National Transportation Safety Board
Office of Research and Engineering
Washington, DC 20594

ERA23FA046

MATERIALS LABORATORY

Factual Report 22-105

December 29, 2022

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A. ACCIDENT INFORMATION

Location: Southington, Ohio
Date: October 28, 2022
Vehicle: Zenith CH 750 Cruzer (N820RC)
Investigator: Heidi Kemner

B. COMPONENTS EXAMINED

1. Separated aileron control rod
2. Separated female rod end assembled with spacer, bolt and nut

C. EXAMINATION PARTICIPANTS

Specialist	Michael Budinski NTSB Washington, DC
Technician	Edward Komarnicki NTSB Washington, DC

D. DETAILS OF THE EXAMINATION

The submitted items are shown in Figures 1 and 2.

Examination under a 5X to 50X stereo zoom microscope and digital microscope revealed that the male control rod threads, where they engaged with the rod end, exhibited shearing damage of the thread crests (see Figure 3a). The jam nut was found (by hand feel) to have a loose fit on the external threads. In Figure 3b, the jam nut was found to be loose and had been threaded or turned over the torque stripe on the external threads. Given the indeterminate position of the jam nut on the external threads of the control rod, it could not be determined if it loosened or backed-off during flight.

The major diameter of the external threads on the aileron control rod piece, measured with a micrometer, was approximately 0.303 inch. Using a thread gage, the thread teeth per inch was confirmed to be 24 tpi. The thread minor diameter, measured using a digital microscope, was approximately 0.258 inch. Typically, a UNC 5/16 x 24 external thread, Class 2A, would have a 0.2603 inch maximum minor diameter and a 0.3042 inch to 0.3114 inch major diameter[1].

[1] Unified Thread Standard (controlled by American National Standards Institute) defines standard thread forms and series and associated dimensions, tolerances, and clearances for screw threads.

Closer digital microscope images of the external threads on the aileron control rod piece where they engaged with the internal rod end threads are shown in Figure 4. The threads crests on the last two full threads exhibit damage consistent with shearing.

Digital microscope images of the internal threads on the rod end piece where they engaged with the external control rod threads are shown in Figure 5. The threads crests on the last two full threads exhibit damage consistent with shearing.

The major diameter of the internal threads on the rod end piece, measured using a digital microscope on a silicone replica, was approximately 0.318 inch. Using a thread gage on a silicone replica, the thread teeth per inch was confirmed to be 24 tpi. The thread minor diameter, measured using a digital microscope on a silicone replica, was approximately 0.273 inch. Typically, a UNC 5/16 x 24 internal thread, Class 2B, would have a 0.3125 inch minimum major diameter and a 0.2670 inch to 0.2770 inch minor diameter.

Submitted by:

Michael K. Budinski
Chief, Materials Laboratory

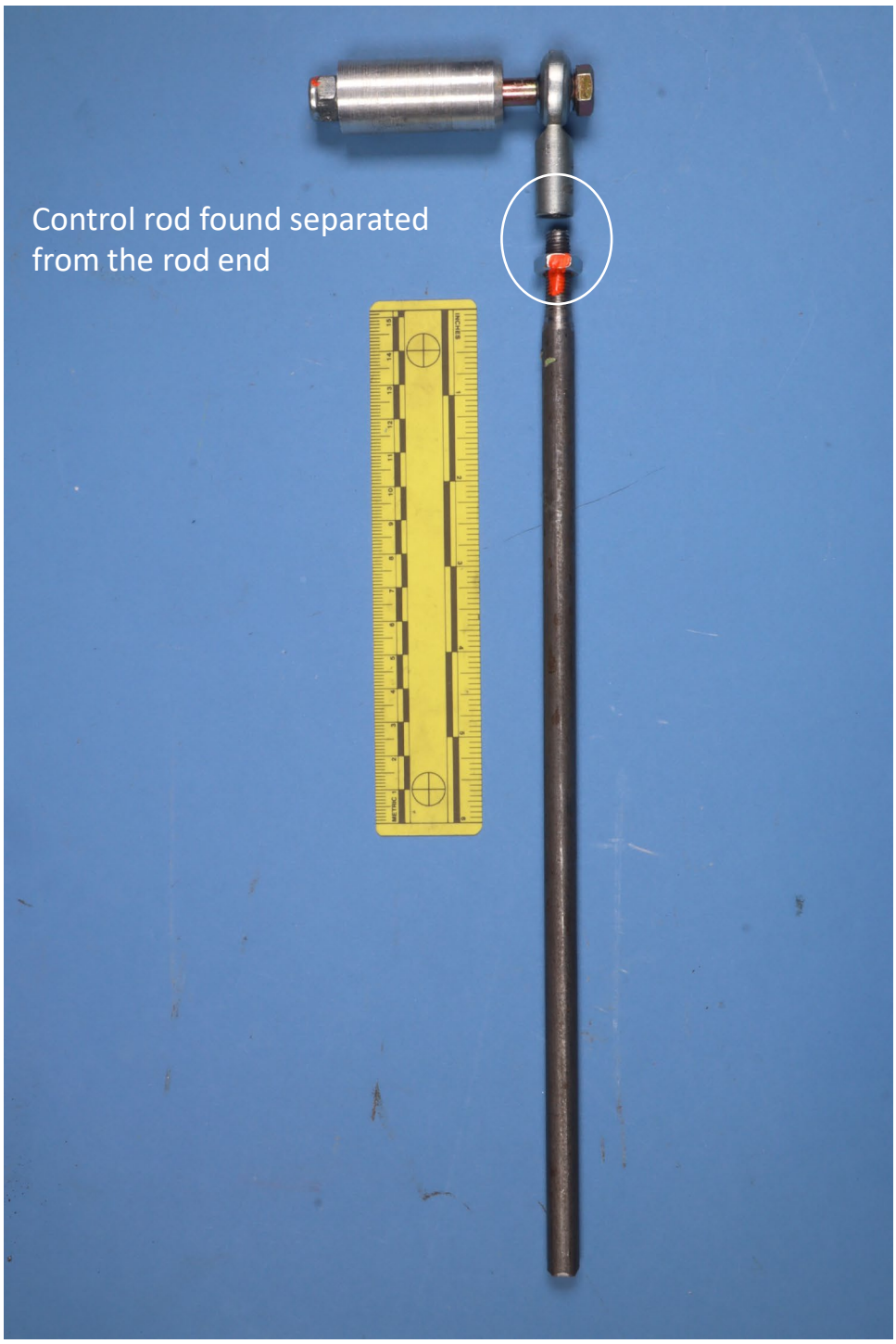

Figure 1. Image of the submitted items.

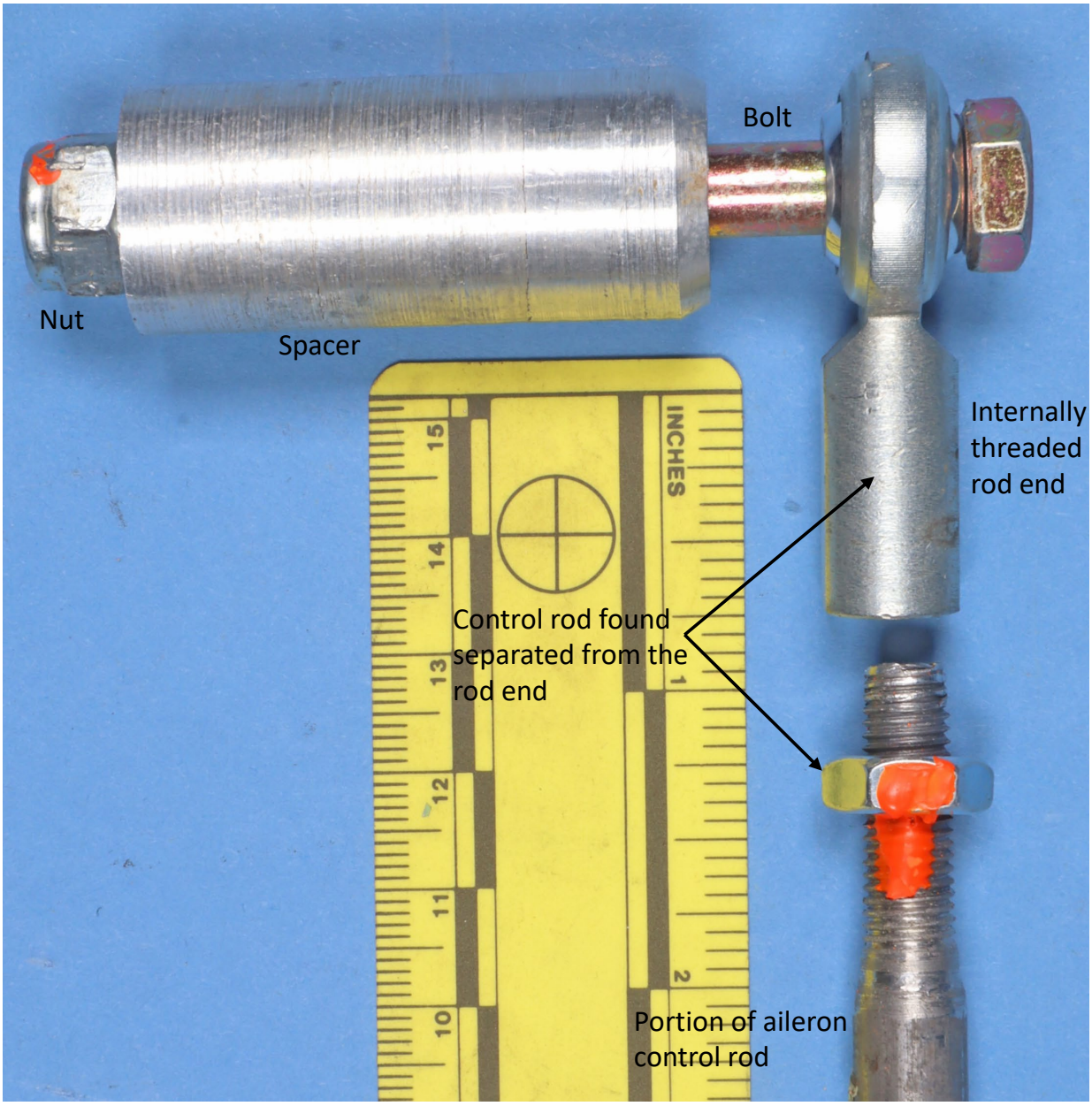

Figure 2. Image showing a close view of the aileron control rod separated from the rod end at the threaded joint.

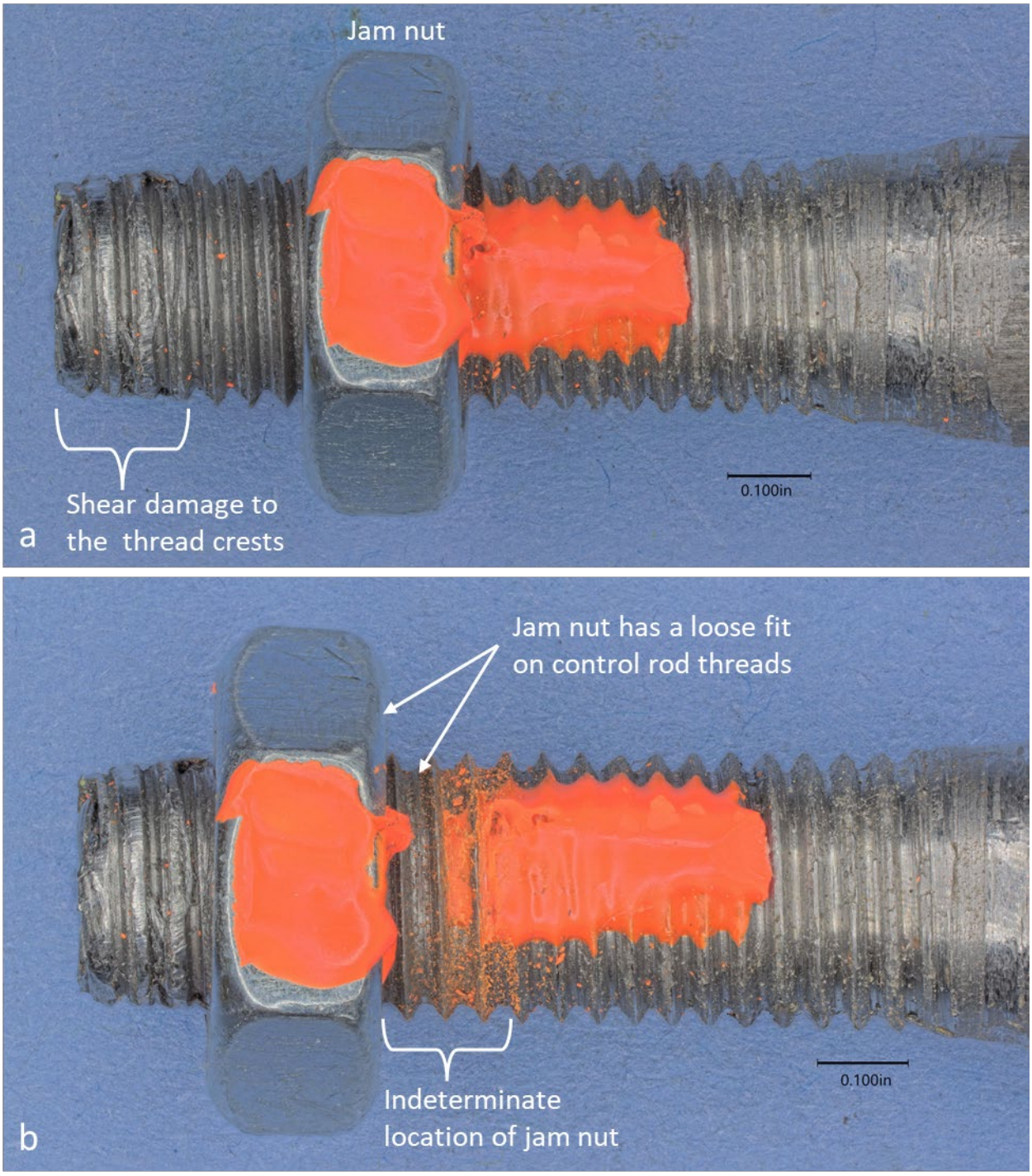

Figure 3. Images of the external threads on the aileron control rod. View a identified shear damage to the thread crests where they mate with the rod end internal threads. View b shows the indeterminate location of the jam nut.

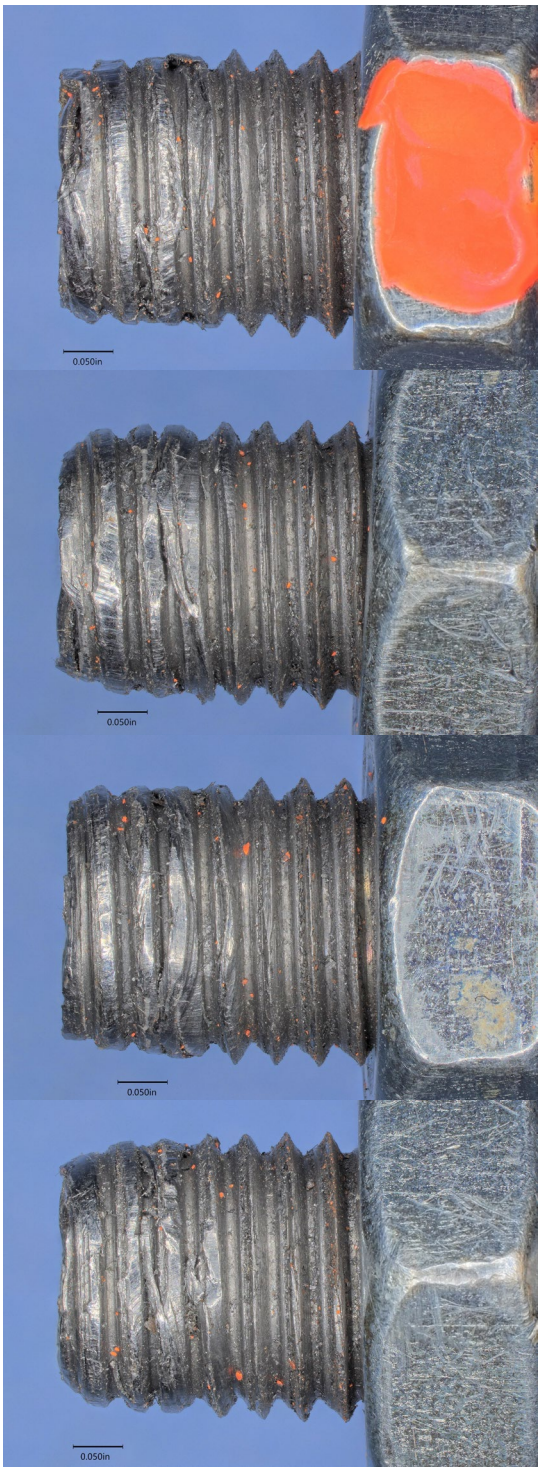

Figure 4. Images of the external threads on the aileron control rod at 90° intervals about the axis of the control rod. Shear damage to the thread crests where they mate with the rod end internal threads is observed.

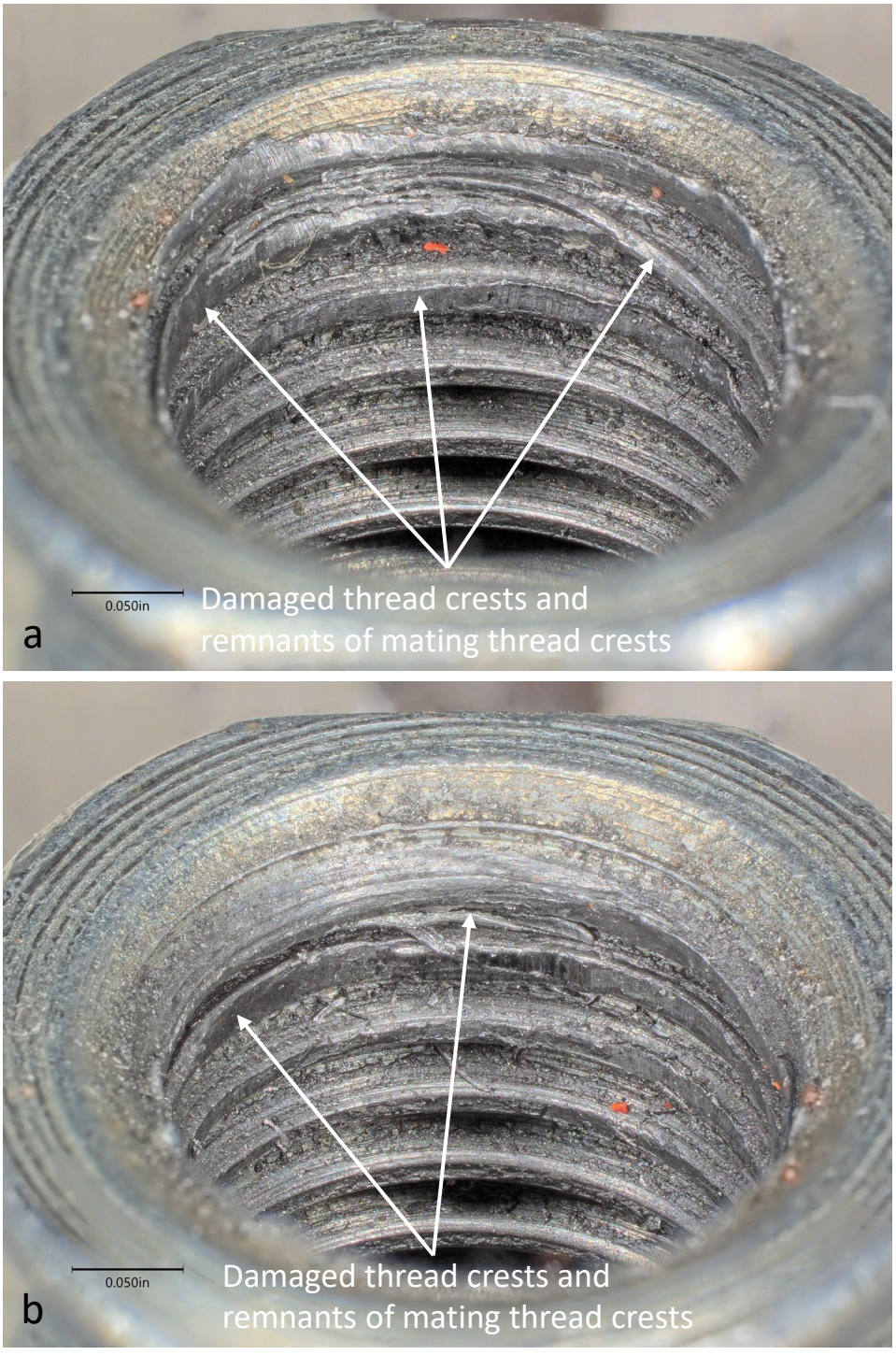

Figure 5. Oblique images of the internal threads in the rod end, 180° apart. Shear damage on the thread crests is noted and remanats of mating thread crest pieces are present.