Aviation Investigation Final Report

Location:	Littleton, North Carolina	**Accident Number:**	ERA14FA313
Date & Time:	June 27, 2014, 09:40 Local	**Registration:**	N182PE
Aircraft:	Cessna 182	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During a personal cross-country flight, the commercial pilot reported to air traffic control that he had a mechanical issue and wanted to return to an airport near his departure airport. The controller acknowledged the pilot's request and cleared him direct to that airport. About 5 minutes later, he reported that he needed to land and requested the nearest airport. The controller cleared the airplane direct to the nearest airport. Shortly thereafter, the pilot reported that he lost engine power and would have to land immediately. During the landing in a field, the nosewheel embedded in soft ground, and the airplane came to rest inverted.

An external examination of the engine revealed that four of the pistons had seized due to bearing and connecting rod damage. Metallurgical examination of the engine case halves revealed a gray-colored sealant on the crankcase main journal bearing saddle bosses mating surfaces. A bead of sealant was also noted on the edges of the mating surfaces both on the interior and exterior edges. The engine likely failed due to insufficient oil supply to the bearings for three of the connecting rods and the rotation of the fourth bearing. It is likely that beads of sealant were squeezed out of the mating faces of the crankcase and that these beads of sealant broke off and contaminated the oil supply, thereby reducing the oil flow. In addition, as the sealant on the saddle faces was squeezed out over time, the crush load could have been reduced, which would have affected the clearances between the bearings and the journals, leading to reduced oil pressure to the connecting rod bearings and increased risk of main bearing shifting and spinning. Thus, the use of sealant likely contributed to the bearing lubrication issue.

A review of the maintenance logbooks revealed that the engine had been overhauled and modified about 4 years (and 300 hours of operation) before the accident. Overhaul and modification instructions and manuals stated that the engine should be overhauled in accordance with the original equipment manufacturer's manuals and service bulletins, which indicated that no sealant should be applied on the main journal bearing saddle bosses.

None of the prescription medications the pilot had reported to the Federal Aviation Administration were

impairing. Given that there was no indication of pilot impairment in his exchanges with the controllers, it is unlikely that the pilot's cardiac disease played a role in the accident. Indomethacin was found only in the pilot's urine, not in other body tissues; thus, it could not have directly caused systemic symptoms.

The diphenhydramine measured in the pilot's aortic blood (0.26 ug/ml) was well above the therapeutic range of 0.0250 to 0.1120 ug/ml. Although diphenhydramine undergoes postmortem redistribution, the level suggests that the pilot had therapeutic amounts in his system at the time of the crash; thus, it is likely the pilot was impaired to some extent by the drug's effects. However, the available evidence indicates that the pilot's behavior and decision-making during the accident sequence were appropriate for a pilot with his skill level and knowledge. Therefore, the effects of diphenhydramine likely did not contribute to the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

Maintenance personnel's application of sealant to the engine case halves during engine overhaul, contrary to manufacturer's instructions, which resulted in internal failure of the engine due to the loss of case bolt torque.

Findings

Aircraft	Recip engine power section - Incorrect service/maintenance
Personnel issues	Installation - Maintenance personnel
Aircraft	Recip engine power section - Failure
Personnel issues	Prescription medication - Pilot
Environmental issues	Rough terrain - Contributed to outcome

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Enroute-cruise	Loss of engine power (partial)
Emergency descent	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing-landing roll	Nose over/nose down

HISTORY OF FLIGHT
On June 27, 2014, about 0940 eastern daylight time, a Cessna 182Q, N182PE, was substantially damaged during a forced landing near Littleton, North Carolina. The commercial pilot was fatally injured. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the flight, which departed from Sabot Airport (1VA0), Sabot, Virginia, at 0848, and was destined for Rocky Mount-Wilson Regional Airport (RWI), Rocky Mount, North Carolina. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91.
According to air traffic control (ATC) voice and radar data provided by the Federal Aviation Administration (FAA), the airplane departed from 1VA0 and climbed to an altitude of 4,000 feet mean sea level (msl). At 0929, the pilot advised ATC that he had mechanical problem and would like to divert to Hanover County Municipal Airport (OFP), Richmond, Virginia and was cleared direct to OFP. At 0932, the pilot advised ATC that "I just got rpm is a gone past the red line and everything else is a looking alright got a low oil pressure but a temperature is okay a so I'm just going back as a precaution." At 0934, the pilot advised ATC that he was going to have to land the airplane and that he was showing Halifax-Northampton Regional Airport (IXA), Roanoke Rapids, North Carolina as the closest airport. The controller confirmed that IXA was the closest airport, which was at the airplane's two o'clock position and 10 miles away. The controller then cleared the flight direct to IXA and requested that the pilot report the airport in sight. At 0935, the controller advised the pilot to descend at his own discretion, maintain 2,500 feet msl and report the airport in sight for the visual approach unless he wanted a different approach; the pilot acknowledged the instructions. At 0937, the pilot advised the controller that he was "losing the engine" and when asked if he would be able to make the field, he responded negative. The controller asked if there were any prominent landmarks that the pilot could describe or did he have a field in sight to land. The pilot responded that "there were many fields and that he still had forward movement." The controller then advised the pilot that IXA was 8.5 miles away.

No further communications were received and the airplane was located by first responders about 1050.

PERSONNEL INFORMATION

The pilot, age 71, held a commercial pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent medical application, dated June 3, 2014, noted a total of 2,721 flight hours; of which 62 flight hours were accrued within the 6-month period prior to the exam. The

pilot was issued a second-class medical certificate with limitations. A review of the pilot's current logbook revealed the last entry was made on February 17, 2014, with a total of 2,533.1 flight hours in single-engine airplanes.

AIRCRAFT INFORMATION

The four-seat, high-wing, fixed-gear airplane, serial number 18265584, was manufactured in 1977. It was powered by a Continental P-Ponk O-470-50/O-470-U13B, serial number 2651/ CMI-820119R engine, equipped with a McCauley D3A34C401C propeller. A review of copies of maintenance logbook records showed a 100-hour inspection was completed April 4, 2014, at a recorded airframe total time of 2,873.5 hours and an engine total time of 1,123.4 hours. Further review of the aircraft records revealed that the engine was overhauled and modified with the P-Ponk STC- SA5966NM and STC-SE4985NM conversion on August 26, 2010. The work was performed by Aero Engines of Winchester, Virginia, and had about 300 hours' time in service since overhaul.

METEOROLOGICAL INFORMATION

The recorded weather at IXA, located 6.6 miles from the accident site at an elevation of 144.5 feet, at 0935, included wind from 040 degrees at 8 knots, 10 statute miles visibility, clear sky, temperature 27 degrees Celsius (C), dew point temperature 22 degrees C, and an altimeter setting of 30.05 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The wreckage was located in an open cotton field. A ground scar extended about 40 feet on a 110-degree magnetic heading. The airplane came to rest inverted and oriented in the opposite direction of the wreckage path. Examination of the airframe revealed that the nose landing gear strut was pushed aft into the firewall, and three of the four engine mounts had broken near their respective engine attach points. The empennage, rudder, and vertical stabilizer displayed downward crush damage. Control continuity was traced from each flight control surface to the cockpit area. The measurement of the flap actuator correlated to a flaps retracted position. Both fuel tanks remained intact and retained a significant quantity of fuel.

External examination of the engine revealed four ruptures to the upper portion of the engine case. Pieces of connecting rod, piston, and engine case were recovered along the wreckage path and within the engine's cowling. Further examination revealed that the mating surfaces of the crankcase halves were coated with a type of rubbery substance. The substance was also found on the interior web mating surfaces and the through bolts. The No. 2 main bearing was impact-damaged to the point where the oil port for the bearing was blocked. The No. 1 and No. 2 rod journals on the crankshaft exhibited heat damage and melting, and the rod cap bearings were missing. The No. 1 and No. 2 connecting rods were separated and heat damaged. The No. 1 main bearing was heat damaged and displaced to the rear.

Examination of the ignition harness reveled that it was in place on the engine. The magnetos were attached to the accessory housing case and were not damaged. They were both tested using an electric drill, and they both produced spark at all terminals when the drive shafts were rotated. The spark plugs were removed and examined. They had normal wear when compared to the Champion Check-A-Plug comparison card. They also exhibited dark gray deposits in the electrode areas.

Examination of the carburetor revealed that is was in place and was not damaged. The throttle and mixture controls were connected and moved freely. The fuel screen was clean and no debris was noted within the screen. The carburetor was disassembled and no fuel was observed in the bowl. The bowl was also free of debris. The floats and needle valve were attached and moved freely.

Examination of the oil pump revealed that it was in place and was not damaged. The gears were free to rotate and were coated with oil. Metal particles were observed on the gears, and scoring was observed within the pump housing. The oil filter was not damaged and was secured on the engine. It was cut open and the paper element contained metal particles. The oil sump and pick-up tube were in place and the sump was impact-damaged and contained oil and metal particles. The oil cooler was in place and not damaged and contained oil and metal particles.

All of the cylinders remained in place on the crankcase halves. The pistons were seized in cylinder Nos. 1, 2, 4, and 6. Cylinder Nos. 3 and had light scoring in the barrels and moderate combustion deposits in the cylinder domes. The valves were in place. All of the cylinders except Nos. 3 and 5 had impact damage around the skirts.

A partial field teardown examination of the engine was completed and the engine was subsequently forwarded to the NTSB Materials Laboratory, Washington, DC, for further examination.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot at the East Carolina University Brody School of Medicine, Greenville, North Carolina. The autopsy report noted the cause of death as "consequences of fracture of cervical spine due to aircraft crash." In addition, the pilot was noted to have an enlarged heart with thickening of the left ventricle and coronary artery disease with 90% stenosis in the right coronary artery.

Toxicological testing performed on the pilot by the FAA Bioaeronautical Science Research Laboratory, Oklahoma City, Oklahoma, identified no carbon and no ethanol. In addition, 0.26 ug/ml of diphenhydramine was identified in the pilot's aortic blood and diphenhydramine and indomethacin were detected in urine. Diphenhydramine is a sedating antihistamine available over the counter in a number of products used to treat cold and allergy symptoms. It is so sedating it is also the active ingredient in a number of over the counter sleep aids. Common products containing diphenhydramine are sold with the names Benadryl and Unisom. Indomethacin is a prescription non-steroidal anti-inflammatory analgesic, also known as Indocin and Tivorbex.

SURVIVAL ASPECTS

First responders noted that the pilot's lap belt remained attached and he was seated in the left cockpit seat; however the shoulder harness was not attached. There was no evidence of the pilot wearing the shoulder harness.

ADDITIONAL INFORMATION

During an interview with the owner of the maintenance facility that performed the most recent engine overhaul, he reported that once an engine is received it is given an overall assessment before disassembly of the engine. After the engine is disassembled, they conduct a detailed inspection of the

engine, noting anything that may not have been done correctly and/or anything that is showing excessive wear. During the overhaul, the facility utilized Loctite 515 or Continental approved gasket purple (also known as "grape jelly"). He further stated that if the engine is to be converted similar to the one in the accident airplane, they will send the engine case out to be bored to fit the appropriate cylinders.

The crankcase halves, crankshaft, camshaft, valve lifters, through bolts and main bearings were examined by an NTSB materials engineer. During examination of the case halves, a gray-colored sealant with silk thread was observed around the perimeter of the mating crank case halves. On the main bearing saddles a bead of sealant was observed at the edges of the mating surfaces both on the interior and exterior edges. The gray sealant was also observed on the mating surfaces of the main journal bearing saddle bosses. Examination of the lower bosses of the camshaft journal saddles revealed that fretting damage was observed on Nos. 3 and 4 camshaft journals.

According to P. Ponk Aviation Service Information Letter 001, dated September 24, 2002, the P. Ponk O-470-50 engine should be maintained, repaired, or overhauled in accordance with current Continental O-470 and TSIO-520-C Service Manuals and Service Bulletins. Continental Service Information Letter SIL99-2C, issued March 29, 1999, and revised September 16, 2014, included information for properly applying sealant to the crankcases of O-470 and TSIO-520 series engines. The diagram for sealant application and silk threading on the Continental O-470 engine was shown in Continental SIL99-2C. As indicated, no sealant should be applied on the main journal bearing saddle bosses. Additionally, Continental SIL99-2C further described in areas where the silk threading was applied, the gasket sealant should be applied in a thin, even coat that is allowed to air dry to a tacky condition before applying the silk thread.

Pilot Information

Certificate:	Commercial; Flight instructor; Private	**Age:**	71
Airplane Rating(s):	Single-engine land; Single-engine sea	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider; Helicopter	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	June 3, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 3738.5 hours (Total, all aircraft), 3451.5 hours (Pilot In Command, all aircraft), 32.7 hours (Last 90 days, all aircraft), 15.6 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N182PE
Model/Series:	182 Q	**Aircraft Category:**	Airplane
Year of Manufacture:	1977	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	18265584
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	April 4, 2014 100 hour	**Certified Max Gross Wt.:**	2950 lbs
Time Since Last Inspection:	35 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2909 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	O-470 SERIES
Registered Owner:	On file	**Rated Power:**	235 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KRZZ,255 ft msl	**Distance from Accident Site:**	9 Nautical Miles
Observation Time:		**Direction from Accident Site:**	357°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	40°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	27°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	SABOT, VA (1VA0)	**Type of Flight Plan Filed:**	IFR
Destination:	ROCKY MOUNT, NC (RWI)	**Type of Clearance:**	IFR
Departure Time:	08:50 Local	**Type of Airspace:**	

Wreckage and Impact Information

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:**	36.290832,-77.700836(est)

Administrative Information

Investigator In Charge (IIC):	Alleyne, Eric
Additional Participating Persons:	Henry J Soderlund; Cessna Aircraft Company; Wichita, KS John T Kent; Continental Motors Inc; Mobile, AL Timothy L Haley; FAA Greensboro FSDO ; Greensboro, NC
Original Publish Date:	April 14, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89555