

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR23FA073

ENGINE EXAMINATION

February 22, 2023

A. ACCIDENT

Location: Santa Monica, California
Date: December 22, 2022
Time: 1518 Local
2315 UTC
Year: 1960
Make: Cessna
Model: 150A

B. ENGINE EXAMINATION

Specialist	Ben O'Con CAMLU Engine Consultant Corona, CA
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C. SUMMARY

The examination of the engine revealed an oil starvation event that occurred at the No. 1 piston connecting rod bearing journal. The No.1 connecting rod separated into 5 identifiable pieces that were recovered from the crankcase. The No. 2, 3 and 4 crankshaft connecting rod bearings and journals showed various stages of thermal damage and discoloration. The examination of the engine sump oil pickup tube, oil filter adapter, and oil filter revealed no anomalies. Additionally, there were no anomalies associated with the engine oil galley or oil pressure relief valve.

D. DETAILS OF THE EXAMINATION

1.0 Engine Prior to Examination

The engine remained attached to the airframe at the accident site and both were recovered after partial submersion by ocean water. The upper left, middle, and lower engine mounts sustained impact damage. The upper right, middle and lower right engine mounts sustained impact damage. The cowling was removed by the IIC to check for visible anomalies to the crankcase which revealed none.

1.1 Exterior Engine Examination

The Continental Motors O-200-A, serial number 2344-0-A, remained attached to the airframe. There were no holes in the crankcase. All accessories remained attached to the accessory case and revealed no impact damage. None of the rocker covers revealed gross deformations. The air induction housing sustained impact damage, and the exhaust assemblies sustained minor damage. Initially, the propeller could not be turned by hand, and experienced binding and restriction when rotated in the opposite direction and subsequent binding remained when rotated in the direction of rotation. The propeller spinner was crushed and remained attached to the propeller flange by only two of the six hub bolts. About 5 quarts of oil were extracted from the oil sump.



Figure 1: Left side view of engine



Figure 2: Right side view of engine

1.2 Engine Disassembly and Examination

Control continuity between the cabin engine controls and the engine were verified. After several propeller rotations, the binding and restricted movement was intermittent. The engine remained attached to the airframe and the propeller remained attached to the engine to attain thumb compression. The cylinder rocker

covers were removed, and the No. 1 cylinder rocker arms did not move, and cylinder No. 2 presented unequal travel of the intake and exhaust rocker arms. Thumb compression was obtained on cylinders No. 3 and 4, while No. 1 revealed no compression and No. 2 revealed limited compression. Each cylinder was inspected with a lighted borescope and No's. 2, 3 and 4 revealed exhaust and intake valve movement with no binding or restriction. Cylinder No. 1 revealed the separation of the piston rod.

The cylinders were removed and No's. 2, 3 and 4 revealed no anomalies. During the removal of the No. 1 cylinder, no damage was observed to the push rods, however, the No. 1 piston was seized to the cylinder. The No. 1 piston skirt revealed damage to the upper and lower sections in alignment with piston rod movement. The No.1 piston rod and bearing were separated from the crankshaft, and the connecting rod endcap and bearing remained in the crankcase. The connecting rod bolts were stretched, and the nuts remained attached to each bolt, but the bolt heads were separated and not present. The oil sump was removed and contained residual oil and metallic fragments.



Figure 3: No. 1 piston rod and bearing failure

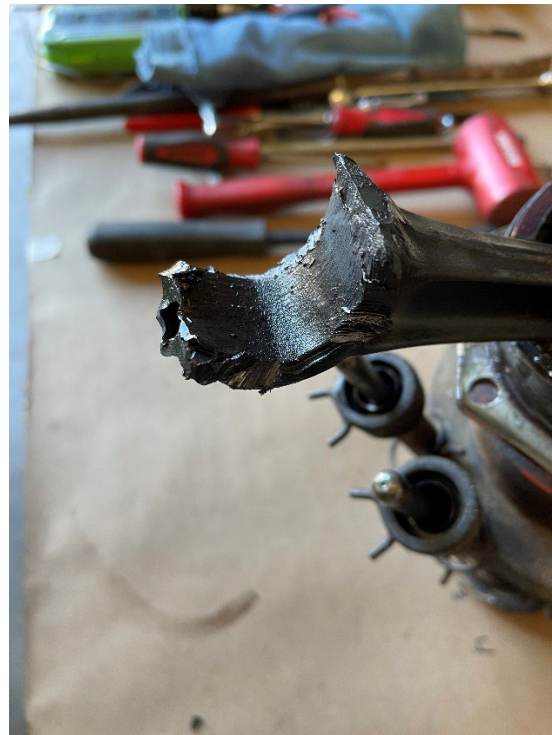


Figure 4: No. 1 piston rod and bearing failure

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 observed at the No. 1 and No. 2 cylinder bays.

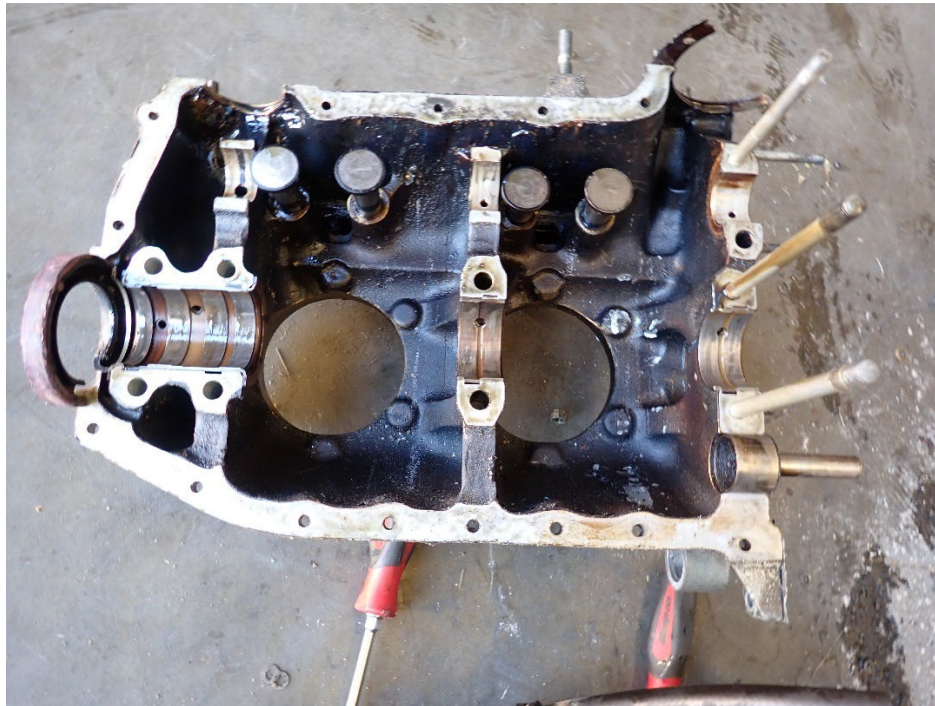


Figure 5: Case half without fretting signatures

The No's. 2, 3 and 4 connecting rod ends were removed to observe the condition of the rod bearings. The No. 2 cylinder connecting rod bearings revealed thermal discoloration and metal deformation. The No. 3 cylinder connecting rod bearings revealed thermal discoloration, and metal deformation with one bearing seized to the connecting rod. The No. 4 cylinder connecting rod bearings revealed only thermal discoloration.

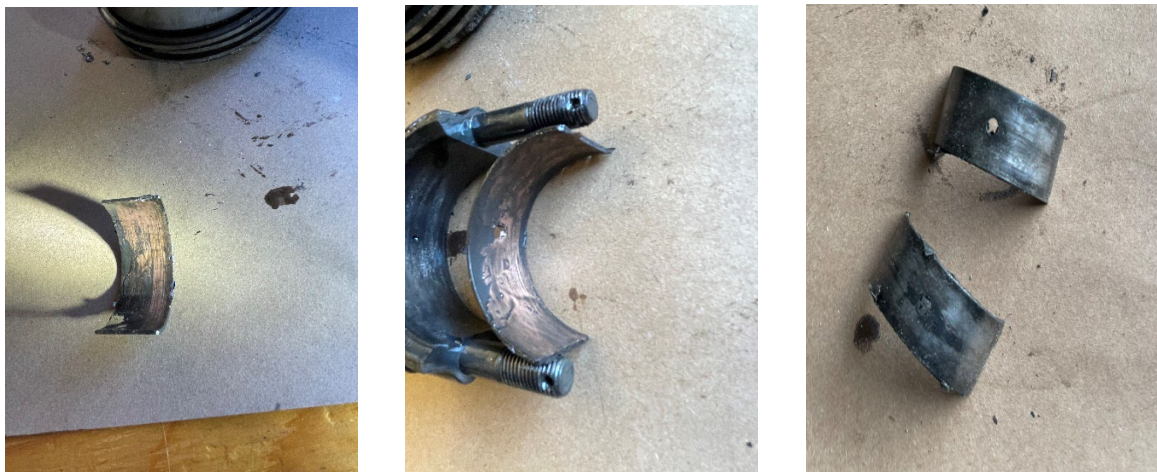


Figure 6: No. 2 connecting rod bearings



Figure 7: No. 3 Connecting rod bearings



Figure 8: No. 4 Connecting rod bearings

The crankshaft oil galleries were clear of obstructions. The crankshaft counterweights moved freely by hand. The camshaft had light impact damage to the area near cylinder No. 1 lifter areas. The camshaft and crankshaft gears were undamaged.

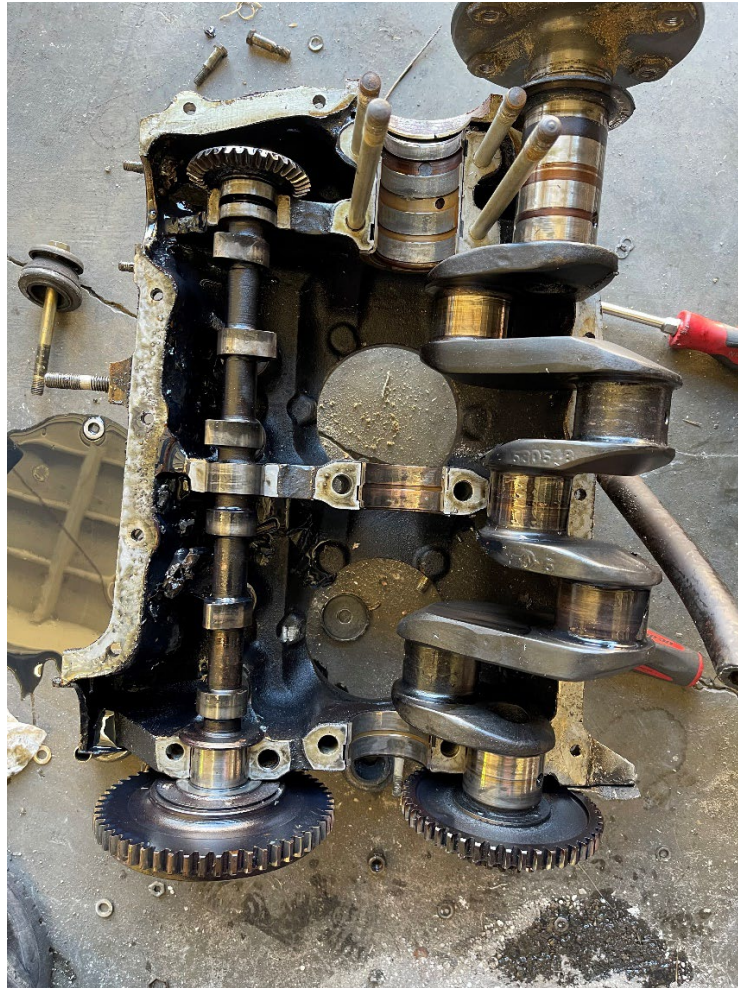


Figure 9: View of crankshaft with gears and camshaft with gears

The lifters were removed and were unremarkable except for the No. 2 lifter, which sustained damage and was missing the face.

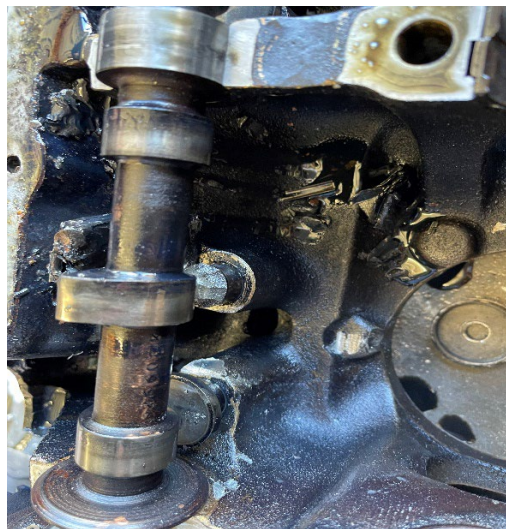


Figure 10: View of damaged No. 2 lifter

The oil filter was removed, cut open and the filter screen was unremarkable. The oil pump was removed and disassembled revealing no anomalies to the gear or the internal pump housing. The oil filter adapter was present, secure, and revealed no anomalies. The oil filter adapter housing was disassembled, and the fiber gasket was intact with no visible damage. The oil filter adapter housing components were undamaged including the copper crush gasket located on the spool. The engine sump oil pickup tube appeared unimpeded.

YEAR 20 <u>22</u> DATE	RECORDING TACH TIME	TODAY'S FLIGHT	TOTAL TIME IN SERVICE	Description of Inspections, Tests, Repairs and Alterations Entries must be endorsed with Name, Rating and Certificate Number of Technician or Repair Facility. (See back pages for other specific entries.)
				
DATE: 8-2-2022				
MAKE: CESSNA MODEL: 150A S/N: 15059132 REG: N7032X TACH: 3344.0 A.F.T.T.: 3344.0				
I CERTIFY THAT THIS AIRCRAFT HAS BEEN INSPECTED I.A.W. AN ANNUAL INSPECTION I.A.W. FAR 43 APPENDIX D AND HAS BEEN DETERMINED TO BE IN AIRWORTHY CONDITION. ELT TESTED 207D 1-4, ELT BATTERIES NEXT EXPIRATION DATE: MAY 2024				
DETAILS ON FILE UNDER W:				

Figure 11: Image of the last annual inspection completed August 2, 2022 (Courtesy of PIC)

ENG		REPAIRS		SIGNATURE	LICENSE NUMBER
DATE	TIME	Aug 28 - 1970		TACK TIME	1607.2
ENGINE GIVEN A COMPLETE OVERHAUL NEW BEARINGS INSTALLED - NEW PISTONS RINGS - CHROME CYLINDERS INSTALLED CYLINDERS WERE FRESH CHROMED WITH NEW VALVE GUIDE SEATS - NEW VALVES + SEATWORK NEW POINTS + CONDENSORS IN MAGS - NEW VACUUM PUMP. ENGINE RUN IN FOR 100 HRS.					
[REDACTED]					
CARRY ACCUMULATED TOTAL TIME FORWARD TO TOP OF NEXT PAGE					

Figure 12: Engine overhaul logbook entry date August 28, 1970

ENGINE LOG		REPAIRS --- ADJUSTMENTS		SIGNATURE	LICENSE NUMBER
DATE	TIME	5 - 8 - 72			
TIME ON TACK		1295			
TIME ON TACK 4-11-71		1213			
TIME PAST YEAR		82 hrs.			
TIME SINCE OVERHAUL		185 hrs.			
TOTAL ENGINE TIME		1295			
ENGINE GIVEN A 100% CHECK. REPLACED VACUUM PUMP. CHANGED OIL - CLEANED OIL SCREEN. ENGINE IS NOW WORTHY.					
[REDACTED]					
Top overhauled engine replaced rings, ground valves, replaced gaskets & seals.					
End reading 1799:16 hrs, total time 1799:16					
Next oil change due 1819:16 hrs.					
CARRY ACCUMULATED TOTAL TIME FORWARD TO TOP OF NEXT PAGE					
CARRY ACCUMULATED TOTAL TIME FORWARD TO TOP OF NEXT PAGE					

Figure 13: Engine top overhaul logbook entry year, 1972

Submitted by:

Michael Hicks
Air Safety Investigator / Investigator-in-charge