

NATIONAL TRANSPORTATION SAFETY BOARD

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



February 1, 2017

MATERIALS LABORATORY FACTUAL REPORT

Report No. 17-012

A. ACCIDENT INFORMATION

Place : Destin, Florida
Date : August 2, 2016
Vehicle : Cessna 414A, N2735A
NTSB No. : ERA16FA279
Investigator : Timothy W. Monville, ASI-ERA

B. COMPONENTS EXAMINED

Union and Fuel Line from Left Auxiliary Fuel Pump.

C. DETAILS OF THE EXAMINATION

The as-received fuel line and union are displayed in figure 1. The line was reportedly found disconnected from the union. The fuel line was made up of a solid aluminum tube, about 0.5 inch inner diameter with flared ends and aluminum AN 818 nuts. The tube had a large dent at about mid length. The union was marked AN815 and D denoting an aluminum flared tube union with no safety wire holes. Dimensions of the tube nuts and union were consistent with AN818-10 components.

The threads of the union mating with the fuel tube were mostly intact and undamaged except for portions of first thread (partial) and the second (first full) threads. Magnified examination found that an approximate 90 degree arc of the first partial thread was fractured as shown in the upper view of figure 2. Examination found features consistent with overstress shearing of the thread toward the tube.

Close inspection of the second thread uncovered fretting wear scars to the flare side flank of the thread, as shown in the lower view of figure 2. The fretting wear damage completely penetrated the blue anodize coating over an approximate a 90 degree arc.

The flare portion of the union mating with the fuel line was undamaged except in an area where the blue anodized coating was worn through, see figure 2. Magnified examinations revealed features within the wear indicative of fretting wear.

The mating nut threads were mostly undamaged except the first (partial) and second (first full) threads at the open end as shown in figure 3. The partial thread showed crest damage around about 270 degrees. The thread was overstress sheared toward the union in a portion of this region. The outward facing flank of the second thread had fretting wear damage in two locations, as noted in figure 3. The relative locations of the fretting wear on the thread flank approximates the location of the fretting wear scars noted on the threads of the union.

The internal surface of the fuel line flare had non-distinct contact patterns around most of the surface and an area of fretting wear, as denoted on figure 3. The shape of the fretting scars matched the general shape of the fretting scars previously noted on the flair of the union.

Joe Epperson
Senior Metallurgist

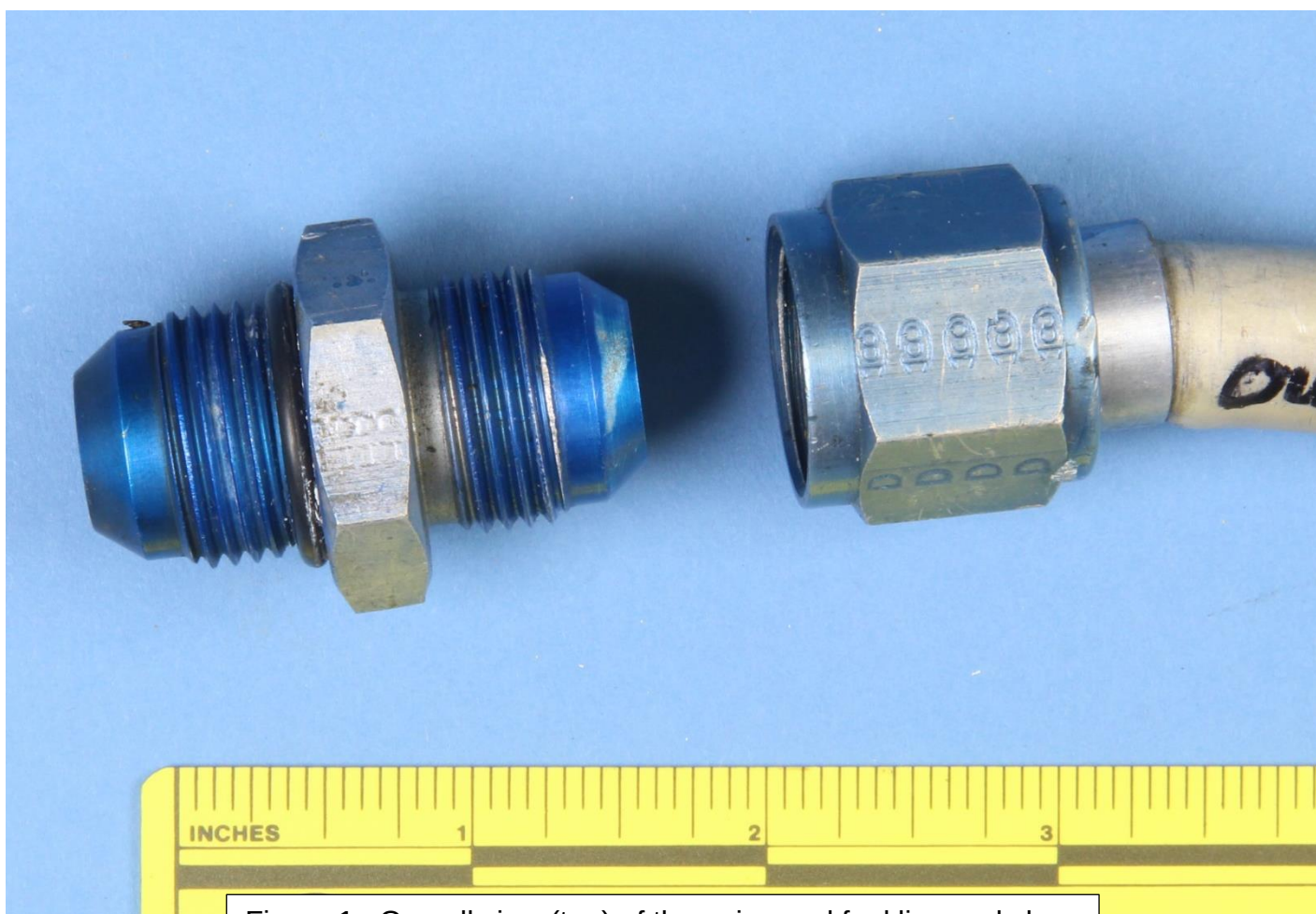


Figure 1. Overall view (top) of the union and fuel line and close up of the nut and union (below).

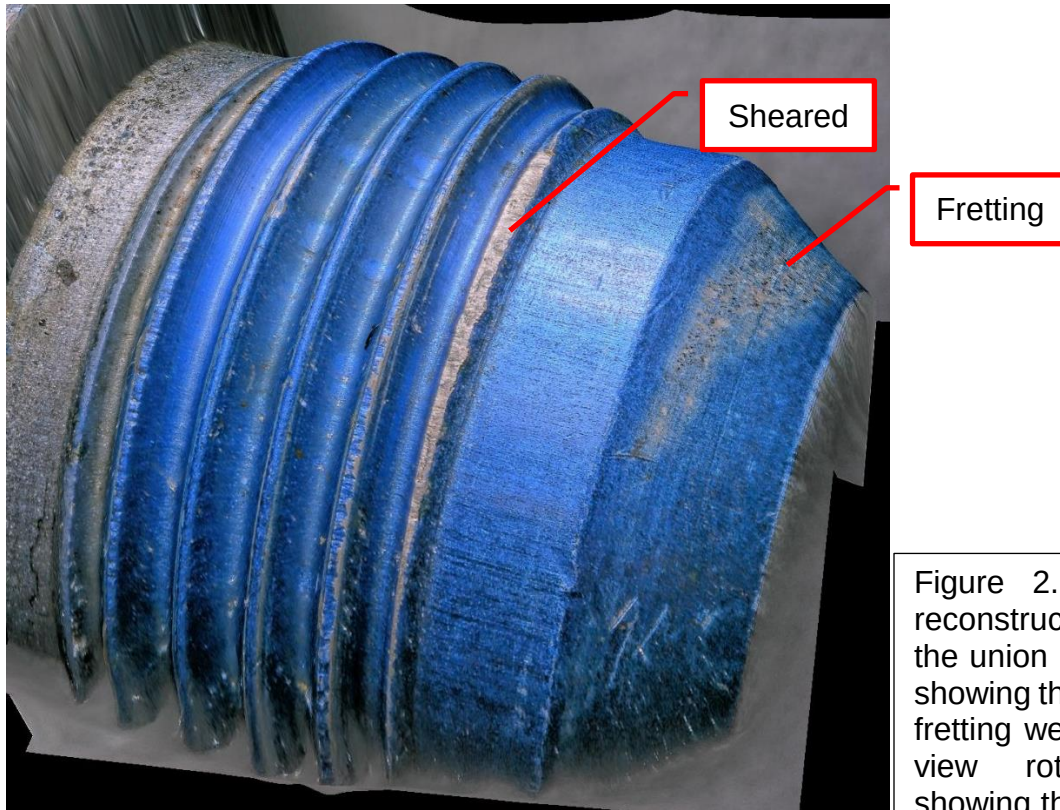
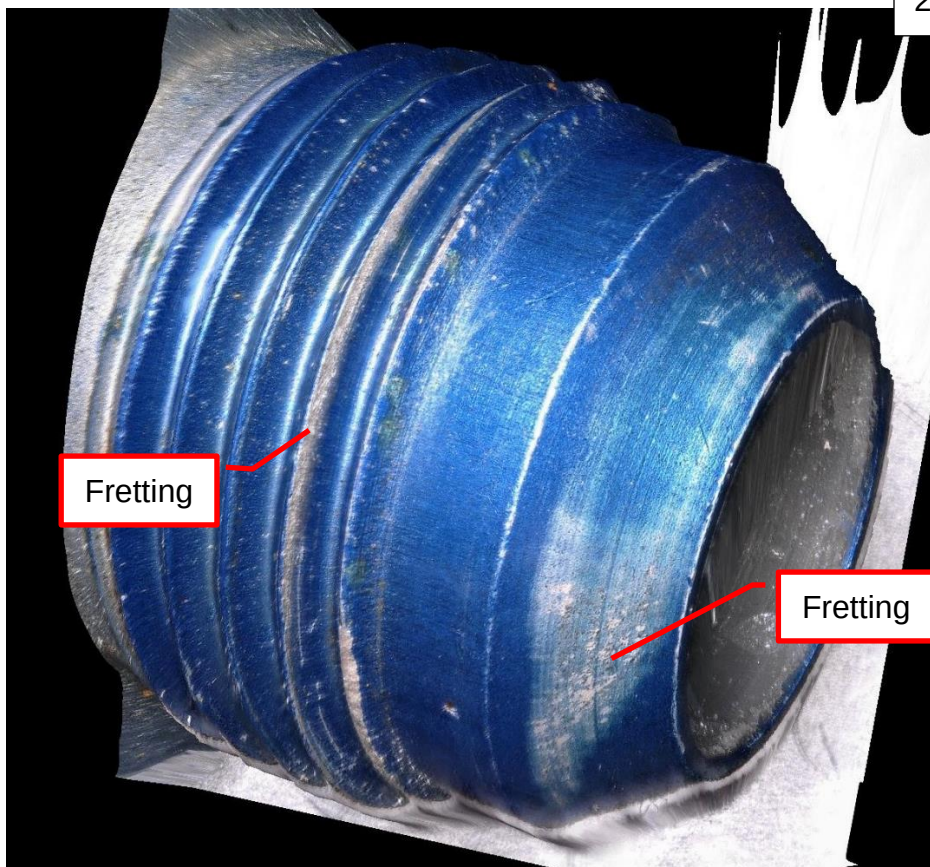


Figure 2. Three dimension reconstructions of the threads on the union mating to the fuel line showing the thread shearing and fretting wear of the flare. Lower view rotated from above showing the fretting wear on the 2nd thread.



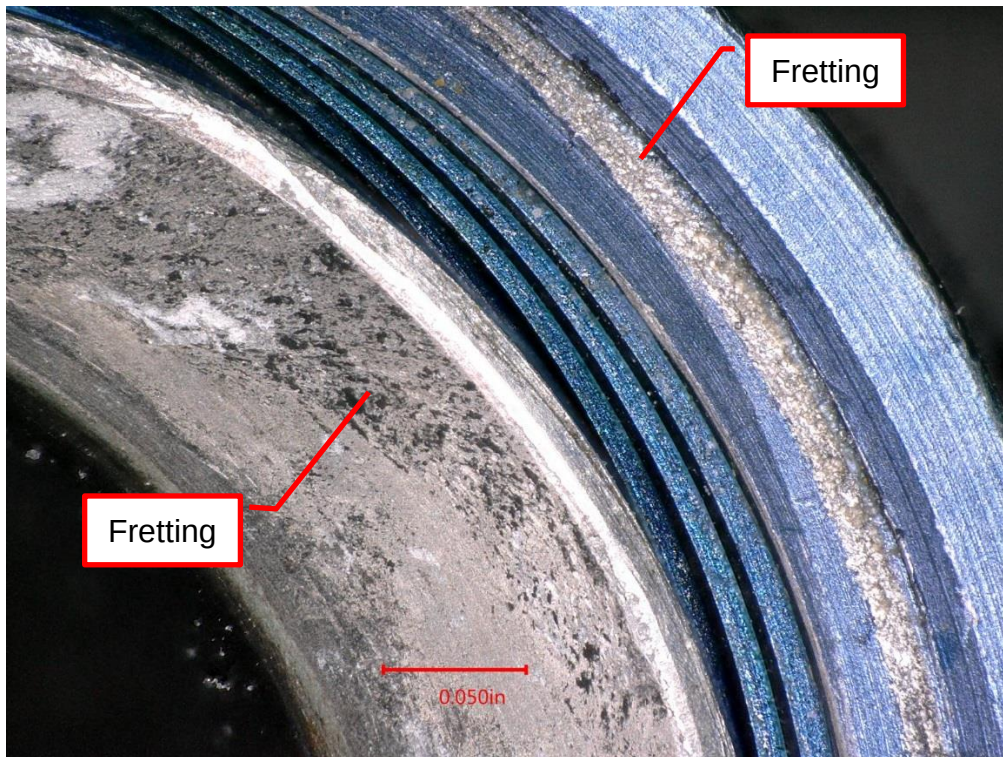
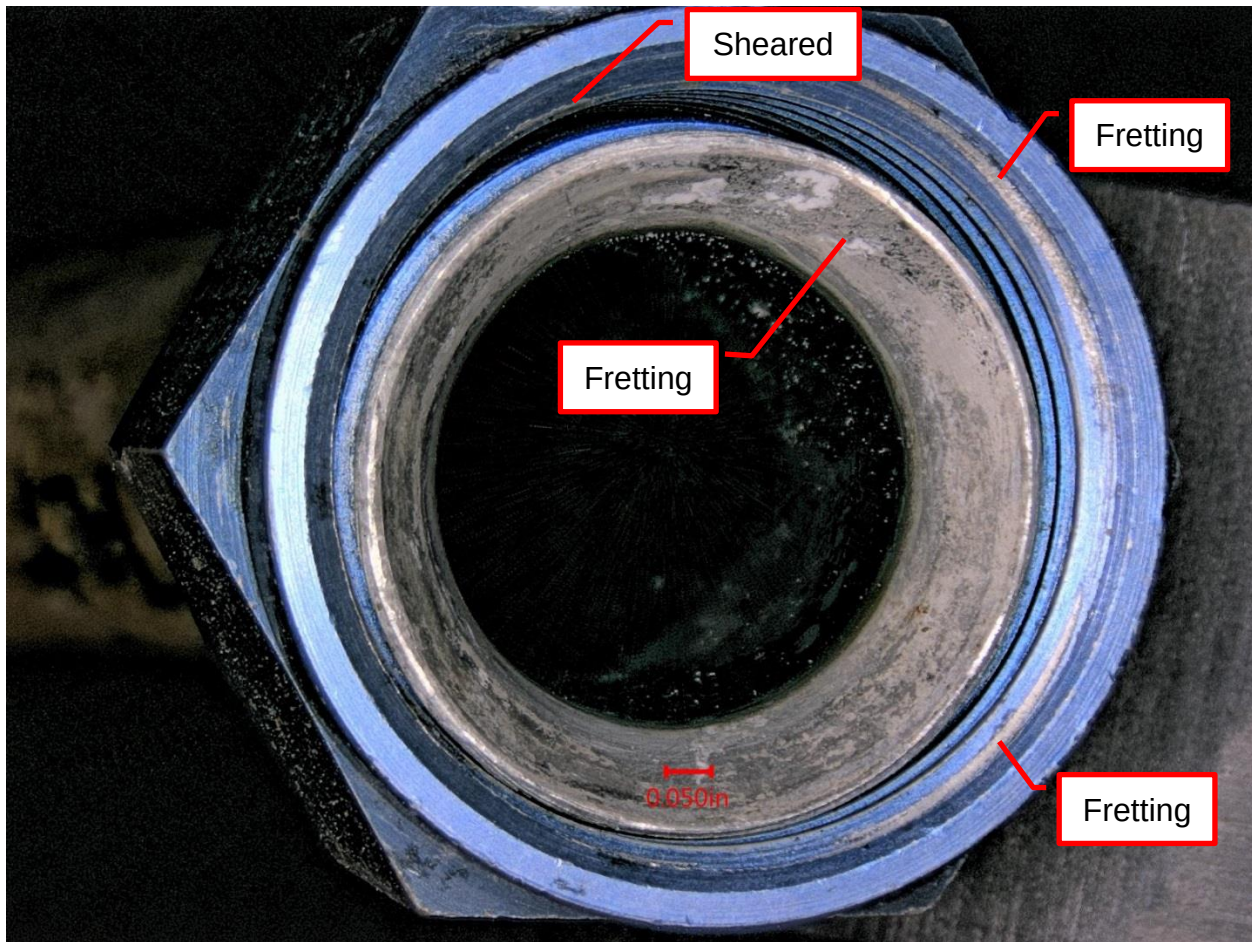


Figure 3. Views of the interior of the fuel line flare and nut. Lower view shows a close up of the thread and flare fretting wear.