



The National Transportation Safety Board

Office of Aviation Safety
Central Region
Memorandum for the Record
Engine Disassembly
Examination
CEN16FA361
Williamson, Iowa
August 7, 2016

The airplane was recovered by Wentworth Aircraft and stored at a facility located at 22100 Hamburg Ave., Lakeville, MN. Under the supervision of the NTSB, the engine was disassembled with the assistance from a representative of Continental Motors on December 7, 2016.

The wreckage was roughly in the same orientation as was found at the accident site. The engine was inverted with cylinders 1, 3, and 5 visible. A fork lift was used to lift the engine so that control cables and electric bundles could be cut and the cowlings removed. The three blade Hartzell propeller hub remained attached to the engine propeller flange. Only one propeller blade remained intact in the propeller hub. The other two composite blades separated approximately six inches outboard of the propeller hub. One separated blade was recovered and presented for inspection. The engine data plate remained attached to the right side crankcase half and indicated that the engine was a Continental Motors model TSIO550C (14B) engine, serial number 1031844. Continental Motors serial data for this engine indicates that it was assembled 2-11-2016 as a factory rebuilt engine and sold to Air Power, Inc.

The top sparkplugs were removed from each cylinder. The sparkplugs from cylinders 1, 3, and 5 were intact. The sparkplugs from cylinders 2, 4, and 6 were broken at the base and oil saturated. The upper barrels and internal insulators had separated. When the sparkplugs were compared to a Champion Check A Plug chart, the wear and coloration were determined to be "normal". A lighted borescope inspection was performed. All valves were intact and appeared normal in coloration with normal combustion deposits exhibited.

The right and left magnetos separated from their respective mounts on the engine but remained attached to the damaged ignition harness. The magnetos were marked with an "A" and "B" for photo identification until the proper orientation could be established. The magneto marked "A" was determined to be the left magneto and the magneto marked with a "B" was determined to be the right magneto. Both magnetos produced spark when rotated manually. Both magnetos incorporated impulse couplers which operated normally.

The engine driven fuel pump was removed. When the fuel inlet hose was removed from the fuel pump, fuel was present. A sample of the fuel was captured and examined. The fuel was light blue in color, uncontaminated and had the odor of aviation fuel. The fuel pump drive coupling was intact. The pump rotated smoothly with turned manually and a small amount of fuel was expelled. The unmetered fuel adjustment screw was impact damaged. The fuel pump assembly bolts were secured correctly and a lead seal with "TCM" was present.

The throttle body and fuel metering unit separated from the engine but remained attached to control cables. The throttle control arm remained attached and was secure on the throttle plate shaft. The top mounted induction system separated. Induction tubes separated at the cylinder head mounts. The fuel manifold valve was disassembled and inspected. The assembly bolts were intact, secured correctly and tight. The cover was removed and the rubber diaphragm, spring and valve were found undamaged. The fuel screen was undamaged and uncontaminated. The fuel screen was removed, and a small amount of fuel was present along with two small drops of liquid resembling water. No other contamination was noted.

The fuel lines from the fuel manifold to the individual fuel injectors were impact damaged. All six fuel injectors separated from their individual cylinder heads. The upper deck pressure components separated as did the two aftercoolers. The aftercoolers were recovered and were impact damaged.

Both right and left turbo chargers remained attached to mounts but were impact damaged. Both turbo charges were internally damaged and compressor and turbine wheels would not rotate manually. Right and left exhaust components were impact damaged. Turbo overboost valves and controllers were impact damaged and had separated.

The right and left dry air pumps were removed and inspected. Both pumps could be manually rotated. The pumps were disassembled and inspected. The rotors and pump vanes were found intact. The pump cavities were smooth and without scoring. The plastic drive couplings were intact.

The oil filter was properly secured to the oil filter mount on the engine oil pump. The oil filter was removed, opened and inspected. No metal contamination was found. The oil pump remained attached and did not display damage. The rear mounted oil cooler was impact damaged. The lower mounted oil sump was impact damaged and forced upward against the rotating mass of the crankshaft.

The starter adapter was intact with the exception of the starter motor mounting flange which was impact damage. The starter motor remained partially attached to the starter adapter. The starter motor appeared to be undamaged.

All six cylinders exhibited impact damage to cooling fins. Rocker box covers were intact but displayed various amounts of impact damage.

An attempt at manually rotating the engine was unsuccessful due to interference with the impact damaged propeller spinner, remaining propeller blade and damaged engine cowlings. After cutting the damaged propeller spinner free, the propeller hub could be turned through approximately 15 degrees of rotation. Crankshaft continuity was confirmed by observing rotation of accessory gears in the aft portion of the crankcase when the propeller hub was manually rotated.

It was not possible to obtain thumb compression due to the limited amount of propeller rotation possible. The top portion of the crankcase halves were intact but impact damage was discovered on the lower crankcase halves exposing internal engine components including valve lifters and camshaft. All four engine mounts separated. The engine driven alternator (alternator 1) remained attached and appeared undamaged. Alternator two (belt driven alternator) was heavily impact damaged.

No pre-impact anomalies were discovered during the examination.

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