

NATIONAL TRANSPORTATION SAFETY BOARD

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



March 4, 2020

MATERIALS LABORATORY FACTUAL REPORT

Report No. 20-001

A. ACCIDENT INFORMATION

Place : Williamsburg, VA
Date : 7/8/2018
Vehicle : Robinson R44
NTSB No. : ERA18FA187
Investigator : Douglas Brazy

B. COMPONENTS EXAMINED

Accessory section idler gears, crankshaft gear, crankshaft bolt and locking tab, oil pump housing and drive shaft (Figure 1).

C. DETAILS OF THE EXAMINATION

For this report references to “top side” and “bottom side” shall refer to the sides of components facing away from the crankcase and towards the crankcase respectively.

The crankshaft gear (Figure 2) exhibited a mostly stained and blackened appearance on the top side and a clean appearance on the bottom side. On the top side a gouge was observed in one area of the oil pump drive boss. This gouge was characterized by material displacement in a direction towards the bottom side. Examination of the gear teeth using a stereo microscope did not reveal any unusual wear patterns. A portion of the crankshaft dowel pin remained attached to the crankshaft gear (Figure 3). Examination of the dowel pin's fracture surface using a stereo microscope revealed features consistent with shear overstress.

The crankshaft gear bolt (Figure 4) had the following head marking “2247 HAP”. Examination of the threads using a stereo microscope did not reveal any unusual wear or other conditions that would affect the bolt's function. Some gouges were observed on the bolt head. These gouges were characterized by material displacement in a direction towards the crankshaft gear.

The crankshaft bolt locking tab (Figure 5) was not deformed and the bends in the tabs were in proper position to prevent rotation of the bolt in relation to the crankshaft gear. Examination of the locking tab using a stereo microscope did not reveal any features consistent with the bolt having rotated within the locking tab.

The left-hand idler gear (Figure 6) exhibited a blacked and stained appearance on both the top and bottom sides. Examination using a stereo microscope did not reveal any damage or unusual wear markings on any of the gear teeth. Examination of the gear's bore and bushing did not reveal any unusual wear. The left-hand idler gear's stud was not damaged and fit the gear bore allowing for rotation of the idler gear.

The right-hand idler gear (Figures 7, 8) exhibited a blackened and stained appearance on both the top and bottom sides. This idler gear exhibited multiple fractures. A portion of the top side of the gear had been displaced towards the bottom side. Examination of the fractures using a stereo microscope revealed features consistent with bending overstress fractures. Examination of the gear teeth still present on the gear did not reveal any damage or unusual wear patterns. A portion of the right-hand idler gear stud had fractured and remained in the gear's bore. Examination of the gear stud's fracture surface revealed fracture features consistent with bending overstress.

The oil pump drive shaft (Figure 9) exhibited a band of gold and blue thermal discoloration on the shank near the yoke end. One of the halves forming the drive shaft yoke had fractured. Examination of the fracture surface using a stereo microscope revealed fracture features consistent with a bending overstress fracture.

The oil pump housing (Figure 10) was made from aluminum. It exhibited a mostly blackened appearance on the top side and partially blackened on the bottom side. The oil pump housing had fractures along the two of the three bolt hole bores for the attachment bolts. The deformation of the oil pump housing and the fractures in the bolt hole bores were consistent with bending overstress. The oil pump housing along with the drive shaft are depicted in figure 11.

Joseph Panagiotou
Fire Protection Engineer

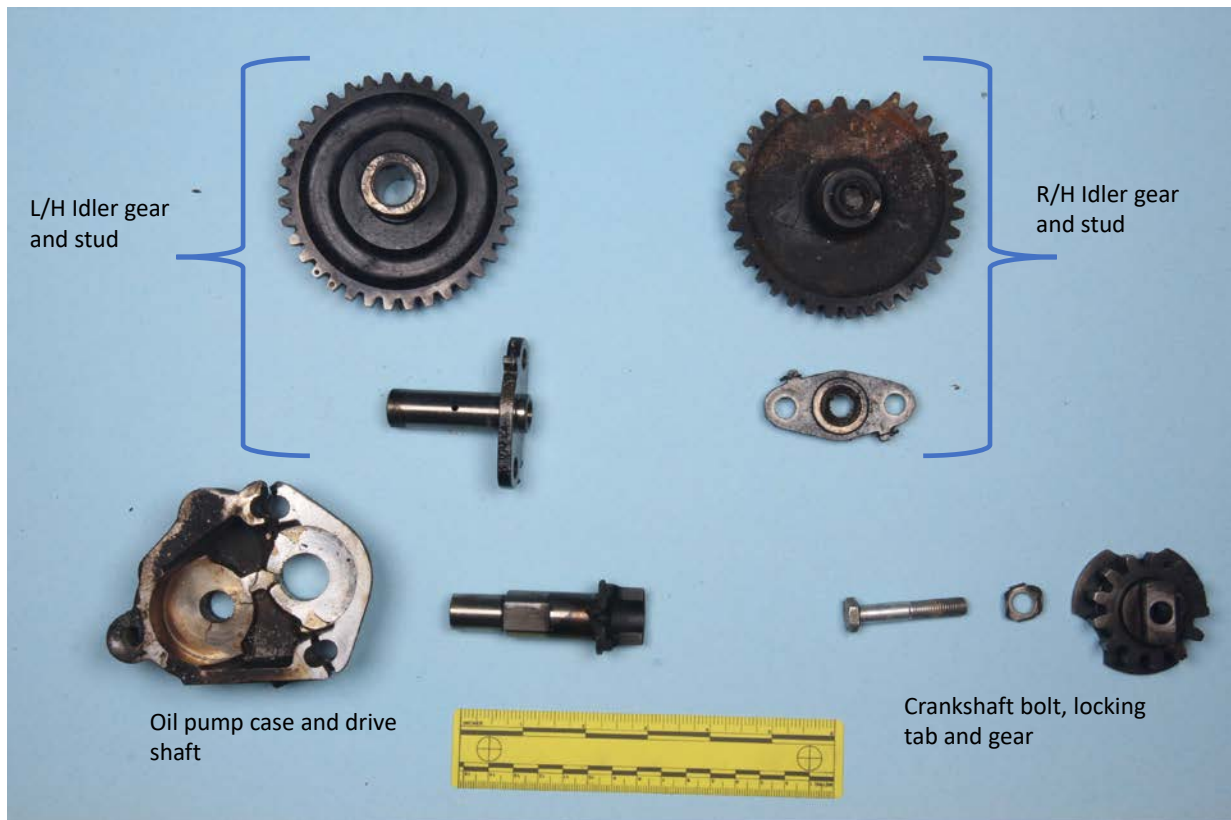


Figure 1: Accessory section gears and components as received.

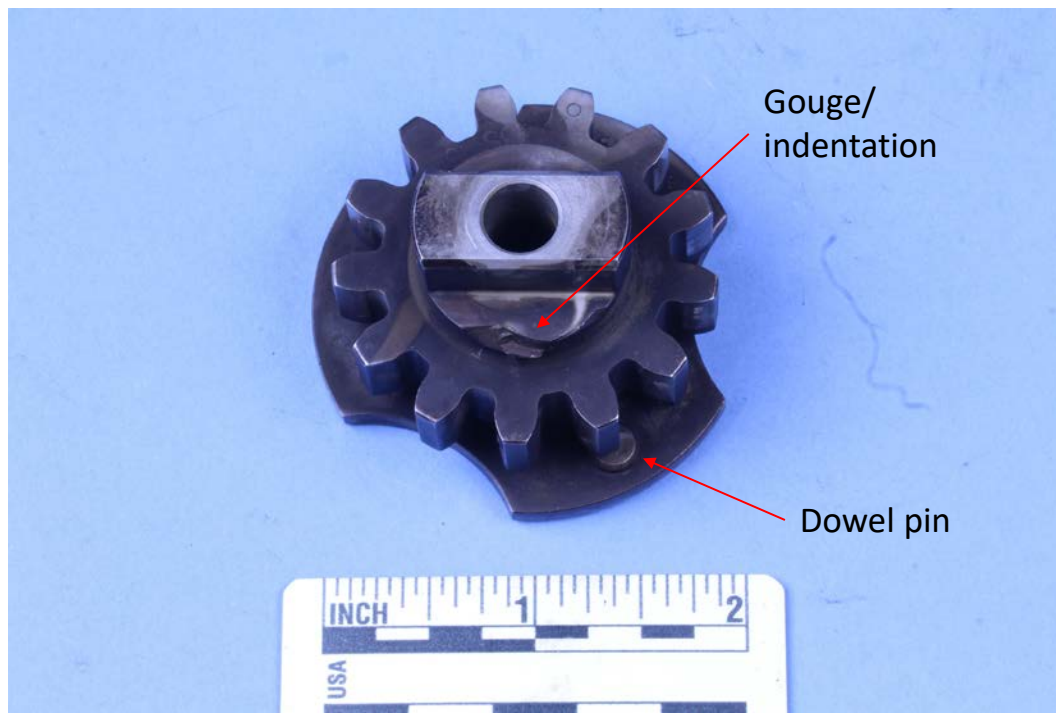


Figure 2: Crankshaft gear (top side).



Figure 3: Crankshaft gear (bottom side).



Figure 4: Crankshaft bolt.

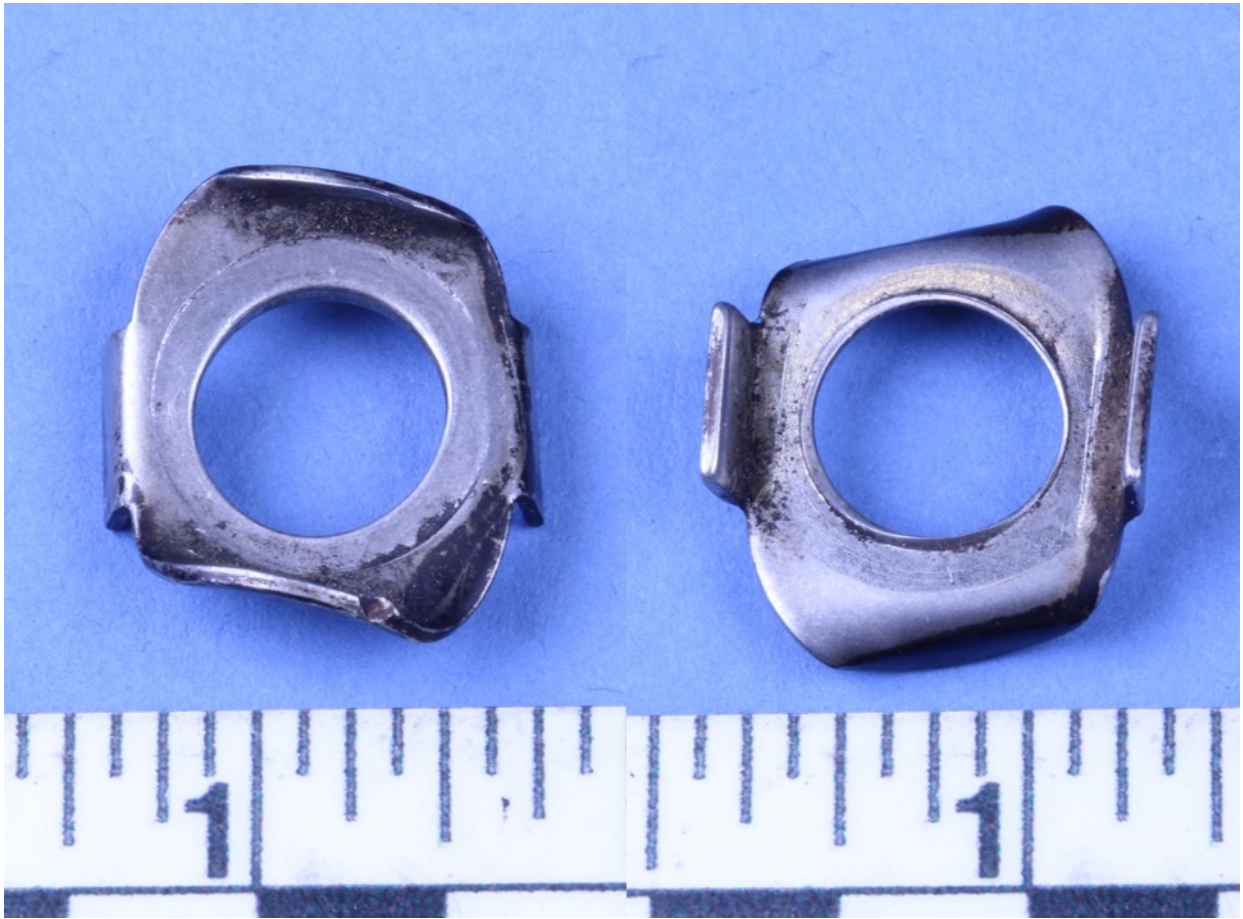


Figure 5: Both sides of the crankshaft bolt locking tab.

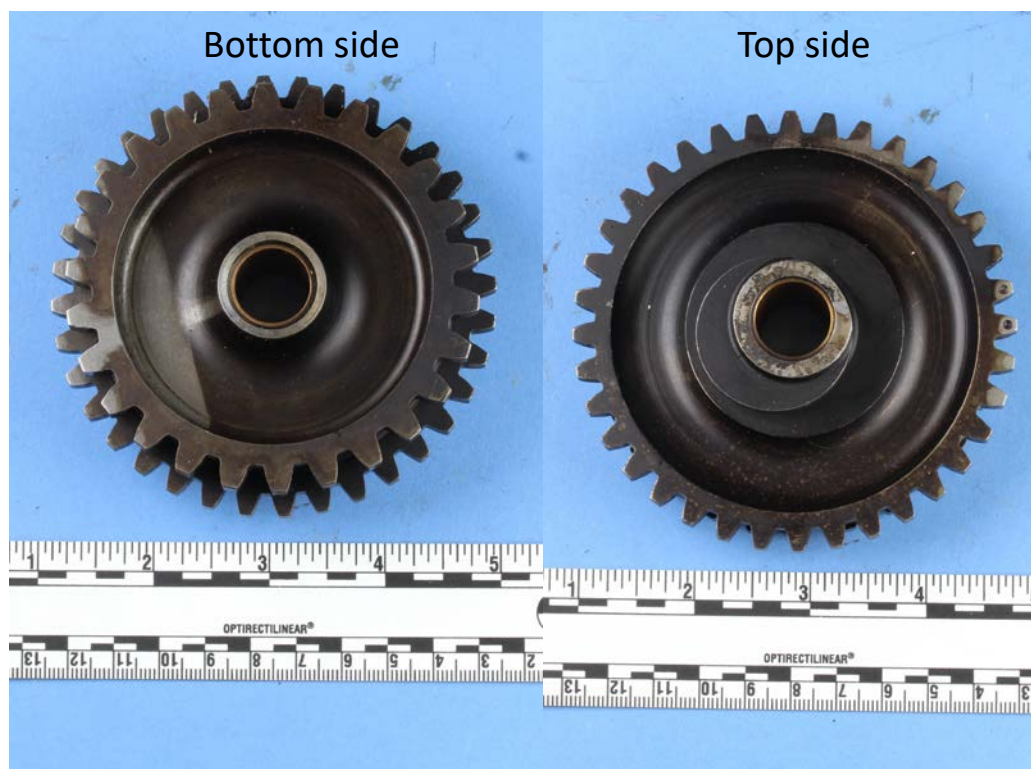


Figure 6: Left-hand idler gear.



Figure 7: Right-hand idler gear (top side).

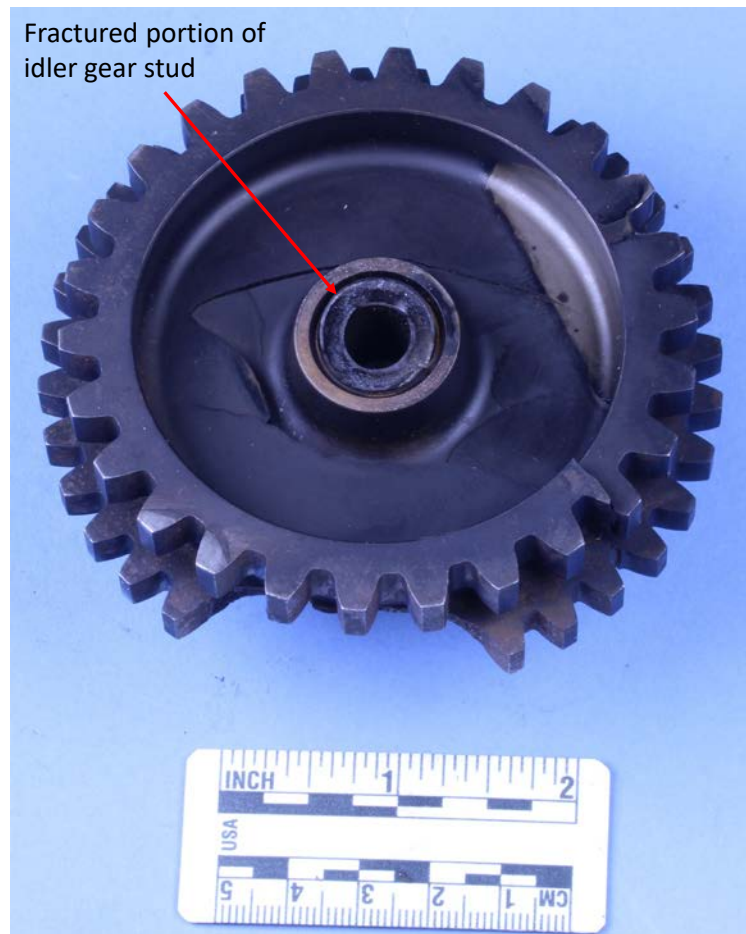


Figure 8: Right-hand idler gear (Bottom side).



Figure 9: Oil pump drive shaft with fractured yoke.



Figure 10: Oil pump housing.



Figure 11: Oil pump housing and drive shaft.