

NATIONAL TRANSPORTATION SAFETY BOARD

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



December 10, 2019

MATERIALS LABORATORY FACTUAL REPORT

Report No. 19-076

A. ACCIDENT INFORMATION

Place : Fort Lauderdale, Florida
Date : December 1, 2018
Vehicle : Cessna 335, N79HP
NTSB No. : ERA19FA060
Investigator : Timothy W. Monville, AS-ERA

B. COMPONENTS EXAMINED

Numbers 2 and 3 cylinder and piston assemblies and oil breather (dipstick tube).

C. DETAILS OF THE EXAMINATION

An overall view of the submitted components from the left engine is shown in figure 1. During the accident flight shortly after takeoff, an occupant in the airplane reported a left engine fire. The airplane also experienced a post-crash fire on the ground. The submitted components were received disassembled from the engine intact as shown in figure 1.

The cylinder head and valve surface on the interior surfaces of the cylinder assemblies had gray deposits with a rough gritty appearance that was particularly prominent in cylinder 2 shown in figure 2. Gritty deposits were also observed on the spark plug electrodes. The deposits were more extensive on the lower spark plugs compared to the upper spark plug as shown in figure 3. The upper spark plug from the number 3 cylinder was covered in a powdery tan substance, including the intact thread surfaces. The barrel surfaces of both cylinder assemblies had smooth gray deposits on the interior surfaces near the head. Longitudinal scoring was observed on the barrel sidewalls on both cylinder assemblies.

The number 2 and 3 piston assemblies are shown in figures 3 and 4, respectively. The edges of the piston crowns were eroded away and had a rough gritty appearance. The center of the piston crown for the 2 piston was also rough with most of the combustion deposits missing from the surface. Brown and tan combustion deposits were mostly present on the number 3 cylinder, but an area had been cleaned to reveal identification markings on the piston crown. The overall damage patterns on the piston assemblies was consistent with detonation.

The oil breather was received without the cap and dipstick assembly, which was not recovered. Contact marks were observed on the lower end of the oil breather as shown in figure 6 before cleaning. Wear marks consistent with contact with the dipstick were observed on approximately $\frac{1}{2}$ the circumference around the lower end of the breather tube adjacent to the end face. Deeper marks were observed at two locations on the chamfered edge at locations shown in figure 6 likely associated with the insertion position of the dipstick and the edge of the dipstick after twisting the cap clockwise to the closed position.

Oily deposits on the lower end of the breather tube were wiped from the surface using a cotton-tipped swab followed by cleaning using a soft-bristled brush dipped in a solution of Alconox detergent and water. The surface was then wiped dry with a paper towel. Optical images of the cleaned surface are shown in figure 7. A series of short sliding contact marks were observed on the interior surface of the breather tube as indicated with brackets in the lower image in figure 7 (a magnified view of the area within the rectangle in the upper image in figure 7). The short sliding contact marks were somewhat circular near the lower end and became more elongated in the circumferential direction at the upper end of the series. The marks overlaid longitudinal contact marks along the entire length within the image shown in figure 7.

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Senior Materials Engineer

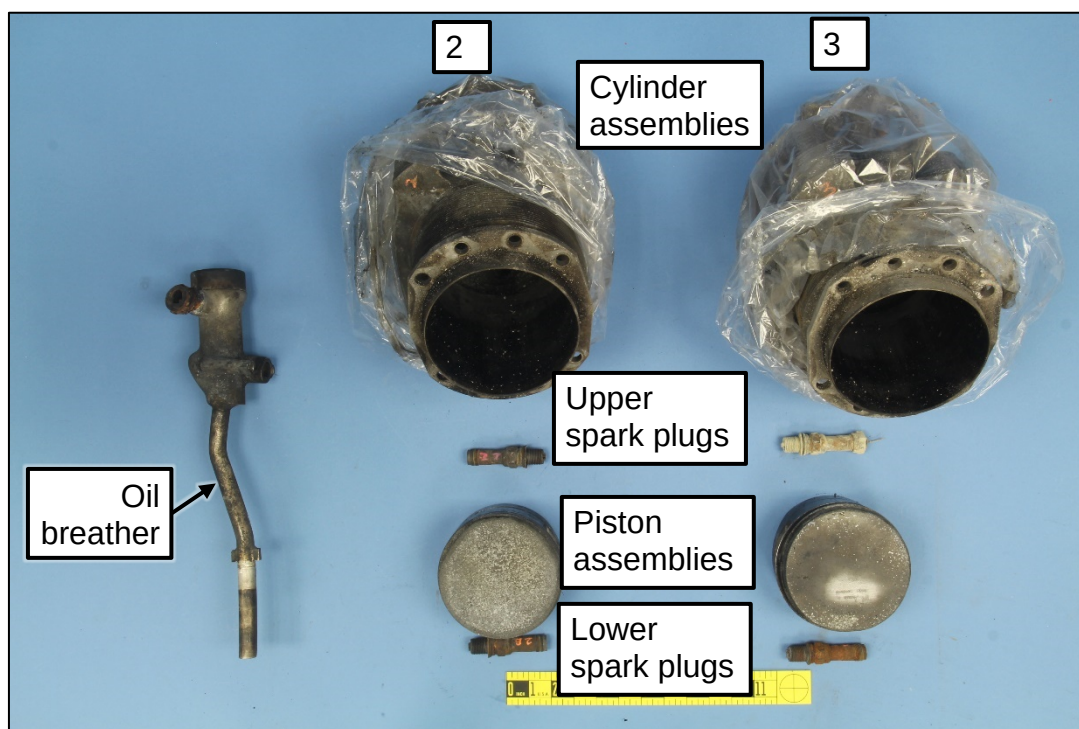


Figure 1. Overall view of the submitted components.



Figure 2. Cylinder 2 interior.



Figure 3. Cylinder 2 spark plugs.



Figure 4. Number 2 piston assembly.



Figure 5. Number 3 piston assembly.



Figure 6. Lower end of the oil breather tube.

