

NATIONAL TRANSPORTATION SAFETY BOARD

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



August 3, 2022

MATERIALS LABORATORY FACTUAL REPORT

Report No. 22-058

A. ACCIDENT INFORMATION

Place : Panama City, Florida
Date : June 6, 2022
Vehicle : Piper PA-28RT-201, N160LL
NTSB No. : ERA22FA261
Investigator : Heidi Kemner, AS-ERA

B. COMPONENTS EXAMINED

Oil pressure sensor with copper tube and fittings.

C. DETAILS OF THE EXAMINATION

The oil pressure sensor with associated copper line and fittings are shown as received in figure 1. The copper line was fractured at the supply-side nut as indicated in figure 1. The supply-side nut had been disassembled from the 45-degree elbow fitting before the parts were submitted for laboratory examination.

The nut side of the fracture was cleaned in a solution of Alconox detergent and water using an ultrasonic cleaner followed by an alcohol rinse. An overall view of the cleaned fracture surface is shown in figure 2 as imaged using a Keyence 7000 microscope with depth-up focus and HDR image settings. The fracture surface had a somewhat rough appearance, and much of the surface was damaged. However, most of the fracture occurred on a flat plane perpendicular to the tube axis, and a darker region with a smooth curving boundary was observed at one side identified as the origin area as indicated with a bracket in figure 2.

Next, the cleaned fracture was placed in a scanning electron microscope (SEM). Feathery transgranular features with fine striations were observed across much of the fracture surface, and an SEM image showing fatigue fracture features typical for the fracture surface in the fatigue region is shown in figure 3. Fatigue features emanated from the origin area indicated with a bracket in figure 3 and extended to the boundary approximately indicated with dashed lines. The remainder of the fracture surface showed a change in fracture plane with dimple features on the fracture surface, features consistent with ductile overstress fracture of the remaining ligament of the tube wall.

Matthew R. Fox, Ph.D.
National Resource Specialist - Materials

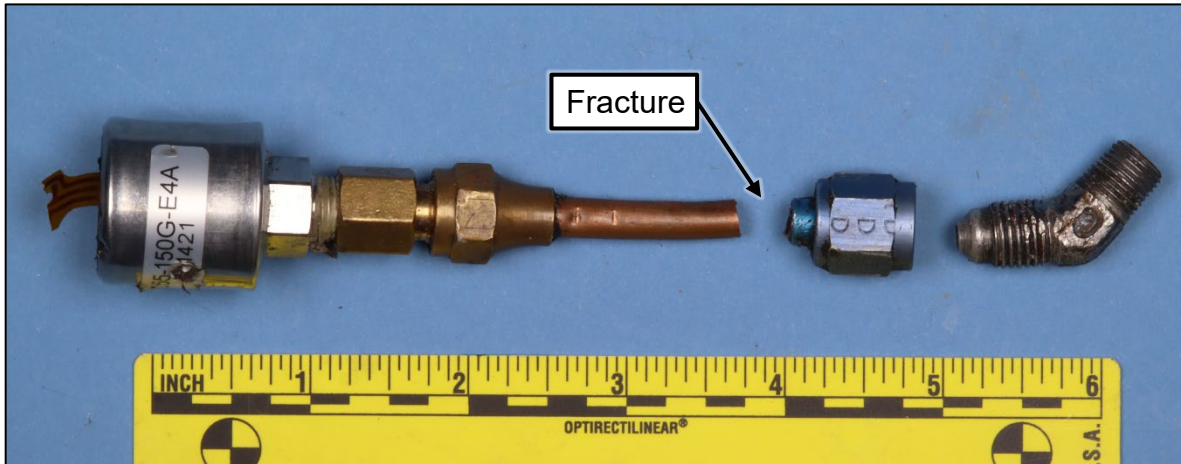


Figure 1. Submitted components including fractured oil pressure sensor line.

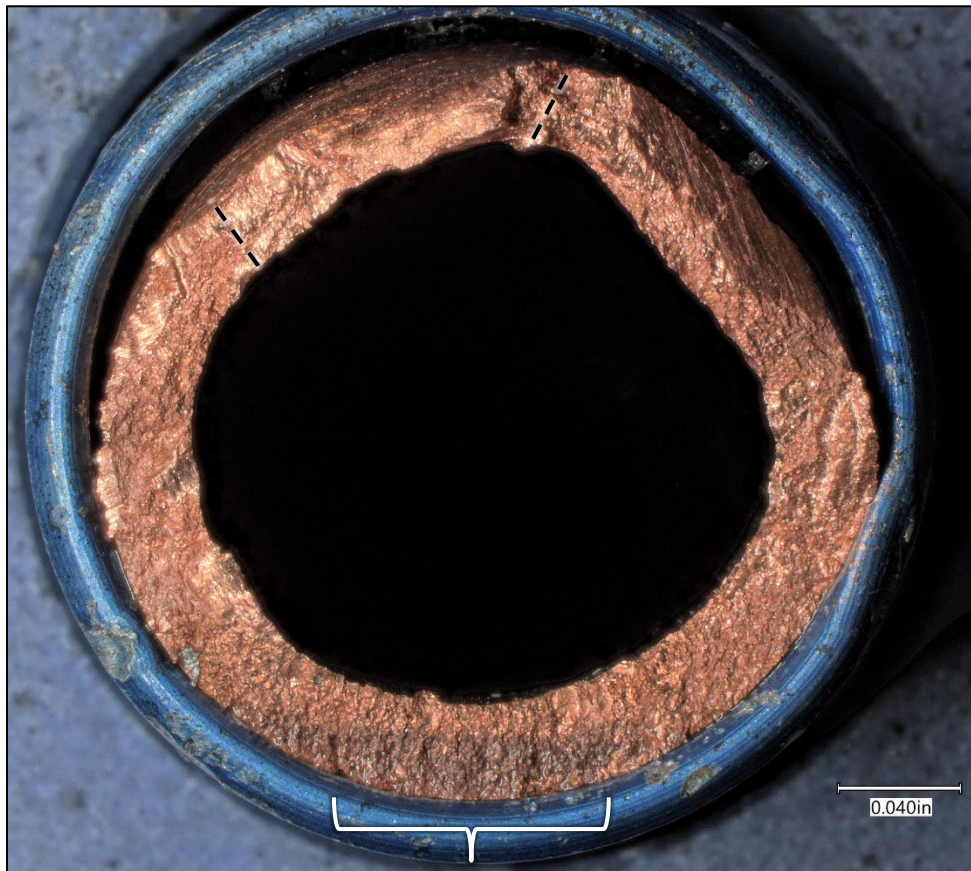


Figure 2. Oil pressure sensor line fracture surface after cleaning. Dashed lines indicate the approximate fatigue boundary from the origin area indicated with a bracket.



Figure 3. SEM image of typical fatigue striations observed within the fatigue region. An arrow indicates the direction of fatigue propagation in the image.