

NATIONAL TRANSPORTATION SAFETY BOARD

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



January 18, 2017

MATERIALS LABORATORY FACTUAL REPORT

Report No. 17-007

1. ACCIDENT

Place : Bluemont, Virginia
Date : October 23, 2015
Vehicle : Piper PA-32-260, N43249
NTSB No. : ERA16LA022
Investigator : Heidi Kemner, AS-ERA

2. COMPONENTS EXAMINED

Parts from a #3 cylinder assembly

3. DETAILS OF THE EXAMINATION

On October 23, 2015, a Piper PA-32-260 experienced a total loss of engine power and the pilot performed a forced landing to a field near Bluemont, Virginia. After the engine teardown, parts from the number 3 cylinder assembly were sent to the NTSB Materials Laboratory for further examination.

Figure 1 displays the parts received from the accident cylinder assembly. Of note in this investigation were the cylinder and the piston. The piston is shown in profile from the pin hole sides in Figures 2a and 2b. One of the sides of the piston exhibited a wear scar about the pin hole. The lines within the wear scar on the piston were consistent with reciprocating rubbing along the axis of the cylinder.

The piston pin was removed and is shown in Figure 3. The pin did not exhibit deformation, but it did exhibit some superficial circumferential wear scars, consistent with rotation inside the piston crown.

The outer surfaces of the cylinder were relatively undamaged, as shown in Figure 1. The inside of the cylinder contained some loose deposits, visible near the valves in Figure 4. These same deposits were found in the exhaust port past the valve. These deposits were not observed in the intake port.

Of note on the inside walls of the cylinder was the presence of the brown-colored compounds, visible in Figures 4 through 6. These deposits were consistent iron oxide or rust. The location of the iron oxide was in the outer quarter of the inner cylinder wall, on one side (or 180°) of the cylinder.

Another feature on the inner cylinder wall was the presence of a circular wear scar, shown in Figures 5 and 6. The size and shape of the wear scar was consistent with the shape of piston pin plug. There was a lack of corrosion in the circular wear region. These features suggest that the corrosion of the cylinder wall was present before the wear or rubbing between the piston assembly and the cylinder occurred.

Additional deposits were found adhered to the inner walls of the cylinder farther inside the cylinder. Some of these deposits are illustrated in Figure 7.

Erik Mueller
Materials Research Engineer

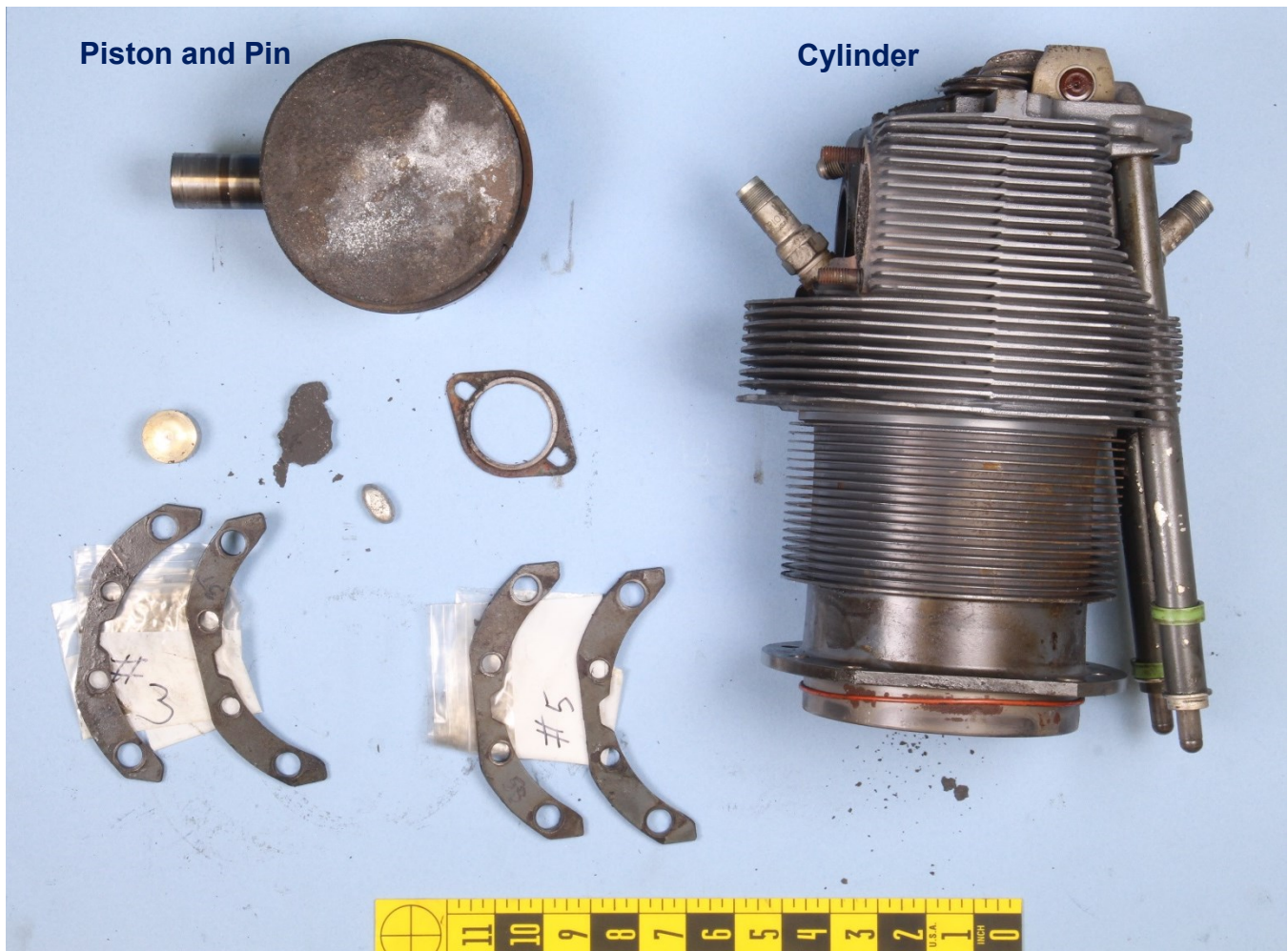


Figure 1 – The components of the cylinder assembly, as received.

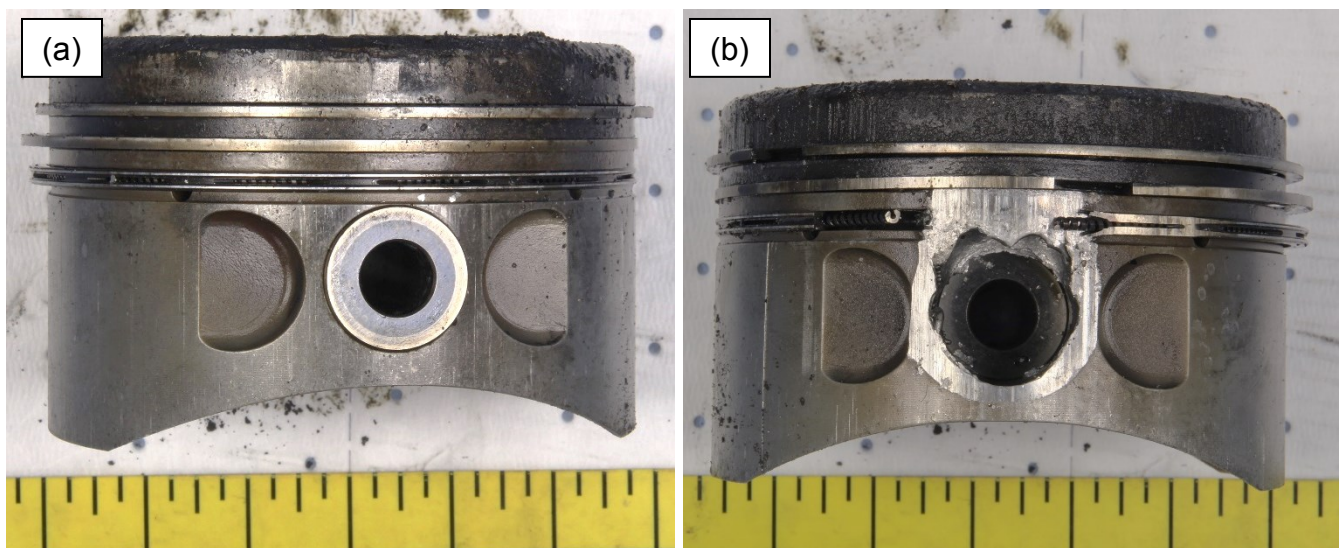


Figure 2 – The piston crown and pin from (a) the undamaged side and (b) the damaged side exhibiting a wear scar.

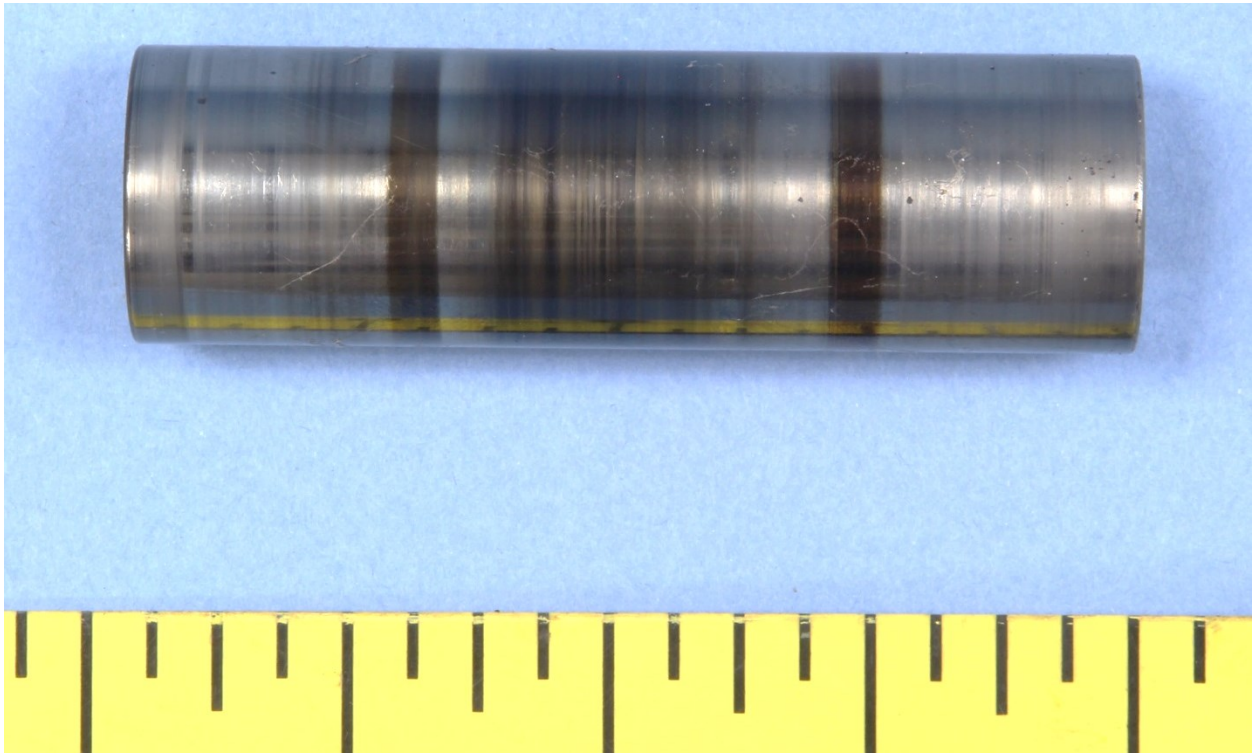


Figure 3 – The piston pin, after removal and cleaning.



Figure 4 – The inside of the cylinder, as received, showing the deposits near the valves. The area on the left shows indications of corrosion and wear (boxed area).

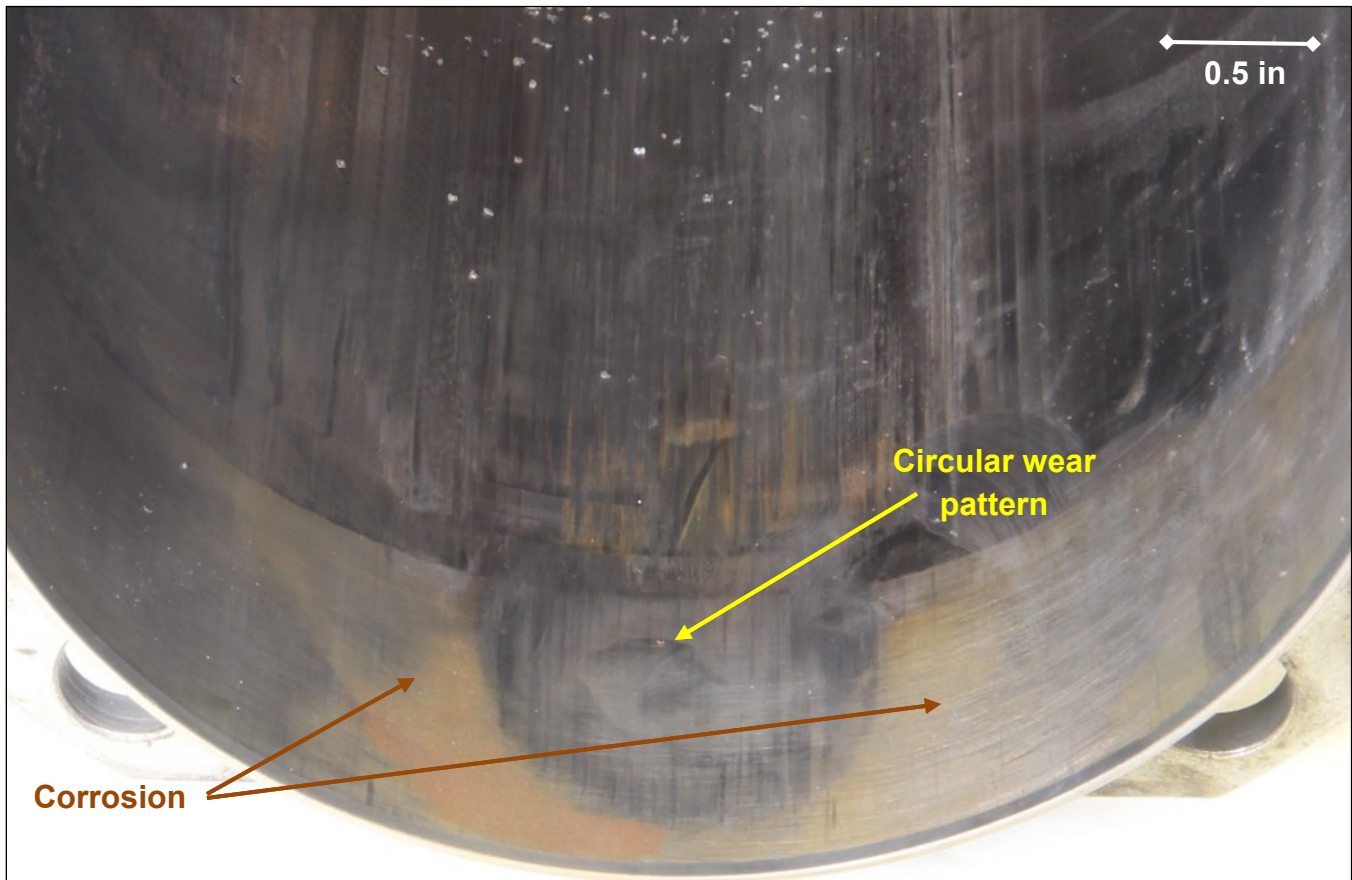


Figure 5 – The boxed area in Figure 4, rotated to show the corrosion and the circular worn area.

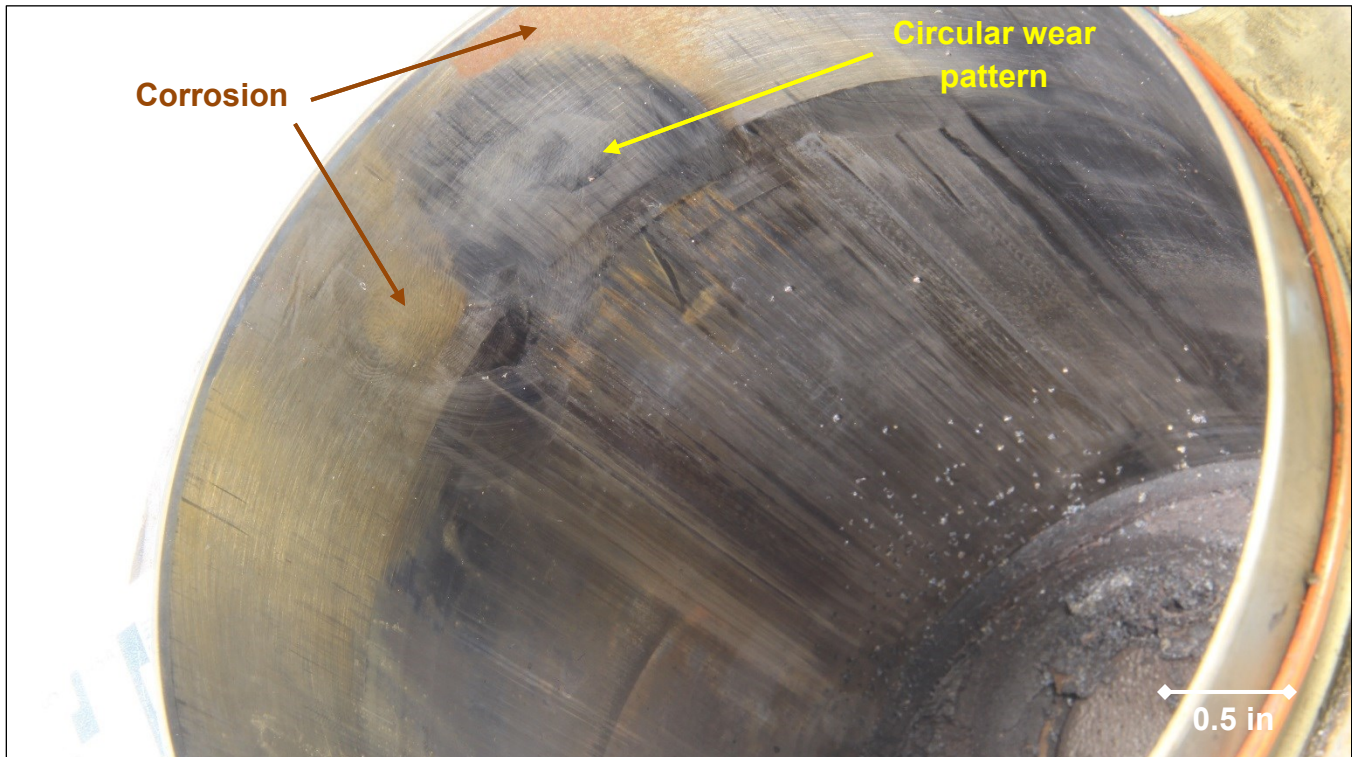


Figure 6 – The boxed area in Figure 4, rotated to show the corrosion and the circular worn area.

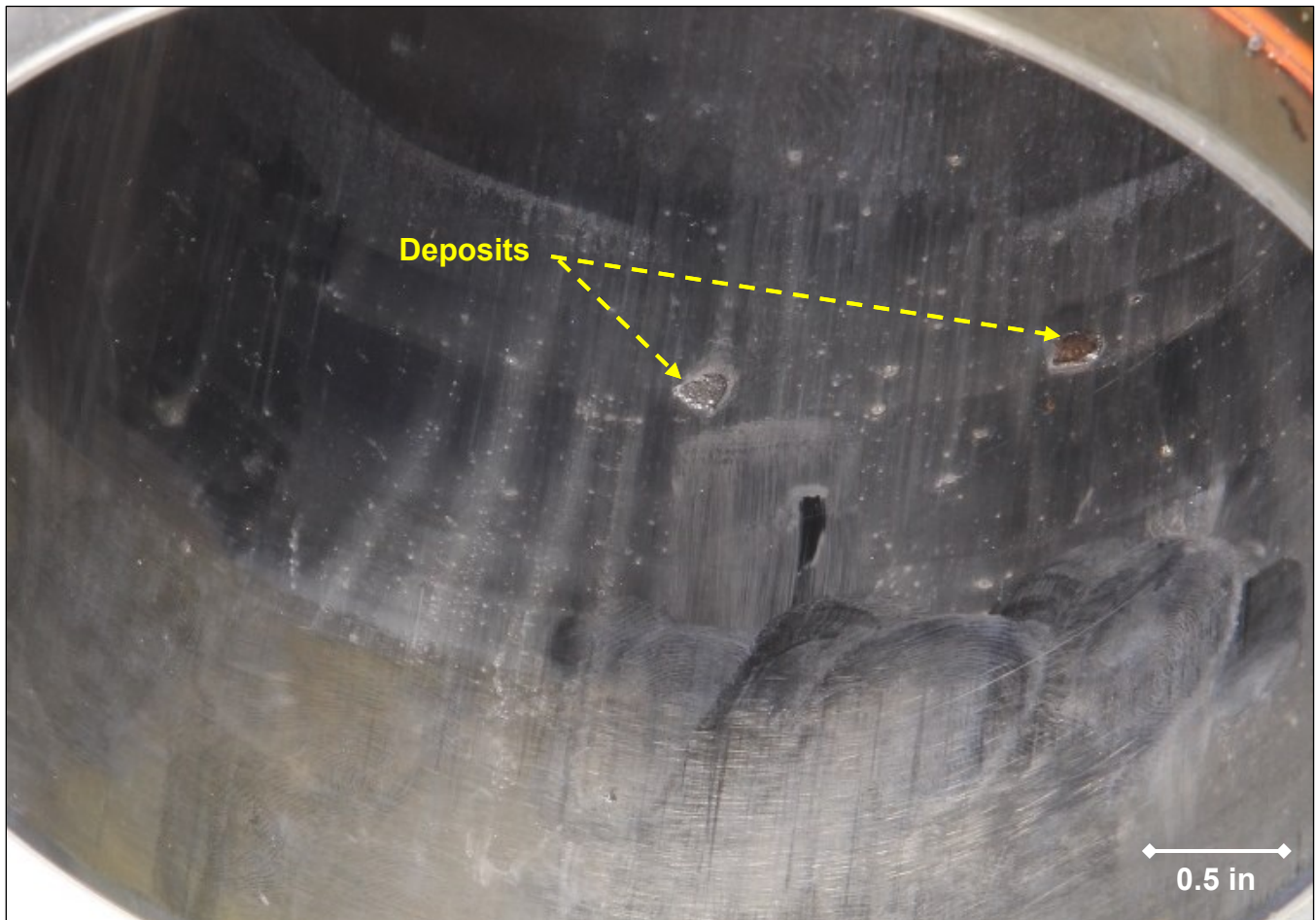


Figure 7 – The inside of the cylinder, rotated 180° from Figure 5, showing two deposits on the inner surface.