

NATIONAL TRANSPORTATION SAFETY BOARD

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



August 19, 2019

MATERIALS LABORATORY FACTUAL REPORT

Report No. 19-041

A. ACCIDENT INFORMATION

Place : Hector, Minnesota
Date : 6/13/2019
Vehicle : Kolb Twinstar
NTSB No. : CEN19LA176
Investigator : Joshua Lindberg

B. COMPONENTS EXAMINED

1. Tubular tail boom pieces

C. DETAILS OF THE EXAMINATION

The purpose of this laboratory investigation is to identify the mode of fracture of the tail boom tube and associated H-section. The as-received tail pieces are shown in figure 1, with key features and part orientation identified. The mating halves of the fracture are identified in the upper image in Figure 1.

Using a 5X to 50X stereo zoom microscope, both halves of the fracture surfaces on the aluminum tube were examined. All fractographic features were consistent with cantilever-bending overstress-fracture due to the application of a monotonically increasing load until fracture. There were no marks on the fracture surface indicating recontact of the fracture surfaces.

Similarly, using a 5X to 50X stereo zoom microscope, both halves of the fracture surfaces on the H-section steel tubes were examined (see Figures 2 and 3). All fractographic features were consistent with cantilever-bending overstress-fracture due to the application of a monotonically increasing load until fracture.

The inside surface of the aluminum tail boom tube, where it contacted the steel H-section via pop rivets, exhibited intergranular network cracks consistent with stress corrosion cracking (see Figure 3 and 4). A survey of the interior region around the rivet holes revealed the presence of chlorine and sodium via standardless semiquantitative energy dispersive spectroscopy. Although noted for completeness, the location of the network cracks did not contribute to the overstress fracture of the tube section.

Michael Budinski
Chief, Materials Laboratory Division

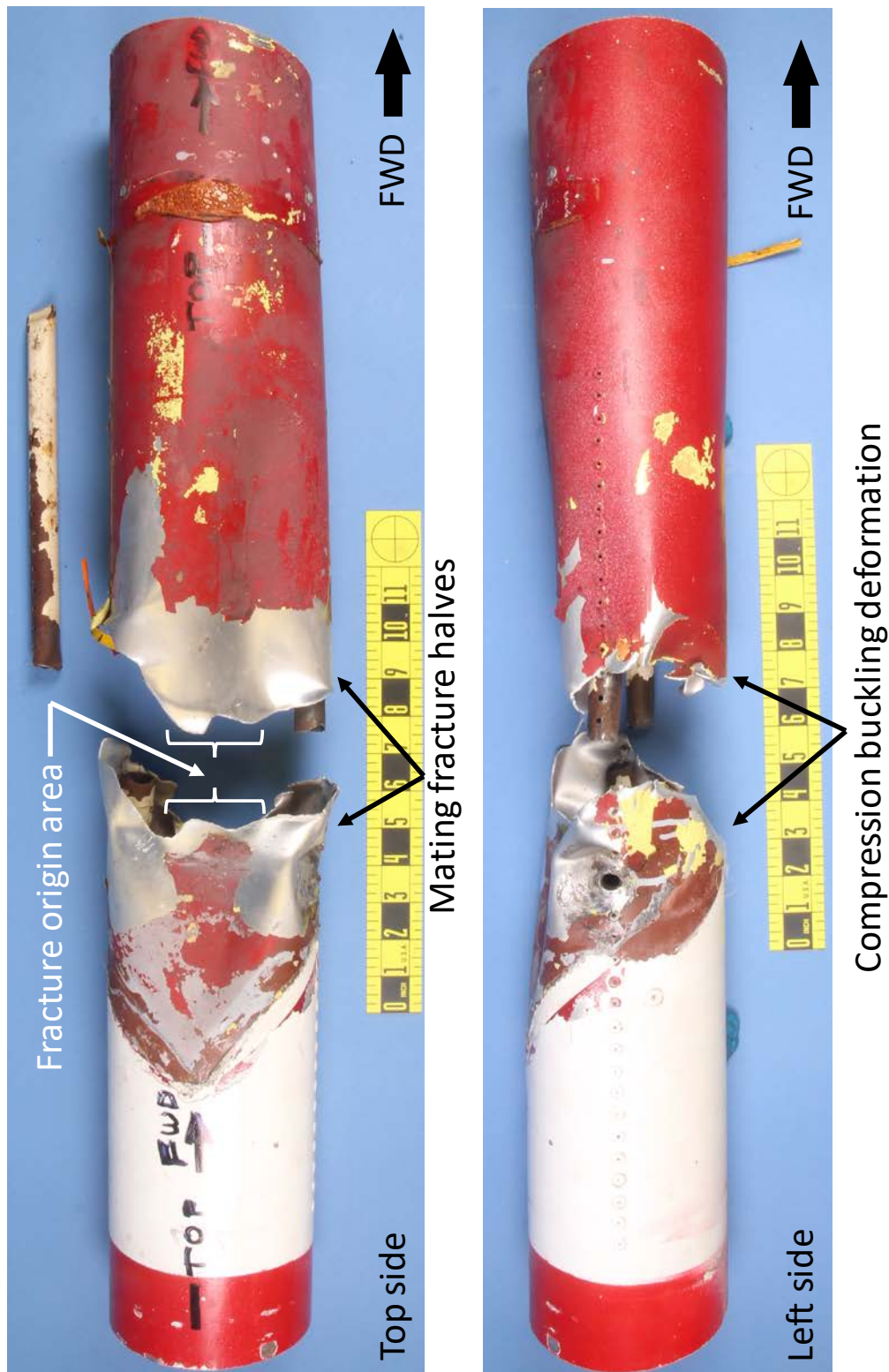


Figure 1 Image of the as-received evidence.

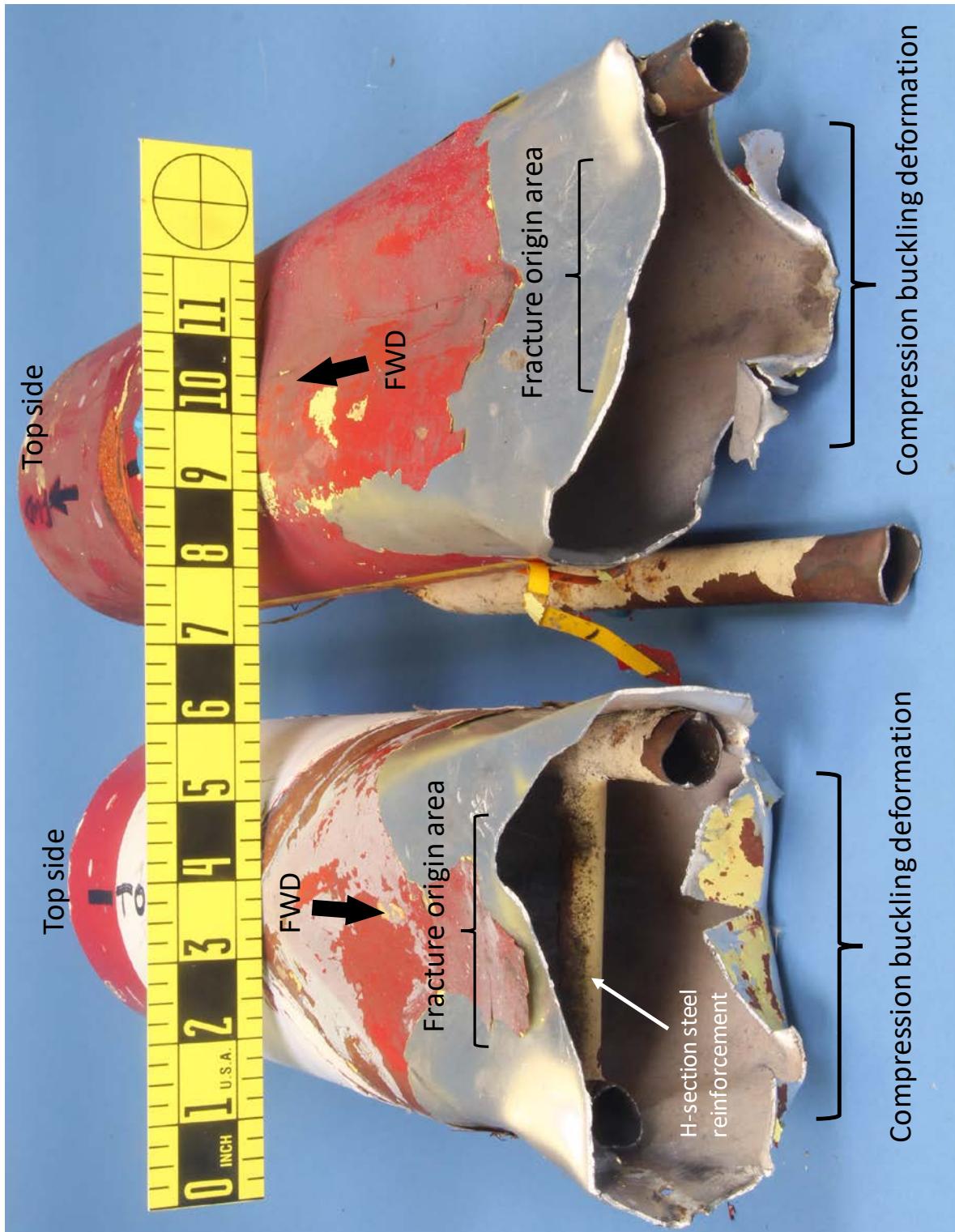


Figure 2 Oblique view of the tail boom tube and H-section fracture surfaces.

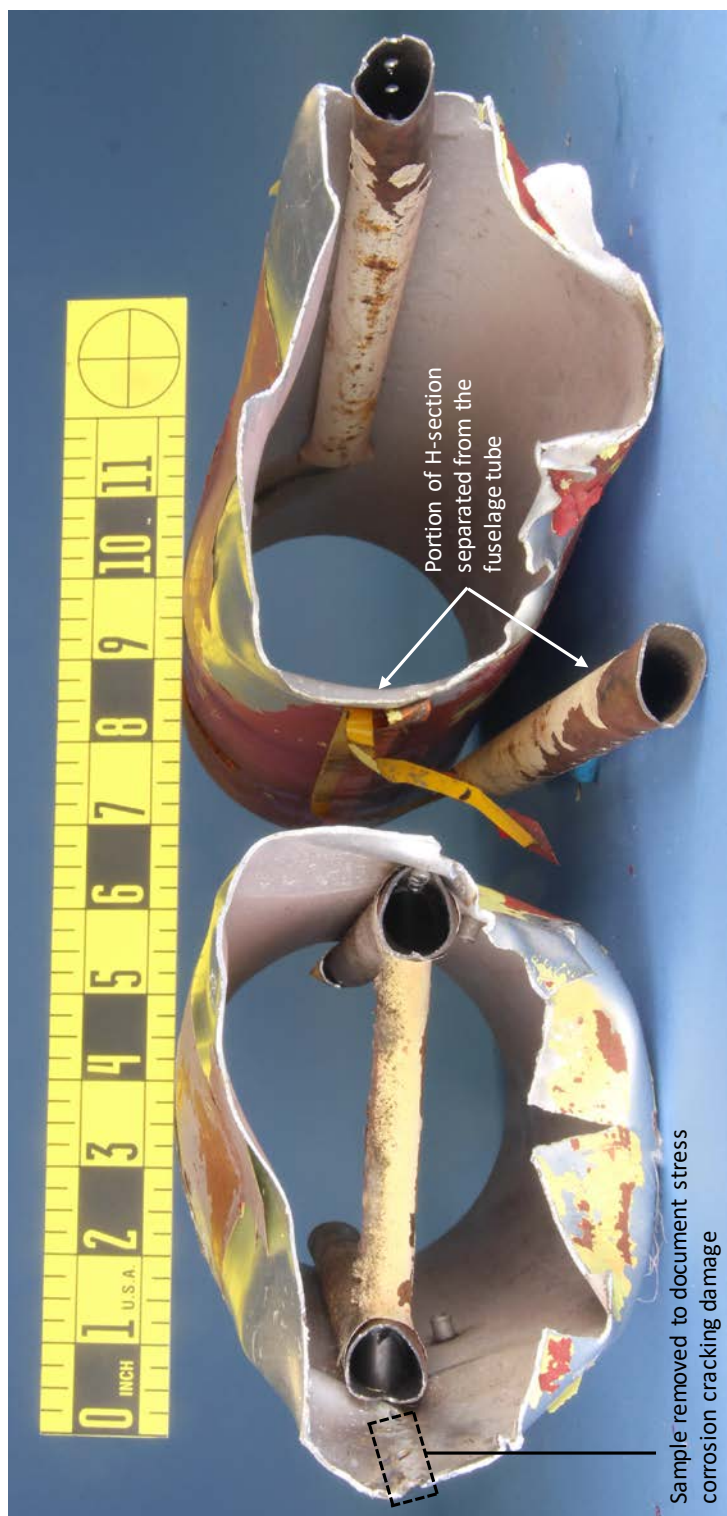


Figure 3 Axial view of the tail boom tube and H-section fracture surfaces.

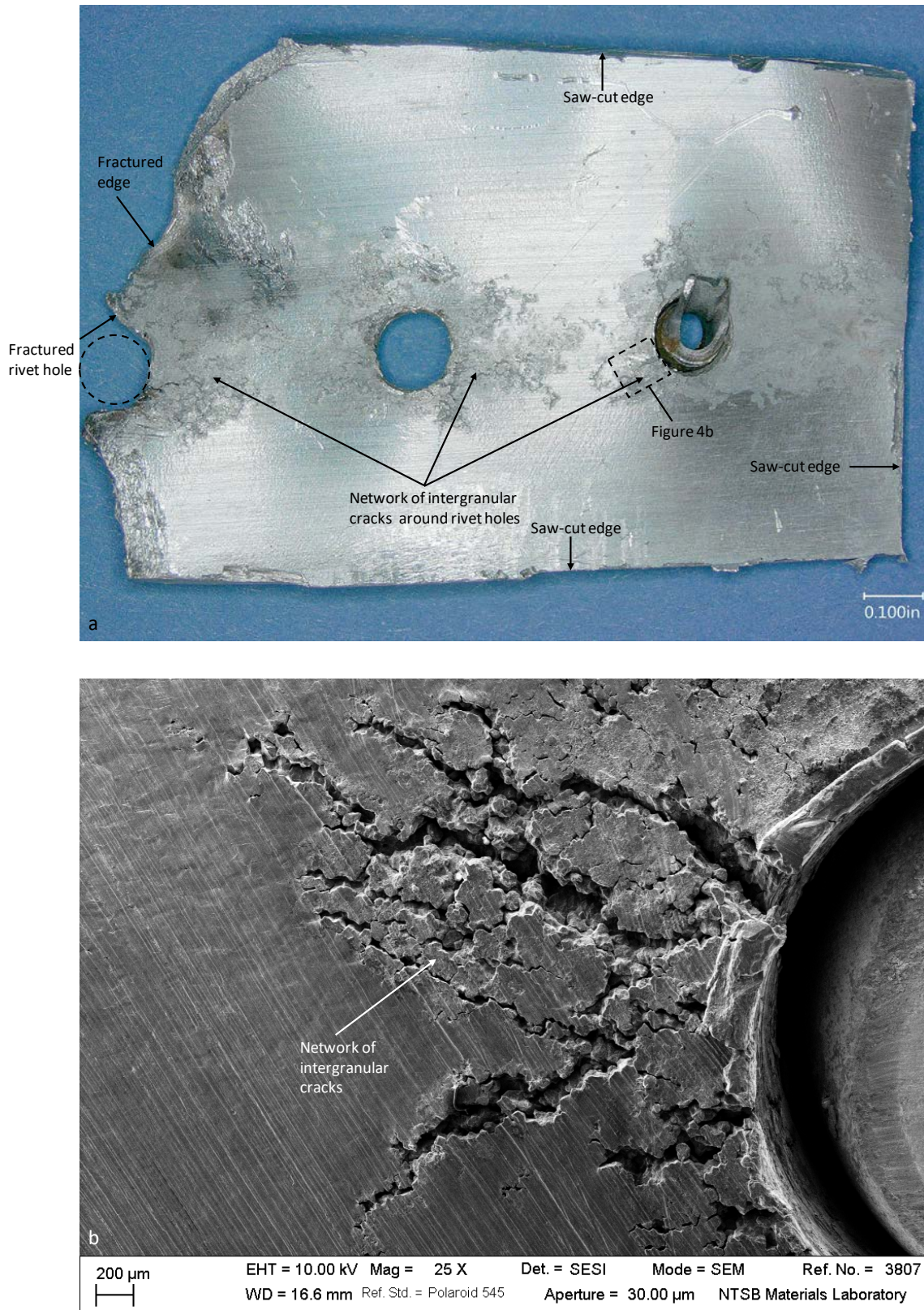


Figure 4 Images of the network of intergranular cracks around the rivet holes in the aluminum tail boom tube. View (a) is a digital microscope image after cleaning. View (b) is a scanning electron microscope image of the cleaned sample showing a closer view of the cracks.