



**ERA18LA190**

**Passadumkeag, Maine**

**July 12, 2018**

**Glasair SH2 – N352GL**

**NTSB ENGINE EXAMINATION REPORT**

**August 29-30, 2018**

**PARTICIPANTS IN THE EXAMINATION**

**Heidi Kemner**  
**Air Safety Investigator**  
**National Transportation Safety Board**  
**Ashburn, Virginia**

**Peter Wentz**  
**Air Safety Investigator**  
**National Transportation Safety Board**  
**Ashburn, Virginia**

**Lynn Spencer**  
**Air Safety Investigator**  
**National Transportation Safety Board**  
**Ashburn, Virginia**

## HISTORY OF FLIGHT

On July 11, 2018, about 1920 eastern daylight time, an experimental, amateur-built Glasair SH2, N352GL, was substantially damaged during a forced landing after a total loss of engine power near Passadumkeag, Maine. The commercial pilot was not injured. The airplane was operated by the pilot/owner as a personal flight conducted under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed at the time of the accident for the local flight, which originated at Lincoln Regional Airport (LRG), Lincoln, Maine, around 1855.

## ENGINE INFORMATION

Engine Manufacturer: Lycoming

Engine Model Number: O-320-X

Engine Serial Number: L-43683-27A

Recent Inspection: August 12, 2017 – Conditional Inspection

| DATE<br>19__ | RECORDING<br>TACH<br>TIME | TODAYS<br>FLIGHT | TOTAL<br>TIME IN<br>SERVICE | DESCRIPTION OF INSPECTIONS, TESTS, REPAIRS AND ALTERATIONS<br>ENTRIES MUST BE ENDORSED WITH NAME, RATING AND CERTIFICATE NUMBER OF<br>MECHANIC OR REPAIR FACILITY. (SEE BACK PAGES FOR OTHER SPECIFIC ENTRIES.)                                                                                           |
|--------------|---------------------------|------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8/12/17      | Tach                      |                  | 609.07                      | Charged oil and filter<br>Serviced with 7 qts Phillips 20-50 XC<br>and CF4E110-2 filter. Run - up & leaks<br>check OK. I certify this engine has<br>been inspected IAW the scope and detail<br>of FAR 43 App. D and determined to be<br>in a condition for safe operation.<br>[Signature] AIP [Signature] |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |
|              |                           |                  |                             |                                                                                                                                                                                                                                                                                                           |

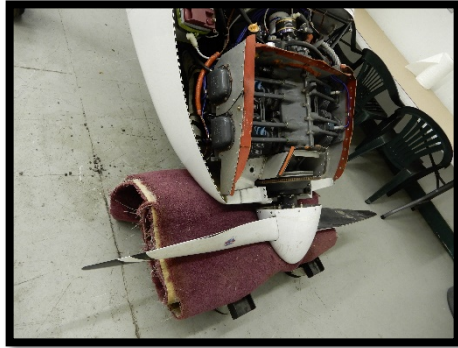
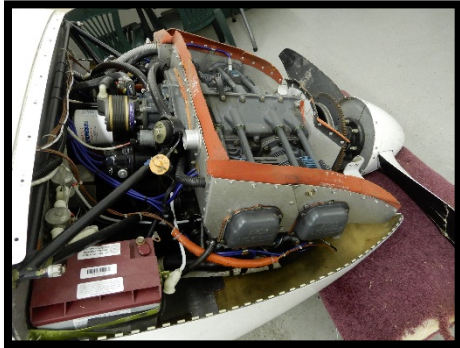
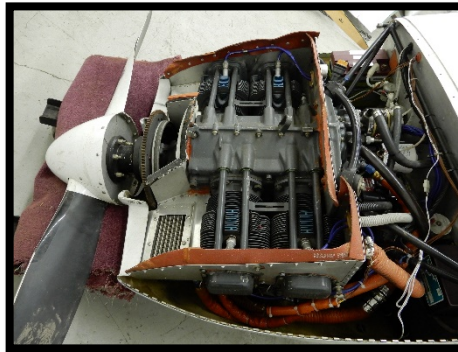
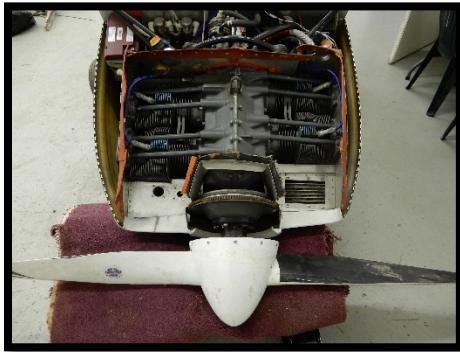
Recent Recorded Tachometer Time: 692.41 hours as of accident date.

[Picture 1. Most Recent Maintenance on Engine](#)

## INITIAL EXAMINATION

The engine remained mounted to the airplane and the following was noted:

- The engine remained attached to the airframe through all engine mounts.
- The crankcase remained intact.
- The cylinders remained attached to the crankcase.
- An unknown amount of oil was noted in the engine.
- The throttle and mixture cables remained attached to the engine but were cut for the engine examination.
- All components remained attached to the engine.
- The cowling was removed and the propeller would not rotate.
- The engine was removed from the engine mounts to facilitate further examination.



## **DETAILED EXAMINATION**

### **Exhaust System**

The exhaust piping was removed and no obstructions were noted, except a small amount of metallic debris was noted in the No. 4 exhaust pipe, but it was not obstructed.

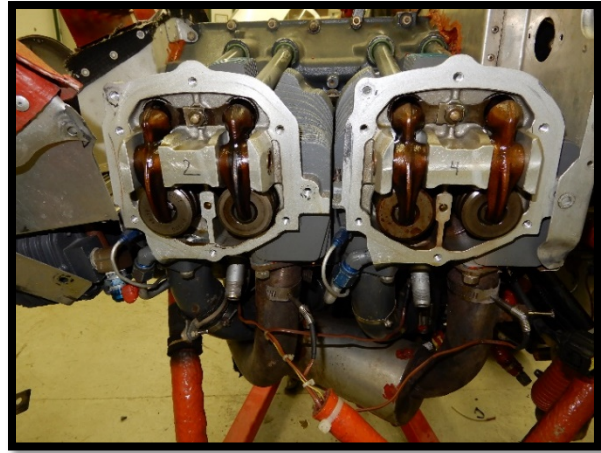
### **Intake System**

The intake piping was removed and no anomalies were noted.



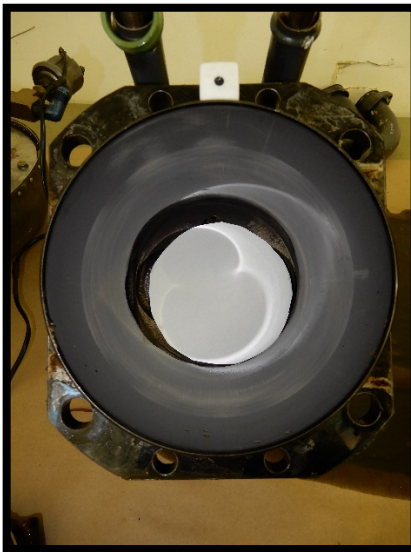
### **Cylinders and Valve Train**

The rocker box covers were removed and no anomalies were noted. All rocker arms, push-rods, and springs remained in place. The cylinders were examined by boroscope and corrosion was noted on the cylinder walls. All cylinders were removed from the engine.



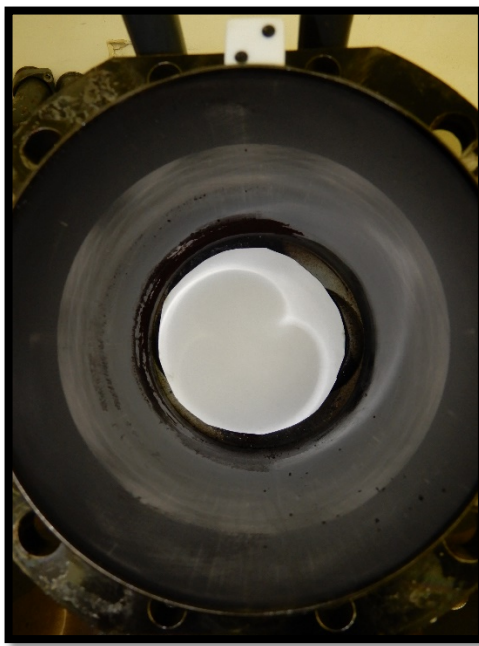
#### No. 1 Cylinder

The No. 1 cylinder was removed from the engine. Lead deposits were noted near the valve faces. The intake and exhaust valves remained seated. The piston was removed from the connecting rod and no anomalies were noted with the piston pin. The piston face was examined and lead deposits were noted. The piston rings remained on the piston and the ring gaps were not aligned. The connecting rod was removed from the crankshaft and a small number of light gouges were in the bearing.



## No. 2 Cylinder

The No. 2 cylinder was removed from the engine. Corrosion was noted on the cylinder walls. The intake and exhaust valves remained seated and no anomalies were noted. The piston was removed from the connecting rod and the piston pin exhibited no anomalies. The face of the piston was examined and lead deposits were noted. In addition, the face of the piston was partially blue in color. The piston rings remained on the piston and the ring gaps were not aligned. The connecting rod was removed from the crankshaft and gouges were noted in the bearing.





### No. 3 Cylinder

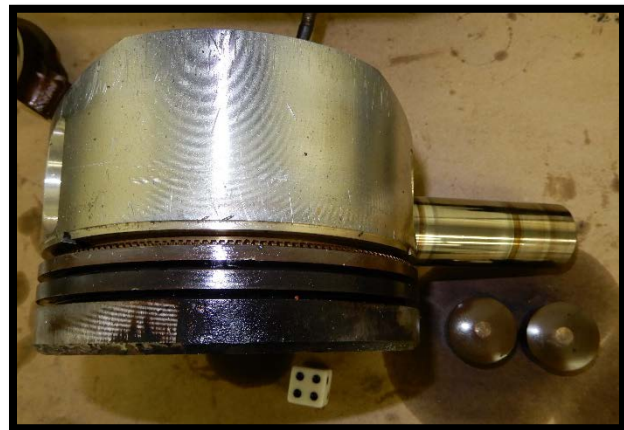
The No. 3 cylinder was removed from the engine and corrosion was noted on the cylinder walls. The intake and exhaust valves remained seated. The piston was removed from the connecting rod and there were no anomalies noted with the piston pin. The piston face was examined and lead deposits were noted on the face. The piston rings remained on the piston and the ring gaps were no aligned. The connecting rod was removed from the crankshaft. A gouge was noted in the No. 3 crankshaft bearing. No other anomalies were noted.





#### No. 4 Cylinder

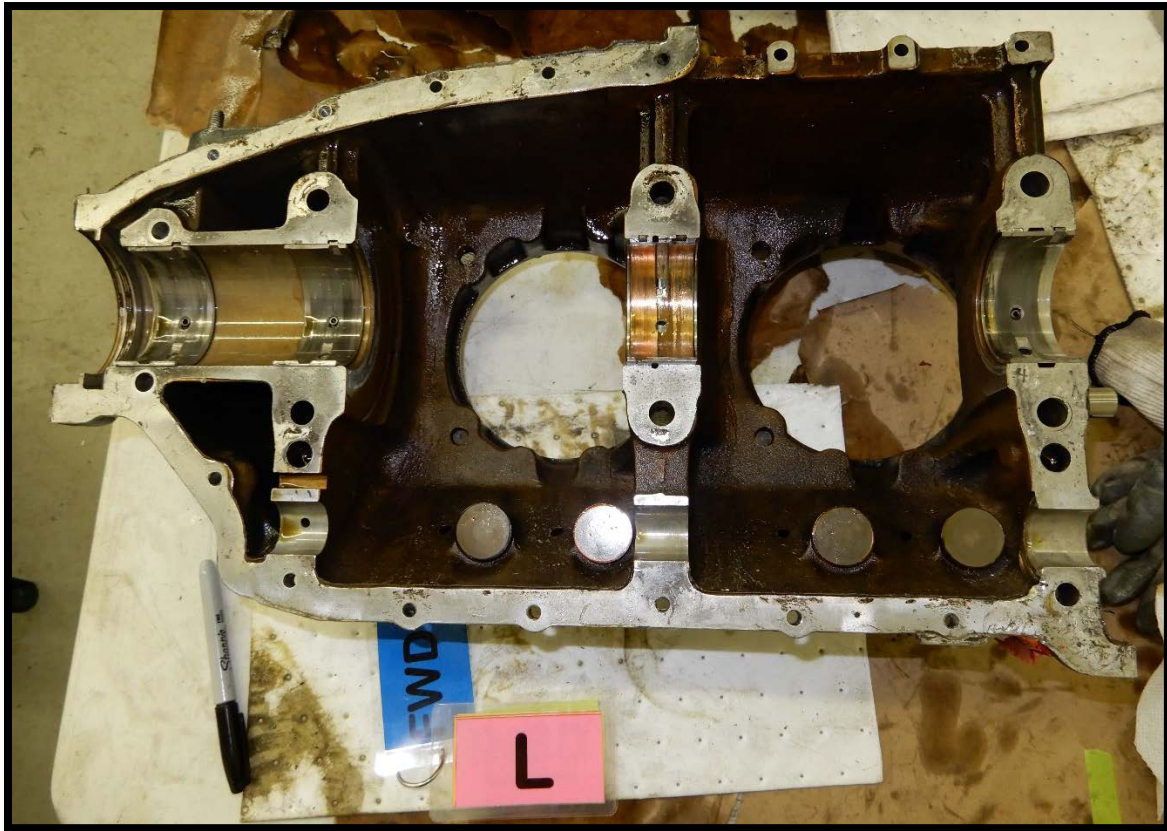
The No. 4 cylinder was removed and examined. The cylinder walls exhibited corrosion. The intake and exhaust valves remained seated and no anomalies were noted. The piston was removed from the connecting rod and no anomalies were noted with the piston pin. The piston rings were removed during engine disassembly, no anomalies were noted, and the piston ring gaps were not aligned. The piston face was examined and no anomalies were noted. The No. 4 connecting rod would not move on the crankshaft. The connecting rod was removed from the crankshaft and the connecting rod bearing exhibited thermal discoloration and impact damage.

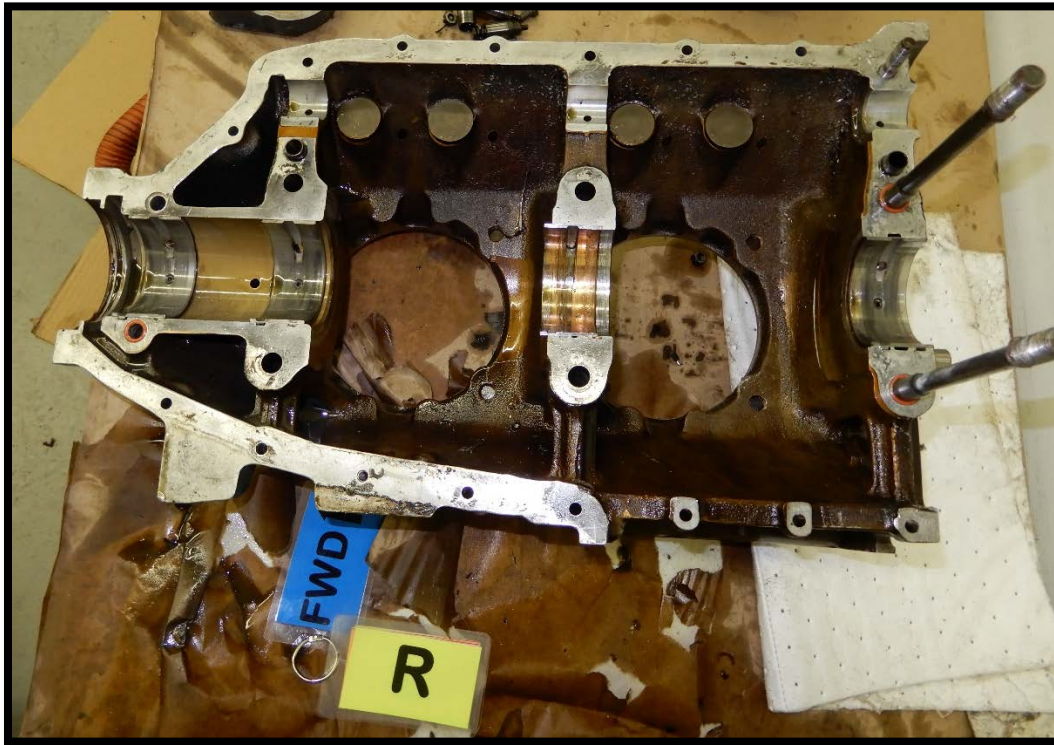




## Crankcase

The crankcase was split and metallic debris was noted throughout the walls of the crankcase. There was no fretting noted on the crankcase. The camshaft lifters were examined and no anomalies were noted. In addition, the camshaft bearings were not damaged.



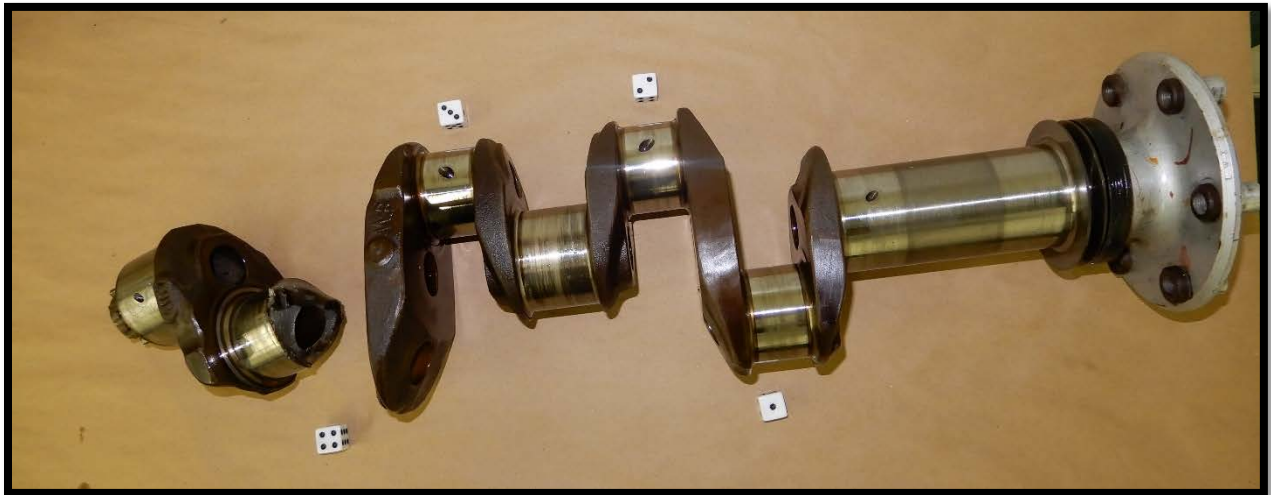


The Nos. 1 and 2 main bearings exhibited initial wear marks but remained in place. The No. 3 main bearing was worn and the top lay of material was worn away so that copper could be seen. The aft section of the No. 3 main bearing was more worn than the front section of the No. 3 main bearing. The No. 4 main bearing exhibited wear on the front section and the left side of the No. 4 main bearing exhibited more damage than the right side of the bearing.



## Crankshaft and Camshaft

The crankshaft was removed from the engine and was fractured at the forward section of the No. 4 connecting rod journal. The Nos. 1 and 2 main bearing journals were examined and no anomalies were noted. The No. 3 main bearing journal exhibited rotational scoring and wear. The No. 4 main bearing journal exhibited a small amount of wear on the forward section, otherwise, no anomalies were noted. All of the oil passages on the crankshaft were free of debris. The Nos. 1 and 3 connecting rod journals were examined and no anomalies were noted. The No. 2 connecting rod journal exhibited rotational scoring. The No. 4 connecting rod journal was fractured, exhibited thermal discoloration, and rotational scoring. The crankshaft was retained and sent to the NTSB materials laboratory for further examination.



The camshaft was examined and no anomalies were noted. Metallic material was noted on the camshaft. The camshaft lobes were examined and no anomalies were noted.



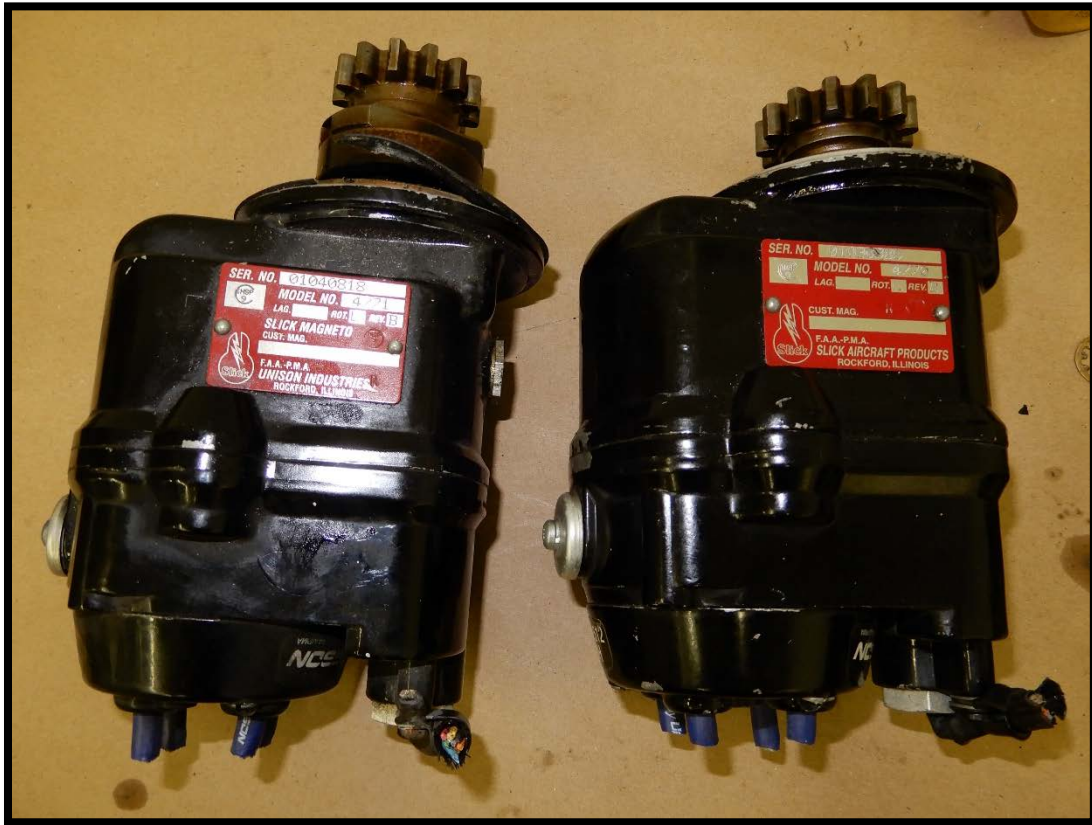
## Spark Plugs

All spark plugs were removed from the engine and they were the massive electrode type. The Nos. 1 and 2 bottom spark plugs were oil soaked. All other spark plugs were light grey in color and exhibited “normal wear” when compared to the Champion Check-A-Plug Chart.



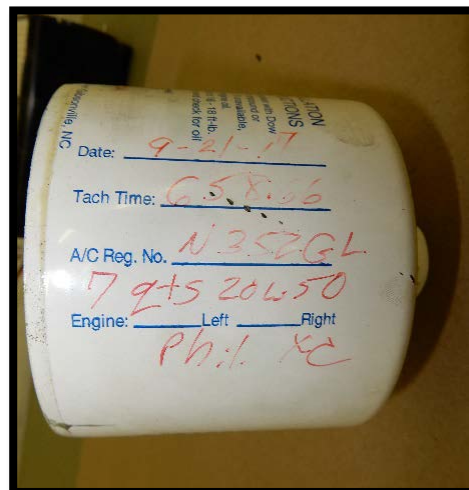
## Magnetos

The magnetos remained attached to the engine and were removed. They were rotated by hand, however, spark could not be produced because of the LASAR ignition system.



## Oil System

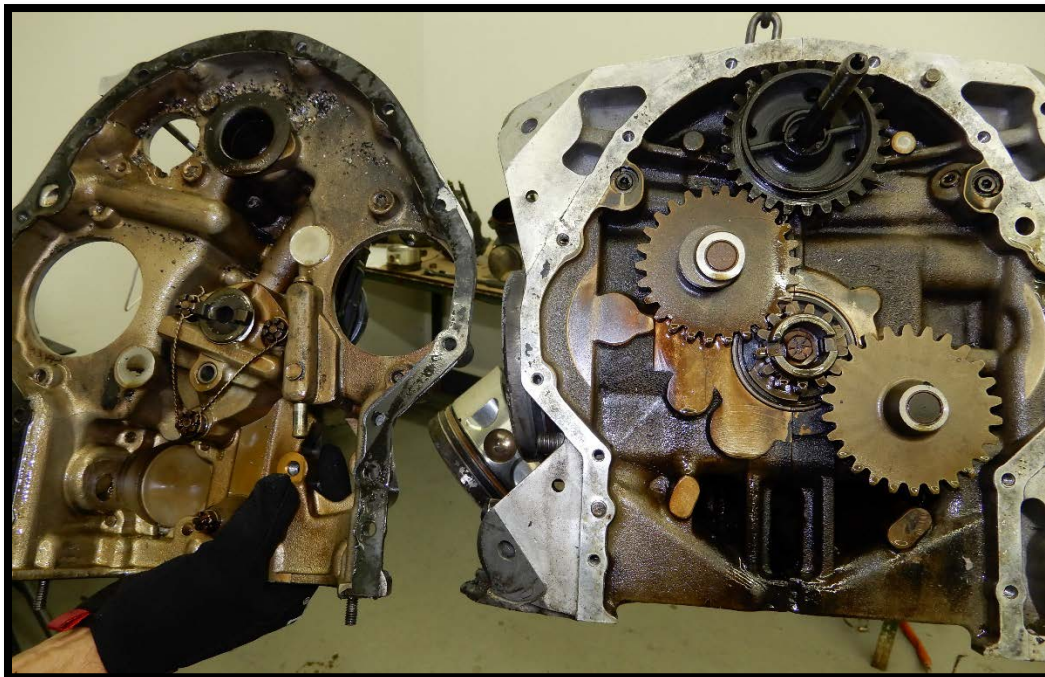
The oil line was detached from the oil cooler and oil drained from it. The oil filter remained attached to the engine, was removed, and disassembled. There was metallic debris noted in the filter.



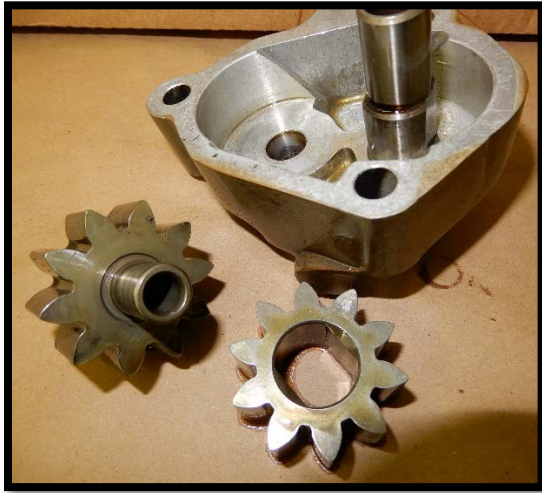
The oil sump was removed from the engine and metallic particles were noted throughout. The oil suction screen was removed from the oil sump and metallic particles were noted in the screen.



The accessory section of the engine was removed and metallic particles were noted on the gears and along the case.



The oil pump was removed from the accessory section of the engine and scoring was noted on the oil pump housing and metallic particles were noted on the gears. The oil pump housing exhibited thermal discoloration near the oil pump drive shaft. In addition, there was a gouge in the oil pump housing near the thermal discoloration.



## Fuel System

Fuel was drained out of the gascolator and debris was noted in it. The fuel line from the gascolator to the engine driven fuel pump was removed, and there was no fuel in it. The fuel line from the engine driven fuel pump to the carburetor was removed and no fuel was noted in the line.

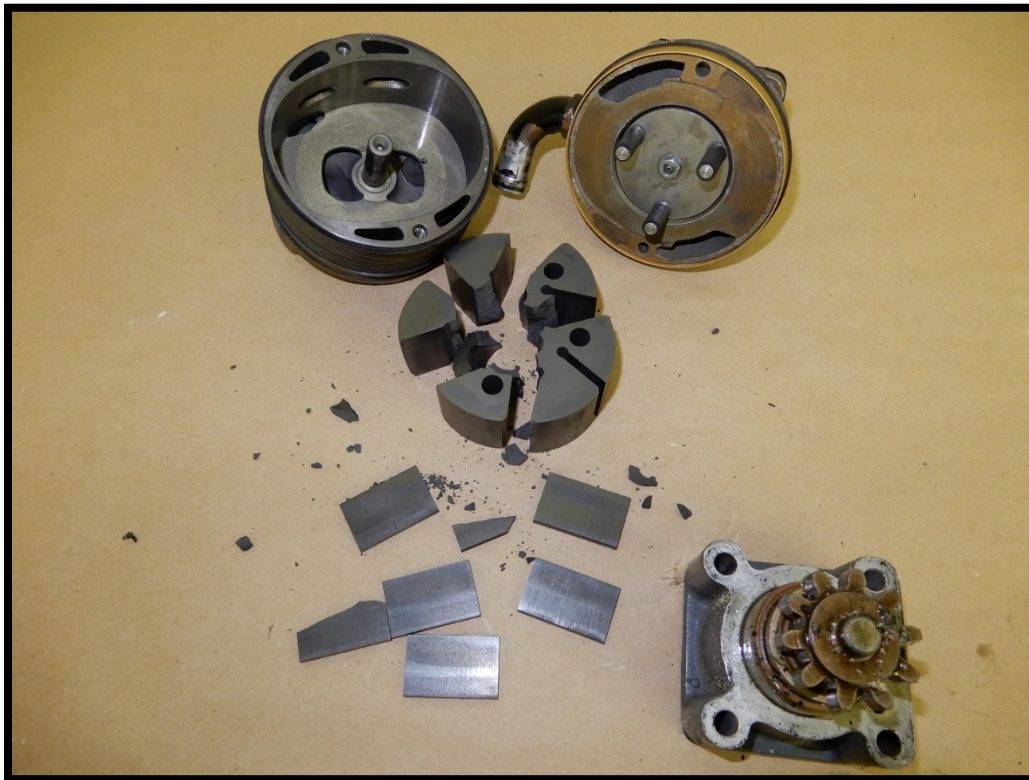


The engine driven fuel pump was removed and a suction and compression test was performed. No anomalies were noted when the pump was actuated by hand.



### **Vacuum System**

The vacuum pump was removed and metallic material was noted on the drive gear. The vacuum pump rotor and 1 vane were fractured. All other vanes remained intact.



## **SUMMARY**

The examination revealed that the crankshaft was fractured at the number 4 crankshaft journal.

## **FUTURE ACTIVITIES**

The wreckage will remain in storage at Anglin Air Recovery in Clayton, Delaware, until it is released by the National Transportation Safety Board IIC.

The crankshaft and the Electronics International SR-8A-4 were retained and sent to the NTSB Laboratory for further examination.