



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

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|--------------------------------|--------------------------------------|-------------------------|-------------|
| Location: | Gilford, New Hampshire | Accident Number: | ERA09FA343 |
| Date & Time: | June 13, 2009, 16:14 Local | Registration: | N52670 |
| Aircraft: | Cessna 177 RG | Aircraft Damage: | Substantial |
| Defining Event: | Loss of engine power (total) | Injuries: | 1 Fatal |
| Flight Conducted Under: | Part 91: General aviation - Personal | | |

Analysis

On the initial flight following an incomplete annual inspection, the airplane experienced a total loss of engine power and impacted a tree during the resultant forced landing. The airframe and powerplant (A&P) with an inspection authorization (IA) rated mechanic reported that he signed off the logbooks with the expectation that another mechanic would perform an engine run-up prior to flight. Federal Aviation regulations did not allow delegation of authority with regards to the inspection and that the IA must perform the inspection prior to approving the airplane for return to service. The accident pilot arrived to the maintenance facility prior to the A&P mechanic, retrieved the logbooks that were signed off, and departed. Oil was noticed on the taxiway that services the maintenance facility, in the engine run-up area, and leading to the runway. The oil cooler return line attach nipple was fractured and gouges were noted on the surface of the hose end socket caused by an inadvertent contact by a wrench slipping off of a nearby bolt or nut and striking the surface of the hose end socket. Results of toxicology testing were consistent with recent use of marijuana and amphetamine. It could not be determined whether impairment due to such use may have played a role in the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A loss of engine power due to oil exhaustion from the fracture of the nipple for the engine oil cooler return line. Contributing to the accident was the mechanic's signoff and release of the airplane without performing the required engine run-up following an annual inspection.

Findings

| | |
|-------------------------|---|
| Personnel issues | Post maintenance inspection - Maintenance personnel |
| Aircraft | Recip eng oil sys - Failure |
| Aircraft | Oil - Fluid level |
| Aircraft | Return to service - Inadequate inspection |
| Personnel issues | Illicit drug - Pilot |

Factual Information

History of Flight

| | |
|-------------------|---|
| Initial climb | Loss of engine power (total) (Defining event) |
| Emergency descent | Off-field or emergency landing |
| Emergency descent | Collision with terr/obj (non-CFIT) |

HISTORY OF FLIGHT

On June 13, 2009, about 1614 eastern daylight time, a Cessna 177RG, N52670, crashed while making a forced landing in a hotel parking lot in Gilford, New Hampshire. Visual meteorological conditions prevailed, and no flight plan was filed. The flight departed Laconia Municipal Airport (LCI), Laconia, New Hampshire about, 1612 with an intended destination of Portland International Jetport (PWM), Portland, Maine. Two planned intermediate stops at Eastern Slopes Regional Airport (IZG), Fryeburg, Maine, and Wiscasset Airport (IWI), Wiscasset, Maine, were scheduled. The certificated airline transport pilot was fatally injured. The personal flight was conducted under Title 14 Code of Federal Regulations (CFR) Part 91.

The fixed base operator lineman, at LCI pulled the airplane out of a hangar at the request of the pilot and witnessed the pilot begin a preflight inspection of the airplane. Approximately 5 minutes later the lineman heard the pilot attempt to start the airplane several times. He also reported that the engine "backfired or popped" twice; however, the engine started and the pilot began his taxi out for takeoff. The lineman returned to his work and did not observe the airplane taxi out to the runway.

Numerous eyewitnesses who observed the airplane after takeoff reported that there was "no engine noise." The airplane's left wing and left horizontal stabilizer struck a tree approximately 55 feet tall, and the stabilizer was found in the lower branches of the tree. The airplane was then observed to bank to the right and then roll wings level, just prior to impacting a second tree near ground level. Several witnesses reported seeing "large quantities of fuel" coming out of the wings, and smoke emanating from the engine area.

PERSONNEL INFORMATION

The pilot, age 50, held an Airline Transport Pilot (ATP) certificate, with a rating for airplane multi-engine land, and a commercial pilot certificate with a rating for airplane single-engine land. His most recent FAA first-class medical certificate was issued on December 5, 2008. At that time, the pilot reported a total flight time of 6,820 hours.

AIRCRAFT INFORMATION

The airplane was manufactured in 1977 and was equipped with a Lycoming IO-360-A1B6D engine. The most recent annual inspection was accomplished on June 12, 2009, and maintenance records indicated the airplane had 4,637.8 total hours at that time. The engine was factory overhauled by Lycoming and installed in the accident airplane in May, 2002. At the last annual inspection the engine had a total time in service of 237.8 hours since overhaul. At the time of the accident the airplane was on its first flight since the completion of the annual inspection.

METEOROLOGICAL INFORMATION

The 1615 recorded weather observation at LCI included wind from 310 degrees at 4 knots; visibility 10 miles, a few clouds at 10,000 feet above ground level, temperature 25 degrees C, dew point 9 degrees C; altimeter 29.89 inches of mercury.

AIRPORT INFORMATION

LCI was located at an elevation of 545 feet mean sea level. The airport was located 3 miles northeast of Laconia, New Hampshire. There was no Air Traffic Control Tower located at the airport. The airport was equipped with a single asphalt runway designated as 8/26 which measured 5,890 feet long and 100 feet wide, and had a lake located 422 feet off the departure end of runway 26.

An examination of the airport taxiways revealed that there was an oil trail on the taxiway beginning approximately 600 feet from the engine run-up area, along the taxiway that services the maintenance facility that performed the 100 hour inspection on the airplane. There was a noticeable thin film refraction of oil in the engine run-up area approximately 3 feet by 4 feet, and a trail of oil on the taxiway leading from the engine run-up area and the runway.

WRECKAGE AND IMPACT INFORMATION

An on scene investigation by the National Transportation Safety Board (NTSB) revealed that the airplane came to rest upright against a tree, adjacent to a hotel parking lot, 5,316 feet from the departure end of runway 26. The distance from the first tree strike to the wreckage was 121 feet and the wreckage path was oriented on a 289 degree heading. The section of the airplane aft of the firewall to the rudder was oriented on a 332 degree heading, and the engine was found rotated approximately 80 degrees to the right of the longitudinal center line of the airplane. The tail cone was bent up just aft of the baggage compartment, and the bottom of the rudder, which remained attached to the vertical stabilizer, came to rest on the hood of a parked car.

Both wings exhibited leading edge crushing. The right wing had impact damage similar in diameter to the last tree struck by the airplane., the right wing flap was found fully extended but moved freely on the tracks.

The left wing was bent down approx 55 degrees, starting at the inboard end of the aileron. The left wing flap was found in the fully retracted position.

Flight control continuity was verified from the cockpit to all flight control surfaces, and to the fracture point on the left horizontal stabilizer.

The main landing gear was found in the up and locked position and the nose landing gear was in the down and unlocked position.

The forward door post of the right side passenger door was crushed aft. The cockpit throttle, mixture, and propeller controls were found in the full forward position. The flap selector was found with a 10 degree flap setting and the flap indicator indicated 20 degrees of flaps, however the flap drive mechanism was found with an extension of 4 inches which correlated to a flaps-retracted setting.

All engine mounts were fracture-separated, and the engine was attached to the firewall by cables and electrical wires. There was no rotational scoring on the propeller blades or the spinner. One propeller blade had impact marks similar to those associated with impacting a tree. The propeller governor remained secure on the mounting pad and showed no evidence of leaking. The governor control arm assembly was impact separated. The governor was removed and the gasket screen was clean. The governor drive coupling was intact and rotated freely by hand and the unit contained a residual amount of oil.

The fuel pump was fractured near the mounting flange. The fuel pump drive mechanism, diaphragms, and valves remained intact. The fuel hoses were impact damaged. The injector servo was impact-separated from the intake manifold; the throttle valve was in the full open position. The injector inlet screen and main fuel strainer were free of debris.

The oil sump was impact separated; however, there was no evidence of pre-impact oil loss on any of the fracture surfaces. There was no indication of oil streaming from the fracture surface onto the engine cylinders.

Oil was noted on the oil cooler, lower right hand cowling, and along the lower right side and belly of the fuselage. The oil cooler return hose was found fractured at the hose end nipple fitting, where the nut attached to the engine oil return boss fitting near the top of the rear accessory case. The oil cooler and return hose were displaced from their normal mounting positions, while the inlet hose to the cooler remained undamaged. The oil return line nipple fitting and accessory case was completely devoid of oil. The associated broken nipple and socket on the return line to the engine was coated in oil. Gouges were observed on the surface of the hose end socket similar to marks made from contact from a wrench or tool.

The engine was examined and partially disassembled. Approximately 2 ounces of oil were extracted from the entire engine oil system. The oil filler cap was secure, but the oil quantity indicator rod was devoid of oil. Crankshaft continuity was confirmed visually; and all four

engine connecting rod bearings had signatures similar to heat distress, were damaged, and seized. The oil pump was intact, rotated by hand with some resistance, and no damage was found to the internal gears.

The dual-unit magneto was impacted separated from the engine; the bottom mounting stud was fractured. No evidence of oil leaks was observed in the vicinity of the magneto. The magneto produced spark on all towers when rotated by hand. The spark plugs were removed; they displayed moderate wear and were gray in color.

The oil filter remained attached to the rear of the engine case and had an install date of June 1, 2009 written on it. The oil filter was cut open and had little oil saturation inside the filter cavity. The previous oil filter was located at the maintenance facility and was sent to and examined by the NTSB investigator. The filter had been previously cut for examination by the facility; however, it could not be determined when it had been cut. The paper element was intact and no metal particles were noted.

The engine crankcase had a fracture that went around the entire circumference of the engine; however there was no evidence of oil in the vicinity of the fracture.

MEDICAL AND PATHOLOGICAL INFORMATION

According to the State of New Hampshire Office of the Chief Medical Examiner, the cause of death was "multiple blunt impact injuries."

The FAA's Civil Aerospace Medical Institute performed forensic toxicology on specimens from the pilot. The report stated no carbon monoxide or cyanide was detected in the blood, no ethanol was detected in vitreous, 2.897 ug/ml, ug/g amphetamine was detected in the urine, 0.195 ug/ml, ug/g was detected in the blood. 0.1799 ug/ml, ug/g tetrahydrocannabinol (marihuana) was detected in the lung, 0.0059 ug/ml, ug/g tetrahydrocannabinol (marihuana) was detected in the blood, tetrahydrocannabinol (marihuana) was detected in the kidney, 0.1291 ug/ml, ug/g tetrahydrocannabinol carboxylic acid (marihuana) was detected in the kidney, 0.116 ug/ml. ug/g tetrahydrocannabinol carboxylic acid (marihuana) was detected in the urine, 0.0117 ug/ml, ug/g tetrahydrocannabinol carboxylic acid (marihuana) detected in the blood, 0.0103 ug/ml, ug/g tetrahydrocannabinol carboxylic acid (marihuana) was detected in the lung.

FAA toxicology staff noted that the blood for toxicology testing performed at the FAA-Civil Aerospace Medical Institute toxicology laboratory was labeled as "chest blood." The toxicology testing accomplished for the Medical Examiner in conjunction with the autopsy noted tetrahydrocannabinol (4.3 ng/mL), tetrahydrocannabinol carboxylic acid (8.4 ng/mL), and amphetamine (94 ng/mL) in "femoral blood."

The pilot's most recent application for an FAA first class medical certificate indicates "No" in response to "Do You Currently Use Any Medication" and to all items under "Medical History," including specifically "Substance dependence or failed a drug test ever, or substance abuse or

use of illegal substance in the last 2 year." Responses to queries regarding medication use or use of illegal substances were "No" on all applications for airman medical certificate dating back to 1979.

TEST AND RESEARCH

JP Instruments Engine Monitoring System

The airplane was equipped with a JP Instruments EDM-700 engine monitoring system which was removed and sent to the NTSB Recorders Laboratory for download. The unit contained 91794 seconds of recorded data, including data from the accident flight. The system monitored several parameters including oil temperature, cylinder head temperature (CHT), and exhaust gas temperature (EGT) for all four cylinders. Approximately 45 seconds prior to the end of the accident flight recording, the oil temperature and CHT indicated continuous increases. Approximately 30 seconds prior to the end of the recording, the CHT indicated a trend of decreasing temperatures, while the oil temperature continued to increase to about 195 degrees F, which was maintained until the end of the recording. The oil temperature probe was mounted on the right front side of the engine, in close proximity to the propeller hub. The oil temperature alarm limit had been set at 230 degrees F.

Oil Cooler

On September 18, 2009 the oil cooler was examined at the oil cooler manufacturer in LaVerne, California under the supervision of the NTSB investigator in charge. Two punctures were noted on the corner of the cooler; these were also noted at the accident scene. The punctures were approximately 2 millimeters in diameter and were similar to damage consistent with impact damage. An air hose was connected to the oil cooler and 20 psi air was introduced into the cooler. The air escaped the two noted punctures and one additional puncture. The punctures were patched and the test was re-conducted. Air pressure was increased in increments up to 250 psi. No other air was noted escaping from the cooler except at the locations previously noted. The external housing surrounding the cooler fins was cut approximately 1 inch from the air. Removal of the external housing revealed a small puncture which was consistent with damage associated during the impact sequence.

Oil Cooler Return Line Hose

The oil cooler return hose and fittings were examined on November 11, 2009 by the NTSB investigator. The only damage were the gouges in the attach nipple that were previously noted. One end of the hose was sealed utilizing a metal threaded plug and an air nozzle attach fitting was threaded to the opposite end. The hose was submerged in water and air pressure was applied to the hose in increments up to 150 psi. No leaks were detected during the test.

ADDITIONAL INFORMATION

Engine oil system

The system was equipped with a Thermostatic Oil Cooler Bypass Valve, which was located near the rear of the engine. After engine start, when the engine oil remains below approximately 180 degrees F, the valve allows oil to flow through the oil filter without passing through the oil cooler. Once the oil reaches approximately 180 degrees F, the valve closes and routes the oil through the cooler, and then to the engine accessory housing.

Maintenance Facility Annual/100 hour Work order/Inspection checklist

A review of the maintenance facility's annual/100 hour inspection checklist revealed that most entries had either the initials of the mechanic performing the work and/or the IA tasked with inspecting the airplane and work performed, as required by CFR Part 43.15. However, the form entitled Power Plant Operational – Preflight Check did not have any initials associated with the listed component. In an interview with the NTSB investigator, the IA reported that the facility replaced the windshield on Friday, June 12, but the windshield had to "cure for twenty-four hours." The IA informed the pilot the airplane was not going to be ready until 1630 on Saturday June 13. The facilities A&P mechanic offered to come in on Saturday in order to perform the required engine run with the pilot. The IA stated that on Saturday, the pilot arrived at the facility early, and asked one of the linemen to pull the airplane out of the hangar. According to the owner of the maintenance facility the repair station's policy was "if there is something left to be done the work order is placed on top of the airplane logbooks" and left on the IA's desk. He further reported that after the accident they looked for the logbooks in their facility; however, they were not found and assumed that the pilot "must have come in and got them." He stated that he, as the IA, signed off the logbooks; however, the facility did not want to do an engine run-up without a windshield so they elected to perform the required engine run-up Saturday.

CFR Part 43.15

CFR Part 43.15 (C) Additional Performance rules for inspections, "Annual and 100-hour inspections," stated in part "...each person approving a reciprocating-engine-powered aircraft for return to service shall, before that approval, run the aircraft engine or engines to determine satisfactory performance in accordance with the manufacturer's recommendations of – power output (static and idle rpm.); magnetos; fuel and oil pressure, and cylinder and oil temperature."

Pilot Information

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| Certificate: | Airline transport; Commercial | Age: | 50, Male |
| Airplane Rating(s): | Single-engine land; Multi-engine land | Seat Occupied: | Left |
| Other Aircraft Rating(s): | None | Restraint Used: | |
| Instrument Rating(s): | Airplane | Second Pilot Present: | No |
| Instructor Rating(s): | None | Toxicology Performed: | Yes |
| Medical Certification: | Class 1 With waivers/limitations | Last FAA Medical Exam: | December 5, 2008 |
| Occupational Pilot: | Yes | Last Flight Review or Equivalent: | |
| Flight Time: | (Estimated) 6820 hours (Total, all aircraft) | | |

Aircraft and Owner/Operator Information

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|--------------------------------------|--|---------------------------------------|-----------------|
| Aircraft Make: | Cessna | Registration: | N52670 |
| Model/Series: | 177 RG | Aircraft Category: | Airplane |
| Year of Manufacture: | | Amateur Built: | |
| Airworthiness Certificate: | Normal | Serial Number: | 177RG1243 |
| Landing Gear Type: | Retractable - Tricycle | Seats: | 4 |
| Date/Type of Last Inspection: | June 12, 2009 Annual | Certified Max Gross Wt.: | 2800 lbs |
| Time Since Last Inspection: | 0 Hrs | Engines: | 1 Reciprocating |
| Airframe Total Time: | 4638 Hrs at time of accident | Engine Manufacturer: | Lycoming |
| ELT: | C91 installed, activated, did not aid in locating accident | Engine Model/Series: | IO-360-A1B6D |
| Registered Owner: | On file | Rated Power: | 200 Horsepower |
| Operator: | On file | Operating Certificate(s) Held: | None |

Meteorological Information and Flight Plan

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|---|----------------------------------|---|------------------|
| Conditions at Accident Site: | Visual (VMC) | Condition of Light: | Day |
| Observation Facility, Elevation: | LCI, 545 ft msl | Distance from Accident Site: | 1 Nautical Miles |
| Observation Time: | 16:15 Local | Direction from Accident Site: | 109° |
| Lowest Cloud Condition: | Few / 10000 ft AGL | Visibility | 10 miles |
| Lowest Ceiling: | None | Visibility (RVR): | |
| Wind Speed/Gusts: | 4 knots / | Turbulence Type Forecast/Actual: | / |
| Wind Direction: | 310° | Turbulence Severity Forecast/Actual: | / |
| Altimeter Setting: | 29.88 inches Hg | Temperature/Dew Point: | 25°C / 9°C |
| Precipitation and Obscuration: | No Obscuration; No Precipitation | | |
| Departure Point: | Gilford, NH (LCI) | Type of Flight Plan Filed: | None |
| Destination: | Fryberg, NH (IZG) | Type of Clearance: | None |
| Departure Time: | Type of Airspace: | | |

Airport Information

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|-----------------------------|-------------------------------|----------------------------------|----------------|
| Airport: | Laconia Municipal Airport LCI | Runway Surface Type: | Asphalt |
| Airport Elevation: | 545 ft msl | Runway Surface Condition: | Dry |
| Runway Used: | 26 | IFR Approach: | None |
| Runway Length/Width: | 5890 ft / 100 ft | VFR Approach/Landing: | Forced landing |

Wreckage and Impact Information

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|----------------------------|---------|-----------------------------|----------------------|
| Crew Injuries: | 1 Fatal | Aircraft Damage: | Substantial |
| Passenger Injuries: | | Aircraft Fire: | None |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Total Injuries: | 1 Fatal | Latitude, Longitude: | 43.565277,-71.446945 |

Administrative Information

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| Investigator In Charge (IIC): | Etcher, Shawn |
| Additional Participating Persons: | Daniel L Jockett; FAA/FSDO; Portland, ME Steve Miller; Cessna Aircraft Company; Wichita, KS Edward Rogalski; Lycoming Engines; Williamsport, PA |
| Original Publish Date: | December 20, 2010 |
| Last Revision Date: | |
| Investigation Class: | Class |
| Note: | The NTSB traveled to the scene of this accident. |
| Investigation Docket: | https://data.nts.gov/Docket?ProjectID=74034 |

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).