

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



## ACCIDENT INVESTIGATION COORDINATING COMMITTEE

AIRCRAFT ACCIDENT REPORT 2021/01

### FINAL REPORT

INVESTIGATION OF THE ACCIDENT INVOLVING  
MANTA AIR OPERATED VIKING AIR DHC-6-300 FLOATPLANE  
8Q-RAE, AT VELANA INTERNATIONAL AIRPORT  
MALDIVES

on

14 February, 2021

## 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 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 the investigation of an accident or incident is prevention of accidents and serious incidents and it shall not be the purpose of this activity to apportion blame or liability.

The AICC was assisted by MCAA, MACL and Manta Aviation Pvt. Ltd.

All timings are given in Local Time unless stated otherwise. Time difference between local and UTC is +5 hours.

The report is released on 6 April, 2022.

Mr. Abdul Razzak Idris

**Chairperson**

**Accident Investigation Coordinating Committee**



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## LIST OF ABBREVIATIONS:

<b>AICC</b>	: Accident Investigation Coordinating Committee
<b>ATIS</b>	: Automatic Terminal Information Service
<b>ATL</b>	: Aircraft Technical Log
<b>ATPL</b>	: Air Transport Pilots License
<b>CC</b>	: Cabin Crew
<b>CPL</b>	: Commercial Pilots License
<b>CVR</b>	: Cockpit Voice Recorder
<b>DHC-6-300</b>	: Viking Air Twin Otter 300 Series
<b>ELT</b>	: Emergency Locator Transmitter
<b>EMMA</b>	: Equalized Maintenance for Maximum Availability
<b>FDR</b>	: Flight Data Recorder
<b>FO</b>	: First Officer
<b>IR</b>	: Instrument Rating
<b>lbs.</b>	: Pounds
<b>LH</b>	: Left Hand
<b>LOPA</b>	: Layout of Passenger Accommodation
<b>LT</b>	: Local Time
<b>LTC</b>	: Line Training Captain
<b>MA</b>	: Manta Air
<b>MACL</b>	: Maldives Airports Company Limited
<b>MCAA</b>	: Maldives Civil Aviation Authority
<b>MCAR</b>	: Maldives Civil Aviation Regulations
<b>MLE</b>	: IATA designated 3 letter code for Velana International Airport
<b>MLF</b>	: Operator designated 3 letter code for Maalifushi water aerodrome
<b>MSN</b>	: Manufacturer Serial Number
<b>Nm</b>	: Nautical Mile
<b>PF</b>	: Pilot Flying
<b>PIC</b>	: Pilot-in-Command
<b>PM</b>	: Pilot Monitoring
<b>RH</b>	: Right Hand
<b>STA</b>	: Fuselage Station location
<b>TAC</b>	: Total Air Cycles

**TAT** : Total Air Time  
**TBD** : To be determined  
**UTC** : Universal Coordinated Time  
**VFR** : Visual Flight Rules  
**VIA:** : Velana International Airport  
**VIP:** : Very Important People  
**°C** : Degrees Celsius

## **SYNOPSIS:**

On Sunday, 14 February 2021, the DHC-6-300 aircraft, registration 8Q-RAE operated by Manta Air was on a charter flight (Flight Number NR117) from Maalifushi water aerodrome (MLF), in Thaa Atoll, to Velana International Airport (VIA) and an accident occurred after touchdown at Velana international Airport. The flight was operated in accordance with the Visual Flight Rules (VFR).

The accident occurred during landing on the North-Right (NR) water runway. Aircraft was observed to touch the water runway on RH float and digging in to water followed by a steep, right turn. Before the aircraft was able to recover from the abnormal turn, it came to halt inverted. The buoyance of the floats kept the aircraft afloat.

During the accident the aircraft was substantially damaged. The aircraft had six passengers, two pilots and one cabin crew onboard. All passengers and crew were able to evacuate safely without injuries except the cabin crew who sustained minor injuries.

The accident occurred at 0732 hours and was reported to AICC at 0756 hours. Investigators from both MCAA and AICC arrived at the accident scene and commenced investigation, forthwith.

## 1.0 FACTUAL INFORMATION:

Aircraft Owner:	Kenn Borek Air Ltd.
Registered owner:	Manta Aviation Pvt Ltd.
Operator:	Manta Air / Manta Aviation Pvt Ltd. (Air Operator Certificate No.014)
Aircraft Type:	DHC-6-300
Aircraft Manufacturer:	de Havilland Canada (Type Certificate now owned by Viking Air Ltd.)
Manufacturer's Serial No.:	617
Nationality:	Republic of Maldives
Registration:	8Q-RAE
Place of Incident / Accident:	MLE - North-Right water runway
Reported location	04° 11' 39.99"N 73° 32' 16.01"E
Date and Time:	14 February 2021 at 07:32 hours

### 1.1 History of Flight:

#### 1.1.1 Background:

The accident flight, operated from MLF (Maalifushi) water aerodrome to MLE was the first flight of the day flown on the aircraft after overnighting at MLF. There were no known defects on the aircraft when it was accepted by the operating crew for the intended flight having accomplished the preflight check. The crew members confirmed that no defects were observed enroute from MLF to MLE either: all went uneventful until touchdown at MLE water aerodrome.

Both crew reported for duty at MLE on the previous day (13 February, 2021) and departed MLE on their first flight of the day at 1325 hours. The Operational Flight Plan issued on 13 February, 2021 confirmed that 4 flights were scheduled for 13th followed by a single flight for 14th February, to be conducted after the layover at MLF. The last flight on the accident aircraft was scheduled to depart MLF at 0630 hours and arrive at MLE at 0735 hours on 14 February, 2021.

A Loadsheet was generated and published for acceptance by the PIC prior to departure from MLF. The FO was the PF while the PIC acting as LTC was the PM (Pilot



Monitoring) on the accident flight. Taxi-out, take-off, cruise and approach into MLE were all normal, as stated earlier.

Having taken-off from MLF, the aircraft flew via waypoint 'VAHOO' and 'CORIS', the last VFR channelling points before landing on 'NR' at MLE. The aircraft was cleared to land at NR runway by MLE ATC, from CORIS. Owing to the presence of other aircraft in the vicinity, the ATC advised the crew to follow specific instructions to deviate eastwards. Upon clearing the other aircraft, flight NR117 was cleared to land and the aircraft turned base for short final. Both crew members confirmed that the FO called for the 'Full Flaps' and 'Max RPM' which the PIC complied with, accordingly.

The PIC recalled that due to the short final leg, the FO pushed the control column forward primarily to avoid overshooting the runway threshold. This resulted in a very steep approach, at very low altitude. The PIC noticed that the descent rate was 800/900 ft/min although the stabilised approach descent rate to be maintained was about 750 ft/min. Consequently, the PIC instructed the FO to level off and flare the aircraft sooner to avoid a "flatter" attitude of the aircraft at touchdown. The FO responded by levelling off the aircraft but as per PIC, the FO could not maintain the correct landing attitude for floatplanes as a result the aircraft floated longer with ground effect. At touchdown, instead of pulling and holding on the control column required for achieving the correct touchdown attitude the FO eased the control column.

Review of the information and data gathered showed that the aircraft touched down in a light crosswind condition with the RH float touching down the water before the LH float which is normal for landing. With the flight controls inadvertently eased immediately after touchdown, the nose of the right-hand float dug into water leading to a steep right turn. The aircraft came to a halt inverted with the cabin submerged in water. The buoyance of the floats kept the wreckage floating. The cabin crew assisted the passengers to evacuate the aircraft. Soon after the accident, the MACL rescue boats arrived at the scene and rescued all the passengers and the crew.

Furthermore, the PIC stated that he had observed that in almost all the landings carried out by the FO on the previous day, the aircraft landing attitude was flatter than normal. PIC believed that the FO had ATR aircraft in his mind and

subconsciously applied part of the landing procedures of the ATR aircraft whilst landing the DHC-6 aircraft operated on floats.

### 1.1.2 Aircraft:

The DHC-6, 300 series aircraft bearing manufacturer's serial number 617, was manufactured by de Havilland, Canada on 20 November 1979. It was registered in the Maldives on 03 December 2020, under the registration 8Q-RAE. Prior to registration of the aircraft under the new registration, it was operated in the Maldives under 8Q-MAU with Maldivian Air Taxi early during the decade. Since manufacture in 1979, the aircraft had changed hands with several operators who operated it in various parts of the world. **Appendix 4.6: Airframe History** provides a summary of all the owners, lessors, and lessees who operated the aircraft. To commence the operation in the Maldives in December, 2020, the aircraft was fitted with Wipaire floats; cabin was reconfigured, under an approved LOPA (**Appendix 4.1**), to seat 8 VIPs passengers plus a standard single seat dedicated for the cabin crew. It had two doors in the cockpit, one on either side of the aircraft, plus two doors in the aft cabin, one emergency exit door marked as EXIT. Four of the five exits were used as Emergency Exits.

### 1.1.3 Flight crew:

The aircraft was operated by three crew members; two pilots and a cabin crew. All had valid licenses issued by MCAA. Review of the records confirm that the medicals, floatplane ratings, and proficiency checks of the pilots were current, as of the date on which the accident occurred. The PIC held ATPL while the FO held a CPL. License details, including hours accrued on type, are detailed in para 1.5 of this report.

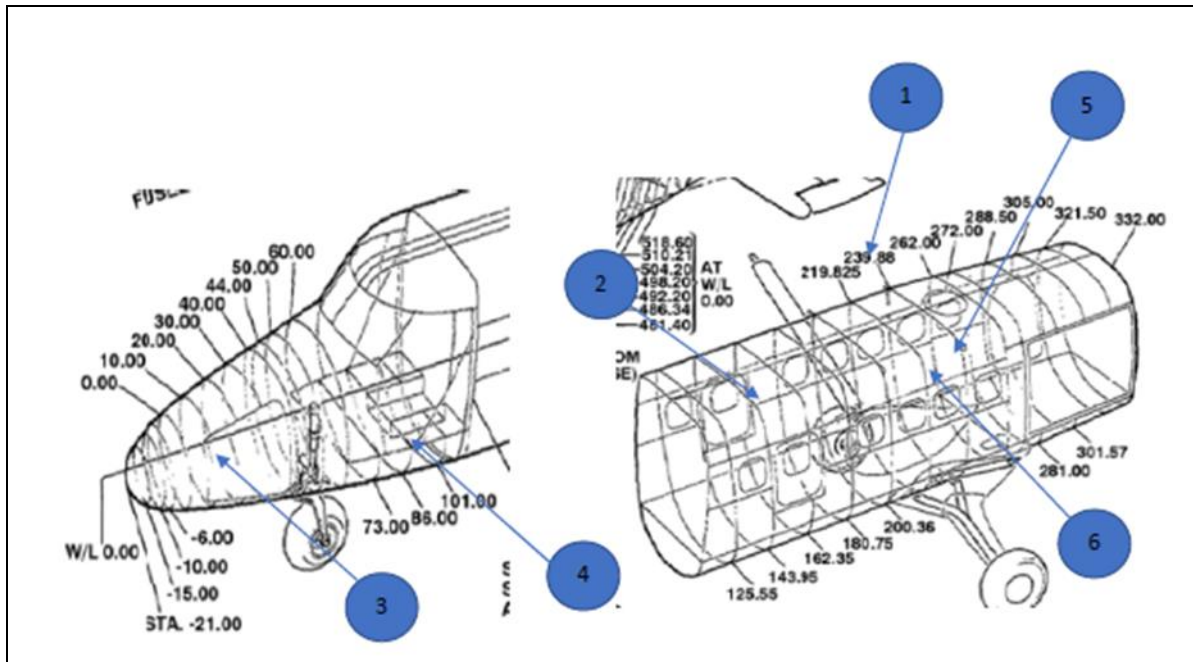
## 1.2 Injury to persons:

Injuries	Flight Crew	Cabin Crew	Passengers	Total on board	Others
<b>Fatal</b>	0	0	0	0	0
<b>Serious</b>	0	0	0	0	0
<b>Minor</b>	0	1	0	1	0
<b>Nil</b>	2	0	6	8	0
<b>Total</b>	2	1	6	9	0

### 1.3 Damages to aircraft:

The aircraft and its components sustained substantial damage during the accident and the wreckage salvage processes. The damages identified in the process include but are not limited to:





#### Fuselage – Exterior:



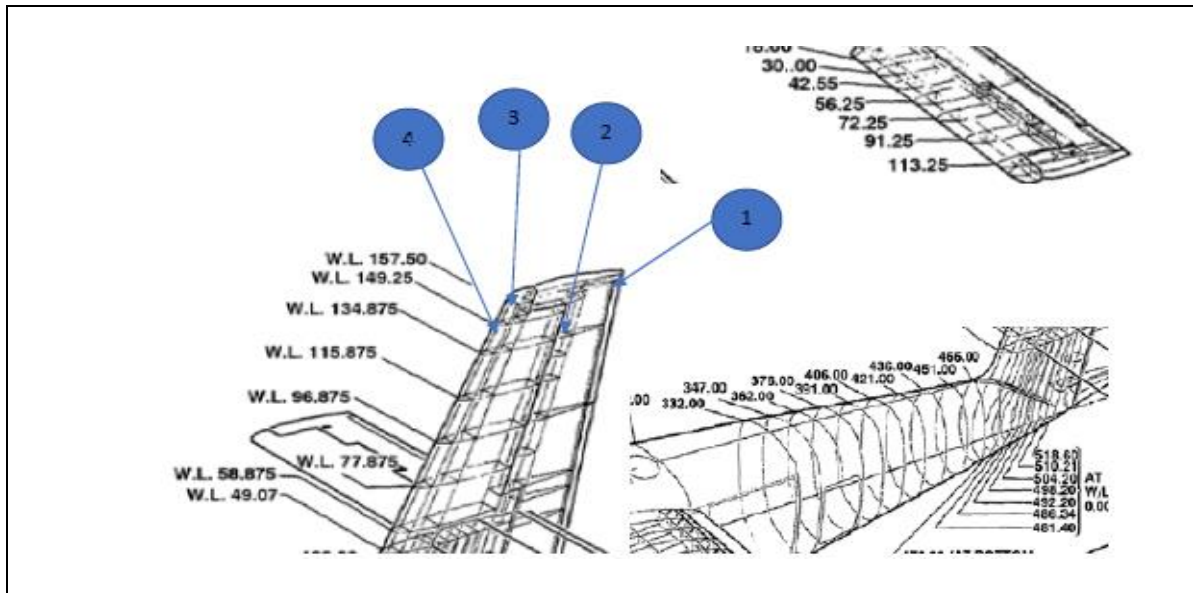
#	Inspection Details	Area	Condition and findings of the area inspected
1	RH wing attachments		N/A
2	RH emergency exit		Lost in accident
3	Nose compartment door		Door was open on impact and is cracked and buckled inwards
4	LH hydraulic Panel		Panel buckled inwards
5	LH wing Attachments		LH wing ripped off from the wing attachment on impact, heavily damaged refer picture
6	LH fuselage skin		Airframe LH side skin above window number five between STA 219.825 and STA 239.88 was severely buckled inwards and cracked open. LH side, above window a hole of dimension 1-2 inches was punctured on the skin.

		LH airframe skin above window six between STA 239.88 and STA 272.00 is buckled inwards.
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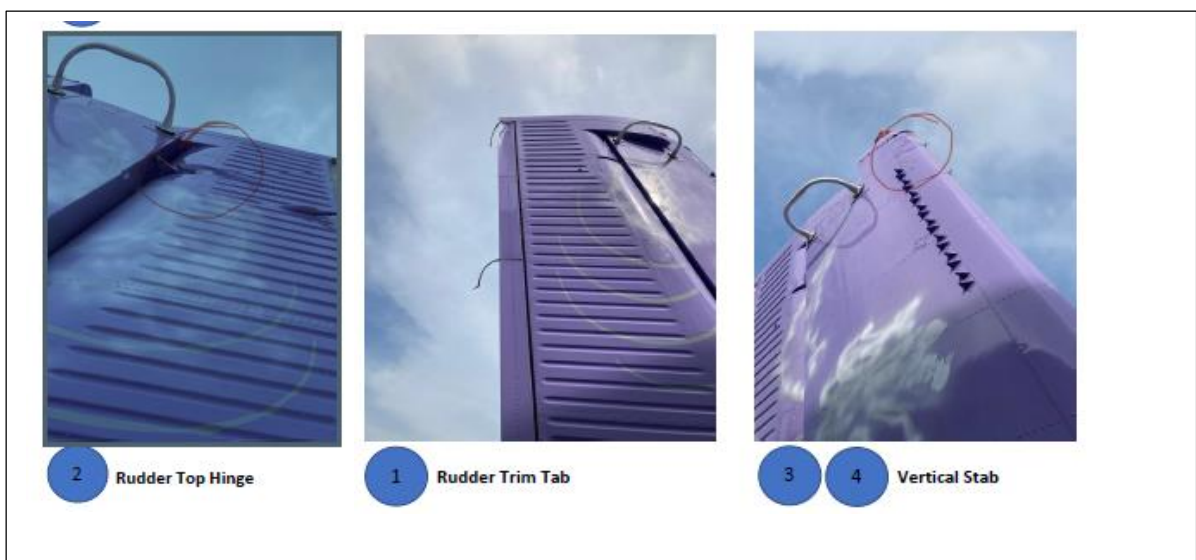
Images of the damaged components and structure are showcased in the pages that follow primarily to provide the readers with more clarity. These images show the extent, nature and the location of the damages sustained on the components and the fuselage.

 <p>3 Nose Compartment Door</p>	 <p>4 Hydraulic bay panel</p>
 <p>1 RH wing attachment</p>	 <p>5 6 LH wing attachment</p>

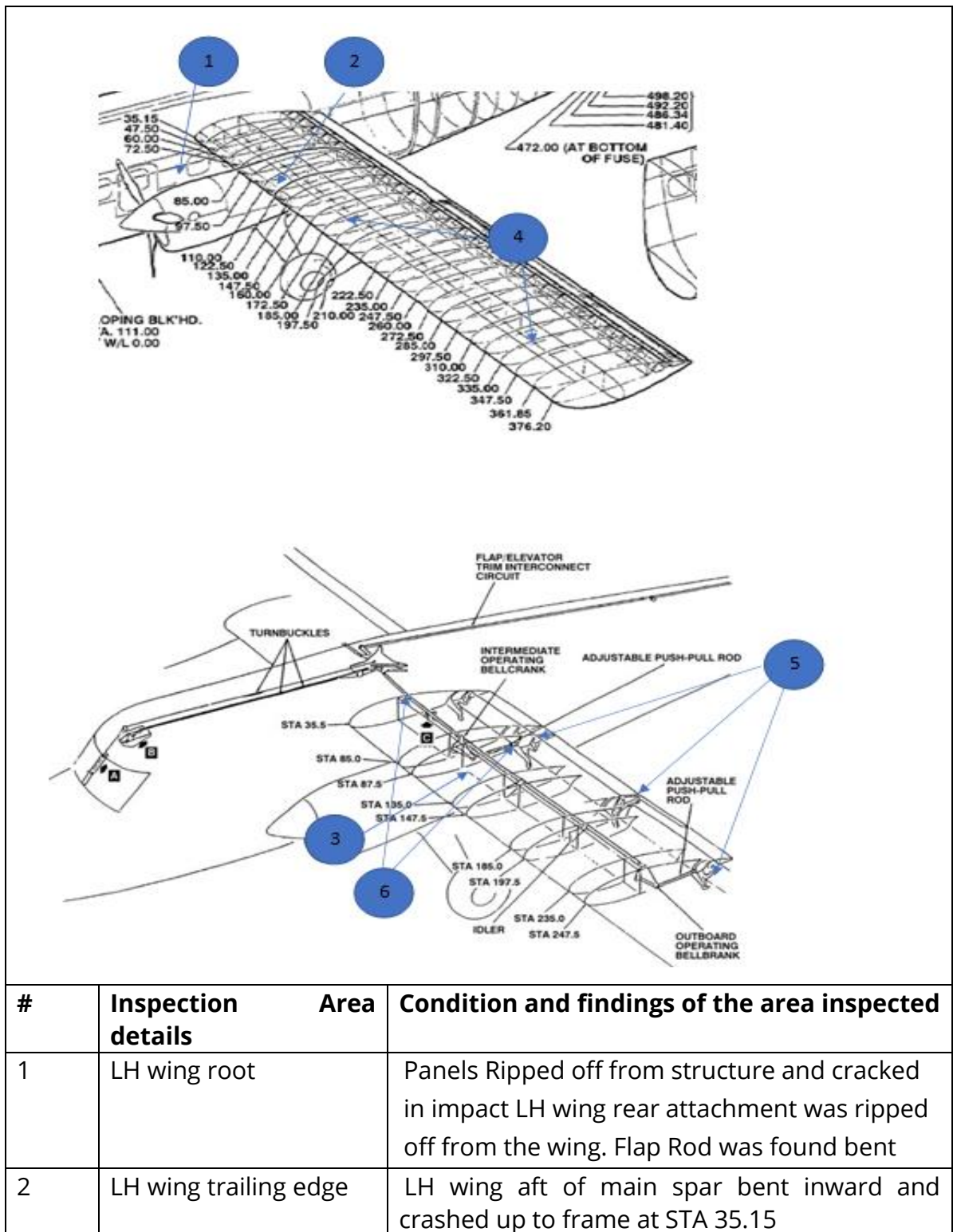
## Empennage:



#	Inspection Details	Area	Condition and findings of the area inspected
1	Rudder Trim Tab		Heavy dent and buckled at top of the tab, damage from keeping on barge in salvage operation
2	Rudder top hinge skin		Heavy dent and buckled at top of the tab, damage from keeping on barge in salvage operation
3	Beacon light cover		Cover broken from screws
4	Vertical Stabilizer		Top end dent.



### Wing Assembly - Left Hand:



3	LH wing leading edge	LH wing outboard of STA 297.00 was crushed and wing cracked open from leading edge and top skin at STA 297.00
4	Flight Controls	Inboard fore flap and trailing flap was ripped off during impact, trailing flap structure between STA 97.5 and STA 172.5 and fore flap attachment at STA 9 was hanging from the aileron push rod. Outboard fore flap and aileron was ripped off from the wing and was not recovered in the salvage operation.
5	Wing Hinge Arms	All wing hinge arms bent, sheared and damaged in impact. Wing Hinge arm at STA 366.2 was ripped off from wing and was not recovered in the salvage operation.
6.	Flight control and flap control rods	Inboard fore flap push rod was bent outwards. Aileron push rod found sheared off near the Belk crank. Outboard fore flap pushrod bent and sheared off near the wing cut out.

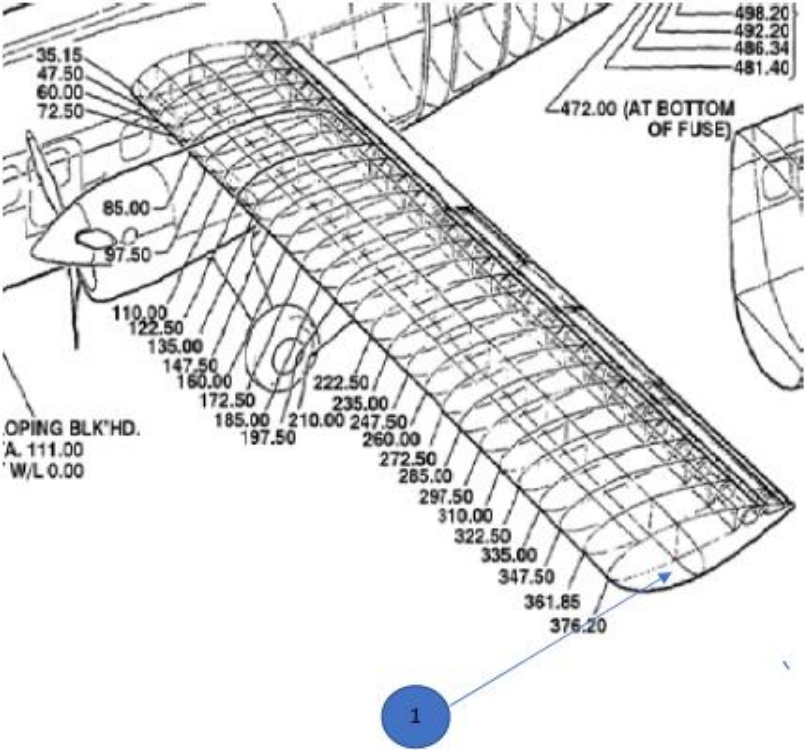
See next page for photo images of the damaged wing.



 <p>2 LH Wing Inboard trailing edge</p>	 <p>2 5 LH Wing trailing edge, shroud skin And Hinge arms.</p>
 <p>3 LH Wing outboard</p>	 <p>3 LH Wing outboard</p>
 <p>1 6 LH Wing outboard and Flap push rod</p>	 <p>3 LH Wing root</p>




Wing Assembly – Right Hand:



Technical drawing of the right wing assembly showing various dimensions and a callout '1' pointing to the outboard panel area.

#	Inspection Area details	Condition and findings of the area inspected
1	Outboard panel	Outboard panel found dented and damaged



Photograph of the right wing tip showing damage, with a callout '1' pointing to the damaged area.

1 RH Wing Tip

### Left Hand Engine and Propeller:

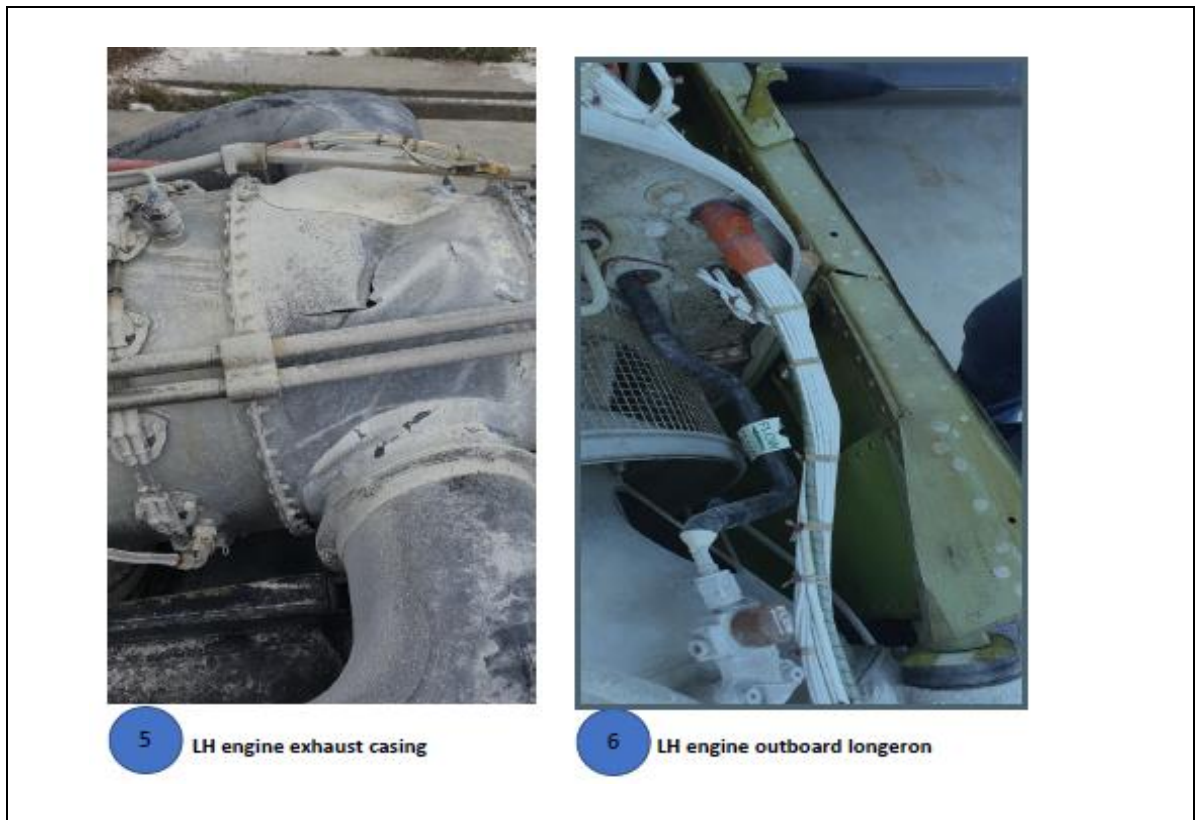
#	Inspection Area details	Condition and findings of the area inspected
1	Engine propeller for free movement	Engine found seized
2	Propeller	One blade has a dent in the trailing edge towards the tip. All blades found bent and twisted extensively and has impact damage marks the blade leading edge
3	LH engine fuel shutoff rod	Found sheared off near the attachment to the bell crank.
4	Pulley bracket	Found ripped off from the nacelle structure
5	Engine exhaust case	Found dented and cracked open
6	Longeron	Outboard longeron found cracked
7	Engine for corrosion	Engine and components severely corroded due to exposure to salt water.



2 Dent on LH Propeller



2 LH Propeller



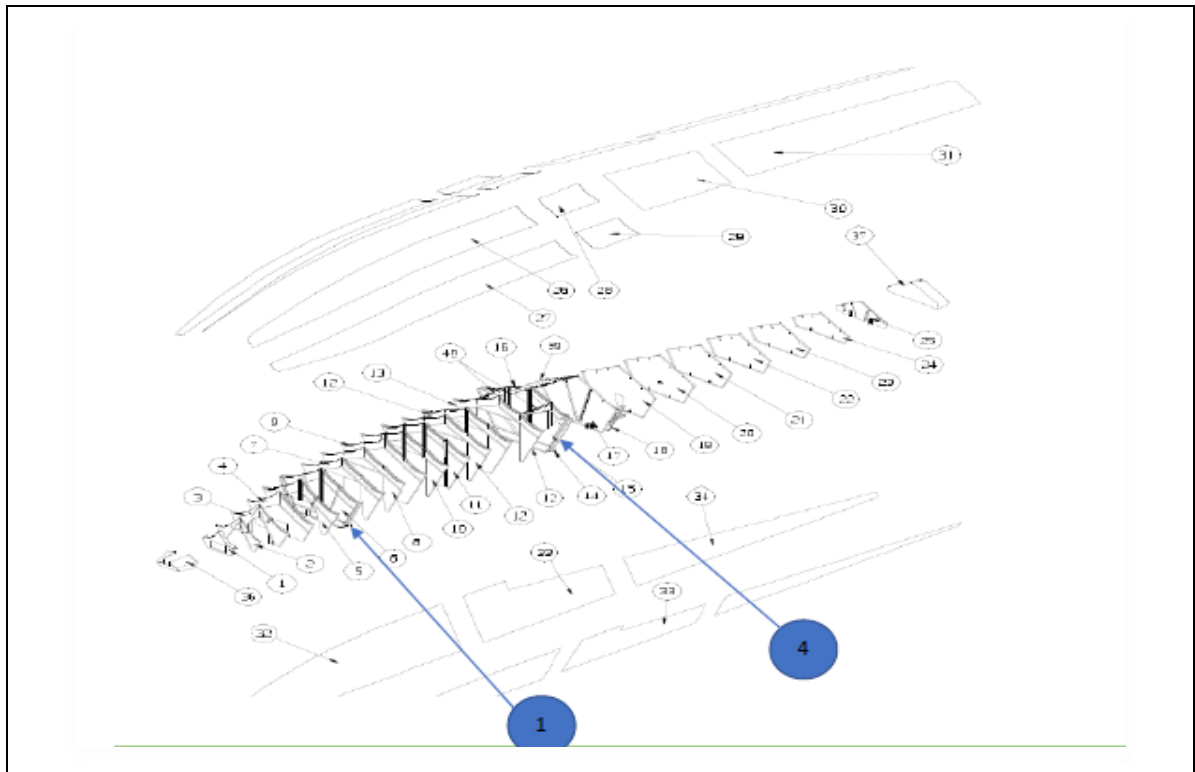
### Right Hand Engine and Propeller:

#	Inspection Area details	Condition and findings of the area inspected
1	Engine propeller for free movement and corrosion	Engine found seized. Engine and components severely corroded due to exposure to salt water. RH propeller found with no bents or impact marks



1 RH Engine and Propeller

## Floats:



#	Inspection Area details	Condition and findings of the area inspected
1	LH float forward strut	Strut ripped off from lower attachment fitting to floats Gunwall near forward strut dented Inboard skin near forward strut punctured
2.	Spreader Bars (not shown in fig)	Forwards spreader bar cracked, bent and sheared from near LH float attachment. Aft spreader Bar sheared, bent and cracked from near LH float attachment
3	V strut (not shown in fig)	LH V strut ripped off from lower attachment fitting RH V strut ripped off from top attachment fitting
4.	LH Pylon and float	Pylon forward attachment and attachment fitting ripped off from float and ruptured top skin. Skin between pylon forward attachment and bulkhead cracked open Pylon lower skin dented and one hole punctured with few rivets sheared Pylon forward attachment cracked.

		Inboard and outboard near pylon bent with skin LH float lower skin towards pylon found dented
5	RH float pylon (not shown in fig)	Top skin found dented.
<div><div><p>4 LH Pylon and float</p></div><div><p>4 LH Pylon and float</p></div><div><p>4 LH pylon Forward attachment</p></div></div>		
<div><div><p>4 LH Pylon and float</p></div><div><p>1 LH float forward strut</p></div><div><div><p>2 3 Aft spreader bar and V strut</p></div></div></div>		

## 1.4 Other damage:

None observed.

## 1.5 Personnel information:

### 1.5.1 Pilot-In-Command:

Age:	33 years
Nationality:	Maldives
Gender:	Male
Type of License:	ATPL
License issued on:	19.11.2014
License expires on:	05.10.2022
Type of medical:	Class 1
Medical issued on:	09.02.2021
Medical expires on:	08.02.2022
Types flown:	DHC-6, ATR 72-600
Hours on type:	7270 hours
Ratings:	DHC-6/IR; ATR 42/72
Last Proficiency check:	25.01.2021
Total hours as PIC:	4138 hours
Total flight time:	7939 hours
Last 90 days:	160:35 hours
Last 28 days:	35:47 hours
Last 24 hours:	04:30 hours

### 1.5.2 Co-pilot:

Age:	33 years
Nationality:	Maldives
Gender:	Male
Type of License:	CPL
License issued on:	08.01.2015
License expires on:	17.05.2023

Type of medical:	Class 1
Medical issued on:	17.01.2021
Medical expires on:	17.01.2022
Types flown:	DHC-6, ATR 42/72
Hours on type:	2138 hours
Ratings:	DHC-6, ATR 42/72
Last Proficiency check:	03.03.2021
Total flight time:	3299 hours
Last 90 days:	21:35 hours
Last 28 days:	21:35 hours
Last 24 hours:	04:30 hours

### 1.5.3 Cabin Crew:

Age:	36 years
Nationality:	Maldivian
Gender:	Male
Type of License:	CCL
License issued on:	16.03.2008
License expires on:	15.03.2023
Type of medical:	Class 3
Medical issued on:	07.07.2020
Medical expires on:	06.07.2022

## 1.6 Aircraft information:

### 1.6.1 General information:

The DHC-6-300 "Twin Otter" is an unpressurised, all-metal, high wing aircraft, powered by two Pratt & Whitney PT6A-27 engines, driving Hartzell three-bladed, reversible-pitch, full feathering propellers. The aircraft is designed for seating two pilots, side by side with dual controls and standard flight instrumentation.

Manufacturer:	de Havilland Canada
Registration:	8Q-RAE
Powerplants:	PT6A-27
Manufacturer's Serial Number (MSN):	617



Year of construction:	1979
Total Air Time and Landing at time of accident:	43,932.14 hours and 78,854 landings
Certificate of Airworthiness:	Normal category, issued on 17 Dec. 2020
Airworthiness Review Certificate:	Issued on 17 December 2020 Expiry date: 16 December 2021
Last periodic inspection	EMMA # 13 on 6 February 2021
Last inspection carried out at TAT	43,907:31 hours

### 1.6.2 Engines and Propellers:

<b>Right Engine (Gas Generator)</b>	
Engine manufacturer	PWC
Year of manufacture	UNKNOWN
Model	PT6A-27
Serial number	PCE-51958
Total Hours since new	6281:15
Last overhaul date	18 January 2002
Hours since overhaul	1899:32
Last check carried out	EMMA No 13 on 06 February 2021
Hours since last check	24:43 hours
<b>Right Engine (Power Section)</b>	
Engine manufacturer	PWC
Year of manufacture	UNKNOWN
Model	PT6A-27
Serial number	51958-100
Last overhaul date	18 January 2002
Hours since overhaul:	1899:32
Last check carried out:	EMMA No 13 on 06 February 2021
Hours since last check:	24:43 hours
<b>Left Engine (Gas Generator)</b>	
Engine manufacturer:	PWC
Year of manufacture:	UNKNOWN



Model:	PT6A-27
Serial number:	PCE 50155
Total Hours since new:	18055:21
Last overhaul date:	9 March 2014
Hours since overhaul:	1728:20
Last check carried out:	EMMA No 13 on 06 February 2021
Hours since last check:	24:43 hours
<b>Left Engine (Power Section)</b>	
Engine manufacturer:	PWC
Year of manufacture:	October 1970
Model:	PT6A-27
Serial number:	50155-100
Last overhaul date:	9 March 2014
Hours since overhaul:	1728:20
Last check carried out:	EMMA No 13 on 6 February 2021
Hours since last check:	24:43 hours
<b>Right Hand Propeller</b>	
Manufacturer:	HARTZELL
Year of manufacture:	UNKNOWN
Model:	HC-B3TN-3DY
Serial number:	BUA21602
Last overhaul date:	21 January 2020
Hours since last overhaul:	142:32 hours
Last check carried out:	EMMA No 13 on 6 February 2021
<b>Left Hand Propeller</b>	
Manufacturer:	HARTZELL
Year of manufacture:	UNKNOWN
Model:	HC-B3TN-3DY
Serial number:	BUA21008
Last overhaul date:	31 July 2019
Hours since last overhaul:	142:32 hours
Last check carried out:	EMMA No 13 on 6 February 2021

### **1.6.3 Cabin Layout and Configuration:**

The aircraft was configured to carry eight passengers and a single cabin crew in a VIP seating configuration. This modification was carried under FAA STC # SA15-70 (Maldives CAA Approval Number MOD/DHC-6/2020/16R1).

*Source: Manta Air, **Appendix: 4.1***

### **1.6.4 Recent maintenance:**

The most recent scheduled maintenance inspections carried out on the aircraft was Equalized Maintenance for Maximum Availability (EMMA) number 13. It was completed on 06 February, 2021 at 43,907:31 TAT and 78,807 TAC. In the 30 days prior to the accident, four defects were recorded and cleared. These include:

1. Traffic alert - unserviceable;
2. LH intercom - unserviceable;
3. Standby Attitude indicator flagged;
4. Capt. side intercom intermittent.

### **1.6.5 Flight Controls:**

The flight controls consist of conventional, manually actuated primary flight controls operated through cables, pulleys, and mechanical linkages. Rudder and elevator trim are manually controlled and mechanically actuated; aileron trim is electrically actuated. Secondary flight controls consist of hydraulically actuated wing flaps.

### **1.6.6 Powerplant:**

The aircraft was installed with 02 PWC PT6A-27 turbo prop engines, each installed with Hartzell constant speed, full feathering reversible propellers. Details of engines are prescribed in section 1.6.2 of this report.

### **1.6.7 Fuel:**

Jet A-1 fuel was used on the aircraft. Last refueling was carried out at the operator's main base, Dhaalu Airport on 13 February, 2021. The operator stores sealed Jet A-1 fuel barrels for refueling company operated DHC-6 floatplanes.

### **1.6.8 Accessories:**

None

### **1.6.9 Defects:**

There were no open defects recorded, survey of the records confirmed.

### 1.6.10 Aircraft loading:

The aircraft had a take-off mass of 11,429 pounds when it was dispatched from MLF to MLE. The landing weight computed was 10,879 lbs., as specified in the Loadsheet. Passenger and Cargo Manifest confirmed that:

- Passengers (06 in total) weighed a total of 1056 lbs.;
- Dead weight Luggage (Cabin + Checked) (17 pieces) weighed a total of 461 lbs.

According to the **Loadsheet** completed, distribution of the loads: passenger and deadload as follows:

#### Deadload Distribution:

	Pcs	Weight	Pcs	Weight	Pcs	Weight	Pcs	Weight
<b>Cabin Baggage</b>			6	78			6	78
<b>Checked Baggage</b>	7	270	2	54			9	324
<b>Cargo</b>							0	0
<b>Others</b>			1	4	1	55	2	59
<b>Total</b>	<b>7</b>	<b>270</b>	<b>9</b>	<b>136</b>	<b>1</b>	<b>55</b>	<b>17</b>	<b>461</b>

#### Passenger Load Distribution:

Passengers	Standard		Actual		Weight
Seat Row	A	D	A	D	
1	M	M	189	189	378
2	M	F	189	150	339
3	M	F	189	150	339
4					0
<b>Total Passenger Weight</b>					<b>1056</b>

Landing CG calculated was at 30.2% MAC and is well within the Centre of Gravity Range:

Forward: 207.74 in (25% MAC) at all weights and Aft: 213.20 in (32%MAC) at all weights.

Source: : Loadsheet provided by Manta Air, refer to Appendix: 4.2

## 1.7 Meteorological information:

Weather report transmitted via ATIS at 0200Z at MLE reads:

METAR VRMM 140200Z 08010KT 9000 FEW018 28/24 Q1012 NOSIG.

For ease of reading, the transmission has been expanded and appended below:

<b>Wind:</b>	<b>80° 10 knots</b>
<b>Visibility:</b>	9000 m
<b>Sky condition:</b>	Few clouds at 1800 ft
<b>Temperature:</b>	28.0 °C
<b>Dew point:</b>	24.0 °C
<b>Pressure:</b>	1012 hPa

No significant weather changes were identified.

## 1.8 Aids to Navigation:

As the flight was conducted under VFR, no navigational aids were required.

## 1.9 Communications:

There were no communication problems or system anomalies throughout the flight from take-off to cruise and up to initial touch down.

## 1.10 Aerodrome information:

Aerodrome: Velana International Airport Reference: 4°12' 12.18" N, 73° 32' 14.54" E

Facilities: 5 water runways with fixed passenger platforms at different locations.

Velana International Airport, whose geographical location given in AIP Maldives is 04° 11' 30" N, 073° 31' 45" E is the primary airport of entry and departure for the Maldives. On the lagoon to the northeast adjoining the airport, a large floatplane operation, to transport passengers to and from the airport is conducted by three different operators. Floatplanes land and takeoff along specific paths that are partially delineated and referred to as, 'North Left', 'North Right' and 'South Left' so that repeatability and predictability can be anticipated by all operators and ATC as well. However, under challenging weather conditions, takeoff and landing

operations are permitted by ATC in north-east/south-west and east/west directions on a case by case basis.

### **1.11 Flight Recorders:**

No Flight Data or Cockpit Voice Recorders are required for operation of the DHC-6 aircraft on floats under Maldives CAA regulations.

### **1.12 Wreckage and impact information:**

#### **1.12.1 Accident site visit:**

Accident site was visited by investigators from both MCAA and AICC to kick-start the investigation: collecting data, interviewing crew, passengers, onlookers, salvaging and assessing the wreckages and records in addition to ensuring drug tests are carried out on crew etc.

#### **1.12.2 Wreckage Condition:**

Details of the damages sustained and the condition of the aircraft wreckage are prescribed in 1.3. While the wreckage still lay submerged underwater several video footages as well as still photographs were captured by scuba divers from ARFF. The recovery of passenger belongings, aircraft documents and other aircraft equipment was carried out by the same divers. The videos and still images captured from the exercise were used to review the location, orientation of the some of the flight controls in relation to the operating and controlling levers, switches in the cockpit.

#### **1.12.3 Salvage operations:**

On the day of the accident the salvage of the wreckage began by a contractor appointed by the Operator. The wreckage was loaded on to a flat top barge using a crane and was transported and offloaded at the Operator's main base at Dhaalu Airport at Dhaalu Kudahuvadhoo island. Both MCAA and AICC were present during the salvage which lasted about 8.5 hrs. During salvage, secondary damage to the wreckage was observed. The missing LH wing was not located until 3 days later and on 17 February 2021, the LH wing was located by the scuba divers from ARFF and the Operators staff members. The LH wing was recovered from underwater using a crane and loaded onto a barge in the presence of MCAA staff. The wing was also transported to Operator's main base at Dhaalu Airport.

### **1.13 Medical and pathological information:**

Drug tests results for all crew members were reported negative.

### **1.14 Fire:**

There were no signs or reports of a fire.

### **1.15 Survival Aspect:**

The crew were unable to provide instructions or offer help to passengers in donning life jackets. However, the Cabin Crew did assist some of the passengers evacuating the aircraft and later offer life jackets to the remaining passengers.

The PIC stated that both FO and himself opened the LH cockpit door with great difficulty, and evacuated through this door. When they both left, the cabin was partly submerged.

Passenger seated at 1D stated that after touchdown the aircraft was still moving at high speed when the LH wing went down after 100 / 200m from touch down. The aircraft path was curved and then the LH wing went down into the water while RH side went up. At the same time an alarm went ON. After the aircraft came to rest, the passenger unlatched his seatbelt and then went to his partner, seated in 2A, and unlatched her seatbelt. He noted that the passenger seated at 1A attempted to open the emergency exit, right next to his seat, and the handle came loose in his hand. At the same time PIC and FO opened the cockpit LH door and both crew members evacuated. Then the male passenger at 1A followed behind the crew. Then passengers at 1D and 2A also left through the cockpit LH door. These two passengers did not use a life jacket as they did not get the opportunity to remove one from under the seat and once out of the aircraft they held on to the aircraft.

Passenger at seat 1A stated that it was a steep approach and the speed was relatively high at the time of the touch down. He confirmed that he attempted to remove the Emergency exit but the handle came off. When the crew opened the LH cockpit door he exited through this door. He held onto the aircraft until rescue arrived.

Passenger at 2D stated that his wife seated at 3A helped him remove the seat belt and with assistance from Cabin crew both he and his wife was helped out of the aircraft through the aft RH service door, while the cabin was partially submerged.

Once outside the aircraft, both passengers swam to the wing and held on to it until the rescue boat arrived. These two passengers did not use a life jacket as they did not get the opportunity to remove one from under the seat and once out of the aircraft they both realized that the land was within swimming distance and being good swimmers, they did not attempt to get a life jacket.

One passenger stated being seated at 4A, which is the last row LH side seat. This is inconsistent with the cabin crew statement in which he stated that the last row on both LH and RH side (4A and 4D) was left unoccupied. It has been established that seats 1A, 1D, 2A, 2D and 3A were occupied, and therefore this passenger could have occupied any of the seats - 3D, 4A and 4D. It shall be noted that the Loadsheet prepared for the flight reflects the seat 3D was occupied – with a female passenger, and therefore it is likely she was seated in 3D, but it must also be noted that the exact seat he occupied cannot be determined. The passenger stated that he was asleep at the time of landing and did not experience any events prior to landing. He confirmed exiting through the RH aft service door and recall receiving a life jacket from the cabin crew once he was out of the aircraft.

The cabin crew reported his hand getting stuck as a heavy suitcase from the baggage area became loose and moved to the left and hit him which stuck his hand. He used his right hand to move the case away and freed himself from the situation.

There was no evidence of an activated ELT.

#### **1.15.1 General:**

During post-accident interviews, one passenger stated that the pilot seated on the left-hand seat (PIC) opened the pilot-side door, soon after the aircraft inverted. The PIC, FO, and three passengers (seated in 1A, 2A and 2D) evacuated the aircraft through the LH cockpit door. The other three passengers (seated 3A, 3D and 4A) and the cabin crew, evacuated the aircraft through the LH main cabin door.

#### **1.15.2 Safety Briefing:**

According to the crew, preflight safety briefings were carried out in accordance to Manta Air operations manual.

### **1.15.3 Personal Floatation Devices:**

The airplane was equipped with life-jackets for each passenger seat plus all crew members. Some passengers removed from the stowage pouch and used the life jackets while others did not. These passengers who failed to remove the life jackets stated that whilst in the water they held on to the wreckage that remained afloat until they were finally rescued.

### **1.15.4 Search and Rescue:**

After receiving the notification, MACL Marine rescue boat arrived on scene in minutes and rescued all of the passengers. More rescue vessels joined the effort later. No search was required.

### **1.16 Tests and research:**

Apart from the investigation work carried out on the wreckage both underwater and on land after salvage, no specific tests and research were undertaken primarily due to resource constraints, strict border control measures taken by the countries from where such undertakings are normally sought.

### **1.17 Organizational and Management Information:**

Manta Air (MA) is a MCAA approved Air Operator Certificate holder who commenced their operation in 2019. MA provides domestic air services using ATR 72 and DHC-6 floatplanes. DHC-6 floatplane aircraft is authorized to conduct day VFR Operations only. The company also holds Aircraft Maintenance Organization Approval (MCAR-145) and MCAR-M Organization Approval. While its operating base is located at MLE, Manta carries out majority of the scheduled and unscheduled maintain at their maintenance base in Dhaalu Airport, located in the south of the country – Maldives.

### **1.18 Additional Information:**

None

### **1.19 Useful or Effective Investigation Techniques**

An attempt was made to inspect the damaged wing areas but due to pandemic related travel restrictions a visit was not made to the island where the wreckage was located and months later when the travel arrangements were made, at about the



same time the wreckage was stored in a shipping container for transport to a repair facility.

## **2.0 ANALYSIS:**

### **2.1 General:**

Valuable data / information was collected from the crew and passenger interviews conducted, the video footages and still images of the aircraft captured whilst on final approach / landing and underwater. These are being used in the analysis to determine the probable cause(s) and condition(s) that lead to the accident.

This accident, like many others resulted from alignment of all the improbable scenarios, often studied in classrooms under “Swiss Cheese Model” - an accident causation theory proposed by James Reason which explains the occurrence of system failures.

Although majority of the aircraft accidents recorded had resulted from unsafe operations, the condition of the wreckage; the nature and extent of the damages sustained on the airframe and the sequence of events that lead to the accident prompts the investigators to focus on:

- Crew qualification and training;
- Loss of Control after touchdown;
- Wing attachment and Wing Strut failures;

### **2.2 Crew Qualification and Training:**

#### **2.2.1 Pilot-in-Command (PIC);**

The PIC held an ATPL and had accumulated a total of over 7000 hours on DHC-6 (floatplane) which included over 4000 hours flown as PIC. After joining Manta Air and prior to re-conversion to DHC-6 on floats, the pilot had flown ATR (72-600) aircraft. Flying history of the PIC confirmed that he had flown DHC-6 aircraft from 2015 to 2017 and ATR 72-600 aircraft from 2017 to 2020.

On the accident flight the PIC was also acting as a LTC. The pilot completed the LTC training on DHC-6 aircraft on 17 January, 2021 and was released for flying as a LTC on either seat of the aircraft. When the PIC was appointed for the first time in his professional career as a LTC he did not meet all specific criteria stipulated in the approved Operations Manual. According to OM Part A, Issue 01, Revision 03, Chapter

5.4 Training, Checking and Supervision Personnel, all DHC-6 LTCs must have the following experience and qualification requirements met:

Function	Prerequisites – Minimum Experiences	Qualification Requirements
LTC	<ul style="list-style-type: none"> <li>– 3,500 hours total time;</li> <li>– 500 hours as Commander;</li> <li>– Undergone at least 2 proficiency checks with Manta Air;</li> <li>– Above average flying skills;</li> <li>– Good knowledge of procedures and operation manuals</li> </ul>	<ul style="list-style-type: none"> <li>– Be qualified to operate in either pilot's seat;</li> <li>– Successfully completed the Training Captain course.</li> </ul>

Records held with Manta confirmed that the PIC had **undergone only a single Proficiency Check as opposed to two required** on DHC-6 after joining Manta Air on 29th August, 2020 and is non-conformance against the requirements set forth in the Operations Manual.

Review of the training records also confirmed that the **PIC had not fully completed the Training Captain Course as described in OM D**, Chapter 2.6.2.1 and referenced in different sections of the OM, Part D.

## 2.2.2 First Officer:

The FO held a CPL and was rated for DHC-6 float operations. Since expiry of the DHC-6 endorsement for not exercising the privileges for more than 3 years on DHC-6 floatplane, he had to pursue the initial training required for re-endorsement of the type rating, in addition to meeting the minimum 4 training sessions and 6 hours (block time) requirements. Re-training required on DHC-6 floatplane began on 5th January, 2021 and was recommended for skill test on 2nd February 2021. The FO had completed around 6.5 hours block time before undergoing the Proficiency Check for the DHC-6 on 3rd February, 2021. The FO was Line Flying Under Supervision (LIFUS), when the accident occurred.

In spite of the PIC not meeting the Operations Manual prescribed LTC requirements, both flight crew members held valid licenses and had undergone required Proficiency Checks. Both PIC and FO held valid medicals too.

**Given the conditions, it was too early for pairing the two crew to fly commercial flights: PIC as LTC and FO as LIFUS.**

## 2.3 Loss of control after touchdown:

### 2.3.1 Aircraft Landing Configuration:

Operations Manual (Chapter 2.18 Approach and 2.19 Landing) of the operator requires following configuration to be maintained during landing:

- Full flaps selected;
- Props MAX RPM;
- Landing Checks completed;
- Sink rate not greater than 750 feet per minute.

It also requires (Chapter 1.7.1 VREF Speeds, OM) maintaining target speed shown in the table below at 50 ft. AGL / or threshold crossing speed:

**MASS (lbs.), SPEED (KIAS)**

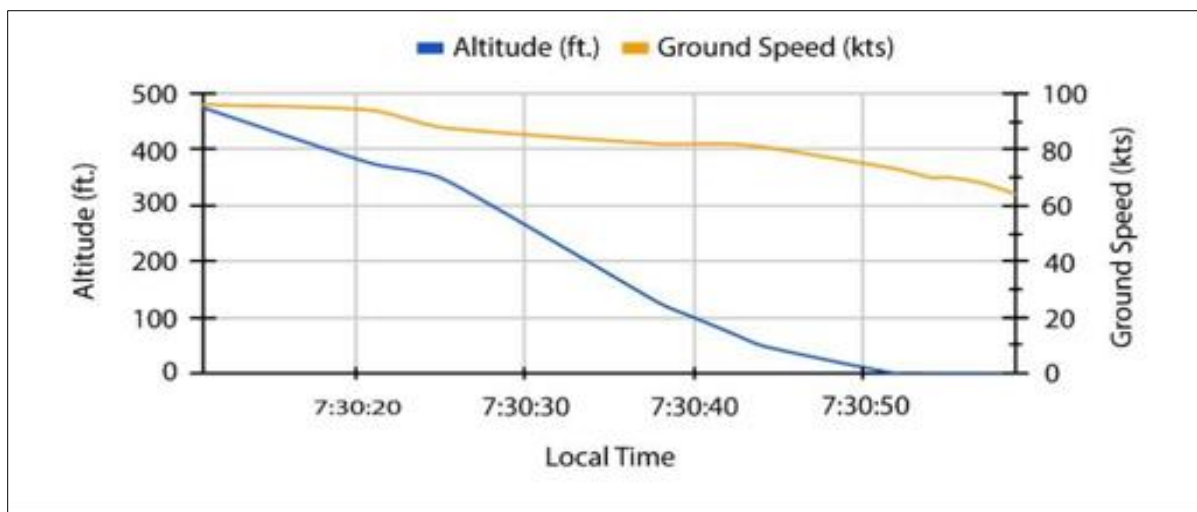
FLAPS	12,300	11,500	10,500	9,500	8,500
0°	94	90	86	82	77
10°	86	83	79	75	71
20°	80	77	73	70	66
30°	76	73	70	66	62
37.5°	74	70	67	64	60

Based on the table above, the target speed to be maintained for 50 ft. AGL remains between 70-67 KIAS given the weight of the aircraft calculated was between 11,500 and 10,500 lbs. (para 4.2 of this report).

The data (Altitude, Ground Speed, Descent Rate and Heading) retrieved from Flight Radar for flight NR117, as presented below confirmed that the speed was within the target speed to be maintained at touchdown:

	ALTITUDE	GROUND SPEED	DESCEND RATE	HEADING
1	475 feet	96 kts	192 ft/min	277
2	350 feet	88 kts	640 ft/min	344
3	100 feet	82 kts	960 ft/min	009
4	050 feet	81 kts	086 ft/min	010
5	Level	73kts	128 ft/min	011
6	Level	70 kts	064 ft/min	013
7	Touch down	68 kts	064 ft/min	013

The graph below depicts the altitude and ground speed of the aircraft from 500 and 0 feet above ground. This too indicate that the target speed was maintained at touch down.



**Considering the analysis above and based on the data gathered (crew statements, CCTV footage and flight radar) it can be deduced that the aircraft on short final and at touchdown had maintained the configuration and speed stipulated in the OM.**

### 2.3.2 Flap Position:

Enhanced CCTV footages of the aircraft whilst it was on approach and the images of the flap lever located in the cockpit captured whilst it was still submerged in an inverted orientation contradicts the actual position of the flaps of the aircraft at touch down. The CCTV footage showed the flaps in a down (extended) position.



As evidenced from the following image, captured from the cockpit of the aircraft whilst in an inverted position showed the flap selector lever being at zero position (fully retracted) :



Flaps, Engine Power, Speed and Fuel Levers in perspective.

The image also showed power levers in MAX position while the propeller levers in minimum cruise position. From the results of the investigation carried out on the wreckage it can be concluded that full flaps were in fact selected to fully extended position during landing, as opposed to the retracted position of the flaps lever indicated above.

Investigators could not establish the reasons for moving the power levers to MAX position while the prop levers were seen in the MIN cruise position, though. One explanation is that since the flaps selector lever, prop levers and power levers are all located on the crew evacuation path and their movements took place during the crew evacuation process. Due to absence of flight data monitoring equipment installed on the aircraft, the exact speed, attitude and landing configuration of the aircraft at touchdown could not be determined with certainty.

**However, it is probable that the aircraft was configured correctly for landing.** Further, it has been observed that it is usual that the crew retracts the flaps as soon as the aircraft touches down. Hence the RH flap at 0-degree position could be explained.

### 2.3.3 Landing Attitude:

A “flatter” than normal landing attitude was performed by the FO and was area of grave concern ever since reconversion of the FO to Twin Otters took place. According to the PIC the FO tended to touchdown flat and ease the control column immediately after, as opposed to keeping the control column pulled on longer. One reason is that FO was flying ATR for a considerably long time and his mind was still conditioned to landing ATR aircraft - an acquired motor memory, an issue known.

Having observed the incorrect landing attitude practiced by the FO, the PIC guided the FO on addressing the issue in five of the seven landings carried out by the FO on the previous day, it was revealed during the interviews conducted post-accident. Incidentally, the issue was also brought to the attention of the FO at dinner the previous night and reminded again by the PIC on approach into MLE.

The steep approach carried out by the crew prompted the PIC to instruct the FO to level off the aircraft early. FO acted accordingly, by leveling off the aircraft prior to touch down. However, due to ground effect the aircraft floated longer. Instinctively, the PIC commanded the FO to pull and hold the control column to ensure maintaining the correct attitude at touchdown. However, rather than holding on the control column longer, the FO eased the control column prior to achieving the correct landing attitude. Consequently, the RH float dug in followed by left-hand wing dropping from which the aircraft failed to recover.

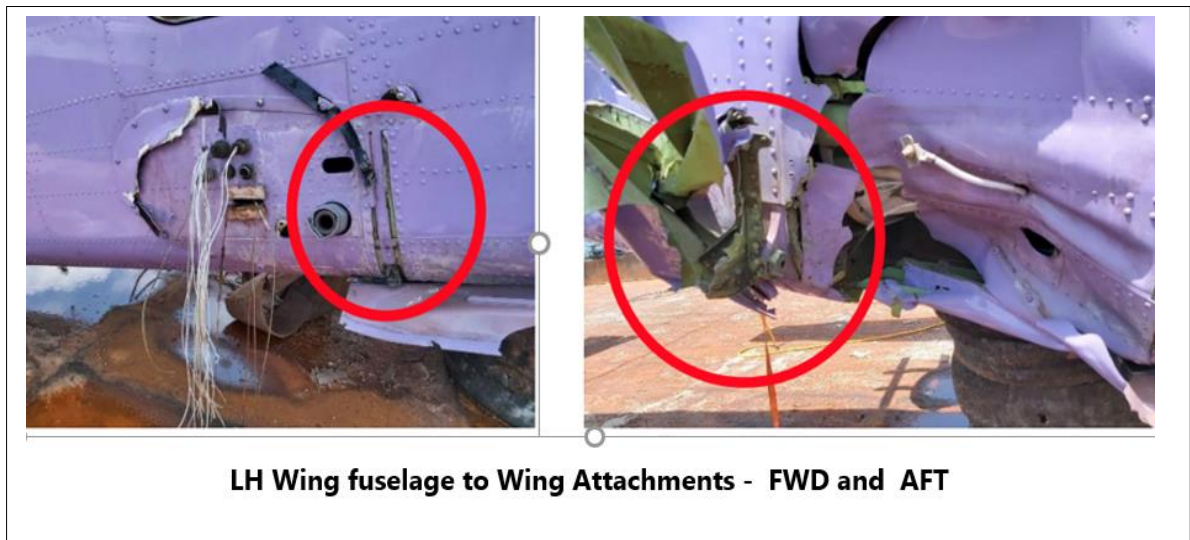
**The FO admitted that he tended to level off and ease the control sooner than normal after touchdown as is the case with ATR 42/72 aircraft. His mind was conditioned to landing ATR aircraft.**

**Past incidents and accidents revealed that pilots who transit from wheelplanes to floatplanes had difficulties in mastering the motor skills necessary to maintain the current landing attitude, in the short timeframe specified in the Operations Manuals of the operators. So was the case with the operating crew of flight NR117.**



## 2.4 Wing and Wing Strut Failure:

Examination of the aircraft wreckage whilst it was still underwater confirmed that the left-hand wing of the aircraft had detached completely. The divers who were carrying out wreckage salvation were unable to locate the left-hand wing for quite some time into the salvage process. To clear the water runway (NR) for inbound and outbound traffic the wreckage (less left-hand wing, left-hand engines and propellers) was removed from where it crashed and lying submerged in an inverted position.



Of the four attachment points, three were found failed (sheared off) as seen from the images above. They include:

- Left-hand wing strut assembly lower end fitting;
- Left-hand wing assembly forward fuselage to wing attachment point;
- Left-hand wing assembly aft fuselage to wing attachment point.

Markedly, none of the past accidents and incidents occurred on DHC-6 aircraft operated in the Maldives had caused such failures: complete detachment of the wings from the fuselage. This prompted the investigators to review the failure of the wing and wing strut assemblies, further. However, failure modes could not be established because no metallurgy test could be carried out on the failed components due to the prevalent COVID-19 pandemic.

#### **2.4.1 History of the Wing and Wing Strut Assemblies:**

Wing Assembly PN C6W1001-17, serial number 617LHKB had a remaining life of 29,164.40 hours and 73,862 flight cycles, as at end of 13 February, 2021. Its discard life is 66,000 hours and 132,000 flight cycles whichever occur sooner with re-lifing of the wing box to be carried out at half-life. To comply with the half-life wing box replacement requirement, the wing assembly had Transport Canada STC # SA97-100 incorporated, at 32,599.8 TAT and 50,340 TAC. A copy of Authorized Release Certificate issued after carrying out the STC is shown in Appendix 4.4. Airframe Log Book shows that the wing assembly had its outboard rib cracked on 01 Feb, 2016, hinge at station 376.20 bent and aft spar cracked at station 374. As rectification action, all affected parts were replaced.

Wing Strut P/N C6W1005-7 S/N VAL0208 was manufactured in Aug 2005 and sold in the same month to the A/C owner listed on the accident notification that was forwarded through the TSB in February 2021. Airframe Log pages received from the owner showed that the assembly had its leading edge damaged in February, 2016 and was removed for repair. The assembly underwent repair and corrosion inspection as required by TCCA AD CF85-14. An excerpt of the Log book page recording damage sustained on and subsequent removal of the strut assembly is shown in Appendix 4.5. The reason for the damage(s) sustained is unknown, however. Notably, during incorporation of the STC, Wing Restraint Retention Rod Installation Modification (6/1752) carried out earlier was removed prior to delivery of the aircraft to the lessee. The reason for removal of the modification (de-modification) is unknown.

This assembly has a discard life of 36,000 hours or 72,000 flight cycles whichever occurs first. As at end of 13 February, 2021, the assembly had a remaining life of 27,172.10 hours and 66,560 landings.

#### **2.4.2 Wing and Wing Strut inspections:**

Wing and wing strut inspections were found to be complied with as called for in the Operator's approved Maintenance Programme compiled for the DHC-6 aircraft fleet operated. Approved Maintenance Program was developed based on the requirements stipulated in the Inspection Requirement Manual (PSM 1-6-7) and Airframe Airworthiness Limitations Manual (PSM 1-6-11) published by Viking Air Ltd plus operators own requirements. Instructions for Continued Airworthiness (ICA) SIE-

23-701 were also found complied with on the wing box assembly following incorporation of SIE STC SA97-100.

One of the inspections called for on wing strut is the 6000 hourly or five years calendar interval whichever occurs earlier (Canadian Airworthiness Directive CF85-14, subject Wing- Wing Struts Special Inspection for Internal Beam Corrosion, Viking SB 6/474). Records confirmed that the AD was carried out on both wing struts by Kenn Borek Air Ltd and released for installation on 18 September, 2020. Records also show that the task card was raised on 19 January, 2018 although it was finally signed off in September, 2020. Task card stated that “wing strut corrosion inspection not required due to L/H strut repairs and R/H strut’s new condition. L/H S/N: VAL0208, R/H S/N 5700204”. The Log Entry, as stated in the same Task Card stated “L/H wing strut CF85-14 Airframe – wing strut corrosion inspection carried out i.a.w SB 6/474. Found Serviceable. R/H Wing Strut New.” This confirmed that right hand strut was replaced while left hand wing strut was corrosion inspected, repaired and reinstalled. All inspections including the ADs as called for in the continuing airworthiness and maintenance requirements Manuals PSM1-6-7 and PSM1-6-11 were complied with on the wing assembly and wing to fuselage attachments, per records available and reviewed. Interestingly, wing restraint mod, 6/1752, SB 6/469 was removed at the time of incorporation of the SIE STC SA97-100.

The summary of the ADs complied with on the wing assembly confirm that they were carried out, as scheduled and airworthiness of the aircraft was not compromised.

AD / Task #	Description	Date complied - last	time remaining for next
CF-2007-31	Wing Front Spar Adapter Assembly	20-Aug-20	187 days, 857:28 FH 2234 FL
CF-85-14	Corrosion of Wing Struts	16-Sep-20	1675 days 5857:28 FH
Task # 53-006	Inspection Fuselage Frame Assembly, Sta. 239	18-Sep-20	187 days 857:28 FH

The cabin crew in his interview stated that he did not observe any external part or internal parts detached or flying away from aircraft prior to or during the accident. Hence it appears that the wing failed or detached after the initial impact. Roll over of the aircraft is not possible with both wings intact.

Passenger seated in 2D (RH side of the cabin) stated that soon after landing the wing away from him (LH wing) went down into the water and a huge sound was heard, which he felt was the sound of wing breaking up. This is likely the impact that resulted in the detachment of the LH wing.

It cannot be ascertained that the wing and wing strut assemblies failed due to excessive forces created on them during landing as at touchdown the speed was comparable to those specified in the OM.

In summary, based on the analysis carried out it is not possible to relate the failure of the wing and wing strut to maintenance overruns or corrosion related fatigue of the attachment points, since no metallurgy tests were carried out on the components primarily due to the COVID 19 pandemic restrictions.

### **3.0 CONCLUSIONS:**

#### **3.1 Findings:**

- a. The FO was Line Flying Under Supervision (LIFUS) when the accident occurred;
- b. The FO had gained only 21:35 hours on DHC-6 since employment with the operator;
- c. The PIC (LTC) did not take over the controls when taking over the control was required;
- d. FO's motor skills for landplane got applied whilst landing the floatplane despite being cautioned by the LTC;
- e. The operator lacked sufficient human resources for carrying out all the trainings as required by the Operations Manual;
- f. PIC was released as a LTC without completing all the training per approved OM of the operator;
- g. Baggage restraining mechanism used for securing the baggage loaded on the floor, near the aft right-hand service door of the cabin was found inadequate;
- h. Left hand wing attachment and wing strut failed from the attachment points after touch-down.

#### **3.2 Causes / Contributing Factors:**

The AICC determines that the causes / contributing factors of this accident were:

- a. FO maintained a flatter than normal attitude of the aircraft at touch down;
- b. FO released the controls too early for an aircraft operated on floats due to his flying motor skills on a land aircraft which require release of the control at touchdown;
- c. Loss of control of the aircraft immediately after touchdown;
- d. PIC did not take over the controls from FO in a timely manner;

### **3.3 Recommendation to all Operators:**

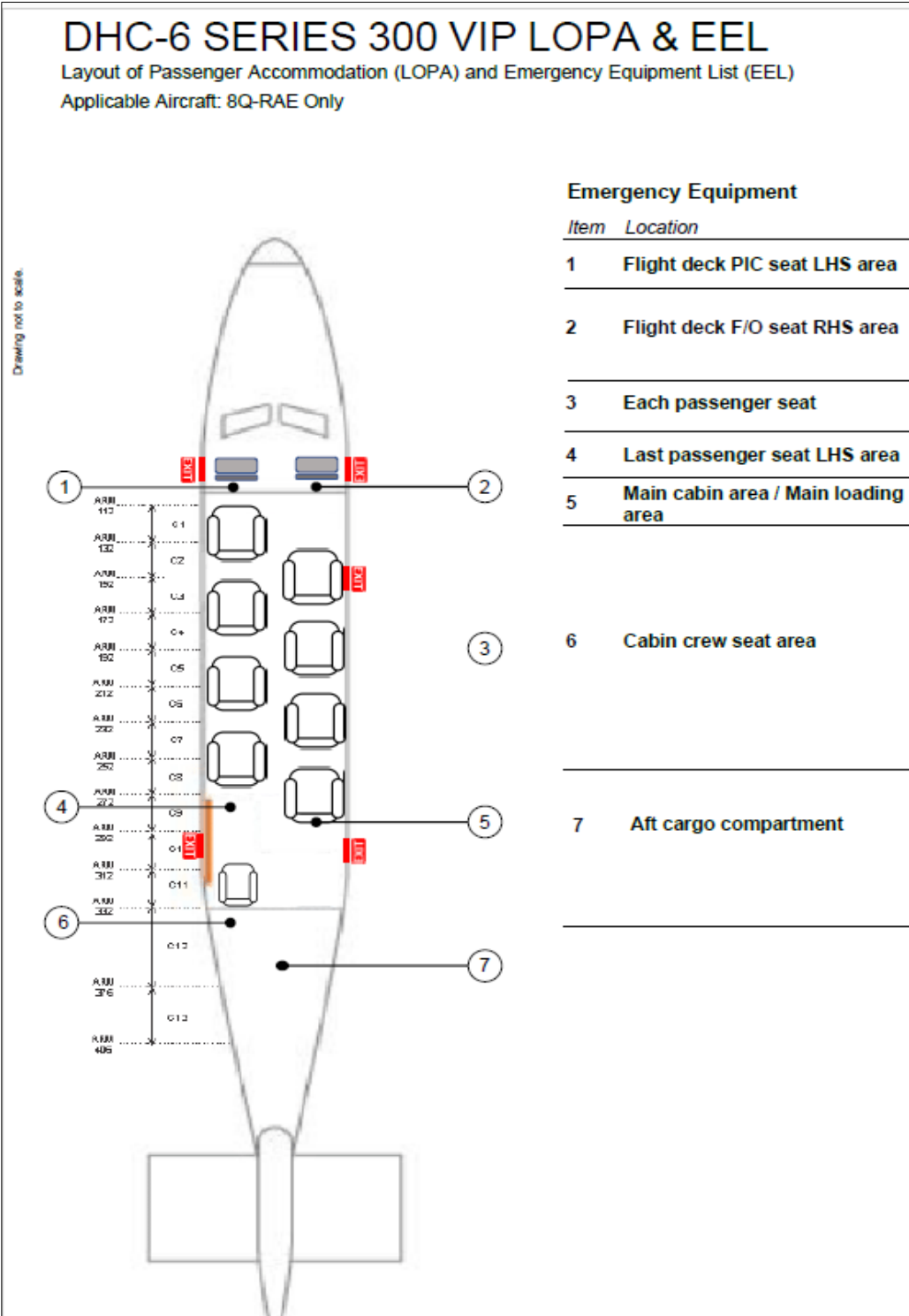
- a. Review cockpit crew training requirements of the operator, especially for those who convert from aircraft on wheels to aircraft operated on floats with more emphasis given to landing performances and techniques that maintain the correct attitude/orientation of the aircraft;
- b. Establish specific procedures to ensure that all pilots including those nominated as LTCs meet the training requirements stipulated in the duly approved Operations Manual in full;
- c. Establish procedures to ensure a copy of the original Loadsheet generated for a given flight is maintained at the departing station for possible review by personnel requiring them later;
- d. Review the procedures established for crew pairing so that the PIC whether or not acting as LTC have sufficient recent experience on operation of floatplanes.

### **3.4 Recommendation to the Regulator:**


- a. To re-evaluate the effectiveness of the current pilot conversion training programs of the operator;
- b. To re-examine the criteria for carriage of flight data recorders on Normal Category aircraft, flight data recording in particular;
- c. Establish procedures in future to ensure that full metallurgical analysis of failed components to be performed to aid in understanding the mode of failure;
- d. Review the adequacy of the baggage restraint systems used in the cabin for securing the baggage loaded in the cabin.

4.0 APPENDICES:

4.1 LOPA - Excerpt:



## 4.2 Loadsheel:



FCGO-029 ISS01REV01 271020  
ALL WEIGHTS IN POUNDS (LB)

### LOADSHEET

Flight Number	NR117	Date	14-Feb-21	From	MLF
A/c Registration	8QRAE	A/c Type	DHC-6 on Floats	To	MLE
Seating Version	08 VIP	Crew	2	1	Total onboard 9

	Weight	Index	MAC %
Dry Operating Weight	8937	9.3	
Total Traffic Load	1517	3.4	
Actual Zero Fuel Weight	10454	12.9	
Take Off Fuel	975	-0.9	
Actual Take Off Weight	11429	12.0	30.1
Trip Fuel	550	-0.5	
Actual Landing Weight	10879	12.5	30.8
Underload	1071		

**Passengers**

Seat Row	Standard	Actual Weight
	A D	A D
1	M M	
2	M F	
3	M F	
4		

**Total Passenger Weight**

Weight	Index	Total Passengers
378	-2.2	Male 4
339	-0.7	Female 2
339	0.6	Child 0
0	0.0	Infant 0
		<b>Total (incl inf) 6</b>

**Total Passenger Weight**

**Total Passenger Weight: 1056 -2.3**

	AREA D		REAR CPT		AFT SHELF		Total	
	Pcs	Weight	Pcs	Weight	Pcs	Weight	Pcs	Weight
Cabin Baggage			6	78			6	78
Checked Baggage	7	270	2	34			9	324
Cargo							0	0
Others			1	4	1	35	2	59
<b>Total</b>	<b>7</b>	<b>270</b>	<b>9</b>	<b>136</b>	<b>1</b>	<b>35</b>	<b>17</b>	<b>461</b>

Fuel	Weight	Index
Take Off Fuel	975	-0.9
Trip Fuel	550	-0.5

**Notes**

O.CSU/REAR CPT  
BAL/AFT

**Prepared by**

Name	JUMANA
Signature	<i>Jumana</i>

**Approved by**

Name	
Signature	

☐ Non-Standard Passenger weights used



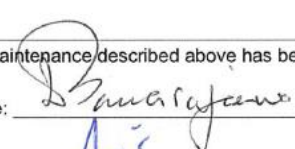


Standard Weights used for Passengers and Cabin baggage, unless ticked above.

Actual weights used for checked baggage, Cargo, Mail and Other deadloads


I certify that this Aircraft is loaded in accordance with the approved weight and balance schedule. LMC is not allowed on this loadsheel



### 4.3 Left Hand Wing Strut Inspection and Repair – Task Card:

Opening Date: 01/19/2018	TTAF: 43789.7	
Task No:	ATA Code: 57-00-00	
Landing: 78688	Aircraft Zone: Area 3: Empenage, Interior and Exterior.	
<b>Description:</b> CF85-14 Airframe - Wing strut corrosion inspection. Inspection Ref : BOROSCOPE REQUIRED SB: 6/474		
<b>Additional Work to be done:</b>		<b>Done</b>
<b>Correction:</b> Wing strut corrosion inspection not required due to L/H strut repairs and R/H strut's new condition. L/H S/N: VAL0208 R/H S/N: 5700204 		
Mechanic: <u>Rajb A</u>		Date: <u>16 Sept 2020</u>
<b>Log Entry:</b> AS ABOVE L/H <del>R/H</del> wing strut CF85-14 Air frame - wing strut corrosion inspection carried out IAW SB 6/474. Found serviceable. R/H wing strut New,		
The maintenance described above has been performed in accordance with the applicable standards of airworthiness.		
Signature: <u></u>	Date: <u>Sep 16/2020</u>	License: <u>429735</u>
Data Entry By: <u></u>	Date: <u>SEP 18 2020</u>	License: <u></u>

4.4 Authorized Release Certificate – Wing re-lifing:

1. Approving Civil Aviation Authority Country <b>Transport Canada</b>		2. AUTHORIZED RELEASE CERTIFICATE FORM ONE		3. Form Tracking No. <b>CWR-14212</b>	
4. Organization Name and Address Kenn Borek Air Ltd 290 McTavish Road NE Calgary AB T2E 7G5 Canada		5. Work Order/Contract/Invoice  OC26156		11. Status/work Repaired	
6. Item 1	7. Description WING, POST MOD 1318	8. Part No. C6W1002-21	9. Qty. 1	10. Serial/Batch No. 210004	
12. Remarks Removed from AC C-FXKB. Refer to OC 26156 steps 1-60 for all work performed. Repaired upper wing skins IAW RD6-57-618. Repaired lower rib flange at STA 185 IAW SIE DWG# SIE-23-967. Installed wing life extension doublers IAW SIE-23-701 and STC SA97-100. Removed wing restraint MOD IAW SIE-KB-6/1572DM. Trailing edge sta 35-207 damaged replaced IAW SA07-122 EAL-C6W1079-1 TN 392570, 391676. Carried out wing Spar adapter assy crack inspection as per SB V6/540. Carried out CF2019-02 task 57-0196 57-023 wing fail safe inspection sta 152.8. Carried out CF 2019-02 task 57-020, 57-024 lower wing skin inspection sta 185. Carried out CF 2019-02 task 54-001 nacelle structure inspection. Carried out CF 2019-02 task 57-024 wing stringer and spar flange insp ribs 8-20. Carried out flap Hinge arm inspection CF2019-02 Task 57-038. Carried out CF2019-02 TASK 54-0031/004/005/007/008/009 Nacell lower longeron inspection. Carried out CF-87-02R wing main spar lower cap angle corrosion insp Carried out SA97-100 Eddy current inspection as per SIE 701 and attached KBAL NDT form. Carried out SA97-100 Ultrasonic inspection As per SIE 701 REF Attached Adarsh NDT inc inspection Form 002. Carried out V6/0018 wing upper skin Ultrasonic Insp Ref Attached Adarsh NDT Inc inspection form 002. Installed stall bar C6W1122-27 TN 385052 LE Skin IAW TAB 668. Installed wing Assy. Tag IAW SB 6/362 TTSN:32599.8 TCSN:50340					
13a. Certifies that the items identified above were manufactured in conformity to: <div><div><div>13b. Qty : 1 Desc : WING, POST MOD 1318 SN/Bat # : 210004 PO / PS : Exp : Sup : Kenn Borek Air Ltd Cond : REPAIRED Loc : CWR # OC26156 Nota p0 : 345200</div><div><div>13c. P/N : C6W1002-21 Model : PSSET Make : RNP : (CWR) OC26156 Cure : Type : DHC6 TTSN : 32599.8H / 50340C TT50 : Spd : Printed on Sep 25, 2020</div></div></div></div>					
14a. <input checked="" type="checkbox"/> CAR 571.10 Maintenance Release <input type="checkbox"/> Other regulations specified in block 12		14b. Signature  14c. Approved Organization Number 278-91			
14d. Name Turner Marc - 426103		14e. Date (dd/mm/yyyy) 10/Jun/2020			

(Previously form 24-0078)

Important: See notes

**Installer Responsibilities**

This certificate does not constitute authority to install. Installers working in accordance with the national regulations of a country other than that specified in block 1 must ensure that their regulations recognize certifications from the country specified. Statements in blocks 13a or 14a do not constitute installation certification. In all cases, the technical record for the aircraft must contain an installation certification issued in accordance with the applicable national regulations before the aircraft may be flown.

DATE	DAILY TOTAL		TOTAL AIR TIME SINCE MFG.		LOG SHEET #	CYCLES
	HRS	MIN	HRS	MIN		
2016						
BROUGHT FORWARD			44576	2		
15 Jan 0.0 hrs. TAT 44576.2 LS 41820 0 cycles						
1. Ferry tanks require installation.						TAC 28112 1. Installed ferry fuel tank system IAW SI500-020 and Kenn Borek Air drawings DHC-28-01-00/03/05/07/11 leak and function checked serviceable. SN on Aft: BENSON145, Fwd: BENSON261. Refer to weight and balance handbook for new C of G and empty weight. K Bouwsema 477495.
15 Jan 0.0 hrs. TAT 44576.2 LS 41821 0 cycles						
4. RH chip detector inspection coming due. 5. Longerons inspection coming due. 6. Original GPS unit #1 position to be re-installed.						TAC 28112 4. RH chip detector and circuitry inspected and tested IAW DHC-6 MM and PT6A-34 MM. No faults found. Serviceable. 5. L&R nacelle longerons inspected IAW AD CF81-07R4. No faults found. Serviceable. 6. Original GPS unit re-installed in #1 position IAW Garmin GNS430 installation instructions. The TAWS inhibit defect from LS 41809 does not pose an airworthiness risk in part due to the redundancy of 2 GPS systems and will be trouble shot at a later date. GPS/NAV/COMM systems tested serviceable. R. Schrader M508608.
20 Jan 5.5 hrs. TAT 44581.7 LS 41822 1 cycle						
1. Replace LH main board ski.						TAC 28113 1. Replaced LH board ski IAW DHC-6 MM. P/N C6US1003-1 S/N on ATL 32-0039. K. Bouwsema M477495.
21 Jan 0.0 hrs. TAT 44581.7 LS 41823 0 cycles						
26 Jan 0.0 hrs. TAT 44581.7 LS 41824 0 cycles						
1. Aircraft LH board ski separated at front harness attach point on take off. Perform heavy landing inspection. 2. Perform EPU battery charge/discharge test. 3. Flap rod draught boot inspection coming due.						TAC 28113 1. Competed heavy landing inspection IAW PSM 1-6-7 inspection requirement manual and DHC-6 MM. Faults are to follow on next log pages. 2. Completed EPU battery charge/discharge test IAW Castleberry MM test procedures. No fault found. 3. Completed flap rod draught boot inspection IAW DHC-6 MM. No faults found. K. Bouwsema M477495.
01 Feb 0.0 hrs. TAT 44581.7 LS 41825 0 cycles						
1. LH wing O/B rib cracked. 2. LH wing str 376.20 hinge arm bent. 3. LH wing aft spar str 374.00 has cracked web. 4. LH wing strut leading edge damaged. 5. LH wing tip fairing damaged.						TAC 28113 1. LH wing O/B aft rib P/N C6W1073-3 B/N 334437 replaced as per original. 2. LH wing str 376.20 hinge arm P/N C6WM115-355P replaced as per original. 3. LH wing aft spar str 374.00 repaired IAW AC 43.13-1B, 4-59 a-e-b. 4. Replaced LH wing strut IAW DHC-6 MM. Fuel lines and system leak checked serviceable P/N C6W1005-7 S/N on VAL0205 TSN 4528.7 CSN 13744 B/N 288861 S/N off VAL0208 TSN 8658.3 CSN 5274. P/N C6W1409-3 S/N 5700109 B/N 333319. 5. Replaced LH wing tip fairing IAW DHC-6 MM. Function checked position strobe lights serviceable P/N C6W1004-1 B/N 334875. K Bouwsema 477495.

## 4.6 Airframe History:

Registration	Operator	Activity	Dates
G-BGMC	de Havilland Canada Inc., Downsview, ON	First Flight	Apr 1979
G-BGMC	Bryman Airways, Plymouth	delivered	Apr 1979
G-BGMC	BAC Charter, Bournemouth	Sold	Jan 1990
OY-SLA	Sataircraft A/S, Copenhagen	Registered	Jan 1990
C-GKBR	Kenn Borek Air, Calgary, AB	Sold	Feb 1990
HP-1167APP	Aeroperlas, Panama City	leased	Oct 1990
C-GKBR	Kenn Borek Air, Calgary, AB	Returned	May 1995
C-GKBR	Maldivian Air Taxi, Male	Leased	Nov 1999
8Q-MAU	Maldivian Air Taxi, Male	Registered	Oct 2006
C-GKBR	Kenn Borek Air, Calgary, AB	Registered	May 2009
C-GKBR	Kenn Borek Air, Calgary, AB	returned	Mar 2015
C-GKBR	Seaborne Airlines, San Juan, PR	Leased	Jun 2015
C-GKBR	Kenn Borek Air, Calgary, AB	Returned	Jan 2018
8Q-RAE	Manta Air Pvt Ltd., Male	Leased	Nov 2020

Source: <https://www.twinotterworld.com/msn-617>