

AAID# AO18-000009



NASSAU, N. P., BAHAMAS

AIRCRAFT ACCIDENT REPORT

LOSS OF CONTROL INFLIGHT AND IMPACT WITH TERRAIN

CESSNA 421B

N421MM

ROCKSOUND, ELEUTHERA,
BAHAMAS

5th June, 2018



The Air Accident Investigation Department (AAID)

The Air Accident Investigation Department (AAID) is the independent accident investigation department under the Bahamas Ministry of Tourism and Aviation (MOTA) charged with the responsibility of investigating all aviation accidents and incidents in the Bahamas.

The AAID's function is to promote and improve safety and public confidence in the aviation industry through excellence in:

- Independent investigation of aviation accidents and other safety occurrences
- Safety data recording, analysis and research
- Fostering safety awareness, knowledge and action.

The AAID does not investigate for the purpose of apportioning blame or to provide a means for determining liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the AAID endeavors to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

The AAID performs its functions in accordance with the provisions of the Bahamas Civil Aviation Act 2016, Civil Aviation (Investigations of Air Accidents and Incidents) Regulations and Amendment Regulations 2017, International Civil Aviation Organization (ICAO) Annex 13 (Eleventh edition, July 2016) and, where applicable, relevant international agreements.

The Air Accident Investigation Department is mandated by the Ministry of Tourism and Aviation to investigate air transportation accidents and incidents, determine probable causes of accidents and incidents, issue safety recommendations, study transportation safety issues and evaluate the safety effectiveness of agencies and stakeholders involved in air transportation. The objective of a safety investigation is to identify and reduce safety-related risk. AAID investigations determine and communicate the safety factors related to the transport safety matter being investigated.

The AAID makes public its findings and recommendations through accident reports, safety studies, special investigation reports, safety recommendations and safety alerts. Unless otherwise indicated, recommendations in this report are addressed to the regulatory authorities of the State having responsibility for the matters with which the recommendation is concerned. It is for those authorities to decide what action is taken. When the AAID issues a safety recommendation, the person, organization or agency is required to provide a written response without delay. The response shall indicate whether the person, organization or agency accepts the recommendation, any reasons for not accepting part or all of the recommendation(s), and details of any proposed safety action(s) resulting from the recommendation(s) issued.

Official Copies of accident reports can be obtained by contacting:

Air Accident Investigation Department
2nd Floor, Manx Corporate Center
#45 West Bay Street
P. O. Box CB-11702
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Tel: 1 (242) 397-5513 / 5509 / 5520 / 5514 / 5525
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Additional copies of the reports can be viewed on the AAID's website at: <http://www.baaid.org> or requested by email: baaid@bahamas.gov.bs.

**AIR ACCIDENT
INVESTIGATION DEPARTMENT
MINISTRY OF TOURISM AND AVIATION
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#45 WEST BAY STREET
NASSAU N. P., BAHAMAS**

AIRCRAFT ACCIDENT REPORT



C421B N421MM

Loss of Control Inflight and Impact with Terrain Rock Sound, Eleuthera, Bahamas June 5, 2018

Abstract:

This report explains the accident which occurred on 5th June 2018 at approximately 3:45pm local, involving a Cessna 421B aircraft which lost control and crashed shortly after takeoff from the Rocksound Int'l Airport, Rocksound, Eleuthera, Bahamas. The pilot and 2 passengers were killed.

This investigation was done in accordance with Annex 13 to the Convention on International Civil Aviation. The investigation is intended neither to apportion blame, nor to assess individual or collective liability. Its sole objective is to draw lessons from the occurrence which may help to prevent future accidents. **Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous conclusions.**

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EXECUTIVE SUMMARY

On 5th June, 2018 at approximately 3:45pm local, a Cessna 421B aircraft crashed in dense bushes shortly after takeoff from Runway 27 at Rocksound Int'l Airport in Rocksound, Eleuthera, Bahamas. The crash site was located approximately 2,503 feet / .41 nautical mile (nm) north of the threshold of Runway 09 and 8,588 feet / 1.42 nm from threshold of runway 27. The pilot and 2 passengers were killed and the aircraft was destroyed by impact forces and a post-crash fire. The ill-fated flight departed Rocksound Int'l Airport with intended destination of Ft. Pierce Int'l Airport, in Ft. Pierce, Florida, USA. The airplane was operated under the provisions of USA 14 Code of Federal Regulations, Part 91 as a private aircraft. At the time of the accident, visual meteorological conditions prevailed.

The Air Accident Investigation Department has determined the probable cause of this accident to be the failure of the pilot to maintain control of the aircraft. Analysis conducted uncovered that the aircraft was not producing required takeoff power at the time of the crash. However, there were no pre-existing conditions that prevented the aircraft engines from operating normally at full power. Additional evidence or clues that may have led the investigation team to a better understanding of what may have aided or definitively resulted in the crash, were destroyed in the post-impact fire.

Findings with respect to this aircraft operation, the aerodrome operations and crash and rescue personnel have been uncovered and recommendations were made to the relevant authorities with a view to being addressed and corrected. Recommendations while not relative to the aircraft and crash itself, were made concerning crash and rescue equipment, and were addressed to the Minister of Tourism and Aviation, required personnel recommendations were addressed to the Airport Authority and aerodrome oversight recommendations were addressed to the Bahamas Civil Aviation Authority.

AAID investigators travelled in support of this investigation and used data obtained from various sources to prepare this aircraft accident report. This report contains facts, which have been established up to the time of publication. Information is published to inform the aviation industry and the public of the circumstances surrounding this accident.

**AIR ACCIDENT
INVESTIGATION DEPARTMENT**

TITLE

Registered Owner: Hat Investments LLC

Manufacturer: Cessna

Aircraft Type: 421B

Nationality: United States of America

Registration: N421MM

Place of Accident: Approx. 0.41 nm /2,503 feet north of threshold of runway 09, Rocksound Eleuthera

Date and Time: June 5, 2018 approximately 3:45pm

Notification: BCAA, NTSB, FAA, ICAO

Investigating Authority: Air Accident Investigation Department,
Ministry of Tourism and Aviation

Investigator in Charge: Mr. Delvin R. Major

Accredited Representatives: Mr. Robert Gretz (NTSB)
Charles McKinley (FAA)

Technical Advisors: Chris Lang – Continental Motors
Andrew Hall – Textron Aviation

Releasing Authority: Air Accident Investigation Department

Date of Draft Final Report Publication: February 8, 2019

Date of Final Report: April 8, 2019

ABBREVIATIONS & DEFINITIONS

When the following terms are used in this report, they have the following meanings:

AAID	Air Accident Investigation Department	— direct exposure to jet blast, 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
ATS	Air Traffic Services	
CAGR	Bahamas Civil Aviation General Regulations	
BCAA	Bahamas Civil Aviation Authority	b) the aircraft sustains damage or structural failure which:
EST	Eastern Standard Time (-5 hours to convert from UTC)	— adversely affects the structural strength, performance or flight characteristics of the aircraft, and
FAA	Federal Aviation Administration (USA)	— 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
ICAO	International Civil Aviation Organization	
IMC	Instrument Meteorological Condition	
IFR	Instrument Flight Rules	
KIAS	Knots Indicated Airspeed	c) the aircraft is missing or is completely inaccessible.
LPIA	Lynden Pindling Int'l Airport	Note 1. — For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.
MET	Meteorological Office / Department	Note 2. — An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.
METAR	Weather Report furnished by Meteorological Department	
NM or nm	Nautical Miles	
NTSB	National Transportation Safety Board (USA)	
VFR	Visual Flight Rules	
VMC	Visual Meteorological Conditions	
UTC / Z	Universal Coordinated Time / Zulu time	

Definitions

When the following terms are used in the Standards and Recommended Practices for Aircraft Accident and Incident Investigation, they have the following meaning:

Accident. An occurrence associated with the operation of an aircraft that takes place between the times any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which: a) a person is fatally or seriously injured as a result of:

- being in the aircraft, or
- direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or

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.

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.

Causes - Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident.

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.

Note - Nothing in the above definition is intended to preclude the functions of an investigator-in-charge being assigned to a commission or other body.

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 the accident investigation authority of the State conducting the investigation, based on information derived from the investigation, made with the intention of preventing accidents or incidents.

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.

Note. — In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies

which can be found in Policy and Guidance Material on the Economic Regulation of International

“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.

1.0 FACTUAL INFORMATION.

1.1 HISTORY OF THE FLIGHT

On 5th June, 2018 at approximately 3:45pm local, (Eastern Daylight Time)¹, a Cessna 421B aircraft crashed in dense bushes shortly after departure from Runway 27 at Rocksound Int'l Airport, Rocksound, Eleuthera, Bahamas. The crash site was located approximately 2,503 feet / .41 nautical mile (nm) north of the threshold of Runway 09 and 8,588 feet / 1.42 nm from threshold of runway 27². The pilot and 2 passengers were killed and the aircraft was destroyed by impact forces and a post-crash fire.



Figure 1. Area map with distances

The aircraft made initial contact with trees before making contact with the ground and other trees in dense bushes. The aircraft descended right wing first, in an approximately 40 degree nose-down angle. A crater approximately 12 inches deep and 10 feet long by 5 feet wide was created when the aircraft hit the ground, subsequently crossing a dirt road, before coming to rest partially in an upward incline in trees. The nose of the aircraft came to rest on a heading of 355° degrees. The fuselage of the aircraft was located at Latitudes 24° 53' 50"N and Longitude 076° 11'33"W. A fire ensued after the crash.

The aircraft arrived at Rock Sound Airport on June 4, (the day before the fateful accident) from Marsh Harbor, Abaco, Bahamas. Due to the unavailability of fuel in Rock Sound, the aircraft was “topped off” in Marsh Harbor. The fuel tanks of this model aircraft can hold 202 gallons of useable fuel. 136.4 gallons of 100LL avgas was uploaded in the tanks to bring the

level back to full (top off) for the flight from Marsh Harbor to Rock Sound, then direct to Fort Pierce, Florida.

For a normal flight, minus any headwinds, or weather deviations, conservatively, the flight time from Marsh Harbor to Rocksound is approximately 45 minutes covering approximately 106 nautical miles.

The ill-fated flight departed Rocksound Int'l Airport with intended destination of Ft. Pierce Int'l Airport, in Ft. Pierce, Florida, USA.

The community was alerted to the possible crash when smoke was observed coming from the vicinity of the airport. An inbound aircraft was asked by airport personnel over the advisory frequency (122.80 MHz – CTAF), to fly in the direction of the smoke, to determine if an aircraft had in fact crashed and was on fire. The pilot of the inbound aircraft later confirmed there was an intense fire, in dense bushes near the runway and it is possible it could be from an aircraft.

As there are no crash and rescue vehicle available at the airport to respond, help was sought and received from the local town volunteer fire truck.



Figure 2. Aerial shot of crash site

As the aircraft crashed off-field, in a heavily wooded area not serviced by easily accessible roads, first responders and rescue personnel encountered difficulty in locating the wreckage at first.

The aircraft was finally found off a dirt road paralleling runway 09/27 approximately 0.41 miles north of the threshold of runway 09.

¹ Unless otherwise indicated, all times in this report are Eastern Daylight Time, based on a 24-hour clock.

² Measurements and map extracted from Google Earth Pro 2018

By the time first responders and rescue personnel located the site of the crash, the aircraft had been burning for some time. After the fire was brought under control, the remains of the 3 occupants were discovered. They were removed and transported to the Rand Morgue at the Princess Margaret Hospital in Nassau, Bahamas.

The aircraft was approximately 80% destroyed as a result of the post-crash fire. The occupants were severely burned. There were no eyewitnesses to the crash.

The airplane was operated under the provisions of USA 14 Code of Federal Regulations Part 91 as a private aircraft.

Visual Meteorological Conditions (VMC) prevailed at the time of the accident. Airport personnel confirmed the pilot had filed required customs and immigration documents required when departing the Bahamas. From these documents the identity and persons on board the ill-fated aircraft was established.

There is no evidence the aircraft had filed a visual flight rules³ (VFR) flight plan for its journey back to Fort Pierce.

1.2 INJURIES TO PERSONS

Injuries	Crew	Passengers	Total
Fatal	1	2	3
Serious			
Minor			
None			
TOTAL	1	2	3

1.3 DAMAGE TO AIRCRAFT

The aircraft was destroyed as a result of the impact forces and the post-impact fire.

1.4 OTHER DAMAGE

Trees and other vegetation at and surrounding the crash site were damaged and destroyed as a result of the crash and post-crash fire.

1.5 PERSONNEL INFORMATION - PIC

The male pilot in command was 41 years old; he received his pilot certifications from the Federal Aviation Administration (FAA) in the United States of America. The pilot was issued a private pilot certificate with single engine aircraft rating for land airplane on June 30, 2007. He received his multi-engine land airplane rating on his second attempt on November 7, 2007.

At the time the multi-engine rating was added to the pilot's certificate, the pilot had logged 131 hours, 73.6 of which was pilot in command.

Based on records received from the FAA, the pilot had documented 1,200 civilian hours at his last medical certificate application conducted on 16th April, 2015. However, the breakdown of hours, such as pilot in command, multi-engine, cross country, instructions etc. was not documented.

As the pilot logs were not available for review, there is no determination of how much actual hours the pilot had amassed between April 2015, (the time of his last medical), and the time of the accident in 2018.

The pilot received training in this aircraft from a certified flight instructor who flew with him and confirmed that he was qualified and knowledgeable of the aircraft and its systems before signing his authorization allowing him to fly the aircraft unsupervised.

1.6 AIRCRAFT INFORMATION

1.6.1 AIRCRAFT HISTORY.

N421MM a Cessna 421B model aircraft, serial number 421B0804 was purchased from Pittsburgh Institute of Aeronautics in the United States by new owner Hat Investment Limited on January 18, 2018.

Investigations could not determine the total hours flown on the aircraft at the time of purchase as this information was not available. Pilot log and required maintenance records for the aircraft were not available to investigators as it could not be determined who was in possession of these records. Some records were located which aided the investigators in

³ VFR - Visual flight rules (VFR) are a set of regulations under which a pilot operates an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima, i.e. in visual meteorological conditions (VMC), as specified in the rules of the relevant aviation

authority. The pilot must be able to operate the aircraft with visual reference to the ground, and by visually avoiding obstructions and other aircraft.

If the weather is below VMC, pilots are required to use instrument flight rules (IFR), and operation of the aircraft will primarily be through referencing the instruments rather than visual reference.

establishing at a minimum the last annual inspection and time on the right engine.

1.6.2 AIRCRAFT MAINTENANCE

The maintenance records that were available revealed that the last annual inspection was completed on August 4, 2017. Both engines were model GTSIO-520-H2B. The right engine serial number 607085 was overhauled on November 19, 2007. 586.9 hours had accumulated on the right engine since overhaul, with a total time documented of 2,826.9 hours.

The left engine serial number 267297R was built on November 21, 1993. The type and time of last inspection was unknown. Also unknown was the total time of the left engine or the time since overhaul. The log books for the left engine had not been located up to the time of this report.

1.6.3 AIRCRAFT GENERAL INFORMATION

N421MM was a Cessna 421B model aircraft with serial number 421B0804. It was a fixed wing, reciprocating, multi-engine aircraft, manufactured in 1974. It was registered to HAT Investments LLC of Spartanburg, South Carolina, USA. The airplane seated 7 and had a maximum gross weight of 7,450 pounds.

1.7 METEOROLOGICAL INFORMATION

METAR⁴ issued by the Nassau Meteorological Department (MET) on 5 June, 2018 at 4:00pm reported winds from 340 degrees at 7 knots. Cumulonimbus (CB) clouds were reported as few at 1,500 feet. Temperature was 30 degrees with dewpoint 23 degrees. Altimeter setting was 29.95 Mb. Distant CBs were reported south to southwest of the airport.

In the vicinity of the accident, the weather was visual meteorological conditions. Weather was not a factor in this accident.

1.8 AIDS TO NAVIGATION

Navigational Aids were not a factor in this accident.

1.9 COMMUNICATIONS

Aside from possible communications on the common traffic advisory frequency (122.8 MHz) to announce his departure, no other communication was available to the pilot. Investigations however, was unable to determine whether any communications occurred.

1.10 AERODROME INFORMATION

Rock Sound International Airport (MYER)⁵ is documented as being situated at coordinates 24°53'30.13N and 076°61'040.00W. It is located 2 miles north from the city. It caters to IFR and VFR traffic, is government owned and a port of entry. It is also a Class E airspace area extending upward from 700 feet above ground level (AGL), to 6,000 feet Above Mean Sea Level (AMSL), within a 7.3 nautical mile (NM) radius of the Rock Sound Airport.

The airport is operated from sunrise to sunset and has Bahamas customs and immigration available. No fuel is available at this airport.

The airport has 2 – 300lbs fire extinguisher available for rescue equipment purposes. There is no capacity for removal of disabled aircraft available at the airport.

The airport is served with one asphalt runway. The runway is oriented on magnetic headings 090 degrees and 270 degrees. 7,213 feet long by 150 feet wide is available for takeoff from this runway. The runway is equipped with white runway edge lighting spaced at 200 feet intervals. Taxiway lights are also available.

1.11 FLIGHT RECORDERS.

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder. Neither recorder is required by Aviation Regulations for this aircraft type.

1.12 WRECKAGE AND IMPACT INFORMATION

The debris field was located approximately 2,503 feet / .41 nautical mile (nm) north of the threshold of Runway 09 and 8,588 feet / 1.42 nm from

⁴ METAR is a format for reporting weather information. A METAR weather report is predominantly used by pilots in fulfillment of a part of a pre-flight weather briefing, and by meteorologists, who use aggregated METAR information to assist in weather forecasting.

⁵ Airport information published in the AIP, the Bahamas, Amendment 01, May 26, 2016.

threshold of runway 27. The coordinates of the fuselage was located at Latitudes 24° 53' 50"N and Longitude 076° 11' 33"W.

The debris field was confined to an area approximately 150 feet long by 50 feet wide. The fire consumed brush and trees in the immediate and surrounding area of the crash.

The energy path through the trees was measured at 355° magnetic. The aircraft forward of the aft pressure bulkhead was significantly damaged by the post-impact fire. Both wings exhibited impact and fire damage.

All components and parts of the aircraft accompanied it and though destroyed by the post-impact fire, they were accounted for as having arrived at the crash site. The right wing was the first to make contact with trees, followed by the right fuselage which then impacted the ground and created a crater approximately 12 inches deep and 10 feet long by 5 feet wide. The aircraft travelled approximately 50 feet from the initial point of contact with the ground, coming to rest in an upward incline in trees.

From all indications and signature marking at the site, it appeared the aircraft impacted the trees vertically (approximately 90 degrees, wing over wing) in an approximate 40 degree nose down, right wing low attitude.



Figure 3. Recreation

A post-crash fire resulted which destroyed approximately 80% of the aircraft.

During the onsite investigation, flight control cable continuity was partially established. All of the empennage flight control surfaces were accounted for at the site.

Both ailerons were observed as melted aluminum and their wing bellcranks were observed with cables attached.

The flap actuator was observed melted and the chains were observed separated from the sprockets.

The elevator trim tab hardware was observed installed with a cotter pin. All of the cockpit controls were observed attached to the input devices and laying loose in the cockpit area of the burned fuselage.

Both wing fuel tip tanks were observed at the site. Both fuel selector valves were observed in the wreckage.

The left fuel selector valve was observed and determined to be in the crossfeed position and the handle was in the left tank position.

The right valve was observed melted, and the position was not able to be determined. A photograph taken while the aircraft was in the process of having an annual inspection indicates that the aircraft had complied with MEB88-3 Auxiliary Fuel Pump Wiring Modification.



Figure 4. Crash site

The cabin area was destroyed by the post-impact fire. One front seat restraint system buckle and one passenger seat buckle were observed in the latched conditioned.

The wreckage was transported to United States of America where further analysis was conducted with assistance from representatives of the manufacturers of the engine and airframe.

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

The three (3) male occupants on board the aircraft at the time of the accident were killed. Varying degree of cremation occurred to each occupant as a result of the intense post-crash fire. DNA analysis and dental records were required to positively identify each victim.

All victims' remains were found outside and forward of the fuselage of the aircraft.

Autopsies were conducted on the recovered remains of the occupants at the Rand Laboratory at the Princess Margaret Hospital in Nassau, Bahamas. Based on the extent of fire damage to the remains, it could not be determined whether fatalities resulted from the crash itself or the post-crash fire.

A forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aeromedical Institute in Oklahoma City, Oklahoma, USA on the samples of the pilot. The report indicated;

- no drugs detected in Liver
- No Ethanol detected in Brain
- Carbon Monoxide – Not Performed
- Cyanide – Not Performed

1.14 FIRE

An intensive post-crash fire destroyed approximately 80% of the aircraft. Approximately 70% of each occupant was cremated as a result of the fire.

The fire also destroyed vegetation and trees in the immediate and surrounding areas of the crash. Evidence or clues that could have led the investigation team to a better understanding of what may have aided or definitively caused the crash, were destroyed in the post-impact fire.

1.15 SURVIVAL ASPECTS

The accident was not survivable due to the high speed, high angle impact with trees and the terrain and the intensity of the post-crash fire.

All occupants were ejected from the aircraft and found forward of where the aircraft came to rest.

Safety belt restraints were unable to restrain the occupants within the fuselage of the aircraft, due to the angle and force of the impact.

1.16 TESTS AND RESEARCH

The recovered airframe of the aircraft was transported to a facility in the United States where documentation and further analysis was conducted by representatives of Textron Aviation (aircraft manufacturer), Continental Motors Inc. (engine manufacturer), as well as the AAID.

Onsite examination of both engines revealed that they were both fire damaged. No evidence of any pre-impact fire was found on the remaining structures of the aircraft.

Both propellers were observed separated from the engines. All three right propeller blades were observed separated from the hub. The left propeller blades remained in the hub. One blade was observed melted with approximately 12 inches of the butt end of the blade remaining. One blade was observed twisted 180° in the hub with the flat side of the blade facing

forward. Approximated 2/3 of the third blade was observed in the hub with the outboard 1/3 melted. Minor leading-edge damage was observed on the three left propeller blades.

Both propellers exhibited signs that the propellers were in the low pitch position at the time of the accident.

The spark plugs were observed with normal wear; however, several spark plugs were observed with corrosion from post impact exposure to moisture.

Both turbochargers had the compressor scroll removed and no sign of rotation were observed on either unit. Neither the left nor the right engines were able to be rotated. Both engines were partially disassembled; engine continuity was established for both engines.

The left and right engines were recovered and transported to Continental Motors Inc. in Mobile Alabama for examination and analysis which occurred from 08-13-18 through 08-16-18. Both manufacturer of the engine, aircraft and AAID participated in the analysis.

The **left engine** exhibited impact and thermal damage. Several of the accessories had separated from their mounts and were located in the shipping crate. The propeller flange had fractured off of the propeller shaft and was not in the shipping crate. The number 5 cylinder head exhibited impact damage and material was missing. The number 5 cylinder head was pushed aft into the number 3 cylinder. The induction system was damaged. The exhaust system exhibited impact damage and was crushed upward. The oil sump was crushed against the crankcase.

Internal inspection of the left engine

The left engine was placed on a stand and disassembled. Impact and thermal damage precluded testing of the engine's fuel and ignition system.

The engine driven fuel pump exhibited severe thermal damage. The fuel pump was partially disassembled and the vanes and rotor were intact. The throttle body/mixture control exhibited impact damage.

The throttle body was partially melted. The mixture control arms did not move freely by hand and the fuel screen exhibited some thermal debris. The fuel manifold valve exhibited impact and thermal damage. About half of the fuel manifold valve cover was missing. The diaphragm appeared to have been burnt away.

The magnetos had fractured from their mounts and remained partially attached to the engine by the

ignition harness. The magnetos were disassembled and the internal components exhibited thermal damage. The ignition harness was thermally damaged.

The engine core was disassembled and continuity throughout the crankshaft and camshaft was observed. No pre-impact anomalies were noted.

The **right engine** and engine accessories exhibited severe thermal damage. Several accessories and components had been separated from the engine and were located loose in the shipping container.

The oil sump was crushed upward into the bottom of the crankcase. The turbo charger and components were separated from the engine and in the bottom of the shipping container.

Internal inspection of the right engine

The engine was placed on a stand and disassembled. All of the engine accessories were thermally damaged which prevented functional testing. The engine accessories were examined and disassembled. Several pistons exhibited thermal damage with portions of the cylinder skirts missing.

The number 3 and 4 piston pins were frozen in the piston preventing removal. Using a plasma cutter, holes were cut in the crankcase above the number 3 and 4 journals to remove the pistons and connecting rods. No pre-impact or pre-fire damage was noted to the engine core or its components.

Both engines were subjected to impact damage and intense thermal damage from the impact and post-

accident fire. Analysis did not reveal evidence of any preexisting failures or conditions that would have prevented normal engine operation and production of required horsepower.

1.17 REGULATORY OVERSIGHT

As this aircraft was operated under Part 91 of the USA code of federal regulations, there was no requirement for oversight by the Bahamas regulatory authorities as it was a private aircraft visiting and not domiciled in the Bahamas.

1.18 ADDITIONAL INFORMATION

Parties to the investigation included the National Transportation Safety Board, the Federal Aviation Administration, Textron Aviation and Continental Motors Inc.

As a result of the investigation of this accident, while safety recommendations directly related to the aircraft or its operations were not made, other safety concerns were observed that required attention.

Those safety concerns were addressed to the relevant authorities for corrective action and have not been included in this report.

2.0 ANALYSIS

1. The aircraft was certified and equipped in accordance with FAA requirements and regulations.
2. Evidence or clues that could have led the investigation team to a better understanding of what may have aided or definitively caused the crash, were destroyed in the post-impact fire.
3. Based on analysis conducted on both engines and signature marks observed on both propellers, it is evident the aircraft was not producing full required power after takeoff and up to the time of the crash, despite there being no pre-existing conditions that prevented the aircraft engines from operating normally at full power.
4. The fuel selector valve for the left engine was located in the wreckage, despite being damaged from fire and impact, the position of the valve was observed in the auxiliary tank position. This is significant as the pilot operating handbook requires the fuel selector position and valve to be on the main tank for takeoff and landing operations. The right valve was observed melted, and the position was not able to be determined.
5. During the engine analysis, no evidence of any pre-impact engine fire was found that would have contributed to the accident.

3.0 CONCLUSIONS

The Air Accident Investigation Department has determined the probable cause of this accident to be the pilot failure to maintain control of the airplane.

Circumstances contributing to the failure to maintain control undetermined. Evidence exist to demonstrate the aircraft was not producing full power at the time it loss control, the reasons for the reduced power unknown.

It could not be determined why the fuel selector was position to the auxiliary tank and not the main tank as required by manufacturer's recommendation. Critical evidence were destroyed in the post impact fire.

3.1 FINDINGS

1. The aircraft was certified and equipped in accordance with existing regulations and approved procedures.
2. The aircraft had a valid certificate of airworthiness.
3. The mass and center of gravity could not be determined.
4. The pilot held a private pilot certificate with single and multi-engine land rating.
5. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR); neither was required by regulations.
6. Post mortem examination were conducted on the pilot and passengers, DNA and dental analysis were required for victim identification.
7. The accident was not survivable due to the high speed, high angle impact with the terrain and the resulting post-impact fire.
8. The examination of both engines did not reveal evidence of any preexisting failures or conditions that would have prevented normal engine operation.
9. The engines of the aircraft were not making required power needed to sustain flight.
10. There was no evidence of airframe or system malfunction prior to the accident.
11. The left fuel selector valve was observed and determined to be in the crossfeed position and the handle was in the left tank position.
12. No evidence of any pre-impact engine fire was found during the engine analysis.
13. The pilot was qualified to operate this type aircraft. He received training and a "check out" in the aircraft prior to operating the aircraft.

4.0 SAFETY RECOMMENDATIONS

As a result of this investigation, the Air Accident Investigation Department makes the following recommendations;

No safety recommendations were made in reference to this accident as no determination as to what led to the accident has been established as critical evidence was lost due to the post impact fire.

Safety recommendations not related directly to this accident were made to the relevant authorities for corrective action as they were uncovered during the investigation of this accident.