

ERA18FA231
Wreckage Examination Summary

Airframe Examination

The aircraft struck the ground in a nose-down, left-wing-low attitude. The initial impact point contained fragments of the red (left) navigation light lens. About 25' further the engine impacted terrain; the aircraft cartwheeled and came to rest in the opposite direction of travel. The left wing came to rest on left side of the forward fuselage/engine. The left fuel tank and left flap were consumed by the postimpact fire. The left fuel cap was manufactured by Monarch; it was thermally damaged. A small grass fire burned an approximately 50' x 50' area on the left of the fuselage. The right wing came to rest upright on the right side of the fuselage. The right wing remained loosely attached by the right lift strut. The right fuel cap was missing. Pieces of tape were found covering the right fuel filler port. The cabin was consumed by the post-impact fire.

The tailcone was melted/charred up to the dorsal. The left cabin door was thermally damaged and found on the left side of the wreckage. The right cabin door, which was an STC parachute style jump door hinged on the top, was found separated from the aircraft. The right cabin door remained in the locked position and the latch pins were extended. Control cable continuity was established for the elevators, rudder and trimmable tail. Control Cable continuity for the ailerons and flaps was established through first responder cable cuts made near the wing roots and the door posts. The fuel strainer bowl was not observed. The fuel strainer screen was impact damaged and sustained post-impact fire damage; it appeared to be clean.

The fuel selector valve sustained thermal damage. The fuel selector handle was not observed. The fuel selector handle connector remained attached to the valve. The fuel selector left and right fuel lines, and the engine fuel line were melted/fractured about 6" from the fuel selector valve. The valve was found loose in the cabin floor area. Air was blown through the left and right lines and could be lightly felt exiting the engine line. The fuel selector cover was removed. The small fuel valve balls were observed inside the valve. The O-rings between the small ball and the large ball appeared to be melted; a black powder was observed between the balls. The fuel selector valve cam was confirmed in the ON position. The ELT remained attached to the tailcone and was melted by the post-impact fire. The aircraft was configured for a pilot (seat 1) and 4 seat locations for parachutists. It was reported that restraints were installed for the parachutists and were attached to the floor. The instrument panel was destroyed by the post-impact fire damage. The propeller was impact separated from the crankshaft. Propeller blade 1 remained straight. It had minor chordwise scoring near the hub and lengthwise scoring near the tip. Propeller blade 2 was bent aft at mid span and sustained thermal damage on the trailing edge near the tip. The cambered side of the blade exhibited chordwise scoring and paint burnishing.

Powerplant Examination

The engine serial number was affiliated with an O-470-L engine that was built on December 5, 1957 and shipped to Cessna on December 10, 1957. An engine logbook that was presented to the NTSB investigator-in-charge (IIC) at the accident site indicated that the engine underwent a major overhaul and conversion to a P.Ponk O-470-50 engine under supplemental type certificate (STC) SE4985NM on July 7, 2014. It was then installed on the accident airplane on July 18, 2014 at a tachometer time of

4,493.3 hours (the engine total time was not listed in the overhaul or installation entries). An entry date November 20, 2015 at a tachometer time of 4,884.2 hours indicated that the muffler, both exhaust manifolds, and clamps were removed and replaced. An entry dated June 9, 2017 at a tachometer time of 5,266.0 hours indicated that the engine was removed for repairs. An August 8, 2017 entry indicated that the engine was disassembled, and the crankcase was overhauled. All of the pre-existing components, were reused with the exception of the main bearings and piston pins. The engine was reinstalled on the accident airplane on August 15, 2017. An entry dated April 6, 2018 indicated that the tachometer had been replaced and the time was not properly documented. The tachometer and Hobbs meter were destroyed by the post-crash fire.

Engine was removed from the firewall and was hanging from a hoist. The propeller remained attached to the crankshaft via the spinner dome and spinner bulkhead. All of the propeller mounting bolts were separated from the propeller hub. Removal of the propeller spinner resulted in the separation of the propeller. One blade was slightly displaced forward, and the other was bent aft and partially melted on the trailing edge toward the tip. The left side cylinders sustained thermal damage as did the left side ignition leads. The left rocker covers were partially melted. All engine mounts were fractured, and the oil sump was punctured. The right magneto was partially displaced from the mounting pad. The throttle body and carburetor were separated from the induction system.

The muffler was separated from the exhaust manifolds. The right manifold was bent up and to the right and the left manifold was displaced aft. The flame cones in the muffler were corroded with the majority of one cone missing.

The induction air filter was thermally damaged. The carburetor was separated from the engine and no blockages were noted in the system though portions were destroyed by the post-crash fire. The throttle lever remained attached to the shaft and throttle valve. The left and right intake elbows were destroyed. The left intake manifold/risers sustained thermal damage. The intake hose clamps between the #2 and #4 cylinders were found loose; one clamp was fractured, and the other was loose. The hose sustained thermal damage. The #6 intake riser was fractured at the cylinder mount area. The balance tube was flattened.

The left magneto remained attached and secured to its mounting pad. Rotation of the crankshaft resulted in an audible snap of the impulse coupling and a spark from each of the leads in firing order. No pre-accident anomalies were noted.

The right magneto was partially displaced from the mounting pad. Manual rotation of its drive coupling resulted in an audible snap of its impulse coupling and a spark from each of its leads in firing order. No pre-accident anomalies were noted.

The ignition harness remained secured to each magneto and the terminal ends remained secured to their respective sparkplugs. The top and bottom leads on the left side of the engine sustained thermal damage. The leads were cut upstream of the fire damage. The top and bottom leads on the right side of the engine were attached to the top sparkplugs. Functional testing of the magnetos resulted in a spark from each of the ignition leads with no pre-accident anomalies noted.

The top sparkplugs were removed from their respective cylinders and all displayed a light grey color consistent with lean fuel-air mixture settings. There was no sign of lead or carbon fouling. The bottom sparkplugs were examined utilizing a lighted borescope and each displayed the same signatures as the

top. The #5 bottom sparkplug was oil coated. All of the sparkplugs, with the exception of the #1 and #3 top displayed a normal worn condition (the #1 and #3 top sparkplugs appeared to have little wear). The top sparkplugs were utilized during the functional testing of the magnetos with no pre-accident anomalies noted.

The carburetor was separated from the engine and sustained thermal damage. The mixture and throttle control cables remained attached and were cut to facilitate examination. The throttle body was thermally damaged and the throttle and mixture control levers were distorted. The mixture control shaft was bent and the lever was displaced from the shaft. The inlet fuel screen was clear. The carburetor was disassembled. The fuel nozzle was clear. The bowl was empty and a dark, sooty "waterline" was noted on the bottom inch of the bowl. The metal floats remained attached to the bracket and the bracket remained attached to the inlet valve. Movement of the floats resulted in a coinciding movement of the valve. There were two beads of what appeared to be re-solidified molten solder at the bottom of the bowl. The mixture control was in a full open position. The one carburetor float displayed some linear marks near the inside toe of the float. Subsequent examination of the carburetor components revealed a bent float and bracket. However, comparison with previous photos revealed that the bending damage likely took place after the carburetor was disassembled.

The oil pickup tube and screen were not observed. The oil filter remained attached to the remote oil filter attach bracket mounted on the firewall. The safety-wire was cut. Removal of the filter revealed that it sustained significant thermal damage.

The oil cooler remained attached to the front right side of the engine. Oil was observed leaking from between the oil cooler adapter and the engine. The bottom side appeared to be slightly displaced due to the impact.

The No. 1 cylinder remained attached to the crankcase with no external pre-accident anomalies noted. The rocker cover was removed and the rockers and valve springs appeared to be well lubricated. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, barrel, cylinder head, valves, or valve seats. Thumb compression was obtained from the cylinder during crankshaft rotation and the rockers functioned normally.

The No. 3 cylinder remained attached to the crankcase with no external pre-accident anomalies noted. The rocker cover was removed and the rockers and valve springs appeared to be well lubricated. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, barrel, cylinder head, valves, or valve seats. Thumb compression was obtained from the cylinder during crankshaft rotation and the rockers functioned normally.

The No. 5 cylinder remained attached to the crankcase with no external pre-accident anomalies noted. The rocker cover was removed and the rockers and valve springs appeared to be well lubricated. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, barrel, cylinder head, valves, or valve seats. Thumb compression was obtained from the cylinder during crankshaft rotation and the rockers functioned normally.

The No. 2 cylinder remained attached to the crankcase with no external pre-accident anomalies noted. The rocker cover was removed and the rockers and valve springs appeared intact. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, barrel, cylinder head,

valves, or valve seats. Thumb compression was obtained from the cylinder during crankshaft rotation and the rockers functioned normally.

The No. 4 cylinder remained attached to the crankcase with no external pre-accident anomalies noted. The rocker cover was removed and the rockers and valve springs appeared intact. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, barrel, cylinder head, valves, or valve seats. Thumb compression was obtained from the cylinder during crankshaft rotation and the rockers functioned normally.

The No. 6 cylinder remained attached to the crankcase with no external pre-accident anomalies noted. The rocker cover was removed and the rockers and valve springs appeared intact. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, barrel, cylinder head, valves, or valve seats. Thumb compression was obtained from the cylinder during crankshaft rotation and the rockers functioned normally.

The crankcase remained intact with no external anomalies noted. Rotation of the crankshaft resulted in free rotation of the crankshaft with no binding noted from the main bearings.

A portion of the crankshaft's propeller flange was fractured. Though the crankshaft was not observed in its entirety, crankshaft continuity was confirmed during the compression test from the propeller flange, aft to the accessory end, and out to each connecting rod and piston. No pre-accident anomalies were noted.

Though the camshaft was not observed, camshaft and valve train continuity was confirmed during the cylinder compression test. The starter motor remained attached to the adapter with no external pre-accident anomalies noted.

The adapter remained attached to the backside of the engine. Rotation of the crankshaft resulted in a coinciding rotation of the alternator's drive pulley.

The alternator remained attached to the mounting brackets. The alternator sustained thermal damage. The vacuum pump remained attached to the accessory pad and was not examined as part of this investigation.

The propeller governor remained attached to the front left side of the crankcase; however, its housing was fractured and a portion of the governor drive shaft was visible. Rotation of the crankshaft resulted in a rotation of the governor drive shaft.

The propeller bolts were separated from the hub and the propeller remained in place on the crankshaft with the aid of the spinner. Removal of the spinner resulted in the removal of the propeller. The two blades remained attached to the hub. Blade #1 was bent forward slightly and displayed span-wise scrapes and paint burnishing. Blade #2 was bent aft and twisted toward low pitch with chord-wise scrapes and paint burnishing. Its trailing edge near the tip was partially melted.

The engine sustained impact and thermal damage, but crankshaft and camshaft continuity were confirmed and thumb compression was obtained from each of the six cylinders. Borescope examination of each of the cylinders revealed no pre-accident anomalies. The magnetos produced a spark from each of their leads in firing order with no pre-accident anomalies noted. The carburetor sustained thermal damage that distorted the housing slightly. The inlet screen was clear.