



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region
November 15, 2017

ENGINE EXAM REPORT

WPR17LA137

This document contains 18 embedded photos.

A. ACCIDENT

Location: Dixon, CA

Date: June 30, 2017

Aircraft: Cirrus Design Corporation SR-22, Registration Number: N744TC, Serial #: 3640

NTSB IIC: Howard Plagens

B. EXAMINATION PARTICIPANTS:

Howard Plagens
Senior Air Safety Investigator
National Transportation Safety Board
Desert Hot Springs, CA 92240

Nicole Charnon
Senior Air Safety Investigator
Continental Motors Inc. (CMI)
Mobile, AL

Brad Miller
Senior Air Safety Investigator
Cirrus Designs Corporation

C. SUMMARY

Examination of the recovered engine was conducted on November 14-15, 2017, at the facilities of Continental Motors Inc., Mobile, Alabama.

D. DETAILS OF THE INVESTIGATION

1.0 Engine Examination

CMI personnel placed the engine on a stand; the engine would not rotate. Cylinder number four had a different serial number from the original factory delivered engine.

CMI personnel had to saw off part of the numbers three, four, and six cylinder bases to facilitate removal due to deformation caused by fractured connecting rods and removed the cylinders. The numbers three and four connecting rods were fractured and separated from their connecting rod journals. The number four connecting rod, rod bearing, and journal displayed thermal discoloration consistent with oil starvation.

The case was separated. Gouging was evident on the forward counterweights and connecting rod journal. There were no blockages noted in the oil passages that fed the crankshaft and connecting rod journals. The camshaft sustained damage in the area that coincided with the fractured connecting rods, and the number three lifter housing was fractured, the lifters were not in place. There were no pre-accident anomalies noted on the lifter faces or camshaft lobes.

The piston face for cylinder number three had a single semicircular dimple imprint consistent with a valve strike while the piston face for cylinder number four had two imprints. The number three piston cylinder skirt was fractured below the oil control ring and the piston pin had separated.

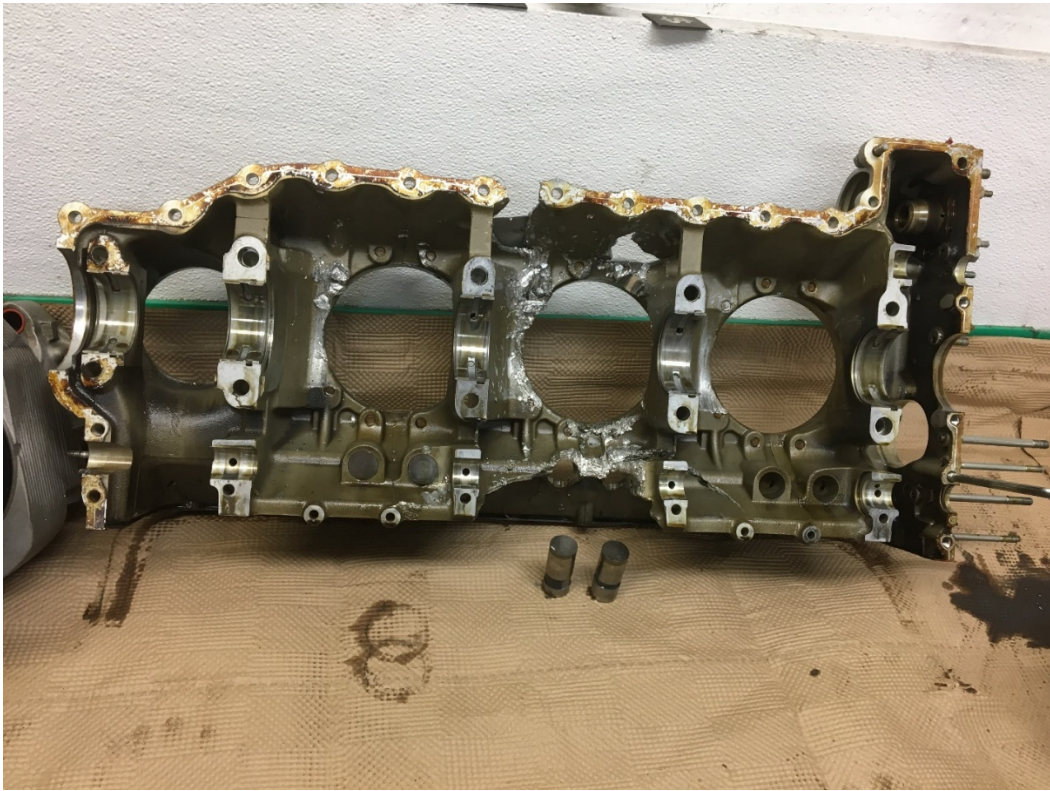


Figure 1 Right Side Crankcase Half

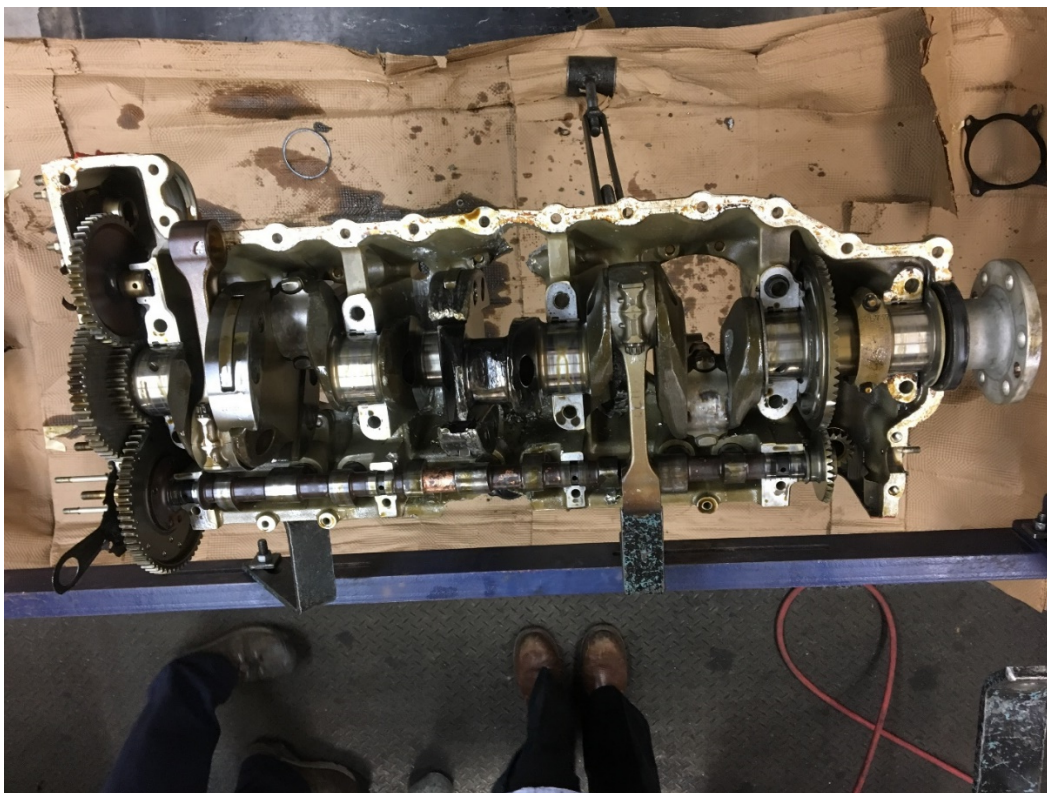


Figure 2 Left Side Crankcase Half

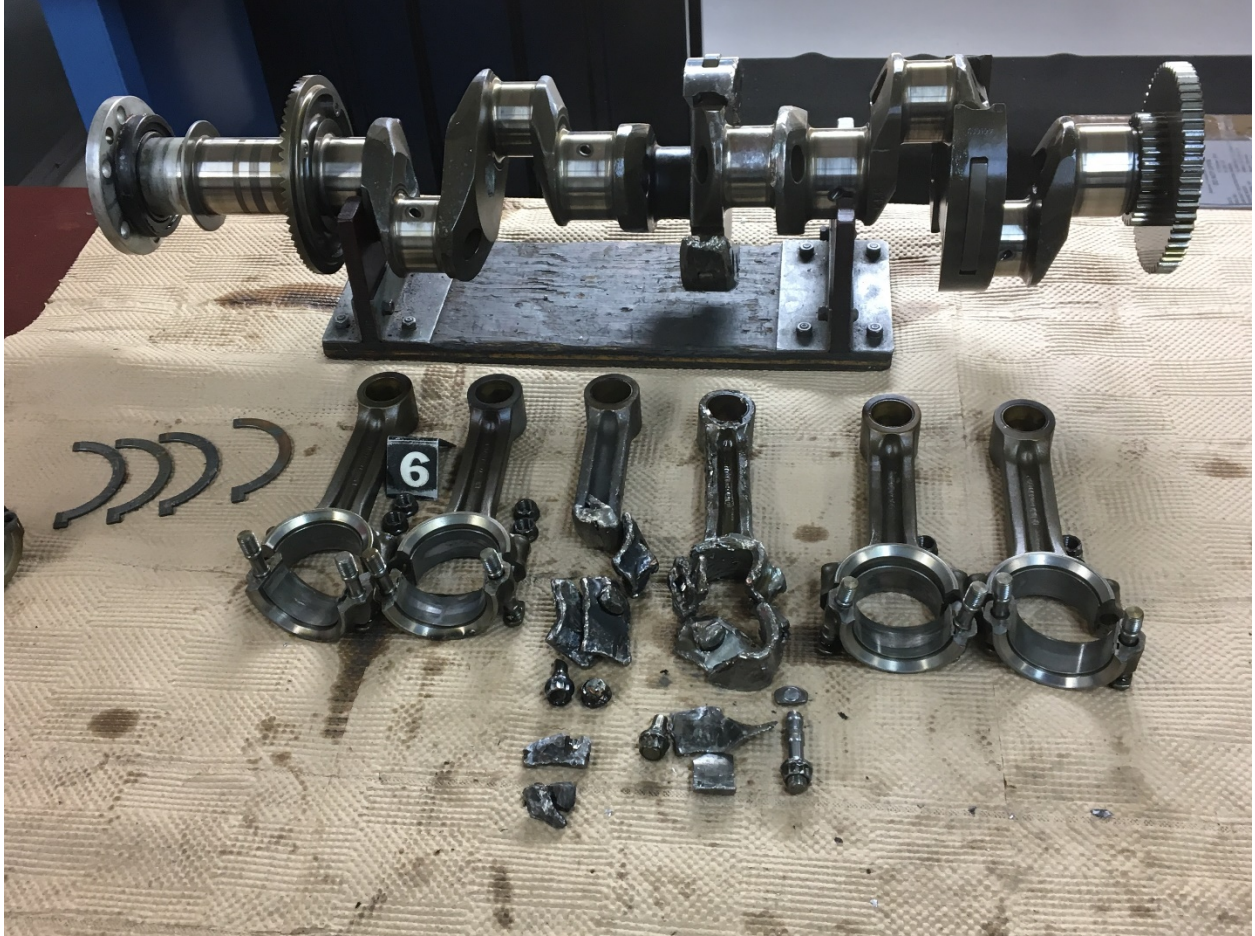


Figure 3 Crankshaft and Connecting Rods

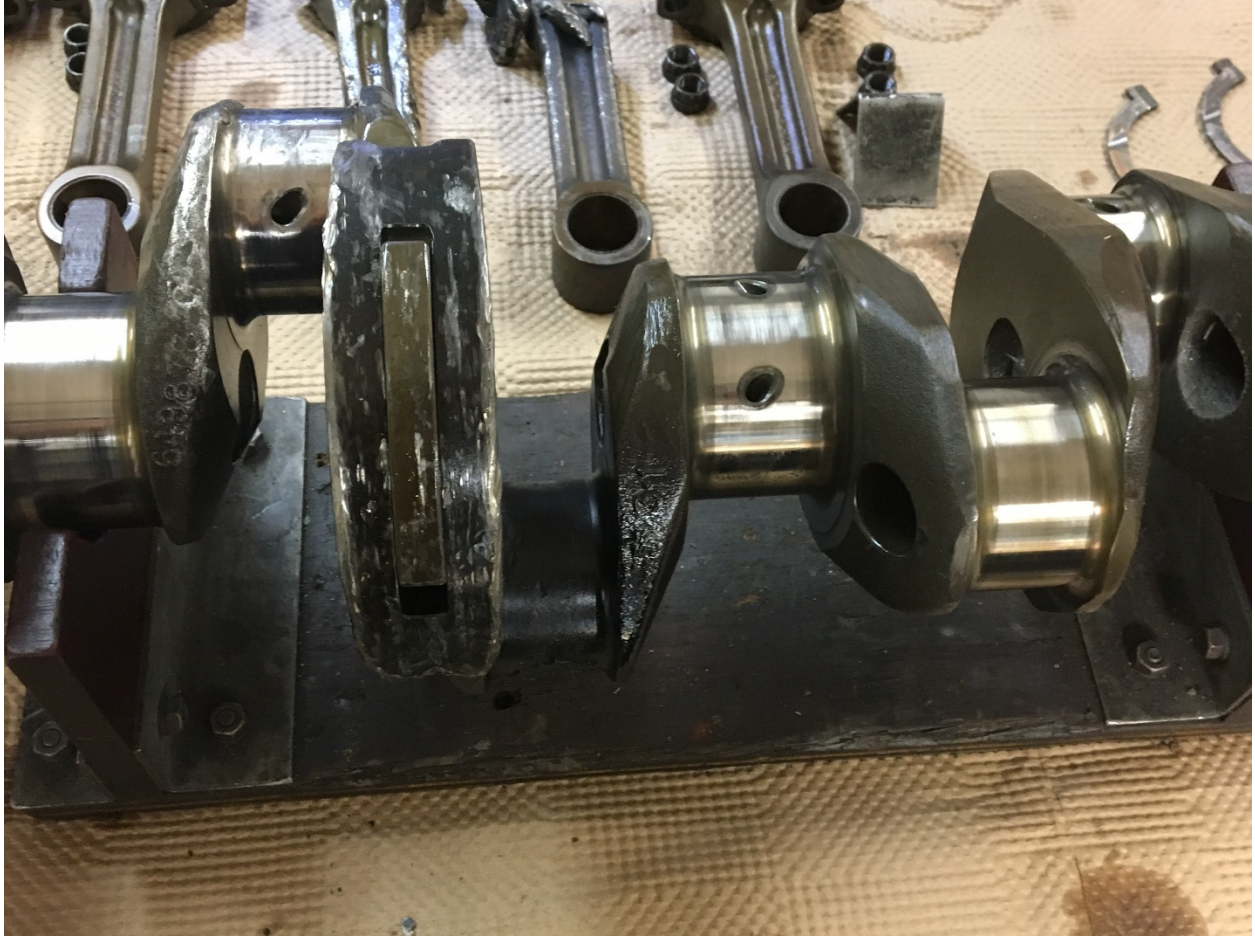


Figure 4 Crankshaft at Number Four Connecting Rod



Figure 5 Cylinders One, Two, and Three



Figure 6 Cylinders Four, Five, and Six

The oil sump was removed, and it contained many pieces of debris including fragments of the number three connecting rod and number four rod bearing.



Figure 7 Oil Pan with Debris

The crankcase had fractured and a section containing two of the mounting bolts for the oil sump screen separated, and the screen was displaced. The screen was clean and open.

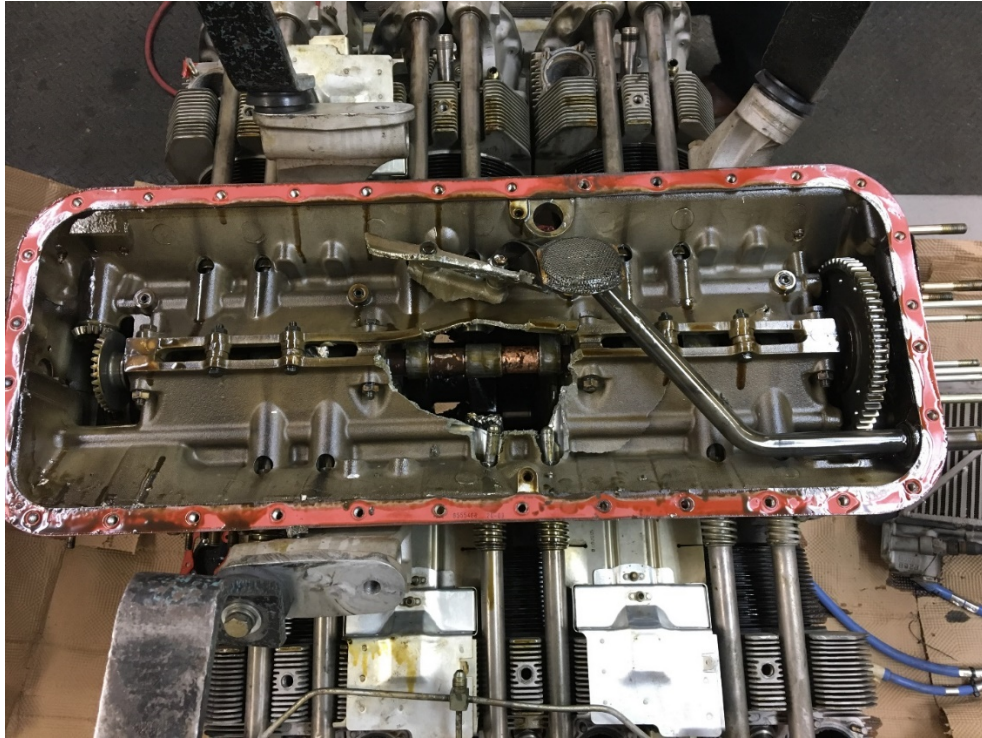


Figure 8 Bottom of Crankcase



Figure 9 Closeup of Displaced Oil Sump Screen

The governor screen was clean. The oil filter contained shiny metallic debris.

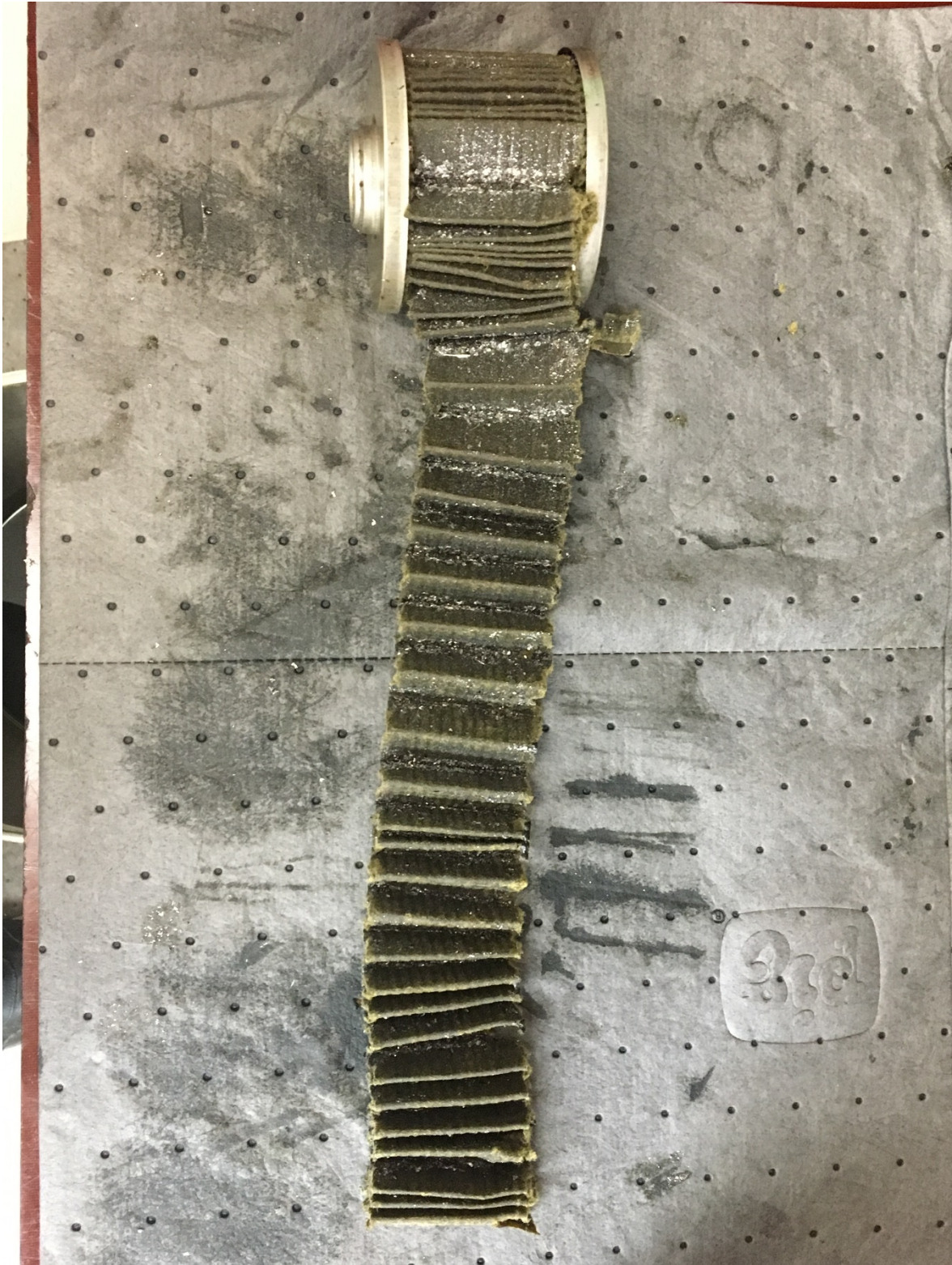


Figure 10 Oil Filter

The oil pump exhibited rotational scoring; the scavenge pump was unremarkable.

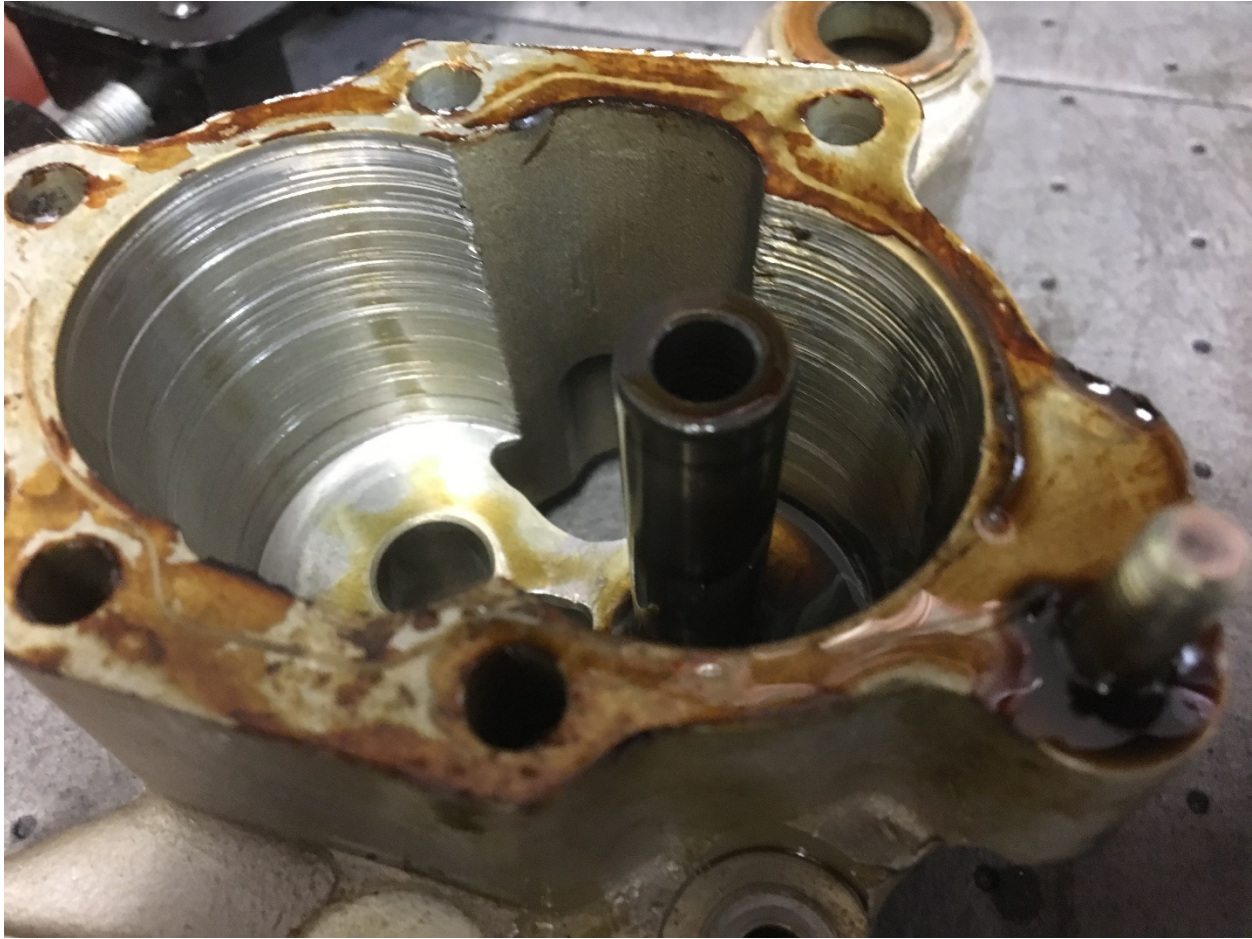


Figure 11 Oil Pump

The engine driven fuel pump was placed on a production test stand and run through various test parameters for an equivalent pump model. Since it was a modified pump for an STC-modified engine, it did not meet CMI production specifications throughout the entire test range. However, it was functional; a leak was observed at the diaphragm area, but no fuel staining was observed on the housing.

The throttle body was placed on a production test stand and run through various test parameters for an equivalent pump model. The fuel metering unit did not meet all of the specified test specifications, but those differences can be attributed to field in service adjustments. The throttle body and metering unit were functional throughout the tested ranges.

The fuel manifold valve was tested on a production test stand, and did not meet all production specifications. These differences could be attributed to the nozzle jets installed with the STC modification. The fuel nozzles were tested during the flow test of the fuel manifold valve and no pre-accident anomalies were noted.

CMI personnel removed the spark plugs; all center electrodes were elliptical and clean with no mechanical deformation except for the number four bottom plug, which was wet and contained debris. The spark plug electrodes were gray, which corresponded to normal operation according to the Champion Aviation Check-A-Plug AV-27 Chart.



Figure 12 Spark Plugs

The magnetos were connected to a test stand, and both magnetos produced spark at all posts.

Air pressure was applied to the left turbocharger check valve, and it released at 12 psi on the first test and 10 psi on the second test. At first release, black fluid discharged from the valve, and the internal screen was clear. Air pressure was applied to right turbocharger check valve, and it released at 15 psi on the first test and 10 psi on the second test. The internal screen was clear.

Examination of the right exhaust pipe with a lighted borescope revealed some circumferential scrape marks and material transfer on its internal surfaces.



Figure 13 Scrape Mark 1 Inside Right Exhaust

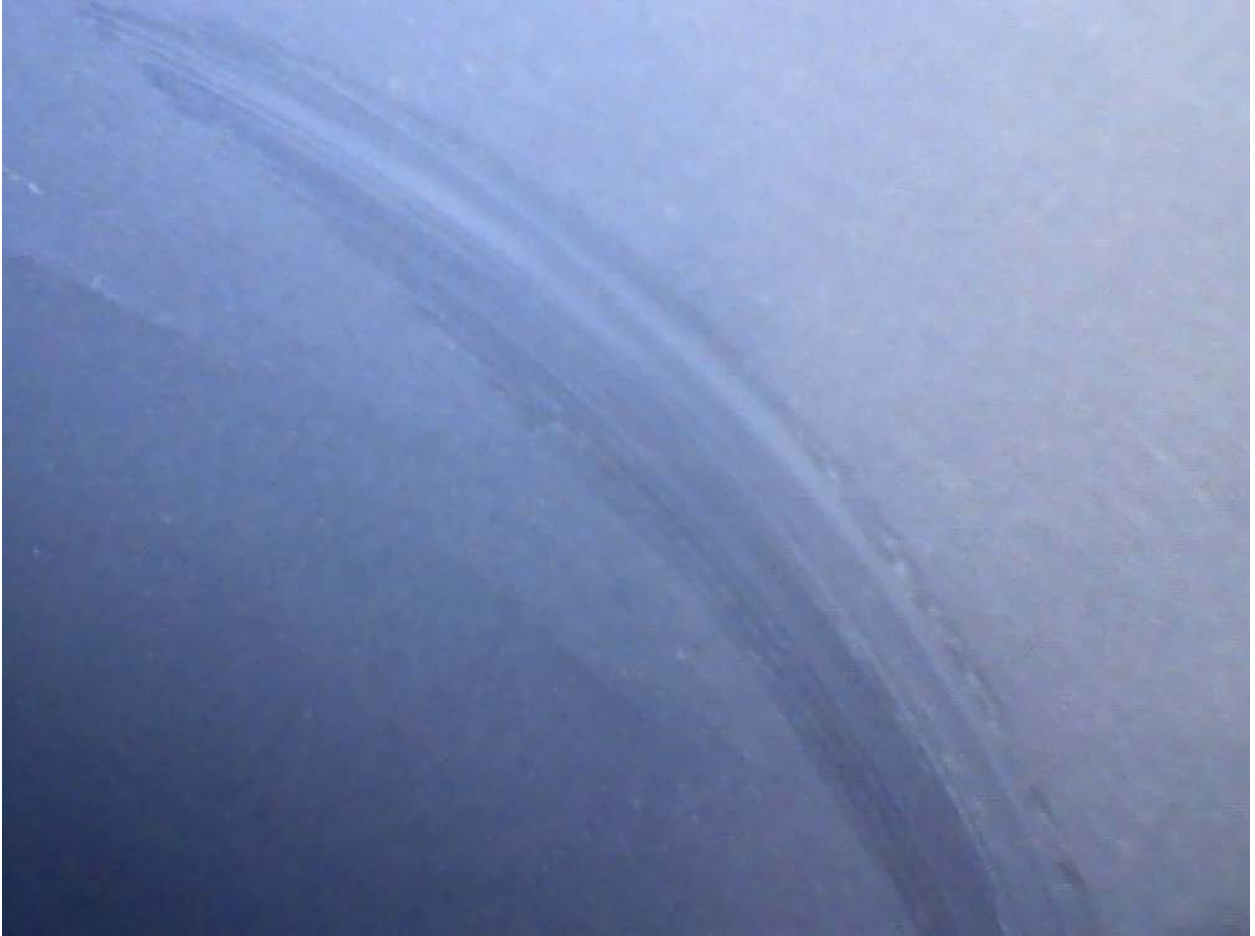


Figure 14 Scrape Mark 2 Inside Right Exhaust



Figure 15 Scrape Mark 3 Inside Right Exhaust



Figure 16 Scrape Mark 4 Inside Right Exhaust



Figure 17 Scrape Mark 5 Inside Exhaust



Figure 18 Scrape Mark 6 Inside Right Exhaust