

NATIONAL TRANSPORTATION SAFETY BOARD

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

January 28, 2020



MATERIALS LABORATORY FACTUAL REPORT

Report No. 19-086

A. ACCIDENT INFORMATION

Place : Independence, Oregon
Date : June 12, 2019
Vehicle : Cessna 140
NTSB No. : WPR19LA169
Investigator : Tealeye Cornejo

B. COMPONENTS EXAMINED

Fractured landing gear axle assembly.

C. DETAILS OF THE EXAMINATION

Figure 1 shows a photograph of the fractured landing gear axle assembly. The landing gear axle fractured at the transition radius between the longitudinal barrel (tube) portion and the plate portion. The plate portion was ultrasonic cleaned with Alconox, a detergent that removes iron oxide from ferrous metal. Scanning electron microscope (SEM) examination of the fractured plate portion revealed a fatigue crack emanating from multiple origins at the outer surface of the transition radius, in the area indicated by brackets "O" in figure 2 and bracket "O" in figure 3. The multiple origin fatigue crack extended approximately 0.7 inch circumferentially around the outer surface of the transition radius, and approximately 0.02 inch below the outer surface. Figure 4 shows typical fatigue striations within the fatigue crack region. The fatigue crack terminated in the general area indicated by a dashed line in figures 2 and 3. The fracture features outside of the fatigue region showed micro-void coalescence fracture features typical of overstress separation.

Frank Zakar
Senior Metallurgist

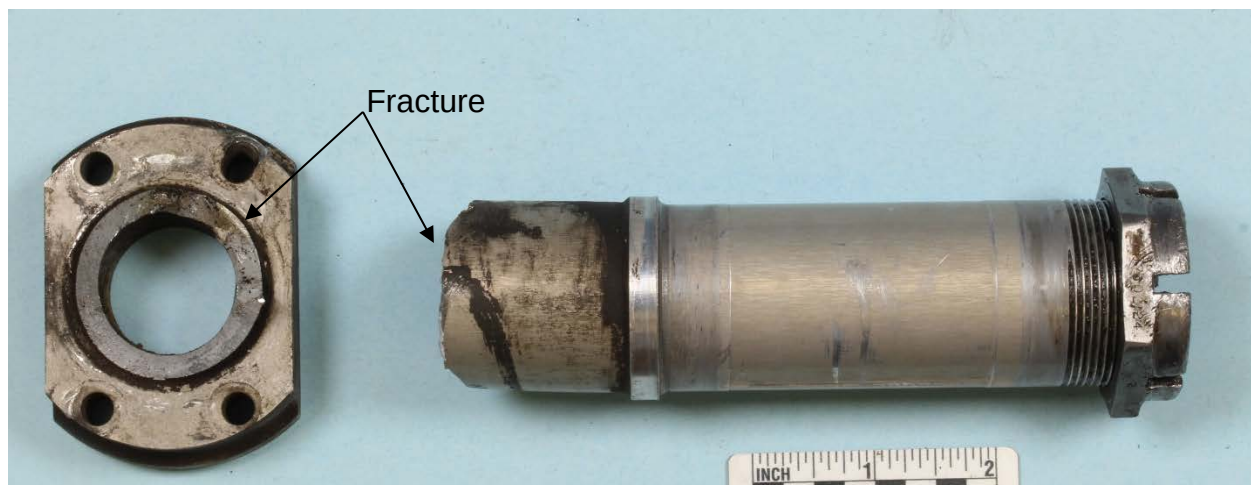


Figure 1. Fractured landing gear axle assembly.

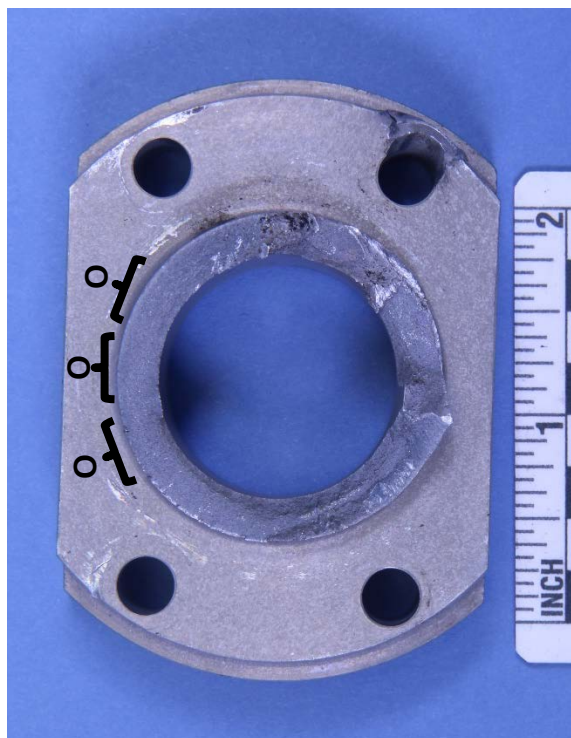


Figure 2. Overall view of one half of the fracture face (plate portion side) showing a fatigue crack that emanated from multiple origins at the outer surface of the transition radius between the flat plate portion and the longitudinal barrel portion, in the area indicated by brackets "O".

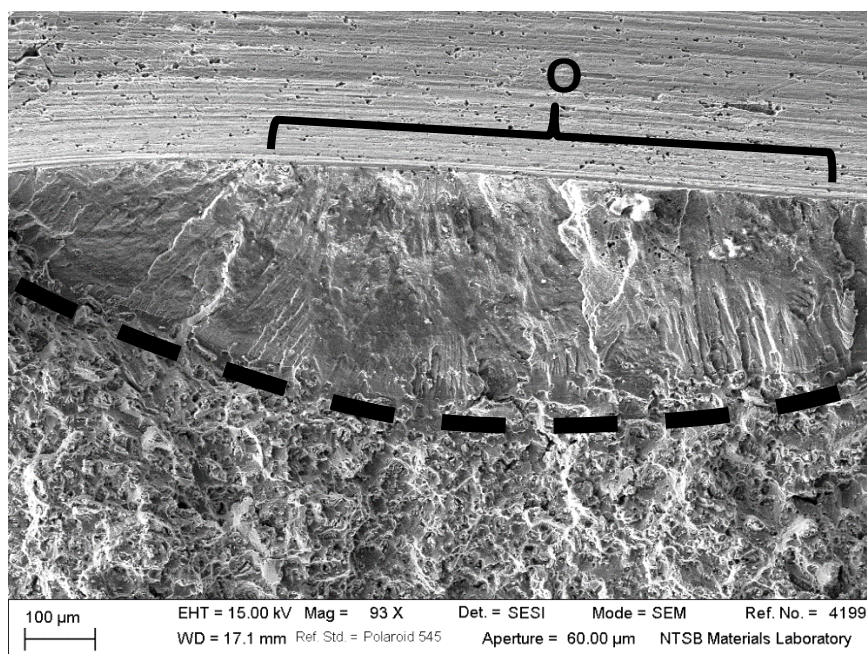


Figure 3. SEM photograph of a portion of the multiple origin fatigue crack that emanated from the outer surface of the axle at the transition radius in the area indicated by bracket "O". The fatigue crack extended to the general area indicated by a dashed line.

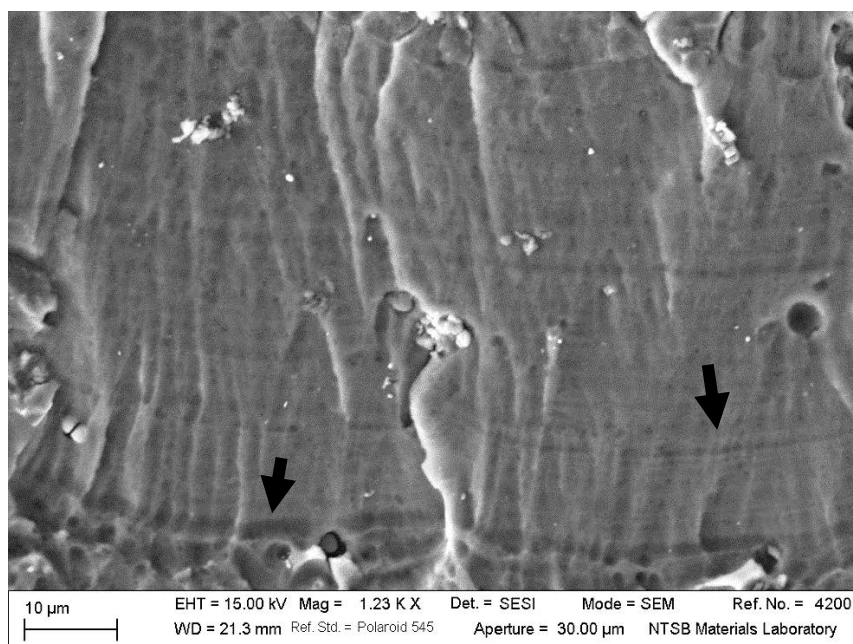


Figure 4. SEM photograph of typical fatigue striations that were found within the fatigue crack region. Fatigue crack propagating was in the general direction indicated by the arrows.