Aviation Investigation Final Report

Location:	Bryan, Texas	**Accident Number:**	CEN16LA107
Date & Time:	February 16, 2016, 11:30 Local	**Registration:**	N732FU
Aircraft:	Cessna P210N	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Serious, 2 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot reported that, 10 miles from the destination airport, the passengers heard a loud "clank" and smoke entered the cockpit. Shortly thereafter, the engine experienced a total loss of power and the propeller stopped turning. The pilot selected a field as a forced landing site, but the airplane impacted trees and terrain at the edge of the field. The pilot and passengers were able to extricate themselves through the right side passenger window.

A postaccident engine examination revealed a catastrophic failure of the engine crankshaft between the No. 2 main bearing journal and the No. 2 connecting rod journal. The damage displayed on the No. 2 bearing was consistent with the bearing having shifted and spun. Several of the bearing supports displayed fretting near the through-bolt holes. An accurate measurement of the preaccident through-bolt torques could not be determined due to the loads subjected upon the crankcase when the crankshaft failed. Review of maintenance records indicated that the through bolts were properly torqued during the remanufacturing process nearly 1,000 flight hours before the accident and that there was no record of major work performed on the engine since that time; however, the wear signatures displayed on the bearing supports indicated that the crankcase halves were shifting in a manner consistent with improper torque of the through bolts.

Probable Cause and Findings

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

A failure of the crankshaft due to improper torque of the crankcase through bolts.

Findings

Aircraft	Recip engine power section - Failure
Personnel issues	(general) - Maintenance personnel

Factual Information

History of Flight

Enroute	Loss of engine power (total) (Defining event)
Landing	Collision with terr/obj (non-CFIT)

On February 16, 2016, at 1130 central standard time, a Cessna P210N, N732FU, collided with trees and the terrain during a forced landing in Bryan, Texas, following a loss of engine power. The private pilot and one passenger received minor injuries. The second passenger was seriously injured. The airplane sustained substantial damage. The airplane was registered to BIA Air LLC, and was being operated by a private individual under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual flight rules (VFR) conditions prevailed for the flight which operated on a VFR flight plan. The flight originated from the Arlington Municipal Airport (GKY), Arlington, Texas, about 1030.

The pilot reported that they were 10 miles from the destination airport when the passengers reported hearing a loud "clank" and smoke entered the cockpit. He contacted air traffic control and requested information regarding a closer airport at which to land. He stated the engine quickly lost power and the propeller stopped turning. He declared an emergency with air traffic control stating that he was not going to be able to make it to the closest airport. The pilot chose a field in which to land. The airplane contacted trees just before landing. The airplane descended to impact with the terrain in a wooded area at the edge of the selected field. The pilot and passengers were able to extricate themselves through the right side passenger window.

A review of the engine logbook revealed the engine was factory remanufactured in September, 2005, and it was installed on the accident airplane on October 10, 2005. The last inspection was a 100-hour inspection conducted on January 6, 2016. The engine had accumulated 989 hours since being remanufactured. The records did not show any major work having been performed on the engine since it was installed.

A postaccident examination of the engine was conducted on under NTSB supervision on May 3, 2016, at the Continental Motors facility in Mobile, Alabama.

The engine was 310 horsepower, a six-cylinder, fuel injected, Continental Motors TSIO-520-P (7) engine, serial number 278936-R. Crankcase damage was observed just below one of the crankcase bolts above the #1 cylinder. The No. 4 stud on the No. 1 cylinder was loose and could be rotated with finger pressure. No torque putty was observed on this stud. A boroscope inspection of the pistons revealed all of the pistons were in the down position.

The crankcase was cracked and a small portion of it was pushed out near the rear backbone bolts. Mechanical damage was visible on the No. 1 and No. 2 cylinder bays. The No. 1 bearing support displayed signatures consistent with minor movement of the bearing. The No. 2 main bearing support sustained damage consistent with a bearing shift and a spun bearing. The No. 1 and No. 2 main bearing supports were fretted near the through bolt holes.

The No. 1 main bearings displayed normal lubrication signatures. The bearing damage was consistent with minor bearing shift. There was fretting on the bearing supports near the through bolt holes.

The No. 2 main bearings were damaged consistent with a bearing shift event. Portions of the bearing were located in the oil sump. A portion of the right side of the bearing remained in the bearing saddle.

The No. 3 bearings remained intact and in their bearing supports. The bearings displayed signatures of heat distress due to lack of lubrication and the copper layer was exposed.

The No. 4 and No. 5 bearings were intact and displayed normal operating signatures.

The crankshaft was broken into two pieces. The fracture was located at the crankshaft cheek between the No. 2 main bearing journal and the No. 2 connecting rod journal. The lock slot on the No. 2 main bearing journal was worn and fretting was noted on several of the bearing supports near the through bolt holes indicating that the crankcase halves were moving. The No. 3 main journal displayed heat discoloration and scratches consistent with particle passage. The No. 2 connecting rod journal could not be observed as the connecting rod was impinged in place on the journal. The remaining connecting rod and main journals displayed normal operating and lubrication signatures.

Cylinder/Piston/Connecting Rod No. 1
The cylinder was attached to the crankcase. The cylinder hold down bolt in the No. 4 position was loose and could be turned by hand. There was no torque putty on this nut. The remainder of the nuts were tight with torque putty in place. Impact damage was noted on the cylinder skirt. The valves, rocker arms, and push rods were normal.

The piston remained attached to its connecting rod and the piston skirt was damaged. The rear piston ring was broken and the forward 3 piston rings were intact. The piston displayed normal combustion signatures.

No anomalies were noted with the connecting rod and connecting rod bearing.

Cylinder/Piston/Connecting Rod No. 2
No anomalies noted with the cylinder, valves, rocker arms, and push rods.

The piston remained attached to its connecting rod and the piston skirt was damaged. The rear piston ring was damaged and the forward 3 piston rings were intact. The piston displayed normal combustion signatures.

The connecting rod remained attached to the journal. Some mechanical damage was visible. The connecting rod was impinged onto its journal by displaced crankshaft material at the crankshaft fracture. The bearing could not be observed due to the connecting rod impingement.

Cylinder/Piston/Connecting Rod Nos. 3, 4, 5, and 6
No anomalies were noted with the cylinder, valves, rocker arms, push rods, pistons, or connecting rods.

The camshaft was intact and no anomalies were noted. The No. 1 intake lifter was impinged and could not be removed. The remaining lifters displayed normal operating signatures.

The torque on the through bolts and cylinder hold-down studs was measured during the engine disassembly. The measurements varied between 626 and 1,137 inch-pounds to tighten, and between 697 and 1,087 inch-pounds to loosen. According to the remanufacture assembly specifications, the through bolts torque should have been either 625 or 800 inch pounds depending on the position of the bolt.

The left magneto did not produce any sparks when placed on a test bench. The magneto was opened and rust was noted inside the magneto. The vent hole in the pressure vent plug was blocked with debris. The right magneto produced a spark when placed on the test bench.

The oil pump was intact and remained attached to the engine. The pump housing contained scoring consistent with hard particle passage. The oil filter was opened and it contained metal particles. The oil sump contained several pieces of metal consistent with piston and bearing material. The oil pickup screen was clean.

No other anomalies were noted that would have resulted in a loss of engine power.

All of the Continental Motors engine component serial numbers, with the exception of the starter, matched the serial numbers of the components installed on the engine when it was remanufactured in 2005. The remanufacturing records indicated the through bolts and cylinder hold-down bolds were properly torqued during the built process.

Pilot Information

Certificate:	Private	**Age:**	54,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	January 19, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	July 11, 2015
Flight Time:	220 hours (Total, all aircraft), 140 hours (Total, this make and model), 220 hours (Pilot In Command, all aircraft), 30 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N732FU
Model/Series:	P210N	**Aircraft Category:**	Airplane
Year of Manufacture:	1980	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	P21000576
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	January 6, 2016 Annual	**Certified Max Gross Wt.:**	4001 lbs
Time Since Last Inspection:	20 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3320 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	TSIO-520-P7B
Registered Owner:	On file	**Rated Power:**	310 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:	CLL,320 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	11:53 Local	**Direction from Accident Site:**	160°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	220°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.98 inches Hg	**Temperature/Dew Point:**	24°C / 0°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Arlington, TX (GKY)	**Type of Flight Plan Filed:**	None
Destination:	College Station, TX (CLL)	**Type of Clearance:**	VFR flight following
Departure Time:	10:30 Local	**Type of Airspace:**	Class E

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious, 1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 2 Minor	**Latitude, Longitude:**	30.773889,-96.454444

Administrative Information

Investigator In Charge (IIC):	Sullivan, Pamela
Additional Participating Persons:	Carl Thomas; FAA; Houston, TX Andrew Hall; Textron Aviation; Wichita, KS Kurt Gibson; Continental Motors; Mobile, AL
Original Publish Date:	March 6, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92736