



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

August 1, 2018

ENGINE EXAMINATION

WPR18LA181

This document contains 9 embedded photos.

A. ACCIDENT

Location: Phoenix, Arizona
Date: June 26, 2018
Aircraft: Cessna 172S, Registration Number: N154ME, Serial #: 172S8534
NTSB IIC: Andrew Swick

B. EXAMINATION PARTICIPANTS:

Andrew Swick
Air Safety Investigator
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C. SUMMARY

On June 26, 2018, about 1020 Mountain standard time, a Cessna 172SP airplane, N154ME, was substantially damaged during a forced landing following a loss of engine power near Phoenix, Arizona. The pilot received minor injuries and the two passengers were not injured. The airplane was registered to an individual and operated by Westwind School of Aeronautics under the provisions of Title 14 *Code of Federal Regulations Part 91* as a business flight. Visual meteorological conditions prevailed, and no flight plan was filed. The local flight departed Phoenix Deer Valley Airport (DVT), Phoenix, Arizona about 0920.

The pilot, who is also a flight instructor, reported that while maneuvering at 4,500-5,000ft mean sea level (msl), the vacuum annunciator lights illuminated and he immediately experienced engine roughness. He decided to depart the practice area and head back to DVT. He did not report an emergency or the engine roughness to ATC, because he didn't anticipate engine failure. The pilot positioned the fuel mixture to full rich, the boost pump switch to 'ON', and the airplane continued to run rough during the return flight. About 8 miles northwest of DVT, as the pilot decreased altitude from 4,500 to 3,500 ft msl, he was instructed by ATC to perform a left 360° turn. After completing the turn the engine stopped operating and the propeller stopped rotating. The pilot configured the airplane for best glide, found a clearing in the desert terrain for the forced landing and updated ATC about his situation. During the landing roll, the airplane impacted rocks and nosed over.

Examination of the airplane by an Federal Aviation Administration inspector revealed that the vertical stabilizer, rudder, right wing and forward fuselage were substantially damaged. The airplane was recovered to a secure location for further examination.

Examination of the recovered engine, a Lycoming IO-360-L2A, serial number L-27790-51A, was conducted on August 1, 2018 at the facilities of Aircraft Engine Specialist, Chandler, Arizona. The no. 4 connecting rod separated at the I-beam near the piston wrist pin, and the crankshaft separated at the no. 4 connecting rod journal. The no. 3 connecting rod was twisted along the I-beam. According to the logbook entries, the engine was about 800 hours over time before overhaul (TBO).

D. DETAILS OF THE INVESTIGATION

1.0 Engine Examination

The engine was relocated from its storage facility in Phoenix, Arizona to the facilities in Chandler, Arizona on August 1, 2018. The engine mounting assembly was cut from the airframe and the mounts remained attached to the engine. The engine was installed on a vertical engine stand and disassembled. About 1/2 a quart of dark oil dripped from the exhaust pipe. The crankshaft could not be rotated by hand. The exhaust assembly had impact damage to several stand pipes and the exhaust muffler. The induction assembly had a small dent on one elbow. The induction tube connections were undamaged and secured. The magneto ignition leads had impact damage near the magneto distributors. The left magneto p-lead was loose at the magneto connection.



Figure 1-Engine Examination, Vertical Stand

The ignition leads were removed from the spark plugs and the upper spark plugs were removed from the cylinders. The spark plugs showed normal wear of the electrodes and light grey combustion deposits in the electrode areas. The cylinder overheads were covered in residual oil and were undamaged. The cylinder combustion chamber and the piston heads contained gray combustion deposits and were undamaged.

The upper and lower vacuum pumps were removed, and their drive shafts could not be rotated by hand. The vacuum pumps were disassembled, and the rotors were fractured into several sections.

Light amounts of metal debris was noted in the accessory section of the engine, visible through the accessory mounts. The accessory section was disassembled, and light amounts of metal debris was noted. The accessory gears were undamaged. The vacuum pump accessory drive shaft/gear assemblies were removed from the accessory section. The longer (lower) accessory drive could not be rotated by hand. The drive shaft was removed, and coking residue was observed on the shaft.

The no. 4 cylinder was removed from the crankcase. The no. 4 connecting rod was separated on the I-beam near the piston attachment. The rod had impact damage and could not be moved by hand.

The crankcase was disassembled revealing the crankshaft, camshaft and internal components. The camshaft was undamaged. The no. 3 and 4 cylinder bays had impact damage.



Figure 2-No. 4 Cylinder Bay, Crankshaft and Connecting Rod Separation

The crankshaft was separated at the no. 4 connecting rod journal. Material wear and deformation was visible between the crankshaft separation surfaces, cheek's outer circumference and the connecting rod yoke and cap end at the no. 4 journal. Thermal discoloration was noted on three of the crankshaft cheeks.

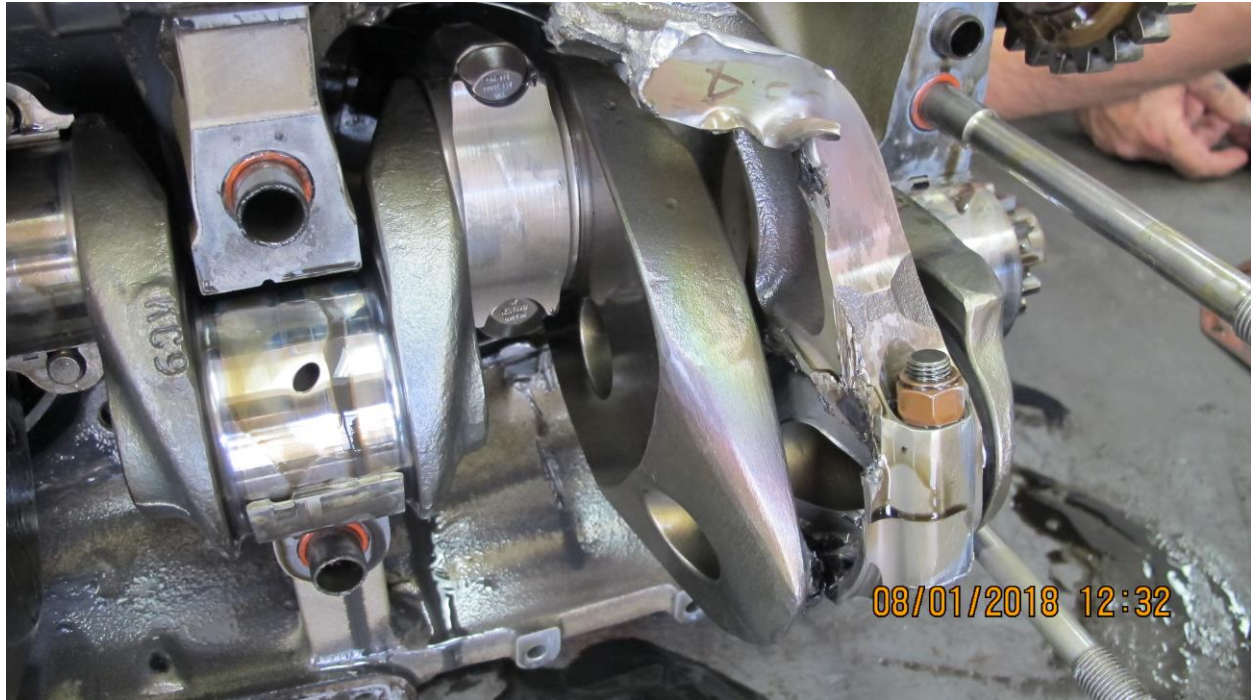


Figure 3-Crankshaft, Aft End



Figure 4-Crankshaft Aft Section and No. 4 Connecting Rod



Figure 5-Crankshaft Separation Surface

The number 3 connecting rod remained attached to the piston and had a slight lengthwise twist in the I-beam. The connecting rod was removed from the piston. The cylinder skirt and adjacent crankcase surfaces had impact damage.



Figure 6-No. 3 Connecting Rod and Cylinder Bay Area

The crankshaft main bearings revealed normal operational wear signatures.



Figure 7-Crankshaft Main Bearings

The no. 4 connecting rod sections were removed from the piston and the crankshaft. Fretting was identified on the connecting rod and cap connection surfaces. The no. 4 connecting rod bearing was worn and had material loss and deformation.



Figure 8-No. 4 Connecting Rod Cap and Bearing



Figure 9-No. 4 Connecting Rod and Bearings

The no. 3 connecting rod end cap could not be removed from the crankshaft. Thermal discoloration is noted on the crankshaft cheeks adjacent to the no. 3 and 4 connecting rod journals. The remaining crankshaft was unremarkable.



Figure 10-Crankshaft

The oil filter was removed and disassembled. Metallic debris was noted in the folds of the filter element.



Figure 11-Oil Filter Element

The crankshaft and the no. 3 and 4 connecting rods were obtained for further examination.

Submitted by: Andrew Swick