AAID# A18-000004

Air Accident Investigation Department
of the Bahamas

NASSAU, N. P., BAHAMAS

AIRCRAFT ACCIDENT REPORT

LOSS OF CONTROL AND IMPACT WITH TERRAIN (WATER)
PIPER AZTEC PA-23-250
N62769
MASTIC POINT, ANDROS
BAHAMAS

January 17, 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 – latest revision) 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
Nassau N. P., Bahamas
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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: aaid.mota@gmail.com or baaid@bahamas.gov.bs.

AIR ACCIDENT
INVESTIGATION DEPARTMENT
MINISTRY OF TOURISM AND AVIATION
2ND FLOOR, MANX CORPORATE CENTER
#45 WEST BAY STREET
NASSAU N. P., BAHAMAS

AIRCRAFT ACCIDENT REPORT

PA23-250
N62769

Loss of Control and Impact with Water
Mastic Point, Andros, Bahamas
January 17, 2018

Abstract:
On January 17, 2018 at approximately 8:15am Eastern Standard Time (EST), a PA23-250 aircraft crashed shortly after takeoff into the Atlantic Ocean approximately 4nm southeast of the Mastic Point settlement in North Andros, Bahamas. The pilot and 5 passengers were killed as a result. The ill-fated flight originated from San Andros Int'l Airport with intended destination of Lynden Pindling International Airport, in Nassau, Bahamas. The flight operated on a visual flight rules flight plan. In the vicinity of the crash, the weather at the time was marginal visual meteorological conditions.

CONTENTS

EXECUTIVE SUMMARY

On the 17th January, 2018, the Air Accident Investigation Department (AAID) received notification of an overdue Piper Aztec aircraft with United States registration N62769. The aircraft with 6 souls on board was enroute to the Lynden Pindling International Airport, Nassau, Bahamas from the San Andros Int'l Airport, in San Andros, Andros, Bahamas.

Air Traffic Control advised that after the aircraft made contact with the ATC facility, it was radar identified and provided weather information as requested from the pilot. Shortly thereafter, the aircraft was observed reversing course as if it was heading back to San Andros Airport. The aircraft was then observed making several unusual turns to various headings while climbing and descending without ATC approval. The aircraft disappeared from the radar screen during this process. Several attempts were made to get a response from the aircraft with no success.

On the 18th January, investigators from the AAID with assistance from the Bahamas Civil Aviation Authority (BCAA) were dispatched to the scene. However, a limited amount of the aircraft wreckage and remains of the victims were recovered.

On 14th February, 2018 a local fishermen searching in the area of the crash site, found the major components and parts of the missing aircraft. However, the authorities were not alerted for several days (18 February). Once notified, recovery and salvage efforts were arranged and mobilized. On 25 February salvage efforts recovered approximately 90% of the wreckage. The wreckage was sent to the United States of America for further analysis.

The Air Accident Investigation Department has determined the probable cause of this accident to be human factors error. The pilot failed to maintain control of the aircraft, possibly as a result of spatial disorientation[1] and a lack of situational awareness which caused him to continue flight into meteorological conditions for which he was not comfortable flying.

This report is submitted pursuant to The Bahamas Civil Aviation (Investigations of Air Accident and Incident) Regulations and Amendment Regulation, (CA(IAAI)AR), 2017 and Annex 13 to the Convention on International Civil Aviation (ICAO). In accordance with referenced regulations and annex, the fundamental purpose of such investigation is to determine the circumstances and causes of these events, with a view to the preservation of life and the avoidance of similar occurrences in the future. It is not the purpose of such investigations to apportion blame or liability.

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.

[1] Spatial Disorientation, spatial unawareness is the inability of a person to correctly determine his/her body position in space. This phenomenon refers especially to aircraft pilots and underwater divers, but also can be induced in normal conditions—chemically or physically (e.g., by blindfolding).

In aviation, the term means the inability to correctly interpret aircraft attitude, altitude or airspeed, in relation to the ground or point of reference, especially after a reference point (e.g., the horizon) has been lost. Spatial disorientation is a condition in which an aircraft pilot's perception of direction does not agree with reality. While it can be brought on by disturbances or disease within the vestibular system, it is more typically a temporary condition resulting from flight into poor weather conditions with low or no visibility. Under these conditions the pilot may be deprived of an external visual horizon, which is critical to maintaining a correct sense of up and down while flying.

According to Wikipedia, "a pilot who enters such conditions will quickly lose spatial orientation if there has been no training in flying with reference to instruments. If the pilot is not proficient in the use of gyroscopic flight instruments, these errors will build up to a point that control of the aircraft is lost, usually in a steep, diving turn known as a graveyard spiral. During the entire time, leading up to and well into the maneuver, the pilot remains unaware that he is turning, believing that he is maintaining straight flight." (Disorientation, 2018) (Spatial disorientation)

AIR ACCIDENT
INVESTIGATION DEPARTMENT

TITLE

Registered Owner:	Kingdom Airways LLC
Manufacturer:	Piper
Aircraft Type:	PA23-250
Nationality:	United States of America
Registration:	N62769
Place of Accident:	4 miles Southeast of Mastic Point, Andros Bahamas
Date and Time:	January 17, 2018 approximately 8:15am (1300 UTC)
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. Todd Gunther (NTSB)
Technical Advisors:	James Childers –Lycoming Engines Damian Galbraith – Piper Aircraft Inc.
Releasing Authority:	Air Accident Investigation Department
Date of Final Report Publication:	July 31, 2018

ABBREVIATIONS & TERMINOLOGY

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

AAID	Air Accident Investigation Department
ATS	Air Traffic Services
CAGR	Bahamas Civil Aviation General Regulations
BCAA	Bahamas Civil Aviation Authority
EST	Eastern Standard Time (-5 hours to convert from UTC)
FAA	Federal Aviation Administration (USA)
ICAO	International Civil Aviation Organization
IMC	Instrument Meteorological Condition
IFR	Instrument Flight Rules
KIAS	Knots Indicated Airspeed
LPIA	Lynden Pindling Int'l Airport
MET	Meteorological Office / Department
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
— 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

b) the aircraft sustains damage or structural failure which:
— adversely affects the structural strength, performance or flight characteristics of the aircraft, and
— 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.

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.
Note 2.— An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

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 the 17th January, 2018 shortly before noon, the Air Accident Investigation Department (AAID) of the Ministry of Tourism and Aviation was notified by Nassau Air Traffic Control Center (ATC) at the Lynden Pindling International Airport (LPIA) of an overdue Piper Aztec aircraft with United States registration N62769. The aircraft with 6 souls on board was enroute to the Lynden Pindling International Airport from the San Andros Int'l Airport, in San Andros, Andros, Bahamas.

ATC advised that after the aircraft made contact with the facility at 1303UTC[2] (8:03am) on frequency 121.0, it was given the inbound transponder code[3] of 0497 for radar identification. Shortly after receiving the code and inquiring about weather in the Nassau vicinity, the target (aircraft on radar screen) after being advised of weather in the southeast and southwest quadrants of Nassau, was observed 8nm East of San Andros Airport (MYAN) heading westward at 2,000 feet and airspeed of 150 kts[4].

At 1310UTC (8:10am), the target was observed turning left, as if it was heading back to San Andros Airport. Attempts were made by ATC to verify if the pilot was returning to San Andros, however, ATC was unable to establish 2 way radio communications with the aircraft.

At 1311UTC (8:11am), the target appeared to be headed south.

At 1313UTC (8:13am), the target appeared to be orbiting at 2,700 feet and descending.

At 1315UTC (8:15), radar contact was lost as the aircraft disappeared from the radar screen in the ATC facility. Several attempts were made to get a response from the aircraft with no success. ATC enlisted the aid of another aircraft in the airspace around the time communication was lost. The aircraft was also unable to make contact with N62769. Coordinates of the last radar contact were latitude N25 00'57" and longitude W077 56'22".

ATC immediately began search and rescue efforts by contacting pilots in the airspace around the San Andros area as well as contacting the San Andros Airport and several other airports on Andros Island to verify whether the aircraft may have landed at one of the 4 airports on Andros Island. After confirmation that the aircraft was not at any of the four airports, an intensive search commenced where the United States Coast Guard, the Royal Bahamas Defense Force (RBDF) and the Bahamas Air and Sea Rescue Association (BASRA) services were all alerted to the disappearance of the aircraft.

Last know coordinates were relayed to search and rescue assets. Aircraft and local boaters in the Andros area assisted in the search and rescue mission.

Around 5:00 pm, the AAID was informed by the US embassy coast guard section that a US Coast Guard helicopter assisting in the search and rescue efforts, located a debris field in approximately 2 ft. of water, some 3-4 miles SE of Mastic Point, Andros. The US Coast Guard also confirmed that two bodies were seen floating in the debris field. The wreckage and bodies were assumed to be that of missing aircraft N62769. The winds and currents were noted as very strong and it was taking the observed bodies on a northerly direction toward the ocean, as opposed to taking them toward the shore of Andros Island.

All assets on the water were alerted to the discovery and proceeded towards the coordinates relayed. Darkness was also approaching by the time the debris field was located, thus making it difficult to continue the search into the night.

The search however, commenced at dawn on the 18th January. Also on the 18th January, investigators from the AAID with assistance from the Bahamas Civil Aviation Authority (BCAA) were dispatched to the scene.

[2] **UTC - Coordinated Universal Time** abbreviated to UTC, is the primary time standard by which the world regulates clocks and time. It is within about 1 second of mean solar time at 0° longitude; it does not observe daylight saving time. To convert from UTC to Eastern Standard Time subtract 5 hours from UTC time displayed.

[3] **Transponder codes** are four digit numbers transmitted by the transponder in an aircraft in response to a secondary surveillance radar interrogation signal to assist air traffic controllers in traffic separation. A discrete transponder code (often called a squawk code) is assigned by air traffic controllers to identify an aircraft uniquely in a flight information region (FIR). This allows easy identification of aircraft on radar.

[4] **Kts** - The **knot** is a unit of speed equal to one nautical mile (1.852 km) per hour, approximately 1.15078 mph.

Police authorities on the island advised the investigation team that recovery efforts were on going by the Royal Bahamas Defense Force (RBDF), local mariners as well as local pilots. Shortly after 10 am the investigative team was advised that the debris field was located.

Around midday, the recovery team from the RBDF returned to Mastic Point dock with some components and parts of the fuselage of the aircraft and some recovered remains of the aircraft's occupants.

Investigations commenced, however, a limited amount of debris was recovered. Major components of the aircraft required to determine whether mechanical issues may have played a role in the accident had not been recovered. The RBDF confirmed that no further searches will be conducted as there was nothing else to be recovered and the parts brought to the shore was all that was found in the debris field. Further recovery efforts were thus terminated.

Based on reports from the RBDF recovery team, it was widely believed that the remainder of the aircraft may be forever lost to the deep ocean that preceded the debris field. It was also believed that the aircraft may have crashed in the ocean well beyond where the parts were found, as no large or heavy parts such as an engine or greater portion of the wing, tail or fuselage was recovered. Signature marks on pieces of the fuselage recovered, including a portion of the wing with a small portion of the fuel tank attached, indicated the aircraft may have experienced a high angle, high speed impact with the ocean, in such a way causing the parts recovered to be dispersed and sunk where they were found.

At the time of the observation by the US Coast Guard helicopter on 17 January, the sea level was reported as approximately 2 feet where the crash occurred, however, by the next day, the tides had risen and divers reported the area where the debris was located, the water level was approximately 10 feet.

The flight was conducted at day under visual flight rules[5] (VFR). Around the time of the accident, weather reports obtained from the Meteorological Department forecasted weather conditions to be Visual Meteorological Conditions (VMC) (visibility greater than 5 miles and ceiling[6] greater than 3,000 feet above ground level (AGL)) in the central Bahamas, however, remnants of a cold front remained in the area. According to other pilots in the airspace in the vicinity of North Andros around the time of the accident, and other witnesses on the ground in Andros, "the weather was bad," conditions were not favorable for flight under Visual Flight Rules (VFR).

Instrument Flight Rules (IFR)[7] is usually required when the weather conditions, visibility and cloud coverage, are lower than that required for VFR flying. The flight categories chart [8] below depicts the categories of flight conditions.

As the residents of North Andros are a close-knit community, they provided information to the investigation team on the condition of anonymity. They concluded that the pilot was a good pilot and he conducted charter flights frequently from San Andros. A student pilot that previously flew with the pilot to build flight time stated "I've been flying through overcast conditions with him before and I had to calm him down and tell him to trust the instruments inside the plane…if I wasn't with him then, he might have been gone that day instead."

Another witness who flew with the pilot previously stated, "he was kinda scared of flying in clouds."

[5] **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.

[6] **Ceiling** – the lowest layer of obscuring phenomenon (clouds, fog etc.)

[7] The U.S. Federal Aviation Administration's (FAA) Instrument Flying Handbook defines **IFR** as: "Rules and regulations established by the FAA to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals." It is also a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying, such as an IFR or VFR flight plan.

[8]

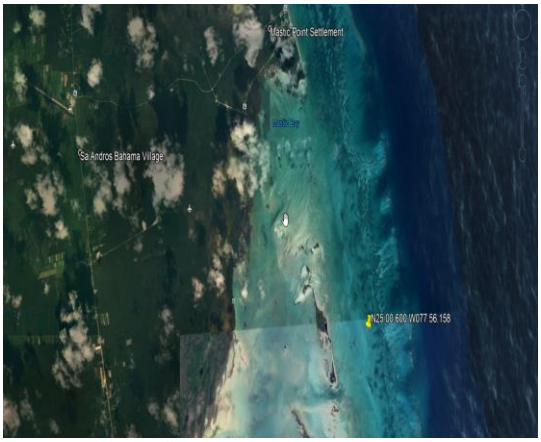
Category	Visibility	Ceiling
VFR	> 5 mi	and > 3000 ft AGL
Marginal VFR	Between 3 and 5 mi	and/or Between 1,000 and 3,000 ft. AGL
IFR	1 mi or more but less than 3 mi	and/or 500 ft. or more but less than 1,000 ft.
Low IFR	< 1 mi	and/or < 500 ft.

On January 18, the day of the search and rescue / recovery exercise, approximately 5% of the aircraft was recovered. Some human remains were also recovered in the debris field. The Royal Bahamas Defense Force, the official search and rescue / recovery agency for the Bahamas, reported that the wreckage brought to investigators who were stationed in Mastic Point, was all the wreckage that was recovered and that the search was terminated.

On February 14, 2018 a local fishermen from the Mastic Point Settlement discovered the remainder of the wreckage. However, the authorities never learned of the discovery until 18 February after viewing a video posted to Facebook about the discovery.

The Authorities was able to made contact with the fisherman who was away on a fishing expedition and upon his return, he took local police to where the site was discovered.

Once the local police confirmed the wreckage was in fact located, a salvage team was engaged to recover the wreckage. On 25 February 2018 the salvage team with assistance from the RBDF and other divers, recovered the wreckage inclusive of all major components and parts in approximately 6 -10 feet of water in low tide.



The wreckage was transported to a facility in the United States of America where further analysis was conducted with assistance from the manufacturer of the aircraft and the engines.

1.2 INJURIES TO PERSONS

Injuries	Crew	Passengers	Total
Fatal	1	5	6
Serious			
Minor			
None			
TOTAL	1	5	6

1.3 DAMAGE TO AIRCRAFT

The aircraft was destroyed as a result of the high angle, high speed impact with the ocean.

1.4 OTHER DAMAGE

No other damage was reported.

1.5 PERSONNEL INFORMATION - PIC

The male pilot in command was 41 years old; he received his pilot certifications in the United States of America.

The pilot's personal log book, as well as the flight log book for the aircraft were both found in good condition in a side pocket of a piece of the cockpit furnishing that was recovered by divers.

A review of documents from the Federal Aviation Administration that issued the pilot his certificates (license) showed that the pilot was issued a private pilot certificate on his second attempt, on 9th June 1999 with airplane single engine land rating privileges.

On 13th February, 2001 the pilot added a multi-engine rating to his private pilot certificate.

Records further showed that the pilot obtained his instrument rating on his second attempt on 4th March, 2014. The limitation "English Proficient; Airplane Multiengine VFR only," was added to his certificate. This limitation was placed on the certificate as the pilot had not demonstrated proficiency using instruments for navigation in a multi-engine aircraft.

The last date of successive entries in the pilot's personal logbook was March 4, 2014 when total hours entered were as follows;

- Single-engine Land -156.8
- Multi-engine Land - 96.4
- Night - 3.1
- Simulated or hood - 62.3
- Cross-country - 88.5
- Dual (with instructor) -143.0
- Pilot in command -164.8
- Total hours - 238.2

The pilot did not document any further training or flying between the period March 4, 2014 (the day he received his instrument rating) and May 23, 2015 the day he satisfactorily completed a familiarity check in a Cessna C172 aircraft. 1.4 flight hours was documented on that check flight with destination Nassau to San Andros with a return to Nassau.

The recovered aircraft flight logbook for N62769 showed the pilot received a familiarity check on September 16, 2017 in the aircraft. The first flight after being checked out in the aircraft was a flight to Governors Harbor, Eleuthera totaling 1.1 hours on September 19, 2017. Other than the flight to Governors Harbor, Eleuthera, no other flights were logged in the aircraft between September 19 and October 31, 2017 when the pilot commenced logging commercial flight time.

Between 31 October, 2017 and 16 January, 2018 one day before the fatal crash, the pilot documented 129 commercial flights in aircraft N62769 totaling 59.7 hours. One hundred and three (103) of the flights conducted were between Nassau and San Andros, Bahamas, the remaining flights were documented with points originating from Nassau to Normans Cay, Exuma, Chub Cay, Berry Islands, Black Point, Exuma, Fresh Creek, Andros, and Mangrove Cay Andros all with a return to Nassau from each point flown.

Unlike the previous 129 flights documented as commercial operations, no documented evidence was found to prove the fateful flight (#130) was for compensation or hire.

Although the Piper Aztec aircraft is a six-place aircraft designed to carry 5 passengers and the pilot at any one time, several flights were documented with as many as 8 passengers being carried on the aircraft at any one time.

Providing there are no other documents available where flight hours were logged, adding the total hours of flights in N62769 aircraft between October 2017 and January 2018 to the last totals which were documented up to 4 March of 2014, would produce the following totals and experience of the pilot;

- Multi engine land -156.1hours
- Pilot in command - 224.5 hours
- Total experience - 297.9 hours

The pilot's hours flown based on the documentation recovered totaled in the last;

- 24 hours – 0.3 hours
- 7 days – 7.4 hours and
- 90 days prior to the accident - 59.7 hours

There were no legal requirements for a pilot to keep a record of duty time and rest period if the flight was private. For commercial operations however, the pilot as well as the operator are required by regulations to document and track pilot's duty time and rest periods.

Investigations revealed that the Pilot's US third Class Medical Certificate issued on 20th November 2013 was expired at the time all flights documented between 31st October 2017 and 18th January 2018 were conducted.

Under US Code of Federal Regulations 14 CFR 61.23 (a)(3)(i) and (d)(3)(ii) Medical certificates: Requirement and duration.

(a) Operations requiring a medical certificate. Except as provided in paragraphs (b) and (c) of this section, a person -

(3) **Must hold at least a third-class medical certificate -**

(i) When exercising the privileges of a private pilot certificate, recreational pilot certificate, or student pilot certificate, except when operating under the conditions and limitations set forth in § 61.113(i);

(d)Duration of a medical certificate.

- (ii) Age 40 or older
  - a recreational pilot certificate, **a private pilot certificate,** a flight instructor certificate (when acting as pilot in command or a required pilot flight crewmember in operations other than glider or balloon), a student pilot certificate, or a sport pilot certificate (when not using a U.S. driver's license as medical qualification)
    - a) **24th month** after the month of the date of examination shown on the medical certificate.

The pilot's most recent medical certificate was issued on 20th November, 2013. As he was over the age of 40, his latest medical certificate should have been within 2 years of his turning age 40, as stipulated under 14 CFR 61.23 (d)(3)(ii). As he attained the age of 40 in 2017, the latest date his medical certificate could have been issued which would have made him legal to use it, was 31st December, 2015.

In accordance with US 14 CFR 61.113 **Private Pilot privileges and limitations**: Pilot in Command - (a) Except as provided in paragraphs (b) through (h) of this section, **no person who holds a private pilot**

certificate may act as pilot in command of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as pilot in command of an aircraft.

1.6 AIRCRAFT INFORMATION

1.6.1 AIRCRAFT HISTORY.

N62769 was a fixed-wing, twin-engine normally aspirated aircraft. It had retractable landing gear, was an all metal airplane and was designed to combine multi-engine power, performance, and safety with smooth, easy handling characteristics and operational adaptability. N62769 was registered in the United States of America to Kingdom Airways LLC of Sussex County, Lewes Delaware, USA.

N62769 was manufactured in 1976 by Piper Aircraft Inc. as a PA-23-250, F- model aircraft, and bore serial number 27-7754010.

The aircraft was properly registered and certified for operations; it was listed in the normal category, standard classification and was issued an Airworthiness Certificate on 19 May, 2017 by the US Federal Aviation Administration.

The aircraft was certificated to use Aviation Gasoline and had a maximum fuel capacity of 144 U.S. gallons. Of that amount, 137 gallons was useable.

On January 16, at 7:00 am, just one day before the fateful flight, the aircraft uploaded 10 gallons of avgas from the fixed based operator (FBO) at the general aviation section at Lynden Pindling International Airport. The amount in the tanks at the time of the accident was unknown. However, the pilot stated on his flight plan that he had a two-hour fuel duration in the tanks.

The aircraft was certified for a maximum takeoff mass of 5,200 pounds which includes the weight of the aircraft, all equipment, components and unusable fluids, passenger, fuel and bags.

The legal landing mass of the aircraft was 4,940 pounds. The standard empty weight of the aircraft including unusable fuel, full operating fluids and full oil was 3,184 pounds.

The maximum useful load which is the difference between the maximum takeoff weight and standard empty weight was 2,016 pounds. The useful load includes passengers, cargo, bags and useable fuel. The mass and balance at the time of the accident was unknown.

1.6.2 AIRCRAFT MAINTENANCE

The AD Log records for N62769 were assessed. All information given that follows are as of the 13th December 2017 – the last maintenance entry in the log books.

Aircraft Type – Piper PA 23-250
Registration – N62769
Serial No: - 27-7754010
Total Time Since New (TTSN) – 4900.7 hours
Hobbs –199.2 hrs.

No. 1 Engine
Manufacturer and Type – Lycoming IO-540-C4B5
Serial No: - L-19022-48A
Hobbs – 199.2
Total Time since Overhaul (TTSOH) – 123

No. 2 Engine
Manufacturer and Type – Lycoming IO-540-C4B5
Serial No: - RL-19871-48A
Hobbs – 199.2

Total Time since Overhaul (TTSOH) – 123

No. 1 Propeller
Manufacturer and Type – Hartzell HC-E2YR-2RBSF
Serial No – BP4929
Hobbs – 199.2
TTSOH – 102.4 hrs.

No. 2 Propeller
Manufacturer and Type – Hartzell HC-E2YR-2RBSF
Serial No – BP8000
Hobbs – 199.2
TTSOH – 102.4 hrs.

Note: The last maintenance entries for the engines and propellers do not include the part number and serial number.

The engines were overhauled in July 2015.

Both propellers were overhauled and the engines were torn down and inspected in December 2016 due to propeller strike.

The aircraft was inspected in accordance with Piper PA23-250 Aztec Maintenance Manual

Maintenance Program - The last maintenance check completed on the aircraft was the 100 hrs. / Annual Inspection. The airframe, engine and propeller

maintenance checks that were carried out were done within the time period as required.

According to the airframe maintenance entry dated December 13th 2017, all the Airworthiness Directives (AD's) that were due were complied with, however no AD's were listed, nor was there an AD's Compliance listing for that inspection. However, it is noted that the AD's that were due and complied with in December 2016 were listed in that Annual Inspection entry dated 9th December 2016.

1.6.3 Aircraft General Information

N62769 was a comfortable six-place seating aircraft and had two separate one hundred fifty pound luggage compartments. All seats were removable to accommodate a variety of passenger and cargo combinations, and a wide range of options permitted the airplane to be custom suited to individual navigation and transportation needs.

As with any aircraft, the Aztec F model like N62769 requires proper loading; however, the weight and balance calculator provided with the airplane makes the determination of acceptable fuel and payload combinations easy and uncomplicated.

The fuselage of the Aztec F is composed of four basic units: the nose section, which is made of sheet metal and fiberglass, the cabin section and the tail cone, which are made of sheet metal, and the tubular steel structure which extends from the nose wheel to the tail cone.

The tubular steel unit strengthens the center section of the airplane, where heavier loads are imposed. The extremities (nose cone, engine cowling nose bowls, wing tips) are constructed of dent resistant reinforced fiberglass.

The Aztec F is not designed for aerobatic flying; therefore, aerobatics in this airplane are prohibited.

Access to the cabin is through the cockpit door on the right side of the fuselage. The forward baggage compartment door is located on the right side of the nose section, and the aft baggage compartment door is on the right side of the fuselage, aft of the rear window.

Except for the second window on the left side, which is the emergency exit window, all windows are double pane.

A storm window located in the forward lower section of the pilot's side window opens downward and in when unlatched.

The wing is of a conventional design and employs a USA 35B modified airfoil section. The wing spar ends are bolted together, providing, in effect, a continuous main spar. The wings are also attached to the tubular steel structural unit by auxiliary front and rear spars fore and aft of the main spar. The dent resistant fiberglass wing tips are detachable for service.

Four thirty-six gallon fuel tanks are mounted in the wings; two tanks are located outboard of each engine nacelle. Each wing also incorporates provisions for the addition of an optional twenty gallon wing tip fuel tank. These tanks are flexible, bladder type fuel cells.

The empennage is made up of a vertical stabilizer and rudder and an all-movable horizontal stabilator.

All surfaces of the empennage are sheet metal with the exception of the durable thermoplastic tip of the rudder and the tips of the stabilator.

All six seats in the Aztec F are removable. The crew seats and center seats are individual bucket seats, and the rear seat is a couch type which will accommodate two people.

The Lycoming I0-540-C4B5 six cylinder engines on the Aztec F are rated at 250 horsepower at 2575 RPM. These engines have a compression ratio of 8.5: 1 and require 91/96 minimum octane aviation fuel.

Each air cooled engine is equipped with a geared starter, an alternator, a vacuum pump, a fuel injector, two magnetos, a shielded ignition system, a diaphragm fuel pump, a propeller governor and an oil thermostat. A hydraulic pump is mounted on the left engine.

The exhaust system is a crossover type with exhaust gases directed overboard at the bottom of the nacelles in the area of the outboard cowl flap.

Dual flight controls are installed in the Aztec F as standard equipment. The control wheels operate the ailerons and the stabilator.

The rudder pedals control the rudder movement, and during ground operations also steer the nose wheel.

The wheel brakes are applied by toe pressure on the top portion of the rudder pedals. These toe brakes are standard on the pilot's side.

Ailerons, stabilator and rudder are cable controlled; wing flaps are hydraulically controlled.

Stabilator and rudder trim are set with the control knobs located overhead.

The horizontal tail is an all-movable, slab type stabilator which incorporates an anti-servo tab along the trailing edge.

The anti-servo tab, which moves in the same direction as the stabilator, but with increased travel, provides a more efficient control surface. The anti-servo tab also functions as a longitudinal trim tab for nose up or nose down correction.

The vertical tail is fitted with a rudder which incorporates a servo tab. The servo tab, which moves in a direction opposite to the travel of the rudder, lessons pedal forces necessary to move the rudder. The servo tab also functions as a rudder trim tab for nose right or nose left correction.

The knob portion of the trim control moves the rudder tab, and the crank portion moves the stabilator tab. Trim position is shown on the indicators in the overhead panel.

Wing flaps are adjustable from no flaps to 50 degrees of flap. Flap position is shown on the indicator located to the right of the flap control lever. Flaps may be set at any position between full extension and full retraction by manually returning the flap control to the neutral position when the flaps have reached the desired degree of travel.

If the flap control is left in the up or the down position, the flaps will automatically extend or retract to their full travel and the lever will automatically return to the neutral position.

For ease of entry or exit, the right flap may be used as a step, but only when it is fully retracted.

Fuel for the Aztec F is stored in four wing-mounted fuel tanks. Each of these tanks, which are flexible, bladder type fuel cells, holds thirty-six U.S. gallons of fuel. Two tanks are installed in each wing outboard of the engine nacelles. Fuel capacity can be increased by the addition of two optional twenty gallon bladder type fuel cells in the wing tips.

A transfer tube connecting the optional tip tank and the outboard tank allows both tanks to function as one. Two fuel fillers are located on the top of each wing; the inboard filler is for the inboard tank, and the outboard filler is for the outboard tank and the optional tip tank when it is installed. Usable fuel is 34.3 U.S. gallons per tank.

All twenty gallons of fuel in each optional wing tip tank is usable; thus, when this option is installed, each outboard tank can carry in effect 54.3 gallons of usable fuel. Fuel tank vents have flame suppressing and anti-icing provisions.

1.7 METEOROLOGICAL INFORMATION

METAR[9] issued by the Nassau Meteorological Department (MET) some 15 miles southeast of the accident site, listed conditions at Nassau for the 17 January at 1300UTC (8:00am) as winds 360 degrees at 05 knots, scattered clouds at 1,800 feet, overcast layer of clouds at 8,000 feet, temperature 24 degrees and dew point[10] at 19 degrees, Altimeter 30.15Mb.

Bahamas Area Forecast[11] issued on the 17 January 2018 from 1200UTC (7:00am) valid for 12 hours from 1200UTC indicated: **Special Features** indicated a weakening frontal boundary remained in the vicinity of the central Bahamas while high pressure behind producing fresh to local strong winds through the period.

Significant Weather section of the forecast reported in the vicinity of the front, few and scattered clouds at 1,600 to 1,800 feet with cumulonimbus and towering cumulonimbus clouds.

Scattered to occasional broken clouds were forecasted at 5,000 feet. Scattered to broken clouds were also forecasted at 8,000 to 12,000 feet merging with higher layers. Towering cumulonimbus to cumulonimbus clouds with tops to above 13,000 feet thru 24,000 feet were forecasted.

Isolated showers and few thundershowers were forecasted with local IFR conditions in the thundershowers and showers. Moderate to severe turbulence in the vicinity of all cumulonimbus and towering cumulonimbus clouds were expected.

Elsewhere over the Bahamas, few to scattered clouds ranging from 1,800 feet to 2,500 feet, scattered and occasional broken clouds were expected at 5,000 feet. Scattered and broken clouds also at

[9] **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.

[10] The **dew point** is the temperature to which air must be cooled to become saturated with water vapor. When further cooled, the airborne water vapor will condense to form liquid water (dew).

[11] An **Aviation Area Forecast** (FA or ARFOR) is a message product of the National Weather Service (NWS) in the United States. FA encompasses the weather conditions over a large regional area and is considered one of the better sources of information for enroute weather. It is also beneficial in verifying airport conditions at airports that do not have terminal aerodrome forecasts.

20,000 feet to 25,000 feet were expected. Marginal VFR conditions were forecasted in isolated showers.

In the northern Bahamas upper winds around 2,000 feet were reported as 340 degrees at 15 knots.

It is not known whether the pilot had received weather briefing from Nassau prior to his departure from San Andros, as this trip was his first flight for the day.

1.8 AIDS TO NAVIGATION

Navigational Aids were not a factor in this accident.

1.9. COMMUNICATIONS

The ATS communication facility available to the aircraft after his departure from San Andros was Nassau Air Traffic Control Center which the pilot utilized. However, after contact was made and radar transponder code issued, the pilot inquired of weather conditions after being advised by ATC that he appeared to be heading westbound instead of inbound to Nassau.

After advising the aircraft that weather was observed to the southeast and southwest of Nassau, no further 2-way radio communication could be established between the aircraft and ATC.

ATC attempted to contact the aircraft to find out his intentions with no success, the target (aircraft) was observed turning left as if returning to San Andros. The target was further observed shortly thereafter, turning south, then appearing to orbit, then descending and finally disappearing from radar screen in the ATC radar center.

ATC documented at the time of disappearance, the aircraft was heading westward and 8nm east of MYAN. Another aircraft in the airspace around the time was engaged by ATC to attempt contact with N62769, also with no success.

Two-way radio communication was not a factor in this accident; however, there was a failure on the part of the pilot to respond to ATC's inquiries after being given a transponder code for his inbound flight and weather conditions.

The reason(s) for the pilot's failure to respond is unknown.

1.10 AERODROME INFORMATION

The aircraft departed San Andros Airport (ICAO Code MYAN[12]). MYAN airport is 2 meters (6.5 Feet) above sea level and the center of the airport is located at coordinates N25 05381 and W-78 04899. It has one runway designated 12/30 with a bitumen surface measuring 5,000 feet long by 75 feet wide.

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 size aircraft.

1.12 WRECKAGE AND IMPACT INFORMATION

The debris field was located in waters some 4 miles southeast of the Mastic Point settlement in North Andros.

Divers estimated the depth of the water where a small amount of debris and human remains from the aircraft were located as approximately 10 feet at high tide.

It was believed that the aircraft's contact with the ocean occurred further beyond the point where the recovered debris was located. No large and identifiable portions of the aircraft including engine, fuselage, empennage[13], wing etc., were found on the initial recovery mission on January 18, 2018.

On February 14, 2018 just 3 days before the one-month anniversary of the fatal crash, local fisherman discovered the wreckage. The AAID contacted the local authorities and with assistance of a salvage team and specialist divers from the Royal Bahamas Defense Force the site was accessed and the remainder of the aircraft was located.

On February 25th, 2018 the airplane wreckage was located by divers from the salvage / recovery ship Amazing Grace as well as divers from the Royal Bahamas Defense Force.

Both engines, propellers, landing gears, empennage, wings and the cockpit instrumentations were located and recovered. A large portion of the aircraft comprising the fuselage (main cabin area) and left and right engines were found in a crumpled pile,

[12] **MYAN** airport code is a 4 letter unique identifier that is assigned to the airports by the International Civil Aviation Organization (ICAO).

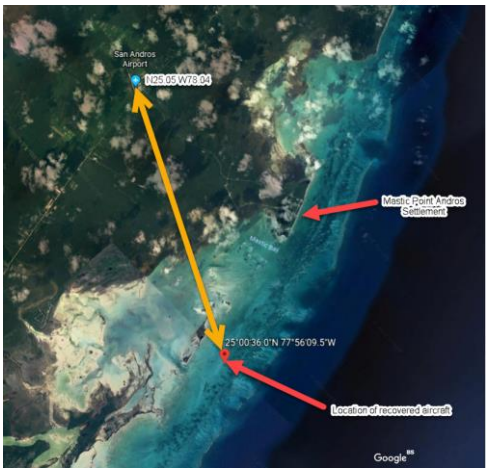
[13] **Empennage** - the rear part of an airplane or airship, usually comprising the stabilizer, elevator, vertical fin, and rudder.

inverted, at a depth of approximately 6 - 10 feet of water at low tide.

According to the divers, the recovered wreckage had been distributed in a debris field about 200 feet long and was oriented on a westerly magnetic bearing of about 280 degrees as if it was heading back to the airport of departure.

The coordinates of the bulk of the recovered wreckage was located at N25°00.600' and W077° 56.158' a distance of 0.044 miles (230 feet) south east from where portions of the aircraft were originally found on January 18, 2018.

The distance from the center of MYAN runway (N25^{0}05381 and W-78^{0}04899) to the crash site where the bulk of the wreckage was located was approximately 4 miles southeast.



All indications were that the aircraft made contact with the ocean straight in, ((approximately 180 degrees), (nose, propeller and engines first, as evidenced from propeller and airframe signature marks), before cartwheeling several times prior to stopping.

Debris was disbursed along the narrow path from the initial point of contact. The debris field was spread out over a distance of approximately 600 to 800 feet from the first impact.

Debris from cockpit instrumentation at the farthest southeastern point from the island was located with debris being spread toward the island. The engines and main cabin were found located almost midway between the initial and final debris path.

All wreckage was located and placed aboard the Amazing Grace during more than 20 dive attempts by each of the 7 divers, due to the fracturing of the aircraft upon impact and the degree to which the aircraft disintegrated as a result of the high speed impact with the ocean.

The wreckage was transported to the Florida Air Recovery Facility in Fort Pierce Florida where further analysis was conducted with assistance from representatives of the manufacturers of the engine and airframe.

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

There were six (6) souls on board the aircraft at the time of the accident, 3 males and 3 females. All occupants received fatal injuries.

Recovery divers retrieved some human remains from the debris field on 18 January, one day after the accident. Those remains were transported to the Rand Morgue at the Princess Margaret Hospital in Nassau, New Providence, Bahamas for DNA analysis for victim identification purposes.

1.14 FIRE

There was no evidence of a fire in flight or post impact.

1.15 SURVIVAL ASPECTS

The accident was not survivable due to the high speed, high angle contact and magnitude of the deceleration forces.

1.16 TESTS AND RESEARCH

The recovered aircraft was transported to a facility in the United States where documentation and

further analysis was conducted by Piper Aircraft representative, Lycoming Engine manufacturer representative as well as the AAID. The summary report of both documentation and analysis follows.

Examination of the airframe, systems, avionics, and engine did not reveal any evidence of a pre-impact mechanical malfunction.

Approximately 90% of the aircraft was recovered from the ocean. Following is the results of documentation of parts recovered.

Between February 28 and March 2, analysis and documentation was conducted of both the airframe, the engines and the propellers with representatives of manufacturers, Lycoming Engine and Piper Aircraft, advisors to the NTSB (Accredited Representatives of the State of Manufacturer, Design and Registry).

1.16.1 Airframe Analysis

Left Wing

The left wing was separated from the fuselage[14] at the wing root. The wing was largely fragmented and the wing spar was fractured in several places. The wing spar and the fractured areas exhibited aft deformation. The wing exhibited damage consistent with salt water emersion.

The left main gear remained attached to its mounts and was fractured at its spindle mount. The gear actuator was fractured from the scissor link and observed in the "gear up" position.

The fuel cell bladders were fragmented; however, two fuel caps were observed secured to their receptacles.

The lift detector was not observed within the recovered wreckage. The Pitot tube exhibited impact damage and was separated from the wing, and its pitot port was clear of obstructions.

The aileron and aileron balance weight were both separated from their attachment points. The outboard approximately 32 inches of aileron exhibited impact damage and skin separations. The remainder of the aileron, about 48.5 inches, was not observed within the recovered wreckage. About 69 inches of inboard flap was separated from the wing and was deformed upward. The remainder of the flap, about 17.6 inches, was not observed within the recovered wreckage. Impact damage precluded verification of flap position; however, the flaps up position actuator was fully extended which is indicative of "full flap" extension.

The aileron bellcrank and supporting structures were separated from the wing. One travel limit stop was fractured and not observed within the recovered wreckage, and the other stop displayed a hard impression but did not exhibit evidence of repeated contact. The bellcrank was fractured at its aileron cable attachment points and were not observed within the recovered wreckage. An approximate 118 inch section of control cable was observed within the wreckage and its separated ends displayed a splayed, broomstrawed appearance, consistent with overload separation. An approximate 70 inch section of aileron balance cable which contained a roll servo bridle clamp exhibited splayed, broomstrawed appearance at the separated ends consistent with overload separation.

Impact damage and separated flight control cables precluded verification of flight control continuity. All control cables that were observed displayed overload separation ends.

Right Wing

The right wing was separated from the fuselage at the wing root and mostly fragmented. The wing spar was fractured in several areas and displayed aft deformation and damage consistent with salt water emersion.

The aileron and aileron balance weight were both separated from their attachment points. The aileron was separated into two sections and exhibited "W" shaped deformation. The aileron bellcrank and supporting structures were separated from the wing. One aileron control cable, about 74 inches in length, remained attached to the bellcrank and exhibited a splayed, broomstrawed appearance consistent with overload separation. The other aileron control cable attach point was fractured and was no located within the recovered wreckage. One of the aileron travel limit stops was fractured and was not observed during the examination, and the other aileron travel limit stop did not exhibit evidence of repeated contact.

Two flight control cables were observed, one was approximately 140 inches in length, and the other was about 132 inches in length. Both cables exhibited a splayed, broomstrawed appearance consistent with overload separations.

[14] **Fuselage -** the central body portion of an aircraft designed to accommodate the crew and the passengers or cargo

The flap was separated from the wing and was separated into two sections and exhibited aft deformation to the leading edge. The full span of the right flap was located within the wreckage. Impact damage precluded verification of flap position; however, the flaps up position actuator was fully extended which is indicative of "full flap extension."

The main landing gear was fractured at the lower strut and was noted to be in the "gear up" position. The fuel cell bladders were fragmented; however, two fuel caps were observed secured to their receptacles.

Impact damage and separated flight control cables precluded verification of flight control continuity. All control cables that were observed displayed overload separation ends.

Empennage

The empennage exhibited impact damage was partially fragmented. The vertical stabilizer was separated about mid-span and exhibited aft deformation to its leading edge.

The rudder remained attached to its vertical stabilizer hinges; however, the hinges were separated from the vertical and displayed damage consistent with salt water emersion. The rudder exhibited impact and or recovery damage and the rudder balance weight was separated from the rudder and was not located within the recovered wreckage.

The rudder cables remained attached the rudder bellcrank and the stops did not exhibit evidence of repeated contact. The left rudder cable was continuous from the rudder to its separated rudder pedal attach point. The right rudder cable was separated about 172 inches from the rudder and displayed an overload separated end.

The rudder trim tab remained attached to the rudder and the rudder trim barrel assembly indicated a "neutral to slight nose left" rudder trim setting. The rudder trim cables were separated in the empennage area of the wreckage.

The left and right stabilators were separated from the torque tube. Both stabilator trim tabs remained attached to their respective stabilator attaching points. The left stabilator leading edge was crushed aft (half circular deformation) to its aft spar. The right stabilator leading edge was separated and was not observed within the recovered wreckage. Both left and right stabilator outboard balance weights were separated from their attach points. The stabilator travel limit stops did not exhibit evidence of repeated contact.

The stabilator control cables remained attached to the stabilator balance weight mast. The top stabilator control cable was about 100 inches in length, and the bottom cable was about 96 inches in length. Both stabilator control cable separated ends displayed a splayed, broomstrawed appearance consistent with overload separation.

The stabilator trim barrel assembly jack screw did not expose any jack screw threads at the top of the trim barrel assembly which is indicative of a "full nose down" stabilator trim setting. The stabilator trim control cables remained attached the trim barrel assembly and were separated in the empennage area of the wreckage. The stabilator trim rod was deformed to the left and separated from the left and right stabilator trim tabs.

Impact damage and separated flight control cables precluded verification of flight control continuity. All control cables that were observed displayed overload separation ends.

Fuselage

The fuselage was largely fragmented. The instrument panel and flight instruments were fragmented and separated from the fuselage. An internal vacuum gyro was found separated from its housing and displayed rotational signatures.

The rudder pedal assembly and T-bar were fractured and separated from their respective attach points. One control cable about 14 inches in length remained attached to the T-bar and exhibited overload separation. An approximate 30 inch section of control cable attached to a section of T- bar type chain, displayed a broomstrawed end consistent with overload separation. One control cable with attached T-bar type chain, about 25 inches in length exhibited an end consistent with overload separation. Another control cable about 51 inches in length was attached to a separated turnbuckle on one end, and exhibited an overload separation at the other end of the section of cable.

One control wheel remained attached to a fractured control wheel shaft and both horns were separated from the control wheel. The other control wheel and shaft were not observed within the recovered wreckage. The flap torque tube was separated and exhibited "U" shaped deformation.

The nose baggage door was separated and the handle and lock was observed in the locked position. The nose baggage door exhibited aft deformation and its hinges were fractured and deformed. All seat assemblies, seat tracks, and seat belts were destroyed by impact forces. The cabin door and emergency exit door were fragmented and separated from the fuselage. The aft baggage door was separated and exhibited aft deformation. All of the windows and windshields were separated from their retainers and were not located within the recovered wreckage.

The nose gear remained attached to its fragmented mount. The nose gear actuator and scissor link was fractured. The nose gear actuator exhibited a "gear up" position. The cabin combustion heater was crushed from impact forces. The alternate air controls were observed in the "off" position. All the aircraft electrical switches were destroyed by impact forces.

Impact damage and separated flight control cables precluded verification of flight control continuity. All observed control cables displayed overload separation ends.

Left and Right Engine Fuel Selectors and Gascolators.

Two fuel selector valves and gascolators were observed separated from their installed locations. Both fuel selector valves were impact damaged and their selector arms were separated and were not located within the recovered wreckage.

Continuity was established through one of the fuel selector valves and the other valve was observed to be obstructed during field testing with low pressure air. Damage consistent with salt water emersion was noted to both fuel selector valves. The separated gascolators exhibited water and material consistent with sand within the gascolator bowls and screens. The fuel selector console was impact damaged and the position of the fuel selector levers could not be verified.

Left Engine

The left engine was separated from the engine mount. The engine mount was partially separated from the nacelle. The air filter assembly was impact damaged and deformed aft and the exhaust system was fragmented.

Left Propeller

The left propeller remained attached to the crankshaft flange; however, the crankshaft was separated at the front main seal area of the engine.

The spinner was mostly separated from the propeller and was not located within the recovered wreckage. Both propeller blades were observed to be bent aft about 90 degrees and exhibited "S" bending. Both blades were displayed leading edge and chord-wise abrasions.

Right Engine

The right engine was partially attached to the engine mount. The nacelle structure was mostly fragmented. The air filter assembly was impact damaged and deformed aft and the exhaust system was fragmented.

Right Propeller

The right propeller remained attached to the engine. The propeller spinner exhibited rotational deformation. Bot propeller blades were bent aft about 90 degrees and exhibited "S" bending. One blade was fractured about mid-span approximately 9 inches from the tip of the blade. Both blades displayed leading edge gouges and chord-wise scoring.

1.16.2 Engine Analysis

Between February 28 and March 2, 2018 the engine and propeller was examined at Florida Air Recovery in Fort Pierce Florida under the supervision of a representative of Textron Lycoming who was appointed advisor to the NTSB, and representatives of the Air Accident Investigations Department – State of Occurrence.

The examinations of the engine and propeller did not reveal evidence of any preexisting failures or conditions that would have prevented engine operation.

1.17 Regulatory Oversight

While the Bahamas Civil Aviation Authority (BCAA) is not mandated to provide oversight over private, general aviation operations to the extent it does to certified commercial operations, they have however proposed an aggressive plan in the aftermath of this accident to provide increased surveillance of the areas frequented by private general aviation operators, as it

is widely suspected they are conducting unauthorized commercial operations while not having been certified by the BCAA.

The BCAA confirmed that the pilot was not the holder of a Bahamas issued pilot license.

The Civil Aviation General Regulations, 2017 requires the issuance of a flight crew[15] license to any person who acts as pilot in command or any other capacity as a required flight crew member of an aircraft of Bahamas or foreign registry.

Bahamas citizens who act as a required flight crew member of a foreign registered aircraft is required to possess a Bahamas issued license for the category, type and class of aircraft while flying in the airspace of the Bahamas.

This requirement to issue licenses is met via the process of conversion or validations, as the Bahamas is not a state that issues its own license initially.

While the BCAA has a documented process to render other states licenses valid, including skill based criteria, there is no documented process or procedures (step by step) involving knowledge-based testing and familiarization with the rules, air law and procedures for flying in the airspace of the Bahamas.

This safety concern was addressed as an urgent safety issue to the BCAA requiring immediate action prior to further processing or issuance of converted or validated licenses to Bahamas citizens and or other nationalities.

Recommendation also issued to the BCAA to increase it surveillance of the general aviation sector and institute a plan of action to ensure all aircraft owners / operators (Bahamian or foreign nationals) they are in possession of required Bahamas issued license (as applicable) and a valid medical certificate when operating their aircraft in the airspace of the Bahamas.

[15] Flight crew as defined by ICAO Annex 1- Personnel Licensing is "a **licensed crew member** charged with duties essential to the operation of an aircraft during a flight duty period."
• In accordance with Annex 1, 1.2 General rules concerning licenses, Note 2 – International Standards and Recommended Practices are established for licensing the following personnel

Flight crew – (which includes the following);
— private pilot — aeroplane, airship, helicopter or powered-lift; — commercial pilot — aeroplane, airship, helicopter or powered-lift; — multi-crew pilot — aeroplane; — airline transport pilot — aeroplane, helicopter or powered-lift — glider pilot; — free balloon pilot; — flight navigator; — flight engineer.

2.0 ANALYSIS

1. The aircraft was certificated, equipped and maintained in accordance with FAA requirements and regulations.

2. Weather related phenomenon (reduced visibility and rain) was a determining factor in the accident. A weakening frontal boundary had previously passed through the area and an impending high pressure area producing fresh and local strong winds followed. Weather conditions were marginal in the area between Nassau and Andros and cloud coverage and bases ranged from 1,800 to 25,000 feet with showers, thundershowers and moderate to severe turbulence. Strong winds were expected throughout the 12 hour forecasted period commencing 1200 UTC (7:00am) for a 12 hour period.

3. Pilots, operating in the airspace around the time of the accident stated that the weather was marginal at best. Individuals interviewed at Mastic Point Andros, also confirmed weather related conditions may have been a factor in this accident as they all confirmed that the weather that morning and around the time the aircraft departed, was "bad."

4. ATC confirmed that after issuing a transponder code to the pilot and his acknowledgement, and request for weather conditions, there was no further response from the aircraft.

5. ATC also confirmed that the pilot did not indicate or reported any mechanical issues or irregularities with the aircraft, prior to his non-response and the aircraft appearing to return to the airport of departure, followed by a series of turns, orbits, unusual climb and descent patterns. The AAID therefore believes that the pilot may have been circumnavigating the marginal weather and reduced visibility and at some point lost control of the aircraft, with fatal consequences.

6. The pilot was certificated by the Federal Aviation Administration (FAA) in the United States of America as a private pilot licence holder, with instrument and multi-engine privileges attached to that certificate. As he did not demonstrate instrument proficiency in a multi-engine aircraft, his private pilot certificate bore the limitations "Multi Engine - VFR only" which meant his instrument rating was limited to single engine airplanes only. He was not authorized to operate any multi-engine aircraft in weather conditions that required use of instruments for navigation.

7. The pilot was also issued a USA [16]medical certificate by the FAA designated physician. As the pilot's most recent medical certificate was issued on 20 November, 2013 and as he attained the age of 40, in 2017, his latest medical certificate should have been within 2 years of his turning 40 in 2017, as stipulated under United States Regulations 14 CFR 61.23 (d)(3)(ii). Therefore the pilot's latest medical certificate should have been completed by December 31 2015 and not as documented in 2013.

8. Based on evidence gathered in the course of the investigation, including other pilots' (who flew with this pilot), accounts, they stated that he was not comfortable flying in weather conditions that were not visual (VFR).

9. The requirements for issuance of Bahamas License to Bahamas citizens and other nationalities was also analyzed. It was found that the BCAA, while issuing validations and conversion of other states licenses to applicants, does have a skills based process but does not have a structured step by step process or procedures as it relates to knowledge-based testing and a requirement of airmen to be familiar with the air laws and procedures of flying in the airspace of the Bahamas.

[16] As the aircraft was registered in the United States of America, airmen are required to also be in possession of a medical certificate issued by the United States of America.

3.0 CONCLUSIONS

The Air Accident Investigation Department has determined the probable cause of this accident to be human factors error. The pilot failed to maintain control of the aircraft, possibly as a result of spatial disorientation and a lack of situational awareness when he continued flight into meteorological conditions he was not comfortable in.

The pilot was not qualified to fly this type aircraft by "instruments only." The crash occurred in meteorological conditions legally requiring such qualification.

3.1 FINDINGS

1. The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures.

2. The aircraft had a valid certificate of airworthiness and had been maintained in compliance with regulations

3. The maintenance records indicated that the aircraft was equipped and maintained in accordance with existing regulations and approved procedures.

4. The mass and center of gravity could not be determined.

5. Control surfaces were accounted for; damages to the aircraft were ascertained.

6. Despite the destruction of the aircraft by impact forces, it was determined that no pre-impact failure or system malfunction contributed to this accident.

7. Reduced visibility may have been a factor in the accident.

8. The aircraft crashed approximately 4 miles southeast of the Mastic Point settlement in North Andros, Bahamas.

9. The pilot was not qualified or licensed to conduct commercial operations.

10. The pilot held a private pilot certificate (issued by the Federal Aviation Administration in the United States of America), with single engine land privileges. An instrument rating for single engine aircraft and a multi-engine rating was also added to his private pilot certificate.

11. The pilot's private pilot license was limited to "VFR only" in a multi engine aircraft, because he did not demonstrate proficiency using the instruments for navigation in a multi-engine aircraft.

12. Although the aircraft was equipped for flights in instrument meteorological conditions, the pilot had an instrument rating, but was not authorized to use that rating in a multi-engine aircraft

13. The pilot's third class medical certificate was expired since December 31, 2015. ***The expiration of a medical certificate invalidates the privileges that can be exercised on any certificate attained.***

14. The pilot did not acquire a Bahamas issued licence or medical certificate as required by CAGR 2017.

15. According to documents recovered from the aircraft, the pilot documented the completion of 129 flights, between October 31, 2017 and January 17, 2018 for remuneration or hire, prior to the fatal flight (130). According to CAGR, 2017 any flights conducted for remuneration or hire constitutes commercial operations, which based on the category of the license issued to the pilot, he was not legal or qualified to do.

16. The pilot carried out normal radio communications with Nassau Air Traffic Control Center initially up

to the point after receiving his radar identification code and requesting weather conditions. Thereafter all calls from ATC to the aircraft went unanswered.

17. ATC observed the aircraft appearing to reverse course as if it was headed back to the departure airport. Subsequent observation noted the aircraft conducting a series of unauthorized heading changes, climbs and descents, and orbits before the aircraft eventually disappeared from radar contact.

18. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR); neither was required by regulations.

19. Post mortem examination could not be conducted on the pilot or passengers, as sufficient remains were never recovered. Remains recovered were sent to the Pathology Lab for DNA analysis for victim identification. All victims were eventually identified by DNA Analysis.

20. The accident was not survivable due to the high speed, high angle contact with the ocean and the magnitude of the deceleration forces.

21. As the Bahamas is not a licensing state, an option provided to it for the recognition of other states license and accepting them for airmen to operate in the airspace of the Bahamas is through a process of validation (for foreigners) and conversion (Bahamas Citizens). While the Bahamas has a process for skills testing, the process and procedures for knowledge based testing including Bahamas air law has not been documented as yet.

3.2 CONTRIBUTING FACTORS

The pilot's limited qualification, experience and proficiency in operating in weather conditions determined to be less than visual meteorological conditions (marginal visual conditions) due to reduced visibility and rain, have been determined to be a contributing factor in this accident.

4.0 SAFETY RECOMMENDATIONS

As a result of this investigation the Air Accident Investigation Department makes the following recommendations accident:

Recommendations made are in light of deficiencies uncovered as it relates to the personnel licensing of airmen, and unauthorized commercial operations.

To the Bahamas Civil Aviation Authority:

1. Recommend an increase in its surveillance and oversight of the general aviation sector and put in place policies to reduce the high incidence of unauthorized commercial operations.
   a. The BCAA has satisfactorily addressed this recommendation and have proposed an aggressive plan to address the unauthorized commercial operations being conducted.

2. Recommend a plan of action be instituted to ensure all airmen (as applicable) who are owners or operators of foreign registered aircraft, they are in possession of Bahamas issued license as required by CAGR, 2017.
   a. The BCAA has satisfactorily addressed this recommendation and have proposed a plan of action to ensure all airmen operating in the airspace of the Bahamas are in possession of a required Bahamas issued license.

3. Recommend increased surveillance to ensure all airmen who are owners / operators of foreign registered aircraft, they are in possession of required medical certificates while operating those foreign registered aircraft in the Bahamas airspace.
   a. The BCAA has satisfactorily addressed this recommendation and have proposed a plan of action to ensure all airmen operating in the airspace of the Bahamas are in possession of a required medical certificate.

4. Recommend institution of policies and procedures to require all converted and validated license applicants be familiar with the Bahamas' air law, procedures and policies.
   a. The BCAA has satisfactorily addressed this recommendation and have proposed a plan of action to ensure all airmen operating in the airspace of the Bahamas are familiar with Bahamas air law and procedures prior to other state's licenses being rendered valid.

5. Recommend knowledge and skill testing applicable to flying in the Bahamas airspace be a requirement for any applicant requesting a Bahamas License.
   a. The BCAA has satisfactorily addressed this recommendation and have proposed a plan of action to ensure all airmen operating in the airspace of the Bahamas undergo required skill and knowledge testing.

6. Recommend the issuance of converted and validated license be discontinued until such time as a process can be put in place to demonstrate applicants for converted or validated licenses are familiar with Bahamas rules and laws of the air and undergo a knowledge and skill testing applicable to the Bahamas requirements.
   a. While the BCAA fundamentally disagrees with this recommendation based on the timeline required to accomplish it, they have nonetheless proposed an alternate method to accomplish the intent of the recommendation. The AAID finds the response to the recommendation acceptable.

7. Recommend an audit of all previously issued converted and validated licenses and ensure all applicants are knowledgeable of Bahamas air laws and procedures and a satisfactory documentation is available on each applicant's file.
   a. While the BCAA fundamentally disagrees with this recommendation based on the timeline required to accomplish it, they have nonetheless proposed an alternate method to accomplish the intent of the recommendation. The AAID finds the response to the recommendation acceptable.