

AAIPU# A08-26107

AIR ACCIDENT INVESTIGATION AND PREVENTION UNIT CIVIL AVIATION DEPARTMENT

NASSAU, N. P., BAHAMAS

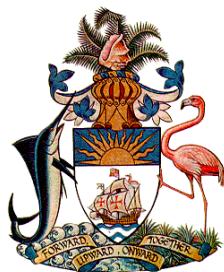
AIRCRAFT ACCIDENT REPORT

POWERPLANT FAILURE

CESSNA CARAVAN CE208B,
N954PA

NEAR CHUB CAY, BERRY ISLAND, BAHAMAS
DECEMBER 20, 2007





**Bahamas Department of Civil Aviation
Air Accident Investigation and Prevention Unit
P. O. Box AP-59244
Lynden Pindling International Airport
Nassau N. P., Bahamas**

AIRCRAFT ACCIDENT REPORT

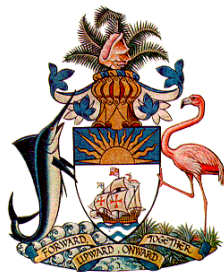
**CESSNA 208B
N954PA**

**POWERPLANT FAILURE
NEAR CHUB CAY, BERRY ISLAND, BAHAMAS
DECEMBER 20, 2007**

**AAIPU# A08-26107
Adopted APRIL 6, 2010**

Abstract: This report outlines the circumstances surrounding the crash of N954PA a Cessna 208 aircraft which crashed in waters near Chub Cay, in the Berry Island while the aircraft was enroute from Santo Domingo in the Dominican Republic to West Palm Beach, Florida, USA.





Bahamas Department of Civil Aviation Air Accident Investigation and Prevention Unit

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April 06, 2010

Captain Patrick L. Rolle
Director
Civil Aviation Department
Seaban House
Crawford Street, Oakes Field
P.O. Box N-975
Nassau, N.P.,
Bahamas

Sir

The attached report summarizes the investigation into the circumstances surrounding the accident involving N954PA, a Cessna 208B Caravan, registered in the United States to Agape Flights Inc. This accident occurred at approximately 4:30PM while enroute from Santo Domingo, Dominican Republic to West Palm Beach, Florida on December 20, 2007.

This report is submitted pursuant to Part XII, Regulation 80, and Schedule 19 of the Bahamas Civil Aviation (Safety) Regulation (CASR 2001) and in accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO), Ninth Edition July 2001.

In accordance with Annex 13 to the Convention on International Civil Aviation (ICAO), and Schedule 19 of the Bahamas Civil Aviation (Safety) Regulations (CASR April 17, 2001), 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 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 information becomes available.

Delvin R. Major
Investigator in Charge
Bahamas Department of Civil Aviation
Air Accident Investigation & Prevention Unit



PARTICIPANTS IN THE INVESTIGATION

| | | |
|------------------------|---|---|
| Delvin R. Major | Flight Standards Inspectorate | IIC / Operations |
| Philip C. Romer | Flight Standards Inspectorate | Airworthiness |
| Dion Demeritte | Flight Standards Inspectorate | Airworthiness |
| Marc Gratton | Pratt & Whitney Canada Corp. | Air Safety Investigator |
| Mary Chamberlin | Pratt & Whitney Canada Corp. | Accessories Technical Support |
| Jan R. Smith | Cessna Aircraft Co. | Air Safety Investigator |
| Ron Hollis | Covington Aircraft | Field Service Representative & Quality Assurance |





BAHAMAS CIVIL AVIATION DEPARTMENT
AIR ACCIDENT INVESTIGATION AND PREVENTION UNIT

SYNOPSIS

Operator: Agape Flight Inc.

Manufacturer: Cessna Aircraft Co.

Model: 208B Caravan

Registration: N954PA

Place of Accident: Chub Cay, Berry Island, Bahamas

Date of Accident: December 20, 2007

Investigating Authority: Flight Standards Inspectorate

Investigator in Charge: Delvin R. Major

Notification: Director of Civil Aviation
Cessna Aircraft Co. – Airframe Manufacturer
Pratt & Whitney – Engine Manufacturer
National Transportation Safety Board

Releasing Authority: Bahamas Civil Aviation Department

Date of Report: April 6, 2010



ABBREVIATIONS and TERMINOLOGY

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

| | |
|----------|---|
| AAIPU | Air Accident Investigation and Prevention Unit |
| ADDS | Aviation Digital Data Service - Report by Meteorological Department |
| AIS | Automatic Information Services |
| ATS | Air Traffic Services |
| BDCA | 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 |
| CG | Center of Gravity |
| CVR | Cockpit Voice Recorder |
| DCA | Director of Civil Aviation |
| CAD | Civil Aviation Department |
| EST | Eastern Standard Time (-5 hours (-4DT) to convert from UTC) |
| FAA | Federal Aviation Administration |
| FSI | Flight Standards Inspectorate |
| FSS | Flight Service Station |
| ICAO | International Civil Aviation Organization |
| ILS | Instrument Landing System |
| IFR | Instrument Flight Rules |
| IMC | Instrument Meteorological Condition |
| MALSF | Medium-intensity Approach Lighting System (with sequenced flashers) |
| MET | Meteorological Office / Department |
| METAR | Weather Report furnished by Meteorological Department |
| MIRL | Medium Intensity Runway Lights |
| NDB | Non-directional Beacon |
| NM or nm | Nautical Miles |
| NTSB | National Transportation Safety Board |
| PAPI | Precision Approach Path Indicator |
| RCA | Root Cause Analysis |
| SEP | Survival and Emergency Procedures Training |
| T/L | Technical Log |
| USA | United States of America |
| VFR | Visual Flight Rules |
| VOR | (Very High Frequency) Omni-directional Range Station |
| VMC | Visual Meteorological Conditions |
| UTC / Z | Universal Coordinated Time / Zulu time |



DEFINITIONS

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

Accident. An occurrence associated with the operation of an aircraft which takes place between the time 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.

Incident. An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in the Accident/Incident Reporting Manual (Doc 9156).

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.

Serious incident. An incident involving circumstances indicating that an accident nearly occurred.

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

Note 2.— Examples of serious incidents can be found in Attachment C of Annex 13 and in the Accident/Incident Reporting Manual (Doc 9156).

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

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

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

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

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

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

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

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

“State of Design” - The State having jurisdiction over the organization responsible for the type design

“State of Manufacture” - The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

"Substantial damage" - means damage or failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component. Engine failure or damage limited to an engine if only one engine fails or is damaged, bent failings or cowlings, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered "substantial damage" for the purpose of this Report.



1.0 FACTUAL INFORMATION:

OVERVIEW:

On Thursday 20th December, 2007 at about 7:45 pm Mr. Albert Miller Jr., of Sarasota, Florida, pilot of N954PA, reported that sometime around 4:30 pm while enroute from Santo Domingo, Dominican Republic to West Palm Beach, Florida the aircraft engine failed without warning. Several attempts to restart the engine were unsuccessful.

The aircraft at the time was in contact with Miami Center at an altitude of approximately 12,000 ft. Miami diverted the aircraft to the nearest airport which was Chub Cay at the time. The aircraft however, was not able to glide to Chub Cay and landed in waters approximately 30 nautical miles (NM) West North West (WNW) of Chub Cay near Isaac Intersection at coordinates N 25°33.03' AND W 78°17.9' The occupants, which included a copilot, was rescued about twenty minutes later by crew of a sailing boat that was passing in the area. They were then transferred to a yacht by the name "Impetuous" which transported them to Chub Cay.

The Coast Guard was contacted and informed. No injuries were reported by the crew. The aircraft is submerged in approximately eighteen to twenty feet of water, with the aircraft tail being visible at low tide.

The aircraft is registered in the United States under the registration number N954PA, to Agape Flights Inc., a volunteer organization which runs the aircraft privately under FAA part 91 rules. Contact could not be made with the crew of the aircraft. However, contact was made with the organization to which the aircraft is registered and the following information was obtained. According to the Director of the organization, Mr. Charles Gardner, "the aircraft was topped off with approximately 2,300 pounds of fuel in Santo Domingo, which would have given them approximately 7 hour fuel endurance. About 3-4 hours into the flight the aircraft engine stopped abruptly. At the time of engine failure the aircraft was at 12,000 feet and was vectored by Miami Center toward Chub Cay which was the closest airport to its position."

Mr. Gardner also reported that the last maintenance conducted on this aircraft was done during the 1st

week of December 2007. He also stated that the aircraft had a rental engine installed sometime in November 2007 and had accumulated approximately 80 hours since and had reported no issues with the engine during this time since installation.

The Manufacture was notified and made party to the investigation. The onsite investigation was conducted by the Flight Standards Inspectorate.

1.1 HISTORY OF THE FLIGHT

On December 20, 2007 at approximately 1630EST, N954PA a Cessna 208B Caravan aircraft, owned and operated by Agape Flight Inc [United States FAR Part 91 Operator] enroute from Santo Domingo, Dominican Republic to West Palm Beach, Florida incurred sudden engine stoppage. At the time N954PA was flying at 12,000 ft. The aircraft was diverted to the nearest airport but was unable to glide the required distance and landed 30 nautical miles (NM) West North West (WNW) of Chub Cay.

There were 2 crew members on board the aircraft. No injuries were reported by the crew. The aircraft is submerged in approximately eighteen to twenty feet of water, with the aircraft tail being visible at low tide. Both crews were qualified in accordance with the United States Code of Federal Regulations.

1.2 INJURIES TO PERSONS

No serious injuries were reported up to the production of this report

1.3 DAMAGE TO AIRCRAFT

The aircraft was recovered from the ocean, by the salvage company gratis. its submerged resting place in three major sections, Left wing, engine and the reminder of the aircraft.

1.4 OTHER DAMAGE

No other damage reported.

1.5 PERSONNEL INFORMATION

At the time of the accident, the aircraft was under the command of 52 year old Albert Miller Jr. Mr. Miller held a US issued CP 267318093 certificate with



Single Engine Land, Multi Engine Land and Instrument ratings issued by the United States Department of Transport, Federal Aviation Administration.

Mr. Albert Miller Jr. also held a valid Second Class Medical Certificate at the time of the accident. No determination could be as to Mr. Miller's experience.

The Non-Flying Pilot was Mr. Paolo Costa age 45. Mr. Costa is the holder of a Private Pilot License [based upon a Foreign License] with Airplane Single Engine Land Rating.

1.6 AIRCRAFT INFORMATION

Cessna Caravan 208B aircraft serial number 208B0556 was manufactured in August 1996 by Cessna Aircraft Company. It was registered in the United States as N954PA to Agape Flights Inc. who owned and operated it. It held a valid Certificate of Airworthiness issued April 19, 2001. The total airframe hours flown since manufacture was 7,390.3 hours. The aircraft had flown 37.9 hours since its last scheduled maintenance inspection, (Phase 4 of Caravan I Phase Card Inspection Program Kit S/N 302). The aircraft was maintained in accordance Cessna Caravan I Phase Card Inspection and the Federal Aviation Regulations.

ENGINES

N954PA was fitted with one [1] Pratt & Whitney Engine; model number PT6A-114A. This engine has a time between overhaul [TBO] intervals of 3,600 hours.

Serial Number PCE-17014 was fitted in the number 1 position. The number 1 engine times since new 9,989.3, time since overhaul 601.7 hours and 37.9 hours since last inspected [Phase 4 of Caravan I Phase Card Inspection Program Kit S/N 302].

PROPELLERS

N954PA was fitted with one [1] McCauley propeller; model number 3GFR34C703-A. This propeller has a time between overhaul [TBO] intervals of 4,000 hours.

Serial Number 942082 was fitted in the number 1 position. The number 1 propeller times since new 8,689.2, time since overhaul 2,905.8 hours and 37.9 hours since last inspected [Phase 4 of Caravan I Phase Card Inspection Program Kit S/N 302].

AIRCRAFT LOAD

Operational empty weight of the aircraft is listed as 4,550 pounds. This was a return journey from a supplies delivery; therefore there were only the flight crew bags and no cargo. There was two [2] souls on board [the pilot and co-pilot].

1.7 METEOROLOGICAL INFORMATION

The Nassau, N.P., Bahamas (approximately 65 miles south of the mishap site) weather at 2200UTC was winds, 090° at 10 knots; sky, few clouds at 2,000 temperature, 25°C; dew-point, 18°C; and barometric pressure, 1,016 milli-bars.

The Freeport, G.B., Bahamas (approximately 85 miles northwest of the mishap site) weather at 2200zula was winds, 110° at 10konts; sky, few clouds at 2,500; temperature, 24°C; dew-point, 17C; and altimeter setting, 30.02 Inch-Hg.

1.8 AIDS TO NAVIGATION

Navigational aids were not a factor in this accident.

1.9 COMMUNICATIONS

The pilot was in communication with the control tower at Lynden Pindling International Airport (MYNN) up until the time of the crash.

1.10 AERODROME INFORMATION

There was no aerodrome involved as this event occurred during enroute.

1.11 FLIGHT RECORDERS

Aircraft not equipped with flight recorders.

1.12 WRECKAGE AND IMPACT INFORMATION

The aircraft was cruising at 12,000' MSL when the engine stopped resulting in the pilot ditching the aircraft approximately 30 NM WNW of Chub Cay, Berry Island.



Upon impact with the water the engine and propeller departed the fuselage. The airplane submerged in waters approximately 20 feet deep during high tide. At low tide the tail of the airplane protruded from the water.

Due to the salt content of the water, the magnesium housing and case of the engine eroded resulting in the loss of engine accessories.

The aircraft was recovered by barge from the crash site located at coordinates N25°33.03' W78°17.09' in the Berry Island chain of islands, Bahamas. The engine and propeller, as a unit, were recovered separately from the fuselage as it had separated on impact. The wreckage was moved to the Port Everglades, Fort Lauderdale, Florida prior to the engine and propeller being separated. The engine was shipped to Pratt & Whitney, Canada, the propeller and the fuselage was trucked to St. Lucie County International Airport (KFPR), Ft. Pierce, Florida.

LEFT WING

The left wing remained attached to the fuselage and with visible damage resulting from the impact with the water. The left flap and aileron remained attached. The left main landing gear also remained attached to the aircraft.

RIGHT WING

The right wing separated from the fuselage at the wing root attachment point. The right flap and aileron remained attached. The right main landing gear also remained attached to the aircraft.

PROPELLER

Propeller was feathered and appeared to have received damages due to impact with the water.

FUSELAGE

The Fuselage sustained damaged due to the impact with the water; this resulted in the engine departing the fuselage. The engine cowling and attachments departed the fuselage leaving it intact aft of the forward bulkhead. All landing gears remained intact. The port horizontal stabilizer separated from the tail due to impact with the water.

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

Not a factor in this investigation

1.14 FIRE

There was no pre or post impact fire.

1.15 SURVIVAL ASPECTS

Not a factor in the investigation.

1.16 TESTS AND RESEARCH

The airframe without the engine and propeller was examined at St. Lucie County International Airport (KFPR), Ft. Pierce, Florida by the Cessna Aircraft Company [Manufacturer] and the Bahamas Civil Aviation Department [State of Occurrence Authority] on 01-14-08. See appendix attachment for full report.

FUSELAGE

The ignition switch was on. The fuel boost switch was on. The power lever was full forward. The fuel condition lever was in the high idle position. The emergency power lever was stowed and did not have provisions for frangible wire. The propeller control lever was in the feather position. All circuit breakers were in the normal position with the exception of the cabin lighting circuit breaker located in the engine compartment which was observed open. The engine bleed air switch was in the off position. The oxygen bottle cockpit pressure indicator read approximately 1,100 PSI.

FLIGHT CONTROLS AND AERODYNAMIC SURFACES

The cockpit flap control lever was set at 20°. The standby flap motor control switches were in the normal position. The aileron trim wheel indicator was full right. The right wing separated from the fuselage in the ditching and the left wing was removed by recovery personnel. Aileron control cable continuity was not established due to overload separations and recovery cuts in the wing root areas. Flight control cable continuity was established for the rudder from the pedals to the rudder, and for the elevators from the cockpit control yoke to the pivot arm in the tail. The flap actuator was in the retracted position. The top approximately 1 foot of the vertical stabilizer and rudder were bent approximately 80° to the right during the recovery.



SEATS/RESTRAINT SYSTEMS/CABIN ENVIRONMENT

According to the BCAA Investigator, the two occupants were utilizing their restraint belts. The #1 and #2 seats were observed in the full aft position and were intact. The seat tracks were intact. The #1 and #2 seat belts and shoulder harnesses were intact. The aft cabin area remained intact. There was a toilet/seat with seatbelt observed in the aft cabin. No other cabin seats were observed.

FUEL SYSTEM

The cockpit fuel shutoff valve control was in the normal open position. The firewall mounted fuel filter bypass flag was in the normal, non-bypass position. The fuel tank caps were open and had seals in place. Three of the four fuel tank finger screens were unobstructed, and one (the right aft) was contaminated with sand particles. The fuel quantity potentiometers moved through their normal range of motion without binding. The cockpit fuel selector handles were in approximately the off position. The left fuel tank shutoff valves moved freely. The right fuel tank shutoff valve linkage exhibited bending damage. The engine driven fuel pump and fuel control were observed lying on the cabin floor behind the copilot seat where they had been placed by recovery personnel during the recovery operation. A fuel sample had previously been taken by BCAA, and the results were not available at the time of this writing.

ENGINE

This engine was a rental unit owned by Covington Aircraft.

Extensive corrosion from exposure to salt water was found throughout the engine, which completely obliterated the magnesium cases of the reduction and accessory gearboxes.

Compressor components were intact and there was no evidence of rubbing damage to any of the blades, stator vane tips or spacers.

The compressor turbine was intact and there was no evidence of rotational contact. The Power Turbine (PT) was intact and showed contact rubbing on the blade tips. The PT shroud showed corresponding damage.

Most of the components from the reduction and accessories gearboxes were not available for review; however the available components did not show any pre impact anomalies.

The splines of fuel pump drive shaft were severely worn and corroded. The mating coupling was not available for review. Detailed examination of the drive shaft revealed that the spline damage occurred prior to impact. P&WC's applicable Maintenance Manual recommends in-situ inspection of the drive shaft to detect the presence of wear on the splines. The recommended interval for this inspection is 600 hrs. Per available information provided by the engine owner, the fuel pump had accumulated 636.7 hrs since the last overhaul. It is unknown if the Operator performed the drive shaft inspection at the recommended interval.

11.17

ADDITIONAL INFORMATION
Not Applicable



2.0 ANALYSIS:

2.1 GENERAL

- **Pilot qualifications** –
 - Pilot was qualified in accordance with the Federal Aviation Administration. Pilot held currency and appropriate flight and medical certificates.
 - Pilot was employed by Agape Flights, Inc. as PIC at the time of the accident.
- **Weather** – Visual Meteorological Conditions existed at the time and was not a factor in this accident.
- **ATC** – Air Traffic Control was available at the Miami International Airport and provided assistance to the aircraft.
- **Aids to Navigation** – navigational aid were operational and was not a factor in the accident.

2.2 AIRCRAFT

The Cessna Caravan 208B aircraft is a single turbine-engine airplane with fixed tricycle landing gear configuration.

Inspections accomplished on the aircraft over the past six months are as follows:

- Phase 4 of Caravan I Phase Card Inspection Program Kit S/N 302 Dec 11, 2007
- Replace Tail navigation light Nov 26, 2007
- Installation of Cargo Partition, Yoke Chart Holder, Fuel Cap lanyard ring, removed & installed starter/generator brushes and avionics switch/beaker Nov 16, 2007
- Replace Engine S/N PCE-PC0445 with PCE-17014 Nov 3, 2007
- 100 hour mini-check Caravan I Phase Card Inspection Program Kit S/N 302 Oct 21, 2007
- Removed, installed new seals, and replaced left & right master cylinders Sep 18, 2007
- Phase 3 of Caravan I Phase Card Inspection Program Kit S/N 302 Sep 11, 2007
- Installation of low Airspeed Awareness System Aug 29, 2007
- 100 hour mini-check Caravan I Phase Card Inspection Program Kit S/N 302 Jul 17, 2007

The airplane was properly certificated, and there was no evidence that airplane maintenance was a factor in the accident.

- **Aircraft performance** – Aircraft performance was not a factor.
- **Mass and balance** – Aircraft Mass and Balance was not a factor.
- **Aircraft Navigational Instrumentation** – aircraft navigational instrumentation was operational and was not a factor in the accident.
- **Human factors** – There was no evidence that incapacitation or physiological factors affected the pilot performance prior to the accident.
- **Psychological and physiological factors affecting personnel involved.** - There was no evidence that the pilot suffered any sudden illness or incapacitation which might have affected his ability to control the aircraft.



3.0 FINDINGS:

applicable Maintenance Manual has been accomplished.

1. The splines of fuel pump drive shaft were severely worn and corroded. The mating coupling was not available for review. Detailed examination of the drive shaft revealed that the spline damage occurred prior to impact. P&WC's applicable Maintenance Manual recommends in-situ inspection of the drive shaft to detect the presence of wear on the splines. The recommended interval for this inspection is 600 hrs. Per available information provided by the engine owner, the fuel pump had accumulated 636.7 hrs since the last overhaul. It is unknown if the Operator performed the drive shaft inspection at the recommended interval.

2. Pilot contacted Miami ARTCC – ZMA [Miami Center Nassau Low Sector] Radar Controller (R61) at 2140 and reported level at 12,000 feet. Again at 2152 Pilot contacted Radar Controller (R61) to declare an emergency; stating, he had lost his engine and was descending through 10,000 feet. The pilot further advised the Radar controller (R61) he is looking for an airport. Radar Controller (R61) issued the direction and distance to Great Harbour Cay & Chub Cay. Pilot advised controller he doesn't believe that he can reach the airport some 30 NM away. Pilot elected to keep two boats in sight and eventually ditched.

PROBABLE CAUSE

The engine power loss was caused by a loss of fuel pressure resulting from a loss of drive to the fuel pump. The drive loss was caused by worn and cracked splines on the drive shaft.

The damage to the splines of the fuel pump drive shaft was likely caused by cracking below the chrome plating covering the splines, which deteriorated into spalling and wear leading to decouple between the accessories gearbox and fuel pump.

The remaining engine damage was caused by exposure to salt water.

CONTRIBUTING FACTORS

Maintenance changed the fuel control unit and coupling shaft on July 17, 2007 due to original FCU failing emergency power checks. However there is no record to show whether or not the splines of fuel pump drive shaft inspection as per P&WC's



4.0 SAFETY RECOMMENDATIONS:

Owners/Operators of PT6-114A engines shall confirm accomplishment of Pratt & Whitney Maintenance Manual Part Number 3043512 Section 72-00-00 Table 602 Periodic Inspection, Section 73-10-02 - Fuel Pump In-situ Inspection, Service Letter

SIL PT6A-149R1 and P&WC S.B. No. 1703R5 – Turbo Engine Operating Time Between Overhauls and Hot Section Inspection Frequency.



5.0 APPENDICES

APPENDIX 01 – AIRCRAFT FLIGHT MANUAL – EMERGENCY PROCEDURE

PRATT & WHITNEY CANADA MAINTENANCE MANUAL MANUAL PART NO. 3043512

TABLE 602, Periodic Inspection (Cont'd)

| Component | Inspection | Interval |
|--|---|-------------------------------------|
| (4) | Check outlet filter for foreign matter or distortion (Ref. 73-10-02). Install new filter as service conditions dictate, not to exceed 600 hours and when fuel system contamination is suspected. | MINOR |
| (5) | If Sundstrand fuel pump installed: (a) Check fuel pump coupling in-situ for fretting and corrosion (Ref. 73-10-02). (b) Remove fuel pump and inspect the drive coupling and cover (accessory gearbox side) for signs of reddish-brown (iron oxide) stains. If stains are observed, return the fuel pump to an approved overhaul facility (Ref. 73-10-02). | Every 600 hours Every 1800 hours |
| (6) | Check drain valve for installation and leaks (Ref. 73-10-06). | MINOR |
| (7) | Check FCU for installation, linkages and pneumatic tubes (Ref. 73-20-00). | MINOR |
| (8) | For engines fitted with a manual override on the fuel control, check FCU Manual Override System for static operation (Ref. 71-00-00, ADJUSTMENT/TEST). | Every 200 hours |
| (9) | Check FCU for bearing wash-out, indicated by blue dye (grease and fuel mixed) at FCU vent (Ref. Fault Isolation - Operating Problems). | ROUTINE |
| (10) | (a) Remove FCU for Drivebody Inspection/ Driveshaft Bearing Replacement. | 3000 hours See NOTE |
| NOTE: This limit is calculated from the time the unit has entered service or the last overhaul of the FCU. | | |
| | (b) Remove FCU and send for overhaul. | See NOTE |
| NOTE 1: For PT6A - 135/135A engines Ref. SB1803. NOTE 2: For PT6A - 114/114A engines Ref. SB1703. | | |
| (11) | Check starting flow control/flow divider for installation and leaks (Ref. 73-10-04). | MINOR |
| (12) | Leak test and function test fuel manifold adapter and nozzle assemblies (Ref. 73-10-05). | See NOTES |

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- (6) Check for leakage from seal drain port:

- (a) Coupling drive oil leaks from fuel pump drain should not exceed 3 cc per hour. If limits are exceeded, replace plain seal on accessory gearbox pad (Ref. 72-60-00, Removal/Installation). If leaks are still present and exceed limits, ship unit for overhaul.
- (b) Fuel leaks should not exceed 20 cc per hour. If leakage exceeds limit, ship fuel pump for overhaul.

NOTE: If limit is exceeded, inspect FCU driveshaft bearing area for fuel contamination (Ref. 73-20-00, Inspection/Check).

- (7) Inspect the splines on the drive coupling for nicks, gouges and chips.
- (8) Examine the external surfaces of the pump for corrosion and for the general condition of the anodic treatment.
- (9) Check for signs of leakage from the joint between the pump cover and pump housing. If leakage is evident, return the pump for overhaul.

B. Filter Elements

NOTE: Refer to Paras. 5.A. and B. for removal and installation of fuel pump filters.

- (1) Examine the inlet filter element for damage and/or breaks in the screen mesh.
- (2) The discharge filter is disposable and should be subjected only to visual examination for defects if the life of the part has not expired.

C. Flexible Hoses

- (1) Check that flexible hoses are fitted to avoid interference with the operation of the reversing linkage mechanism (Ref. 76-10-00).

D. Sundstrand Fuel Pump Coupling In-Situ Inspection

- (1) Remove the drain line and fitting from the fuel pump drain port (2, Fig. 202).

CAUTION: IF A COTTON SWAB OR SIMILAR DEVICE IS USED FOR THIS INSPECTION, CARE MUST BE TAKEN TO MAKE SURE NO FOREIGN MATTER REMAINS IN THE DRAIN PORT OR ASSOCIATED FITTINGS AND LINES.

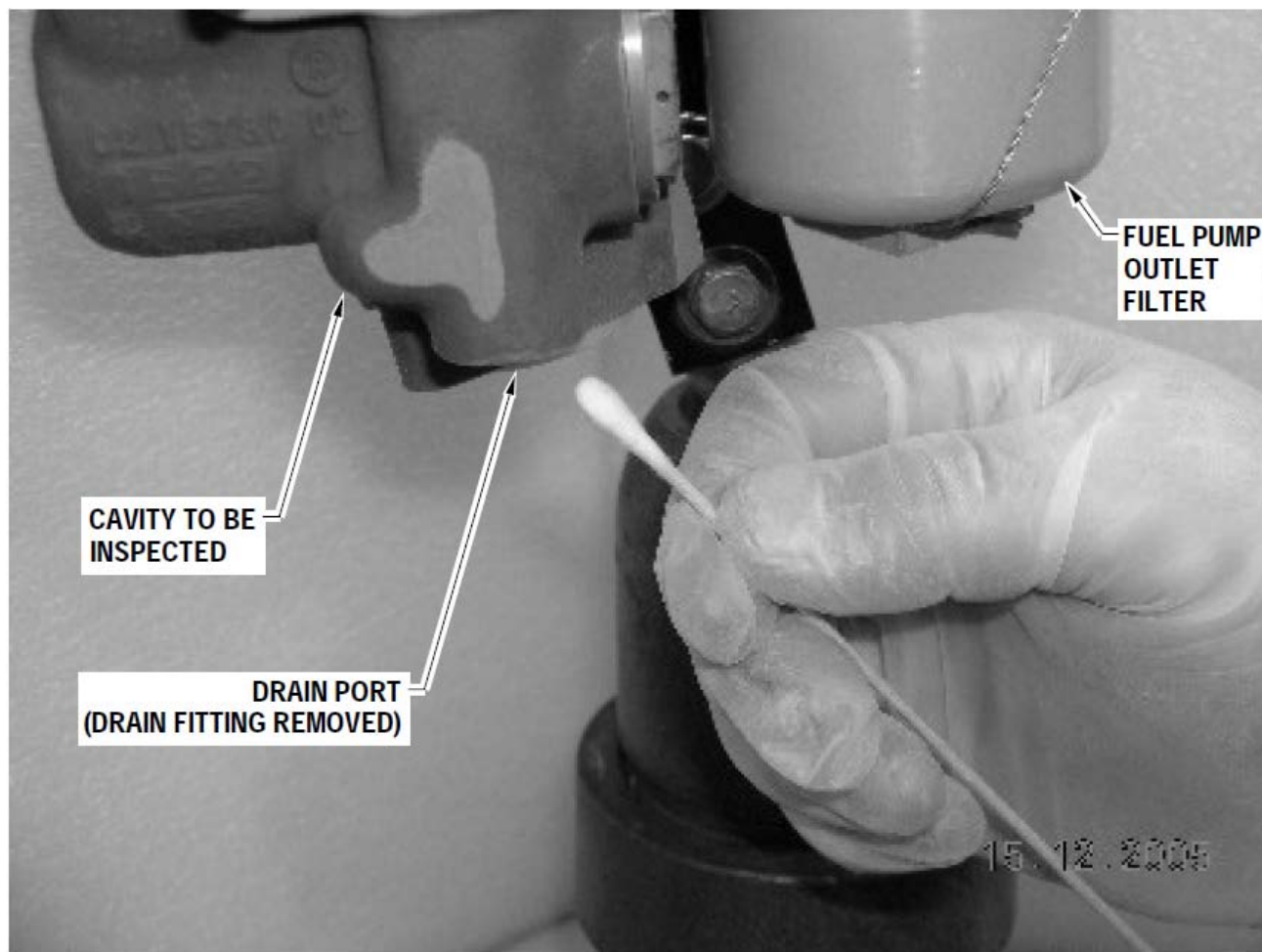
- (2) Insert a cotton swab, or equivalent, 1.0 to 1.5 in. deep into the drain port of the fuel pump (Ref. Fig. 203).
- (3) Angle the cotton swab (Ref. Fig. 203) and roll it inside the drain port to collect evidence of a possible reddish-brown deposit (iron oxide).
- (4) If no reddish-brown (iron oxide) stain is evident, the fuel pump may remain in service.

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C107468

Fuel Pump In-situ Inspection
Figure 203

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CAUTION: DO NOT REMOVE THE FUEL PUMP COUPLING. REMOVAL MAY CAUSE CHIPPING OF THE SPLINES AND/OR LOSS OF THE CIRCLIP RETENTION. THE CIRCLIP ALLOWS VERY LIMITED MOVEMENT OF THE PUMP COUPLING.

- (5) If a reddish-brown (iron oxide) stain is evident:
- (a) Remove fuel pump (Ref. Para. 6.).
 - (b) Examine the input coupling shaft area of the pump face (Ref. Fig. 201) for residue from fretting corrosion (iron oxide deposit). If none is present, the pump may remain in service.
 - (c) Evidence of corrosion residue indicates possible spline wear. Return the fuel pump to an approved overhaul facility.
 - (d) Install a replacement fuel pump (Ref. Para. 6.).

9. Approved Repairs

A. General

NOTE: After minor repairs are done, make sure that all areas are cleaned and corrosion preventive treatment is applied to aluminum surfaces. Do not allow filings to enter the unit.

- (1) Minor damage such as burrs, scores, scratches, nicks, and similar surface defects may be cleaned up by blending with a fine stone and/or crocus cloth (PWC05-061), making sure that all sharp edges and high spots are removed.
- (2) Clean up minor thread damage in the seal seepage drain port, and in the fuel inlet and outlet ports (when the nipple and elbow are removed) using a suitable swiss file or chase the threads using a suitable tap (Ref. IPC).
- (3) Clean up minor thread damage on studs with a suitable swiss file, or chase threads using a 1/4-28 UNF-3A die.
- (4) Blend out minor chips and nicks in the edges of splines, using a hard Arkansas stone, to remove rough edges and high spots that could damage mating splines and prevent proper meshing.

B. Corrosion Removal

- (1) Light surface corrosion may be removed from the pump housing and cover using one of the two methods outlined in following text. Severe corrosion, indicated by surface etching, is cause for rejection of the pump, which must be returned to an overhaul facility.
 - (a) Remove corrosion deposits by vapor blasting with No. 1200 grit (PWC05-168) or finer. Make sure that areas adjacent to the corrosion are masked to prevent damage to the surrounding parts.

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FUEL PUMP - MAINTENANCE PRACTICES

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Pratt & Whitney Canada

A United Technologies Company

S.I.L NO. PT6A-149R1

SERVICE INFORMATION LETTER

Subject: Maintenance of Engine Fuel Pump Drive and Coupling Shaft Assembly

Applicability: All PT6A Engine Models with Hamilton Sundstrand (HS) Fuel Pumps

Purpose: This Service Information Letter (SIL) is revised to remove the reference to the 3600 hour, Time Between Overhaul (TBO) for the HS Fuel Pump.

Introduction

This Service Information Letter (SIL) is being issued to advise operators, owners, pilots and maintenance providers of recent revision to the Engine Maintenance Manuals (EMM) regarding inspection intervals of the HS fuel pump.

In December 2005, Pratt & Whitney Canada Corp. (P&WC) issued Service Bulletin's (SB's) 1645, 3425, 4229, 12183, 13406 and 14384 for the affected engine models and pumps, to recommend a one-time removal and visual inspection of the fuel pump.

The Engine Maintenance Manual (EMM) periodic inspection intervals and instructions for the fuel pump in-situ inspection procedures has been revised (Ref. EMM 72-00-00 Engine Inspection Table 601 Periodic Inspection) and will require that the same inspections performed per the SB be repeated at the time of every Hot Section Inspection.

The SB's governing the Engine Operating Time Between Overhaul (TBO) are also being revised to introduce a new overhaul interval for the HS fuel pump.

The appropriate SB's are being revised to reflect the change outlined in this SIL.

Operators are encouraged to report to P&WC when the fuel pump is removed from service as a result of the EMM periodic inspection. Please fill in the template on page 3 and send it to P&WC via one of the following:

Fax: (450) 647-6908
E-Mail: pt6atboevaluation@smtp.pwc.ca
Mail: PT6A Service Engineering
Pratt & Whitney Canada Corp.
1000 Marie-Victorin
Mail Stop 01PM4
Longueuil, Quebec, Canada
J4G 1A1

This Service Information Letter is valid until superseded or cancelled by revision.

ISSUED: August 1, 2007
Rev 1 Nov 16, 2007

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**PRATT & WHITNEY CANADA
SERVICE INFORMATION LETTER**

S.I.L. NO. PT6A-149R1

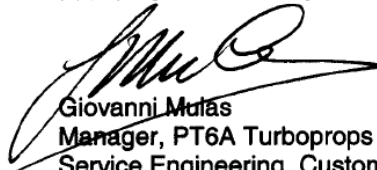
The Customer Help Desk or your Field Service Representative (FSR) can be contacted for added information if needed before taking any action. The contact information is:

Customer Help Desk
USA & Canada 1-800-268-8000
Overseas.....1-450-647-8000
Fax.....1-450-647-2888

For FSR listings visit our internet site:
<http://www.pwc.ca> (Customer Support)

Yours truly,

PRATT & WHITNEY CANADA CORP



Giovanni Molas
Manager, PT6A Turboprops
Service Engineering, Customer Support

This Service Information Letter is valid until superseded or cancelled by revision.

ISSUED: August 1, 2007
Rev 1 November 16, 2007

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PRATT & WHITNEY CANADA
SERVICE INFORMATION LETTER

S.I.L. NO. PT6A-149R1

TO: P&WC PT6A Service Engineering

From:

Owner Name: _____

Operator Name: _____

Maintenance Facility: _____

Engine Data:

Engine Model: _____

Engine S/N: _____

Fuel Pump P/N: _____

Fuel Pump S/N: _____

Fuel Pump TSN: _____

Fuel Pump TSO: _____

| Fuel Pump Inspection | |
|--------------------------|--------------------|
| <input type="checkbox"/> | In-Situ Inspection |
| <input type="checkbox"/> | Visual Inspection |

This Service Information Letter is valid until superseded or cancelled by revision.

ISSUED: August 1, 2007
Rev 1 November 16, 2007

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PRATT & WHITNEY CANADA
SERVICE BULLETIN

P&WC S.B. No. 1703R5

TURBOPROP ENGINE
OPERATING TIME BETWEEN OVERHAULS AND HOT SECTION INSPECTION FREQUENCY

2. Material Information (Cont'd)

3. Accomplishment Instructions

A. Basic Time Between Overhaul (TBO) Recommendations:

- (1) The basic industry TBO for all PT6A-114 and PT6A-114A engines is 3,600 hours.

NOTE: 1. The term hours in this document is the Engine Flight Hours (EFH).

NOTE: 2. The rotor component life limitations of P&WC S.B. No. 1002 override TBO considerations.

NOTE: 3. Engines that are within the basic recommended TBO and that have been maintained or stored per maintenance manual requirements have no related calendar time limits.

- (2) The basic TBO may be extended, subject to the approval of the operator's Airworthiness Authority (Ref. Para. 3.B.).

- (3) The Hamilton Sundstrand fuel pump may be operated to the engine TBO (basic or extended, as applicable).

- (4) The engine accessories that follow may be operated to the engine TBO (basic or extended, as applicable) plus 500 hours.

FCU

Fuel Heater

Propeller Governor

Ignition Exciter

Compressor Bleed Valve

Flow Divider

Fuel Pump (Argo-Tech only)

Where accessories are removed (for repair or other reason) and subsequently reinstalled, operating time since new or overhaul must be recorded on the repair tag.

B. TBO Extension Recommendations:

NOTE: 1. The TBO established by individual operators and/or for individual engines is independent of the TBO published for the industry.

NOTE: 2. TBO extensions, recommended by P&WC, do not affect the applicable Warranty and Service Policy originally supplied with the engine. P&WC will continue to use the basic industry TBO (refer to Para. 3.A.(1)) to calculate the pro-rata credit and the benefits per the Primary Parts Service Policy and/or the Extended Engine Service policy.

P&WC
Oct 29/2001
Revision No. 5: Nov 14/2007

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APPENDIX 07
APPENDIX 08

AGAPE FLIGHTS FACTUAL NOTES
INVESTIGATION REPORT R. HOLLIS

