Metabolic and endocrine systems

(a) Metabolic, nutritional or endocrine dysfunction

Applicants with metabolic, nutritional or endocrine dysfunction may be assessed as fit if the condition is asymptomatic, clinically compensated and stable with or without replacement therapy, and regularly reviewed by an appropriate specialist.

(b) Obesity

Applicants with a Body Mass Index ≥ 35 may be assessed as fit only if the excess weight is not likely to interfere with the safe exercise of the applicable licence(s) and the results of a risk assessment, including evaluation of the cardiovascular system and evaluation of the possibility of sleep apnoea, are satisfactory.

(c) Addison's disease

Applicants with Addison's disease should be assessed as unfit. A fit assessment with an OML may be considered, provided that cortisone is carried and available for use whilst exercising the privileges of the applicable licence(s).

(d) Gout

Applicants with acute gout should be assessed as unfit. A fit assessment may be considered once asymptomatic, after cessation of treatment or the condition is stabilised on anti-hyperuricaemic therapy.

(e) Thyroid dysfunction

Applicants with hyperthyroidism or hypothyroidism should be assessed as unfit. A fit assessment may be considered when a stable euthyroid state is attained.

(f) Abnormal glucose metabolism

Glycosuria and abnormal blood glucose levels require investigation. A fit assessment may be considered if normal glucose tolerance is demonstrated (low renal threshold) or impaired glucose tolerance without diabetic pathology is fully controlled by diet and regularly reviewed.

(g) Diabetes mellitus

Subject to good control of blood sugar with no hypoglycaemic episodes:

(1) applicants with diabetes mellitus not requiring medication may be assessed as fit;

(2) the use of antidiabetic medications that are not likely to cause hypoglycaemia may be acceptable for a fit assessment with an OML.

AMC2 MED.B.025 Metabolic and endocrine systems

(a) Metabolic, nutritional or endocrine dysfunction

Applicants with metabolic, nutritional or endocrine dysfunction should be assessed as unfit. A fit assessment may be considered if the condition is asymptomatic, clinically compensated and stable.

(b) Obesity

Applicants with a Body Mass Index ≥ 35 may be assessed as fit only if the excess weight is not likely to interfere with the safe exercise of the applicable licence(s) and the results of a risk assessment, including evaluation of the cardiovascular system and evaluation of the possibility of sleep apnoea, are satisfactory.

(c) Addison’s disease

Applicants with Addison’s disease may be assessed as fit provided that cortisone is carried and available for use whilst exercising the privileges of the applicable licence(s).

(d) Gout

Applicants with acute gout should be assessed as unfit until asymptomatic.

(e) Thyroid dysfunction

Applicants with thyroid disease may be assessed as fit once a stable euthyroid state is attained.

(f) Abnormal glucose metabolism

Glycosuria and abnormal blood glucose levels require investigation. A fit assessment may be considered if normal glucose tolerance is demonstrated (low renal threshold) or impaired glucose tolerance is fully controlled by diet and regularly reviewed.

(g) Diabetes mellitus

Applicants with diabetes mellitus may be assessed as fit. The use of antidiabetic medications that are not likely to cause hypoglycaemia may be acceptable.

AMC1 MED.B.030 Haematology

(a) Abnormal haemoglobin

Applicants with abnormal haemoglobin should be investigated.

(b) Anaemia

(1) Applicants with anaemia demonstrated by a reduced haemoglobin level require investigation. Applicants with an haematocrit of less than 32 % should be assessed as unfit. A fit assessment may be considered in cases where the primary cause, such as iron or B12 deficiency, has been treated and the haemoglobin or haematocrit has stabilised at a satisfactory level.

(2) Applicants with anaemia which is unamenable to treatment should be assessed as unfit.

(c) Erythrocytosis

Applicants with erythrocytosis should be assessed as unfit. A fit assessment with an OML may be considered if investigation establishes that the condition is stable and no associated pathology is demonstrated.

(d) Haemoglobinopathy

(1) Applicants with a haemoglobinopathy should be assessed as unfit. A fit assessment may be considered where minor thalassaemia or other haemoglobinopathy is diagnosed without a history of crises and where full functional capability is demonstrated. The haemoglobin level should be satisfactory.

(2) Applicants with sickle cell disease (homozygote) should be assessed as unfit.

(e) Coagulation disorders

(1) Applicants with a coagulation disorder should be assessed as unfit. A fit assessment may be considered if there is no history of significant bleeding episodes.

(2) Applicants with thrombocytopenia with a platelet count less than $75x10^9$/L should be assessed as unfit. A fit assessment may be considered once the platelet count is above $75x10^9$/L and stable.

(f) Haemorrhagic disorders

Applicants with a haemorrhagic disorder require investigation. A fit assessment with an OML may be considered if there is no history of significant bleeding.

(g) Thromboembolic disorders

(1) Applicants with a thrombotic disorder require investigation. A fit assessment may be considered when the applicant is asymptomatic and there is only minimal risk of secondary complication or recurrence.

(2) If anticoagulation is used as treatment, refer to AMC1 MED.B.010(g).

(3) Applicants with arterial embolus should be assessed as unfit. A fit assessment may be considered once recovery is complete, the applicant is asymptomatic, and there is only minimal risk of secondary complication or recurrence.

(h) Disorders of the lymphatic system

Applicants with significant localised and generalised enlargement of the lymphatic glands or haematological disease should be assessed as unfit and require investigation. A fit assessment may be considered in cases of an acute infectious process which is fully recovered or Hodgkin’s lymphoma or other lymphoid malignancy which has been treated and is in full remission.

(i) Leukaemia

(1) Applicants with acute leukaemia should be assessed as unfit. Once in established remission, applicants may be assessed as fit.

(2) Applicants with chronic leukaemia should be assessed as unfit. After a period of demonstrated stability a fit assessment may be considered.

(3) Applicants with a history of leukaemia should have no history of central nervous system involvement and no continuing side-effects from treatment of flight safety importance. Haemoglobin and platelet levels should be satisfactory. Regular follow-up is required.

(j) Splenomegaly

Applicants with splenomegaly should be assessed as unfit and require investigation. A fit assessment may be considered when the enlargement is minimal, stable and no associated pathology is demonstrated, or if the enlargement is minimal and associated with another acceptable condition.

AMC2 MED.B.030 Haematology

(a) Abnormal haemoglobin

Haemoglobin should be tested when clinically indicated.

(b) Anaemia

Applicants with anaemia demonstrated by a reduced haemoglobin level or low haematocrit may be assessed as fit once the primary cause has been treated and the haemoglobin or haematocrit has stabilised at a satisfactory level.

(c) Erythrocytosis

Applicants with erythrocytosis may be assessed as fit if the condition is stable and no associated pathology is demonstrated.

(d) Haemoglobinopathy

Applicants with a haemoglobinopathy may be assessed as fit if minor thalassaemia or other haemoglobinopathy is diagnosed without a history of crises and where full functional capability is demonstrated.

(e) Coagulation and haemorrhagic disorders

Applicants with a coagulation or haemorrhagic disorder may be assessed as fit if there is no likelihood of significant bleeding.

(f) Thromboembolic disorders

Applicants with a thrombotic disorder may be assessed as fit if there is minimal likelihood of significant clotting episodes. If anticoagulation is used as treatment, refer to AMC2 MED.B.010(g).

(g) Disorders of the lymphatic system

Applicants with significant enlargement of the lymphatic glands or haematological disease may be assessed as fit if the condition is unlikely to interfere with the safe exercise of the privileges of the applicable licence(s). Applicants may be assessed as fit in cases of acute infectious process which is fully recovered or Hodgkin's lymphoma or other lymphoid malignancy which has been treated and is in full remission.

(h) Leukaemia

(1) Applicants with acute leukaemia may be assessed as fit once in established remission.

(2) Applicants with chronic leukaemia may be assessed as fit after a period of demonstrated stability.

(3) In cases (h)(1) and (h)(2), there should be no history of central nervous system involvement and no continuing side effects from treatment of flight safety importance. Haemoglobin and platelet levels should be satisfactory. Regular follow-up is required.

(i) Splenomegaly

Applicants with splenomegaly may be assessed as fit if the enlargement is minimal, stable and no associated pathology is demonstrated, or if the enlargement is minimal and associated with another acceptable condition.

AMC1 MED.B.035 Genitourinary system

(a) Abnormal urinalysis

Investigation is required if there is any abnormal finding on urinalysis.

(b) Renal disease

(1) Applicants presenting with any signs of renal disease should be assessed as unfit. A fit assessment may be considered if blood pressure is satisfactory and renal function is acceptable.

(2) Applicants requiring dialysis should be assessed as unfit.

(c) Urinary calculi

(1) Applicants with an asymptomatic calculus or a history of renal colic require investigation.

(2) Applicants presenting with one or more urinary calculi should be assessed as unfit and require investigation.

(3) Whilst awaiting assessment or treatment, a fit assessment with an OML may be considered.

(4) After successful treatment for a calculus a fit assessment without an OML may be considered.

(5) Applicants with parenchymal residual calculi may be considered for a fit assessment with an OML.

(d) Renal and urological surgery

(1) Applicants who have undergone a major surgical operation on the genitourinary system or its adnexa involving a total or partial excision or a diversion of any of its organs, should be assessed as unfit until recovery is complete, the applicant is asymptomatic, and the risk of secondary complication is minimal.

(2) After other urological surgery, a fit assessment may be considered when the applicant is completely asymptomatic and there is only minimal risk of secondary complication or recurrence.

(3) Applicants with compensated nephrectomy without hypertension or uraemia may be considered for a fit assessment.

(4) Applicants who have undergone renal transplantation may be considered for a fit assessment with an OML if it is fully compensated and tolerated with only minimal immuno-suppressive therapy after at least 12 months.

(5) Applicants who have undergone total cystectomy may be considered for a fit assessment with an OML if there is satisfactory urinary function, no infection and no recurrence of primary pathology.

AMC2 MED.B.035 Genitourinary system

(a) Renal disease

Applicants presenting with renal disease may be assessed as fit if blood pressure is satisfactory and renal function is acceptable. Applicants requiring dialysis should be assessed as unfit.

(b) Urinary calculi

(1) Applicants presenting with one or more urinary calculi should be assessed as unfit.

(2) Applicants with an asymptomatic calculus or a history of renal colic require investigation.

(3) While awaiting assessment or treatment, a fit assessment with an OSL may be considered.

(4) After successful treatment the applicant may be assessed as fit.

(5) Applicants with parenchymal residual calculi may be assessed as fit.

(c) Renal and urological surgery

(1) Applicants who have undergone a major surgical operation on the genitourinary system or its adnexa involving a total or partial excision or a diversion of any of its organs, should be assessed as unfit until recovery is complete, the applicant is asymptomatic, and the risk of secondary complication is minimal.

(2) After other urological surgery, a fit assessment may be considered when the applicant is completely asymptomatic and there is only minimal risk of secondary complication or recurrence.

(3) Applicants with compensated nephrectomy without hypertension or uraemia may be assessed as fit.

(4) Applicants who have undergone renal transplantation may be considered for a fit assessment if it is fully compensated and with only minimal immuno-suppressive therapy.

(5) Applicants who have undergone total cystectomy may be considered for a fit assessment if there is satisfactory urinary function, no infection and no recurrence of primary pathology.

AMC1 MED.B.040 Infectious disease

(a) Infectious disease General

In cases of infectious disease, consideration should be given to a history of, or clinical signs indicating, underlying impairment of the immune system.

(b) Tuberculosis

(1) Applicants with active tuberculosis should be assessed as unfit. A fit assessment may be considered following completion of therapy.

(2) Applicants with quiescent or healed lesions may be assessed as fit. Specialist evaluation should consider the extent of the disease, the treatment required and possible side effects of medication.

(c) Syphilis

Applicants with acute syphilis should be assessed as unfit. A fit assessment may be considered in the case of those fully treated and recovered from the primary and secondary stages.

(d) HIV positivity

(1) Applicants who are HIV positive may be assessed as fit with an OML if a full investigation provides no evidence of HIV associated diseases that might give rise to incapacitating symptoms. Frequent review of the immunological status and neurological evaluation by an appropriate specialist should be carried out. A cardiological evaluation may also be required, depending on the medication.

(2) Applicants with signs or symptoms of an AIDS-defining condition should be assessed as unfit.

(e) Infectious hepatitis

Applicants with infectious hepatitis should be assessed as unfit. A fit assessment may be considered once the applicant has become asymptomatic. Regular review of the liver function should be carried out.

AMC2 MED.B.040 Infectious disease

(a) Tuberculosis

(1) Applicants with active tuberculosis should be assessed as unfit. A fit assessment may be considered following completion of therapy.

(2) Applicants with quiescent or healed lesions may be assessed as fit. Specialist evaluation should consider the extent of the disease, the treatment required and possible side effects of medication.

(b) HIV positivity

(1) Applicants who are HIV positive may be assessed as fit if a full investigation provides no evidence of HIV associated diseases that might give rise to incapacitating symptoms. Frequent review of the immunological status and neurological evaluation by an appropriate specialist should be carried out. A cardiological evaluation may be required, depending on the medication.

(2) Applicants with signs or symptoms of an AIDS-defining condition should be assessed as unfit.

AMC1 MED.B.045 Obstetrics and gynaecology

(a) Gynaecological surgery

Applicants who have undergone a major gynaecological operation should be assessed as unfit. A fit assessment may be considered if recovery is complete, the applicant is asymptomatic, and the risk of

(b) Pregnancy

(1) A pregnant licence holder may be assessed as fit with an OML during the first 26 weeks of gestation following review of the obstetric evaluation by the AeMC or AME who should inform the medical assessor of the licensing authority.

(2) The AeMC or AME should provide written advice to the applicant and the supervising physician regarding potentially significant complications of pregnancy.

AMC2 MED.B.045 Obstetrics and gynaecology

(a) Gynaecological surgery

Applicants who have undergone a major gynaecological operation should be assessed as unfit until recovery is complete, the applicant is asymptomatic, and the risk of secondary complication or recurrence is minimal.

(b) Pregnancy

(1) A pregnant licence holder may be assessed as fit during the first 26 weeks of gestation following satisfactory obstetric evaluation.

(2) Licence privileges may be resumed upon satisfactory confirmation of full recovery following confinement or termination of pregnancy.

AMC1 MED.B.050 Musculoskeletal system

(a) Applicants with any significant sequelae from disease, injury or congenital abnormality affecting the bones, joints, muscles or tendons with or without surgery require full evaluation prior to a fit assessment.

(b) Applicants with inflammatory, infiltrative, traumatic or degenerative disease of the musculoskeletal system may be assessed as fit, provided the condition is in remission or is stable and the applicant is taking no disqualifying medication and has satisfactorily completed a medical flight or simulator flight test. Appropriate limitation(s) apply.

(c) Applicants with abnormal musculoskeletal system, including obesity, undertaking medical fight or flight simulator testing should satisfactorily perform all tasks required for the type of flight intended, including the emergency and evacuation procedures.

AMC2 MED.B.050 Musculoskeletal system

(a) Applicants with any significant sequelae from disease, injury or congenital abnormality affecting the bones, joints, muscles or tendons with or without surgery should require full evaluation prior to a fit assessment.

(b) Applicants with inflammatory, infiltrative, traumatic or degenerative disease of the musculoskeletal system may be assessed as fit provided the condition is in remission or is stable and the applicant is taking no disqualifying medication and has satisfactorily completed a medical flight test. Appropriate limitation(s) may apply.

(c) Applicants with abnormal musculoskeletal system, including obesity, undertaking a medical flight test should satisfactorily perform all tasks required for the type of flight intended, including the emergency and evacuation procedures.

AMC1 MED.B.055 Mental health

(a) Mental health assessment as part of the initial class 1 aero-medical examination

(1) A comprehensive mental health assessment should be conducted and recorded taking into account social, environmental and cultural contexts.

(2) The applicant's history and symptoms of disorders that might pose a threat to flight safety should be identified and recorded.

(3) The mental health assessment should include assessment and documentation of:

(i) general attitudes to mental health, including understanding possible indications of reduced mental health in themselves and others;

(ii) coping strategies under periods of psychological stress or pressure in the past, including seeking advice from others;

(iii) childhood behavioural problems;

(iv) interpersonal and relationship issues;

(v) current work and life stressors; and

(vi) overt personality disorders.

(4) Where there are signs or is established evidence that an applicant may have a psychiatric or psychological disorder, the applicant should be referred for specialist opinion and advice.

(b) Mental health assessment as part of revalidation or renewal class 1 medical examination

(1) The assessment should include review and documentation of:

(i) current work and life stressors;

(ii) coping strategies under periods of psychological stress or pressure in the past, including seeking advice from others;

(iii) any difficulties with operational crew resource management (CRM);

(iv) any difficulties with employer and/or other colleagues and managers; and

(v) interpersonal and relationship issues, including difficulties with relatives, friends, and work colleagues.

(2) Where there are signs or is established evidence that an applicant may have a psychiatric or psychological disorder, the applicant should be referred for specialist opinion and advice.

(3) Established evidence should be verifiable information from an identifiable source related to the mental fitness or personality of a particular individual. Sources for this information can be accidents or incidents, problems in training or proficiency checks, behaviour or knowledge relevant to the safe exercise of the privileges of the applicable licence(s).

(c) Assessment of holders of a class 1 medical certificate referenced in MED.B.055(d)

Assessment of holders of a class 1 medical certificate referenced in MED.B.055(d) may require psychiatric and psychological evaluation as determined by the medical assessor of the licensing authority. A SIC limitation should be imposed in case of a fit assessment. Follow-up and removal of SIC limitation, as necessary, should be determined by the medical assessor of the licensing authority.

(d) Psychoactive substance testing

(1) Drug tests should screen for opioids, cannabinoids, amphetamines, cocaine, hallucinogens and sedative hypnotics. Following a risk assessment performed by the competent authority on the target population, screening tests may include additional drugs.

(2) For renewal/revalidation, random psychoactive substance screening test may be performed based on the risk assessment by the competent authority on the target population. If random psychoactive substance screening test is considered, it should be performed and reported in accordance with the procedures developed by the competent authority.

(3) In the case of a positive psychoactive substance screening result, confirmation should be required in accordance with national standards and procedures for psychoactive substance testing.

(4) In case of a positive confirmation test, a psychiatric evaluation should be undertaken before a fit assessment may be considered by the medical assessor of the licensing authority.

(e) Assessment and referral decisions

(1) Psychotic disorder

Applicants with a history, or the occurrence, of a functional psychotic disorder should be assessed as unfit. A fit assessment may be considered if a cause can be unequivocally identified as one which is transient, has ceased and the risk of recurrence is minimal.

(2) Organic mental disorder

Applicants with an organic mental disorder should be assessed as unfit. Once the cause has been treated, an applicant may be assessed as fit following satisfactory psychiatric evaluation.

(3) Psychoactive medication

Applicants who use psychoactive medication likely to affect flight safety should be assessed as unfit. If stability on maintenance psychoactive medication is confirmed, a fit assessment with an OML may be considered. If the dosage or type of medication is changed, a further period of unfit assessment should be required until stability is confirmed.

(4) Schizophrenia, schizotypal or delusional disorder

Applicants with an established history or clinical diagnosis of schizophrenia, schizotypal or delusional disorder may only be considered for a fit assessment if the medical assessor of the licensing authority concludes that the original diagnosis was inappropriate or inaccurate as confirmed by psychiatric evaluation, or, in the case of a single episode of delirium of which the cause was clear, provided that the applicant has suffered no permanent mental impairment.

(5) Mood disorder

Applicants with an established mood disorder should be assessed as unfit. After full recovery and after full consideration of the individual case, a fit assessment may be considered, depending on the characteristics and severity of the mood disorder.

(6) Neurotic, stress-related or somatoform disorder

Where there are signs or is established evidence that an applicant may have a neurotic, stress-related or somatoform disorder, the applicant should be referred for psychiatric or psychological opinion and advice.

(7) Personality or behavioural disorders

Where there are signs or is established evidence that an applicant may have a personality or behavioural disorder, the applicant should be referred for psychiatric or psychological opinion and advice.

(8) Disorders due to alcohol or other psychoactive substance(s) use or misuse

(i) Applicants with mental or behavioural disorders due to alcohol or other psychoactive substance(s) use or misuse, with or without dependency, should be assessed as unfit.

(ii) A fit assessment may be considered after a period of two years of documented sobriety or freedom from psychoactive substance use or misuse. At revalidation or renewal, a fit assessment may be considered earlier with an OML. Depending on the individual case, treatment and evaluation may include in-patient treatment of some weeks and inclusion into a support programme followed by ongoing checks, including drug and alcohol testing and reports resulting from the support programme, which may be required indefinitely.

(9) Deliberate self-harm and suicide attempt

Applicants who have carried out a single self-destructive action or repeated acts of deliberate self-harm or suicide attempt should be assessed as unfit. A fit assessment may be considered after full consideration of an individual case and may require psychiatric or psychological evaluation. Neuropsychological evaluation may also be required.

(10) Assessment

The assessment should take into consideration if the indication for the treatment, side effects and addiction risks of such treatment and the characteristics of the psychiatric disorder are compatible with flight safety.

(f) Specialist opinion and advice

(1) In case a specialist evaluation is needed, following the evaluation, the specialist should submit a written report to the AME, AeMC or medical assessor of the licensing authority as appropriate, detailing their opinion and recommendation.

(2) Psychiatric evaluations should be conducted by a qualified psychiatrist having adequate knowledge and experience in aviation medicine.

(3) The psychological opinion and advice should be based on a clinical psychological assessment conducted by a suitably qualified and accredited clinical psychologist with expertise and experience in aviation psychology.

(4) The psychological evaluation may include a collection of biographical data, the administration of aptitude as well as personality tests and clinical interview.

AMC2 MED.B.055 Mental health

(a) Mental health assessment as part of class 2 aero-medical examination

(1) A mental health assessment should be conducted and recorded taking into account social, environmental and cultural contexts.

(2) The applicant's history and symptoms of disorders that might pose a threat to flight safety should be identified and recorded.

(3) Where there are signs or is established evidence that an applicant may have a psychiatric or psychological disorder, the applicant should be referred for specialist opinion and advice.

(4) Established evidence should be verifiable information from an identifiable source related to the mental fitness or personality of a particular individual. Sources for this information can be accidents or incidents, problems in training or proficiency checks, behaviour or knowledge relevant to the safe exercise of the privileges of the applicable licence(s).

(b) Assessment of holders of a class 2medical certificate referenced in MED.B.055(d)

Assessment of holders of a class 2 medical certificate referenced in MED.B.055(d) may require psychiatric and psychological evaluation as determined by the AME, AeMC or medical assessor of the licensing authority. Follow-up, as necessary, should be determined in consultation with the medical assessor of the licensing authority.

(c) Assessment and referral decisions

(1) Psychotic disorder

Applicants with a history, or the occurrence, of a functional psychotic disorder should be assessed as unfit. A fit assessment may be considered if a cause can be unequivocally identified as one which is transient, has ceased and the risk of recurrence is minimal.

(2) Organic mental disorder

Applicants with an organic mental disorder should be assessed as unfit. Once the cause has been treated, an applicant may be assessed as fit following satisfactory psychiatric evaluation.

(3) Schizophrenia, schizotypal or delusional disorder

Applicants with an established history or clinical diagnosis of schizophrenia, schizotypal or delusional disorder may only be considered for a fit assessment in consultation with the medical assessor of the licensing authority if the original diagnosis was inappropriate or inaccurate as confirmed by psychiatric evaluation, or, in the case of a single episode of delirium of which the cause was clear, provided that the applicant has suffered no permanent mental impairment.

(4) Mood disorder

Applicants with an established mood disorder should be assessed as unfit. After full recovery and after full consideration of the individual case, a fit assessment may be considered, depending on the characteristics and severity of the mood disorder.

(5) Neurotic, stress-related or somatoform disorder

Where there are signs or is established evidence that an applicant may have a neurotic, stress-related or somatoform disorder, the applicant should be referred for psychiatric opinion and advice.

(6) Personality or behavioural disorders

Where there are signs or is established evidence that an applicant may have a personality or behavioural disorder, the applicant should be referred for psychiatric opinion and advice.

(7) Psychoactive medication

Applicants who use psychoactive medication likely to affect flight safety should be assessed as unfit. If stability on maintenance psychoactive medication is confirmed, a fit assessment with an OSL or OPL may be considered. If the dosage or type of medication is changed, a further period of unfit assessment should be required until stability is confirmed.

(8) Disorders due to alcohol or other psychoactive substance(s) use or misuse

(i) Applicants with mental or behavioural disorders due to alcohol or other psychoactive substance(s) use or misuse, with or without dependency, should be assessed as unfit.

(ii) Drug and alcohol tests

(A) In the case of a positive drug or alcohol result, confirmation should be required in accordance with national procedures for drugs and alcohol testing.

(B) In case of a positive confirmation test, a psychiatric evaluation should be undertaken before a fit assessment may be considered.

(iii) A fit assessment may be considered after a period of two years of documented sobriety or freedom from psychoactive substance use or misuse. At revalidation or renewal, a fit assessment may be considered earlier with an OSL or OPL. Depending on the individual case, treatment and evaluation may include in-patient treatment of some weeks and inclusion into a support programme followed by ongoing checks, including drug and alcohol testing and reports resulting from the support programme, which may be required indefinitely.

(9) Deliberate self-harm

Applicants who have carried out a single self-destructive action or repeated acts of deliberate self-harm or suicide attempt should be assessed as unfit. A fit assessment may be considered after full consideration of an individual case and may require psychiatric or psychological evaluation. Neuropsychological evaluation may also be required.

(e) Specialist opinion and advice

(1) In case a specialist evaluation is needed, following the evaluation, the specialist should submit a written report to the AME, AeMC or medical assessor of the licensing authority as appropriate, detailing their opinion and recommendation.

(2) Psychiatric evaluations should be conducted by a qualified psychiatrist having adequate knowledge and experience in aviation medicine.

(3) The psychological opinion and advice should be based on a clinical psychological assessment conducted by a suitably qualified and accredited clinical psychologist with expertise and experience in aviation psychology.

(4) The psychological evaluation may include a collection of biographical data, the administration of aptitude as well as personality tests and clinical interview.

GM1 MED.B.055 Mental health

(a) Symptoms of concern may include but are not limited to:

(1) use of alcohol or other psychoactive substances;

(2) loss of interest/energy;

(3) eating and weight changes;

(4) sleeping problems;

(5) low mood and, if present, any suicidal thoughts;

(6) family history of psychiatric disorders, particularly suicide;

(7) anger, agitation or high mood; and

(8) depersonalisation or loss of control.

(b) The following aspects should be taken into consideration when conducting the mental health examination:

(1) Appearance;

(2) Attitude;

(3) Behaviour;

(4) Mood;

(5) Speech;

(6) Thoughts process and content;

(7) Perception;

(8) Cognition;

(9) Insight; and

(10) Judgement.

GM2 MED.B.055 Mental health

(a) Drugs and alcohol screening tests used should:

(1) provide information regarding medium-term consumption;

(2) be accepted on national level by the competent authority based on the availability and suitability for the scope mentioned in point(a)(1) above.

(b) Statistical data of the screening campaign mentioned in AMC1 MED.B.055(d)(1) should be made available to the Agency on a yearly basis.

GM3 MED.B.055 Mental health

(a) The mental health assessment for class 2 applicants should include assessment and documentation of:

(1) general attitudes to mental health, including understanding possible indications of reduced mental health in themselves and others;

(2) coping strategies under periods of psychological stress or pressure in the past, including seeking advice from others;

(3) childhood behavioural problems;

(4) interpersonal and relationship issues, including difficulties with relatives, friends, and work colleagues;

(5) current work and life stressors, including difficulties with aviation operational environment; and

(6) overt personality disorders.

(b) In regard to symptoms of concern and aspects to be taken into consideration when conducting mental health examination for class 2 applicants, guidance presented in GM1 MED.B.055 should be used.

GM4 MED.B.055 Mental health

Drugs and alcohol screening tests used should:

(a) provide information regarding medium-term consumption;

(b) be accepted on national level by the competent authority based on the availability and suitability with the scope mentioned in GM2 MED.B.055(a) above.

AMC1 MED.B.065 Neurology

(a) Epilepsy

(1) Applicants with a diagnosis of epilepsy should be assessed as unfit unless there is unequivocal evidence of a syndrome of benign childhood epilepsy associated with a very low risk of recurrence, and unless the applicant has been free of recurrence and off treatment for more than 10 years. One or more convulsive episode after the age of 5 should lead to unfitness. In the case of an acute symptomatic seizure, which is considered to have a very low risk of recurrence, a fit assessment may be considered after neurological evaluation.

(2) Applicants may be assessed as fit with an OML if:

(i) there is a history of a single afebrile epileptiform seizure;

(ii) there has been no recurrence after at least 10 years off treatment;

(iii) there is no evidence of continuing predisposition to epilepsy.

(b) EEG

(1) Electroencephalography is required when indicated by the applicant's history or on clinical grounds.

(2) Applicants with epileptiform paroxysmal EEG abnormalities and focal slow waves should be assessed as unfit.

(c) Neurological disease

Applicants with any disease of the nervous system which is likely to cause a hazard to flight safety should be assessed as unfit. However, in certain cases, including cases of minor functional losses associated withstable disease, a fit assessment may be considered after full evaluation which should include a medical flight test which may be conducted in a flight simulation training device.

(d) Migraine

Applicants with an established diagnosis of migraine or other severe periodic headaches likely to cause a hazard to flight safety should be assessed as unfit. A fit assessment may be considered after full evaluation. The evaluation should take into account at least the following: auras, visual field loss, frequency, severity, therapy. Appropriate limitation(s) may apply.

(e) Episode of disturbance of consciousness

In the case of a single episode of disturbance of consciousness, which can be satisfactorily explained, a fit assessment may be considered, but applicants experiencing a recurrence should be assessed as unfit.

(f) Head injury

Applicants with a head injury which was severe enough to cause loss of consciousness or is associated with penetrating brain injury should be evaluated by a neurologist. A fit assessment may be considered if there has been a full recovery and the risk of epilepsy is sufficiently low.

(g) Spinal or peripheral nerve injury

Applicants with a history or diagnosis of spinal or peripheral nerve injury or a disorder of the nervous system due to a traumatic injury should be assessed as unfit. A fit assessment may be considered if neurological evaluation is satisfactory and the conditions of AMC1 MED.B.050 are satisfied.

(h) Vascular deficiencies

Applicants with a disorder of the nervous system due to vascular deficiencies including haemorrhagic and ischaemic events should be assessed as unfit. A fit assessment may be considered if neurological evaluation is satisfactory and the conditions of AMC1 MED.B.050 are satisfied. A cardiological evaluation and medical flight test should be undertaken for applicants with residual deficiencies.

AMC2 MED.B.065 Neurology

(a) Epilepsy

Applicants may be assessed as fit if:

(1) there is a history of a single afebrile epileptiform seizure, considered to have a very low risk of recurrence;

(2) there has been no recurrence after at least 10 years off treatment; and

(3) there is no evidence of continuing predisposition to epilepsy.

(b) Neurological disease

Applicants with any disease of the nervous system which is likely to cause a hazard to flight safety should be assessed as unfit. However, in certain cases, including cases of functional loss associated with stable disease, a fit assessment may be considered after full evaluation which should include a medical flight test which may be conducted in a flight simulation training device.

(c) Migraine

Applicants with an established diagnosis of migraine or other severe periodic headaches likely to cause a hazard to flight safety should be assessed as unfit. A fit assessment may be considered after full evaluation. The evaluation should take into account at least the following: auras, visual field loss, frequency, severity, and therapy. Appropriate limitation(s) may apply.

(d) Head injury

Applicants with a head injury which was severe enough to cause loss of consciousness or is associated with penetrating brain injury may be assessed as fit if there has been a full recovery and the risk of epilepsy is sufficiently low. An evaluation by a neurologist may be required depending on the staging of the original injury.

(e) Spinal or peripheral nerve injury

Applicants with a history or diagnosis of spinal or peripheral nerve injury or a disorder of the nervous system due to a traumatic injury should be assessed as unfit. A fit assessment may be considered if neurological evaluation is satisfactory and the conditions of AMC2 MED.B.050 are satisfied.

(f) Vascular deficiencies

Applicants with a disorder of the nervous system due to vascular deficiencies including haemorrhagic and ischaemic events should be assessed as unfit. A fit assessment may be considered if neurological evaluation is satisfactory and the provisions of AMC2 MED.B.050 are met. A cardiological evaluation and medical flight test should be undertaken for applicants with residual deficiencies.

AMC1 MED.B.070 Visual system

(a) Eye examination

(1) At each aero-medical examination, an assessment of the visual fitness should be undertaken and the eyes should be examined with regard to possible pathology.

(2) All abnormal and doubtful cases should be referred to an ophthalmologist. Conditions which indicate ophthalmological examination include but are not limited to a substantial decrease in the uncorrected visual acuity, any decrease in best corrected visual acuity and/or the occurrence of eye disease, eye injury, or eye surgery.

(3) Where specialist ophthalmological examinations are required for any significant reason, this should be imposed as a limitation on the medical certificate.

(4) The possible cumulative effect of more than one eye condition should be evaluated by an ophthalmologist.

(b) Comprehensive eye examination

A comprehensive eye examination by an eye specialist is required at the initial examination. All abnormal and doubtful cases should be referred to an ophthalmologist. The examination should include:

(1) history;

(2) visual acuities near, intermediate and distant vision (uncorrected and with best optical correction if needed);

(3) examination of the external eye, anatomy, media (slit lamp) and fundoscopy;

(4) ocular motility;

(5) binocular vision;

(6) visual fields;

(7) tonometry on clinical indication;

(8) objective refraction: hyperopic initial applicants with a hyperopia of more than +2 dioptres and under the age of 25 should undergo objective refraction in cycloplegia;

(9) assessment of mesopic contrast sensitivity; and

(10) colour vision.

(c) Routine eye examination

A routine eye examination may be performed by an AME and should include:

(1) history;

(2) visual acuities - near, intermediate and distant vision (uncorrected and with best optical correction if needed);

(3) examination of the external eye, anatomy, media and fundoscopy; and

(4) further examination on clinical indication.

(d) Refractive error and anisometropia

(1) Applicants with the following conditions may be assessed as fit subject to satisfactory ophthalmic evaluation and provided that optimal correction has been considered and no significant pathology is demonstrated:

(i) hypermetropia not exceeding +5.0 dioptres;

(ii) myopia not exceeding –6.0 dioptres;

(iii) astigmatism not exceeding 2.0 dioptres;

(iv) anisometropia not exceeding 2.0 dioptres.

(2) Applicants should wear contact lenses if:

(i) hypermetropia exceeds +5.0 dioptres;

(ii) anisometropia exceeds 3.0 dioptres.

(3) An evaluation by an eye specialist should be undertaken 5-yearly if:

(i) the refractive error is between –3.0 and –6.0 dioptres or +3 and +5 dioptres;

(ii) astigmatism or anisometropia is between 2.0 and 3.0 dioptres.

(4) An evaluation by an eye specialist should be undertaken 2-yearly if:

(i) the refractive error is greater than –6.0 dioptres or +5.0 dioptres;

(ii) astigmatism or anisometropia exceeds 3.0 dioptres.

(e) Uncorrected visual acuity

No limits apply to uncorrected visual acuity.

(f) Visual acuity

(1) Reduced vision in one eye or monocularity: Applicants for revalidation or renewal with reduced central vision or acquired loss of vision in one eye may be assessed as fit with an OML if:

(i) the binocular visual field or, in the case of monocularity, the monocular visual field is acceptable;

(ii) in the case of monocularity, a period of adaptation time has passed from the known point of visual loss, during which the applicant should be assessed as unfit;

(iii) the unaffected eye achieves distant visual acuity of 6/6 (1,0) corrected or uncorrected;

(iv) the unaffected eye achieves intermediate visual acuity of N14 and N5 for near;

(v) the underlying pathology is acceptable according to ophthalmological assessment and there is no significant ocular pathology in the unaffected eye; and

(vi) a medical flight test is satisfactory.

(2) Visual fields

Applicants with a visual field defect, who do not have reduced central vision or acquired loss of vision in one eye, may be assessed as fit if the binocular visual field is normal.

(g) Keratoconus

Applicants with keratoconus may be assessed as fit if the visual requirements are met with the use of corrective lenses and periodic evaluation is undertaken by an ophthalmologist.

(h) Binocular function

Applicants with heterophoria (imbalance of the ocular muscles) exceeding:

(1) at 6 metres:

2.0 prism dioptres in hyperphoria,

10.0 prism dioptres in esophoria,

8.0 prism dioptres in exophoria

and

(2) at 33 centimetres:

1.0 prism dioptre in hyperphoria,

8.0 prism dioptres in esophoria,

12.0 prism dioptres in exophoria

should be assessed as unfit. A fit assessment may be considered if an orthoptic evaluation demonstrates that the fusional reserves are sufficient to prevent asthenopia and diplopia.

(i) Eye surgery

The assessment after eye surgery should include an ophthalmological examination.

(1) After refractive surgery, a fit assessment may be considered, provided that:

(i) stability of refraction of less than 0.75 dioptres variation diurnally has been achieved;

(ii) examination of the eye shows no post-operative complications;

(iii) glare sensitivity is within normal standards;

(iv) mesopic contrast sensitivity is not impaired;

(v) an evaluation is undertaken by an eye specialist.

(2) Following intraocular lens surgery, including cataract surgery, a fit assessment may be considered once recovery is complete and the visual requirements are met with or without correction. Intraocular lenses should be monofocal and should not impair colour vision and night vision.

(3) Retinal surgery entails unfitness. A fit assessment may be considered 6 months after surgery, or earlier if recovery is complete. A fit assessment may also be considered earlier after retinal laser therapy. Regular follow-up by an ophthalmologist should be carried out.

(4) Glaucoma surgery entails unfitness. A fit assessment may be considered 6 months after surgery or earlier if recovery is complete. Regular follow-up by an ophthalmologist should be carried out.

(j) Visual correction

Correcting lenses should permit the licence holder to meet the visual requirements at all distances.

AMC2 MED.B.070 Visual system

(a) Eye examination

(1) At each aero-medical revalidation examination an assessment of the visual fitness of the applicant should be undertaken and the eyes should be examined with regard to possible pathology. Conditions which indicate further ophthalmological examination include but are not limited to a

substantial decrease in the uncorrected visual acuity, any decrease in best corrected visual acuity and/or the occurrence of eye disease, eye injury, or eye surgery.

(2) At the initial assessment, the examination should include:

(i) history;

(ii) visual acuities near, intermediate and distant vision (uncorrected and with best optical correction if needed);

(iii) examination of the external eye, anatomy, media and fundoscopy;

(iv) ocular motility;

(v) binocular vision;

(vi) visual fields;

(vii) colour vision;

(viii) further examination on clinical indication.

(3) At the initial assessment the applicant should submit a copy of the recent spectacle prescription if visual correction is required to meet the visual requirements.

(b) Routine eye examination

A routine eye examination should include:

(1) history;

(2) visual acuities - near, intermediate and distant vision (uncorrected and with best optical correction if needed);

(3) examination of the external eye, anatomy, media and fundoscopy;

(4) further examination on clinical indication.

(c) Visual acuity

Reduced vision in one eye or monocularity: Applicants with reduced vision or loss of vision in one eye may be assessed as fit if:

(1) the binocular visual field or, in the case of monocularity, the monocular visual field is acceptable;

(2) in the case of monocularity, a period of adaptation time has passed from the known point of visual loss, during which the applicant should be assessed as unfit;

(3) the unaffected eye achieves distant visual acuity of 6/6 (1,0), corrected or uncorrected;

(4) the unaffected eye achieves intermediate visual acuity of N14 or equivalent and N5 or equivalent for near (Refer to GM1 MED.B.070);

(5) there is no significant ocular pathology in the unaffected eye; and

(6) a medical flight test is satisfactory.

(d) Binocular function

Reduced stereopsis, abnormal convergence not interfering with near vision and ocular misalignment where the fusional reserves are sufficient to prevent asthenopia and diplopia may be acceptable.

(e) Eye surgery

(1) The assessment after eye surgery should include an ophthalmological examination.

(2) After refractive surgery a fit assessment may be considered provided that there is satisfactory stability of refraction, there are no post-operative complications and no increase in glare sensitivity.

(3) After cataract, retinal or glaucoma surgery a fit assessment may be considered once recovery is complete and the visual requirements are met with or without correction.

(f) Visual correction

Correcting lenses should permit the licence holder to meet the visual requirements at all distances.

GM1 MED.B.070 Visual system

COMPARISON OF DIFFERENT READING CHARTS (APPROXIMATE FIGURES)

(a) Test distance: 40 cm

Decimal	Nieden	Jäger	Snellen	N	Parinaud
1,0	1	2	1,5	3	2
0,8	2	3	2	4	3
0,7	3	4	2,5		
0,6	4	5	3	5	4
0,5	5	5		6	5
0,4	7	9	4	8	6
0,35	8	10	4,5		8
0,32	9	12	5,5	10	10
0,3	9	12		12	
0,25	9	12		14	
0,2	10	14	7,5	16	14
0,16	11	14	12	20	

(b) Test distance: 80 cm

Decimal	Nieden	Jäger	Snellen	N	Parinaud
1,2	4	5	3	5	4
1,0	5	5		6	5

0,8	7	9	4	8	6
0,7	8	10	4,5		8
0,63	9	12	5,5	10	10
0,6	9	12		12	10
0,5	9	12		14	10
0,4	10	14	7,5	16	14
0,32	11	14	12	20	14

GM2 MED.B.070 Visual system

EYE SPECIALIST

The term 'eye specialist' refers to an ophthalmologist or a vision care specialist qualified in optometry and trained to recognise pathological conditions.

AMC1 MED.B.075 Colour vision

(a) At revalidation and renewal examinations, colour vision should be tested on clinical indication.

(b) The Ishihara test (24 plate version) is considered passed if the first 15 plates, presented in a random order, are identified without error.

(c) Those failing the Ishihara test should be examined either by:

(1) anomaloscopy (Nagel or equivalent). This test is considered passed if the colour match is trichromatic and the matching range is 4 scale units or less, or if the anomalous quotient is acceptable; or by

(2) lantern testing with a Spectrolux, Beynes or Holmes-Wright lantern. This test is considered passed if the applicant passes without error a test with accepted lanterns.

(3) Colour Assessment and Diagnosis (CAD) test. This test is considered passed if the threshold is less than 6 standard normal (SN) units for deutan deficiency, or less than 12 SN units for protan deficiency. A threshold greater than 2 SN units for tritan deficiency indicates an acquired cause which should be investigated.

AMC2 MED.B.075 Colour vision

(a) Colour vision should be tested on clinical indication at revalidation and renewal examinations.

(b) The Ishihara test (24 plate version) is considered passed if the first 15 plates, presented in a random order, are identified without error.

(c) Those failing the Ishihara test should be examined either by:

(1) anomaloscopy (Nagel or equivalent). This test is considered passed if the colour match is trichromatic and the matching range is 4 scale units or less, or if the anomalous quotient is acceptable; or by

(2) lantern testing with a Spectrolux, Beynes or Holmes-Wright lantern. This test is considered passed if the applicant passes without error a test with accepted lanterns.

(3) Colour Assessment and Diagnosis (CAD) test. This test is considered passed if the threshold is less than 6 standard normal (SN) units for deutan deficiency, or less than 12 SN units for protan deficiency. A threshold greater than 2 SN units for tritan deficiency indicates an acquired cause which should be investigated.

AMC1 MED.B.080 Otorhinolaryngology (ENT)

(a) Hearing

(1) Applicants should understand correctly conversational speech when tested with each ear at a distance of 2 metres from and with the applicant's back turned towards the AME.

(2) Applicants with hypoacusis may be assessed as fit if a speech discrimination test or functional flight deck hearing test demonstrates satisfactory hearing ability. A vestibular function test may be appropriate.

(3) If the hearing requirements can only be met with the use of hearing aids, the hearing aids should provide optimal hearing function, be well tolerated and suitable for aviation purposes.

(b) Comprehensive ENT examination

A comprehensive ENT examination should include:

(1) history;

(2) clinical examination including otoscopy, rhinoscopy, and examination of the mouth and throat;

(3) tympanometry or equivalent;

(4) clinical examination of the vestibular system.

(c) Ear conditions

(1) Applicants with an active pathological process of the internal or middle ear should be assessed as unfit. A fit assessment may be considered once the condition has stabilised or there has been a full recovery.

(2) Applicants with an unhealed perforation or dysfunction of the tympanic membranes should be assessed as unfit. An applicant with a single dry perforation of non-infectious origin and which does not interfere with the normal function of the ear may be considered for a fit assessment.

(d) Vestibular disturbance

Applicants with disturbance of vestibular function should be assessed as unfit. A fit assessment may be considered after full recovery. The presence of spontaneous or positional nystagmus requires complete vestibular evaluation by specialist. Applicants with significant abnormal caloric or rotational vestibular responses should be assessed as unfit. Abnormal vestibular responses should be assessed in their clinical context.

(e) Sinus dysfunction

Applicants with any dysfunction of the sinuses should be assessed as unfit until there has been full recovery.

(f) Oral/upper respiratory tract infections

Applicants with a significant infection of the oral cavity or upper respiratory tract should be assessed as unfit. A fit assessment may be considered after full recovery.

(g) Speech disorder

Applicants with a significant disorder of speech or voice should be assessed as unfit.

(h) Air passage restrictions

Applicants with significant restriction of the nasal air passage on either side, or significant malformation of the oral cavity or upper respiratory tract may be assessed as fit if ENT evaluation is satisfactory.

(i) Eustachian tube(s)

Applicants with permanent dysfunction of the Eustachian tube(s) may be assessed as fit if ENT evaluation is satisfactory.

(j) Sequelae of surgery of the internal or middle ear

Applicants with sequelae of surgery of the internal or middle ear should be assessed as unfit until recovery is complete, the applicant is asymptomatic, and the risk of secondary complication is minimal.

AMC2 MED.B.080 Otorhinolaryngology (ENT)

(a) Hearing

(1) Applicants should understand correctly conversational speech when tested with each ear at a distance of 2 metres from and with the applicant's back turned towards the AME.

(2) Applicants with hypoacusis may be assessed as fit if a speech discrimination test or functional cockpit hearing test demonstrates satisfactory hearing ability.

(3) If the hearing requirements can be met only with the use of hearing aids, the hearing aids should provide optimal hearing function, be well tolerated and suitable for aviation purposes.

(4) Applicants with profound deafness or major disorder of speech, or both, may be assessed as fit with an SSL, such as 'limited to areas and operations where the use of radio is not mandatory'. The aircraft should be equipped with appropriate alternative warning devices in lieu of sound warnings.

(b) Examination

An ENT examination should form part of all initial, revalidation and renewal examinations.

(c) Ear conditions

(1) Applicants with an active pathological process of the internal or middle ear should be assessed as unfit until the condition has stabilised or there has been a full recovery.

(2) Applicants with an unhealed perforation or dysfunction of the tympanic membranes should be assessed as unfit. An applicant with a single dry perforation of non-infectious origin which does not interfere with the normal function of the ear may be considered for a fit assessment.

(d) Vestibular disturbance

Applicants with disturbance of vestibular function should be assessed as unfit pending full recovery.

(e) Sinus dysfunction

Applicants with any dysfunction of the sinuses should be assessed as unfit pending full recovery.

(f) Oral/upper respiratory tract infections

Applicants with a significant infection of the oral cavity or upper respiratory tract should be assessed as unfit. A fit assessment may be considered after full recovery.

(g) Speech disorder

Applicants with a significant disorder of speech or voice should be assessed as unfit.

(h) Air passage restrictions

Applicants with significant restriction of the nasal air passage on either side, or significant malformation of the oral cavity or upper respiratory tract may be assessed as fit if ENT evaluation is satisfactory.

(i) Eustachian tube dysfunction

Applicants with permanent dysfunction of the Eustachian tube(s) may be assessed as fit if ENT evaluation is satisfactory.

(j) Sequelae of surgery of the internal or middle ear

Applicants with sequelae of surgery of the internal or middle ear should be assessed as unfit until recovery is complete, the applicant is asymptomatic, and the risk of secondary complication is minimal.

GM1 MED.B.080 Otorhinolaryngology (ENT)

PURE TONE AUDIOGRAM

The pure tone audiogram may also cover the 4 000 Hz frequency for early detection of decrease in hearing.

GM2 MED.B.080 Otorhinolaryngology (ENT)

PURE TONE AUDIOGRAM

The pure tone audiogram may also cover the 4 000 Hz frequency for early detection of decrease in hearing.

AMC1 MED.B.085 Dermatology

(a) If doubt exists about the fitness of applicants with eczema (exogenous and endogenous), severe psoriasis, bacterial infections, drug induced or bullous eruptions or urticaria, the AME should refer the case to the medical assessor of the licensing authority.

(b) Systemic effects of radiant or pharmacological treatment for a dermatological condition should be reviewed before a fit assessment may be considered.

(c) In cases where a dermatological condition is associated with a systemic illness, full consideration should be given to the underlying illness before a fit assessment may be considered.

AMC2 MED.B.085 Dermatology

In cases where a dermatological condition is associated with a systemic illness, full consideration should be given to the underlying illness before a fit assessment may be considered.

AMC1 MED.B.090 Oncology

(a) Applicants who have been diagnosed with a malignant disease may be assessed as fit provided that:

    (1) after primary treatment, there is no evidence of residual malignant disease likely to jeopardise flight safety;

    (2) time appropriate to the type of tumour and primary treatment has elapsed;

    (3) the risk of inflight incapacitation from a recurrence or metastasis is sufficiently low;

(4) there is no evidence of short or long-term sequelae from treatment. Special attention should be paid to applicants who have received anthracycline chemotherapy;

(5) satisfactory oncology follow-up reports are provided to the medical assessor of the licensing authority.

(b) An OML should be applied as appropriate.

(c) Applicants receiving ongoing chemotherapy or radiation treatment should be assessed as unfit.

(d) Applicants with pre-malignant conditions of the skin may be assessed as fit if treated or excised as necessary and there is regular follow-up.

AMC2 MED.B.090 Oncology

(a) Applicants who have been diagnosed with a malignant disease may be considered for a fit assessment provided that:

(1) after primary treatment, there is no evidence of residual malignant disease likely to jeopardise flight safety;

(2) time appropriate to the type of tumour and primary treatment has elapsed;

(3) the risk of in-flight incapacitation from a recurrence or metastasis is sufficiently low;

(4) there is no evidence of short or long-term sequelae from treatment that may jeopardise flight safety;

(5) arrangements for an oncological follow-up have been made for an appropriate period of time.

(b) Applicants receiving ongoing chemotherapy or radiation treatment should be assessed as unfit.

(c) Applicants with pre-malignant conditions of the skin may be assessed as fit if treated or excised as necessary and there is a regular follow-up.

SECTION 3 – SPECIFIC REQUIREMENTS FOR LAPL MEDICAL CERTIFICATES

AMC1 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

When a specialist evaluation is required under this section, the aero-medical assessment of the applicant should be performed by an AeMC, an AME or, in the case of AMC5 MED.B.095(d), by the medical assessor of the licensing authority.

AMC2 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

CARDIOVASCULAR SYSTEM

(a) Examination

Pulse and blood pressure should be recorded at each examination.

(b) General

(1) Cardiovascular risk factor assessment

An accumulation of risk factors (smoking, family history, lipid abnormalities, hypertension, etc.) requires cardiovascular evaluation.

(2) Aortic aneurysm

Applicants with an aortic aneurysm may be assessed as fit subject to satisfactory cardiological evaluation and a regular follow-up.

(3) Cardiac valvular abnormalities

(i) Applicants with a cardiac murmur may be assessed as fit if the murmur is assessed as being of no pathological significance.

(ii) Applicants with a cardiac valvular abnormality may be assessed as fit subject to satisfactory cardiological evaluation.

(4) Valvular surgery

After cardiac valve replacement or repair, a fit assessment may be considered, with an ORL if anticoagulation is needed, subject to satisfactory post-operative cardiological evaluation. Anticoagulation should be stable and the haemorrhagic risk should be acceptable. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. The INR target range should be determined by the type of surgery performed. Applicants who measure their INR on a 'near patient' testing system within 12 hours prior to flight and only exercise the privileges of their licence if the INR is within the target range, may be assessed as fit without the above-mentioned limitation. The INR results should be recorded and the results should be reviewed at each aero-medical assessment. Applicants taking anticoagulation medication not requiring INR monitoring, may be assessed as fit without the above-mentioned limitation in consultation with the medical assessor of the licensing authority after a stabilisation period of 3 months.

(5) Other cardiac disorders

(i) Applicants with other cardiac disorders may be assessed as fit subject to satisfactory cardiological evaluation. A fit assessment may be considered, with an ORL if anticoagulation is needed. Anticoagulation should be stable and the haemorrhagic risk should be acceptable. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. The INR target range should be determined by the type of surgery performed. Applicants who measure their INR on a 'near patient' testing system within 12 hours prior to flight and only exercise the privileges of their licence if the INR is within the target range, may be assessed as fit without the above-mentioned limitation. The INR results should be recorded and the results should be reviewed at each aero-medical assessment. Applicants taking anticoagulation medication not requiring INR monitoring, may be assessed as fit without the above-mentioned limitation in consultation with the medical assessor of the licensing authority after a stabilisation period of 3 months.

(ii) Applicants with symptomatic hypertrophic cardiomyopathy should be assessed as unfit.

(c) Blood pressure

(1) When the blood pressure consistently exceeds 160 mmHg systolic and/or 95 mmHg diastolic, with or without treatment, the applicant should be assessed as unfit.

(2) Applicants initiating medication for the control of blood pressure should be assessed as unfit until the absence of significant side effects has been established.

(d) Coronary artery disease

(1) Applicants with suspected myocardial ischaemia should undergo a cardiological evaluation before a fit assessment may be considered.

(2) Applicants with angina pectoris requiring medication for cardiac symptoms should be assessed as unfit.

(3) After an ischaemic cardiac event, including myocardial infarction or revascularisation, applicants without symptoms should have reduced cardiovascular risk factors to an appropriate level. Medication, when used to control cardiac symptoms, is not acceptable. All applicants should be on appropriate secondary prevention treatment.

(4) In cases (d)(1), (d)(2) and (d)(3), applicants who have had a satisfactory cardiological evaluation to include an exercise test or equivalent that is negative for ischaemia may be assessed as fit.

(e) Rhythm and conduction disturbances

(1) Applicants with a significant disturbance of cardiac rhythm or conduction should be assessed as unfit unless a cardiological evaluation concludes that the disturbance is not likely to interfere with the safe exercise of the privileges of the licence. A fit assessment may be considered, with an ORL if anticoagulation is needed. Anticoagulation should be stable and the haemorrhagic risk should be acceptable. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range. The INR target

range should be determined by the type of surgery performed. Applicants who measure their INR on a 'near patient' testing system within 12 hours prior to flight and only exercise the privileges of their licence if the INR is within the target range, may be assessed as fit without the above-mentioned limitation. The INR results should be recorded and the results should be reviewed at each aero-medical assessment. Applicants taking anticoagulation medication not requiring INR monitoring, may be assessed as fit without the above-mentioned limitation in consultation with the medical assessor of the licensing authority after a stabilisation period of 3 months.

(2) Pre-excitation

Applicants with ventricular pre-excitation may be assessed as fit subject to satisfactory cardiological evaluation. Applicants with ventricular pre-excitation associated with a significant arrhythmia should be assessed as unfit.

(3) Automatic implantable defibrillating system

Applicants with an automatic implantable defibrillating system should be assessed as unfit.

(4) Pacemaker

A fit assessment may be considered subject to satisfactory cardiological evaluation.

AMC3 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

RESPIRATORY SYSTEM

(a) Applicants should undergo pulmonary morphological or functional tests when clinically indicated.

(b) Asthma and chronic obstructive pulmonary disease

Applicants with asthma or impairment of pulmonary function may be assessed as fit provided that the condition is considered stable with satisfactory pulmonary function and medication is compatible with flight safety. Systemic steroids may be acceptable provided that the dosage required is acceptable and there are no adverse side effects.

(c) Sarcoidosis

(1) Applicants with active sarcoidosis should be assessed as unfit. Investigation should be undertaken with respect to the possibility of systemic involvement. A fit assessment may be considered once the disease is inactive.

(2) Applicants with cardiac sarcoidosis should be assessed as unfit.

(d) Pneumothorax

(1) Applicants with spontaneous pneumothorax may be assessed as fit subject to satisfactory respiratory evaluation following recovery from a single

spontaneous pneumothorax or following recovery from surgical intervention for a recurrent pneumothorax.

(2) Applicants with traumatic pneumothorax may be assessed as fit following recovery.

(e) Thoracic surgery

Applicants who have undergone thoracic surgery may be assessed as fit following recovery.

(f) Sleep apnoea syndrome/sleep disorder

Applicants with unsatisfactorily treated sleep apnoea syndrome should be assessed as unfit.

AMC4 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

DIGESTIVE SYSTEM

(a) Gallstones

Applicants with symptomatic gallstones should be assessed as unfit. A fit assessment may be considered following gallstone removal.

(b) Inflammatory bowel disease

Applicants with an established diagnosis or history of chronic inflammatory bowel disease may be assessed as fit provided that the disease is stable and not likely to interfere with the safe exercise of the privileges of the licence.

(c) Peptic ulceration

Applicants with peptic ulceration may be assessed as fit subject to satisfactory gastroenterological evaluation.

(d) Digestive tract and abdominal surgery

Applicants who have undergone a surgical operation:

(1) for herniae; or

(2) on the digestive tract or its adnexa, including a total or partial excision or diversion of any of these organs,

should be assessed as unfit. A fit assessment may be considered if recovery is complete, the applicant is asymptomatic, and there is only a minimal risk of secondary complication or recurrence.

(e) Pancreatitis

Applicants with pancreatitis may be assessed as fit after satisfactory recovery.

(f) Liver disease

Applicants with morphological or functional liver disease or after surgery, including liver transplantation, may be assessed as fit subject to satisfactory gastroenterological evaluation.

AMC5 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

METABOLIC AND ENDOCRINE SYSTEMS

(a) Metabolic, nutritional or endocrine dysfunction

Applicants with metabolic, nutritional or endocrine dysfunction may be assessed as fit subject to demonstrated stability of the condition and satisfactory aero-medical evaluation.

(b) Obesity

Obese applicants may be assessed as fit if the excess weight is not likely to interfere with the safe exercise of the licence.

(c) Thyroid dysfunction

Applicants with thyroid disease may be assessed as fit once a stable euthyroid state is attained.

(d) Diabetes mellitus

(1) Applicants using antidiabetic medications that are not likely to cause hypoglycaemia may be assessed as fit.

(2) Applicants with diabetes mellitus Type 1 should be assessed as unfit.

(3) Applicants with diabetes mellitus Type 2 treated with insulin may be assessed as fit with limitations for revalidation if blood sugar control has been achieved and the process under (e) and (f) is followed. An ORL is required. A TML for 12 months may be needed to ensure compliance with the follow-up requirements below. Licence privileges should not include rotary aircraft flying.

(e) Aero-medical assessment by, or under the guidance of, the medical assessor of the licensing authority:

(1) A diabetology review at yearly intervals, including:

(i) symptom review;

(ii) review of data logging of blood sugar;

(iii) cardiovascular status. Exercise ECG at age 40, at 5-yearly intervals thereafter and on clinical indication, including an accumulation of risk factors;

(iv) nephropathy status.

(2) Ophthalmological review at yearly intervals, including:

(i) visual fields — Humphrey-perimeter;

(ii) retinae — full dilatation slit lamp examination;

(iii) cataract — clinical screening.

The development of retinopathy requires a full ophthalmological review.

(3) Blood testing at 6-monthly intervals:

(i) HbA1c;

(ii) renal profile;

(iii) liver profile;

(iv) lipid profile.

(4) Applicants should be assessed as temporarily unfit after:

(i) changes of medication/insulin leading to a change to the testing regime until stable blood sugar control can be demonstrated;

(ii) a single unexplained episode of severe hypoglycaemia until stable blood sugar control can be demonstrated.

(5) Applicants should be assessed as unfit in the following cases:

(i) loss of hypoglycaemic awareness;

(ii) development of retinopathy with any visual field loss;

(iii) significant nephropathy;

(iv) any other complication of the disease where flight safety may be jeopardised.

(f) Pilot responsibility

Blood sugar testing is carried out during non-operational and operational periods. A whole blood glucose measuring device with memory should be carried and used. Equipment for continuous glucose monitoring (CGMS) should not be used. Pilots should prove to the AME or AeMC or medical assessor of the licensing authority that testing has been performed as indicated below and with which results.

(1) Testing during non-operational periods: normally 3–4 times/day or as recommended by the treating physician, and on any awareness of hypoglycaemia.

(2) Testing frequency during operational periods:

(i) 120 minutes before departure;

(ii) <30 minutes before departure;

(iii) 60 minutes during flight;

(iv) 30 minutes before landing.

(3) Actions following glucose testing:

(i) 120 minutes before departure: if the test result is >15 mmol/l, piloting should not be commenced.

(ii) 10–15g of carbohydrate should be ingested and a re-test performed within 30 minutes if:

(A) any test result is <4,5 mmol/l;

(B) the pre-landing test measurement is missed or a subsequent go-around/diversion is performed.

AMC6 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

HAEMATOLOGY

Applicants with a haematological condition, such as:

(a) abnormal haemoglobin including, but not limited to, anaemia, erythrocytosis or haemoglobinopathy;

(b) coagulation, haemorrhagic or thrombotic disorder;

(c) significant lymphatic enlargement;

(d) acute or chronic leukaemia;

(e) splenomegaly;

may be assessed as fit subject to satisfactory aero-medical evaluation. If anticoagulation is being used as treatment, refer to AMC2 MED.B.095(b)(4).

AMC7 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

GENITOURINARY SYSTEM

(a) Applicants with a genitourinary disorder, such as:

(1) renal disease; or

(2) one or more urinary calculi, or a history of renal colic

may be assessed as fit subject to satisfactory renal and urological evaluation, as applicable.

(b) Applicants who have undergone a major surgical operation on the genitourinary system or its adnexa may be assessed as fit following recovery.

(c) Applicants who have undergone renal transplantation may be assessed as fit subject to satisfactory renal evaluation.

AMC8 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

INFECTIOUS DISEASE

(a) Applicants who are HIV positive may be assessed as fit subject to satisfactory aero-medical evaluation.

(b) Applicants with other chronic infections may be assessed as fit provided the infections are not likely to interfere with the safe exercise of the privileges of the licence.

AMC9 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

OBSTETRICS AND GYNAECOLOGY

(a) Pregnancy

Holders of a LAPL medical certificate should only exercise the privileges of their licences until the end of the 26th week of gestation under routine antenatal care.

(b) Applicants who have undergone a major gynaecological operation may be assessed as fit after recovery.

AMC10 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

MUSCULOSKELETAL SYSTEM

Applicants should have satisfactory functional use of the musculoskeletal system to enable the safe exercise of the privileges of the licence.

AMC11 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

MENTAL HEALTH

(a) Applicants with a mental or behavioural disorder due to use or misuse of alcohol or other psychoactive substances, with or without dependency, should be assessed as unfit. A fit assessment may be considered after a period of two years of documented sobriety or freedom from psychoactive substance use or misuse, subject to satisfactory psychiatric evaluation after successful treatment. At revalidation or renewal, a fit assessment may be considered earlier. Depending on the individual case, treatment and evaluation may include in-patient treatment of some weeks followed by ongoing checks, including blood testing and peer reports, which may be required indefinitely.

(b) Applicants with a history of, or the occurrence of, a functional psychotic disorder should be assessed as unfit. A fit assessment may be considered if a cause can be unequivocally identified as one which is transient, has ceased, and the risk of recurrence is minimal.

(c) Applicants with an established history or clinical diagnosis of schizophrenia, schizotypal or delusional disorder should be assessed as unfit. A fit assessment may only be considered if the original diagnosis was inappropriate or inaccurate as confirmed by psychiatric evaluation or, in the case of a single episode of delirium, provided that the applicant has suffered no permanent impairment.

(d) Psychoactive substances

Applicants who use or misuse psychoactive substances or psychoactive medication likely to affect flight safety should be assessed as unfit. If stability on maintenance psychoactive medication is confirmed, a fit assessment with appropriate limitation(s) may be considered. If the dosage or type of medication is changed, a further period of unfit assessment should be required until stability is confirmed.

(e) Applicants with a psychiatric condition, such as:

(1) mood disorder;

(2) neurotic disorder;

(3) personality disorder;

(4) mental or behavioural disorder

should undergo satisfactory psychiatric evaluation before a fit assessment may be considered.

(f) Applicants with a history of significant or repeated acts of deliberate self-harm should undergo satisfactory psychiatric or psychological evaluation or both before a fit assessment may be considered.

(g) Psychiatric evaluations and reviews may include reports from the applicant's flight instructor.

(h) Applicants with a psychological disorder may need to be referred for psychological opinion and advice.

(i) In case a specialist evaluation is needed, following the evaluation, the specialist should submit a written report to the AME, AeMC, GMP or medical assessor of the licensing authority as appropriate, detailing their opinion and recommendation.

AMC12 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

NEUROLOGY

(a) Epilepsy and seizures

(1) Applicants with an established diagnosis of and under treatment for epilepsy should be assessed as unfit. A re-assessment after all treatment has been stopped for at least 5 years should include a review of neurological reports.

(2) Applicants may be assessed as fit if:

(i) there is a history of a single afebrile epileptiform seizure considered to have a very low risk of recurrence;

(ii) there has been no recurrence after at least 5 years off treatment;

(iii) a cause has been identified and treated and there is no evidence of continuing predisposition to epilepsy.

(b) Neurological disease

Applicants with any disease of the nervous system which is likely to cause a hazard to flight safety should be assessed as unfit. However, in certain cases, including cases of functional loss associated with stable disease, a fit assessment may be considered after full evaluation including, if necessary, a medical flight test.

(c) Migraine

Applicants with an established diagnosis of migraine or other severe periodic headaches likely to cause a hazard to flight safety should be assessed as unfit. A fit assessment may be considered after full evaluation. The evaluation should take into account at least the following: auras, visual field loss, frequency, severity, therapy. Appropriate limitation(s) may apply.

(d) Head injury

Applicants with a head injury which was severe enough to cause loss of consciousness or is associated with penetrating brain injury may be assessed as fit if there has been a full recovery and the risk of epilepsy is sufficiently low. An evaluation by a neurologist may be required depending on the staging of the original injury.

(e) Spinal or peripheral nerve injury

Applicants with a history or diagnosis of spinal or peripheral nerve injury or a disorder of the nervous system due to a traumatic injury may be assessed as fit if neurological evaluation is satisfactory and the conditions of AMC10 MED.B.095 are satisfied.

(f) Vascular deficiencies

Applicants with a disorder of the nervous system due to vascular deficiencies including haemorrhagic and ischaemic events should be assessed as unfit. A fit assessment may be considered if neurological evaluation is satisfactory and the conditions of AMC10 MED.B.095 are satisfied. A cardiological evaluation and medical flight test should be undertaken for applicants with residual deficiencies.

AMC13 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

VISUAL SYSTEM

(a) Applicants should not possess any abnormality of the function of the eyes or their adnexa or any active pathological condition, congenital or acquired, acute or chronic, or any sequelae of eye surgery or trauma, which is likely to interfere with the safe exercise of the privileges of the applicable licence.

(b) Eye examination

The examination should include visual acuities (near, intermediate and distant vision) and visual field.

(c) Visual acuity

(1) Visual acuity with or without corrective lenses should be 6/9 (0,7) binocularly and 6/12 (0,5) in each eye.

(2) Applicants who do not meet the required visual acuity should be assessed by an AME or AeMC, taking into account the privileges of the licence held and the risk involved.

(3) Applicants should be able to read, binocularly, an N5 chart (or equivalent) at 30-50 cm and an N14 chart (or equivalent) at 100 cm, with correction if prescribed (Refer to GM1 MED.B.070).

(d) Visual acuity

Applicants with substandard vision in one eye may be assessed as fit if the better eye:

(1) achieves distant visual acuity of 6/6 (1,0), corrected or uncorrected;

(2) achieves distant visual acuity less than 6/6 (1,0) but not less than 6/9 (0,7), after ophthalmological evaluation.

(e) Visual field defects

Applicants with a visual field defect may be assessed as fit if the binocular visual field or, in the case of monocularity, the monocular visual field is acceptable.

(f) Eye surgery

(1) After refractive surgery, a fit assessment may be considered, provided that there is satisfactory stability of refraction, there are no post-operative complications and no significant increase in glare sensitivity.

(2) After cataract, retinal or glaucoma surgery a fit assessment may be considered once recovery is complete.

(g) Visual correction

Correcting lenses should permit the licence holder to meet the visual requirements at all distances.

AMC14 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

COLOUR VISION

Applicants for a night rating should correctly identify 9 of the first 15 plates of the 24-plate edition of Ishihara pseudoisochromatic plates or should be colour safe.

AMC15 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

OTORHINOLARYNGOLOGY (ENT)

(a) Hearing

(1) Applicants should understand correctly conversational speech when tested with or without hearing aids at a distance of 2 metres from and with the applicant's back turned towards the examiner.

(2) If the hearing requirements can only be met with the use of hearing aid(s), the hearing aid(s) should provide optimal hearing function, be well-tolerated, and be suitable for aviation purposes.

(3) Applicants with hypoacusis should demonstrate satisfactory functional hearing ability.

(4) Applicants with profound deafness or major disorder of speech, or both, may be assessed as fit with an SSL such as 'limited to areas and operations where the use of radio is not mandatory'. The aircraft should be equipped with appropriate alternative warning devices in lieu of sound warnings.

(b) Ear conditions

Applicants with:

(1) an active pathological process of the internal or middle ear;

(2) unhealed perforation or dysfunction of the tympanic membrane(s);

(3) disturbance of vestibular function;

(4) significant restriction of the nasal passages;

(5) sinus dysfunction;

(6) significant malformation or significant infection of the oral cavity or upper respiratory tract; or

(7) significant disorder of speech or voice

should undergo further examination to establish that the condition does not interfere with the safe exercise of the privileges of the licence.

AMC16 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

DERMATOLOGY

In cases where a dermatological condition is associated with a systemic illness, full consideration should be given to the underlying illness before a fit assessment may be considered.

AMC17 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

ONCOLOGY

(a) In the case of malignant disease, applicants may be considered for a fit assessment if:

  (1) there is no evidence of residual malignant disease likely to jeopardise flight safety;

  (2) time appropriate to the type of tumour has elapsed since the end of primary treatment;

  (3) the risk of in-flight incapacitation from a recurrence or metastasis is sufficiently low;

  (4) there is no evidence of short or long-term sequelae from treatment that may jeopardise flight safety.

(b) Arrangements for an oncological follow-up should be made for an appropriate period of time.

(c) Applicants with an established history or clinical diagnosis of intracerebral malignant tumour should be assessed as unfit.

GM1 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

DIABETES MELLITUS TYPE 2 TREATED WITH INSULIN – GENERAL

(a) Pilots and their treating physician should be aware that if the HbA1c target level was set to normal (non-diabetic) levels, this will significantly increase the chance of hypoglycaemia. For safety reasons the target level of HbA1c is therefore set to 7,5–8,5 % even though there is evidence that lower HbA1c levels are correlated with fewer diabetic complications.

(b) The safety pilot should be briefed pre-flight on the potential condition of the pilot. The results of blood sugar testing before and during flight should be shared with the safety pilot for the acceptability of the values obtained.

GM2 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

DIABETES MELLITUS TYPE 2 TREATED WITH INSULIN – CONVERSION TABLE FOR HbA1c IN % AND MMOL/MOL

HbA1c in %	HbA1c in mmol/mol
4,7	28
5,0	31
5,3	34
5,6	38
5,9	41
6,2	44
6,5	48
6,8	51
7,4	57
8,0	64
8,6	70
9,2	77
9,8	84
10,4	90
11,6	103

GM3 MED.B.095 Medical examination and assessment of applicants for LAPL medical certificates

MOOD DISORDER

After full recovery from a mood disorder and after full consideration of the individual case, a fit assessment may be considered, depending on the characteristics and gravity of the mood disorder. If stability on maintenance psychoactive medication is confirmed, a fit assessment may be considered. If the dosage or type of medication is changed, a further evaluation may be required until stability is confirmed.

SUBPART C – REQUIREMENTS FOR MEDICAL FITNESS OF CABIN CREW

SECTION 1 – GENERAL REQUIREMENTS

AMC1 MED.C.005 Aero-medical assessments

(a) When conducting aero-medical examinations and assessments of cabin crew members, as applicable, their medical fitness should be assessed with particular regard to their physical and mental ability to:

(1) undergo the training required for cabin crew to acquire and maintain competence, e.g. actual fire-fighting, slide descending, using Protective Breathing Equipment (PBE) in a simulated smoke-filled environment, providing first aid;

(2) manipulate the aircraft systems and emergency equipment to be used by cabin crew, e.g. cabin management systems, doors/exits, escape devices, fire extinguishers, taking also into account the class and type of aircraft operated, e.g. narrow-bodied or wide-bodied, single/multi-deck, single/multi-cabin crew operation;

(3) continuously tolerate the aircraft environment whilst performing duties, e.g. altitude, pressure, re-circulated air, noise; and the type of operations such as short/medium/long/ultra long haul; and

(4) perform the required duties and responsibilities efficiently during normal and abnormal operations, and in emergency situations and psychologically demanding circumstances, e.g. assistance to crew members and passengers in case of decompression; stress management, decision-making, crowd control and effective crew coordination, management of disruptive passengers and of security threats. When relevant, operating as single cabin crew should also be taken into account when assessing the medical fitness of cabin crew.

(b) Intervals

(1) The interval between aero-medical assessments should be determined by the competent authority. The intervals established by the competent authority apply to cabin crew members who:

(i) undergo aero-medical assessments by an AME, AeMC or OHMP under the oversight of that competent authority; or

(ii) are employed by an operator under the oversight of that competent authority.

(2) The interval between aero-medical assessments may be reduced by the AME, AeMC or OHMP for medical reasons and in accordance with MED.C.035.

(3) Aero-medical assessments for the revalidation of a cabin crew medical report may be undertaken up to 45 days prior to the expiry date of the previous medical report. The validity period of the aero-medical assessment should be calculated from the expiry date of the previous aero-medical assessment.

SECTION 2 – REQUIREMENTS FOR AERO-MEDICAL ASSESSMENT OF CABIN CREW

AMC1 MED.C.025 Content of aero-medical assessments

Aero-medical examinations and assessments of cabin crew members should be conducted in accordance with AMC2 to AMC18 MED.C.025.

AMC2 MED.C.025 Content of aero-medical assessments

CARDIOVASCULAR SYSTEM

(a) Examination

(1) A standard 12-lead resting electrocardiogram (ECG) and report should be completed on clinical indication, at the first examination after the age of 40 and then at least every five years after the age of 50. If cardiovascular risk factors such as smoking, abnormal cholesterol levels or obesity are present, the intervals of resting ECGs should be reduced to two years.

(2) Extended cardiovascular assessment should be required when clinically indicated.

(b) Cardiovascular system - general

(1) Cabin crew members with any of the following conditions:

(i) aneurysm of the thoracic or supra-renal abdominal aorta, before surgery;

(ii) significant functional abnormality of any of the heart valves; or

(iii) heart or heart/lung transplantation

should be assessed as unfit.

(2) Cabin crew members with an established diagnosis of one of the following conditions:

(i) peripheral arterial disease before or after surgery;

(ii) aneurysm of the abdominal aorta, before or after surgery;

(iii) minor cardiac valvular abnormalities;

(iv) after cardiac valve surgery;

(v) abnormality of the pericardium, myocardium or endocardium;

(vi) congenital abnormality of the heart, before or after corrective surgery;

(vii) a cardiovascular condition requiring systemic anticoagulation;

(viii) vasovagal syncope of uncertain cause;

(ix) arterial or venous thrombosis; or

(x) pulmonary embolism

should be evaluated by a cardiologist before a fit assessment may be considered.

(c) Thromboembolic disorders

Whilst anticoagulation therapy is initiated, cabin crew members should be assessed as unfit. After a period of stable anticoagulation, a fit assessment may be considered with limitation(s), as appropriate. Anticoagulation should be considered stable if, within the last 6 months, at least 5 INR values are documented, of which at least 4 are within the INR target range and the haemorrhagic risk is acceptable. In cases of anticoagulation medication not requiring INR monitoring, a fit assessment may be considered after a stabilisation period of 3 months. Cabin crew members with pulmonary embolism should also be evaluated by a cardiologist. Following cessation of anticoagulant therapy, for any indication, cabin crew members should undergo a re-assessment.

(d) Syncope

(1) In the case of a single episode of vasovagal syncope which can be satisfactorily explained, a fit assessment may be considered.

(2) Cabin crew members with a history of recurrent vasovagal syncope should be assessed as unfit. A fit assessment may be considered after a 6-month period without recurrence, provided cardiological evaluation is satisfactory. Neurological review may be indicated.

(e) Blood pressure

Blood pressure should be recorded at each examination.

(1) The blood pressure should be within normal limits and should not consistently exceed 160 mmHg systolic and/or 95 mmHg diastolic, with or without treatment, taking into account other risk factors.

(2) Cabin crew members initiating medication for the control of blood pressure should be assessed as unfit until the absence of any significant side effects has been established and verification that the treatment is compatible with the safe exercise of cabin crew duties has been achieved.

(f) Coronary artery disease

(1) Cabin crew members with:

(i) cardiac ischaemia;

(ii) symptomatic coronary artery disease; or

(iii) symptoms of coronary artery disease controlled by medication

should be assessed as unfit.

(2) Cabin crew members who are asymptomatic after myocardial infarction or surgery for coronary artery disease should have fully recovered before a fit assessment may be considered. The affected cabin crew members should be on appropriate secondary prevention treatment.

(g) Rhythm/conduction disturbances

(1) Cabin crew members with any significant disturbance of cardiac conduction or rhythm should undergo cardiological evaluation before a fit assessment may be considered.

(2) Cabin crew members with a history of:

(i) ablation therapy; or

(ii) pacemaker implantation

should undergo satisfactory cardiovascular evaluation before a fit assessment may be made.

(3) Cabin crew members with:

(i) symptomatic sinoatrial disease;

(ii) symptomatic hypertrophic cardiomyopathy

(iii) complete atrioventricular block;

(iv) symptomatic QT prolongation;

(v) an automatic implantable defibrillating system; or

(vi) a ventricular anti-tachycardia pacemaker

should be assessed as unfit.

AMC3 MED.C.025 Content of aero-medical assessments

RESPIRATORY SYSTEM

(a) Cabin crew members with significant impairment of pulmonary function should be assessed as unfit. A fit assessment may be considered once pulmonary function has recovered and is satisfactory.

(b) Cabin crew members should undergo pulmonary morphological or functional tests on when clinically indicated.

(c) Cabin crew members with a history or established diagnosis of:

(1) asthma;

(2) active inflammatory disease of the respiratory system;

(3) active sarcoidosis;

(4) pneumothorax;

(5) sleep apnoea syndrome/sleep disorder; or

(6) major thoracic surgery

should undergo respiratory evaluation with a satisfactory result before a fit assessment may be considered.

(d) Cabin crew members who have undergone a pneumonectomy should be assessed as unfit.

AMC4 MED.C.025 Content of aero-medical assessments

DIGESTIVE SYSTEM

(a) Cabin crew members with any disease or sequelae of surgical intervention in any part of the digestive tract or its adnexa likely to cause incapacitation in flight, in particular any obstruction due to stricture or compression, should be assessed as unfit.

(b) Cabin crew members should be free from herniae that might give rise to incapacitating symptoms.

(c) Cabin crew members with disorders of the gastro-intestinal system, including:

(1) recurrent severe dyspeptic disorder requiring medication;

(2) peptic ulceration;

(3) pancreatitis;

(4) symptomatic gallstones;

(5) an established diagnosis or history of chronic inflammatory bowel disease;

(6) after surgical operation on the digestive tract or its adnexa, including surgery involving total or partial excision or a diversion of any of these organs;

(7) morphological or functional liver disease; or

(8) after surgery, including liver transplantation

may be assessed as fit subject to satisfactory gastroenterological evaluation.

AMC5 MED.C.025 Content of aero-medical assessments

METABOLIC AND ENDOCRINE SYSTEMS

(a) Cabin crew members should not possess any functional or structural metabolic, nutritional or endocrine disorder which is likely to interfere with the safe exercise of their duties and responsibilities.

(b) Cabin crew members with metabolic, nutritional or endocrine dysfunction may be assessed as fit, subject to demonstrated stability of the condition and satisfactory aero-medical evaluation.

(c) Diabetes mellitus

(1) Cabin crew members with diabetes mellitus requiring insulin may be assessed as fit:

(i) if it can be demonstrated that adequate blood sugar control has been achieved and hypoglycaemia awareness is established and maintained; and

(ii) in the absence, within the preceding 12 months, of any;

(A) hospitalisation related to diabetes; or

(B) hypoglycaemia that resulted in a seizure, loss of consciousness, impaired cognitive function or that required the intervention by another party; or

(C) episode of hypoglycaemia unawareness.

(2) Limitations should be imposed as appropriate. A limitation to undergo specific medical examinations (SIC) and a restriction to operate only in multi-cabin crew operations (MCL) should be placed as a minimum.

(3) Cabin crew members with diabetes mellitus not requiring insulin may be assessed as fit if it can be demonstrated that adequate blood sugar control has been achieved and hypoglycaemia awareness, if applicable considering the medication, is achieved.

AMC6 MED.C.025 Content of aero-medical assessments

HAEMATOLOGY

Cabin crew members with a haematological condition, such as:

(a) abnormal haemoglobin including, but not limited to, anaemia, erythrocytosis or haemoglobinopathy;

(b) coagulation, haemorrhagic or thrombotic disorder;

(c) significant lymphatic enlargement;

(d) acute or chronic leukaemia; or

(e) splenomegaly

may be assessed as fit subject to satisfactory aero-medical evaluation. If anticoagulation is being used as treatment, refer to AMC2 MED.C.025(c).

AMC7 MED.C.025 Content of aero-medical assessments

GENITOURINARY SYSTEM

(a) Urine analysis should form part of every aero-medical examination and assessment. The urine should not contain any abnormal element(s) considered to be of pathological significance.

(b) Cabin crew members with any disease or sequelae of surgical procedures on the kidneys or the urinary tract, in particular any obstruction due to stricture or compression likely to cause incapacitation should be assessed as unfit.

(c) Cabin crew members with a genitourinary disorder, such as:

(1) renal disease; or

(2) a history of renal colic due to one or more urinary calculi

may be assessed as fit subject to satisfactory renal/urological evaluation.

(d) Cabin crew members who have undergone a major surgical operation in the genitourinary apparatus involving a total or partial excision or a diversion of its organs should be assessed as unfit and be re-assessed after recovery before a fit assessment may be made.

(e) Cabin crew members who have undergone renal transplantation may be considered for a fit assessment if it is fully compensated and tolerated with only minimal immuno-suppressive therapy after at least 12 months. A requirement to undergo specific medical examinations (SIC) and a restriction to operate only in multi-cabin crew operations (MCL) should be considered.

(f) Cabin crew members requiring dialysis should be assessed as unfit.

AMC8 MED.C.025 Content of aero-medical assessments

INFECTIOUS DISEASE

Cabin crew members who are HIV positive may be assessed as fit if investigation provides no evidence of clinical disease and subject to satisfactory aero-medical evaluation.

AMC9 MED.C.025 Content of aero-medical assessments

OBSTETRICS AND GYNAECOLOGY

(a) Cabin crew members who have undergone a major gynaecological operation should be assessed as unfit until after recovery.

(b) Pregnancy

(1) A pregnant cabin crew member may be assessed as fit only during the first 16 weeks of gestation following review of the obstetric evaluation by the AME or OHMP.

(2) A limitation not to perform duties as single cabin crew member should be considered.

(3) The AME or OHMP should provide written advice to the cabin crew member and supervising physician regarding potentially significant complications of pregnancy resulting from flying duties.

AMC10 MED.C.025 Content of aero-medical assessments

MUSCULOSKELETAL SYSTEM

(a) Cabin crew members should have sufficient standing height, arm and leg length and muscular strength for the safe exercise of their duties and responsibilities.

(b) Cabin crew members should have satisfactory functional use of the musculoskeletal system. Particular attention should be paid to emergency procedures and evacuation, and related training.

(c) Cabin crew members with any significant sequelae from disease, injury or congenital abnormality affecting the bones, joints, muscles or tendons with or without surgery require full evaluation prior to a fit assessment.

(d) Cabin crew members with inflammatory, infiltrative, traumatic or degenerative disease of the musculoskeletal system may be assessed as fit provided the condition is in remission or is stable and the affected cabin crew member is not taking any medication that may lead to unfitness.

AMC11 MED.C.025 Content of aero-medical assessments

MENTAL HEALTH

(a) Cabin crew members with a mental or behavioural disorder due to use or misuse of alcohol or other psychoactive substances should be assessed as unfit pending recovery and freedom from psychoactive substance use or misuse and subject to satisfactory psychiatric evaluation after successful treatment.

(b) Cabin crew members with an established history or clinical diagnosis of schizophrenia, schizotypal or delusional disorder should be assessed as unfit.

(c) Cabin crew members with a psychiatric condition such as:

(1) mood disorder;

(2) neurotic disorder;

(3) personality disorder; or

(4) mental or behavioural disorder

should undergo satisfactory psychiatric evaluation before a fit assessment may be considered.

(d) Cabin crew members with a history of a single or repeated acts of deliberate self-harm should be assessed as unfit. Cabin crew members should undergo satisfactory psychiatric evaluation before a fit assessment may be considered.

(e) Where there is established evidence that a cabin crew member has a psychological disorder, he/she should be referred for psychological opinion and advice.

(f) The psychological evaluation may include a collection of biographical data, the review of aptitudes, and personality tests and psychological interview.

(g) The psychologist should submit a report to the AME or OHMP, detailing the results and recommendation.

AMC12 MED.C.025 Content of aero-medical assessments

NEUROLOGY

(a) Cabin crew members with an established history or clinical diagnosis of:

(1) epilepsy; or

(2) recurring episodes of disturbance of consciousness of uncertain cause

should be assessed as unfit.

(b) Cabin crew members with an established history or clinical diagnosis of:

(1) epilepsy without recurrence after 5 years of age and without treatment for more than 10 years;

(2) epileptiform EEG abnormalities and focal slow waves;

(3) progressive or non-progressive disease of the nervous system;

(4) inflammatory disease of the central or peripheral nervous system;

(5) migraine;

(6) a single episode of disturbance of consciousness of uncertain cause;

(7) loss of consciousness after head injury;

(8) penetrating brain injury; or

(9) spinal or peripheral nerve injury

should undergo further evaluation before a fit assessment may be considered.

(c) Cabin crew members with a disorder of the nervous system due to vascular deficiencies including haemorrhagic and ischaemic events should be assessed as unfit. A fit assessment may be considered if neurological review and musculoskeletal assessments are satisfactory.

AMC13 MED.C.025 Content of aero-medical assessments

VISUAL SYSTEM

(a) Examination

(1) a routine eye examination should form part of the initial and all further examinations and assessments; and

(2) an extended eye examination should be undertaken by an eye specialist when clinically indicated.(Refer to GM2 MED.B.070)

(b) Distant visual acuity, with or without correction, should be with both eyes 6/9 (0,7) or better.

(c) Cabin crew members should be able to read an N5 chart (or equivalent) at 30–50 cm, with correction if prescribed (Refer to GM1 MED.B.070).

(d) The binocular visual field or, in the case of monocularity, the monocular visual field should be acceptable.

(e) Cabin crew members who have undergone refractive surgery may be assessed as fit subject to satisfactory ophthalmic evaluation.

(f) Cabin crew members with diplopia should be assessed as unfit.

(g) Spectacles and contact lenses:

If satisfactory visual function is achieved only with the use of correction:

(1) in the case of myopia or hyperopia or both, spectacles or contact lenses should be worn whilst on duty;

(2) in the case of presbyopia, spectacles should be readily available for immediate use;

(3) the correction should provide optimal visual function and be well-tolerated;

(4) a spare set of similarly correcting spectacles should be readily available for immediate use whilst on duty;

(5) orthokeratologic lenses should not be used.

AMC14 MED.C.025 Content of aero-medical assessments

COLOUR VISION

Cabin crew members should be able to correctly identify 9 of the first 15 plates of the 24-plate edition of Ishihara pseudoisochromatic plates. Alternatively, cabin crew members should demonstrate the ability to readily perceive those colours of which the perception is required for the safe performance of their duties.

AMC15 MED.C.025 Content of aero-medical assessments

OTORHINOLARYNGOLOGY (ENT)

(a) Hearing should be satisfactory for the safe exercise of cabin crew duties and responsibilities. Cabin crew with hypoacusis should demonstrate satisfactory functional hearing abilities.

(b) Examination

(1) An ear, nose and throat (ENT) examination should form part of all examinations and assessments. A tympanometry or equivalent should be performed at the initial examination and when clinically indicated.

(2) Hearing should be tested at all examinations and assessments:

(i) the cabin crew member should understand correctly conversational speech when tested with each ear at a distance of 2 metres from and with the cabin crew member’s back turned towards the examiner;

(ii) notwithstanding (b)(2)(i), hearing should be tested with pure tone audiometry at the initial examination and when clinically indicated;

(iii) at initial examination the cabin crew member should not have a hearing loss of more than 35 dB at any of the frequencies 500 Hz, 1 000 Hz or 2 000 Hz, or more than 50 dB at 3 000 Hz, in either ear separately.

(3) If the hearing requirements can be met only with the use of hearing aid(s), the hearing aid(s) should provide optimal hearing function, be well-tolerated, and suitable for aviation purposes.

(c) Cabin crew members with:

(1) an active pathological process of the internal or middle ear;

(2) unhealed perforation or dysfunction of the tympanic membrane(s);

(3) disturbance of vestibular function;

(4) significant restriction of the nasal passages;

(5) sinus dysfunction;

(6) significant malformation or significant infection of the oral cavity or upper respiratory tract;

(7) significant disorder of speech or voice

should undergo further examination to establish that the condition does not interfere with the safe exercise of their duties and responsibilities.

AMC16 MED.C.025 Content of aero-medical assessments

DERMATOLOGY

In cases where a dermatological condition is associated with a systemic illness, full consideration should be given to the underlying illness before a fit assessment may be made.

AMC17 MED.C.025 Content of aero-medical assessments

ONCOLOGY

(a) After treatment for malignant disease, cabin crew members should undergo satisfactory oncological and aero-medical evaluation before a fit assessment may be considered.

(b) Cabin crew members with an established history or clinical diagnosis of intracerebral malignant tumour should be assessed as unfit. Considering the histology of the tumour, a fit assessment may be considered after successful treatment and recovery.

GM1 MED.C.025 Content of aero-medical assessments

(a) When conducting aero-medical examinations and assessments, typical cabin crew duties as listed in (b) and (c), particularly those to be performed during abnormal operations and emergency situations, and cabin crew responsibilities to the travelling public should be considered in order to identify:

(1) any physical and/or mental conditions that could be detrimental to the performance of the duties required from cabin crew; and

(2) which examination(s), test(s) or investigation(s) should be undergone to complete an appropriate aero-medical assessment.

(b) Main cabin crew duties and responsibilities during day-to-day normal operations

(1) During pre/post-flight ground operations with/without passengers on board:

(i) monitoring of situation inside the aircraft cabin and awareness of conditions outside the aircraft including observation of visible aircraft surfaces and information to flight crew of any surface contamination such as ice or snow;

(ii) assistance to special categories of passengers (SCPs) such as infants and children (accompanied or unaccompanied), persons with disabilities or reduced mobility, medical cases with or without medical escort, and inadmissible persons, deportees and passengers in custody;

(iii) observation of passengers (any suspicious behaviour, passengers under the influence of alcohol and/or drugs, mentally disturbed), observation of potential able-bodied persons, crowd control during boarding and disembarkation;

(iv) safe stowage of cabin luggage, safety demonstrations and cabin secured checks, management of passengers and ground services during re-fuelling, observation of use of portable electronic devices;

(v) preparedness to carry out safety and emergency duties at any time, and security alertness.

(2) During flight:

(i) operation and monitoring of aircraft systems, surveillance of the cabin, lavatories, galleys, crew areas and flight crew compartment;

(ii) coordination with flight crew on situation in the cabin and turbulence events/effects;

(iii) management and observation of passengers (consumption of alcohol, behaviour, potential medical issues), observation of use of portable electronic devices;

(iv) safety and security awareness and preparedness to carry out safety and emergency duties at any time, and cabin secured checks prior to landing.

(c) Main cabin crew duties and responsibilities during abnormal and emergency operations

(1) In case of planned or unplanned emergency evacuation: briefing and/or commands to passengers including SCPs and selection and briefing to able-bodied persons; crowd control monitoring and evacuation conduct including in the absence of command from the flight crew; post-evacuation duties including assistance, first aid and management of survivors and survival in particular environments; activation of applicable communication means towards search and rescue services.

(2) In case of decompression: checking of crew members, passengers, cabin, lavatories, galleys, crew rest areas and flight crew compartment, and administering oxygen to crew members and passengers as necessary.

(3) In case of pilot incapacitation: secure pilot in his/her seat or remove from flight crew compartment; administer first aid and assist operating pilot as required.

(4) In case of fire or smoke: identify source/cause/type of fire/smoke to perform the necessary required actions; coordinate with other cabin crew members and flight crew; select appropriate extinguisher/agent and fight the fire using portable breathing equipment (PBE), gloves, and protective clothing as required; management of necessary passengers' movement if possible; instructions to passengers to prevent smoke inhalation/suffocation; give first aid as necessary; monitor the affected area until landing; preparation for possible emergency landing.

(5) In case of first aid and medical emergencies: assistance to crew members and/or passengers; correct assessment and correct use of therapeutic oxygen, defibrillator, first-aid kits/emergency medical kit contents as required; management of events, of incapacitated person(s) and of other passengers; coordination and effective communication with other crew members, in particular when medical advice is transmitted by frequency to flight crew or by a telecommunication connection.

(6) In case of disruptive passenger behaviour: passenger management as appropriate including use of restraint technique as considered required.

(7) In case of security threats (bomb threat on ground or in-flight and/or hijack): control of cabin areas and passengers' management as required by the type of threat, management of suspicious device, protection of flight crew compartment door.

(8) In case of handling of dangerous goods: observing safety procedures when handling the affected device, in particular when handling chemical substances that are leaking; protection and management of self and passengers and effective coordination and communication with other crew members.

GM2 MED.C.025 Content of aero-medical assessments

DIABETES MELLITUS TREATED WITH INSULIN

When considering a fit assessment for cabin crew with diabetes mellitus requiring insulin, account should be taken of the IATA Guidelines on Insulin-Treated Diabetes (Cabin Crew), as last amended.

GM3 MED.C.025 Content of aero-medical assessments

COLOUR VISION – GENERAL

Examples of colours of which the perception is required for the safe performance of cabin crew members' duties are: cabin crew indication panels, pressure gauges of emergency equipment (e.g. fire extinguishers) and cabin door status.

GM4 MED.C.025 Content of aero-medical assessments

OTORHINOLARYNGOLOGY (ENT) – PURE TONE AUDIOGRAM

The pure tone audiogram may also cover the 4 000 Hz frequency for early detection of decrease in hearing.

SECTION 3 – ADDITIONAL REQUIREMENTS FOR APPLICANTS FOR, OR HOLDERS OF, A CABIN CREW ATTESTATION

AMC1 MED.C.035 Limitations

When assessing whether the holder of a cabin crew attestation may be able to perform cabin crew duties safely if complying with one or more limitations, the following possible limitations should be considered:

(a) a restriction to operate only in multi-cabin crew operations (MCL);

(b) a restriction to specified aircraft type(s) (OAL) or to a specified type of operation (OOL);

(c) a requirement to undergo the next aero-medical examination and assessment at an earlier date than required by MED.C.005(b) (TML);

(d) a requirement to undergo specific medical examination(s) (SIC);

(e) a requirement for visual correction (CVL), or by means of contact lenses that correct for defective vision (CCL);

(f) a requirement to use hearing aids (HAL); and

(g) special restriction as specified (SSL).

SUBPART D – AERO-MEDICAL EXAMINERS (AME)

SECTION 1 – AERO-MEDICAL EXAMINERS

AMC1 MED.D.020 Training courses in aviation medicine

BASIC TRAINING COURSE

(a) Basic training course for AMEs

The basic training course for AMEs should consist of 60 hours of theoretical and practical training, including specific examination techniques.

(b) The learning objectives to acquire the necessary competencies should include theoretical knowledge, risk management, and decision-making principles in the following subjects. Demonstrations and practical skills should also be included, where appropriate.

(1) Introduction to aviation medicine;

(2) Basic aeronautical knowledge;

(3) Aviation physiology;

(4) Cardiovascular system;

(5) Respiratory system;

(6) Digestive system;

(7) Metabolic and endocrine systems;

(8) Haematology;

(9) Genitourinary system;

(10) Obstetrics and gynaecology;

(11) Musculoskeletal system;

(12) Psychiatry;

(13) Psychology;

(14) Neurology;

(15) Visual system and colour vision;

(16) Otorhinolaryngology;

(17) Oncology;

(18) Incidents and accidents escape and survival;

(19) Medication and flying;

(20) Legislation, rules and regulations;

(21) Cabin crew working environment;

(22) In-flight environment; and

(23) Space medicine.

AMC2 MED.D.020 Training courses in aviation medicine

ADVANCED TRAINING COURSE

(a) Advanced training course for AMEs

The advanced training course for AMEs should consist of 66 hours of theoretical and practical training, including specific examination techniques.

(b) The learning objectives to acquire the necessary competencies should include theoretical knowledge, risk management, and decision-making principles in the following subjects. Demonstrations and practical skills should also be included, where appropriate.

(1) Pilot working environment;

(2) Aerospace physiology;

(3) Clinical medicine;

(4) Cardiovascular system;

(5) Neurology;

(6) Psychiatry/psychology;

(7) Visual system and colour vision;

(8) Otorhinolaryngology;

(9) Dentistry;

(10) Human factors in aviation;

(11) Incidents and accidents, escape and survival; and

(12) Tropical medicine.

(c) Practical training in an AeMC should be under the guidance and supervision of the head of the AeMC.

(d) After the successful completion of the practical training, a report of demonstrated competency should be issued.

GM1 MED.D.020 Training courses in aviation medicine

BASIC TRAINING COURSE

(a) Basic training course in aviation medicine 60 hours

(1) Introduction to aviation medicine 2 hours

(i) History of aviation medicine

(ii) Specific aspects of civil aviation medicine

(iii) Different types of recreational flying

(iv) AME and pilots relationship

(v) Responsibility of the AME in aviation safety

(vi) Communication and interview techniques

(2) Basic aeronautical knowledge 2 hours

(i) Flight mechanisms

(ii) Man-machine interface, informational processing

(iii) Propulsion

(iv) Conventional instruments, 'glass cockpit'

(v) Recreational flying

(vi) Simulator/aircraft experience

(3) Aviation physiology 9 hours

(i) Atmosphere

(A) Functional limits for humans in flight

(B) Divisions of the atmosphere

(C) Gas laws — physiological significance

(D) Physiological effects of decompression

(ii) Respiration

(A) Blood gas exchange

(B) Oxygen saturation

(iii) Hypoxia signs and symptoms

(A) Average time of useful consciousness (TUC)

(B) Hyperventilation signs and symptoms

(C) Barotrauma

(D) Decompression sickness

(iv) Acceleration

(A) G-Vector orientation

(B) Effects and limits of G-load

(C) Methods to increase Gz-tolerance

(D) Positive/negative acceleration

(E) Acceleration and the vestibular system

(v) Visual disorientation

(A) Sloping cloud deck

(B) Ground lights and stars confusion

(C) Visual autokinesis

(vi) Vestibular disorientation

(A) Anatomy of the inner ear

(B) Function of the semicircular canals

(C) Function of the otolith organs

(D) The oculogyral and coriolis illusion

(E) ‘Leans’

(F) Forward acceleration illusion of ‘nose up’

(G) Deceleration illusion of ‘nose down’

(H) Motion sickness — causes and management

(vii) Noise and vibration

(A) Preventive measures

(4) Cardiovascular system 3 hours

(i) Relation to aviation; risk of incapacitation

(ii) Examination procedures: ECG, laboratory testing and other special examinations

(iii) Cardiovascular diseases:

(A) Hypertension, treatment and assessment

(B) Ischaemic heart disease

(C) ECG findings

(D) Assessment of satisfactory recovery from myocardial infarction, interventional procedures and surgery

(E) Cardiomyopathies; pericarditis; rheumatic heart disease; valvular diseases

(F) Rhythm and conduction disturbances, treatment and assessment

(G) Congenital heart disease: surgical treatment, assessment

(H) Cardiovascular syncope: single and repeated episodes

Topics (5) to (11) inclusive, and (17) 10 hours

(5) Respiratory system

(i) Relation to aviation, risk of incapacitation

(ii) Examination procedures: spirometry, peak flow, x-ray, other examinations

(iii) Pulmonary diseases: asthma, chronic obstructive pulmonary diseases

(iv) Infections, tuberculosis

(v) Bullae, pneumothorax

(vi) Obstructive sleep apnoea

(vii) Treatment and assessment

(6) Digestive system

(i) Relation to aviation, risk of incapacitation

(ii) Examination of the system

(iii) Gastro-intestinal disorders: gastritis, ulcer disease

(iv) Biliary tract disorders

(v) Hepatitis and pancreatitis

(vi) Inflammatory bowel disease, irritable colon/irritable bowel disease

(vii) Herniae

(viii) Treatment and assessment including post-abdominal surgery

(7) Metabolic and endocrine systems

(i) Relation to aviation, risk of incapacitation

(ii) Endocrine disorders

(iii) Diabetes mellitus Type 1 & 2

(A) Diagnostic tests and criteria

(B) Anti-diabetic therapy

(C) Operational aspects in aviation

(D) Satisfactory control criteria for aviation

(iv) Hyper/hypothyroidism

(v) Pituitary and adrenal glands disorders

(vi) Treatment and assessment

(8) Haematology

(i) Relation to aviation, risk of incapacitation

(ii) Blood donation aspects

(iii) Erythrocytosis; anaemia; leukaemia; lymphoma

(iv) Sickle cell disorders

(v) Platelet disorders

(vi) Haemoglobinopathies; geographical distribution; classification

(vii) Treatment and assessment

(9) Genitourinary system

(i) Relation to aviation, risk of incapacitation

(ii) Action to be taken after discovery of abnormalities in routine dipstick urinalysis, e.g. haematuria; albuminuria

(iii) Urinary system disorders:

(A) Nephritis; pyelonephritis; obstructive uropathies

(B) Tuberculosis

(C) Lithiasis: single episode; recurrence

(D) Nephrectomy, transplantation, other treatment and assessment

(10) Obstetrics and gynaecology

(i) Relation to aviation, risk of incapacitation

(ii) Pregnancy and aviation

(iii) Disorders, treatment and assessment

(11) Musculoskeletal system

(i) Vertebral column diseases

(ii) Arthropathies and arthroprosthesis

(iii) Pilots with a physical impairment

(iv) Treatment of musculoskeletal system, assessment for flying

(12) Psychiatry 2 hours

(i) Relation to aviation, risk of incapacitation

(ii) Psychiatric examination

(iii) Psychiatric disorders: neurosis; personality disorders; psychosis; organic mental illness

(iv) Alcohol and other psychoactive substance(s) use

(v) Treatment, rehabilitation and assessment

(13) Psychology 2 hours

(i) Introduction to psychology in aviation as a supplement to psychiatric assessment

(ii) Methods of psychological examination

(iii) Behaviour and personality

(iv) Workload management and situational awareness

(v) Flight motivation and suitability

(vi) Group social factors

(vii) Psychological stress, stress coping, fatigue

(viii) Psychomotor functions and age

(ix) Mental fitness and training

(14) Neurology 3 hours

(i) Relation to aviation, risk of incapacitation

(ii) Examination procedures

(iii) Neurological disorders

(A) Seizures — assessment of single episode

(B) Epilepsy

(C) Multiple sclerosis

(D) Head trauma

(E) Post-traumatic states

(F) Vascular diseases

(G) Tumours

(H) Disturbance of consciousness — assessment of single and repeated episodes

(iv) Degenerative diseases

(v) Sleep disorders

(vi) Treatment and assessment

(15) Visual system and colour vision 4 hours

(i) Anatomy of the eye

(ii) Relation to aviation duties

(iii) Examination techniques

(A) Visual acuity assessment

(B) Visual aids

(C) Visual fields — acceptable limits for certification

(D) Ocular muscle balance

(E) Assessment of pathological eye conditions

(F) Glaucoma

(iv) Monocularity and medical flight tests

(v) Colour vision

(vi) Methods of testing: pseudoisochromatic plates, lantern tests, anomaloscopy

(vii) Importance of standardisation of tests and of test protocols

(viii) Assessment after eye surgery

(16) Otorhinolaryngology 3 hours

(i) Anatomy of the systems

(ii) Clinical examination in ORL

(iii) Functional hearing tests

(iv) Vestibular system; vertigo, examination techniques

(v) Assessment after ENT surgery

(vi) Barotrauma ears and sinuses

(vii) Aeronautical ENT pathology

(viii) ENT requirements

(17) Oncology

(i) Relation to aviation, risk of metastasis and incapacitation

(ii) Risk management

(iii) Different methods of treatment and assessment

(18) Incidents and accidents, escape and survival 1 hour

(i) Accident statistics

(ii) Injuries

(iii) Aviation pathology, post-mortem examination, identification

(iv) Aircraft evacuation

(A) Fire

(B) Ditching

(C) By parachute

(19) Medication and flying 2 hours

(i) Hazards of medications

(ii) Common side effects; prescription medications; over-the-counter medications; herbal medications; ‘alternative’ therapies

(iii) Medication for sleep disturbance

(20) Legislation, rules and regulations 4 hours

(i) ICAO Standards and Recommended Practices, Part -MED provisions (e.g.CAAP Air Crew Part MED)

(ii) Incapacitation: acceptable aero-medical risk of incapacitation; types of incapacitation; operational aspects

(iii) Basic principles in assessment of fitness for aviation

(iv) Operational and environmental conditions

(v) Use of medical literature in assessing medical fitness; differences between scientific study populations and licensed populations

(vi) Flexibility

(vii) Annex 1 to the Chicago Convention, paragraph 1.2.4.9

(viii) Accredited Medical Conclusion; consideration of knowledge, skill and experience

(ix) Trained versus untrained crews; incapacitation training

(x) Medical flight tests

(21) Cabin crew working environment 1 hour

(i) Cabin environment, workload, duty and rest time, fatigue risk management

(ii) Cabin crew safety duties and associated training

(iii) Types of aircraft and types of operations

(iv) Single-cabin crew and multi-cabin crew operations

(22) In-flight environment 1 hour

(i) Hygiene aboard aircraft: water supply, oxygen supply, disposal of waste, cleaning, disinfection and disinsection

(ii) Catering

(iii) Crew nutrition

(iv) Aircraft and transmission of diseases

(23) Space medicine 1 hour

(i) Microgravity and metabolism, life sciences

(24) Practical demonstrations of basic aeronautical knowledge 8 hours

(25) Concluding items 2 hours

(i) Final examination

(ii) De-briefing and critique

GM2 MED.D.020 Training courses in aviation medicine

ADVANCED TRAINING COURSE

(a) Advanced training course in aviation medicine 66 hours

(1) Pilot working environment 6 hours

(i) Commercial aircraft flight crew compartment

(ii) Business jets, commuter flights, cargo flights

(iii) Professional airline operations

(iv) Fixed wing and helicopter, specialised operations including aerial work

(v) Air traffic control

(vi) Single-pilot/multi-pilot

(vii) Exposure to radiation and other harmful agents

(2) Aerospace physiology 4 hours

(i) Brief review of basics in physiology (hypoxia, rapid/slow decompression, hyperventilation, acceleration, ejection, spatial disorientation)

(ii) Simulator sickness

(3) Clinical medicine 5 hours

(i) Complete physical examination

(ii) Review of basics with relationship to commercial flight operations

(iii) Class 1 requirements

(iv) Clinical cases

(v) Communication and interview techniques

(4) Cardiovascular system 4 hours

(i) Cardiovascular examination and review of basics

(ii) Class 1 requirements

(iii) Diagnostic steps in cardiovascular system

(iv) Clinical cases

(5) Neurology 3 hours

(i) Brief review of basics (neurological and psychiatric examination)

(ii) Alcohol and other psychoactive substance(s) use

(iii) Class 1 requirements

(iv) Clinical cases

(6) Psychiatry/psychology 5 hours

(i) Brief review of basics (psychiatric/psychological evaluation techniques)

(ii) Alcohol and other psychoactive substance(s) use

(iii) Class 1 requirements

(iv) Clinical cases

(7) Visual system and colour vision 5 hours

(i) Brief review of basics (visual acuity, refraction, colour vision, visual fields, night vision, stereopsis, monocularity)

(ii) Class 1 visual requirements

(iii) Implications of refractive and other eye surgery

(iv) Clinical cases

(8) Otorhinolaryngology 4 hours

(i) Brief review of basics (barotrauma — ears and sinuses, functional hearing tests)

(ii) Noise and its prevention

(iii) Vibration, kinetosis

(iv) Class 1 hearing requirements

(v) Clinical cases

(9) Dentistry 2 hours

(i) Oral examination including dental formula

(ii) Oral cavity, dental disorders and treatment, including implants, fillings, prosthesis, etc.

(iii) Barodontalgia

(iv) Clinical cases

(10) Human factors in aviation, including 8 hours demonstration and practical experience22 hours

(i) Long-haul flight operations

(A) Flight time limitations

(B) Sleep disturbance

(C) Extended/expanded crew

(D) Jet lag/time zones

(ii) Human information processing and system design

(A) Flight Management System (FMS), Primary Flight Display (PFD), datalink, fly by wire

(B) Adaptation to the glass cockpit

(C) Crew Coordination Concept (CCC), Crew Resource Management (CRM), Line Oriented Flight Training (LOFT) etc.

(D) Practical simulator training

(E) Ergonomics

(iii) Crew commonality

(A) Flying under the same type rating, e.g. A-318, A-319, A-320, A-321

(iv) Human factors in aircraft incidents and accidents

(v) Flight safety strategies in commercial aviation

(vi) Fear and refusal of flying

(vii) Psychological selection criteria

(viii) Operational requirements (flight time limitation, fatigue risk management, etc.)

(11) Incidents and accidents, escape and survival 2 hours

(i) Accident statistics

(ii) Types of injuries

(iii) Aviation pathology, post-mortem examination related to aircraft accidents, identification

(iv) Rescue and emergency evacuation

(12) Tropical medicine 2 hours

(i) Endemicity of tropical disease

(ii) Infectious diseases (communicable diseases, sexually transmitted diseases, HIV etc.)

(iii) Vaccination of flight crew and passengers

(iv) Diseases transmitted by vectors

(v) Food and water-borne diseases

(vi) Parasitic diseases

(vii) International health regulations

(viii) Personal hygiene of aviation personnel

(13) Concluding items 2 hours

(i) Final examination

(ii) De-briefing and critique

GM3 MED.D.020 Training courses in aviation medicine

GENERAL

(a) Principles of training:

To acquire knowledge and skills for the aero-medical examination and assessment, the training should be:

(1) based on regulations;

(2) based on general clinical skills and knowledge necessary to conduct relevant examinations for the different medical certificates;

(3) based on knowledge of the different risk assessments required for various types of medical certification;

(4) based on an understanding of the limits of the decision-making competences of an AME in assessing safety-critical medical conditions for when to defer and when to deny;

(5) based on knowledge of the aviation environment; and

(6) exemplified by clinical cases and practical demonstrations.

(b) Training outcomes:

The trainee should demonstrate a thorough understanding of:

(1) the aero-medical examination and assessment process:

(i) principles, requirements and methods;

(ii) ability to investigate all clinical aspects that present aero-medical risks, the reasonable use of additional investigations;

(iii) the role in the assessment of the ability of the pilot or cabin crew member to safely perform their duties in special cases, such as the medical flight test;

(iv) aero-medical decision-making based on risk management;

(v) medical confidentiality; and

(vi) correct use of appropriate forms, and the reporting and storing of information;

(2) the conditions under which the pilots and cabin crew carry out their duties; and

(3) principles of preventive medicine, including aero-medical advice in order to help prevent future limitations.

(c) The principles and training outcomes stated at (a) and (b) should also be taken into consideration for refresher training programmes

AMC1 MED.D.030 Validity of AME certificates

REFRESHER TRAINING

(a) It is the responsibility of the AME to continuously maintain and improve their competencies.

(b) During the period of validity of the AME certificate, an AME should attend a minimum of 20 hours of refresher training.

(c) An AME exercising class 1 privileges should attend at least 10 hours of refresher training per year.

(d) A proportionate number of refresher training hours should be provided by, or conducted under the direct supervision of, the competent authority or the medical assessor.

(e) The curricula of refresher training hours referred to in (c) should be decided by the competent authority following a risk-based assessment.

(f) Attendance at scientific meetings and congresses, and flight deck experience may be credited by the competent authority for a specified number of hours against the training obligations of the AME, provided the competent authority has assessed it in advance as being relevant for crediting purposes.

(g) In case of renewal of an AME certificate, the practical training should include at least 10 aero-medical assessments, in accordance with the type of the requested AME certificate.

GM1 MED.D.030 Validity of AME certificates

REFRESHER TRAINING

(a) The curricula for the refresher training hours that should be provided by, or conducted under the direct supervision of, the competent authority or the medical assessor may include but are not limited to subjects such as:

(1) Psychiatry

(i) Relation to aviation, risk of incapacitation;

(ii) Psychiatric examination;

(iii) Psychiatric disorders: neurosis, personality disorders, psychosis, organic mental illness;

(iv) Alcohol and other psychoactive substance(s) use; and

(v) Treatment, rehabilitation and assessment.

(2) Psychology

(i) Introduction to psychology in aviation as a supplement to psychiatric assessment;

(ii) Methods of psychological examination;

(iii) Behaviour and personality;

(iv) Workload management and situational awareness;

(v) Flight motivation and suitability;

(vi) Group social factors;

(vii) Psychological stress, stress coping, fatigue;

(viii) Psychomotor functions and age; and

(ix) Mental fitness and training.

(3) Communication and interview techniques

(b) Scientific meetings, congresses or flight deck experience that may be credited by the competent authority:

International Academy of Aviation and Space Medicine Annual Congresses (ICASM)	10 hours credit
European Conference of Aerospace Medicine (ECAM)	10 hours credit
Aerospace Medical Association Annual Scientific Meetings (AsMA)	10 hours credit
Other scientific meetings (A minimum of 6 hours to be under the direct supervision of the medical assessor of the competent authority)	10 hours credit

Flight crew compartment experience (a maximum of 5 hours credit per 3 years):

(i)	Jump seat	5 sectors — 1 hour credit
(ii)	Simulator	4 hours — 1 hour credit
(iii)	Aircraft piloting	4 hours — 1 hour credit

(c) An AME exercising class 1 revalidation/renewal privileges should attend international aviation medicine scientific meetings or congresses at regular intervals.

(d) Aero-medical examinations of military pilots may be considered as equivalent in accordance with MED.D.030(a)(3), subject to approval by the medical assessor of the competent authority.

GM2 MED.D.030 Validity of AME certificates

AME PEER SUPPORT GROUPS

(a) The competent authority should promote better performance of AMEs by supporting the establishment of AME peer support groups that could provide both professional support and educational enhancement.

(b) Attendance to AME peer support group meetings may be credited by the competent authority as refresher training. The competent authority should determine a maximum of hours that can be credited as refresher training during the period of authorisation.

(c) AME peer support groups may be established as part of, or complementary to, national associations of aerospace medicine.