

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



ACCIDENT INVESTIGATION COORDINATING COMMITTEE

Republic of Maldives

SAFETY INVESTIGATION REPORT 2022/01

FINAL REPORT

**INVESTIGATION OF THE RUNWAY EXCURSION
SERIOUS INCIDENT INVOLVING BOMBARDIER DHC-8-300 AIRCRAFT,
8Q-IAK OPERATED BY ISLAND AVIATION SERVICES (IAS)
AT KADHDHOO AIRPORT, MALDIVES**

on

05 May 2022

INTRODUCTION

Maldives is a signatory to the Convention on International Civil Aviation (Chicago, 1944) which established the principles and arrangements for the safe and orderly development of international air transport. Article 26 of the Convention obligates Signatories to investigate accidents and serious incidents to civil aircraft occurring in their State.

This report is based upon the investigation carried out by the Accident Investigation Coordinating Committee (AICC) in accordance with Annex 13 to the Convention, the Civil Aviation Act 2/2001 and the Civil Aviation Regulations. The sole objective of this investigation is to prevent accidents and serious incidents. It is not the purpose of this investigation to apportion blame or liability.

In investigating this serious incident, AICC was assisted by Maldives Civil Aviation Authority (MCAA), Island Aviation Services Ltd. (IAS), and Transport Safety Investigation Bureau (TSIB) Singapore.

All timings in this report are local time unless otherwise stated. Time difference between local and UTC is +5 hrs.

The report is released on 16 August 2023



Mr. Abdul Razzak Idris

Chairperson

Accident Investigation Coordinating Committee



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LIST OF ABBREVIATIONS

AAL	: Above Aerodrome Level
AICC	: Accident Investigation Coordinating Committee
AMSL	: (Elevation) Above Mean Sea Level
APAPI	: Abbreviated precision approach path indicators
ATC	: Air Traffic Control
ATCO	: Air Traffic Control Officer
ATL	: Aircraft Technical Log
CAMO	: Continuous Airworthiness Management Organisation
CG	: Center of Gravity
CVR	: Cockpit Voice Recorder
DHC-8-300	: Bombardier Dash 8, series 300 aircraft
FDR	: Flight Data Recorder
FDTL	: Flight and Duty Time Limitation
FO	: First Officer
GKK	: IATA designated 3 letter code for Kooddoo Airport
IAS	: Island Aviation Services Ltd.
IFR	: Instrument Flight Rules
KDO	: IATA designated 3 letter code for Kadhdhoo Airport
lbs.	: Pounds
LDA	: Landing Distance Available
LWMAC	: Landing Weight Mean Aerodynamic Chord
MCAA	: Maldives Civil Aviation Authority
MCAR	: Maldives Civil Aviation Regulations
MEHT	: Minimum Eye Height Above Threshold
MEL/DDG	: Minimum Equipment List / Dispatch Deviation Guide
METAR	: Aviation Routine Weather Report
MLE	: IATA designated three letter code for Velana International Airport
MMEL	: Master Minimum Equipment List
MMS	: Maldives Meteorological Service
MSN	: Manufacturer Serial Number
MTOM	: Maximum Take-Off Mass
PAPI	: Precision Approach Path Indicator

PF	: Pilot Flying
PIC	: Pilot-in-command
PM	: Pilot Monitoring
PWC	: Pratt & Whitney, Canada
QAR/FDM	: Quick Access Recorder / Flight Data Monitoring
RCR	: Runway Condition Report
SOP's	: Standard Operating Procedures
SPECI	: Special Aviation Routine Weather Report
SSCVR	: Solid-State Cockpit Voice Recorder
STOL	: Short Take Off and Landing
TAC	: Total Air Cycles
TAT	: Total Air Time
TOMAC	: Take-Off Mean Aerodynamic Chord
TORA	: Take off run available
TSIB	: Transport Safety Investigation Board, Singapore
UTC	: Coordinated Universal Time
VRMK	: ICAO designated 4 letter Aerodrome code for Kadhdhoo Airport

SYNOPSIS

On 5 May 2022, a Bombardier DHC-8-300 aircraft (Registration Markings 8Q-IAK), departed Kooddoo airport (GKK), under Instrument Flight Rules (IFR), on a scheduled passenger service (Q2 274) to Kadhdhoo Airport (KDO). There were 39 passengers, 2 cockpit crew and 2 cabin crew onboard.

On the first approach to land at KDO, a go-around was initiated after approaching to land on Runway 03, and on the second attempt, the aircraft landed on Runway 21 and over-ran the runway. The aircraft came to rest approximately 35 m (115 feet) past the end of the runway on the grass field.

There were no reports of any injuries to any of the occupants, or any damage to the aircraft.

The incident occurred at 19:47 hours LT and the MCAA reported the incident to the Accident Investigation Coordinating Committee (AICC) at 20:04 hours LT. An investigation was initiated the same night.

1. FACTUAL INFORMATION

Aircraft Legal Owner:	AS Air Lease V (Ireland) Limited
Registered owner:	Island Aviation Services Limited
Operator:	Island Aviation Services Limited (Air Operator Certificate No.007)
Place of Incident / Accident:	Kadhdhoo Airport (Code 2C) (VRMK)
Reported location:	01° 51' 30.0" N; 073° 31' 10.0" E
Date and Time:	05 May 2022 at 19:47 hours LT

1.1 History of Flight

On 5 May 2022, Bombardier DHC-8-300 aircraft (registration markings 8Q-IAK), operated by Island Aviation Services (IAS), departed Kooddoo airport (GKK), under IFR, on a scheduled passenger service (Q2 274) to Kadhdhoo Airport (KDO). There were 39 passengers, 2 flight crew and 2 cabin crew onboard. The PIC was the Pilot Flying (PF) and the First Officer (FO) was Pilot Monitoring (PM) seated on the right seat.

The aircraft was released for flight from the Operator's main base (with a Daily Check carried out at 22:00 hours on 4 May 2022) in Velana International Airport (MLE) on sectors MLE-GKK-KDO-MLE. Prior to flight Q2 274, the same aircraft was operated on sectors MLE-KDM-RUL-MLE.

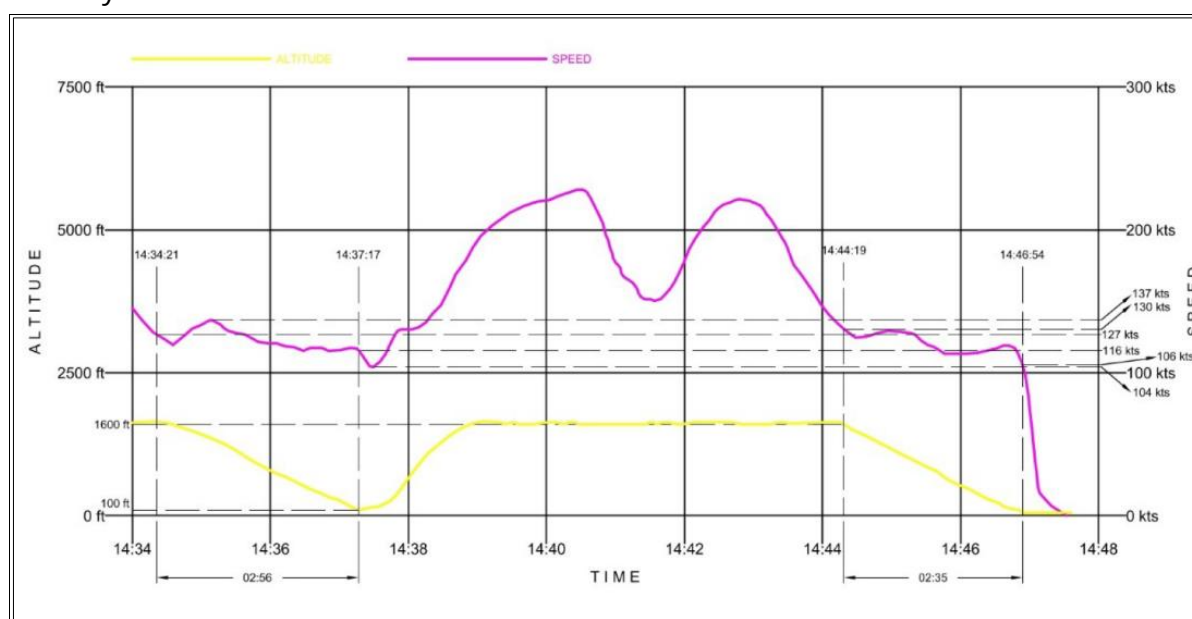
On the second leg of the multi sectoral flights departing from GKK, pre-departure checklist was completed before the aircraft departed GKK. The crew completed the after-take-off checklist immediately after take-off. The aircraft, enroute to KDO, was unable to fly on the most direct route and had to detour to the east quite considerably due to adverse weather conditions. The flight from GKK to KDO was uneventful until the first approach to KDO.

As confirmed by ATCO, the active runway at KDO was Runway 21. However, on receipt of the advice on surface conditions prevailing from ATCO, the crew requested to land on Runway 03. No sooner the request for 03 was approved by ATCO, the crew commenced approach and, in the process, performed the landing checklist as part of the procedures. The aircraft continued to approach to land on Runway 03 but shortly before touchdown, the crew decided to go-around, as they encountered mechanical turbulence and gusting wind conditions.

On the second approach, the crew decided to land on Runway 21 and continued the approach with ATC clearance. The ATCO reported the wind as 280° / 15 knots. The crew completed the landing checklist and requested for PAPI. Notably, there was no report of the runway surface condition provided by ATCO.

The aircraft approached Runway 21 and touched down approximately 442 meters before the end of Runway 21 and overran on to the grass, finally stopping approximately 35 m (115 feet) past the end of the runway.

An overview of the speeds, altitudes (plotted against time) of the aircraft covering the two approaches made to land at KDO are illustrated in the Flight Radar Plot for DQA274, dated 05 May VRMO-VRMK.



Immediately after the aircraft came to a stop, the crew shutdown both the engines after completing the engine shut-down checklist. The PIC then instructed the FO to complete the evacuation checklist which includes engine fire shutdown checklist and instructed the cabin crew for evacuation by using the standard command – “evacuate left”. Both cabin crew members assisted the passengers evacuate the aircraft through the air stair door. No emergency exits were used for evacuation. After a successful evacuation, the aircraft was manually pushed back onto the runway and later to the apron by the ground personnel.

1.2 Injuries to Persons

Injuries	Flight Crew	Cabin Crew	Passengers	Total on board	Others
Fatal	0	0	0	0	0
Serious	0	0	0	0	0
Minor	0	0	0	0	0
Nil	2	2	38+1	42+1	0
Total	2	2	38+1	42+1	0

1.3 Damage to aircraft

No damage to aircraft or its components were reported.

1.4 Other Damage

None found.

1.5 Personnel Information

1.5.1 Pilot-In-Command

Age:	26 years
Nationality:	Maldives
Gender:	Female
Type of License:	Air Transport Pilot License - A
License issued on:	20 Jan 2022
License expires on:	19 Jan 2027
Type of medical:	Class 1 medical certificate
Medical issued on:	06 Sep 2021
Medical expires on:	06 Sep 2022
Types flown:	DHC8 series
Hrs. on type:	3,331: 15hrs
Ratings:	DHC8 / IR
Last Proficiency check:	01 Jan 2021
Total hours as PIC on type:	473:10 hours
Total flight time:	3,531:40 hours
Last 90 days:	173:00 hours
Last 28 days:	17:45 hours

Last 24 hours:	04:55 hours
Previous rest period:	29, 30 April and 1 May 2022

1.5.2 Co-pilot

Age:	26 years
Nationality:	Maldives
Gender:	Male
Type of License:	CPL-A
License issued on:	22 May 2019
License expires on:	21 May 2024
Type of medical:	Class 1 medical certificate
Medical issued on:	26 Aug 2021
Medical expires on:	26 Aug 2022
Types flown:	DHC8 series.
Hrs. on type:	1368:00 hrs.
Ratings:	DHC8 series
Last Proficiency check:	17 Mar 2022
Total flight time:	1568:15 hours
Last 90 days:	141:45 hours
Last 28 days:	64:25 hours
Last 24 hours:	04:55 hours
Previous rest period:	2 and 3 May 2022

1.5.3 Cabin Crew 1

Age:	29 years
Nationality:	Maldives
Gender:	Female
Type of License:	Cabin Crew License
License issued on:	29 Dec 2019
License expires on:	28 Dec 2024
Type of medical:	Class 3 Medical Certificate
Medical issued on:	07 Aug 2021

Medical expires on:	07 Aug 2023
Previous rest period:	02 and 03 May 2022

1.5.4 Cabin Crew 2

Age:	23 years
Nationality:	Maldives
Gender:	Female
Type of License:	Cabin Crew License
License issued on:	25 Sep 2019
License expires on:	24 Sep 2024
Type of medical:	Class 3 Medical Certificate
Medical issued on:	21 Apr 2021
Medical expires on:	20 Apr 2023
Previous rest period:	30 Apr and 01 May 2022

1.6 Aircraft Information

DHC-8-300 aircraft bearing MSN 557 was built in 2001 by Bombardier Inc. of Canada. The aircraft was registered in the Maldives for the first time on 19 July, 2014 and ever since it has been in operation with Island Aviation Services Ltd. The initial Certificate of Airworthiness was issued by the MCAA on 19 July 2014, as per records held with the operator.

1.6.1 General Information

The DHC-8 (Dash-8) 300 series aircraft is a twin turboprop, all-metal, high wing regional transport passenger aircraft. The airliner is equipped with two wing mounted Pratt&Whitney PW123 series turbo prop engines driving Hamilton Sundstrand four bladed propellers. The aircraft has a dual control cockpit with a dual digital automatic flight control system, an automatic flight director and an auto pilot.

Manufacturer	Bombardier Inc
Model:	DHC-8-300 series
Manufacturer's serial number:	557
Year of Manufacture:	2001

Nationality:	8Q (Republic of Maldives)
Registration Markings:	8Q-IAK
Certificate of Registration:	Valid – since issued on 19 Jul 2014
Owner:	Island Aviation Services Ltd
Operator:	Island Aviation Services Ltd
Validity of Certificate of Airworthiness:	Valid since issued on 19 July 2014 (Large aeroplanes category)
Airworthiness Review Certificate:	Issued by MCAA on 16 July 2020 Valid till 15 July 2021 1 st Extension issued by the Operator's MCAR-M Organization – Valid until 15 July 2022
Total Flying Hours since manufacture:	32,877:47 hours
Total Landings since manufacture :	61,591 landings
Total Flying Hours since overhaul:	Not applicable
Last periodic inspection:	1A check
Last inspection carried out at TAT/TAC:	32,480:47 hours / 61,060 cycles
Total Flying Hours since last periodic inspection:	397 hours

1.6.2 Engines and Propellers

Right Engine (TMM Module)	
Right engine manufacturer	PWC
Year of manufacture	1997
Model	PW123E (p/n: 3038400)
Serial number	TM-AE0031
Total Hrs. since new	45,880.76 hours
Last overhaul date	15 Dec 2017
Hrs. since overhaul	9,009.89 hours
Last check carried out	Repaired
Hrs. since last check	3827.99 hours
Right Engine (RGB)	
Right engine manufacturer	PWC
Year of manufacture	1995
Model	PW123E (p/n: 3038400)

Serial number	PCE-RGB-123337
Last overhaul date`	15 Dec 2017
Hrs. since overhaul:	8028.17
Last check carried out:	Repaired
Hrs. since last check:	2846.35 hours
Left Engine (TMM Module)	
Left engine manufacturer:	PWC
Year of manufacture:	2017
Model:	PW123E
Serial number:	TM-AW0215
Total hrs. since new:	6954.70 hrs
Last overhaul date:	N/A
Hrs. since overhaul:	N/A
Last check carried out:	Repaired
Hrs. since last check:	56.72 hours
Left Engine (RGB)	
Left engine manufacturer:	PWC
Year of manufacture:	2017
Model:	PW123E
Serial number:	TM-AW0215
Last overhaul date:	N/A
Hrs. since overhaul:	N/A
Last check carried out:	Repaired
Hrs. since last check:	56.72 hours
Right Propeller	
Manufacturer:	Hamilton Sundstrand
Year of manufacture:	2006
Model:	14SF-23 (p/n: 806700-1)
Serial number:	20060914
Last overhaul date:	07 May 2019 (#4 blade s/n: 888076-23)
Hrs. since last overhaul:	4055.65 hours
Last check carried out:	Overhaul

Left Propeller	
Manufacturer:	Hamilton Sundstrand
Year of manufacture:	1997
Model:	14SF-23 (p/n: 806700-1)
Serial number:	MFG970321
Last overhaul date:	14 Jul 2021 (#1 Blade s/n: 2006111152-23)
Hrs. since last overhaul:	934.07
Last check carried out:	Overhaul

*Engine / Propellor details including hours are stated as provided by the Operator, and has not been independently verified.

1.6.3 Recent maintenance

As per Aircraft Technical Log (ATL) sheet number 07007, the latest daily inspection was carried out at 22:00 hours on 4 May 2022. The most recent major maintenance inspection was carried on 09 July 2019, at 28,086:52 hours and 55,570 cycles and next fall due at 33086:52 hours.

1.6.4 Fuel

Jet A-1 fuel was used on the aircraft engines. Prior to departure of flight Q2 274, the aircraft was refueled at the main base MLE. The quantity of fuel uplifted recorded was 2800 lbs. Total fuel onboard at departure from MLE was 5400 pounds. No fuel was uplifted from GKK. The following fuel masses were recorded on the ATL sheet by the crew and are determined using the fuel quantity gauges installed on the aircraft.

Departure from MLE (actual):	5400 lbs.
Arrival at GKK (actual):	4000 lbs.
Departure from GKK (actual):	4000 lbs.
Arrival at KDO (actual):	3100 lbs.

1.6.5 Defects

Operator's Deferred Defects List generated for the entire fleet shows 2 defects applicable to aircraft registration 8Q-IAK, the details of which are copied below:

- Deferred defect no. 63749/1
Auxiliary Fuel Quantity indicators
Date deferred: 9 Jan 2022
Date of expiry: 9 May 2022
MEL 28-3 Cat D

2. Deferred defect no. 69995/2
#1 Fuel Quantity indication
Date deferred: 1 May 2022
Date of expiry: 10 flight days
MEL 28-2 Cat A

Under the Master Minimum Equipment List (MMEL), operation of the aircraft is permitted with the defects deferred.

1.6.6 Aircraft Load

At GKK, the crew members were provided with a printed loadsheet which was accepted and signed by the PIC. The loadsheet was prepared by a full-time staff member of IAS, who was licensed to prepare loadsheets. The following masses were depicted in the loadsheet:

Take-off mass (Actual) from GKK:	38,983 lbs.
----------------------------------	-------------

Landing mass (Forecast) at KDO:	38,482 lbs.
---------------------------------	-------------

For DHC-8 -300 series aircraft the maximum takeoff mass (MTOM) type certificated is 42,999 pounds while its maximum landing mass remains at 41,999 pounds. Based on the loadsheet, both takeoff and landing masses were well within the limitations set by the Operator. The CG limitations were also within allowable limits. Depicted below are the prescribed limitations for TOMAC (Take-off mass) plus the Actual CG position:

Forward CG limit:	19.96
Actual CG position:	34.24
Aft CG limit:	40.00
For LWMAC (Landing mass) the following are the prescribed limitations:	
Forward CG limit:	19.74
Actual CG position:	34.23
Aft CG limit:	40.00

Take-off weight, landing weight and Centre of Gravity were found within limits. It can be concluded that both the landing mass and the mass distribution were well within limitations.

1.7 Meteorological information

The incident occurred on a day when the whole archipelago was experiencing adverse weather conditions, typical of the westerly monsoon. A cautionary weather alert was also in effect, with a forecast onset of thunderstorms and heavy rain about an hour after the time of incident (**Figure 1 - Weather Map and Alerts**).

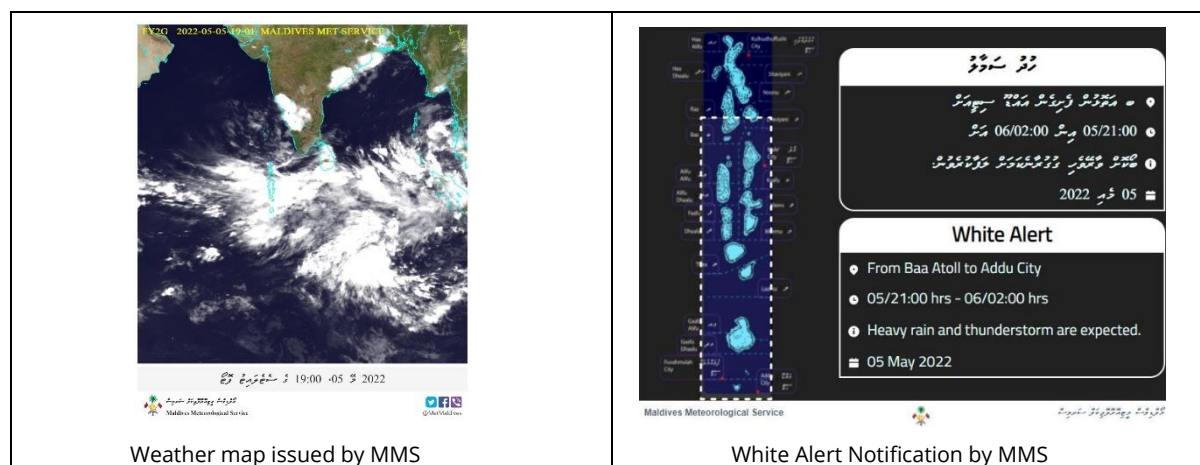


Figure 1 – Weather Map and Alerts

The last aviation routine weather report (METAR), issued by the aerodrome meteorological office prior to the incident, indicated the presence of thunder clouds to the west of KDO with no apparent thunderstorm or precipitation. However, a special aviation routine weather report (SPECI) issued a few minutes after the incident indicated mature thunderstorm activity but no falling rain.

The last wind velocities the aircraft received from ATC during the two separate approaches from both directions imply moderate westerly winds.

On 05 May 2022 Maldives Meteorological Service (MMS) issued a white alert effective from 21:00 hours 5 May to 02:00 hours 6 May 2022. The affected region was from Baa Atoll to Addu City and the alert stated, “heavy rain and thunderstorms are expected”. It shall be noted that the incident occurred 1 hour 13 minutes before the effectivity of this alert.

Upon departure from GKK, the flight crew requested for weather from KDO Tower and the weather provided. At 19:15 hours on 5 May 2022, the METAR reported for KDO aerodrome was as follows:

5/5/2022 14:00 METAR VRMK 051400Z 27008KT 9999 FEW017 FEW018CB
BKN120 28.7/25.7 Q1009.9 CB W

.....

Reports received after the incident were:

5/5/2022 SPECI VRMK 051452Z 27010KT 9999 TS FEW017 FEW018CB BKN120
28.9/25.5 Q1010.7 CB SW, W

5/5/2022 1600 SPECI VRMK 051557Z 30015G31KT 8000-TSRA SCT017
FEW018CB BKN120 27.4/25.9 Q1011.5 RETS CB SW, W, NY.

1.8 Aids to Navigation

KDO is equipped with an enroute non-directional radio beacon (NDB). Markings on the runway included thresholds, designators, aiming points and the centerline.

Abbreviated precision approach path indicators (APAPI) were available for both runway 03 and 21. These were located on the left side, when viewed from the direction of approach and were set at a minimum eye height above threshold (MEHT) of 40 feet. Runway lighting included those delineating the sides, both thresholds and ends. Additionally, a barrette of green and wingbar lights is located on both sides in line with the thresholds.

1.9 Communications

There were no communication issues or defects recorded. Both VHF Communication systems were operating normally.

1.10 Aerodrome information

Kadhdhoo Airport is a domestic airport located on Kadhdhoo island at Laamu Atoll in the Republic of Maldives and it is operated by Kadhdhoo Airport Company Ltd. – a 100% state owned enterprise.

The aerodrome movement area at KDO constitutes a runway designated as 03/21, which is 1220 meters in length and 30 meters wide and an apron and two taxiways connecting the runway and apron (**Figures 2 and 3**). The runway elevation above mean sea level (AMSL) is declared as 4 feet. The surface area is bituminous with a reported bearing strength of PCN15. Runway strip dimensions are declared as 1340 meters by 150 meters. No stopways are provided but clearways measuring 610 meters by 150 meters are

declared for runways 03 and 21. Take Off Run Available (TORA) and Landing Distance Available (LDA) for runways 03 and 21 are declared as 1220 meters.

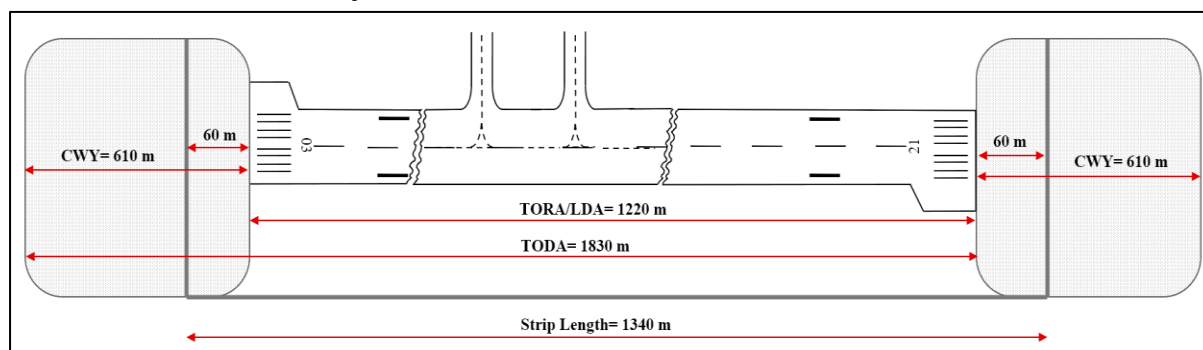


Figure 2 – Schematic of Kadhdhoo Runway and Clearway.



Figure 3: Aerial view of Kadhdhoo Airport

Leading particulars of the airport:

Kadhdhoo Aerodrome with dimensions and designation

Arrival Aerodrome: Kadhdhoo Airport

Code 2C

ICAO 4 letter code: VRMK

Reference co-ordinates:

Latitude: 01° 51' 30.0" N

Longitude: 73° 31' 10.0" E

Elevation: 1.2 m (4 ft) above mean sea level

Number of Runways: 01

Direction of runway: 03 / 21

Runway:

Length / Width: 1220m x 30m (4003ft x 98ft)

	Surface:	Bituminous
	Strength:	PCN 15
Age of pavement:	Over 25 years	
Average no of movements per day:	06 (pre pandemic 2019 data)	
Landing Aids:	Visual Aid (Abbreviated Precision Approach Path Indicator- (APAPI))	
Runway Lights:		
	Runway edge lights:	Available
	(Landing) Threshold identification lights:	Available
	Runway end lights:	Available
	Approach Lights:	None
Centerline lights:	None (Not required)	

Kadhdhoo Airport is one of the 4 STOL Airports having a runway length of 1,200 meters, built in the 1980's to suit the then existing air traffic situation of the Maldives. Since then, the traffic has increased multifold and the operating aircraft are larger than those operated at that time.

Today, these airports are served by DHC-8 200 series, DHC-8 300 series, ATR 42s and ATR 72 aircraft. Since these airports runways are only 1,200 meters in length, some of the aircraft types including DHC-8 300 series aircraft operate with a weight limitation.

1.11 Flight Recorders

The aircraft was equipped with a flight data recorder (FDR) as well as a cockpit voice recorder (CVR) to record safety-critical parameters and cockpit audios. Both recorders were intact, and data was downloaded and used for the investigation.

The FDR was a solid state L3 Communications (L3HARRIS) of model F1000 SSFDR and part number S800-2000-01 while the CVR was a solid-state component manufactured by Allied Signal (Honeywell) of model SSCVR and part number 980-6022-001, that records on a continuous loop with a recording capacity of 30 minutes to 2 hours, depending on the channel.

The Operator used cloud-based POLARIS Programme to analyze the FDR data downloaded. Decoding of the CVR was carried out at TSIB, Singapore at request by AICC.

1.12 Wreckage and impact information

1.12.1 Incident site visit

The incident site was visited by one of the investigators from MCAA. During this visit both the flight crew members and the cabin crew were interviewed. Additionally, the aircraft was visually checked for damage.

1.12.2 Wreckage Condition

Aircraft did not sustain any damage as a result of the excursion.

1.12.3 Salvage operations

Aircraft was pushed back manually and positioned on the runway and later moved to the apron.

1.13 Medical and pathological information

All crew members were subjected to drug tests. The results were reported negative for all 4 crew members.

1.14 Fire

There was no fire or fire alarms.

1.15 Survival Aspect

None required.

1.16 Tests and research

None carried out.

1.17 Organizational and Management Information

Island Aviation Services is a MCAA approved Air Operator Certificate holder. The company is permitted to provide both domestic and international passenger transport services. At the time of the occurrence, IAS fleet consisted of DeHavilland DHC-8s, Viking Air DHC-6s

and 2 Airbus A320 aircraft. It holds AOC 007 approval, CAMO approval MV. CAMO.001 and AMO Approval MV.145.031 AOC issued by the MCAA.

1.18 Additional Information

There was no evidence of an issued runway condition report (RCR).

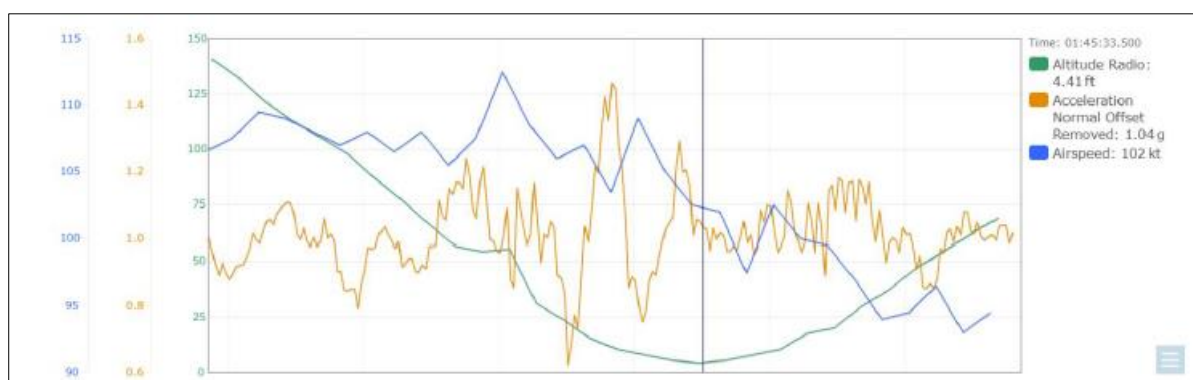
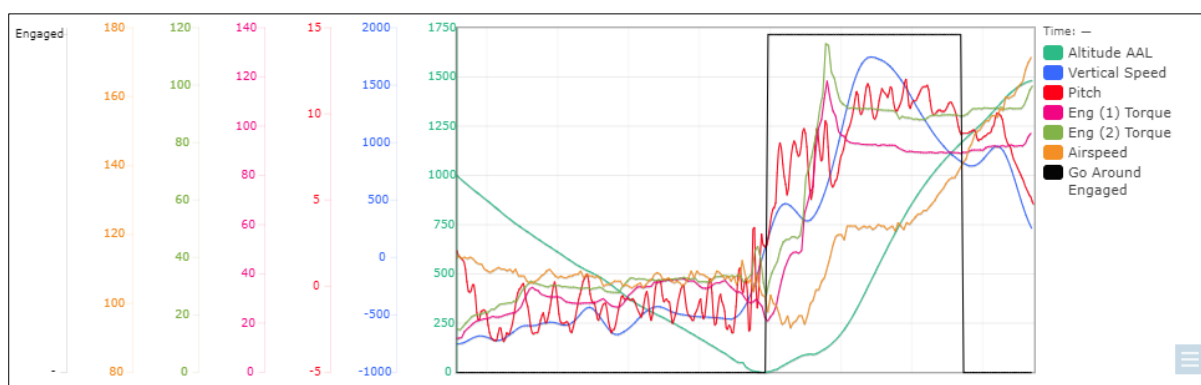
2. ANALYSIS

This section focuses on examination of the flight data recorder, cockpit voice recorder readouts or analysis reports, prevailing weather conditions at the aerodrome, aerodrome infrastructure, history of the aircraft and crew including their training and experiences and the operator's organizational management. It is aimed at establishing causal factors of the serious incident. It is also the objective of the analysis to put together recommendations when implemented by the stakeholders will minimize recurrence of similar serious incidents in future. For increased clarity, the data and information collated are analyzed under three separate sub-titles namely, Operational Aspects, Engineering and Maintenance Aspects and Infrastructure Aspects.

2.1 Operational Aspects

The PIC and FO were medically fit, held valid licenses and had adequate rest. They had operated themselves within FDTL limits prior to operation of Q2-274 in the evening on 05 May, 2022. It was evident that both cockpit crew had undergone necessary trainings including CRM and fulfilled qualification and experience requirements of the operator prior to operating the flight.

The aircraft, enroute to KDO being unable to fly the most direct route had to deviate to the east quite considerably due to adverse weather conditions as evident from **Figure 4 – Flight Track Information**. Before descent checklist was followed by the crew. On receiving surface wind conditions from KDO, the crew requested to land on Runway 03 in lieu of the runway 21 in use. Following approval by the ATCO the aircraft approached Runway 03 to land but shortly before touchdown at 04 ft RA, the PIC, who was also the PF decided to initiate a go-around. Mechanical turbulence and gusting wind conditions experienced by the aircraft was the reason for PIC initiating a go-around. Turbulence was evident from **Figure 5 – FDR Data** with a minimum value of 0.69g at 22ft RA and a maximum value of 1.47g at 12ft RA. PIC asked FO if they should go-around, to which FO agreed and PIC initiated a go-around. The go-around was initiated at 4 ft RA.

**Figure 4 - Flight Track Information****Figure 5 - FDR Data -First Approach****Figure 6 - FDR Data - First Approach**

The figure 5 above shows normal acceleration, radio altitude and airspeed while Figure 6 shows parameters from 1000 feet at runway 03 until 1500 feet after the go-around.

At 01:54:06 UTC, during the second (final) approach, passing 500 feet for landing runway 21 the heading of the aircraft was 221 degrees. The flap was set at 35 degrees with vertical speed at 612 feet per minute and air speed at 106 knots, as evidenced by **Figure 7 – FDR Data, Second Approach**.

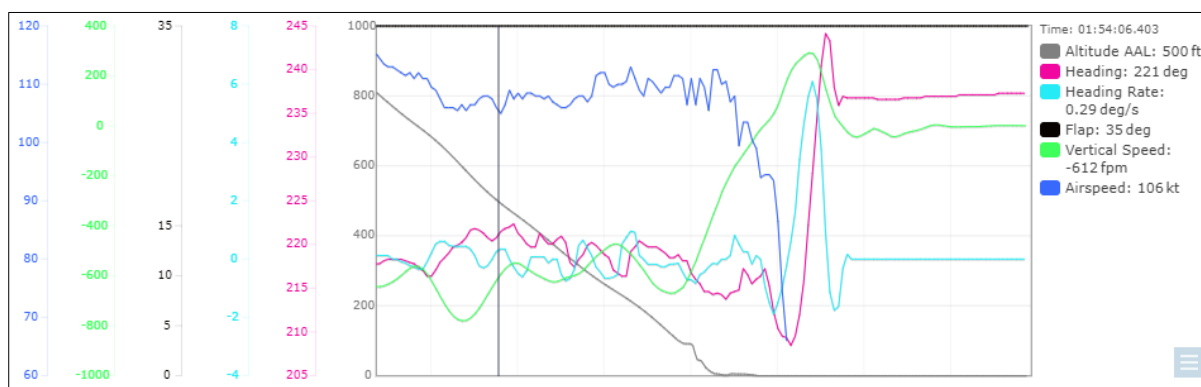


Figure 7 – FDR Data, Second Approach

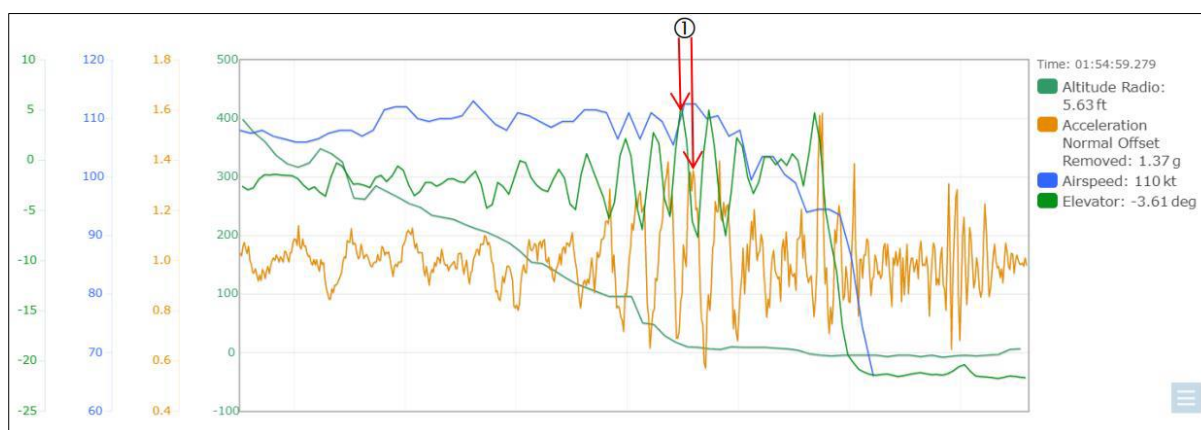


Figure 8 – FDR Data, Second Approach

FDR data indicated oscillations in elevator deflection that coincided with the peaks in normal acceleration which can be seen in **Figure 8 – FDR Data, Second Approach**. The range of each elevator deflection oscillation was in excess of 7 degrees with transition across the 0.0-degree threshold. The size of oscillations diverged in increasing value. Acceleration of the aircraft was found to be normal. During the landing roll and runway excursion, the aircraft's heading veered to the right from a minimum of 208 degrees to a maximum of 244 degrees. The runway heading was 209 degrees. The aircraft came to a stop on a heading of 237 degrees, though.

Measured from the tyre marks to the location where the aircraft stopped the total distance travelled approximates at 477 meters (1,565 feet). The aircraft crossed Runway

03 end by around 35 meters (**Figure 9 and 10**). The landing distance required for landing the aircraft in the configuration (calculated unfactored) it was, using Flap 35 (using Dash 8 Flight Manual perf. chart 5-11-2), approximates at 570 meters (1,870 feet) for a landing weight of 38,482 pounds and a head wind of approximately 5 knots. The distance from the touch down point to the Runway End was only 442 meters (1,450 feet).

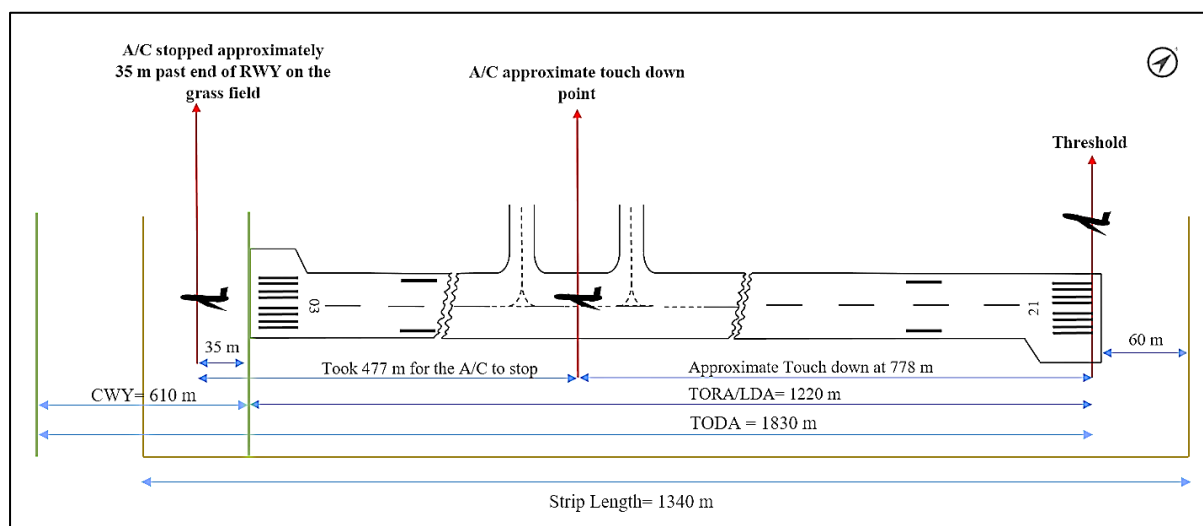


Figure 9 - Distances, touchdown and stop points



Figure. 10: Tyre markings showing touchdown point plus remaining Runway length

2.2 Engineering and Maintenance Aspects

The Airworthiness Review Certificate issued to the aircraft was valid up to 15 July, 2022. The aircraft had accrued 32,877:47 hours and 61,591 landings. Last A Check was accomplished at 32,480:47 hours and 61,060 landings. Since the last Check, the aircraft had accrued 397 hours. Aircraft departed on the multisectoral flight with valid Certificate of Release to Service on 05 May, 2022. After a quick turnaround at GKK, the aircraft left for KDO without incidents.

Aircraft completed one sector (MLE-GKK) with NIL snags prior to operating the incident flight. The incident flight was the second flight of the multisectoral flights scheduled. Scrutiny of the records confirmed that there were two active MEL deferred defects invoked with regard to fuel quantity indication systems before the incident flight.

2.3 Infrastructure Aspects

Kadhdhoo Airport, one of the 4 STOL Airport having a runway length of 1,200 meters (4000 feet), that was built in the 1980's. It was suitable for operating the smaller Do228 aircraft operated at the time. Since then, the traffic increased several folds and it is today serviced by DHC-8 200 series, DHC-8 300 series, ATR 42 and ATR 72 aircraft. Since these airports runways are only 1,200 meters in length, some of the aircraft types including DHC-8 300 and ATR72 aircraft are being operated with weight restrictions.

The runway is being regularly inspected as confirmed by records held with the operator. Operating experience suggests that operation of the Dash-300 series aircraft has been carried out safely.

3. CONCLUSIONS

3.1 Findings

AICC identifies the following as the findings.

1. Medical fitness and FDTL of the crew were not factors in this incident.
2. PIC was the PF on GKK-KDO sector;
3. Despite runway 21 being the active runway, PIC briefed FO for landing on Runway 03;
4. On the attempt to land on Runway 03 at KDO, the aircraft encountered mechanical turbulence and gusting winds which led the crew to initiate a go-around instead of landing. Vertical acceleration of the aircraft reached 1.47G at 12ft during this attempt to land;
5. During landing at runway 21, FO can be heard requesting PIC to cut the power. This is a likely indication that the aircraft had excessive power while it was flared which led to ballooning and floating.
6. Aircraft touched down firmly at approximately 778 meters (2553 feet) from runway 21 threshold, way beyond the aiming point markers. The distance from the touch down point to the Runway End was only 442 meters (1,450 feet). The landing distance required for the aircraft in the configuration according to the Dash 8 Flight Manual perf. chart 5-11-2, approximates to 570 meters (1,870 feet) for a landing weight of 38,482 pounds and a head wind of approximately 5 knots. Aircraft overran at the end by approximately 35 meters and came to rest on the unpaved surface.

3.2 Causes / Contributing Factors

The AICC determines that the probable causes of the serious incident are:

1. Volatile winds prevailing at KDO;
2. Failure to initiate a second go-around even after missing the aiming point marker by a considerable distance.

2.3. SAFETY RECOMMENDATIONS

2.3.1. Recommendations for the Operator

- a) Review landing criteria in part OM-A 8.3.1.9.6 (Issue 3, dated 01 December 2015) for differing runway lengths,
- b) Review training policy, in account of the serious incident,
- c) Line-training PIC and FO for a given number of sectors based on the outcome of the review undertaken in item b).

4. APPENDICES

4.1 Loadsheets - GKK-KDO sector

4.2 ATL showing entries pre and post incident.

LOADSHEET
ALL WEIGHTS IN POUNDS

CHECKED: [REDACTED] R [REDACTED] DND 02

FROM/TO FLIGHT: GKK KDO 020505
A/C REG: 901AK
VERSION: 50Y
CR: 8/2
OSMAYDS: 1257
IME: 1257

WEIGHT DISTRIBUTION

LOAD IN COMPARTMENTS	WEIGHT	1/	2/	3/	4/
	1639	1/	430	937	272
		0/	0		

PASSENGER/CABIN BAG: 5644 10/ 19/ 3/ 1 TTL 20 CAB 0
PAX 30
BLKD 0

TOTAL TRAFFIC LOAD: 7202
DRY OPERATING WEIGHT: 27901
ZERO FUEL WEIGHT ACTUAL: 33083 MAX 39409
TAKE OFF FUEL: 3900
TAKE OFF WEIGHT ACTUAL: 36983 MAX 42909
TRIP FUEL: 501
LANDING WEIGHT ACTUAL: 36482 MAX 41999 L ADJ

BALANCE AND SEATING CONDITIONS: LAST MINUTE CHANGES
DOI 95.6 DEST SPEC CL/CPT 1 - WEIGHT

MAGZFW 34.2
MAGTOW 34.2
MAGLAW 34.2

FWD-LMT ACTL AFT-LMT
IFMAC 18.12 34.17 40.00
TOMAC 19.96 34.24 40.00
LUMAC 19.74 34.23 40.00
A4.B0.C10.D12.E5.F7
SEATROW TRIM

UNDERLOAD BEFORE LMC 3517 LMC TOTAL
LOADMESSAGE AND CAPTAIN'S INFORMATION BEFORE LMC


TAXI FUEL 100 TAXI WGT 39002 MAX 43200

-KDO. 1/1/0/0.0. T140. 1/140
-PAX/2. PAD/0
-MLE. 15/15/3/1.0. T1491. 1/263. 2/937. 3/272
-PAX/36. PAD/0

SI PAX WEIGHTS USED WITH F139 C78 I23
NOTED NO
SERIAL WEIGHT ADJUSTMENT WEIGHT/INDEX
ADD
NIL
DEDUCTIONS
NIL

ALL TANKS 4000
AUTHORIZED WEIGHTS USED FOR PASSENGERS CREW AND BAGGAGE


KDO	FAC	O	POS	O	BAR	O	TBR	140
MLE	FRE	18	PGB	O	DOB	1473	TBA	O



Purdue University
School of Aeronautics & Astronautics

AIRCRAFT TECHNICAL LOG

★ 0336



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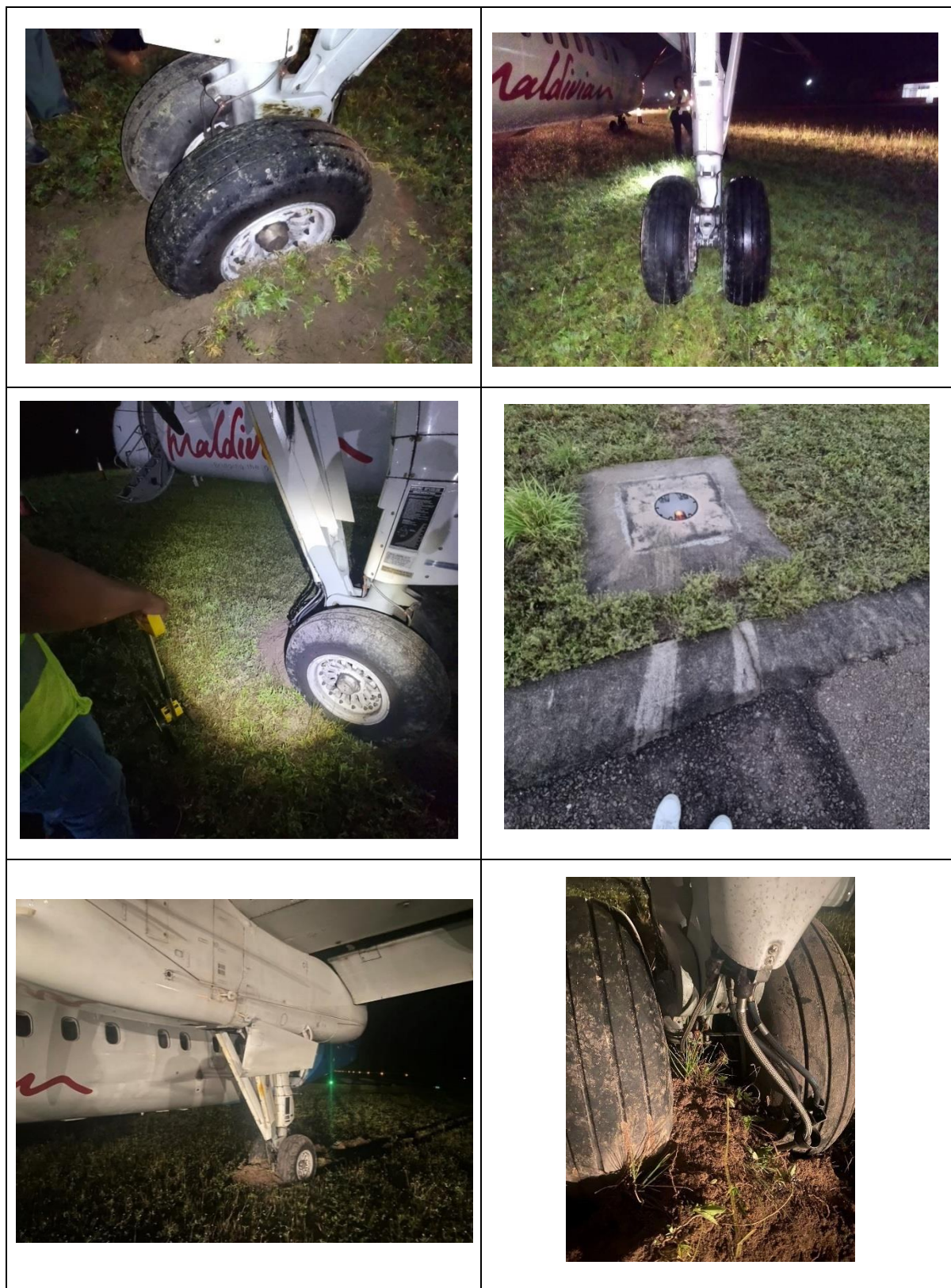
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4.3 Photos of the aircraft on accident site



4.4 Comments from Operator for draft final report

- a) The report identifies a disconnect between infrastructure development practices and the type of civil aircraft operated. We would suggest that a recommendation be put forth to better streamline this for future developments. We believe that stakeholder engagement (local airline operators) would be key to streamline such developments.
- b) We would also like to note that the aiming point markers for KDO are at 250m (820.21ft), for a runway length of 1220m, with reference to annex 14 recommendations on runway markings.