TITLE

AIRCRAFT ACCIDENT REPORT

Piper Aztec, PA-23-250 – Registration – N27FT

at Sparendaam, East Coast Demerara, Guyana

Region No. 4 Guyana

April 13, 2013

REPORT # GCAA: 2/5/1/78

This report represents the conclusions reached by the Guyana Aircraft Accident Investigation Unit on the circumstances surrounding the aircraft accident, involving United States registered Piper Aztec aircraft – N27FT.

This investigation was done in accordance with Annex 13 to the Convention on International Civil Aviation. The investigation is intended neither to apportion blame, nor to assess individual or collective liability. Its sole objective is to draw lessons from the occurrence which may help to prevent future accidents.

Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous conclusions.

Note: - All times in this report are Coordinated Universal Time (UTC) unless otherwise stated. UTC is four hours ahead of Guyana Standard Time (GST).

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ABBREVIATIONS

AIC - Aeronautical Information Circular

AMO - Approved Maintenance Organisation

ANS - Air Navigation Services

ATC – Air Traffic Control

ATM - Air Transport Management

ASRD – Aviation Safety Regulation Directorate

ATPL - Airline Transport Pilot Licence

ATS – Air Traffic Services

CPL - Commercial Pilot Licence

CSU - Constant Speed Unit

GAAIU - Guyana Aircraft Accident and Incident Investigation Unit

GCAA – Guyana Civil Aviation Authority

IAW - In Accordance With

ICAO – International Civil Aviation Organization

IR - Instrument Rating

LiDAR - Laser Imaging and Ranging survey

MHz - Megahertz

NTSB – National Transportation Safety Board (United States)

RFFS- Rescue and Fire Fighting Service

SYGO - Ogle International Airport

TSO - Time Since Overhaul

UTC – Coordinated Universal Time

VFR – Visual Flight Rules

VHF - Very High Frequency

VOR - VHF Omni Radio Range

SYNOPSIS

At 18:54hrs, on 13th April, 2013 a Piper PA-23-250 aircraft, registration – N27FT was destroyed when it crashed into a residential area shortly after departing from Ogle International Airport (SYGO) Guyana. The pilot and the one passenger on board were killed by the impact and subsequent fire.

There were no other fatalities.

The house closest to where the aircraft crashed was destroyed. Two properties on either side were damaged.

The accident was notified to: -

The State of Registry/Manufacture - Federal Aviation Administration

- National Transportation Safety Board, USA.

This accident investigation is under the jurisdiction of Guyana, as the State of Occurrence. A non-travelling accredited representative was appointed by the NTSB, USA.

1. FACTUAL INFORMATION

1.1. History of the Flight

The aircraft contacted the Ogle Control Tower at 18:49hrs and requested taxi instructions to fly Ogle/Ogle to do an aerial survey over an area identified as Area "C", which is located from 05445N 0581144W to 052339N 0584764W and 73.2 nautical miles from the Timehri VOR on the 222° radial. The pilot reported 2 persons on board and 6 ½ hours of fuel and requested to operate at an altitude of 1500ft. The aircraft was given takeoff clearance and departed RWY 07, Ogle International Airport at 18:53hrs. ATC reported that the take-off run appeared to be normal, however when the aircraft reached approximately 150ft over the end of the runway, it was observed to be losing altitude. Approximately 10 seconds later the pilot requested to return for immediate landing. He was given immediate clearance to land and acknowledged this. By this time the aircraft had made a right turn and was north east of the airport. A few seconds later the pilot stated that he was going to crash. The aircraft was observed by the Air Traffic Controller and several other persons as it went down and crashed into a populated area; the Sparendaam Village at 18:54hrs.

1.2. Injuries to Persons

Table: 1

Injury	Crew	Passengers	Others	Total
Fatal	1	1	0	**2**
Serious	0	0	0	**0**
Minor/None	0	0	0	**0**
Total	**1**	**1**	**0**	**2**

The two occupants of the aircraft were killed. There were no fatalities or physical injuries to persons on the ground.

1.3. Damage to Aircraft

The aircraft was destroyed.

1.4. Other Damage

A house located at Lot 78 Sparendaam Housing Scheme, East Coast Demerara was completely destroyed by fire. Some coconut trees which were in the descent path of the aircraft were damaged.

Two neighbouring residences were also damaged. The residence on the western side suffered major damage and was considered to be unsafe for habitation. The house on the eastern side was scorched and had minor damage to its gutters and outer staircase.

1.5 Personnel Information – Flight Crew

Pilot Licence	US ATPL #1623411
Aircraft Ratings	ATP - Airplane Single Engine Land & CPL - Multi Engine Land
Date of Birth/Age	7th July, 1941/71 years
Type of Medical	US 2nd Class
Date of Last Medical	June, 2012.
Total Flying Hours	+ 19,500Hrs

Prior to this series of flights, the pilot had last flown this aircraft on 15th July, 2012.

1.6 Aircraft Information

1.6.1 General

This aeroplane is a six-seater, twin-engine piston, low wing monoplane of all metal construction.

Manufacturer	Piper Aircraft Corporation
Aircraft Registration	N27FT
Type and Model	Piper Aztec – PA23-250
Year of Manufacture	1976
Serial Number	27-7654174

Standard Airworthiness Certificate	Issued 3rd May, 2002
Total Airframe Time	6328:18hrs
Date of Next Annual Inspection	Unknown
Gross Weight	4800lbs
No. and Type of Engines	2–Lycoming IO-540-C4B5,
Left Engine Serial Number	L-21161-48A
Right Engine Serial Number	L-19957-48A
Engines TSO	Unknown
Recommended Fuel	Av Gas 100/130
Fuel used	Av Gas 100/130

1.6.2 Maintenance

The aircraft maintenance records were not available to the Accident investigator. The total airframe time was extracted from a work sheet prepared by a local Approved Maintenance Organization (AMO) that had carried out a starter check on the aircraft. This was requested by the pilot. This check was done the day before the accident. It was found that the starter Bendix-Drive was defective. This defective drive was replaced and appropriate engine start checks were carried out satisfactorily. The AMO had also patched a hole in the starboard engine cowling. Both of these repairs were recorded by the AMO.

After the accident a report that this aircraft had a maintenance problem on landing Barbados was received. The Barbados Civil Aviation Department confirmed that a spark plug was removed from the right engine. It was cleaned/serviced and reinserted. The engine ground run was satisfactory.

The manufacturer's recommended maintenance for this aircraft and its approved components is detailed in the latest edition of the Piper Aztec Service Manual, published on 1st January, 2009-Part Number 753-564.

1.6.3 Passenger Accommodation

The aircraft was equipped to carry out a LiDAR Survey. The lone passenger on the flight was the LiDAR Survey Engineer who was seated in the first passenger row on the right side of the aircraft. The survey equipment was located behind the pilot.

1.6.4 Mass and Balance

No mass and balance information was available for the flight.

1.7 Meteorological Information

The meteorological reports for Ogle Airport around the time of the accident are as follows:

1700Z – 09010KT 9999 SHRA BKN012 BKN080 26/25 Q1012
1800Z – 07008KT 9999 BKN012 FEW014CB BKN080 26/25 Q1011 CB SSW & W
1900Z – 08010KT 9999 BKN013 FEW015CB BKN080 26/24 Q1011 CB W & WNW

The accident occurred during mid-afternoon, when there was bright sunshine and calm winds, with unlimited visibility, and few scattered and broken clouds. The CB clouds were not in the area of flight.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

The aircraft was in contact with the Ogle Control Tower on frequency 118.5MHz. The communications systems of both the aircraft and the Ogle Control Tower were functioning satisfactorily at the time of the accident.

1.10 Aerodrome Information

This was an off-aerodrome accident that occurred one minute after takeoff. The departure aerodrome meets ICAO Category 3C non-precision approach requirements. The rescue and fire-fighting capability of the aerodrome is Category 5.

1.11 Flight Recorders

This aircraft is not required to be equipped with flight recorders.

1.12 Wreckage Information

1.12.1 Wreckage Site

The wreckage site was largely confined to an area located at Lot 78 Sparendaam on the East Coast of Demerara. On its descent path, the aircraft damaged some fruit trees and crashed near to the occupied residence on the lot. This building was completely destroyed by fire. Several trees, plants and shrubs on the lot were destroyed. The fences along the western, northern and eastern sides were damaged. Two houses located on the eastern and western sides of the accident site were also damaged by fire.

1.12.2 Wreckage Distribution

The tail of the aircraft, which was easily identifiable, was used as a reference point from which to measure the positions of the other identifiable parts of the aircraft, and the bodies of the pilot and the passenger. Measurements taken from the tail tie down were as follows:

1. Port main landing gear – 6ft
2. Port engine – 12ft
3. Starboard main landing gear 21ft
4. Starboard engine – 44ft
5. Nose landing gear – 21ft
6. Body of Survey Technician – 13ft
7. Body of pilot – 6ft.

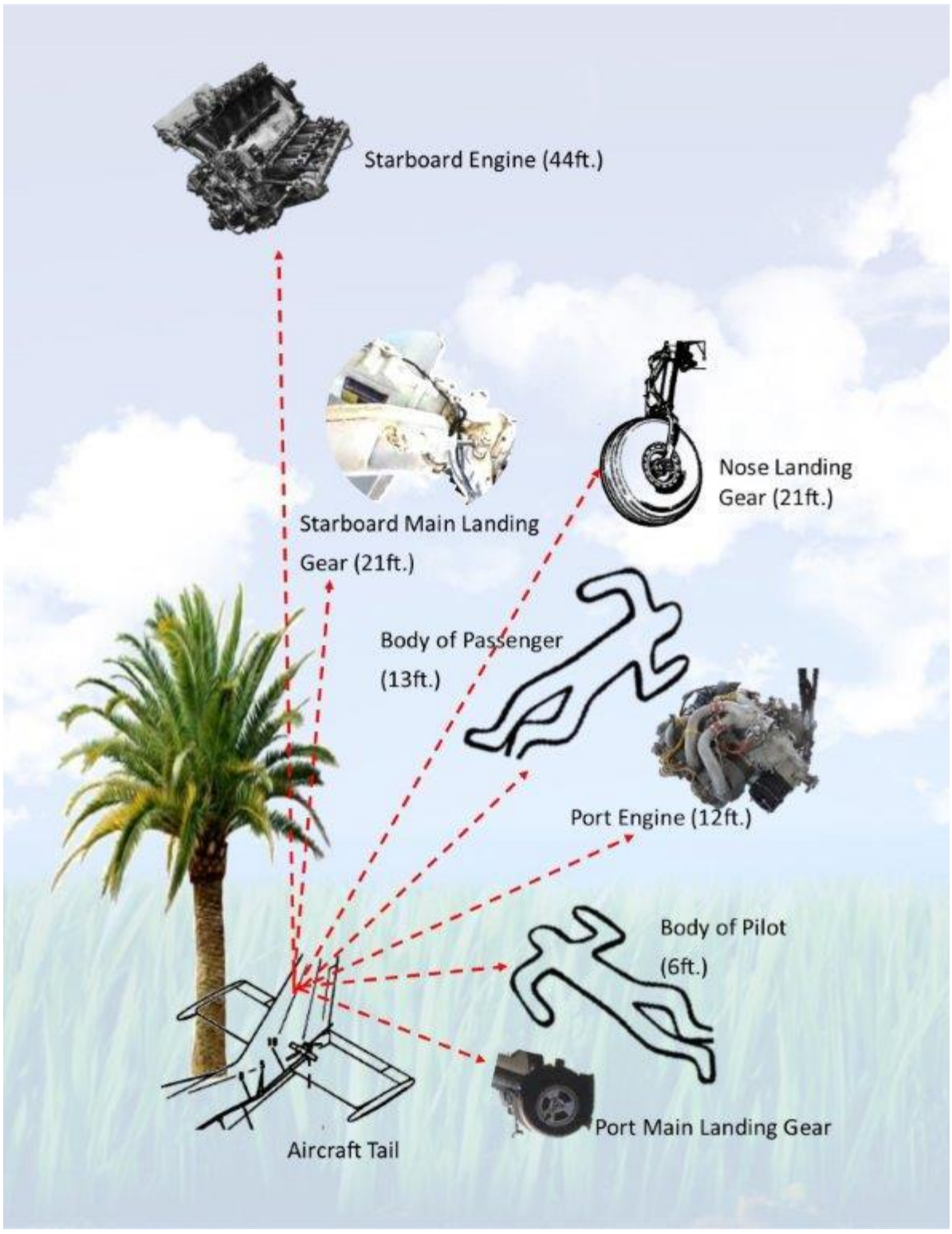


Diagram of Wreckage Site

Note:- Diagram not to scale

1.12.3 Damage to Aircraft

The aircraft was completely destroyed. Apart from the tail, the only other recognizable parts were the aircraft steel frame, undercarriage and engines. The starboard engine became disconnected from the aircraft and was found in the north western area of the site. The remainder of the aircraft along with the port engine was found inverted in the south western corner of the lot.

On-site inspection of the starboard propeller revealed that there was no evidence that the engine was producing power. The Constant Speed Unit (CSU) control was connected to the governor and the propeller blades were in fine pitch.

On-site inspection of the port engine revealed that it was damaged by fire and several pieces were fused together. The CSU control was separated from the governor. The propeller blades were feathered and one blade was broken more than half way up. The missing part was not located. The engine sump was also missing.

1.13 Medical and Pathological Information

1.13.1 Pilot

The body of the pilot was examined by a Guyanese Forensic Pathologist.

External examination showed that the body was totally carbonized with pieces of burnt cloth on soft tissue. Both feet were dislodged from the ankles and both knees were dislocated. The right elbow was dislocated. There was also multiple post mortem incised wounds to the body from tissue contraction.

Internal examination revealed that there was subscapular haemorrhage to the head and neck and severe oedema to the brain. In the thoracic cavity there was haemorrhage to soft tissue on the upper chest; fracture of the first, second, third, fourth and fifth ribs in the axillary line on the right side; and fracture of the third to sixth ribs, lateral aspect on the left side. The lungs were heavy and boggy. The trachea and bronchii showed a bloody liquid mixed with soot. The heart was dilated with mild ventricular hypertrophy, and moderate coronary sclerosis.

Examination of the abdominal cavity showed that the abdomen was distended with bilateral retro-peritoneal contusions. The stomach contained milky liquid, and the intestines had watery stool.

The cause of death was stated as burns with multiple blunt trauma.

1.13.2 The Passenger

The body of the passenger was examined by a Guyanese Forensic Pathologist.

External examination showed that the body was totally carbonized with pieces of burnt cloth on soft tissue and metal fragment in the form of a hook in the genital area. The left elbow appeared to be dislocated; the right wrist and left ankle appeared to be fractured. There were also multiple post mortem incised wounds to the body from tissue contraction.

Internal examination of the head, neck and skull showed no fractures or haemorrhage. The brain showed epidural haematoma to the left side which appeared to be post mortem. In the thoracic cavity, the lungs were heavy and boggy with haemorrhage to the upper lobe. The trachea and bronchii had a bloody liquid mixed with soot. The heart was dilated.

The abdominal cavity showed bilateral retro-peritoneal contusions. The stomach had a creamish liquid; the intestines contained watery stool; and the liver and kidneys were congested.

The cause of death was stated as burns with multiple blunt trauma.

1.14 Fire

The Air Traffic Controller reported that she kept the aircraft in sight during takeoff until it disappeared from her sight. She stated in her report that the aircraft was on fire seconds before it crashed. Other eyewitnesses did not report seeing the aircraft on fire before the crash. Immediately after the aircraft went down the Controller reported that she observed a large flame. She immediately notified the Ogle Airport Rescue and Fire Fighting Service (RFFS) of the accident and the approximate location.

The RFFS responded but reported that they had problems accessing the site due to narrow roads in the area. A significant amount of road maintenance work was being done in the area which also hampered access to the site. The first RFFS vehicle reached the accident site at 19:05hrs and the fire was under control by 19:20hrs. Three water tenders and one foam dispersal unit went into action.

1.15 Survival Aspects

The aircraft crashed one minute after takeoff. The Ogle International Airport RFFS was immediately activated. However, by the time they reached the crash site the two victims, the aircraft and a house were all consumed by the fire. The Guyana Police Service and the Georgetown Public Hospital were also notified and responded.

The seats and seat belts were destroyed by the fire.

The aircraft's Emergency Locator Transmitter was heard on frequency 121.5MHz.

1.16 Tests and Research

Tests were carried out on the aircraft's magnetos and engines under the supervision of the NTSB on behalf of the Guyana Aircraft Accident and Incident Investigation Unit (GAAIU).

1.16.1 The Engines

The engines were examined at the Lycoming factory in Williamsport, Pennsylvania, under supervision of the NTSB.

1.16.1.1. Port Engine

The port engine was completely disassembled and documented. The powerplant is a six-cylinder air cooled, direct drive, horizontally opposed, fuel-injected, internal combustion engine, rated at 250hp at 2575rpm. The engine data plate was missing.

Model - Lycoming IO-540-C4B5
Serial Number – L-21161-48A
Total Time - Unknown
Crankshaft S/N – 27658

The crankcase backbone serial number was used to identify this engine. The engine sustained severe fire damage. The oil sump and the fuel injector servo were completely destroyed by the fire. Due to fire related damages the crankshaft could not be rotated. Valve train continuity was established by inspection of the gears.

The propeller governor sustained fire damage but the governor control arm was functional. The propeller governor screen was free of visible contamination.

The fuel injector servo was not available for inspection. The flow divider sustained fire related damage. All fuel injector nozzle lines were attached at their respective points on the flow divider. The fuel injection nozzles were secure at each cylinder with the respective fuel line attached. Examination of the nozzles show that the No.2 and No.6 cylinder nozzles appeared to be partially obstructed at the discharge end.

The engine driven fuel pump was destroyed by the fire.

The spark plug electrodes were mechanically undamaged and displayed discolouration consistent with normal operation.

The starter motor housing was cracked and the alternator showed post-accident fire damage.

The vacuum pump data tag and drive coupling were burned off but the vanes and stator were intact. The oil system sustained fire and thermal damages. No metal particles were located in the remnant of the oil filter element.

The rocker arms, push rod tubes and the push rods all suffered thermal and fire related damages. In the accessory housing, the bosses suffered thermal and fire related damages. No abnormalities were observed on the oil pump parting surface. The lower portion of the accessory housing was consumed by fire. No abnormalities were observed on the body of the oil pump. The impellers were rusted and sustained thermal and fire related damages. The gears, splines and drives were normal and suffered thermal and fire related damages. The push pull tubes and push rods were attached to the engine and had thermal signatures consistent with post impact fire. The cylinders were removed and each push rod was visually inspected and found to be unremarkable. All rockers had normal wear patterns. The portion of the accessory housing that was not consumed by fire was

removed and the oil pump was disassembled. The gears in the accessory housing were rust covered but the gears turned freely. The oil pump gears showed no evidence of metallic particles or scoring on the oil pump housing.

The six cylinders in this engine remained secure on their respective mounts on the crankcase. All the cylinders exhibited rust inside the walls and showed thermal and fire related damages. The pistons exhibited no signs of detonation and had normal combustion signatures on the piston heads. The intake and exhaust valve heads were unremarkable. In cylinder #4, the rocker shaft support bosses were cracked, post impact and the rocker box cover showed signs of impact damage.

In the crankcase, the oil galley was clear; no obstructions were observed in the oil holes; no abnormalities were observed on the parting surfaces, the bearing saddles and dowels and the cylinder base pads. Thermal signatures, consistent with a post-crash fire, were evident on the area of the crankcase where the oil sump was mounted.

In the crankshaft, five of the six journal rods and three of the journals mains showed heat damage. Two of the journal mains were rusted. No abnormalities were observed on the thrust face, oil passages, crankshaft gear and attaching parts, counterweight, the rollers, clips and washers. Thermal and fire related damages were observed on the nose seal. Thermal signatures consistent with a post-crash fire were evident on the crankshaft.

In the camshaft, the lobe condition, cam-gear, tach-shaft and bushing, and the hydraulic tappet bodies showed signs of thermal and fire related damages; no abnormalities were noted. The connecting rods showed thermal and fire related damages. No abnormalities were noted. The front main bearing showed lead/tin overlay run-out consistent with a post- crash fire. All the rod bearings displayed lead/tin overlay run-out consistent with extreme heat. No abnormalities were noted.

1.16.1.2. Starboard Engine

The starboard engine was completely disassembled and its condition documented. The powerplant is a six-cylinder air cooled, direct drive, horizontally opposed, fuel-injected, internal combustion engine, rated at 250hp at 2575rpm.

Model - Lycoming IO-540-C4B5

Serial Number – L-19957-48A

Total Time - Unknown

Crankshaft S/N – 54953

The engine had thermal signatures consistent with a post-crash fire and the engine sustained moderate fire damages. All four engine mounting rings were broken. The crankshaft propeller mounting flange was bent thus the engine was not runnable. The oil filter adapter was broken off the accessory housing. The left magneto mounting ears were broken. The engine driven fuel pump was fractured from the accessory housing. The starter mounting flange was broken.

The engine was rotated and the valve train, which had not been damaged by impact forces or fire, operated in proper order and appeared to be free of any pre-mishap mechanical malfunction. Normal lift action was observed at each rocker assembly with the exception of #3 and #4 intake valves.

The propeller governor was removed from the engine and the control arm and drive shaft functioned normally. The propeller governor screen was free of visible contamination.

The fuel injector servo was disconnected from the bottom of the oil sump prior to shipping but was sent for inspection in the engine shipping container. The aircraft supplied fuel injector servo air-box was attached but was destroyed due to post impact forces. The fuel injection servo and induction system were examined and observed to be free of obstruction. The throttle/mixture controls were found securely attached at their respective control arms of the fuel injector servo. The fuel injector servo inlet strainer contained a moderate amount of dirt and fuzz. The fuel injector servo regulator valve stem was intact and the nut was installed. All fuel injector nozzle lines remained attached at their respective locations on the flow divider. Impact damages to the supplied aircraft fuel line were observed at the gage port of the flow divider due to post impact damages. The fuel injector nozzles remained secure at each cylinder with the respective fuel lines attached. The nozzles were removed and examined. The nozzles remained free of visible contamination or obstruction to flow. The engine driven fuel pump was destroyed due to post impact forces.

The spark plug electrodes remained mechanically undamaged and displayed colouration consistent with normal operation. The static oil soaking of the spark plugs, was attributed to engine position at the accident site and post recovery handling.

The starter mounting flange was broken by post impact damage. The alternator was not available for examination. The vacuum pump rotated and provided suction and pressure from the appropriate fittings.

The oil suction screen was removed and found to contain carbon and a small amount of metallic debris, some of which could be attracted by a magnet. The oil filter element was inspected and found to contain a small amount of metallic debris that could be attracted by a magnet along with particles of aluminum.

The push rod tubes and the push rods were attached to the engine, they were disassembled and visual inspection found then to be unremarkable. No abnormalities were observed in the rocker arms. In the accessory housing, no abnormalities were observed in the bosses and the oil pump parting surface. The body of the oil pump showed light scoring of the inside diameter. No abnormalities were observed on the impellers. The gears, splines and drives were all normal.

All six of the cylinders of this engine were found secure on their respective mounts on the crankcase. The cylinders were removed and the pistons were disconnected from the connecting rods. The pistons showed no signs of detonation and had normal combustion signatures on the piston heads. Visual inspection of the intake and exhaust valve heads were unremarkable.

In the crankcase, the oil galley was clear; no obstructions were observed in the oil holes. No abnormalities were observed on the parting surfaces, the bearing saddles and dowels and the cylinder base pads.

In the crankshaft, the six journals rods and the five journals mains no abnormalities were observed. No abnormalities were observed on the thrust face, oil passages, crankshaft gear and attaching parts, counterweight, the rollers, clips and washers, and the nose seal.

In the camshaft, the #3 and #4 intake lobes were worn approximately 0.200inch. No abnormalities were observed on the cam gear, and the tach shaft and bushing. One intake

camshaft lobe was found to be worn and producing metal along with spalling of the #3 and #4 intake tappet body. No abnormalities were observed on the other tappets. No abnormalities were observed on the connecting rods.

Visual examination of the engine revealed no evidence of pre-impact catastrophic mechanical malfunction.

1.16.2 Magnetos

The magnetos from the left engine were not available for examination.

The magnetos from the right engine were sent for further examination at the Continental Motors Inc. facility in Mobile Alabama.

1.16.2.1 Magneto (L)

Manufacturer - Kelly Aerospace
Part Number - IO-163010-(unreadable) OR
Serial Number- J022091
Type Number - S6LN-200

Visual examination revealed a label affixed to this unit indicating “weak spark”. The letter “L”, indicating Left, was written on the data plate. External examination revealed that both mounting lugs had been broken off and an undetermined black coloured burnt residue was present on the outer case surface. The input drive shaft appeared to be bent at the main bearing. The ground wire remained attached to the case and the “switch” (P-Lead) connection socket was empty. The retard socket contained remnants of a connector plug. The sparkplug cable cap was not present.

The unit was installed on a magneto test stand and operated at speeds ranging from 300 to 1,100rpm. Normal sparks were observed at each lead output. The unit vibrated excessively during the tests due to the bent shaft, as such, higher speeds could not be safely attained.

1.16.2.2 Magneto (R)

Manufacturer - Bendix
Part Number - IO-163050-9
Serial Number - 884359
Type Number - S61N-204

The letter “R”, indicating Right, was written on the data plate. External examination of this unit did not reveal any obvious signs of damage. The “retard” socket was capped with a threaded plug. The ground wire remained attached to the case. The spark plug cable cap was not present.
The unit was installed on a magneto test stand and operated at speeds ranging from 0-2,000rpm. The unit did not produce sparks at any speed.

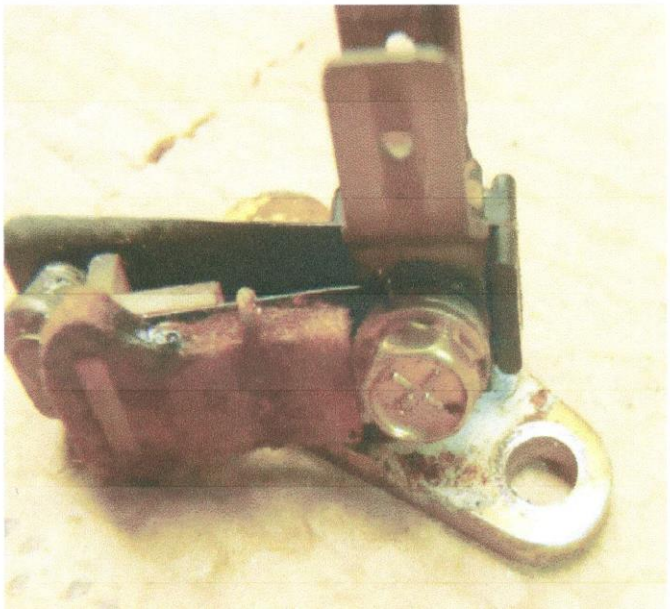
Point continuity was checked utilizing a Magneto Synchronizer connected between the P-Lead connection and ground. The magneto indicator light partially extinguished when the magneto input shaft was rotated to the “point closed” position, however the light did not completely extinguish. Capacitor continuity was checked and indicated an appropriate closed circuit condition.

The points cover was removed and internal components examined. Grease-like fragments were present within the case. The metal mounting brackets of the points exhibited corrosion in multiple locations. The electrical resistance across the point contacts was measured with an ohmmeter. In both states the contacts exhibited an open circuit condition, with a resistance of 3.16 Ohms measured with the points closed and 15.6 Ohms when they were open.

The point assembly was removed, disassembled and examined. Corrosion was present on the mounting bracket and the point contacts exhibited shiny-grey discolouration.

The plastic lifter bushing was intact and did not exhibit thermal damage consistent with capacitor failure.

Exemplar points were installed and the magneto was fitted on the test stand. The unit produced sparks at all test speeds (300-2,000rpm).



Picture No.1 - Corrosion on Points Assembly Bracket – Right Magneto

1.17 Organisation and Management

The aircraft was owned by Angiel Envirosafe Inc. The pilot was the Chief Executive Officer of the company. The company provided aerial camera platform services and was sub-contracted by DIGITALWORLD to carry out a Laser Imaging and Ranging (LiDAR) survey for the Amaila Falls Hydro-power project that was being developed by the Government of Guyana.

Information provided by DIGITALWORLD indicated that the pilot was well versed in LiDAR acquisition flying and had gotten most of his LiDAR/aerial photography experience in heavily forested, mountainous areas including projects in Jamaica and Trinidad.

1.18 Other Information

1.18.1 General

The Government of Guyana had initiated a major development project, the Amaila Falls Hydro Project, for the establishment of a hydroelectric station in Guyana's hinterland.

The contractor, SITHE GLOBAL, established a project specific company, Amaila Falls Hydropower Inc. which contracted ATLIS GEOMATICS Inc. to perform a LiDAR survey for the project. ATLIS GEOMATICS in turn subcontracted GEODIGITAL International Corporation to perform the ground and flight operations to acquire the necessary LiDAR data. GEODIGITAL advised that it has a strategic partnership with DIGITAL WORLD MAPPING Inc. (DIGITAL WORLD), for LiDAR collections in South and Central America, this company, DIGITAL WORLD, was in turn contracted for the acquisition component of the project on behalf of GEODIGITAL. Thus DIGITALWORLD was given Cabinet Approval to operate the American Registered Piper Aztec aircraft, N27FT, to carry out the LiDAR Surveys for the Amaila Falls Hydro Inc.

1.18.2 GCAA Requirements to Operate in Guyana

The Cabinet Approval was forwarded to the Guyana Civil Aviation Authority (GCAA). By way of Letter of Approval dated April 4, 2013, from the Air Transport Management(ATM) Section of the GCAA, GEODIGITAL Inc. was advised of the approval and ten conditions for the aircraft, N27FT, to operate in Guyana. Among these were;

a) the requirement for the aircraft to be insured against third party risk;
b) flight plans and communications arrangements had to be worked out with the Air Navigation Services Directorate (ANSD) of the GCAA prior to commencement of operations;
c) the pilot had to present himself to the GCAA before commencement of flying in Guyana;
d) the operation was subject to applicable legislation and procedures of Guyana.

There was no coordination between the Aviation Safety Regulation Directorate (ASRD) and the ATM Section of the GCAA with regard to the requirements for the aircraft to operate in Guyana.

The pilot met with the ANSD and submitted a map of the areas of operations. The area of the survey was to be executed in the northwestern and western areas of Guyana for ten days. Based on the information supplied by the pilot, the Aeronautical Information Service issued AIC #B01/13 dated 7th April, 2013. This AIC identified four areas; Areas A; B; C; D; along which the aircraft would operate from 7th to 17th April, 2013. A repetitive

flight plan was also submitted. Information contained in the filed Repetitive Flight Plan showed that the aircraft was properly equipped for the intended operation.

The pilot also presented himself to the Aviation Safety Regulation Directorate (ASRD) of the GCAA, where his pilot and medical certificates, were examined.

The Operation commenced on 9th April, 2013 and six flights had been completed prior to the accident flight. The accident flight was the second one for the fifth day of operations and was intended to proceed to Area C to carry out a survey along that line.

1.18.3 Eyewitness Statements

One credible witness, an experienced aircraft engineer, who observed the aircraft taking off for the accident flight, stated that during taxi the starboard engine shut down and was restarted. The aircraft took off and he estimated that at about 100ft above ground the starboard engine again shut down. He stated that the aircraft seemed to waver a bit and levelled out, with the port engine sputtering and went out of his view. There was silence for about 5-7 seconds followed by a loud boom (explosion). The account of the sputtering, then silence prior to the explosion is corroborated by two other credible witnesses, a Grade 1A Technician and another aircraft engineer, both of whom observed the aircraft shortly after takeoff.

2 ANALYSIS

2.1. The Pilot

2.1.1. General

The pilot was a 71-year-old American citizen who was the holder of an American Airline Transport Pilot Licence with commercial privileges for multi-engine land aircraft. His second class medical would have expired two months after this accident on 30th June, 2013. Review of the pilot's log book shows that before this series of flights which commenced on 1st April, 2013, the pilot had last flown this aircraft more than eight months before on 15th July, 2012.

2.1.2 Medical and Pathological Information

Nothing in the pilot's post mortem report indicates any pre-existing condition that may have affected the pilot's ability to conduct a safe flight.

2.2 The Aircraft

2.2.1 General

The aircraft's Certificate of Airworthiness was valid until November, 2014.

The aircraft's maintenance records were not available to the accident investigators, thus it could not be determined if the aircraft was being maintained in accordance with an approved maintenance schedule, or in accordance with the manufacturer's recommended maintenance as is detailed in the aircraft Service Manual, Airworthiness Directives and other required maintenance documents. The rusted condition of several components, and the maintenance done in Barbados and Guyana indicates that required maintenance of this aircraft was possibly not being done in a timely manner.

2.2.3 Mass and Balance

No mass and balance information was available for the aircraft. The configuration of the equipment on board was not known. Thus although the aircraft was not considered to be overweight, it could not be determined if the aircraft was properly configured in terms of mass and balance and center of gravity schedule.

It was also noted that the LiDAR equipment was installed in the aircraft. It could not be verified if this equipment was properly installed and what requirements had to be met for its proper installation.

2.2.4 The Aircraft engines

The port engine suffered severe damage from the impact and subsequent fire. The NTSB report indicated that nothing was found during the examination of this engine that would have precluded it from achieving power prior to impact. All damage found was consistent with the engine being involved in the post-crash fire of the aircraft at the accident sight. However, on-site examination of this engine showed that it was not producing power. The CSU control was broken off from the governor and the propeller blades were feathered.

The starboard engine became detached from the airframe and dropped to the ground approximately 44ft before the rest of the aircraft. It was noted that all four of this engine's mounting rings were broken. The reason for this separation could not be determined. However, damage to several trees in the aircraft's flight path indicate that the starboard engine may have impacted these trees. This possibly resulted in this engine's separation from the air frame. The NTSB report identified moderate fire damage on this engine. Most of the damage was attributed to post-impact damage as visual examination revealed no evidence of pre-impact catastrophic mechanical malfunction. However, the on-site examination of this engine indicated that it was not producing power. The CSU control was connected to the governor and the propeller blades were in fine pitch.

2.2.5 The Magnetos

The magnetos from the port engine were consumed by the fire and were therefore not available for examination.

The two magnetos from the starboard engine were sent to the Continental Motors facility in Mobile, Alabama, for examination. Under test conditions, and in consideration of impact damage suffered by the starboard engine, the left magneto was considered to have operated as expected. However initial visual examination of this magneto noted a label, affixed to the unit that indicated "Weak Spark". The right magneto did not produce any

sparks under test conditions. However, when exemplar points were installed in the magneto on the test stand, the unit produced sparks at all speeds. This indicates that the right magneto may have failed. This may have resulted in a failed ignition of the right engine.

To ensure efficient combustion and power generation by the engine, the fuel air mixture in the combustion chamber needs to be ignited at the correct moment. This is the job of the ignition system. The magneto is part of the aircraft's ignition system that converts mechanical rotation into high voltage pulses that are used to fire the spark plugs without aid from an external power source, such as a battery or electrical system. Generally, magnetos are renowned for their reliability but regular servicing is necessary to ensure that the magnetos' internal and external timing do not drift away from the correct gap, which will in turn degrade the quality of the spark produced. Manufacturers normally recommend inspections and minor servicing at specified intervals. Major disassembly inspection, cleaning, lubrication and adjustment is required at higher intervals.

The discovery of grease-like fragments within the points case and the rusted condition of the metal mounting bracket indicate that maintenance of the magnetos were most likely not being done at the stipulated intervals as required. If routine maintenance is not done, the performance of the magneto deteriorates significantly. This may result in hard starts, and general deterioration of engine efficiency.

2.3 Weather

The weather was not a factor in this accident.

2.4 Fire

The aircraft was consumed by post-impact fire. The arrival of the RFFS was delayed due to difficulty in accessing the accident site.

2.5 Survivability

The destruction of the aircraft by fire prevented an assessment of the possible failure of structures such as seats and seat belts. The impact and fire makes it unlikely that the occupants of the aircraft could have survived this accident.

2.6 Other Information

The Letter of Approval from the GCAA, outlining the conditions of operations was not as precise as it could have been. It did not specifically list the documents that should have been presented to the Authority. However, the pilot did submit his licence and log book for examination and these were found to be satisfactory. The Authority was satisfied that the pilot was qualified to operate the required flights in Guyana.

There is no law requiring the aircraft's maintenance records to be submitted to the GCAA for scrutiny prior to operation in Guyana.

The pilot also met with and held discussions with the ANS Directorate of the GCAA, as required. He submitted the required repetitive flight plan and information regarding the planned areas of operations to ensure that there was good understanding of the pattern of flight between the pilot and air traffic controllers.

Although the letter stated the requirement for third party insurance, the insurance policy was neither requested nor submitted prior to commencement of operations. The insurance policy was submitted subsequent to the accident. The policy showed that there was third party insurance. Attempts were made to ascertain if the insurers would cover damages to property in Guyana. The Air Transport Officer of the GCAA initiated queries about insurance of this aircraft, with the NTSB. The response from the NTSB indicated that there was the possibility that the aircraft's insurance may not have covered operations in South America. The insurers have since confirmed that the aircraft operator's insurance did not provide coverage for this particular loss. This information was conveyed to the insured's estate since 17th April, 2013 and to the GCAA Air Transport Officer. There was no indication of any other insurance that may have provided coverage for this operation.

3. CONCLUSION

3.1 Cause

The probable cause of this accident was due to failure of the right engine and possible loss of power in the left engine, and subsequent attempted forced landing in which the aircraft was destroyed by post impact forces and post-impact fire.

3.2. Contributory Causes

1. Probable failure by the pilot/operator to observe both the aircraft's maintenance schedule and the schedule recommended for servicing of the magnetos.
2. The possibility that the pilot may not have reacted adequately to the engine failure.

3.3 Findings

3.3.1. The Pilot

1. The pilot's licence was valid and he was qualified to undertake the planned flight.
2. The pilot must have been aware of the failure of the right engine during taxi, but decided to proceed with the flight despite what could be considered as a warning of impending disaster.
3. Shortly after takeoff the pilot requested to return to the airport to land. Approval to land was given.
4. The pilot advised Air Traffic Control that he was going to crash.
5. The pilot died as a result of burns with multiple blunt trauma.

3.3.2. The Company

1. The company, Angiel Envirosafe, which was owned by the pilot, was subcontracted to carry out the LiDAR survey for the Amaila Falls Hydropower Project.
2. The company owned the aircraft which was approved to carry out this flight.
3. The organisation that contracted the company to carry out the operation considered the pilot and the company to be quite skilled and experienced in LiDAR acquisition flying.

3.3.3. The Aircraft

1. The aircraft had a valid Certificate of Airworthiness.
2. No maintenance records were available for review; thus it cannot be confirmed that the aircraft was properly maintained.
3. No Mass and Balance information was submitted for the aircraft.
4. The aircraft's right engine cut out during taxi and again shortly after takeoff.
5. After the right engine cut out after takeoff, the aircraft's left engine was heard sputtering and failed.
6. The aircraft crashed one minute after takeoff.
7. The aircraft was destroyed by impact forces and post-impact fire.

3.3.4. The Weather

VFR weather conditions existed at the time of the accident.

3.3.5 The GCAA

1. Although the Authority required the aircraft to be insured against third party risks, no check was carried out to ensure that this was in place, or to ensure that the aircraft was insured to cover the intended operations.
2. The Letter of Approval, for foreign aircraft operations in Guyana, from the GCAA was not detailed enough.
3. Approval for foreign aircraft to operate in Guyana is given by the Air Transport Management Section of the Authority without sufficient coordination between this non-technical section and the ASRD, the safety/technical section of the Authority.

4. SAFETY RECOMMENDATIONS

1. The GCAA should consider imposing a requirement for foreign aircraft operators, who are desirous of operating within Guyana, to present documentation on recent aircraft maintenance.
2. The GCAA should ensure that pilots, desirous of operating aircraft in Guyana, in which specialised equipment is installed, must ensure that such specialised installations are approved by the State of Registry or the State of the Operator and such approval should be presented to the GCAA prior to commencing operation.
3. Foreign aircraft desirous of operating within Guyana should be required to ensure that appropriate maintenance support is available to provide the maintenance services to the aircraft.
4. The GCAA should ensure that all aircraft operating in Guyana have full insurance coverage for their intended operations.
5. The GCAA should be more thorough in the preparation of approvals. This should include details of the records to be kept and the records to be submitted prior to each flight. This will ensure that requirements to operate in Guyana are unambiguously conveyed to potential operators.
6. There should be greater cooperation and coordination between the Air Transport Management Section and the Aviation Safety Regulation Directorate of the Authority. This will ensure that the GCAA safety inspectorate is made aware of the approval to operate and will allow for enforcement of the requirements for operating in Guyana.