



## Belize Department of Civil Aviation

**Report No.:** A-001-11-2017  
**Name:** Accident Investigation Final Report  
**Registration:** V3-HGX.

**CESSNA 208B GRAND CARAVAN  
17 NOVEMBER 2017  
PLACENCIA AIRPORT, PLACENCIA VILLAGE  
STANN CREEK DISTRICT, BELIZE C.A.**

**Investigators:**

Shaun Young (Investigator in Charge)  
Francis Lizama (Accident Investigator)

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Approved by: Minister of Tourism and Civil Aviation

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Publication date:

**FINAL REPORT**  
In accordance with the Aircraft Accident and Incident  
Investigation Regulations (BCAR 13) of the Civil Aviation Act,  
Chapter 239 of the Laws of Belize, R.E. 2011



## **INTRODUCTION**

In accordance with The Belize Civil Aviation Act, Chapter 239 of the substantive laws of Belize; BCAR 13 and Annex 13 of the Convention on International Civil Aviation, the objectives of an aircraft accident/incident investigation is not to apportion blame or liability, nor impose any legal responsibility. The sole purpose of the investigation is the prevention of accidents and incidents.

The Belize Department of Civil Aviation Aircraft Accident and Incident Investigator is responsible for all activities deriving from any technical investigation in relation to accidents/incidents investigations involving national and international aircraft within the territory of Belize, in order to promote aviation and operational safety. In accordance with the mandate granted to the BDCA under the Belize Civil Aviation Act.

Any investigation conducted in accordance with the provisions of the Civil Aviation Act Chapter 239 Part II (5), BCAR 13 Chapter 3 (BCAR 13.7) and Annex 13, shall be separate from any judicial or administrative proceedings to apportion blame or liability.



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## 0.02 DEFINITIONS

### **Accident.**

An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

- a) a person is fatally or seriously injured as a result of:
  - 1) being in the aircraft, or
  - 2) direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
  - 3) direct exposure to jet blast,
  - 4) *except* when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or
- b) the aircraft sustains damage or structural failure which:
  - 1) adversely affects the structural strength, performance or flight characteristics of the aircraft, and
  - 2) would normally require major repair or replacement of the affected component, *except* for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or
- c) The aircraft is missing or is completely inaccessible.

### **Accredited representative.**

A person designated by a State, on the basis of his or her qualifications, for the purpose of participating in an investigation conducted by another State. Where the State has established an accident investigation authority, the designated accredited representative would normally be from that authority.

### **Adviser.**

A person appointed by a State, on the basis of his or her qualifications, for the purpose of assisting its accredited representative in an investigation.

### **Aircraft.**

Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

### **Probable Causes.**

Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident. The identification of probable causes does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

### **Flight recorder.**

Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

### **Investigation:**

A process conducted for the purpose of accident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations.

### **Investigator-in-charge:**

A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation.

**Maximum mass:** Maximum certificated take-off mass.

### **Operator:**

A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

### **Preliminary Report:**

The communication used for the prompt dissemination of data obtained during the early stages of the investigation.

### **Safety recommendation:**

A proposal of an accident investigation authority based on information derived from an investigation, made with the intention of preventing accidents or incidents and which in no case has the purpose of creating a presumption of blame or liability for an accident or incident. In addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies.



**Serious incident:**

An incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down.

Note 1. The difference between an accident and a serious incident lies only in the result.

**Serious injury:**

An injury which is sustained by a person in an accident and which:

- a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or
- b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
- c) involves lacerations which cause severe hemorrhage, nerve, muscle or tendon damage; or
- d) involves injury to any internal organ; or
- e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or
- f) Involves verified exposure to (infectious) substances or injurious radiation.

**State of Design:**

The State having jurisdiction over the organization responsible for the type design.

**State of Manufacture:**

The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

**State of Occurrence:**

The State in the territory of which an accident or incident occurs.

**State of the Operator:**

The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

**State of Registry:** The State on whose register the aircraft is entered.



### 0.03 ABBREVIATIONS

#### A

AD Airworthiness Directive

AGL Above ground level

ATC Air Traffic Control

#### B

BCAR Belize Civil Aviation Regulation

BDCA Belize Department of Civil Aviation

#### C

C Degrees Celsius (Centigrade)

Centre (runway identification)

CAVOK Visibility, cloud and present weather

better than prescribed values and

conditions (cloud and visibility OK)

CG Centre-of-gravity

C of A Certificate of airworthiness

CPL Commercial Pilot License

CRM Crew resource management

#### D

#### E

ELT Emergency locator transmitter

#### F

FOD Foreign object damage (also the object)

#### G

g Normal acceleration

GPS Global positioning system

#### H

h Hour(s)

HSI Horizontal situation indicator

#### I

IFR Instrument flight rules

IIC Investigator-in-charge

#### J

#### K

Kg Kilogram(s)

Km Kilometer(s)

Kt Knot(s)

#### L

L Liter(s)

LDA Landing distance available

#### M

M Meter(s)

MEL Minimum equipment list

MET Meteorological

Meteorology

Meteorological services

MHz Megahertz

min Minute(s)

mm Millimeter(s)

MSL Mean sea level

#### N

N North

NOTAM Notice to airmen

NM Nautical mile(s)

#### O

OAT Outside air temperature

OPS Operations

#### P

PIC Pilot-in-command

#### Q

#### R

RA Radio altimeter

RF Radio frequency

RPM Revolutions per minute

#### S

s Second(s)

SB Service Bulletin

S/N Serial number

STOL Short take-off and landing

#### T

TAF Terminal aerodrome forecast

TAS True airspeed

TDP Take-off decision point

TODA Take-off distance available

TORA Take-off run available

TWR Aerodrome control tower

#### U

UTC Coordinated Universal Time

#### V

VFR Visual flight rules

VHF Very high frequency (30 to 300 MHz)

VMC Visual meteorological conditions

VSI Vertical speed indicator

#### W

#### X

#### Y

#### Z



**FINAL REPORT**  
**Aircraft Accident**  
**Registration Mark V3-HGX**

**PART 1.0 – FACTUAL INFORMATION**

**1.0. INFORMATION:**

Manufacturer:	Cessna Aircraft Co.
Model:	Cessna 208 B Grand Caravan
Serial Number:	208B1162
Type Certificate number:	A37CE
Category:	Normal passenger
Colors:	White with maroon stripes and company logo
Date of Accident:	17 November 2017
Coordinates of Accident location:	N 16° 32' 14.9" W 088° 27' 33.2"
Elevation of accident site:	12 feet
Approximate time of the Accident:	0846 am local time 1446 UTC
Proprietor or operator:	Tropic Air Limited
Airworthiness Certificate:	G/209
Date of issue:	15 January 2010
Date of expiry:	31 July 2019
Aircraft Insurance Policy:	Insurance Corporation of Belize
Date of issue:	3 November 2017
Date of expiry:	3 November 2018
Limitations:	Coverage area: Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Mexico, and Caribbean, USA in respect of flights for maintenance/repair/ferry purpose and worldwide with respect of products.
Accident Site:	200-300 feet North East of the end of Runway 07 at Placencia. Aircraft ditched in the Caribbean Sea
Flight Crew Information	
Pilot in Command:	Male (Captain)
Type and license number:	CPL #P [REDACTED]
Issuing authority:	BDCA (BELIZE)
Validity of Pilot License:	VALID
Initial Date of issue:	[REDACTED] October 2010
Date of expiry (at last renewal):	[REDACTED] October 2018
Medical Information	
Validity of Medical certificate:	VALID
Certificate type:	1 <sup>st</sup> class (commercial operations)
Date of issue:	[REDACTED] September 2017
Date of expiry:	[REDACTED] March 2018
Nationality:	Belizean



Flight hrs at last medical check-up:	██████████0 hrs
PIC Flight hours	
Total hours on aircraft type:	12,092 hrs (As of 16 Nov, 2017)
Total hours:	19,040 hrs at September 2017
Number of Persons on Board:	11 Passengers /1 Crew
Phase of flight which the accident Occurred:	Take-off (Initial climb shortly after rotation)
Total time of the aircraft on its last A/W certificate renewal:	1054.3 hours (Last Annual Inspection 5 October 2016)

**1.00.1 SYNOPSIS:** On 17 November at approximately 8:46 am (local time), a Tropic Air Cessna C208B Grand Caravan with registration V3-HGX, was ditched in the Caribbean Sea shortly after taking off from runway 07 at the Placencia airstrip with 11 passengers and 1 crew on board. All 11 passengers successfully exited the aircraft with only minor injuries and were taken for medical attention. This was a regular commercial passenger flight from Sir Barry Bowen Municipal Airport with 2 stops and final destination being Punta Gorda. The accident occurred during the transition from take-off roll/rotation to initial climb out whilst the aircraft had just been airborne at 5.4 feet AGL and at a distance of 28 feet past the end of runway 07 of the Placencia airport. A part of the landing gear made contact with the upper portion of the front passenger door frame of a sport utility vehicle that was driving along the main road. The impact caused the aircraft to deviate from its normal climb profile which caused the pilot to ditch the aircraft in the water (approximately 200-300 feet) northeast from the main shoreline (see Figure 1).

**HISTORY OF FLIGHT:** On 17 November, 2017, a Tropic Air Cessna 208B Grand Caravan with registration V3-HGX, departed from the Sir Barry Bowen Municipal Airport at approximately 7:15 a.m. local time with one aircraft captain, 11 passengers and 1 crew on board. The flight was a regular operated commercial passenger flight with scheduled stops in Dangriga, Placencia and with the final destination being Punta Gorda. The pilot reported that the portion of the flight from Belize City to Dangriga was uneventful and normal and so was the landing at Placencia.

At approximately 8:40 a.m. local time the airplane taxied from the Tropic Air ramp and taxied towards the west on runway 25. The pilot did a turnaround using all the available runway at normal speed and started his takeoff run to the east on runway 07. The pilot proceeded down the runway in a normal takeoff roll with normal takeoff speed and prior to reaching the end of the runway, he rotated the aircraft and lifted the nose wheel to get airborne. At exactly 28 feet past the end of runway 07 and during the initial climb phase, a part of the aircraft landing gear made contact with the upper part of the front right-hand passenger door frame of a vehicle that had breached the area in front of the runway which is normally protected by traffic barriers. The impact caused the aircraft to deviate from its initial climb profile, and the pilot reported that the engine was working for a couple seconds and it abruptly shut down shortly after. The pilot realized that he was unable to return to the airport.

The pilot carried out emergency drills for engine loss after take-off over water and decided to ditch the aircraft in the sea, which was approximately 200-300 feet from the main shoreline in front of the Placencia airport. The flight crew and all passengers were safely evacuated from the fuselage with the assistance of witnesses and passing boats which provided an impromptu rescue for the passengers. All passengers received only minor injuries.



**1.00.2 PLACE OF IMPACT:** The aircraft made impact with the Caribbean Sea approximately 200-300 feet to the northeast from the end of runway 07 at Placencia (figure 1 Google Earth Map 1). The pilot ditched the aircraft after the right main wheel made contact with the right side of a vehicle (see figure 3) at approximately 28 feet east from the end of Runway 07. The aircraft was airborne at an altitude of approximately 5.5 feet above ground level when it made contact with the top vehicle. (See figures 1, 2 and 3 below).



**FIGURE 1: Google Earth Map 1- Impact Point & Final Resting Position**



**FIGURE 2: Google Earth Map 2 – V3-HGX/ SUV IMPACT AREA**



**FIGURE 3: Vehicle Impact whilst on Placencia Road**

**1.01. INJURY TO PERSONS:**

INJURY	Crew	Passengers	Others	Total
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	1	11	*2	14
None	0	0	0	0
<b>TOTAL</b>	<b>1</b>	<b>11</b>	<b>2</b>	<b>14</b>

\* denotes 2 occupants of the vehicle

**TABLE 1: Injury to persons**

**1.02. AIRCRAFT DAMAGE:**

The damage to aircraft is also documented in the airworthiness investigation report which is attached at Annex G. The following are the damages that were seen to the aircraft during the data gathering phase of the investigation process:

- a) Cargo pod was completely torn up to the second compartment.
- b) All propeller blades had structural damage.
- c) Engine exhaust was completely compressed due to the impact.
- d) STBD wing and aileron were broken at aileron center station.
- e) Landing gear fairing.
- f) Water damage to the entire structure. (See Figure 4 below)



**FIGURE 4: AIRCRAFT DAMAGE**

**1.03. Other Damages:** The only other damage caused during this accident was limited to the top of the vehicle which was being driven along the Placencia road. (See figure 3 for Subaru damage).

**1.04. PERSONAL INFORMATION OF THE PILOT:**

The pilot, [REDACTED] a male, age 50 (DOB [REDACTED]) held a commercial pilot license (CPL) # P-[REDACTED] issued by the BDCA with ratings for Airplane Single Engine Land, Instrument Airplane, Airplane Multi Engine Land – (VFR Only). He is English language proficient to Level 6. He satisfactorily completed an instrument proficiency check in the RBFM1001 (Flight Simulator) and C208B Cessna Caravan on 15 September 2017. He had a grand total time of 19,040.00 flying hours. He received a first-class medical certificate on 19 September 2017.

According to the Pilots logbook, these are his/her hours before the accident:

Flight hours of the pilots in:

Last 12 months	640 hrs
Last 6 months	440 hrs
Last 3 months	100 hrs
Last month	35 hrs
Last week	17 hrs (approximately)
Last 48 hrs	9 hrs (approximately)
Last 24 hrs	5 hrs
Day of the accident:	2 hrs
Total hours on aircraft type:	12,092 hrs (As of 16 Nov 2017)
Total hours:	19,040 hours at September 2017



#### **1.04.1 PERSONAL INFORMATION OF THE CO-PILOT:**

Not applicable as there was no proper declaration of a First Officer on board. The name was written in pencil.

#### **1.05. AIRCRAFT INFORMATION:**

The aircraft was delivered to Tropic Air on 20<sup>th</sup> October 2005. The Certificate of Registration was initially issued on 15<sup>th</sup> November 2005 when the aircraft was registered under the BDCA registry as V3-HGX and the initial issue of the Certificate of Airworthiness was issued on 16<sup>th</sup> December 2005. A conformity check was carried out in March 2009 by a BDCA Airworthiness Inspector. V3-HGX is a Cessna C208B Grand Caravan equipped with G1000 integrated flight instrument system, with manufacture Serial #208B1162. It had a reading of 2106.1 on the Hobbs meter at the time of the accident. Maintenance was performed in accordance with BCAR 145 requirements by Tropic Air Maintenance personnel. Attached at **Annex “A”** are the current Certificate of Airworthiness and Certificate of Registration. The maintenance performed on the aircraft is provided in **1.05.1 – History of aircraft.**

##### **1.05.1. HISTORY OF THE AIRCRAFT:**

The aircraft had major works and defect rectification as detailed below:

- a) Engine was installed January 12, 2016. (Work Order 20154306).
- b) 100 hours Inspection on 8 February 2016. (Work Order 20160569).
- c) Pratt @Whitney 100 hours Inspection 21 March 2016. (Work Order 20161317).
- d) 100-hour Inspection 13 April 2016. (Work Order 21061727).
- e) Yellow Alert on turbine tracker 24 April 2016. (Work Order 20161858).
- f) P3 inlet /outlet port inspection for corrosion and debris. None found 16 May 2016. (Work Order 20162179).
- g) 100-hour inspection 16 May 2016. (Work Order 20162115).
- h) Inspected P3 and PY at FCU for moisture, none found, 18 May 2016. (Work Order 20162211).
- i) Fuel Pump inlet screen / outlet screen, engine chip detector bridge test and borescope and fuel nozzle servicing complied with June 15, 2016. (Work Order 20161985).
- j) Engine report – engine at 840 degrees Celsius and went up to 880 degrees Celsius. (Action: troubleshoot carried out on engine for hot start. The following were inspected: P3 bleed air, check for leaks, P3 @ PY lines check for looseness. EPH readjusted to full closed position, removed free play linkage, P3 filter check for condition. All inspection carried out found in satisfactory condition. (Work Order 201171344).
- k) Trouble shoot carried out due to high ITT, fuel flow divider serial number L1036 was removed, inspected, and replaced in service condition. (Work Order 20171810).



- l) Trim harness replaced due to hot start. (Work Order 201721882).
- m) Removed and installed BOV to inspect bearing area 26 May 2016. (Work Order 20172485).
- n) FCU and fuel pump removed in serviceable condition to service V3-HHI July 19, 2017. (Work Order 20172951).
- o) FCU and fuel pump installed. (Work Order 20172952).
- p) ECTM report engine start of ITT 872 degrees Celsius for duration of 7.81 seconds, August 20, 2017. According to Pratt @ Whitney Canada, over temperature limits, no action is required and falls within area A of graph. (Work Order 201733385). An external inspection was carried out on, September 28, 2017. and found to be satisfactory (Work Order 20174168).

**Other Significant Reports and Inspections**

- a) 28 September 2017, Pilot report –delayed acceleration on take-off at airport. Initial trouble shooting resulted in the replacement of the FCU and aircraft was flown to maintenance facility for further trouble shooting.
- b) 29 September 2017, Pilot report – trouble shooting on previous defect continued (delayed acceleration). Due to engine not attaining full torque, propeller carbon brush and bleed air heat tube flange attached to engine gasket were replaced. The FCU previously removed was reinstalled. Aircraft was released to service.

**1.05.1.1 Summary of inspection and repairs within the last eleven (11) months**

27 <sup>th</sup> October 2017	FCU inspection for corrosion in P3 adapter.
25 <sup>th</sup> September 2017	#5 engine fuel nozzle tip replaced due to nozzle tip voids/streaking.
26 <sup>th</sup> September 2017	100-hour inspection
28 <sup>th</sup> Sept 2017	Due to engine not attaining full torque, propeller carbon brush and bleed air heat tube flange replaced
4 <sup>th</sup> Jul7 2017	AGB scavenge pump inlet screen cleaned
19 <sup>th</sup> July 2017	FCU and fuel pump removed in serviceable condition to service another aircraft. FCU SN f66824 Fuel Pump SN 003975
7 <sup>th</sup> August 2017	FCU and fuel pump installed FCU F66892 Fuel Pump SN 004172
20 <sup>th</sup> August 2017	ECTM report 872 °C engine ITT at start for duration of 7.81 seconds. Over temperature inspection carried out and was result was found within limits.
5 <sup>th</sup> July 2017	Engine preserved for 30 days.
6 <sup>th</sup> June 2017	Pratt & Whitney S.I. complied with.
12 <sup>th</sup> June 2017	Engine High Idle adjusted from 58%Ng to 64% Ng.
13 <sup>th</sup> June 2017	<ul style="list-style-type: none"> <li>• Removed and replaced oil filter housing packing due to suspect of leak at compressor inlet. No leaks found after ground run. Removed and reinstalled BOV to inspect #1 bearing area.</li> </ul>



24 <sup>th</sup> June 2017	P3 air filter replaced due to base damaged.
27 <sup>th</sup> June 2017	Pratt & Whitney 100-hour inspection
26 <sup>th</sup> May 2017	<ul style="list-style-type: none"> <li>• Trim Harness replace due to hot start.</li> <li>• Pratt &amp; Whitney 100-hour inspection.</li> </ul>
28 <sup>th</sup> April 2017	Trouble shoot carried out due to high ITT. Fuel flow divider was removed, inspected and replaced
8 <sup>th</sup> April 2017	FCU inspection for corrosion in P3 adapter.
18 <sup>th</sup> April 2017	Complied with Pratt & Whitney Service Instruction 58-2016106-2015R1
20 <sup>th</sup> April 2017	Pratt & Whitney 100 Hour Inspection
23 <sup>rd</sup> March 2017	Pratt & Whitney 100 Hour Inspection
27 <sup>th</sup> March 2017	Report of engine starting at 840°C and goes up to 880°C. Troubleshoot for hot start. The following were inspected leaks, P3 bleed air, P3 and Py lines checked for looseness. EPH re-adjusted to fully closed position. All condition satisfactory.
28 <sup>th</sup> March 2017	Engine starts at high temperature. Fuel nozzles/flow divider removed, cleaned inspected, torqued and reinstalled. Borescope inspection carried out and a few cracks were noted on inner starter vane ring. No leaks found.
28 <sup>th</sup> February 2017	Pilot reports starts having ITT greater than 800°C
24 <sup>th</sup> February 2017	LH & RH Igniters replaced
31 <sup>st</sup> January 2017	Fuel Pump inlet screen, engine chip detector bridge test

**TABLE 2:** Summary of aircraft inspection and repairs within the last eleven (11) months

**MOTOR AND PROPELLERS:**

**1.05.2. Motor:**

Mark and Manufacture:  
Type:  
Serial Number:  
Series:  
Total time:  
Time since repair:

**PT6A-114A**

Pratt and Whitney (Canada)  
PT6A-114A Turboprop Gas Turbine Engine  
PC 2179  
PT6A Small Series  
8,157.10 hrs.  
1,895.9 hrs.

**1.05.2.1 Propeller:**

Mark and Manufacture:  
Model:  
Serial Number:  
Series:  
Total time:  
Time since repair:

**Hartzell Propeller Inc.**

HC-B3MN-3/M10083 overhauled propeller  
HC-B3MN-3/ M10083  
29105  
HC-B3MN-3  
4,590.5 hrs.  
2,536.4 hrs.

**1.05.3 FUEL:**

Fuel Onboard aircraft:  
Fuel Type:

**800 pounds (119 Gallons),  
Jet A**



#### **1.05.4 AUXILLARY EQUIPMENT:**

Not applicable.

**1.05.5 DEFECTS:** All engine and aircraft defects are included in the airworthiness investigation report which is described at 1.05.1. History of the aircraft.

#### **1.05.6 WEIGHT AND BALANCE:**

See attached appendix M the passenger manifest including weight and balance calculation, C of G envelope and cargo weight information.

#### **1.06. METEOROLÓGICAL INFORMATION:**

The Meteorological conditions on the day of the accident were as follows:

On Friday, November 17, 2017 the 05:43 am. Aviation Forecast (Area Forecast for the Country of Belize) scattered clouds at 2000 ft, the surface wind 320 degrees 05 knots BECMG 050 degrees 07 knots, temperature 29-32 (C), and visibility greater than 10 km.

The hourly report at Placencia Station - 9920201 at 08:40:00 on 17 November 2017 was 004 degrees 7 knots (average), at 08:45:00 was 004 degrees 7 knots.

Special Features: mainly fair conditions prevailed.

See attached at Annex "H", weather report.

#### **1.07. NAVIGATIONAL AIDS:**

Placencia airport is an uncontrolled government aerodrome and as such there are no navigational aids other than a windsock.

#### **1.08. COMMUNICATIONS:**

As Placencia is an uncontrolled aerodrome, all radio transmissions from the aircraft were made by the Captain on 122.8 MHz (Unicom frequency) and company's base radio (when applicable). The normal radio call is to report the pilot's position to the Placencia ground station followed by notification of how many persons are arriving at Placencia and confirmation that they are on the ground.

#### **1.09. AERODROME INFORMATION:**

Placencia Aerodrome is located in Placencia Village, Stann Creek District in Belize, Central America. The aerodrome reference coordinates are 16 32' 13'' N/ 088 21' 42'' W. The length is 2,135 feet and width 25 feet, with an elevation of 12 feet AGL. Runway orientation is 07 / 25 with an asphalt surface and Aerodrome Rating (AR) is 1A.

##### **1.9.1 History of the aerodrome**

The airport was built around the main public access road which joins Placencia to the southern highway. The location of the aerodrome presents an inherent hazard of having motor vehicles drivers, who are not aware of the danger of aircraft taking off/landing, driving in front of the approach or landing path of aircraft and causing a aircraft and vehicle collision. The Belize Airport Authority, prior to this accident, had installed barriers and signage on the main road to warn/prevent/stop vehicles that were approaching the end of runway 07 and were not cognizant of the fact that aircraft are operated at a very low altitude when crossing over this portion of the road (See figure 5 map below).



**FIGURE 5:** Google Earth Map 1- Map of the accident site

#### **1.10. FLIGHT RECORDERS:**

The data information collected for this accident was compiled using the ADAS Box information from this aircraft. The ADAS box was shipped for readout at a recognized facility and the read out was facilitated by the Accredited Representative of the NTSB.

#### **1.11. WRECKAGE OF THE AIRCRAFT AND IMPACT INFORMATION:**

Photos of the remains of the aircraft are attached at Figure 4 including the remains of the aircraft and the vehicle (Figure 4). See Annex M for pictures of remains of the aircraft. The aircraft's remains were safely removed from the sea and transported to a secure facility near the Placencia airport where the investigators continued their investigation. When the remains were no longer needed for the purposes of the investigation, they were returned to the Operator.

##### **1.11.1 Impact Information**

The aircraft made contact with the vehicle and this led to damage to the vehicle. After losing power the pilot carried out ditching procedures, the aircraft made impact with the sea. The force of the aircraft crashing into the sea caused significant damage to the undercarriage and the airframe. This type of damage occurs when an object is dropped from a high altitude at a high rate of speed and collides with water, which is an incompressible fluid and will cause the aircraft to display signs of crashing into a solid object.

#### **1.12. FIRES:**

There was no evidence of pre-impact nor post impact fires seen during this investigation. There was no signs or evidence of an engine fire and witnesses did not report seeing a fire at any stage of the accident.

#### **1.13. SURVIVAL ASPECTS:**

The aircraft made impact with the water and as a result it started sinking a few moments after impact. The depth of the water in this area is approximately 15-20 feet. The specifications of the caravan show a height of 14.9 feet and a wingspan of 52.1 feet. Upon impact the aircraft started to take in water rapidly. Two employees of the company who were sitting near to the rear of the aircraft quickly released their seatbelts and opened the emergency exits. The witness stated that the aircraft took water in so quickly that the cockpit was almost full of water within a couple of minutes. Passengers made their



way to the emergency exits with guidance from Tropic Air employees who assisted in getting all persons out of the aircraft and onto the wing. The aircraft's nose sank into the mud below due to the weight and this led to the tail being raised slightly over the top of the water. The aircraft was not totally submerged in water but only the tail section was visibly out of the water.

The chance of survival in this type of accident was medium to high due to the relatively shallow depth of water, assistance of the Tropic Air staff and the assistance that arrived from boats that were passing near to the scene of the accident. The passengers had life jackets that offered them some level of protection. All passengers exited the aircraft with minor injuries and were taken for medical attention. There were no fatalities reported as a result of this accident.

#### **1.14. TEST AND RESEARCH:**

Test and research done during the investigation were as follows:

1. The ADAS box was removed, placed in fresh water, and sent to the manufacturer for data analysis. The box was shipped to the NTSB recommended facility for readout analysis. The ADAS data was used to calculate actual aircraft takeoff roll, speed, and altitude (See Annex H).
2. The aircraft engine was removed, prepared, packaged, and sent to the manufacturer where it was dismantled and analyzed to determine any malfunction.

##### **1.14.1. TEST AND RESEARCH OF TURBINE COMPRESSOR:**

See attached report at Annex E from Pratt and Whitney providing factual notes of engine teardown. Section 3.2.1 details the testing of compressor section, and section 3.2.3 details testing of the turbine section.

#### **1.15. INFORMATION ABOUT ORGANIZATION AND MANAGEMENT:**

Tropic Air management structure is detailed in the Tropic Air GOM. Aircraft operations are planned by the operations center located in San Pedro, Ambergris Caye. The Director of Operations is responsible for the planning and scheduling of all flights. Passenger and cargo requests are then passed down to station managers who oversee that the correct number of passengers and cargo are loaded prior to the dispatch of aircraft. Pilots are responsible for signing manifests as being true and accurate and are tasked with the safe and professional conduct of flights.

#### **1.16. ADDITIONAL INFORMATION:**

Not applicable

#### **1.17. USEFUL AND EFFECTIVE RESEARCH TECHNIQUES:**

**1.17.1. DATA GATHERING AND ANALYSIS.** The investigators carried out a review of the crash site, the aircraft documentation and conducted interviews of the crew, passengers, and witnesses in accordance with Annex 13 investigation procedures. Upon arrival at the scene there were several witnesses who gave an account of the story and the rescue effort needed to rescue the passengers. This was useful because there were several aspects of the events that were not accurately recalled by all the passengers on board and the witnesses assisted in this area.

**2. WITNESS INTERVIEWS.** The aircraft passengers were interviewed, and their statements recorded and played back to confirm their recollection of the events of the accident, including pre-crash and post-crash.

**3. FLIGHT PARAMETER RECORDINGS.** The ADAS box data was used to ascertain the actual conditions of the aircraft during the accident. The data was extrapolated to obtain the correct values for the exact time the aircraft made contact with the vehicle, the events occurring immediately after the



aircraft hit the car and information available prior to the engine shutting down. This information was then analyzed by the investigation team.

#### **1.18. PHOTOGRAPHY INFORMATION:**

The evidence collected during this investigation included photos of most of the perishable evidence due to the location of the crash scene being in the Caribbean Sea. A lot of evidence was lost due to the corrosive effect that the salt water had on the aircraft components. As a result, photographs were primarily taken to provide evidence of components prior to corrosion. Photographic evidence of the engine teardown will also be provided when it becomes available from the manufacturer.

## **PART 2 – ANALYSIS OF DATA**

**2.0 ANALYSIS:** Analysis of the factual information gathered revealed several shortcomings in various areas; a combination of some of these failures contributed to this accident.

**2.1 FINDINGS:** The following findings have been formed after analysis of the data gathered and has been divided into different areas:

#### **1. PRE-EXISTING CONDITIONS**

- a.) The aircraft experienced delayed acceleration 49 days prior to the accident. On 28<sup>th</sup> September 2017, V3-HGX experienced delayed acceleration whilst at BZE. The event was documented, and maintenance was called in to diagnose the problem. The FCU was replaced and the aircraft was flown to San Pedro for further diagnosis. The next day, 29<sup>TH</sup> September 2017, the aircraft maintenance engineers did further troubleshooting of the previous defect. The maintenance engineers installed the previously removed FCU. The maintenance then released the aircraft to service.
- b.) It is a common practice that when simultaneous take offs (Maya followed by Tropic) occur at Placencia, the ground crew from Maya would put down the barrier prior to the aircraft taking off. Maya ground crew would then lift the barrier to allow waiting traffic to pass whilst the Tropic Air aircraft is back tracking on Runway 07. Tropic Air ground crew would then lower the barrier to allow its aircraft to take off and then lift it again after departure.
- c.) Standard weights of 189 lbs (males) and 149 lbs (females) are currently being used by local operators to calculate weight & balance and to calculate other values pertaining to the operation of the flight such as take-off weight of the aircraft. However, by using standard weights it leads to the aircraft actually having more weight than what is shown on the passenger manifest because in some instances the actual weights of both females and males significantly exceed the standard weights being used. On a small aircraft 10 (ten) persons who actually weigh a minimum of 25 lbs more than standard weight would result in the aircraft being approximately 250 lbs over the documented weight. Having more take-off weight results in the aircraft requiring a longer take-off roll. At small aerodromes with short runways the margin for error on calculation of take-off roll is minimal.
- d.) During the interview, the pilot was asked whether, if he receives a manifest that reflects inaccurate weight and balance information, if he will exercise his command authority. He responded “Yes, I always do that, but some people are not happy with me doing it”. (It was found that the manifest had a person’s name which was written in pen/pencil and his weight was not accounted for in the weight and balance calculation. However, the PIC signed the manifest but did not exercise his command authority at this time.



- e.) The pilot did not recall the last time he received ditching training from the operator and the procedures he followed during the accident were based solely on instincts.

## 2. THE EVENT (THE ACCIDENT)

- a.) The aircraft departed from Sir Barry Bowen Municipal Airport with thirteen (13) passengers and one (1) crew and landed at Dangriga without incident. At Dangriga, four (4) passengers came off and two (2) passengers boarded. There were nine (9) declared passengers on the manifest but in reality, there were 10 passengers and one (1) crew on board as it was found that a Tropic Air employee's name was written onto the manifest in the section titled "First Officer" in pen/pencil. The aircraft departed Dangriga and landed at Placencia uneventfully.
- b.) The passenger manifest did not accurately reflect that there were ten (10) passengers and one (1) crew on board. Instead, it reflected nine (9) passengers and one (1) crew on. This was an indication that the aircraft weight and balance was inaccurate.  
The pilot signed for this inaccurate passenger manifest and did not verify the section on the front page which indicates passenger names, weight and gender with the fuselage station section on the back page which indicates the weight of passengers and where they are seated. It was also found that the dispatcher did not sign the manifest.
- c.) The pilot back tracked runway 07 for departure and stated that he used all the runway available to him. The pilot also stated that he was halfway down the runway when he saw a vehicle which had already passed the barrier/speed bump. The vehicle was turning around the curve of the road which leads directly in front of the take-off path of runway 07. The pilot mentioned that he "was hoping the vehicle would stop".
- d.) The pilot continued his take-off roll and upon reaching near to the end of runway 07 he rotated the aircraft and mentioned that the stall warning horn sounded during the take-off. He stated that his normal rotation speed was 65 knots. Shortly after he became air borne, he stated that he felt like he had hit something; he said that the impact felt like he went over a speed bump. He stated he was unaware of what exactly he had hit and was unsure of what side of the aircraft was hit. The pilot believed that the stall warning horn went off because the angle of attack was two degrees higher than what it should have been.
- e.) The aircraft continued to climb for approximately five (5) to ten (10) seconds after it made contact with the vehicle and subsequently the engine shutdown.
- f.) After the aircraft engine shutdown, the pilot made the decision to ditch the aircraft in the sea. He did not unlatch nor attempt to open his door until after the aircraft touched down in the water. This is contrary to the proper ditching procedure which includes unlatching the door as a part of the procedure. He also stated Mr. Villafranco could not open the co-pilot's door and as a result, he then went to the back of the aircraft. The door at the back was opened by another Tropic Air employee that was on board. The co-pilot's door was difficult to open due to high pressure against it from the sea water. This then revealed that both PIC and acting copilot were not fully aware of proper ditching procedures for this type of aircraft.
- g.) The pilot stated he did the required passenger briefing at all three (3) stops, however, during interviews, some passengers stated that they do not recall getting any safety brief by the pilot. Conduct of the passenger brief establishes amongst other things that the pilot has explained to



his passengers the actions to be taken in case of an emergency and where their life preservers are located.

- h.) The PIC stated that he cannot swim and as such, he was unprepared to deal with emergencies involving aircraft evacuation whilst in water.
- i.) The life vests on board the aircraft were not easy to open due to the type of packaging and locating them was difficult which increased the passenger response time to the emergency.
- j.) The pilot lost consciousness for a few seconds after hitting his head when the aircraft made impact with the water and this caused a delayed response to the evacuation procedures.
- k.) The pilot stated that with a competent first officer he would have been able to respond differently to this type of emergency because the first officer would have been able to relieve him of some duties during the emergency.
- l.) Post-crash events began when the aircraft hit the water and persons were ushered out of the aircraft by a Tropic Air employee who was on board at the rear of the aircraft. The PIC was reportedly not involved in the evacuation process.
- m.) Some workers who were passing by the main road attempted to rescue the passengers. However, the vessel that was brought for rescue was severely inadequate to hold the number of persons and it also had a leak. One female passenger stated that all the men boarded the leaking vessel first. Shortly after, two tourist boats came to the rescue of the passengers in the water. Although the rescue boats came, there was no direct coordination, by any employee of the operator nor the aerodrome management, to facilitate a water rescue.
- n.) The response to the emergency was inadequate, uncoordinated, and the official aerodrome emergency plan (airport emergency contingency plan) did not function as it DOES NOT include provisions for water rescue. The operator's station managers and personnel tried to deal with the emergency in accordance with the operator's SOPs, however, these SOPs also did not take into consideration the need to rescue persons from the water. There was no prior coordination with rescue boats, ambulance services nor first responders (emergency response) services.
- o.) The angle at which the aircraft made contact with the vehicle was not directly head on, but off to the right-hand side of the road. The aircraft did not fly along the path of the runway extended center line which is standard operating procedure, but instead, the trajectory of the aircraft shows the pilot's inputs resulted in the aircraft making a slight right turn immediately after the wheels were off the ground.
- p.) According to data calculations (performance charts), take off would have been possible at 1,263 feet from the beginning of runway 07 (length 2,135 feet). A distance of 872 feet of available stop distance remained for the pilot to abort the take-off, however, this was not done as the pilot stated he believed he had past the point of no return.



### 3.) THE FLIGHT CREW/MACHINE/ENVIRONMENT

#### PART I: THE FLIGHT CREW

- a. Shortly after the accident occurred, the PIC was facilitated with a flight to Punta Gorda by the Operator. In Punta Gorda, a BDCA inspector assigned to assist in the investigation informed the pilot that he needed to take a drug and alcohol test; the pilot refused to do so in contravention of BCAR 13.45. **BCAR 13.45 Medical examinations: “When appropriate, the BDCA conducting an investigation shall arrange for medical examination of the crew, passengers and involved aviation personnel, by a physician, preferably experienced in accident investigation. These examinations shall be expeditious”.** The Pilot did not take the required medical examination the following day.
- b. The pilot, by his own admission, stated that he could not swim and this prevented him from carrying out his duties and responsibilities after ditching, such as ensuring the safety of all passengers on board and assisting passengers to evacuate the aircraft. A competent second crew member would have been able to assist him in carrying out his duties if he was incapacitated for a short period of time.

#### PART II: MACHINE

- a. On the 20<sup>th</sup> August 2017, the engine condition trend monitoring reported 872 degrees centigrade engine ITT during start for duration of 7.81 seconds. This was documented as high ITT due to the period of time that the event lasted. Over temperature inspection was performed in accordance with the maintenance manual high temperature inspection procedures and the result was found to be within acceptable limits.
- b. There were two recent aircraft maintenance log entries (dated the 28<sup>th</sup> and 29<sup>th</sup> of September 2017) where delayed acceleration was reported and the FCU was replaced. After troubleshooting, the old FCU was replaced on the aircraft engine. The action taken by Tropic Air maintenance personnel was to replace propeller carbon brush and bleed air heat tube flange attached to engine gasket. After this was done, the aircraft was released to service. Note that the accident occurred 48 days after delayed acceleration was reported.
- c. The normal operation of this type of aircraft into and out of Placencia with full weight and full passengers should allow that the aircraft wheels are off the ground at a distance of 1,681 feet with a maximum take-off weight of 9,062 lbs at an outside air temperature of 32 Degrees Celsius (89°F) and at sea level with winds calm. The calculations show that the aircraft should have not been at an altitude of 5.3 feet above ground level at 28 feet past the end of runway 07.

#### PART III: THE ENVIRONMENT (Placencia Aerodrome)

- a. The Tropic Air station supervisor at Placencia notified the airport management (BAA) via email that one of the barriers at Placencia were inoperative. This was done a couple of days prior to the accident.
- b. The runway at Placencia airport has a take-off path for runway 07 and a landing path for runway 25 that are both intersected by a main public road. The presence of vehicles on this specific portion of the road constitutes a permanent hazard for aircraft operating at this airport. This hazard becomes elevated to a high risk when vehicles that are driving on the



above-mentioned portion of the road **are not properly controlled** by means of adhering to traffic signs of low flying aircraft and dual sided road barriers that are working properly.

- c. The problem of drivers not complying with traffic signs and persons driving around the barrier is a recurrent issue in Placencia. This is not the first instance that low flying aircraft have come in close contact or have had near misses with vehicles operating along the road. There are traffic signs in place warning motorists of low flying aircraft and instructing them to give way to low flying aircraft. Currently, there is a fining system in place. However, when drivers do not comply with the system they are not fined because the system is not effectively implemented to include surveillance. The Ministry of Transport personnel are not present in Placencia on a regular basis to enforce traffic fines. As a result, the fining system is not functioning for those drivers who do not stop at the barriers or yield to low flying aircraft.
- d. The operation of the barriers (a safety net) is primarily the responsibility of the aerodrome management (BAA). Presently, the responsibility has been given to the operators via a letter from BAA which was accepted by both major local operators. However, there still seems to be operational issues when the barrier switch is inoperative, although BAA is informed of the problem, the operators do not take the initiative and physically send out persons to stop oncoming traffic. There have been instances where aircraft still land and take off without both barriers being properly placed and functioning.
- e. Private aircraft operating into Placencia airport are not being protected from motorists that have passed the warning signs and fail to give way to low flying aircraft. Private operators do not have ground personnel with whom they can communicate and who can inform them that they are about to land or take-off.

#### 4.) HUMAN FACTORS

- a. Lack of CRM (Crew Resource Management) in the cockpit did not allow for the person who sat in the co-pilot's station to adequately assist the PIC in dealing with the emergency at hand although he has been operating under the Tropic Air First Officer Program.
- b. The one crew operation of the Cessna caravan in such an emergency did not permit the pilot to delegate tasks to other flight crew members during the emergency. Such tasks may have included: radio calls, directives for passengers to put on life preservers, directions to emergency exits, assistance in ditching procedures and confirmation that all emergency checklist items have been completed (if time permitted). This would have been done whilst the pilot focused only on dealing with the emergency at hand.
- c. The operator did not ensure that the flight crew was adequately trained to respond to an emergency that resulted in the aircraft being ditched. Lack of proper ditching training and a PIC who cannot swim, led to a very ineffective pilot response to this type of emergency (in water).

#### 2.2 APPRECIATION OF THE EMERGENCY LANDING AREA:

The emergency landing area was in the Caribbean Sea at a distance of 200-300 feet to the northeast of the main shoreline located directly in front of the runway 07 at Placencia Airport. (See Figure 1 – Google Earth Map 1). The depth of water did not exceed 25 feet of salt water.



### **PART 3 CONCLUSIONS AND CONTRIBUTING FACTORS**

3.00 CONCLUSION(S): This accident is the result of an accumulation of failures in the areas of road traffic management and operator standard operating procedures, and a lack of implementation of aviation industry best practices.

**3.01 CONTRIBUTING FACTORS:** The following are factors that are derived from the failures in the areas mentioned in section 3.00 (conclusions):

- a. There is a lack of traffic surveillance to ensure that drivers comply with the warning signs of low flying aircraft and do not breach the barriers when they are down or inoperative. The left barrier at Placencia was reportedly inoperative and the right barrier was said to be working. As a result, this removed a significant level of protection for vehicles which operate on the portion of the road which intersects the departure path of aircraft. The purpose of the barriers is to protect vehicles from coming in close contact with low flying aircraft. The driver of the vehicle failed to adhere to traffic warning signs regarding low flying aircraft and drove his vehicle directly into the departure path of an aircraft (Probable cause).
- b. ADAS data calculations showed that the pilot had a period of 13.33 seconds when he achieved take off performance, but he did not rotate the aircraft. Although the aircraft engine performance was normal, the actual take-off weight was within limits and the distance available to the pilot to abort the take-off was 872 feet; the pilot still flew the aircraft at a dangerously low altitude over the road and did not properly assess the risk at hand which was a vehicle advancing into the aircraft's departure path which could cause a collision. (Probable cause).
- c. The angle at which the aircraft made contact with the vehicle was not a direct head on angle, but the contact was made when the vehicle was off to the right-hand side of the extended centerline of runway 07. The aircraft did not follow the direct path of the extended center line of runway 07 prior to making contact, but instead it made a slight right turn shortly after the wheels left the ground. The pilot did not take collision avoidance (evasive) measures in a timely manner (probable cause).
- d. The pilot did not demonstrate adequate knowledge of proper ditching procedures which led to an inadequate response to the emergency at hand. The operator did not provide the flight crew with the proper ditching training.

#### **3.02 PROBABLE CAUSES:**

1. The driver of the vehicle failed to adhere to traffic warning signs regarding low flying aircraft and drove his vehicle directly into the departure path of an aircraft.
2. The pilot flew the aircraft at a dangerously low altitude over the road and did not properly assess the risk at hand which was a vehicle advancing into the aircraft's departure path which could cause a collision.
3. The pilot did not take collision avoidance (evasive) measures in a timely manner.



## **PART 4 – SAFETY RECCOMENDATIONS**

### 4.00 SAFETY RECOMMENDATIONS:

#### All Aircraft operators

- a) All operators who operate any type of aircraft in Belize into small uncontrolled aerodromes where landings and take offs take place over water, must ensure that all flight crew are competent enough and prepared to deal with emergencies involving ditching. BDCA must confirm that this is done by all operators including revision of records and approval of training.

#### Civil Aviation Department

- b) The Department of Civil Aviation should apply the relevant fines against the pilot and the operator, in accordance with BCAR 13, for the pilot's outright refusal to take the mandatory drug and alcohol test when so informed by the BDCA Inspector.
- c) The BDCA inspectorate should immediately start to conduct random checks for the quick access and serviceability (opening and deploying) of life preservers (jackets) for all aircraft that operate overwater.
- d) BAA and all local operators should update and test their aircraft emergency response plan and shall include therein, provisions for water rescue at aerodromes where landing and take-offs are conducted over a body of water (regardless of the size). The BDCA must verify that a copy of this plan is available at all stations and ensure the plan has been updated and include water rescue procedures. Coordination must also be done with the National Emergency Management Organization (NEMO) and the local village councils. These plans must also be tested and the BDCA shall be represented at these mock exercises.

#### Transport Department

- e) The Ministry of Transport should revise its traffic fining system for offences relating to violations around Placencia airport with a view of increasing fine amounts and implementing continuous surveillance.

#### **Long term recommendations**

#### **Belize Airports Authority**

- f) A study should be done to determine the feasibility of displacing the end of runway 07 by at least 1,000 feet to the west and extending the beginning of runway 07 to the west by at least 1,000 feet or a study should be done to determine the feasibility of rehabilitating the runway at Riversdale to allow for constantly increasing local operations.



## Section 5.00 Annexes

### **LIST OF ANNEXES, FIGURES AND TABLES ATTACHED**

- Annex A: Certificate of Airworthiness, Certificate of Registration of the aircraft.
- Annex B: Passenger Manifest front and back pages
- Annex C: Passenger Seating and Actual Weights
- Annex D: Aircraft calculated ground roll distance
- Annex E: Summary of the engine factual data report of engine teardown
- Annex F: Airworthiness report including aircraft and vehicle damages
- Annex G: ADAS box data showing aircraft performance
- FIGURE 1: Google Earth Map 1- Impact point & final resting position (page 9)
- FIGURE 2: Google Earth Map 2 – V3-HGX/ SUV Impact Area (page 10)
- FIGURE 3: Photo of Vehicle after impact on Placencia Road (page 10)
- TABLE 1: Injury to persons (page 11)
- FIGURE 4: Aircraft damage (page 11)
- TABLE 2: Summary of aircraft inspection and repairs for last eleven (11) months (page 14-15)
- FIGURE 5: Google Earth Map 1- Map of the accident site (page 16)



Belize DEPARTMENT OF CIVIL AVIATION Standard Certificate of Airworthiness		
1. Nationality and Registration Marks <b>V3-HGX</b>	2. Manufacturer and Model <b>CESSNA AIRCRAFT CO. C-208B</b>	3. Aircraft Serial Number <b>208B1162</b>
4. Category <b>NORMAL (PASSENGER)</b>	5. Type Certificate No. <b>A37CE</b>	
6. This Certificate of Airworthiness is issued pursuant to the Convention on International Civil Aviation dated 7 <sup>th</sup> December 1944, the Belize Civil Aviation Act and the Belize Civil Aviation Regulations (BCARs) in respect of the above mentioned aircraft which has been inspected and found to conform to the Type Certificate, therefore, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation. This Certificate must remain onboard the aircraft.		
7. Date of Issue <b>JANUARY 15, 2010</b>	8. Name and Signature  <b>(J. A. CONTRERAS)</b> DIRECTOR BELIZE DEPARTMENT OF CIVIL AVIATION	9. BDCA Stamp Register Office of Civil Aviation Belize
10. BDCA File Register No. <b>G/209</b>		11. MTOW: <b>9,062 LBS</b>

Revision: Original Form BDCA1040

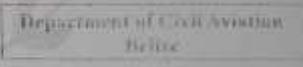
  

12. Period of Validity This Certificate is valid for the period(s) shown below	Signature, Official Stamp and Date
From: 15.01.2010 To: 31.07.2010	
From: 01.08.2010 To: 31.07.2011	
From: 01.08.2011 To: 31.08.2011	
From: 01.09.2011 To: 31.07.2012	
From: 01.08.2012 To: 31.07.2013	
From: 01.08.2013 To: 31.07.2014	
From: 01.08.2014 To: 31.07.2019	

Revision: Original BDCA Form 1040

**Annex A: Aircraft Airworthiness Certificate**



 <b>BELIZE</b> <b>DEPARTMENT OF CIVIL AVIATION</b> <b>Certificate of Registration</b>			
1. Nationality and Registration Marks <b>V3-HGX</b>	2. Manufacturer and Model <b>CESSNA AIRCRAFT CO. C-208B</b>	3. Aircraft Serial Number <b>208B1162</b>	This Certificate must remain onboard the aircraft when operating.
4. Name of Owner: <b>TROPIC AIR LIMITED (CHARTERER BY DEMISE)</b>			
5. Address of Owner: <b>P.O. BOX 20, SAN PEDRO TOWN, AMBERGRIS CAYE, BELIZE</b>			
6. It is hereby certified that the above described aircraft has been duly entered in the Belize Civil Aircraft Register in accordance with the Convention on International Civil Aviation dated December 7 <sup>th</sup> , 1944, the Belize Civil Aviation Act and the Belize Civil Aviation Regulations.(BCARs)			
7. Date of Issue <b>JANUARY 15, 2010</b>	8. Name and Signature  <b>(J. A. CONTRERAS)</b> DIRECTOR BELIZE DEPARTMENT OF CIVIL AVIATION		9. BDCA Stamp 
10. BDCA File Register No: <b>G/209</b>			<b>MTOW: 9,062 LBS</b>

Revision: Original Form BDCA 1055

**Annex A (Cont...): Aircraft Certificate of Registration**



PASSENGER MANIFEST Page 1 of 1



**TROPIC AIR**  
THE AIRLINES OF BELIZE - TROPICAIR.COM  
P.O. Box 38, Commerce Drive, San Pedro Town, Belize

**PASSENGER MANIFEST**

FLIGHT DATE	17NOV2017 CAPTAIN		
FLIGHT	9N3073 FIRST OFFICER		
ORIGIN	PLJ STD	0655 ETD	0655 EXTRA CREW
DESTINATION	PND STA	0910 ETA	0910 FLT ATTENDANT
AIRCRAFT	V3-HGX FLT OBS		
AIRCRAFT TYPE	Cessna 208B FLT MECH		
FLT ROUTE	PLJ-PND		

PASSENGER NAME	ORIGIN	DEST	GEN	CAB	SEC	SEAT	PAX WE lb	BAGGAGE PCS	BAGGAGE WT lb	LOCATOR	SSR
1. ACOSTA/AMANDAMS	TZA	PND	F	Y	3	FREE	149	0	0.00	003UK7	DOCS
2. AUDINET/DARRELMR	DGA	PND	M	Y	1	FREE	189	0	0.00	003U7P	DOCS
3. CUELLO/SANDRAMRS	TZA	PND	F	Y	5	FREE	149	0	0.00	003UL4	DOCS
4. FABER/PATRICKMR	TZA	PND	M	Y	8	FREE	189	0	0.00	003V29	DOCS
5. HULSE/GODWINMR	TZA	PND	M	Y	2	FREE	199	0	0.00	003U7D	DOCS
6. MASTRY/CRISTYMR	TZA	PND	F	Y	1	FREE	149	0	0.00	003UL2	DOCS
7. MONTALVO/MIZRAIMR	TZA	PND	M	Y	5	FREE	189	0	0.00	003V2W	DOCS
8. PASTOR/DITROYMR	DGA	PND	M	Y	2	FREE	189	0	0.00	003V8N	DOCS
9. ROBINSON/JULIEMS	TZA	PND	F	Y	7	FREE	149	0	0.00	003UJT	DOCS

FINAL DESTINATION: PND PASSENGERS: 9

TOTAL (Excluding Flight Crew): 9 Pax, 1541.00 Carga+Pax+Baggage

CARGO: 0.00

MALE 5 FEMALE 4 CHILD 0 INFANT 0

REASON FOR DELAY	NOTES

CERTIFIED CORRECTED BY (DEPARTURE LEAD) \_\_\_\_\_ ACCEPTED BY (PILOT-IN-COMMAND) \_\_\_\_\_

<https://smartclient-latam.ttinteractive.com/Zenith/BackOffice/TropicAir/en-GB/Manifest/...> 11/17/2017

**Annex B: Passenger Manifest Front Page**



**Tropic Air Limited  
Weight & Balance Sheet**

Date:  A/C Reg No:  A/C Type:  A/C Config:

Occupants:  +  =  Flight No:  From:  To:  Comments:

Alternate:  PIC:  SIC:

---

Weight (lbs)	FMG Limit (kg)	AFT Limit (kg)	Fuel Onboard (M - lbs)
Empty Weight: 8151	102.2		900
Payload: 1820			
Zero Fuel: 9971	197.0	198.8	204.4
(Max 9062 lbs)	2105 lbs Under Load		
Fuel: 900			
Ramp: 7257			
(Max 9067 lbs)			
Taxi Fuel: 20			
Take-Off: 7277	191.8	198.8	204.4
(Max 9062 lbs)	1325 lbs Under Load		
Trip Fuel: 130			
Landing: 7407	191.4	198.2	204.4
(Max 8902 lbs)	1263 lbs Under Load		

Fuselage Stations (M - lbs)			
PNC	125	189	30
2A	0	149	2
3A	168	188	149
4A	149	189	40
5A	0	148	30
6A	0	188	0

Cargo Fuel			
A	0		
B	300		
C	0		
D	0		

Weight / 100 lbs

Longitudinal CG (in)

I certify the aircraft weight and center of gravity are within AFM limits.

Prepared By:  PIC Signature:

Load Supervisor:

Select Keyboard to type or Autograph to write in the selected textbox.

**Annex B (cont...) Passenger Manifest back page**



**Annex C: Passenger seating configuration and actual weights.**

- Note: All passengers were interviewed to confirm their actual seating position on the day of the accident and to confirm their actual weight.



#### **Annex D: Aircraft calculated ground roll distance**

- Note: This graphic shows the calculated take off distance of the aircraft calculated using the actual weights and actual meteorological conditions that existed on the day of the accident. It shows the distances that should have been attained by the aircraft and the calculated altitudes that the aircraft should have attained at various points of the take off climb.



### **Annex E: Summary of engine teardown by Pratt and Whitney Canada**

The following is a summary of the engine teardown inspection done at the Manufacturer facility.

The engine manufacturer, Pratt & Whitney Canada, examined the engine under the supervision of an investigator from the Transportation Safety Board of Canada who acted as the accredited representative for the country of Belize (State of occurrence).

- The engine was covered with salt deposits. The compressor and power rotors did not rotate. The reduction gearbox housing was perforated at 1 and 9 o'clock positions due to Corrosion. There was no damaged observed to the exhaust duct and gas generator case except spot corrosion. The AGB housing surfaces showed paint flaking, pitting holes and flanges thinning due to corrosion. In addition, the housing was perforated at 1, 5 and 6 o'clock positions due to corrosion.
- There was no metal particle debris observed on the chip detectors. The P3 air filter had water contamination and salt deposits and the oil filter showed normal coloration and water contamination.
- On the compressor section, there was salt deposits and no damage observed. The No.1 & No. 2 bearing had no rotation due to salt deposits.
- Dents were observed on the 1<sup>st</sup> stage rotor air foils leading edge. The stator and shroud, spacers and impellers were covered with salt deposit and no damage observed.
- On the combustion section, the liners were covered with salt and had corrosion. The large and small exit ducts were also covered with salt with no damage observed.
- The power turbine section was also covered with salt deposits.
- The front and rear reduction gear boxes were mostly destroyed due to corrosion. No damages were observed.
- The fuel control unit was not tested and was covered with salt. It was disassembled and salt deposits were observed internally. The bellows were tested, and no leaks were found.
- The fuel oil heater was covered with salt and no damage was observed. No test was performed.
- Propeller governor and propeller over speed governor were covered with salt. No test performed.
- The overall inspection on the engine shows that it had saltwater contamination with no other form of damage observed.



## **ANNEX F – Airworthiness report including damages to the aircraft**

On November 17, 2017 at about 9:30 am the Belize Department of Civil Aviation received a call that a Tropic Air airplane was involved in an accident at the Palencia Airstrip.

BDCA Operations and airworthiness inspectors Mr. Charles Meighan and Mr. Deon Anthony boarded a Tropic Air aircraft from the Philip Goldson International Airport to the Placencia Airstrip at 10:00 am. They reported that upon arrival at about 10:30 am at the Placencia Airstrip they observed a SUBARU FORESTER vehicle with license plate SC C-12483 parked in the middle of the main road. About 28 ft from the end of the run way, also was a Tropic Air aircraft with registration mark V3-HGX submerged in the Caribbean Sea at about Two hundred and fifty feet (250') from the end of the runway 07.

Further investigation revealed that the aircraft was airborne and was approximately twenty-eight feet from the end of the runway at an altitude of four (4) to five (5) feet when the right hand main wheel made contact with the left-hand side of the vehicle as shown below. The aircraft lost its engine shortly after and crashed in the Caribbean Sea.



**Damages to Aircraft and vehicle** The windshield and roof of the vehicle were extensively damaged as a result of the impact of the aircraft as shown below.

1. The aircraft was extensively damaged due to the impact from crash landing in the Caribbean Sea as shown in the picture below.
2. The aircraft was removed from the sea and the engine was removed from the airframe for further investigation.





SNO683 FlightData.log.xlsx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Time Actual	Time Value	Engine ITT	OAT	AC Hour Mel	Internal Boar	Static Press	Engine Ng	Engine Np	Engine Wt	Airspeed	Altitude	Aircraft Bus	Internal Batt	Engine Torque	Cont
3602	11/17/2017 08:45:56.78	1510926357	731.231	32.968	0	51.104	29.997	97.13	1876.5881	449.794	62.712	-61.401	27.935	2.995	1799.845	
3603	11/17/2017 08:45:57.27	1510926357	731.414	33.106	0	51.124	29.997	97.13	1872.48	449.93	63.925	-57.636	27.942	2.995	1793.441	
3604	11/17/2017 08:45:57.76	1510926358	731.774	33.021	0	51.084	29.997	97.114	1872.953	451.053	64.834	-57.636	27.942	2.995	1795.638	
3605	11/17/2017 08:45:58.25	1510926358	731.5	32.991	0	51.024	29.994	97.13	1871.0601	450.448	66.75	-55.754	27.936	2.995	1797.037	
3606	11/17/2017 08:45:58.74	1510926359	731.402	33.079	0	51.064	29.999	97.136	1871.869	449.827	66.75	-55.754	27.917	2.995	1797.551	
3607	11/17/2017 08:45:59.22	1510926359	730.582	33.116	0	51.124	29.999	97.122	1873.267	449.892	68.382	-55.754	27.918	2.995	1800.291	
3608	11/17/2017 08:45:59.71	1510926360	729.829	33.11	0	51.124	29.994	97.138	1873.425	449.052	69.437	-55.754	27.92	2.995	1800.8331	
3609	11/17/2017 08:46:00.20	1510926360	728.668	33.167	0	51.124	29.994	97.138	1870.903	449.897	70.512	-57.636	27.911	2.995	1800.8331	
3610	11/17/2017 08:46:00.69	1510926361	731.151	33.002	0	51.064	29.997	97.13	1871.5341	450.060	70.75	-57.636	27.904	2.995	1800.875	
3611	11/17/2017 08:46:01.18	1510926361	731.714	32.888	0	51.004	29.999	97.146	1871.848	449.562	71.587	-55.754	27.908	2.995	1797.298	
3612	11/17/2017 08:46:01.67	1510926362	730.749	32.896	0	51.084	29.999	97.146	1873.118	449.816	71.895	-53.871	27.92	2.995	1794.488	
3613	11/17/2017 08:46:02.16	1510926362	727.409	32.959	0	51.144	29.991	97.098	1875.799	455.666	72.393	-53.871	27.911	2.995	1788.356	
3614	11/17/2017 08:46:02.64	1510926363	674.689	33.038	0	51.164	29.986	92.968	1823.340	467.29	73.199	-53.871	27.916	2.995	1570.817	
3615	11/17/2017 08:46:03.13	1510926363	836.252	33.021	0	51.164	29.986	84.893	1760.8871	208.788	74.274	-53.871	27.898	2.995	1002.842	
3616	11/17/2017 08:46:03.62	1510926364	834.706	33.080	0	51.184	29.978	81.373	1837.402	209.232	74.811	-51.880	27.897	2.995	1036.323	
3617	11/17/2017 08:46:04.11	1510926364	638.072	33.152	0	51.204	29.973	80.784	1878.240	220.024	75.348	-48.223	27.86	2.995	769.031	
3618	11/17/2017 08:46:04.60	1510926365	601.851	33.159	0	51.184	29.970	78.079	1857.86	167.65	74.811	-46.341	27.833	2.996	494.882	
3619	11/17/2017 08:46:05.09	1510926365	571.275	33.173	0	51.084	29.978	73.483	1796.934	139.432	73.736	-44.450	27.774	2.995	385.74	
3620	11/17/2017 08:46:05.58	1510926366	552.167	33.03	0	51.124	29.976	86.476	1862.54	0	72.124	-38.81	27.732	2.995	298.268	
3621	11/17/2017 08:46:06.06	1510926366	540.06	32.854	0	51.124	29.976	83.294	1597.465	0	71.855	-42.576	27.652	2.995	223.09	
3622	11/17/2017 08:46:06.55	1510926367	501.638	32.968	0	51.124	29.976	56.23	1491.307	0	71.049	-36.928	27.522	2.995	133.527	
3623	11/17/2017 08:46:07.04	1510926367	470.282	32.868	0	51.124	29.983	47.635	1408.04	0	70.78	-31.28	27.205	2.995	74.446	
3624	11/17/2017 08:46:07.53	1510926368	427.418	33.07	0	51.124	29.955	42.015	1279.8	0	70.243	-27.515	26.872	2.995	40.882	
3625	11/17/2017 08:46:08.02	1510926368	421.897	33.111	0	51.204	29.945	38.23	1105.394	0	71.318	-21.867	26.497	2.995	30.264	

**ANNEX G – ADAS box data showing aircraft performance values**

Color Legend:

**Blue** – Aircraft performance data during the event which shows aircraft performance at 66 kts to 73 kts for 13.33 seconds. 66 Kts is the airspeed that allow the aircraft to be rotated for takeoff.

**Turquoise**: Engine ITT parameters

**Orange**: OAT

**Yellow**: airspeed values

Olive green: altitude

**Green**: Engine torque values

-END-