

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR23LA003

ENGINE EXAMINATION

Factual Report

January 25, 2023

Table of Contents

A. ACCIDENT.....	3
B. EXAMINATION PARTICIPANTS	3
C. SUMMARY	3
D. DETAILS OF THE EXAMINATION.....	4
1.0 ENGINE PRIOR TO THE EXAMINATION	4
1.1 EXTERIOR ENGINE EXAMINATION	4
1.2 ENGINE DISASSEMBLY AND EXAMINATION	5

A. ACCIDENT

Location: Boulder City, Nevada
Date: 10/02/2022
Time: 2000 PDT
0300 UTC
Airplane: Cessna 182C

B. ENGINE EXAMINATION PARTICIPANTS

NTSB-IIC Scott Johnson
 NTSB, AS-WPR
 Seattle, Washington

Investigator Andrew Swick
 NTSB, AS-WPR
 Phoenix, Arizona

Investigator Stephen Stein
 NTSB, AS-NTSB
 Tacoma, Washington

C. SUMMARY

The examination of the engine revealed an oil starvation event that occurred at the No. 4 connecting rod bearing journal. The No. 4 connecting rod was not available during the examination. The No. 3, 2 and 1 crankshaft connecting rod journals showed various stages of thermal damage and discoloration. The examination of the oil filter adapter revealed a loose fit between the oil pump housing and oil filter adapter sleeve. The safety wire securing the spool and the sleeve was attached. The fiber gasket positioned between the two surfaces was damaged and torn.

D. DETAILS OF THE EXAMINATION

1.0 Engine Prior to the Examination

The engine and cowling assembly remained attached to the airframe during the relocation of the wreckage from the accident site. The wreckage was submersed in a freshwater lake for about 3 months and after recovery remained in storage for about a month. According to the recovery personnel, the No. 4 wrist pin fell from the cowling area during recovery efforts and the No. 4 connecting rod was not found.

1.1 Exterior Engine Examination

The Continental Motors O-470-L engine, serial number 69446-70-L-R, was secured to the airframe and no damage was noted to the engine mounts or engine mounting carriage. A large hole was located in upper side the crankcase halves between cylinders No. 3 and 4 and was about 3 to 4 inches wide. Water was visible in the crankcase about 3 inches from the top of the crankcase. The crankshaft was visible and the No. 4 connecting rod bearing journal was visible. The induction and exhaust assemblies were undamaged.



Figure 1-Left view of the wreckage.

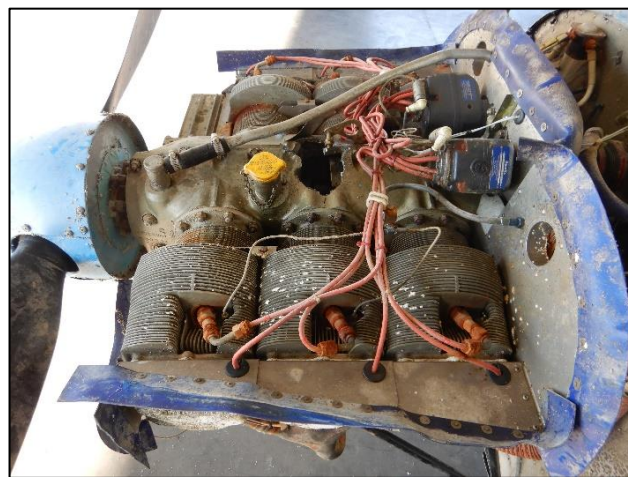


Figure 2-Left upper view of the engine.

The propeller spinner remained attached to the propeller and had crushing damage near the tip. The lower cowling was crushed upwards, and the cowling assembly was removed from the engine. About eight gallons of water was drained from the engine. Residual oil was found at the lower side of the engine and cylinder overheads.

1.2 Engine Disassembly and Examination

Control continuity between the cabin engine controls and the engine were verified. The engine was removed from the airframe and the propeller was removed from the engine. The cylinder rocker covers were removed, and the cylinder overhead components were undamaged and had a layer of residual oil.



Figure 3-Left cylinders, view of overhead components.



Figure 4-Right cylinders, view of overhead components.

The cylinders were removed, and internal mechanical damage was noted on the skirt areas on No. 3 and 4 cylinders. The No. 4 piston was found in the No. 4 cylinder and had damage to the wrist pin attachment area.



Figure 11-Cylinders, pistons and connecting rods.

The oil sump was removed and contained residual oil and metallic fragments. The metallic fragments were identified as cylinder and bearing material. Two pieces were identified as the portion of the head side of a connecting rod bolt and a small section of connecting rod bolt nut. No cotter pins were found in the debris.



Figure 7-Oil sump debris



Figure 8-Portions of the connecting rod bolt and nut.

The crankcase halves were disassembled, and the crankshaft main bearings were intact and showed normal operational wear. The crankcase halves showed no signs of fretting or main bearing shift in the bearing saddle areas. The crankcase oil galley plugs were removed, and the oil galleys were free from obstruction. Internal mechanical damage was noted at the No. 3 and 4 cylinder bay areas.

The connecting rods were removed from the crankshaft and the connecting rod bearings were displayed out on an examination table. The No. 1, 2 and 3 connecting rod bearings had thermal discoloration and metal deformation. Fragments of bearing material were found in the oil sump. The No. 5 and 6 connecting rod bearings had thermal discoloration.



Figure 9-Connecting rod bearings.

The crankshaft oil galleys were clear of obstructions. The crankshaft counterweights moved freely by hand. The camshaft had light impact damage to the area near cylinder No. 4 lifter areas. The camshaft and crankshaft gears were undamaged.

The lifters were removed and several showed pitting on the head surfaces.



Figure 10-Lifters

The oil filter and the oil pump were removed as one unit. The oil filter adapter housing spool and the filter element were safety wired securely to the adapter housing. The oil pump housing and oil filter adapter sleeve had a loose fit and could be rotated freely by hand. The fiber gasket between the oil pump and the oil filter adapter sleeve was protruding on the forward upper side. The oil filter adapter housing was disassembled, and the fiber gasket was found damaged. The oil filter adapter housing components were undamaged including the copper crush gasket located on the spool. The oil filter was disassembled and contained small amounts of metal debris.



Figure 11-Oil filter adapter housing and filter.



Figure 12-Oil filter adapter housing gasket.

Submitted by:

Andrew Swick
Aviation Accident Investigator