AAIPU# A14-005111

AIR ACCIDENT INVESTIGATION & PREVENTION UNIT
CIVIL AVIATION DEPARTMENT

NASSAU, N. P., BAHAMAS

AIRCRAFT ACCIDENT REPORT

CONTROLLED FLIGHT INTO TERRAIN (OBSTACLE)
DIPLOMAT AVIATION (BAHAMAS) LTD.
GATES LEARJET MODEL 35A
N17UF
GRAND BAHAMA SHIPYARD
FREEPORT, GRAND BAHAMA, BAHAMAS
NOVEMBER 9, 2014

Bahamas Department of Civil Aviation
Air Accident Investigation and Prevention Unit

The Air Accident Investigation and Prevention Unit (AAIPU) is the accident investigation unit of the Bahamas Civil Aviation Department (BCAD).

The AAIPU'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 AAIPU does not investigate for the purpose of apportioning blame or to provide a means for determining liability.

The AAIPU performs its functions in accordance with the provisions of the *Bahamas Civil Aviation (Safety) (Amendment) Regulations (CASAR) 2014, Schedule 19, International Civil Aviation Organization (ICAO) Annex 13* and, where applicable, relevant international agreements.

The Civil Aviation Department is mandated by the Ministry of Transportation 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 AAIPU makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations and safety alerts. When the AAIPU issues a safety recommendation, the person, organization or agency must provide a written response within 90 days. That response must indicate whether the person, organization or agency accepts the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

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Mr. Ivan Cleare
Director (Acting)
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CONTROLLED FLIGHT INTO TERRAIN (OBSTACLE)
DIPLOMAT AVIATION (BAHAMAS) LTD.
LEARJET 35A, N17UF
GRAND BAHAMA SHIPYARD
FREEPORT, GRAND BAHAMA, BAHAMAS
NOVEMBER 9, 2014

Abstract: This report outlines the accident involving a Bombardier Learjet, Model 35A, registered to and operated by Diplomat Aviation (Bahamas) Limited. The aircraft struck a crane, stationed at Dock 2 of the Grand Bahama Shipyard Company, during a second landing attempt to runway 06 at the Freeport International Airport in Freeport Grand Bahama, Bahamas. After hitting the crane the aircraft crashed into a garbage pile and Generator Housing Unit at the City Services Limited Garbage and Metal Recycling Plant adjacent to the Grand Bahama Shipyard. The accident occurred on November 9 at 4:52 pm local (2152Z) and resulted in nine (9) fatal injuries. The weather at the time of the accident was bad.

Table of Contents

FOREWARD ..... **vi**
EXECUTIVE SUMMARY ..... **vii**
TITLE ..... **viii**
ABBREVIATIONS and TERMINOLOGY ..... **ix**
DEFINITIONS ..... **x**

PART 1 FACTUAL INFORMATION: **1**
1.1 HISTORY OF THE FLIGHT **1**
1.2 INJURIES TO PERSONS **2**
1.3 DAMAGE TO AIRCRAFT **2**
1.4 OTHER DAMAGE **2**
1.5 PERSONNEL INFORMATION **2**
1.5.1 The Captain (Pilot Flying) 3
1.5.2 First Officer (Pilot not Flying) 3
1.6 AIRCRAFT INFORMATION **3**
1.6.1 Aircraft Fuelling Information 4
1.6.2 Weight and Balance and Stall Information 4
1.6.3 Maintenance Records and actions prior to the accident 4
1.7 METEOROLOGICAL INFORMATION **4**
1.8 AIDS TO NAVIGATION **6**
1.9 COMMUNICATIONS **6**
1.10 AERODROME INFORMATION **6**
1.11 FLIGHT RECORDERS **7**
1.11.1 Cockpit Voice Recorder 7
1.11.2 Digital Electronic Engine Control 7
1.11.3 Flight Data Recorder (FDR) 7
1.11.4 Analysis - N1 Digital Electronic Engine Control 7
1.12 WRECKAGE AND IMPACT INFORMATION **8**
1.12.1 Airframe and Ground Damage 8
1.12.2 The Cockpit 10
1.13 MEDICAL AND PATHOLOGICAL INFORMATION **13**
1.14 FIRE **13**
1.15 SURVIVAL ASPECTS **13**
1.16 TESTS AND RESEARCH **14**
1.17 ORGANIZATIONAL AND MANAGEMENT INFORMATION **14**
1.17.1 General 14
1.18 ADDITIONAL INFORMATION **14**
1.18.1 Crew Resource Management Training (CRM) 14
1.18.2 Bahamas Civil Aviation Safety Regulations 2013(BASR) 14

PART 2 ANALYSIS **18**
2.1 General **18**
2.2 The approach and attempted landing **18**
2.3 The Fire **19**
2.4 Airplane handling **20**
2.5 PHYSIOLOGICAL / PSYCHOLOGICAL FACTORS **20**
2.6 Survival Factors **20**
2.7 FLIGHT RECORDERS **20**
2.8 Maintenance Oversight **21**

PART 3 CONCLUSIONS **22**
3.1 FINDINGS **22**
3.2 PROBABLE CAUSE **23**
3.3 CONTRIBUTING FACTORS **23**

PART 4 SAFETY RECOMMENDATIONS: **24**

PART 5 APPENDICES **25**

Appendix 1 ILS z Runway 06 Instrument Approach Chart 25
APPENDIX 2 Overview of Approach to Runway 06 26
APPENDIX 3 Overlay of Weather conditions over Freeport before and after the accident 27
APPENDIX 4 Overlay of Weather Conditions Approach Chart over weather 28
APPENDIX 5 Overlay of Weather Conditions Approach Chart under weather 29
APPENDIX 6 Satellite Loop for the period 21:30 (4:30pm) 30
APPENDIX 7 Satellite loop for the period 22:30 (5:30pm) 30
APPENDIX 8 Actual weather conditions prior to, during and after the accident 31
APPENDIX 9 Instrument Approach Chart Rwy 06 Google Earth View 33

FOREWARD

February 20, 2015

Mr. Ivan Cleare
Director (Acting)
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Bahamas

Sir

I am duty-bound to submit this report on the circumstances of the fatal accident involving N17UF, a Bombardier Learjet 35A aircraft, registered in the United States to Diplomat Aviation (Bahamas) Limited at 1421 SW 107th Ave #300 Miami, Florida, USA. This accident occurred on November 9th, 2014 at 4:52pm local time (2152Z) when the aircraft hit a stationary crane at the Grand Bahama Shipyard and a generator unit in the City Services Limited Garbage and Metal Recycling Plant adjacent to the Grand Bahama Shipyard while on approach and attempting to find the runway at Freeport Int'l Airport visually during instrument meteorological conditions.

This report is submitted pursuant to Part XII, Regulation 80, and Schedule 19 of the Bahamas Civil Aviation (Safety)(Amendment) Regulation (CASR 2014) and in accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO).

In accordance with Annex 13 to the Convention on International Civil Aviation (ICAO), and Schedule 19 of the Bahamas Civil Aviation (Safety)(Amendment) Regulations (CASAR), the fundamental purpose of such investigations 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.

This report contains facts that have been determined up to the time of publication. Information is published to inform the aviation industry and the public of the circumstances surrounding this accident. The contents of this report may be subjected to alterations or corrections if additional factual information becomes available.

Regards

Delvin R. Major
Investigator in Charge
Air Accident Investigation and Prevention Unit
Bahamas Department of Civil Aviation
JL Center, Blake Road
Nassau, N. P., Bahamas

BAHAMAS CIVIL AVIATION DEPARTMENT
AIR ACCIDENT INVESTIGATION AND PREVENTION UNIT

EXECUTIVE SUMMARY

On November 9, 2014 at 4:52pm (2152Z) a Bombardier Learjet 35A, Registration N17UF, registered to and operated by Diplomat Aviation (Bahamas) Limited, crashed into a garbage and metal recycling plant after striking a towering crane in the Grand Bahama Shipyard, while attempting a second landing approach to runway 06 at Freeport International Airport (MYGF), Freeport, Grand Bahama, Bahamas.

The aircraft made an initial ILS instrument approach to Runway 06 at the Freeport International Airport but due to poor visibility and rain at the decision height, the crew executed a go around procedure. The crew requested to hold at the published holding point at 2,000 feet while they waited for the weather to improve.

Once cleared for the second ILS approach, the crew proceeded inbound from the holding location to intercept the localizer of the ILS system associated with the instrument approach. During the approach, the crew periodically reported their position to ATC, as the approach was not in a radar environment. The crew was given current weather conditions and advised that the conditions were again deteriorating. The crew continued their approach and descended visually while attempting to find the runway, until the aircraft struck the crane positioned at Dock #2 of the Shipyard at approximately 220 feet above sea level, some 3.2 nautical miles (nm) from the runway threshold.

A fireball lasting approximately 3 seconds was observed as a result of the contact between the aircraft and the crane. The right outboard wing, right landing gear and right wingtip fuel tank, separated from the aircraft on impact. This resulted in the aircraft travelling out of control, some 1,578 feet (526 yards) before crashing inverted into a pile of garbage and other debris in the City Services Garbage and Metal Recycling Plant adjacent to the Grand Bahama Shipyard. Both crew and 7 passengers were fatally injured.

No person on the ground was injured. The crane in the shipyard that was struck received minimal damages while the generator unit and other equipment in the recycling plant received extensive damages.

The Air Accident Investigation & Prevention Unit (AAIPU) determines that the probable cause(s) of this accident were:

- The poor decision making of the crew in initiating and continuing a descent in IMC below the authorized altitude, without visual contact with the runway environment and

Contributing Factors includes:

- Improper planning of the approach
- Failure of the crew to follow the approved ILS approach while in IMC conditions.
- Insufficient horizontal or vertical situational awareness
- Poor decision making
- Deliberate actions of the crew by disabling the terrain alert warning system
- Inadequate CRM practice

BAHAMAS CIVIL AVIATION DEPARTMENT
AIR ACCIDENT INVESTIGATION AND PREVENTION UNIT

TITLE

Registered Owner:	Diplomat Aviation (Bahamas) Limited
Operator:	Diplomat Aviation (Bahamas) Limited
Manufacturer:	Bombardier Learjet[1]
Model:	35A
Aircraft Type:	Fixed Wing Multi Engine
Nationality:	United States
Registration:	N17UF
Place of Accident:	Grand Bahama Shipyard and City Services Limited Recycling Plant
Date and Time:	November 9th, 2014 at 2152Z (4:52pm local EST)
Notification:	DCA, NTSB, ICAO, FAA, Bombardier
Investigating Authority:	Bahamas Department of Civil Aviation Air Accident Investigation and Prevention Unit
Investigator in Charge:	Mr. Delvin R. Major
Accredited Representative:	An Investigator from the NTSB assisted in the investigation.
Advisors to ACCREP:	Accident Investigators from both the FAA as well as Bombardier were advisors to the accredited representative
Releasing Authority:	Civil Aviation Department, Nassau, N. P., Bahamas
Date of Report Publication:	February 20, 2015

[1] *At the time of manufacture, the type certificate for the aircraft belonged to Gates Learjet Corporation. The type certificate now belongs to Bombardier.*

ABBREVIATIONS AND TERMINOLOGY

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

AAIPU	Air Accident Investigation and Prevention Unit
AIS	Automatic Information Services
ATS	Air Traffic Services
BDCA /CAD	Bahamas Department of Civil Aviation
CASR	Bahamas Civil Aviation (Safety) Regulations (April 17, 2001)
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CRM	Crew Resources Management
CVR	Cockpit Voice Recorder
DCA	Director of Civil Aviation
DEEC	Digital Electronic Engine Control
EST	Eastern Standard Time (-4 hours to convert from UTC)
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Condition
MET	Meteorological Office / Department
METAR	Weather Report furnished by Meteorological Department
NM or nm	Nautical Miles
NTSB	National Transportation Safety Board
NVM	Non Volatile Memory
RVSM	Reduced Vertical Separation Minimums
SOP	Standard Operating Procedures
STC	Supplemental Type Certificate
USA	United States of America
VFR	Visual Flight Rules
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 which 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.

Fatal injury. - means any injury which results in death within 30 days of the accident.

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.

Maximum mass. Maximum certificated take-off mass.

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

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

Safety recommendation. A proposal of 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

PART 1 FACTUAL INFORMATION:

1.1 HISTORY OF THE FLIGHT

On November 9, 2014 at 4:52pm (2152Z) a Diplomat Aviation (Bahamas) Limited Bombardier Learjet 35A aircraft, registration N17UF crashed into a garbage and metal recycling plant after striking a towering crane in the Grand Bahama Shipyard while attempting a landing at Freeport International Airport (MYGF).

N17UF was a business flight operated under the provisions of the USA 14 Code of Federal Regulations Part 91. Day, instrument meteorological conditions prevailed and an instrument flight rules flight plan was filed for the 24-minute flight from Lynden Pindling International Airport (LPIA)(MYNN) destined for Freeport International Airport (MYGF), Freeport, Grand Bahama, Bahamas.

The accident resulted in two (2) wreckage sites. Site one (1), the initial impact site, identified as dock number 2 in the Grand Bahama Shipyard, and site two (2), the garbage and metal recycling plant owned and operated by City Services Limited. Portions of the right hand wing and right hand wingtip tank were located at site 1. The rest of the aircraft was located at site 2, with the exception of the right-hand main landing gear, which was never found.

The aircraft made an initial ILS instrument approach to Runway 06 (ILS z RWY 06) at the Freeport International Airport but, due to poor visibility and rain at the decision height, the crew executed a go around procedure. The crew requested to hold at the published holding point *(which was located on the 146 degree radial of the Freeport VOR/DME beginning at the 12 nm mark at 2,000 feet)* while they waited for the weather to improve.

Once advised by ATC that the weather was improving, the crew requested to return and attempt the ILS z RWY 06 approach a second time. ATC cleared the aircraft for the ILS z RWY 06 approach a second time with instructions to proceed from the holding position direct to HOLIR[2] Intersection, which is the initial fix for this approach. The crew proceeded inbound from the holding location to intercept the localizer of the ILS system associated with the instrument approach.

During the approach, the crew periodically reported their position and altitude to ATC, as this approach was not in a radar environment.

The crew was given current weather conditions and advised that the conditions were again deteriorating. The crew acknowledged the instructions and continued the **"Before Landing Checks"** from the aircraft checklist. The crew deliberately continued descending below the published minimum altitude for this approach while attempting to find the runway visually. Repeated warnings about altitude and terrain proximity from the onboard Terrain Awareness Warning System (TAWS) were ignored. One of the crew disabled the warning alert system (unable to determined who did it) and continued with the **"Before Landing Checks"**.

The crew continued the descent while looking visually for the runway until the aircraft right wing struck the crane positioned at Dock #2 of the Grand Bahama Shipyard, some 3.2 nautical miles (nm) from the runway threshold. The impact occurred with two support beams above the crane operator's cab, approximately 115 feet above the base of the loading dock which was an additional 90 feet above sea level.

[2] *HOLIR intersection is defined by intercepting the 248 degree radial of the Freeport VOR/DME inbound, 12 nm at 2,000 feet*

The crane was stationed at coordinates, Latitude 26 degrees, 31.617 minutes North and Longitude, 78 degrees, 45.363 minutes West. Just seconds prior to the impact upon seeing the crane, the first officer exclaimed "climb, climb, climb."

A fireball lasting approximately 3 seconds was observed (despite the heavy rain conditions) from a tower camera system stationed at an industry partner facility. The right outboard wing and fuel tank that struck the crane, as well as the right main landing gear, separated from the aircraft on impact. The separation of the wing structure from the aircraft resulted in the aircraft becoming inverted while it travelled in a downward direction some additional 1,578 feet (.4809km / 526 yards) from the point of initial impact. The aircraft eventually crashed into a pile of garbage and came to a sudden stop after making contact with a generator unit in the City Services Garbage and Recycling Plant (*identified as site 2)* adjacent to the Grand Bahama Shipyard *(identified as site 1*). The sudden stop proved catastrophic for all occupants and resulted in the captain being ejected from the aircraft after the cockpit was compromised due to the impact. He landed on the top of the generator unit. Other occupants of the aircraft were found in the fuselage which was also compromised due to the sudden stop as a result of the impact with the generator unit. No injuries to persons on the ground were reported. The crane in the shipyard that was struck received minimal damages. A generator unit and other equipment in the recycling plant received extensive damages.

Due to the heavy downpour of rain around the time of the accident, operations at the shipyard, the Freeport container port *(¼ mile away*), as well as the recycling plant had ceased and workers were inside the facilities. Workers at the Shipyard as well as workers at the adjacent recycling plant upon hearing the loud impact, alerted the authorities who, upon further investigation, discovered the aircraft in the mounds of garbage and other debris in the recycling plant. Upon further investigation it was realized that both crew and 7 passengers were fatally injured. The authorities as well as first responders worked thru the night to extricate the passengers and crew who were all later transported to the Rand Hospital morgue. The scene of the crash was cordoned off and secured by officers of the Royal Bahamas Police Force (RBPF) until the arrival of the Air Accident Investigation & Prevention Unit (AAIPU) the following morning. Security of the accident site by the RBPF continued until the conclusion of the onsite investigation.

1.2 INJURIES TO PERSONS

Injuries	*Crew*	*Passengers*	*Others*	*Total*
Fatal	**2**	**7**		**9**

1.3 DAMAGE TO AIRCRAFT

The aircraft was destroyed by the initial and secondary impacts with the crane in the shipyard and garbage and debris pile and generator unit in the City Services Limited Garbage and Metal Recycling Plant.

1.4 OTHER DAMAGE

Management personnel of City Services Limited estimated damages sustained by the generator-housing unit and other equipment on the property to be in excess of one (1) million dollars. Damages sustained by the Grand Bahama Shipyard to its crane and other surrounding areas were reported by management personnel as minimal.

1.5 PERSONNEL INFORMATION

Both pilots resided in Nassau, Bahamas where the airplane was based and maintained by the operator. The pilot in command (captain) was the Pilot Flying while the other pilot (copilot) was the Pilot not flying.

Both pilots were licensed and certified by the USA Federal Aviation Administration and both were in possession of valid first class medical certificates as required by regulations. Both medicals were issued in November 2014.

1.5.1 The Captain (Pilot Flying)

The captain of N17UF was 62 years old. He was hired by Diplomat Aviation (Bahamas) Limited in February 2010. He held a Federal Aviation Administration (FAA) Class I medical certificate with the limitations "must wear corrective lens"[3] dated 06 November 2014. His total pilot hours reported at the time of that medical certification was 13,500 hours[4]. The captain held the following certificates Airline Transport Pilot, Airplane Multi Engine Land, Commercial Privileges, and Airplane Single Engine Land. He held the following type rating A/LR–JET. The captain received his initial PIC training at SIMCOM Training Center in Orlando, Florida in 2003. However, no training records dating back that far was available as there is no regulatory requirement to keep records beyond 12 months as per Federal Aviation Regulations (FAR) Part 142.73.

His total time in the Learjet as well as total time as pilot in command is unknown. In the preceding 30, 60 and 90 days the amount of hours logged was unknown. FAA records indicated no accidents, violations or enforcement actions against the captain.

The captain received annual Learjet 35 recurrent training at the same SIMCOM Training Center where he got his initial training. On his latest proficiency check completed 29 November 2013 both Oral exam and Proficiency Check were noted as having been completed satisfactory. On that last recurrent training, the pilot noted his total flight hours as 13,800 hours, 7,600 as PIC and 6,200 as SIC. The amount of total or PIC time that was logged in the Learjet 35 aircraft is unknown.

1.5.2 First Officer (Pilot not Flying)

The first officer of N17UF was aged 35 years old. He was hired by the Diplomat Aviation (Bahamas) Limited in February 2010. He held a FAA Class I medical certificate with the limitations "must wear corrective lens"[5] issued 06 November 2014. His total pilot hours reported at the time of his last medical certification was 1,020 hours. He held the following certificates Commercial Pilot, Airplane Multi Engine Land, Instrument Airplane Private Privileges, and Airplane Single Engine Land. He held the following type rating C/LR–JET. The first officer received his initial type rating training at SIMCOM Training Center in 2010. However, no training records dating back that far was available as there is no regulatory requirement to keep records beyond 12 months as per FAR Part 142.73. His total time in the Learjet aircraft is unknown. In the preceding 30, 60 and 90 days the amount of flight time logged was unknown. FAA records indicated no accidents, violations or enforcement actions against the first officer.

The first officer received annual Learjet 35 recurrent training at SIMCOM Training Center in Orlando Florida. On his latest proficiency check completed 29 November 2013 both Oral exam and Proficiency Check were noted as having been completed satisfactory. At that time the first officer noted his flight hours as 996 total flight hours with 400 hours in turbine and 387 hours as SIC. His instrument hours were listed as 300 hours. Based on the hours listed on his training form on November 26, 2013 and the medical certificate application on November 6, 2014, it would appear that the copilot flew a total of 24 hours for the preceding year. The amount of total time acquired by the copilot on the Learjet aircraft is unknown.

1.6 AIRCRAFT INFORMATION

N17UF, serial number 258, was manufactured in 1979. It was issued an airworthiness certificate, with standard classification, in the transport category, on July 18, 1979. Diplomat Aviation (Bahamas) Ltd was the most recent registered owner.

[3] *It was never determined whether the pilot flying was wearing corrective lenses at the time of the accident.*

[4] *(There appears to be a discrepancy in the amount of hours documented by the captain as during flight training documentation he documented 13,800 hours on November 13, 2013 and on November 6, 2014 when he completed his medical examination he documented his total hours as 13,500 hours).*

[5] *It was never determined whether the pilot not flying was wearing corrective lenses at the time of the accident.*

The aircraft had accumulated 12,046.1 flight hours and 10534 landings as of August 28, 2014. The aircraft was equipped with Garrett TFE731-2C-2B turbo fan engines. The left engine serial number P74716 accumulated 11,722.1 flight hours and 10,157 cycles as of August 28, 2014. The right engine serial number P74722 accumulated a total of 11,681.2 flight hours and 10,098 cycles as of August 28, 2014.

1.6.1 Aircraft Fuelling Information

The aircraft uplifted 160 gallons of Jet A fuel from Truck #17487 on 9 November 2014 from Odyssey Aviation at Lynden Pindling Int'l Airport. The exact amount of fuel on the aircraft prior to its departure was unknown. However, on the flight plan filed for the aircraft for its 24-minute flight to Freeport, the fuel endurance of 3 hours was noted.

1.6.2 Weight and Balance and Stall Information

The airplane type certificate listed the maximum allowable takeoff weight at 17,000 pounds. The maximum allowable structural weight was 17,250 pounds. The weight of the airplane at the time of the accident was unknown.

1.6.3 Maintenance Records and actions prior to the accident

The Air Accident Investigation & Prevention Unit examined N17UF's Maintenance records from the time of its manufacture to the date of the accident. The last calendar inspection prior to the accident was a B1-B6, C1-C6 inspection on January 24, 2014 @ 11,999.3 flight hours and 10,497 cycles before the accident flight. The aircraft final maintenance visit was August 28, 2014 12,046.1 Flight hours and 10,534 cycles, at which time STC ST09568SC [Installation of R134A Freon Air-condition system] and out of phase inspections [3 month/100hr Ni-Cad, 3 month Main Battery Capacitance Check & 300 Hr L/H & R/H Thrust Reverse Inspection] was completed before the accident.

1.7 METEOROLOGICAL INFORMATION

The Bahamas Area Forecast published on 9 November 2014 by the Bahamas Meteorological Department indicated that for the Northwest Bahamas there was a frontal boundary over the northwest Bahamas and lower, moving over the northern Bahamas. Significant Weather for all areas indicated a few scattered to occasional and broken clouds could be expected with ranges from 1,500 feet to tops above18,000 feet. Towering cumulus clouds and isolated showers with chances of isolated thundershowers were forecasted with reduced visibility and ceilings below 1,500 feet. The report indicated a possibility of heavy showers and moderate to severe turbulence in the vicinity of the towering cumulus clouds.

The accident occurred during instrument meteorological conditions (IMC). A full weather briefing for conditions at MYGF prior to the accident, was not available to the crew as the weather reporting services (MET) at Freeport Int'l Airport was closed at the time of the accident. MET is listed in the AIP as providing services Monday to Friday, 1200 – 1400 UTC. ATC personnel that have been cross-trained to provide limited weather reports and observations provided weather and field conditions to the aircraft. The **Bahamas Public Weather Forecast** conditions for the Northern Bahamas, which included Freeport, was issued by the Bahamas Meteorological Department located at Lynden Pindling Int'l Airport in Nassau Bahamas at 12:00pm for the period "this afternoon and tonight" and indicated:

"General Situation: A weak cold front remains across the extreme Northwest Bahamas (NW); while a weak surface low will move over the extreme Northwest Bahamas tonight and tomorrow"

> For the NW Bahamas weather "partly cloudy with a few scattered showers and possible isolated thunderstorms tonight and tomorrow." Winds were forecasted to be south to southwest at 10 to 15 knots over open waters.

Area Forecast also published by the Bahamas Meteorological Department located at Lynden Pindling Int'l Airport in Nassau Bahamas was valid for 12 hours from 1800 UTC (2pm Local).

The forecast indicated a frontal boundary over NW Bahamas and lower moving north over the northern islands. Significant weather for all areas indicated few or scattered clouds at 1,500 feet to 3,000 feet. Scattered to occasional broken clouds were expected between 6,000 and 8,000 feet with towering cumulonimbus clouds with tops above 18,000 and 24,000 feet. Isolated showers and chance for isolated thundershowers with ceilings and visibility below 1,500 feet and 3 miles respectively were expected in heavy showers and thundershowers with moderate to severe turbulence in the vicinity of the towering cumulus and cumulonimbus clouds.

Upper winds for the 2,000 feet altitude level were forecasted to be 230 degrees at 12 knots.

At 21:22:57 (4:22:57pm local) ATC (Approach Control) issued the following weather information to N17UF when the first contact was made stating aircraft was 10 nm from the LAUTH Intersection:

- IMC conditions were advised with 2,000 broken, 4 miles visibility, temperature 21 degree, dew point 20 degrees, altimeter 29.83 in HG, winds out of the north at 000 degrees at 5 knots. Runway 6 was in use and the aircraft could expect ILS z Runway 6 approach.

At 21:29:09 After contacting ATC again (Tower Controller), ATC issued the following weather update to N17UF:

- Field conditions light rain overhead, visibility two and a half miles with mist, cloud layer 800 feet. Winds were now reported as 340 degrees at 13 knots.

At 21:36:24 Tower controller reported that he had the aircraft in sight and he was cleared to land.

At 21:36:29 N17UF report that he was "going around" he later reported to the controller that he did not have the runway in sight at the decision height (DH).

At 21:38:34 after request from N17UF the controller again issued weather conditions as:

- Winds 340 degrees at 9 knots with gusts to 15 knots, altimeter 29.82, visibility one and one half miles with haze, light to moderate rain showers overhead.

At 21:43:20 ATC again updated N17UF with conditions at the field, which included;

- Moderate rain showers overhead, visibility had increased to 3 miles, broken cloud layer at 900 feet, temperature 21 degrees and altimeter at 29.82 in HG. N17UF requested to return to Freeport for the second ILS approach.

At 21:44:28 ATC advised N17UF that the conditions had improved greatly and visibility was now 3.5 miles.

At 21:45:44 Freeport tower controller advised N17UF that sunshine was coming through and visibility was 3 to 4 miles.

At 21:50:29 Freeport tower controller advised N17UF that there was once again moderate rain showers at the field and winds were 340 degrees at 12 knots and he was cleared to land. N17UF acknowledge his landing clearance. This was the last transmission uttered by N17UF.

At 21:52:03 Freeport tower controller updated the weather again, which included moderate rain showers and one and a half (1.5) miles visibility. This was the last update given to the aircraft. There was no response from the aircraft after that update.

1.8 AIDS TO NAVIGATION

Freeport International Airport does not have radar capabilities and therefore pilots are required to provide distance, location and altitude positions to ATC when conducting approaches. Freeport ATC does not have capabilities to track flight path. Miami Flight center was able to provide valuable flight path direction and altitude information of the aircraft route from MYNN up until the aircraft was lost.

1.9 COMMUNICATIONS

Communications with N17UF were established with Freeport Approach and Departure Controls on frequency 126.50 MHz as well as Freeport Control Tower on 118.50 MHz. There were no problems with availability of communications.

1.10 AERODROME INFORMATION

Information relative to Freeport International Airport (MYGF) was obtained from the Bahamas Department of Civil Aviation Aeronautical Information Publication (AIP) Amendment 01/2014 dated 1 May 2014.

The airport is served with two runways, runway 06 and runway 24. Runway 06 has a bearing of 061 degree true and 068 degrees magnetic heading. Runway 24 is oriented 241 degrees true and 248 degrees magnetic heading. The airport has a magnetic variation of 7 degrees west. The runway is constructed of asphalt and has takeoff and landing dimensions available of 150 feet wide by 10,979 feet long. The airport is located at coordinates Latitude 26 degree 33 minutes and 31.27 seconds North and Longitude 78 degree 41 minutes and 43.99 seconds West at the midpoint of Runway 06/24. Obstacles are detailed in the AIP which may affect operations to both runways 06 and 24. Such obstacles include cranes, trees and buildings.

The airport is located 1.9nm, on a bearing of 354 degrees from the geographical center of downtown Freeport. The elevation is 7 ft. MSL. It is privately operated and a port of entry. The Civil Aviation Administration is responsible for administration of the airport. The airport caters to both IFR and VFR traffic. Instrument approaches available to Runways 06 and 24 includes:

1. ILS z RWY 06
2. VOR y RWY 06
3. VOR y RWY 24
4. VOR z RWY 06
5. VOR z RWY 24
6. RNAV (GNSS) RWY 06
7. RNAV (GNSS) RWY 24

Customs and Immigration offers pre-clearance into the United States of America. Bahamas Immigration and Customs services available 24 hours.

MET briefing is available Monday to Friday 1200 to 1400 UTC. Flight Services available daily, 1100 to 0300 UTC. ATS is available daily, 1100 to 0300 UTC.

The airport is equipped for Category 7 rescue and firefighting operations with 3 rescue units with capacity between 1,500 to 3,000 gallons of water, 210 to 420 gallons of foam and 500 to 700 pounds of dry chemical.

1.11 FLIGHT RECORDERS

1.11.1 Cockpit Voice Recorder

The aircraft was equipped with a Fairchild Model GA100 Cockpit Voice Recorder (CVR)[6] and 2 Honeywell International N1 Digital Electronic Engine Control[7] (DEEC) monitors which were recovered and sent to the National Transportation Safety Board in Washington DC and Honeywell Aerospace in Phoenix, Arizona respectively, for readout.

The Cockpit Voice Recorder (CVR) was located in the rear section of the fuselage beside the Emergency Locator Transmitter. The CVR box was damaged. The data plate on the CVR identified it as a Fairchild Model GA100, P/N GA100-0000, and S/N 01525.

1.11.2 Digital Electronic Engine Control

The upper and lower Honeywell-manufactured N1 Digital Electronic Engine Control (DEEC) was found following retrieval of the CVR. The fuselage was cut with a gas-powered circular saw in order to facilitate removal of the DEECs. The DEECs were found in their standard installation location next to the engine synchronization unit.

The upper DEEC had a corner missing, allowing the electronics inside it to be exposed. The data plate on the upper DEEC identified it as P/N 2119020-4003, S/N 72-BK0080.

The lower DEEC also had damage to the front. The internal circuit board was visible. The data plate on the lower DEEC identified it as P/N 2119020-4003, S/N 72-BK0078.

1.11.3 Flight Data Recorder (FDR)

The aircraft did not appear to be equipped with an FDR. The aircraft was not equipped with an FDR at build and no records were found of an FDR ever having been installed after delivery.

Tests were done on the following components and a summary of those tests is presented here. The full context of each test is available at the AAIPU office located at the J L Center, Blake Road, Nassau Bahamas.

1. N1 Digital Electronic Engine Controls (DEEC)
2. Cockpit Voice Recorder

1.11.4 Analysis - N1 Digital Electronic Engine Control

This report presents the findings of the investigation of two N1 Digital Electronic Engine Controls (N1 DEECs) at the Honeywell Aerospace facility in Tucson, Arizona on November 17, 2014. The investigation was conducted under the supervision of the National Transportation Safety Board (NTSB).

BACKGROUND

The N1 DEEC, S/N 72-BK0078 was installed on a TFE731-2C-2B and was associated with the left engine of the aircraft. The N1 DEEC, S/N 72- BK0080 was installed on a TFE731-2-2B and was associated with the right engine of the aircraft.

[6] ***Cockpit Voice Recorder (CVR)*** *- a device used to record the audio environment on the flight deck for accidents and incident investigation purposes. The CVR records and stores the audio signals of the microphones and earphones of the pilots' headsets and of an area microphone installed in the cockpit.*

[7] ***The Digital Electronic Engine Control (DEEC)*** *is a highly successful, commercially developed component that integrates a variety of engine functions to improve performance and extend engine life.*

ANALYSIS

The PN 2119020-4003 DEECs include an incident recorder that collects engine and aircraft operational data and records it into Non-Volatile Memory (NVM) for post-accident/incident download and analysis. The purpose of this recorder is to provide a record of engine speeds and inter-turbine temperatures, aircraft parameters relating to the engine, and control modes during operation. It should be noted that the DEEC casing is not designed to be crash worthy, and memory data could be lost for a variety of reasons including, but not limited to, impact and fire damage.

The incident recorder collects data into ten memory buffers for the last 85 minutes, 20 seconds of engine ground and/or flight time while the DEEC is powered. The recorder will automatically power off approximately five minutes after weight-on-wheels (WOW) is established. This feature prevents the DEEC from accidentally overwriting the data in memory if aircraft power remains on after the engines have been shut down.

The incident recorder stores the following parameters in NVM:

N1 (Low Pressure spool % speed)	N2 (High Pressure spool % speed)
ITT (inter-turbine temperature)	WOW (weight-on-wheels)
Mach	PLA (power lever angle)
ALT (pressure altitude)	TR (thrust reverser deploy)
Control Mode (auto / manual)	Time Stamp

CONCLUSIONS

The download of the incident recorder data and engine event data from both N1 DEECs was completed successfully. Analysis of the data indicated that both engines were rotating, operating, and responding to power lever inputs throughout the recorded data. In addition, the engines appeared to be able to achieve between 95% and 101% N1 when commanded.

1.12 WRECKAGE AND IMPACT INFORMATION

The accident occurred at the Grand Bahama Shipyard in Freeport (geographic location shown for reference in Figure, below). There were two wreckage sites:

(1) dock number 2, identified as the initial impact site (site 1);
(2) a garbage and metal recycling plant approximately 600 yards northeast of dock number 2 (site 2).

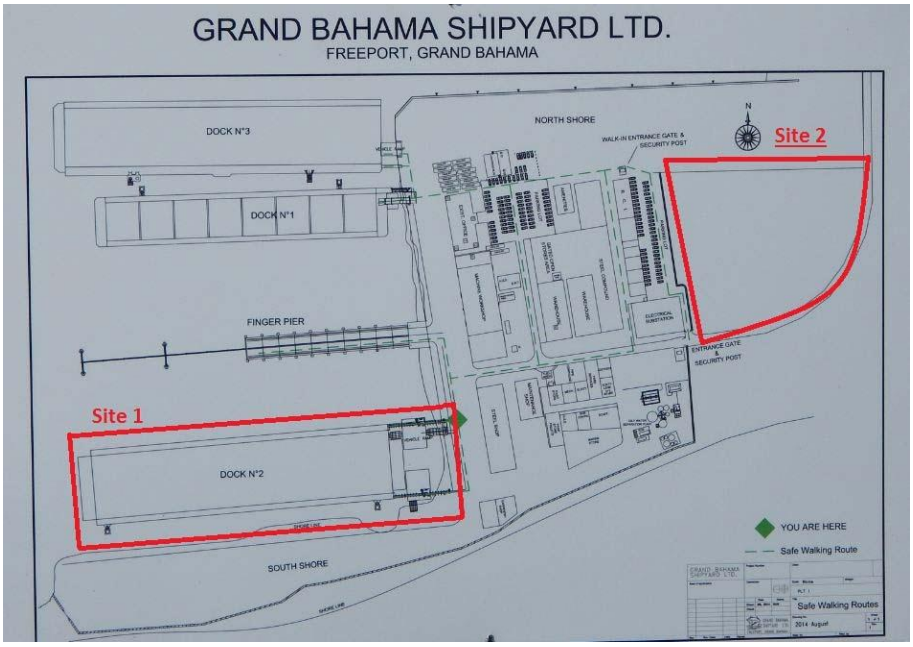
Portions of the right-hand wing and right-hand wing tip tank were located at site1. The rest of the aircraft was located at site 2. The two sites are shown in the diagram below.

The paint scheme observed on the wreckage appeared to be consistent with a photograph of the aircraft retrieved from www.flightaware.com

1.12.1 Airframe and Ground Damage

The right-hand wing had extensive damage starting forward of the outboard landing gear door. The majority of the wing outboard of that point was not at the examination site (it was located at site 1). Following wing reposition by the crane, it was noted that there appeared to be blue paint transfer present on the wing upper surface near the inboard edge of the fracture. The right-hand main landing gear was not found. Most of the right-hand flap was still connected to the right-hand wing. Approximately one foot of the outboard end of the flap was found at site 1. The flap appeared to be pulled aft. Flight control cables and electrical wiring all appeared to have been severed at the same location.

The left-hand wing found at the examination site was intact up to the outboard edge of the left-hand flap. The left-hand flap was still attached to the wing and it appeared to have been extended to the 8 degree position. The left-hand main landing gear was found attached to the wing in the extended position. Part number and serial number were not noted for the landing gear.



Following wing reposition by the crane, it was noted that this portion of the wing appeared to be relatively intact, with the exception of some compression damage to the leading edge.

A portion of the left-hand tip tank with the red navigation light was found near the pile of junk corresponding to the reported original resting place of the fuselage and wings. After removal of junk from the vicinity of the portion of the tip tank, a missing section of the left-hand wing was found. The complete wing extension outboard of the aileron was attached to the tip tank. The leading edge of the wing extension was compressed. Inboard of the wing section, forward of the aileron appeared to be compressed. The left-hand aileron was attached. The balance tab and aileron trim tab appeared to be attached to the aileron.

The nose landing gear was not attached to the fuselage structure, and therefore position (extended/retracted) could not be determined.

It was noted that the tail was inverted and dug into the junk pile. Both elevators were still attached to the horizontal stabilizer. The horizontal stabilizer appeared to be damaged, but intact. The leading edge of the horizontal stabilizer and the trailing edges of the elevators showed damage consistent with an inverted impact. No drag or skid marks were noted in the area aft of the tail assembly.

A GPS measurement at the location of the tail assembly was taken: N 26 deg 31.770 min, W 078 deg 45.133 min, elevation 2.0 feet.

The rudder was found detached and just to the left (facing the direction of travel of the aircraft) of the remnants of the vertical stabilizer. The rudder trim tab was found still attached to the rudder, and appeared to be in the neutral position.

The right-hand engine was found just forward of the remnants of the vertical stabilizer. The right-hand engine mechanical fuel control window indicated 120%. Fan blades were noted to have damage consistent with engine operating at time of impact. The thrust reverser for the right-hand engine was identified as an Aeronca design (an STC owned by Learjet) and was observed to be in the stowed position.

After examination in-situ, the tail assembly, the right-hand engine, and the rudder were moved to the examination site.

The left-hand engine located at the examination site had damage to the fan blades consistent with the engine operating upon impact. The left-hand engine mechanical fuel control window indicated 120%. The thrust reverser for the left-hand engine was identified as an Aeronca design and appeared to be stowed but was damaged. Part numbers and serial numbers of the engines were not observed.

After the tail section was moved to the examination site, the Horizontal Stabilizer Trim Actuator (HSTA) was extracted by cutting the surrounding structure with a gas-powered circular saw. A Learjet repair and overhaul sticker was noted adhered to the HSTA. The data plate on the HSTA identified it as P/N 2332540-214, S/N 142. The HSTA was shipped to Learjet for examination.

Upon initial examination, the flight deck was not accessible due to compression of the cockpit into the fuselage. The wreckage was manipulated several times via forklift in order to expose key portions of the instrument panel. During manipulation, the wing was moved topside up. Residual fuel was noted draining out of the wing at this time.

The upper and lower main passenger doors appeared to be intact and in the closed position

1.12.2 The Cockpit

The instrument panel was heavily damaged and heavily contaminated with human remains.

The annunciator panel and flight control panel were retrieved for possible future examination. The panels were contaminated with human remains. The panels were sent for analysis.

Engine instruments were observed to have the following values posted:

- right turbine 99.4%;
- right ITT 870;
- right fan damaged beyond recognition;
- left turbine 95.3%;
- left ITT 870;
- left fan approximately 95%.

A Universal Avionics Systems Corporation manufactured FMS was retrieved from the wreckage for future possible examination. It appeared to be relatively intact and had some human remains, but did not appear to be heavily contaminated. The unit was identified as P/N 1117-1-216, S/N4333, and SCN 21.0. The FMS was quarantined for future analysis.

The standby altimeter had a baro-correction setting of 29.82 inches Mercury (in HG)

The pilot's trim barrel switch (located on the left-hand horn of the pilot's control wheel) was missing the top hat.

The Fuel Quantity Indicator was damaged beyond usefulness and was therefore not retrieved.

Sandel-manufactured TAWS was retrieved from the wreckage and sent to the NTSB lab for analysis. The front panel of the unit was significantly damaged and heavily contaminated with human remains. The back panel also had significant damage. The data plate on the unit identified it as P/N ST3400-102. The serial number was smudged, but appeared to be 2688.

The NAV controller was found in the center pedestal with the following frequencies tuned:

- NAV-1/DME and NAV-2/DME both tuned to 109.70;
- ADF1 and ADF2 tuned to 274.0

On the nose section, one Rosemont pitot probe was noted, consistent with an RVSM installation. FAA record review revealed that in October 2004, the aircraft had incorporated an RVSM STC held by Flight Test Associates, Inc.

Wreckage at Site 1

At site 1, various small pieces of aircraft wreckage consistent with wing and wing tip tank structure were found on the southern pier of dock number 2, starting around pier frame 21. The wreckage on the pier appeared to extend inland to pier frame 11. A crane, identified as the point of impact, was located at pier frame 18. A GPS measurement at the north side of the pier at frame 18 was taken: N 26 deg 31.617 min, W 078 deg 45.363 min, elevation 89.9 feet.

Pieces of wreckage consistent with wing and wing tip tank structure were found at various points on the ladder platforms accessing the crane.

At the level of the operator's platform, the following pieces were found:

- the aft portion and inboard center portion of the right-hand tip tank;
- the right-hand wing extension (still attached to the tip tank;
- the right-hand aileron and wing forward of the aileron (still attached together); the aileron balance tab was still intact and attached to the aileron.

The ladder leading from the operator's platform to the uppermost crane platform was twisted starting approximately at the 32nd rung.

Signature marks were observed on the blue crane structure holding up the uppermost platform. The color of the blue crane structure appeared to be consistent with blue paint transfer marks found on aircraft wreckage. Additional pieces of aircraft wreckage consistent with wing and wing tip tank structure were found on the bottom of dock number 2, below the pier, extending from the position of the crane out to the foot bridge crossing to the dry dock, on a line extending to site 2. Blue paint transfer was noted on the inside of the number 4 lower wing access panel (found at the beginning of the wreckage trail at the bottom of the dock). Other pieces also exhibited signs of blue paint transfer.

Near the end of the wreckage trail on the bottom of the dry dock at the base of the pier, a portion of the outer right-hand wing tip tank, including the green navigation light, was found

The outboard portion of the right-hand flap (identified by the data plate found on the piece) was found on the bottom of the dry dock, near the middle of the dock, at the far end of the wreckage trail. The forward section of the right-hand wing tip tank was found at the foot bridge, and was the furthest piece along the wreckage trail.

Wreckage at Site 2

At site 2, the final resting place of the right-hand engine, horizontal stabilizer and vertical stabilizer was a pile of junk approximately 10 to 12 feet high. The final resting place of the fuselage, wings, cockpit and left-hand engine, was identified as another pile of junk, smaller than the first pile, abutting a mobile power generator, about 20 feet beyond the first pile, along the direction of travel of the aircraft. The general layout of site 2 is shown adjacent.

The forward fuselage of the aircraft had come to rest after impacting the side of the mobile power generator. The mobile power generator appeared to show some evidence of fire damage on the top. It was not determined whether this fire damage was as a result of the impact with the aircraft or whether this fire evidence was previously on the generator unit.

The fuselage, wings, cockpit and left-hand engine had been moved from their final resting place to an examination site to facilitate removal of human remains; the right-hand engine, horizontal stabilizer and vertical stabilizer had not been moved from the final resting point. The examination site was on the far side of the mobile power generator along the direction of travel of the aircraft.

At the examination site, the fuselage, having been moved from its original resting site, was found upside down. Standing from the rear of the fuselage, looking forward, the left-hand wing was on the right-hand side, upside down, and the right-hand wing was on the left-hand side, upside down. The left- hand engine was sitting on the ground below the right-hand wing.

The Cockpit Voice Recorder (CVR) was located in the rear section of the fuselage beside the Emergency Locator Transmitter. The CVR box was damaged. The data plate on the CVR identified it as a Fairchild Model GA100, P/N GA100-0000, and S/N 01525. The CVR was sent via FedEx to the NTSB laboratory for analysis.

The upper and lower Honeywell-manufactured N1 Digital Electronic Engine Controls (DEEC) was found following retrieval of the CVR. The fuselage was cut with a gas-powered circular saw in order to facilitate removal of the DEECs. The DEECs were found in their standard installation location next to the engine synchronization unit.

The upper DEEC had a corner missing, allowing the electronics inside it to be exposed. The data plate on the upper DEEC identified it as P/N 2119020-4003, S/N 72-BK0080.

The lower DEEC also had damage to the front. The internal circuit board was visible. The data plate on the lower DEEC identified it as P/N 2119020-4003, S/N 72-BK0078.

The DEECs were sent via FedEx to the manufacturer, Honeywell Aerospace in Tucson Arizona, for analysis.

No Flight Data Recorder (FDR) was found in the aft fuselage section of the aircraft. No FDR was required by regulations.

Summary

All primary and secondary control surfaces were accounted for. Aircraft damage appeared to be consistent with the right-hand wing striking the crane in flight and subsequent impact in the junkyard. No airworthiness concerns were identified as a result of the on-site examination.

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

Both pilots died as a result of injuries sustained in the accident. The local pathologist at the Rand Memorial Hospital in Freeport, Grand Bahama, performed autopsies on both pilots. Toxicology specimens were taken, secured and sent to the Accident Research Laboratory at the Federal Aviation Administration Civil Aerospace Medical Institute (CAMI)[8] at the Mike Mulroney Aeronautical Center in Oklahoma City. No carboxyhemoglobin or cyanide testing were performed. Ethanol test was done on both pilots and no ethanol was detected in the fluid samples from either pilots.

The samples were tested for amphetamines, opiates, marihuana, cocaine, phencyclidine, benzodiazepines, barbiturates, antidepressants and antihistamines. The samples for both pilots were negative for the above listed drugs.

1.14 FIRE

A camera, stationed at an industry partner facility captured at local time 4:52:20.73, a fireball that grew in size and intensity when the aircraft hit the crane, and lasted until time 4:52:22.77, some 2 seconds.

Cameras positioned at the Shipyard also captured the moment of impact and the fireball that ensued which corroborated the industry partners' camera footage.

Aside from what appeared to be evidence of burn marks on the top of the generator housing unit where the aircraft came to rest after impact, no other fire was reported or appeared to have occurred in the city services recycling plant as a result of the crash. First responders reported that the junkyard site was inundated with water when they arrived shortly after the impact, that it was raining and that fuel was noted to be floating on the water.

1.15 SURVIVAL ASPECTS

The survivability for the occupants of the accident aircraft could not be assessed because the severe impact forces, multiple impacts and destruction of the airplane and fuselage during the crash sequence, precluded a calculation of the g-forces sustained by the occupants. The occupy able area of the cockpit was severely compromised by the loss of the windshield and upper fuselage structure over the cockpit when the aircraft hit the ground inverted and subsequently collided with the generator unit during the crash sequence.

The seatbelt restraints were not able to restrain the captain as he was thrown from the cockpit as a result of the forces sustained when the generator unit was hit. He was found on the top of the generator unit. It was unknown whether the copilot's restraint was effective as he was confined in the remainder of the cockpit when it hit the generator unit. The instrument panel had moved downward and pinned his body.

The Police Department arrived on scene shortly after the report of the crash was received. A command was established and EMS services as well as other police services were dispatched to the scene. The police officers of the RBPF secured the scene and assistance from the GB Shipyard were enlisted to assist in using heavy equipment to remove the aircraft and extricate the bodies still trapped in the fuselage.

[8] **Civil Aerospace Medical Institute** (**CAMI**) is the medical certification, education, research, and occupational medicine wing of the Office of Aerospace Medicine (AAM) under the auspices of the Federal Aviation Administration Office of Aviation Safety. The Institute's primary goal is to enhance aviation safety. CAMI is located at the Mike Monroney Aeronautical Center (MMAC) in Oklahoma City, Oklahoma, at the corner of Southwest 66th Street and MacArthur Boulevard.

1.16 TESTS AND RESEARCH

Aside from recorders that were tested and analyzed no other components airframe or engine were tested or analyzed.

1.17 ORGANIZATIONAL AND MANAGEMENT INFORMATION

1.17.1 General

Diplomat Aviation Limited was formed to hold title to the aircraft N17UF and be the vehicle for any future business if it materialized. Both pilots were hired in February 2010 and were trained at SIMCOM Training Center in Orlando Florida. They were the only pilots for the company's aircraft. The company stated they kept records for the pilots, however, despite repeated requests, these records were never provided to the investigation team up to the publication of this report. Both pilots were due for recurrent training by the end of November 2014. The crew flew approximately 35 to 40 trips amassing an approximate 100 hours annually.

The main areas of travel for this crew were the United States, Canada, the Caribbean and South America. The day of the accident, the accident flight was the only flight conducted by this crew. The aircraft was based in the Bahamas and Maintenance was conducted in the United States of America.

1.18 ADDITIONAL INFORMATION

1.18.1 Crew Resource Management Training (CRM)

There is no evidence from training records reviewed that the crew completed any CRM training during their last proficiency check on November 29, 2013.

1.18.2 Bahamas Civil Aviation Safety Regulations 2013(BASR)

The following regulations were promulgated by the Bahamas Government for the Civil Aviation Community for guidance and adherence when conducting commercial or private operations in the airspace of the Commonwealth of the Bahamas. Adherences to these regulations are mandatory and unauthorized deviations can result in penalties as prescribed by Schedule 1 of said regulations.

BASR SCHEDULE 10 - SUBPART H: FLIGHT RULES FOR ALL OPERATIONS

10.470 APPLICABILITY

(a) The flight rules of this Subpart are applicable to all operations of aircraft in the airspace of the Bahamas.

10.475 NEGLIGENT OR RECKLESS OPERATIONS OF THE AIRCRAFT

(a) No person may operate an aircraft in a negligent or reckless manner so as to endanger life or property of others.

10.477 COMPLIANCE WITH LOCAL REGULATIONS

(a) All pilots shall be familiar with the laws, regulations and procedures pertinent to the performance of their duties, prescribed for the
  (1) Areas to be traversed,
  (2) The aerodromes to be used; and
  (3) The air navigation facilities relating to them.

(b) The PIC shall ensure that other members of the flight crew are familiar with such of these laws, regulations and procedures as are pertinent to the performance of their respective duties in the

operation of the aeroplane.

(c) All other members of the crew shall be familiar with the laws, regulations and procedures as are pertinent to the performance of their respective duties in the operation of the aircraft.

(d) The operator of the aircraft shall ensure that the crew members of the aircraft are familiar with the laws, regulations and procedures of the States where operations are conducted.

10.505 MINIMUM SAFE VFR ALTITUDES: COMMERCIAL AIR TRANSPORT OPERATIONS

(a) No person may operate an aeroplane in commercial air transport during the day, under VFR, at an altitude less than 1,000 feet above the surface or within 1,000 feet of any mountain, hill, or other obstruction to flight.

10.510 AERODROME OPERATING MINIMA

(a) No person may operate an aircraft to or from an aerodrome (or heliport) using an operating minima lower than those specified by the State in which the aerodrome is located, except with specific approval of that Authority.

(b) No person may continue a flight towards the aerodrome of intended landing, unless the latest available information indicates that at the expected time of arrival, a landing can be effected at that aerodrome, or at least one alternate aerodrome, in compliances with the operating minima applicable to that flight.

10.587 STABILIZED FINAL APPROACH

(a) The PIC of an aeroplane on final approach for landing will establish the aircraft in landing configuration (landing gear, flaps, airspeed, attitude and power) at or before 150 m (500 ft) above the elevation of the runway touchdown zone and maintain a stabilized configuration until the landing flare.

SUBPART I: OPERATIONS IN CONTROLLED FLIGHT

10.603 APPLICABILITY

The flight rules of this Subpart are applicable to all operations of aircraft in the airspace of the Bahamas.

10.610 ADHERENCE TO ATC CLEARANCES

(a) When an ATC clearance has been obtained, no PIC may deviate from the clearance, except in an emergency, unless he or she obtains an amended clearance. This requirement does not prohibit a pilot from cancelling an IFR clearance when operating in VMC conditions or cancelling a controlled flight clearance when operating in airspace that does not required controlled flight.

(b) When operating in airspace requiring controlled flight, no PIC may operate contrary to ATC instructions, except in an emergency.

SUBPART K: IFR FLIGHT RULES

10.703 APPLICABILITY

(a) The IFR rules of this Subpart are applicable in airspace of the Bahamas.

10.720 MINIMUM ALTITUDES FOR IFR OPERATIONS

(a) *Operation of aircraft at minimum altitudes*. Except when necessary for takeoff or landing, no person may operate an aircraft under IFR below—

(1) The applicable minimum altitudes prescribed by the authorities having jurisdiction over the airspace being overflown; or

10.755 INSTRUMENT APPROACHES TO CIVIL AERODROMES

(a) Each person operating an civil aircraft shall use a standard instrument approach procedure prescribed by the State having jurisdiction over the aerodrome, unless specifically approved by that State.

(c) No person may make an instrument approach at an aerodrome except in accordance with IFR weather minimums and the published instrument approach procedures.

10.765 COMMENCING AN INSTRUMENT APPROACH

(a) *N*o pilot may continue an instrument approach past the outer marker fix in case of a precision approach, or below 300 m (1,000 ft), at any aerodrome in case of a non-precision approach, unless—

(1) A source approved by the Authority issues a weather report for that aerodrome; and

(2) The latest weather report for that aerodrome reports the visibility to be equal to or more than the visibility minimums prescribed for that procedure.

(b) If after passing the outer marker fix in case of a precision approach, or below 300 m (1,000 ft) above the aerodrome in case of a non-precision approach, the reported visibility or controlling RVR falls below the specified minimum, the pilot may continue the approach to DH or MDA.

SUBPART L: GENERAL AVIATION: TURBOJET & LARGE AIRPLANES

10.795 APPLICABILITY

(a) This Subpart prescribes requirements, in addition to those found in Subparts A through J of this Schedule . that apply to the general aviation operations of—

(1) Large airplanes;

(2) Turbojet-powered airplanes; and

(3) Other airplanes configured for more than 9 passengers.

(b) Corporate aviation operations involving three or more aircraft that are operated by pilots employed for the purpose of flying the aircraft, at least one of which is an aeroplane, should be conducted in accordance with this Subpart.

(c) This Subpart also specifically applies to operators of the airplanes listed in (a) and (b), including their managers, licensed persons and service providers who perform the functions associated with maintenance, training, dispatch and flight operations.

10.800 OPERATOR IS RESPONSIBLE

(a) The operator subject to the requirements of this Subpart shall ensure that the personnel employed for operations and maintenance—

(1) Have completed all required training before being assigned to their specific functions;

(2) Are qualified for the duties, responsibilities and functions they are assigned;

(3) Comply with the laws, regulations and procedures applicable to their assignment;

(b) The operator shall ensure that its personnel are provided with the manuals and other reference documents necessary to the performance of their duties and responsibilities.

(c) The operator shall ensure that the owner's responsibilities for maintenance and maintenance records of

this Schedule and Schedule 5 have been met for the aircraft that he is operating.

(d) The operator shall ensure the completion and retention of the records required for operations under this Subpart to demonstrate conformance with the applicable requirements.

(e) The operator shall ensure the completion, submission and retention of the reports required for operations under this Schedule.

10.865 AERODROME OPERATING MINIMA & MINIMUM FLIGHT ALTITUDES

(a) An operator shall ensure that no pilot-in-command operates to or from an aerodrome using operating minima lower than those which may be established for that aerodrome by the State in which it is located, except with the specific approval of that State.

PART 2 ANALYSIS

2.1 GENERAL

Weather was a factor in this accident.

Air Traffic Control services were provided in accordance with established criteria and were not a factor in the cause of this accident.

The flight crew was properly trained and qualified in accordance with USA existing regulations. They were trained by SIMCOM Training Center in Orlando, Florida, USA. From training records reviewed, no evidence of crew resource management (CRM) could be established as having been completed during the latest recurrent training.

It became apparent during the investigation that the crew intentionally went well below the published glideslope during their approach and withheld this information from ATC.

There is evidence that the lack of CRM contributed to this accident. There were no standard cockpit management procedures being followed during the last 30 minutes of the flight. The PIC appeared more passive and the SIC was more commanding in issuing instructions of what was going on at the time.

There is strong evidence that came from the CVR recording, that indicates that one of the pilots willfully disabled the terrain awareness warning system (TAWS) while it was alerting them to the presence of "terrain" and advising them that they were "too low" and to "pull up". One of the crew intentionally uttered the words "ah shut up" after which the alerts of "too low", "terrain" and "pull up" ceased. The cockpit once again became quiet (free from alerts) and the briefing and checklist continued up to the point the aircraft struck the crane.

Despite advising ATC of their altitude as 2,000 feet and on the ILS Approach, the aircraft was actually at 1,000 feet and descending looking for the runway visually and not on the glideslope of the ILS z RWY 06 approach as approved by ATC. Additionally, the aircraft never entered or held at the published holding position or altitude as they advised ATC they were doing. The aircraft also never maintained the authorized altitude as they made the approach from the area of the holding position toward the airport. Radar data from Miami Center supports this assertion. CVR recording also supports this assertion during the final minutes of the flight after departing the area of the holding position. As Freeport Int'l Airport does not have radar in which to detect and verify aircraft position, there was no way for controllers to know an aircraft was not at the exact position or altitude that they reported.

Although the airplane operated in level flight for several miles, well below the altitude authorized for this approach, the weather conditions were such that they continued descent, without any sense of urgency or concerns of the locations of the cranes. The crew deliberately disabled warning alerts that were advising them of the presence of "terrain" (it could not determine whether the alerts being emitted by the TAWS unit was to the presence of the ground itself or the cranes that were installed).

Analysis of the data indicated that both engines were rotating, operating, and responding to power lever inputs throughout the recorded data. In addition, the engines appeared to be able to achieve between 95% and 101% N1 when commanded.

2.2 THE APPROACH AND ATTEMPTED LANDING

The Evidence suggests that the flight was routine until the airplane began its descent after passage of the LAUTH intersection. The weather conditions were deteriorating such that the crew was advised that the field was IFR and they can expect an instrument approach. They were issued the ILS z Rwy 06 approach.

Evidence further indicates that the pilots were unfamiliar or confused about the approach that was issued. Voice recorder evidence also shows that at no time during the descent and approach did the crew brief each other on the procedure to use in the event the landing was unsuccessful and a go around may be needed.

An unstable approach was flown on the initial ILS approach to the runway as the "glideslope', "glideslope" aural warning was heard repeatedly from the aircraft altitude alerting system. Following those aural warning alerts, the crew eventually initiated a go around. It appeared that on both the first and second approach and the hold at the published holding point, the crew was not flying the ILS approach nor holding as they advised and just pretending to for the benefit of ATC. This was evident from the radar plot retrieved from the Miami Center.

A "stabilized" approach generally involves positioning the airplane at a point aligned with the final approach course such that a 2 1/2° to 3° glide path can be flown at the desired reference speed with the airplane landing gear and flaps configured for landing. The airspeed and descent rate should be stabilized, as well as course alignment, to preclude the need for abrupt or excessive control inputs. For an instrument approach, these conditions should be met at the final approach fix, generally 4 to 6 miles from the runway and more than 1,000 feet above the landing altitude. For a visual approach, these conditions could be met closer to the runway and at a slightly lower altitude, but at least 1 mile from the runway and above 500 feet.

Because of the unstabilized approach, the approach path angle would not have been consistent with that normally experienced by the pilots. The excess airspeed would have precluded the pilots from establishing landing flap setting until just before reaching the runway threshold. The higher than normal rate of descent and the higher than normal airspeed would have precluded the pilot from establishing a normal elevator trim setting for landing. A precise flare and touchdown would have been more difficult under these circumstances as compared to a normal stabilized approach. These factors coupled with the reduced visibility at the last moments probably resulted in the captain's decision to initiate a go around as the pilot advised ATC that they were going around and that they did not see the runway.

The primary reason for a stabilized approach path is to allow a pilot sufficient time to configure the airplane flap setting, landing gear, trim setting, descent rate, and airspeed for the critical flare phase of landing. A stabilized approach provides a margin of error should a destabilizing event occur, such as turbulence, and it sets the stage for a more precise flare and touchdown. Since the captain of N17UF did not fly a stabilized approach, he did not have as much margin for error as would be available during a stabilized approach.

On the go around, the failure to familiarize themselves with the go around procedure became evident, as both crew were not sure of "where to go", "when to turn" and "what altitude to climb to" all information that is contained on the ILS z 06 approach plates. Eventually the crew found the information and proceeded outbound to the holding fix.

On the inbound for the second approach, the crew again was not flying the aircraft at the altitude authorized for this approach and despite advising ATC that they were at the authorized altitude, data analysis from the engine monitoring devices confirmed the aircraft was below 2,000 feet. Additionally, recordings from the CVR as well as radar data from Miami center confirmed that the aircraft was well below the authorized altitude specified for the approach during the last 11 minutes of the flight.

2.3 THE FIRE

Evidence gathered from camera footage at the shipyard and other industry partner's camera operating at the time of the accident showed an explosion that occurred the moment the aircraft right wing struck the crane and lasted some 2 seconds. Eye witnessed statements also corroborated this explosion.

2.4 AIRPLANE HANDLING

From intra cockpit communications between the pilots as well as ATC transmissions, it is evident that the PIC was the flying pilot while the SIC provided support in carrying out non-flying pilot duties.

The PIC made the decision to descend from 1,000 feet down to 400 feet, then 300 feet during the second approach while advising the SIC "to look out for the runway". He continued to enquire as to whether the "runway was in sight." The alerts of "glideslope, glideslope", "terrain, terrain" and "pull up, pull up" coming from the TAWS unit could be heard (as the crew continued to descend). The crew ignored it. The airplane was configured for the landing as instructions for gear and flaps settings were issued.

Once the wing of the airplane struck the crane, the aircraft became uncontrollable and with the outboard portion of the right wing gone, the left wing continued rising until the aircraft rolled over and became inverted where it remained until impacting the garbage pile in the recycling plant premises some 500+ yards away. This was corroborated by camera footage, eyewitness' accounts and the impact damage to the horizontal stabilizer and flaps.

2.5 PHYSIOLOGICAL / PSYCHOLOGICAL FACTORS

The absence of evidence pointing to airworthiness and environmental reasons for this accident strongly indicates that actions by both of the pilots were the primary cause of the accident. Notwithstanding the unstabilized approach flown in this case, a properly trained and experienced pilot, who is vigilant and alert, should have been able to land the airplane successfully. Both pilots were trained properly and had sufficient experience to prepare them to complete a safe landing following an unstabilized approach. There were no reported physiological factors present which could have affected adversely the pilots' flying ability, decision making and judgment, and which could have led to the accident.

The presence of and the need for the VIPs on board to get to Freeport that evening was a strong motivator and or psychological factor acting on the crew.

Toxicological samples taken from both pilots were analyzed. No carboxyhemoglobin or cyanide testing were performed. Ethanol test was done and no ethanol was detected in the fluid samples from either pilots.

The samples were tested for amphetamines, opiates, marihuana, cocaine, phencyclidine, benzodiazepines, barbiturates, antidepressants and antihistamines. The samples for both pilots were negative for the above listed drugs.

2.6 SURVIVAL FACTORS

The accident was not survivable for the two pilots and seven passengers because of severe impact forces and destruction of the airplane during the crash sequence. Additional loss of life was avoided as the aircraft flew over several buildings (housing workers avoiding the rain) and crashed into the garbage pile. The AAIPU concludes that the pilots were unable to control the airplane after the loss of the outboard portion of the wing, which included portions of the right aileron. They had no control of the pitch and roll axis of the aircraft due to this loss and the final descent was uncontrollable.

There was no evidence of post-crash fire. The fire and rescue actions were timely and effective. Command and control of the scene was well organized and secured by the Royal Bahamas Police Force. Vital evidence that assisted investigators was preserved.

2.7 FLIGHT RECORDERS

This accident investigation illustrates the importance of the cockpit voice recorder (CVR). The CVR on N17UF provided information and data that aided investigators in better understanding the circumstances leading to the accident. CVR information is never used in isolation to determine the cause of an accident.

However, in the human performance area, the cockpit voice recorder can provide critical insight into many issues in an accident scenario, including the judgment and decision making of a flight crew.

The CVR provided valuable information as to the mindset and activities being carried out by the crew during the last minutes and seconds of the flight.

The DEEC recorded 45 minutes and 50 seconds of data from engine start prior to flight, until engine shut off after the crash based on N1 speed, total pressure (PT2) and static pressure. From 11 minutes 40 seconds before the end of the recording, up to the end of the recording (which occurred after the crash), the aircraft was below 2,000 feet pressure altitude. The throttle and engine power increased over 90% approximately 4 seconds before the end of the recording.

2.8 MAINTENANCE OVERSIGHT

The airplane was maintained in accordance with FAA regulations and in accordance with the Aircraft Manufacturer's Maintenance Program.

PART 3 CONCLUSIONS

3.1 FINDINGS

1. Weather was a factor in the accident.

2. Air Traffic Services were proper and did not contribute to the cause of the accident

3. The flight crew was properly certificated and qualified to conduct the flight.

4. The flight crew was trained adequately and had sufficient overall and recent experience in the Learjet airplane

5. There was a lack of CRM on the flight deck.

6. There was deliberate non-adherence to standard procedures by the crew.

7. The descent into the Freeport area and the approach for landing was not flown on the specified altitude required for this approach on the first nor second attempt for landing.

8. The final approach was unstabilized – the average rate of descent, was exceeded as evidenced by the aural warning system of the aircraft warning that the aircraft was not on the glideslope.

9. The crew continued descent below the minimum required altitude despite warnings from the TAWS system that they were below the glide slope.

10. The crew ignored, and then disabled the terrain awareness warning system that alerted them to the fact that they were too low, the presence of terrain and that they needed to pull up.

11. The airplane struck a crane in the shipyard while attempting to find the runway visually during IMC conditions.

12. A fireball ensued when the aircraft struck the crane.

13. The loss of control following the loss of the right wing and part of the aileron during the wing strike precluded a successful emergency landing.

14. Airworthiness factors were not causal in this accident.

15. Both engines were producing power at the time of the crash.

16. No evidence was uncovered that either of the pilots was suffering from any stress or fatigue prior to assignment of duty.

17. No alcohol or drugs were found in the urine or other specimen examined for either pilot.

3.2 PROBABLE CAUSE

The Air Accident Investigation & Prevention Unit (AAIPU) determines that the probable causes of this accident as;

- The poor decision making of the crew in initiating and continuing a descent in IMC below the authorized altitude, without visual contact with the runway environment.

3.3 CONTRIBUTING FACTORS

Contributing Factors includes:

- Improper planning of the approach
- Failure of the crew to follow the approved ILS approach while in IMC conditions.
- Insufficient horizontal or vertical situational awareness
- Poor decision making
- Deliberate actions of the crew by disabling the terrain alert warning system
- Inadequate CRM practice

PART 4 SAFETY RECOMMENDATIONS:

The AAIPU recommends that:

1. Due to the high incidence of aircraft activity at MYGF either
   a) a radar be installed at the Freeport International Airport or
   b) the installation of a monitor in the FPO tower that would allow the local controller to view Miami Center radar that is now available all the way to the ground

2. Due to the high incidence of aircraft activity at MYGF
   a) The hour for MET services at MYGF is increased to allow for weather reports to be available upon request to participating aircraft.

      And in any case

      Whenever the weather is IMC, a certified MET personnel be available to provide accurate up to the minute weather information for the field.

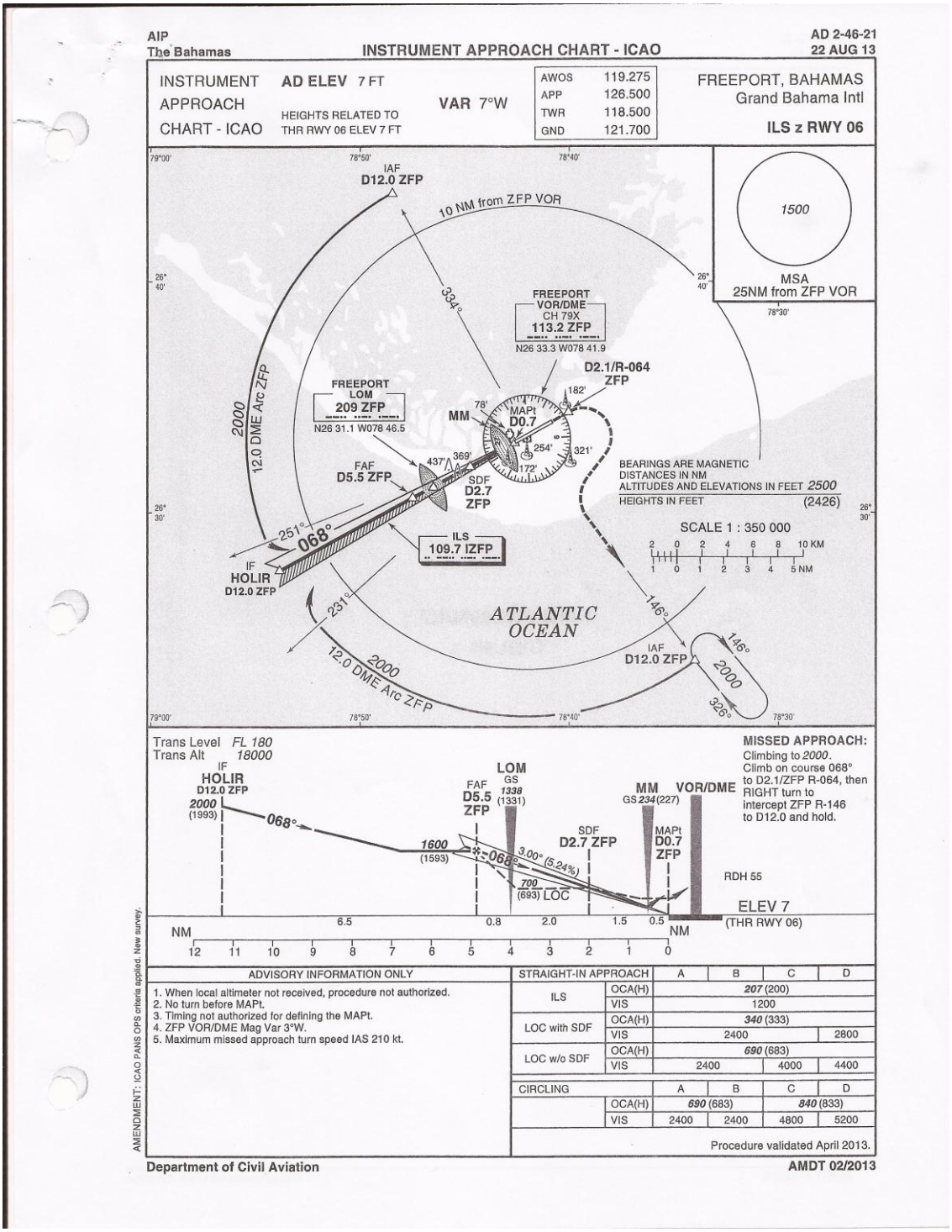
3. The CAA conducts an awareness campaign amongst non-121 flight crew community about the risks of deviating from published approach procedures.

4. The CAA conducts a special study of corporate / private operations in order to ascertain the level of safety and basis for formulating policy change.

5. No recommendation is made for operations of aircraft as regulation currently exist. These regulations were not followed by the crew. Applicable Regulations are found in 1.18.2 of this report.

PART 5 APPENDICES

Appendix 1 ILS z Runway 06 Instrument Approach Chart

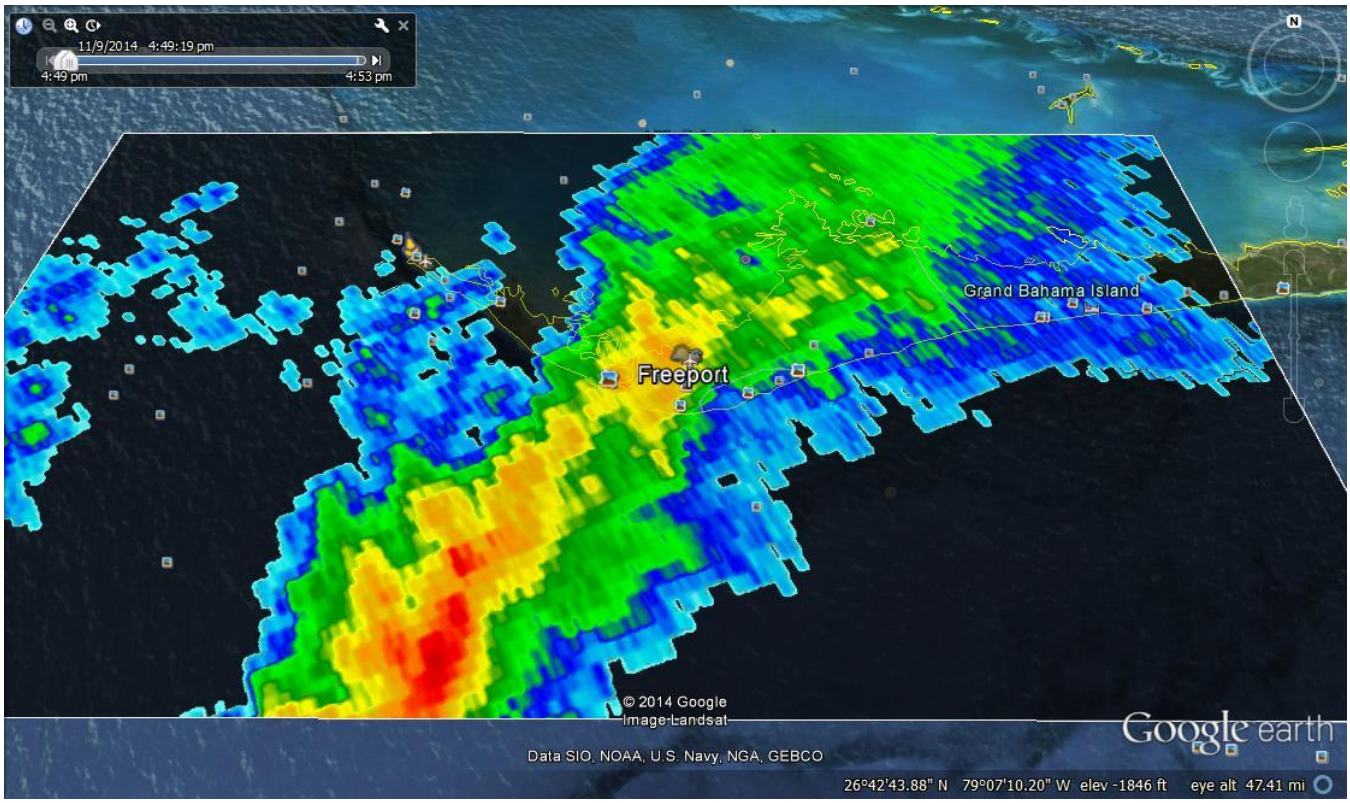


Instrument Approach Chart – ICAO, for Freeport, Bahamas, Grand Bahama Int'l Airport, ILS z RWY 06 dated 22 Aug, 2013 and published in the Bahamas Department of Civil Aviation Aeronautical Information Publication, Amendment 02/2013.

APPENDIX 2 Overview of Approach to Runway 06

View of the airport and runway as you approach runway 06 over the Harbour. Note that the shipyard lies directly under the path of operations to runway 06 on approach and under the path of departures on runway 24.

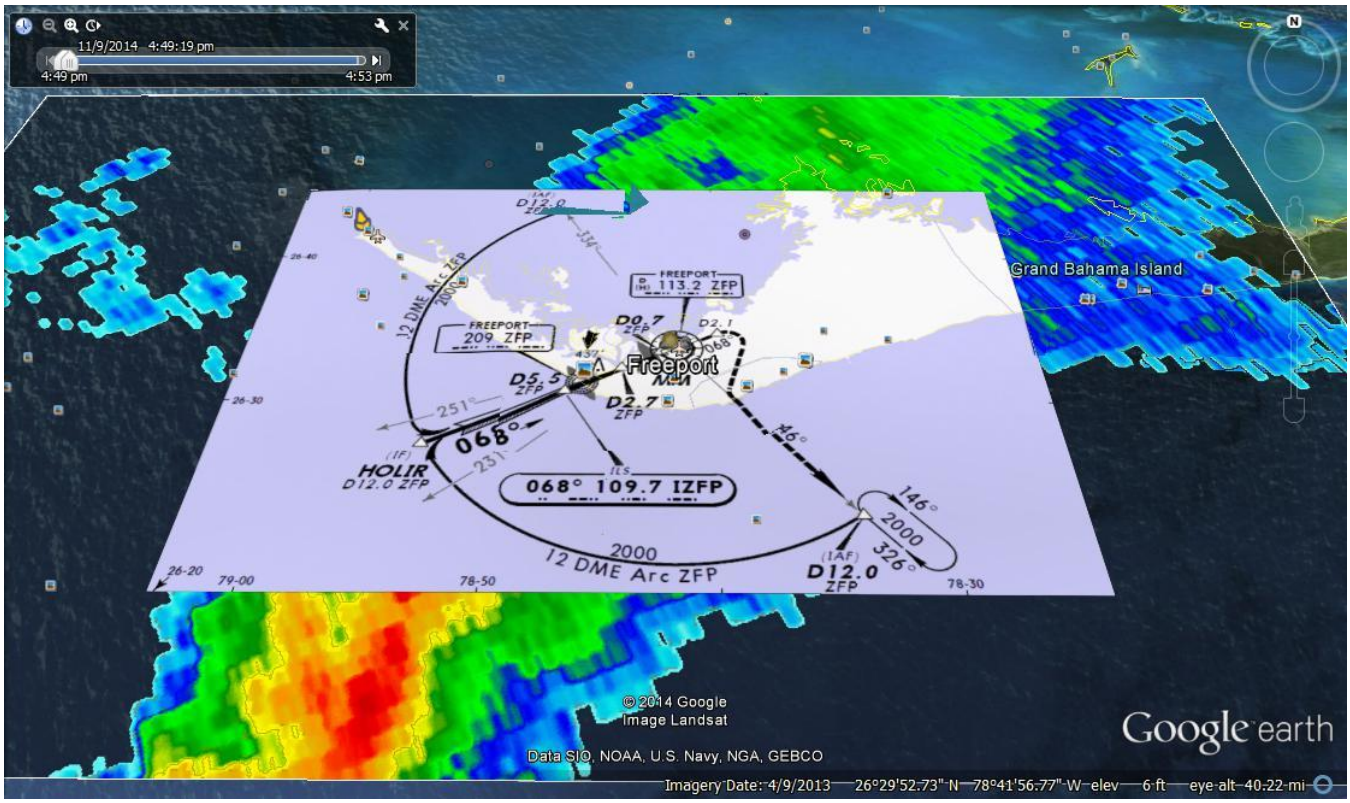
APPENDIX 3 Overlay of Weather conditions over Freeport before and after the accident



Overview of the weather overlay over Freeport Grand Bahama, as shown on Google Earth during the period 4:49pm to 4:53pm (3minutes prior and 1 minute after the accident)

Information courtesy of Data SIO, NOAA, US Navy, NGA, GEBCO and Google Earth

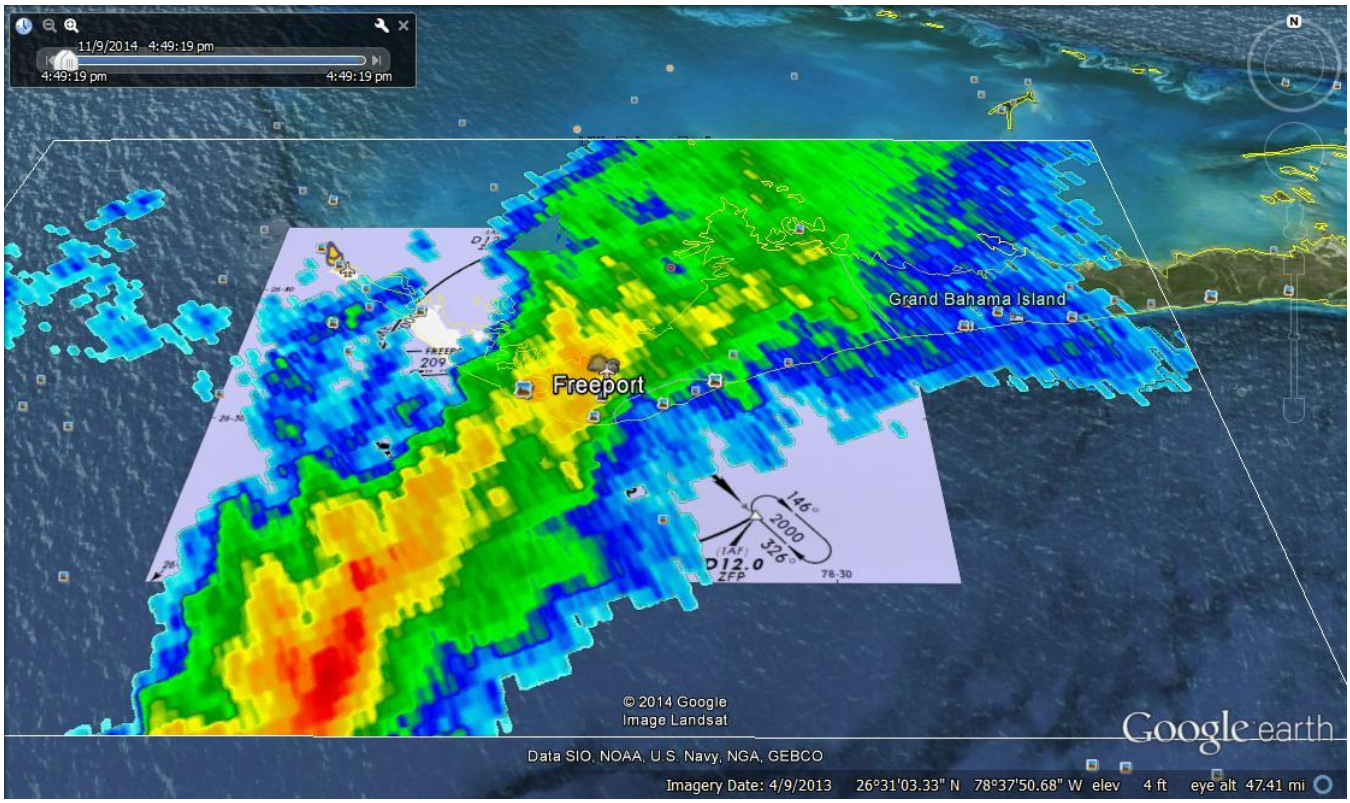
APPENDIX 4 Overlay of Weather Conditions Approach Chart over weather



Overlay of the Instrument Approach Chart for ILS z RWY 06 over the weather conditions at Freeport. This chart also overlaid during the period 4:49pm to 4:53pm the time during which the accident occurred.

Information courtesy of Data SIO, NOAA, US Navy, NGA, GEBCO and Google Earth

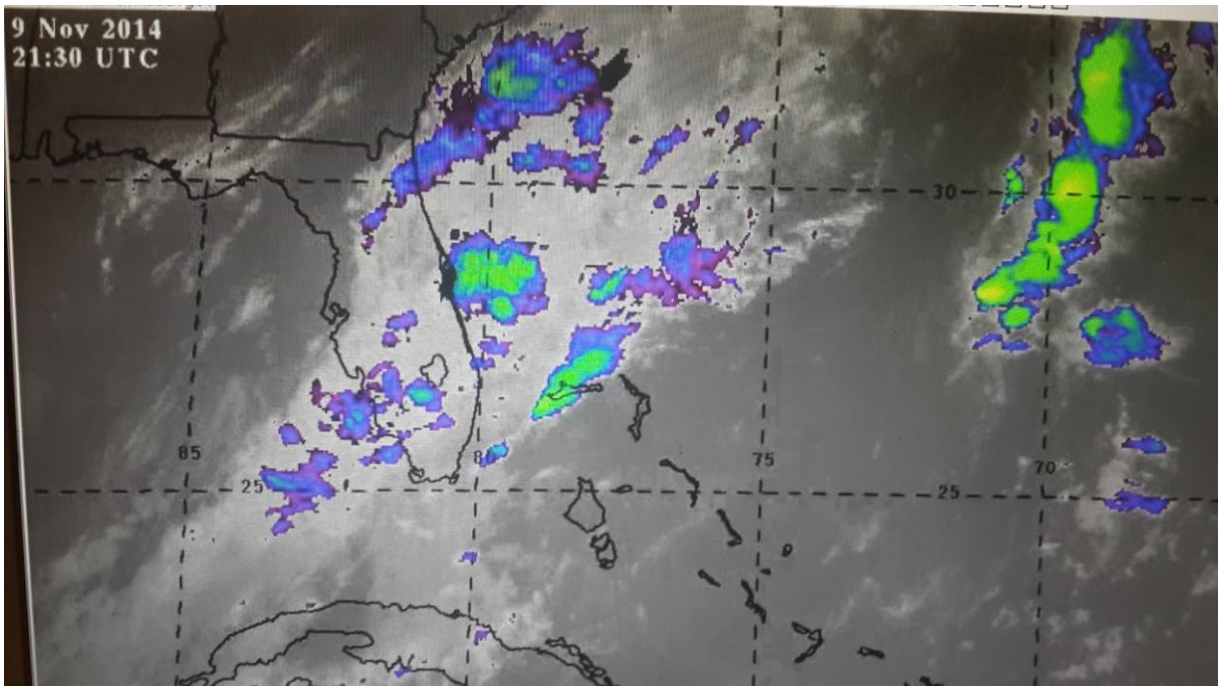
APPENDIX 5 Overlay of Weather Conditions Approach Chart under weather



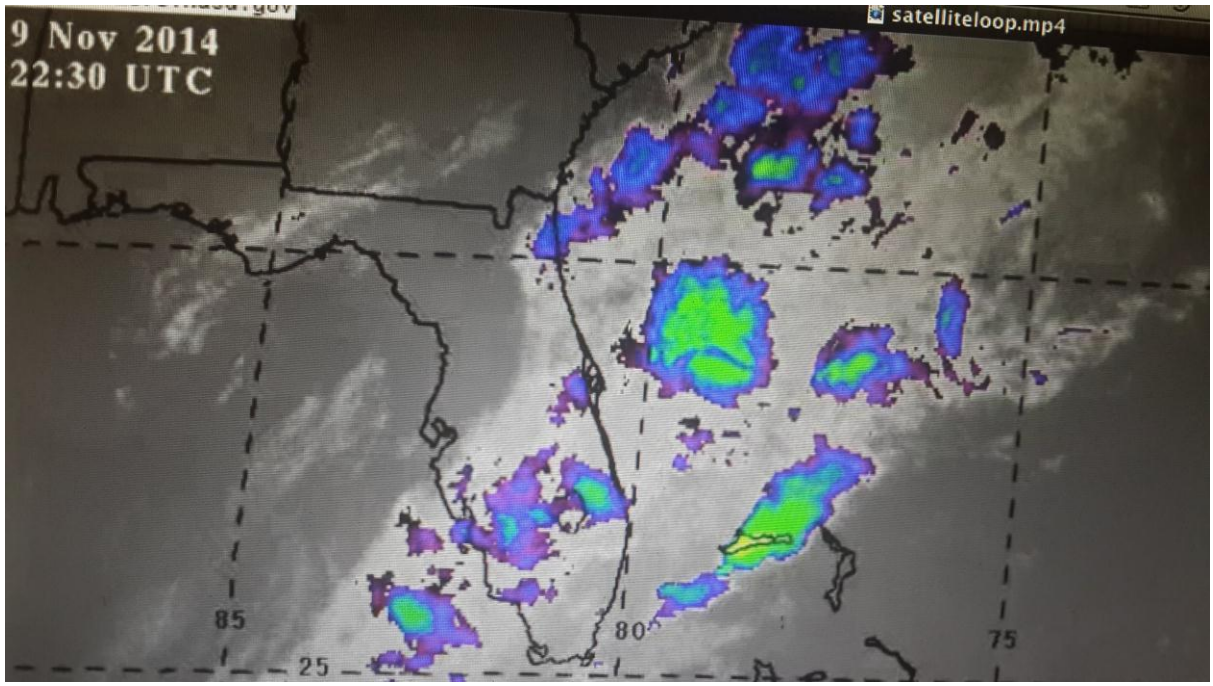
Overlay of the Instrument Approach Chart for ILS z RWY 06 under the weather conditions at Freeport. This chart also displayed during the period 4:49pm to 4:53pm the time during which the accident occurred.

Information courtesy of Data SIO, NOAA, US Navy, NGA, GEBCO and Google Earth

APPENDIX 6 Satellite Loop for the period 21:30 (4:30pm)



APPENDIX 7 Satellite loop for the period 22:30 (5:30pm)



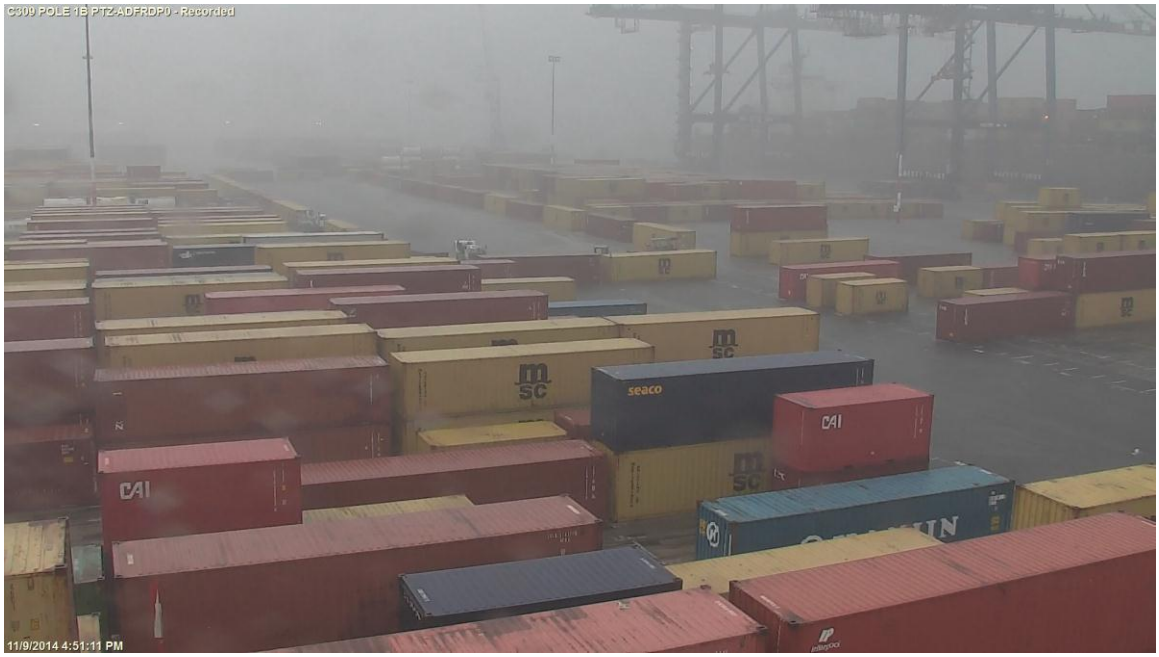
Above both Satellite loops show a period between 4:30 pm and 5:30pm where weather was present over the Freeport area. Weather intensity varied significantly during the period.

Information provided by the Bahamas Meteorological Department
Nassau, Bahamas courtesy of weather.msfc.nasa.gov

APPENDIX 8 Actual weather conditions prior to, during and after the accident

Weather conditions looking toward the airport taken from Camera located at an industry partner camera system at 4:44pm (8 minutes before the accident)

Weather conditions looking toward the airport taken from Camera located at an industry partner camera system at 4:50pm (2 minutes before the accident)



Weather conditions looking toward the airport taken from Camera located at an industry partner camera system at 4:51pm (less than 1 minute before the accident). This camera also captured the footage of the actual impact of the aircraft with the crane. (Footage not displayed or presented in this report).

Weather conditions looking toward the airport taken from Camera located at an industry partner camera system at 5:15pm (22 minutes after the accident)

APPENDIX 9 Instrument Approach Chart Rwy 06 Google Earth View

Approach plate-showing path of flight in relation to GB Shipyard and airport.

Note 1: Stars on chart shows location of GB Shipyard (site 1) and location of City Services (site 2) where the aircraft ended up.

Note 2: Path of approach passes directly over both facilities. Approach plate depicts altitude of aircraft over this position should be in excess of 1,000 feet.