

# NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering  
Materials Laboratory Division  
Washington, D.C. 20594



July 2, 2019

## MATERIALS LABORATORY FACTUAL REPORT

Report No. 19-040

### A. ACCIDENT INFORMATION

Place : Sheldon, Missouri  
Date : April 26, 2019  
Vehicle : Beech E50  
NTSB No. : CEN19LA127  
Investigator : Mike Hodges, AS--CEN

### B. COMPONENTS EXAMINED

Number 2 cylinder assembly from the right engine, number 4 piston assembly and number 6 cylinder assembly from the left engine, and oil screens from both engines.

### C. DETAILS OF THE EXAMINATION

An overall view of the submitted components is shown in figure 1. The components were from each of the two Lycoming GSO-480 engines installed on the accident airplane. The cylinder head on each of the submitted cylinder assemblies had similar damage with material fractured and missing from the head between the exhaust valve and one of the spark plug ports. Photographs of the interior of the cylinders are shown in figures 2 and 3, and the damaged area is outlined with a dashed line. Material was also fractured and missing from the side of the number 4 piston assembly from the left engine as shown in figure 4, and a dashed line in figure 4 outlines the area of damage. The piston compression rings and oil rings were also fractured, and pieces were missing. The damage to the piston and cylinder assemblies was consistent with detonation damage.

Oil-covered particles were observed in the grooves of the oil screens from the left and right engines. A close view of the oil screen from the left engine is shown in figure 5 and is representative of debris observed in both the left and right oil screens. Particles were removed from each oil screen using a scalpel while viewed under an optical stereomicroscope. The particles were mostly oil-covered thin flakes with angular edges. A view of several typical particles removed from the left engine oil screen is shown in figure 6 where unlabeled arrows indicate the oil-covered particles. A sample of particles from each oil screen was placed into respective beakers of acetone and then placed in an ultrasonic cleaner. After cleaning, the particles had broken into smaller pieces. The particles were dried and placed onto carbon-coated aluminum stubs for analysis using energy-dispersive x-ray spectroscopy (EDS) in a scanning electron microscope. Approximately 6 particles from each oil screen sample were analyzed. Particles from both oil screens had EDS spectra with high peaks of carbon, oxygen, bromine, and lead and a relatively small peak of iron. A peak of aluminum was also detected on the largest

particle analyzed from the left engine. One of the particles from the right engine had relatively small peaks of chromium and nickel.

Matthew R. Fox, Ph.D.  
Senior Materials Engineer

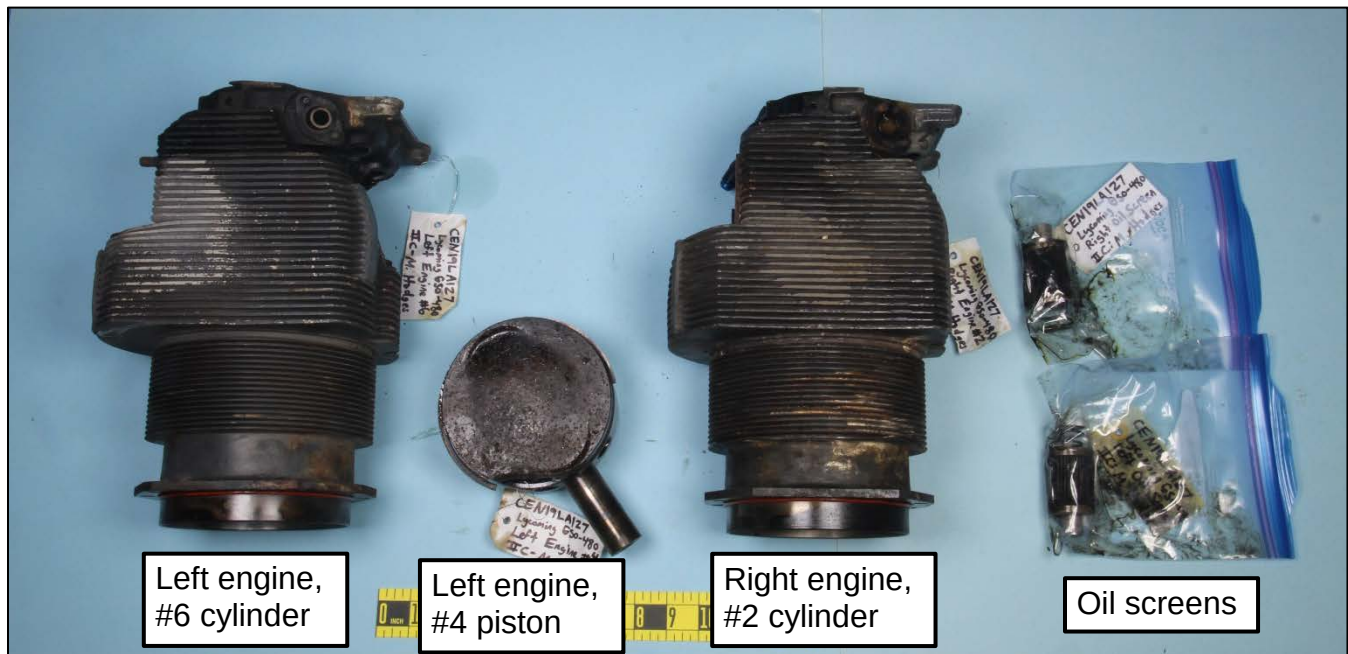


Figure 1. Overall view of the submitted components.



Figure 2. Interior of the number 6 cylinder assembly from the left engine. A dashed line indicates an area of missing cylinder head material between the exhaust valve and one of the spark plug ports.



Figure 3. Interior of the number 2 cylinder assembly from the right engine. A dashed line indicates an area of missing cylinder head material between the exhaust valve and one of the spark plug ports.



Figure 4. Number 4 piston assembly from the left engine. A dashed line indicates an area of missing piston material and fractured piston rings.

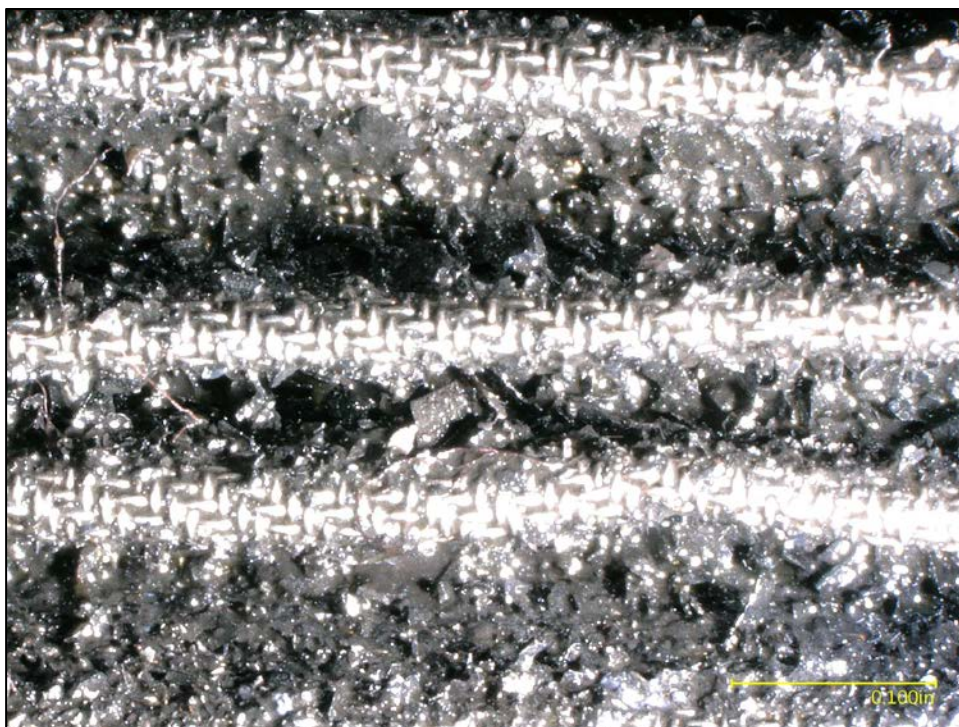


Figure 5. Close view of particles in the oil screen from the left engine.

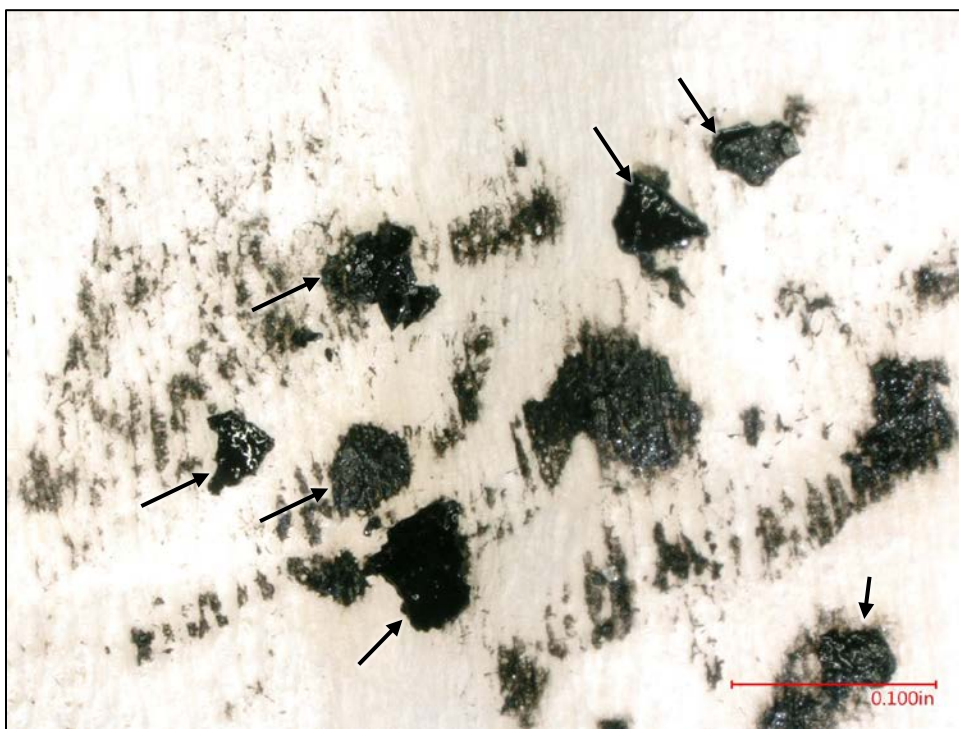


Figure 6. Sample of particles removed with a scalpel from the left engine oil screen and placed on white paper. Unlabeled arrows indicate particles.