



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

Date: March 27, 2018

SUMMARY OF AIRPLANE EXAMINATION

WPR16FA152

A. ACCIDENT

Location:	Columbia Airport, Columbia, California
Date:	July 27, 2016
Aircraft:	Cessna 310B, N6605B
NTSB Investigator-in-Charge	Chris Shaver

B. EXAMINATION PARTICIPANTS

Chris Shaver
Investigator-in-Charge
National Transportation Safety Board
Western Pacific Region
Federal Way, Washington

Bjorn Beijens
Aviation Safety Inspector (Operations)
Federal Aviation Administration
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Nicole Charnon
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Continental Motors, Inc.
Mobile, Alabama

Henry Soderlund
Senior Air Safety Investigator
Textron Aviation
Wichita, Kansas

C. SUMMARY

On July 27, 2016, about 1645, Pacific daylight time, a twin-engine Cessna 310B airplane, N6605B, sustained substantial damage following a loss of control during takeoff at the Columbia Airport (O22), Columbia, California. The pilot and three passengers sustained fatal injuries. The airplane was being operated by the pilot as a personal cross-country flight under the provisions of Title 14 *Code of Federal Regulations* Part 91, and no flight plan was filed. Visual meteorological conditions prevailed for the flight, which was originating at the time of the accident.

Witnesses stationed on airport property observed the airplane become airborne, ascending to an altitude of about 50 ft above ground level before drifting to the left of the runway and losing altitude. The airplane was then observed to have impacted a ramp area with its left wing, and then coming to rest upright before bursting into flames. The majority of the airplane was consumed by thermal activity.

D. DETAILS OF THE EXAMINATION

1.0 Accident Site Examination

A survey of the accident site revealed that the airplane impacted an airport ramp with the left wing tip about 200 ft left of the runway 17 centerline on a magnetic heading of 220°. The airplane remained airborne and continued forward about 60 ft before the belly, right propeller, and right main fuel tank impacted the ground. Multiple ground contact marks from the right propeller were observed. Between the initial ground contact and the belly contact, two left propeller ground contact marks were observed. The aircraft bounced forward and impacted boulders placed around an adjacent drainage culvert. Subsequent to the bottom of the aircraft scraping the boulders, the airplane became airborne and traveled 250 ft from the initial impact point before coming to rest upright. During the accident sequence the right propeller spinner contacting the back of a Jet A fuel truck; the tip of one blade from the right propeller was found in front of the boulders.

2.0 Airframe and engine follow-up examinations

An initial examination of the airframe and engine was performed at the accident site on July 28, 2016. Representatives from the NTSB, the FAA, Textron Aviation, and Continental Motors were present. Follow-up examinations of both engines was conducted at the facilities of

Continental Motors, Mobile, Alabama. The results of the examinations revealed no mechanical anomalies with either the engine or airframe that would have precluded normal operation.

2.0.1 Airframe examination notes

The following airframe examination notes were provided to the NTSB IIC by a Textron Aviation Senior Air Safety Investigator. The examination, which was performed at the accident site, was overseen by representatives from the NTSB and the FAA.

The rudder trim tab appeared streamlined and the actuator measurement was 2.2 inches. The aileron trim tab was in a trailing edge down position with an actuator measurement of 1 inch.

Both fuel strainer screens appeared to be clean but exhibited fire damage. Both main fuel tanks were separated from the aircraft during the impact sequence. Fuel was found in both auxiliary fuel tanks, approximately 13 gallons in the left tank and 6 gallons in the right tank.

The cockpit controls were consumed by the post-impact fire.

The seats and interior furnishings were consumed by the post-impact fire.

The instrument panel was consumed by fire.

On the left propeller, blade 1 was loose in the hub and blades 2 and 3 could not be rotated. None of the right propeller blades could be rotated. One of the right propeller blade tips was separated and the blade was bent 360°. The other two blades were bent beyond 180°.

A review of FAA documents found that according to the aircraft's Type Certificate Data Sheet, the only engine approved to be installed on the aircraft was a Continental O-470-M engine. The engines found on the aircraft at the time of the accident were fuel injected. The Type Certificate Data Sheet also listed the approved propellers as either Hartzell HC82XF-2 or HC-A2XF-2.

The FAA Supplemental Type Certificate (STC) database was reviewed in an attempt to find any STCs that would account for the installation of fuel injected IO-470 engines on the accident aircraft. STC SA2-1578 was issued to Bendix Corporation. The STC description stated, "Installation of Teledyne Continental Motors O-470-BI or O-470-MI engines modified for fuel injection." STC SE2-1577 was also issued to Bendix corporation. The STC description stated, "Installation of Bendix RS-5BD1 or RSA- 5AD1 fuel injection system." The STC was listed as applicable for the Teledyne Continental Motors O- 470-B.

An STC for the installation of the McCauley propellers was not located.

2.0.2 Engine examination notes

The following postaccident engine examination notes were provided to the NTSB IIC by a Continental Motors Senior Air Safety Investigator. The examination of both the left and right engines was overseen by the NTSB IIC. Both engines were shipped from the accident location to

the Continental Motors factory facility, which is located in Mobile, Alabama. The left engine was examined on February 22, 2017, while the right engine was examined on February 23, 2017. The results of the examinations revealed the following:

Left engine

Summary

The engine propeller flange was bent and cracked, and the #3 cylinder head was fractured. There were no external pre-accident anomalies noted on the engine or engine-related systems. Crankshaft and camshaft continuity were confirmed along with thumb compression on each cylinder prior to engine disassembly. No internal pre-accident anomalies were noted that would have prevented the engine's ability to produce full, rated power.

The outlet fitting of the engine-driven fuel pump was fractured and replacement of the fitting was not possible, which prevented the functional testing of the unit. Disassembly of the fuel pump did not reveal any pre-accident anomalies that would have precluded its ability to pump fuel. The throttle body/fuel metering unit and the fuel manifold valve/fuel injector nozzles were flow tested on the production test stands in the as-received condition without any adjustments. The results of the flow tests can be found in Appendix A of this report.

The magneto-to-engine timing was checked prior to engine disassembly. The left magneto was timed to 23° BTDC and the right magneto was timed to 24° BTDC. The magnetos were placed on a test stand and both produced a spark from each of their ignition leads in firing order with no pre-accident anomalies noted.

External inspection of engine

The intake filter was in place and intact. The induction pipes and balance tube were dented and displaced. The exhaust pipes and manifolds were dented and displaced with some areas being flattened.

The right side cylinders sustained impact-related damage to the rocker covers. The #3 cylinder head was fractured, and the intake rocker, rocker shaft, and rocker boss were separated. The #1 bottom ignition lead was damaged.

Internal inspection of engine

Due to the impact-related damage, the NTSB IIC decided to teardown the engine. Prior to the teardown, crankshaft and camshaft continuity was confirmed during a cylinder thumb compression test. No pre-accident anomalies were noted. The teardown examination did not reveal any pre-accident anomalies with any of the internal engine components. Witness marks were noted on the crankcase in the area of the #3 connecting rod and front set of counterweights. The witness marks were consistent in shape as the head of the connecting rod bolt and the edge of the counterweight. Though it was apparent that the counterweight and connecting rod bolt made a brief contact with the crankcase, there was no indication of crankshaft or crankcase

cracking or permanent displacement. The witness marks were attributed to the impact sustained by the crankshaft flange and #3 cylinder.

Component examinations

The ignition system remained attached to the engine with no pre-accident anomalies noted. The sparkplugs displayed a near-new wear condition with normal combustion deposits. The bottom #2, #4, and #6 sparkplugs were oil coated. The magnetos and ignition harnesses were tested on a test bench and each magneto produced a strong, blue spark across a 7mm gap from each terminal end (the #1 bottom ignition lead had to be cut near the end due to impact-related damage). The engine-driven fuel pump's outlet fitting was fractured. The pump was removed from the engine and the drive shaft remained intact. The pump was disassembled, and no pre-accident anomalies were noted with the internal components.

The throttle body/fuel metering unit sustained impact-related damage that displaced the left and right induction elbows and fractured the throttle control pushrod and the mixture control lever. The unit was placed on a Continental Motors production test stand using the original production specifications. The unit did not meet production specifications throughout its entire test range; however, it was capable of performing its normal functions adequately with any difference between the specifications and the observed values being attributable to normal adjustments that are made in the field by qualified maintenance personnel.

The fuel manifold valve, which was placed on the production test bench and flow tested, met test specification.

Right engine

Summary

There were no external pre-accident anomalies noted on the engine or engine-related systems. Though improper maintenance practices were noted during the disassembly of the engine, the errors did not appear to interfere with the engine's pre-accident operational status. No internal pre-accident anomalies were noted that would have prevented the engine's ability to produce full, rated power prior to the accident sequence.

The magnetos were placed on a test stand and both produced a spark from each of their ignition leads in firing order with no pre-accident anomalies noted.

Due to thermal damage sustained by the fuel system components, teardown inspections were conducted. No pre-accident anomalies were noted with any of the components.

External inspection of the engine

An external examination of the engine revealed that there were no signs of pre-accident oil leaks nor were there any external signs of operational distress on any of the components. The throttle body was partially melted away. The throttle rod end remained attached to the bent throttle lever.

The mixture rod end remained attached to the mixture control lever. Both rod ends were fractured in the threaded area. The inlet fuel fitting on the fuel metering unit was fractured.

The intake filter was in place but sustained thermal damage. The left and right intake elbows were thermally damaged and displaced. The intake manifolds and risers remained in place. The exhaust pipes and manifolds were dented in some places. The belt-driven alternator was displaced from its mount.

Internal inspection of engine

Due to the thermal damage, the NTSB IIC decided to teardown the engine. Prior to the teardown, crankshaft and camshaft continuity could not be confirmed because the crankshaft could not rotate. The left side crankcase was fractured in the area of the #5 main bearing and the bearing was slightly displaced. The fracture appeared to be irregular in shape and fresh and was likely due to impact damage. There were no signs of operational distress on the #5 main bearing or #5 main crankshaft journal. The teardown examination did not reveal any signs of pre-accident operational distress.

During the teardown examination it was noted that the through-bolts were coated with orange material that was consistent in texture as RTV silicone. There was no indication of case half fretting or main bearing shift. It was also noted that the cotter pins for the #4 and #6 connecting rod bolts were not bent around their respective nut.

The ignition system remained attached to the engine with no pre-accident anomalies noted. The magneto mounting flanges were fractured under their attaching hardware. The ignition harness sustained thermal damage. The top sparkplugs were removed and documented at the accident site and only the left side sparkplugs were reinstalled. The #1 top sparkplug was not located in the crate with the engine components. The sparkplugs displayed a near-new wear condition with normal combustion deposits. The magnetos and ignition harnesses were tested on a test bench and each magneto produced a strong, blue spark from each terminal end (three of the ignition leads on each ignition harness had to be cut to remove the thermally damaged ends. The cut leads produced a spark during the magneto bench test).

The engine-driven fuel pump was removed from the backside of the engine. Its fittings were intact as was the drive coupling. The pump was disassembled, and no pre-accident anomalies were observed.

The throttle body/fuel metering unit sustained thermal damage that precluded functional testing. The unit was disassembled, and no pre-accident anomalies were noted.

The fuel manifold valve was intact, and all the injection lines and nozzles were in place. Disassembly of the fuel manifold valve revealed no pre-accident anomalies. The screen was clear. All of the fuel injection nozzles were free from obstructions.