

NATIONAL TRANSPORTATION SAFETY BOARD

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



April 13, 2022

MATERIALS LABORATORY FACTUAL REPORT

Report No. 22-023

A. ACCIDENT INFORMATION

Place : Forkston, Pennsylvania
Date : April 22, 2021
Vehicle : Robinson Helicopter R44, N4055N
NTSB No. : ERA21LA191
Investigator : Ralph Hicks, ASI – ERA

B. COMPONENTS EXAMINED

Crankshaft Gear, gear retaining bolt, and lockplate.

C. DETAILS OF THE EXAMINATION

A crankshaft gear, retaining bolt, and lockplate were submitted to the NTSB Materials Laboratory for examination as shown in figures 1 – 3, respectively. By design, the crankshaft gear contains a hole in its pilot flange that interfaces with an alignment dowel that is press fit into a counterbored recess on the aft end of the crankshaft. The alignment dowel had fractured, and the separated piece of the dowel was captured in the pilot flange hole.

All components (except the tip of the bolt) had dark tinted surfaces, including the dowel fragment's fracture surface, consistent with exposure to elevated temperatures. The tip of the bolt had a shiny appearance and stripped threads, consistent with damage during extraction of the bolt. All surfaces were examined for indications of burnishing, rubbing, or wear, but none were found. The dowel's fracture surface, shown in figure 4, had a flat featureless appearance, with no apparent crack arrest marks. Shear lips were observed along the radially inward and outward edges of the fracture surface. The chamfer around the pilot flange hole exhibited deformation and metal transfer at the leading edge (the edge that leads during rotating of the crankshaft/gear assembly) as indicated in figure 4. The features were consistent with an overstress fracture of the dowel in shear and bending.

Donald Kramer, Ph.D.
Sr. Materials Engineer



Figure 1: Images of the crankshaft gear as received. a) aft-facing side and b) forward-facing (crankshaft-facing) side.



Figure 2: Image of the crankshaft bolt as received.



a)



b)

Figure 3: Images of the lockplate; a) gear-facing side and b) bolthead-facing side.

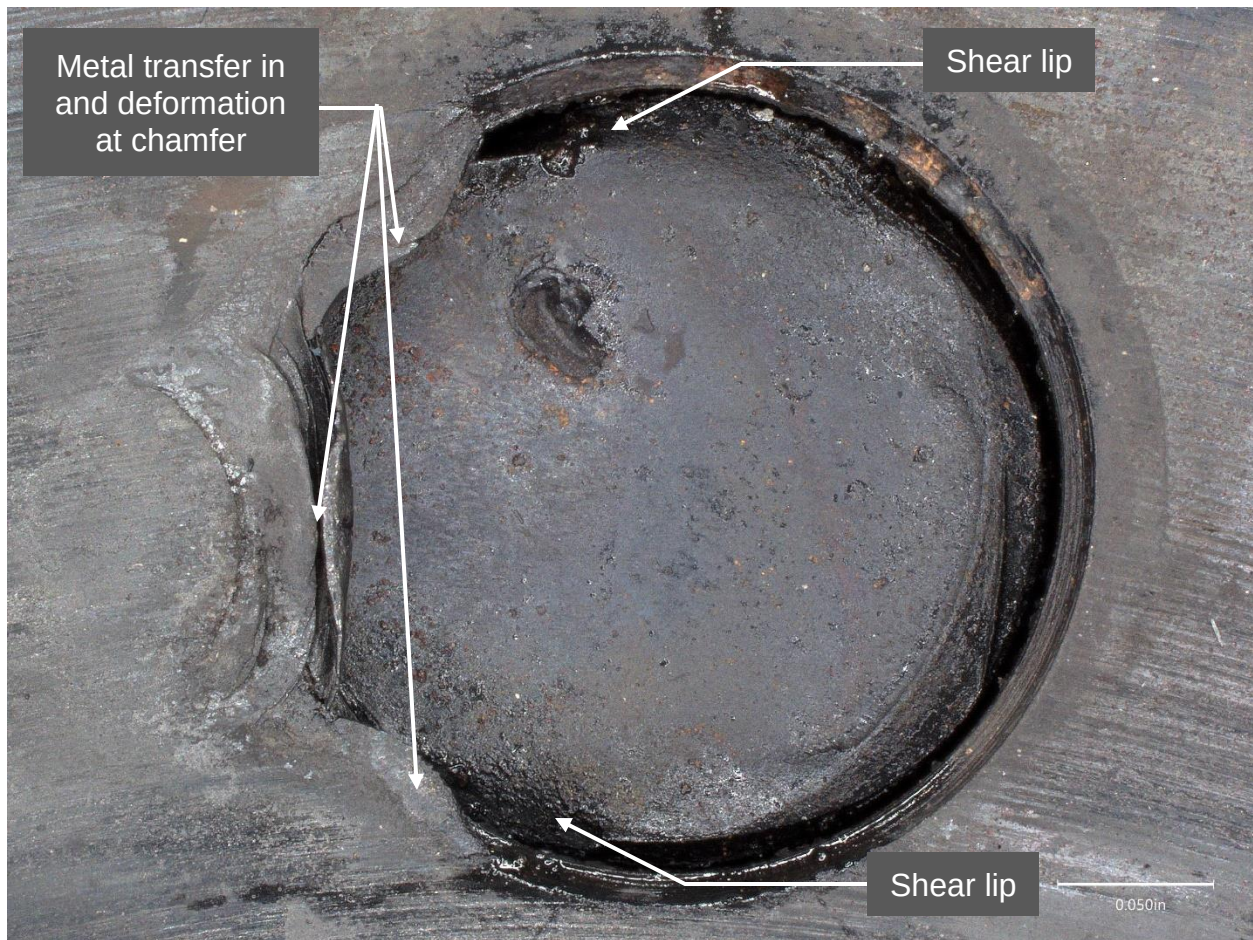


Figure 4: Image of the alignment dowel's fracture surface.