

NATIONAL TRANSPORTATION SAFETY BOARD

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



April 1, 2021

MATERIALS LABORATORY FACTUAL REPORT

Report No. 21-024

A. ACCIDENT INFORMATION

Place : Selma, AL
Date : June 10, 2020
Vehicle : Piper PA-32RT-300T, N543GS
NTSB No. : ERA20LA212
Investigator : Heidi Kemner (AS-ERA)

B. COMPONENTS EXAMINED

Connecting rod journal bearings, camshaft, oil suction screen with debris.

C. DETAILS OF THE EXAMINATION

Four connecting rod journal bearings were submitted for examination, as shown in Figures 1 and 2. The outer diameter (OD) of each bearing half was labeled with the mating crankshaft journal location of 1, 2, 3, or 4, but whether each bearing was in the cap or rod position was not indicated.

There was extensive damage to all the submitted bearings. Circumferential score marks and heavy wear were visible on the inner diameter (ID) of the bearing halves. Galling and displaced material were observed on most of the IDs, with the worst galling damage on the ID of bearing #3, details of which are shown in digital microscope images in Figure 3. Discoloration due to overheating was also present on the journal IDs. No evidence of remaining Babbitt material was observed on the ID surfaces.

The bearing halves had material pushed out of the ID onto the sides, resulting in thinning of the bearing walls and widening of the bearing widths. The deformed shape and displaced material were worst on bearings #3 and #4. Scuff marks and rub damage were observed on the bearing ODs. Bearing #3 also had a channel gouged into the OD, as seen in the top left image of Figure 2.

Several pieces of connecting rod were submitted and are shown in Figure 4. The pieces were extremely deformed and had heavy smearing damage.

The journal bearings and connecting rod pieces had damage consistent with high temperatures, likely due to oil starvation.

The camshaft was submitted separated adjacent to one cheek. Only 1 half of the fractured camshaft was submitted. The fracture surface spiraled circumferentially around the shaft diameter and had shear lips present around half of the circumference. The separation of the camshaft was consistent with torsional overstress.

The oil suction screen and debris found within it were also submitted, as shown in the top photo of Figure 6. The debris was sorted using a magnet and is shown grouped in the bottom photo. The magnetic debris weighed 9.8 grams, while the non-magnetic debris weighed 3.1 grams. Thus, approximately 75% of the debris was metallic and most of it likely resulted from damage to the hardware during the accident. The remaining 25% of the debris was not metallic.

Adrienne V. Lamm
Materials Engineer

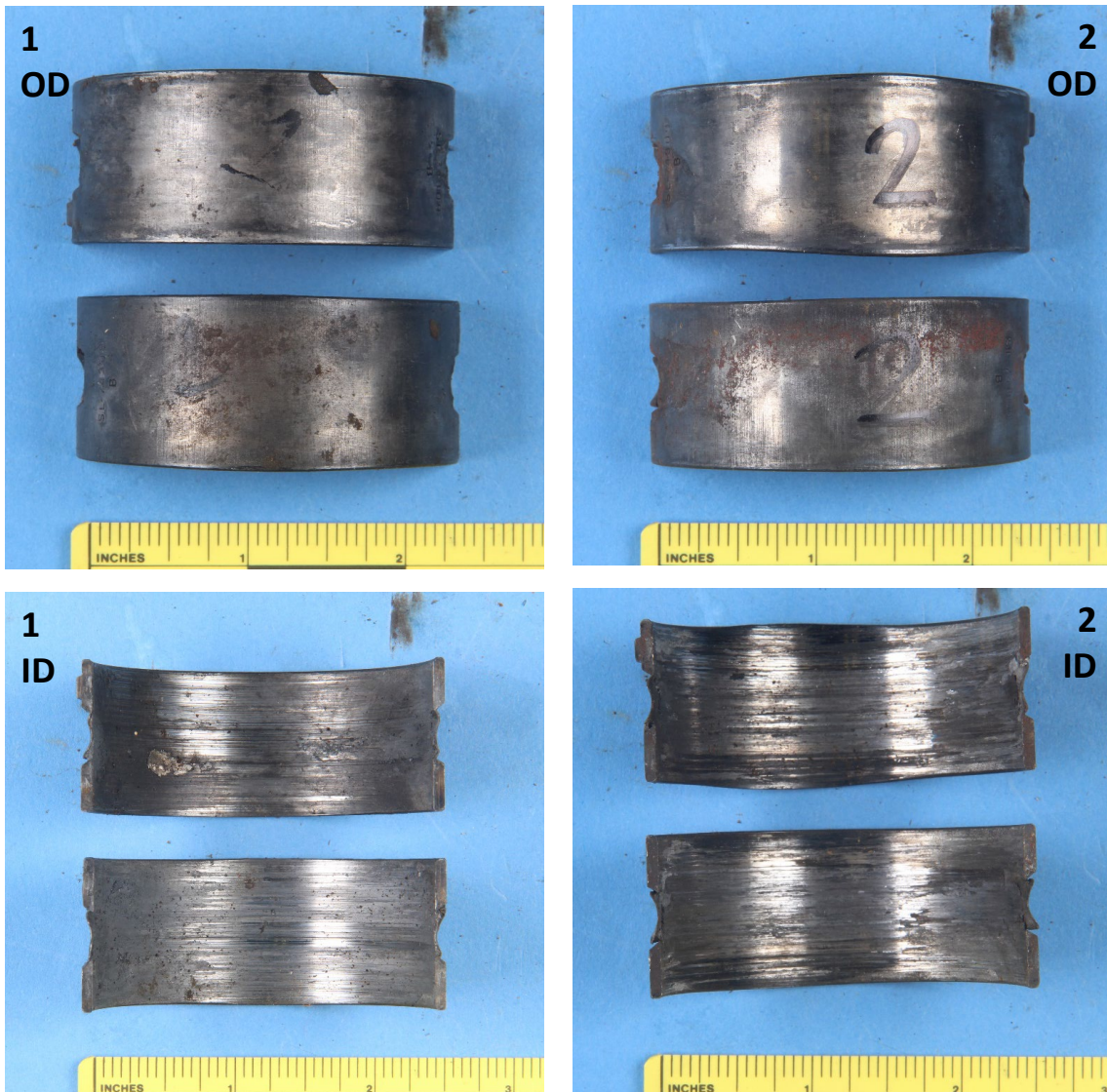


Figure 1: Overall photos showing bearings #1 (left) and #2 (right). The top photos show the outer diameter and the bottom photos show the inner diameter of the bearing halves.

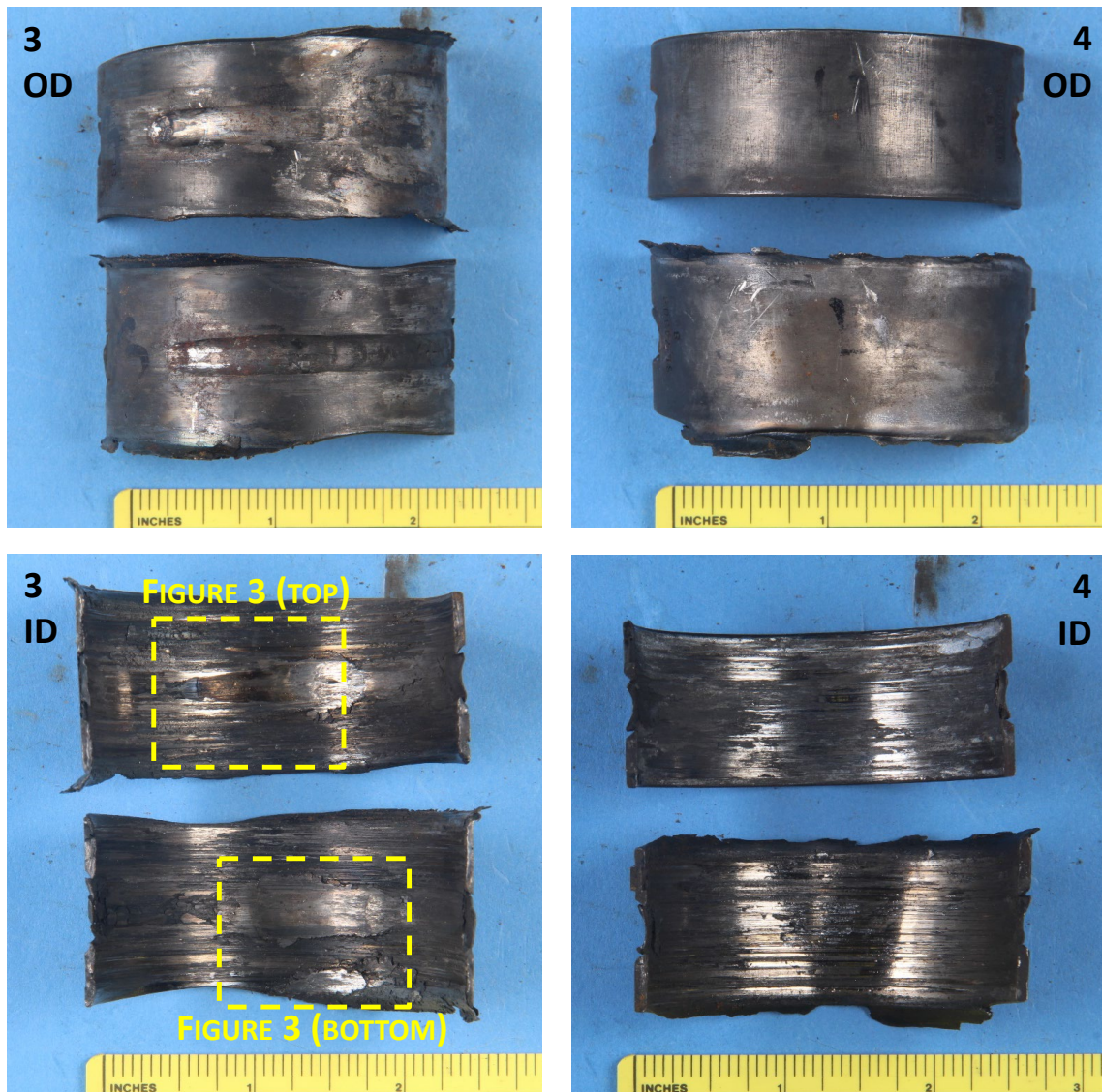


Figure 2: Overall photos showing bearings #3 (left) and #4 (right). The top photos show the outer diameter and the bottom photos show the inner diameter of the bearing halves.

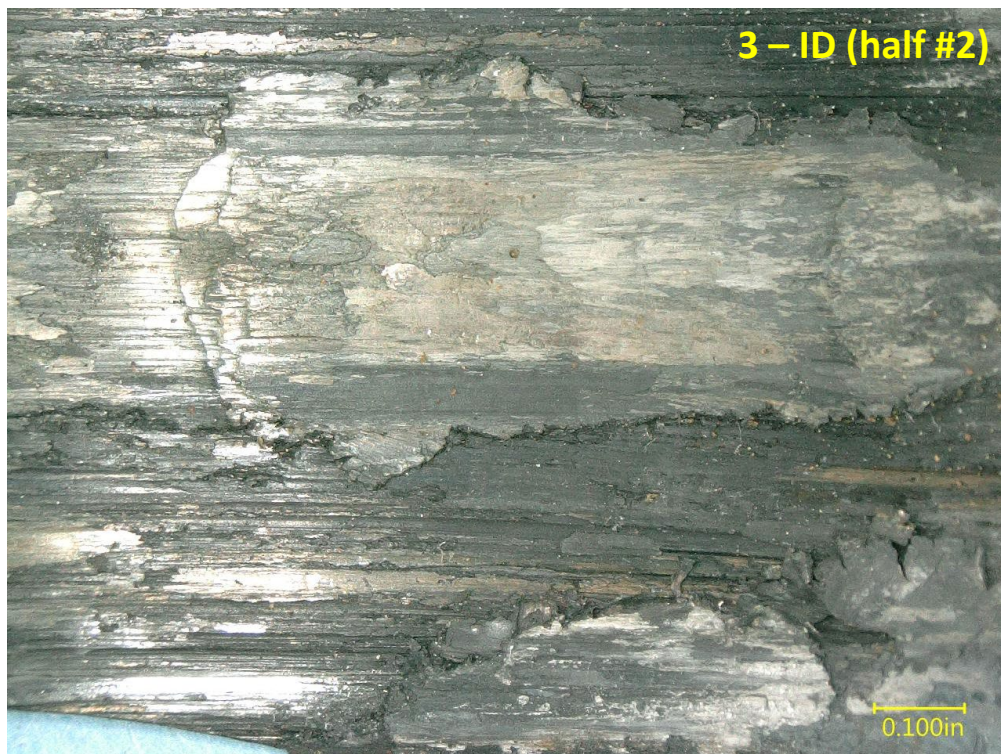
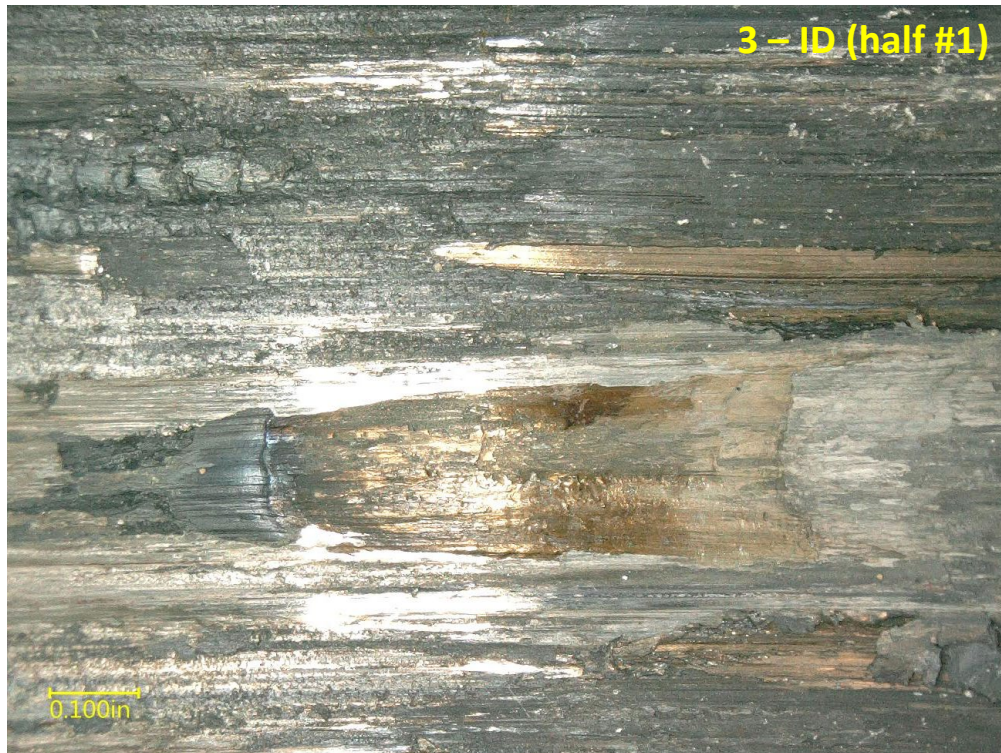


Figure 3: Digital microscope images of the inner diameter surface on the two halves of bearing #3 in the areas indicated in Figure 2.



Figure 4: Overall photos showing the two sides of the connecting rod pieces.



Figure 5: Overall and close-up photos showing the separated camshaft. The bottom two photos show the fracture surface adjacent to one cheek.



Figure 6: Overall photos of the oil suction screen debris (top) as-received and (bottom) after sorting using a magnet.