

NATIONAL TRANSPORTATION SAFETY BOARD

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



September 14, 2021

MATERIALS LABORATORY FACTUAL REPORT

Report No. 21-067

A. ACCIDENT INFORMATION

Place : Paragould, Arkansas
Date : June 15, 2021
Vehicle : Air Tractor 502B, N6088K
NTSB No. : CEN21FA270
Investigator : Samantha Link, ASI-CEN

B. COMPONENTS EXAMINED

Two pieces from the aft fuselage frame, with one cross-brace tube fractured at both ends.

C. DETAILS OF THE EXAMINATION

Two pieces from the aft fuselage frame of an Air Tractor 502B were sent to the NTSB Materials Laboratory for examination, as shown in figure 1. The first piece consisted of a left-side upper node, a right-side upper node and a top cap that bridged the nodes. Most of the tubes that formed each node had been cut, but two tubes on the right side were fractured and exhibited slanted fracture surfaces that were consistent with tensile overstress. The second piece consisted of a cross-brace tube that joined the top left node to the top right node and two arms T-welded near the center of the tube that extended downward. At the end of the arms, an elevator control linkage was attached with a pin, which allowed the lower end of the linkage to rotate forward and aft. The forward and aft motion transferred pilot control input to a cable that controlled elevator pitch. The ends of the cross-brace tube were fractured where they joined the left- and right-side nodes, as seen in figure 1. In addition, the control linkage clevis exhibited twist deformation such that the lower end of the left arm had rotated aft and the lower end of the right arm had rotated forward (clockwise twist when viewed below looking up).

The pieces were cleaned using an alkaline detergent and a soft nylon brush, in accordance with standard laboratory procedures. The cross-brace tube fractures were then examined with the aid of a stereomicroscope. Images of the right-side fracture are shown in figures 2a – c and images of the left-side fracture are shown in figures 3a and b. The fractured tube walls all exhibited either transverse shear features or 45° inclined slant fractures, consistent with overstress. The right side of the tube exhibited upward bending along the forward-top and bottom-aft portions of the tube just inboard of the fracture, as indicated in figures 2a and b and the mating fracture on the node-side exhibited downward bending, as indicated in figure 2c. Similar bending features were observed on the left-side fracture. Whereas the right-side fracture was comparatively planar, the left side

fracture progress along a longitudinal and helical path in one location (the upper forward quadrant). Taken as a whole, the features were consistent with a shear/torsion overstress fracture on the right end of the cross-brace, followed by an overstress fracture of the left end of the cross-brace in a mixture of shear, torsion, and bending.

Donald Kramer, Ph.D.
Sr. Materials Engineer

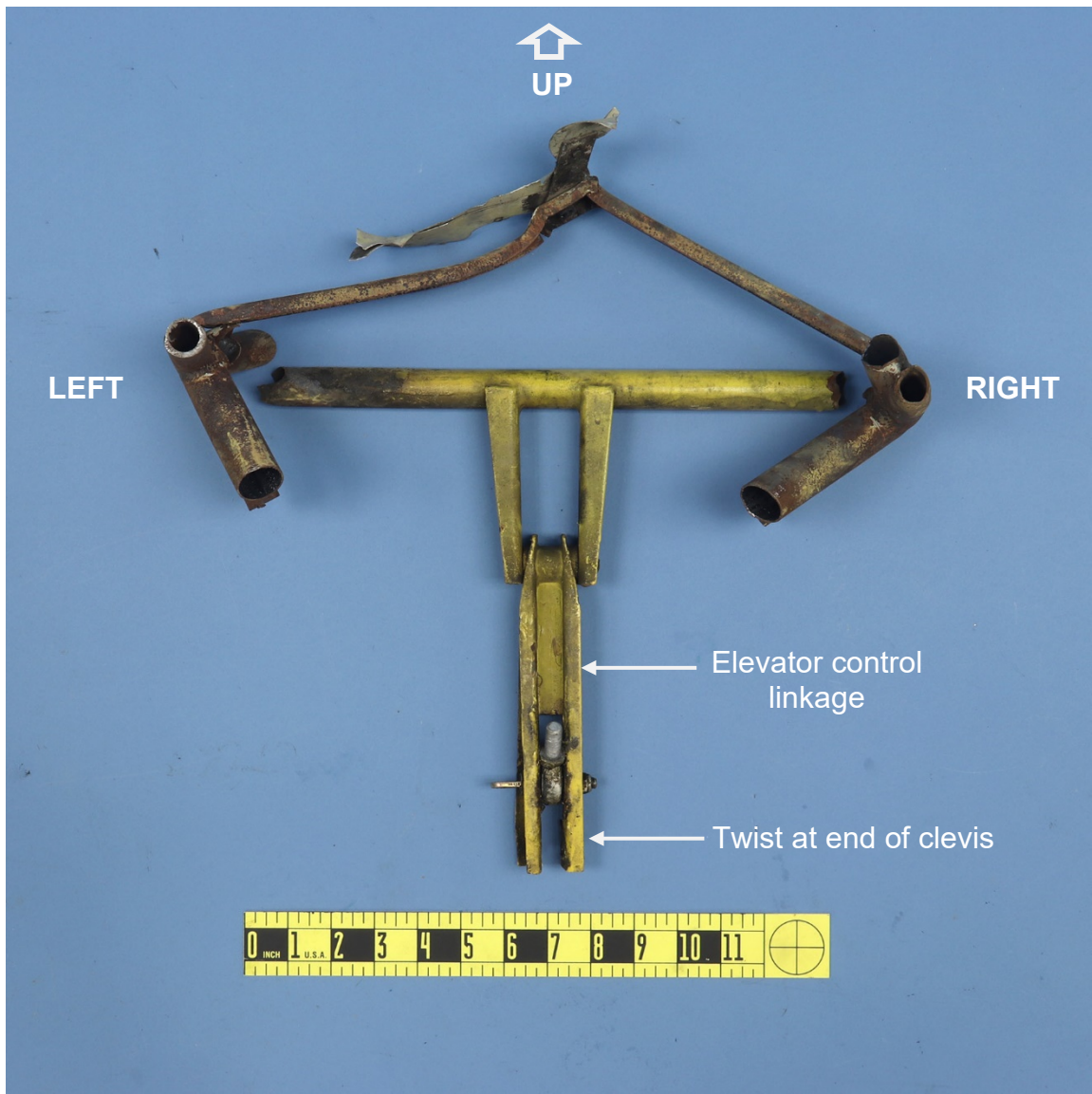


Figure 1: The aft fuselage frame pieces, as received, viewed aft looking forward.

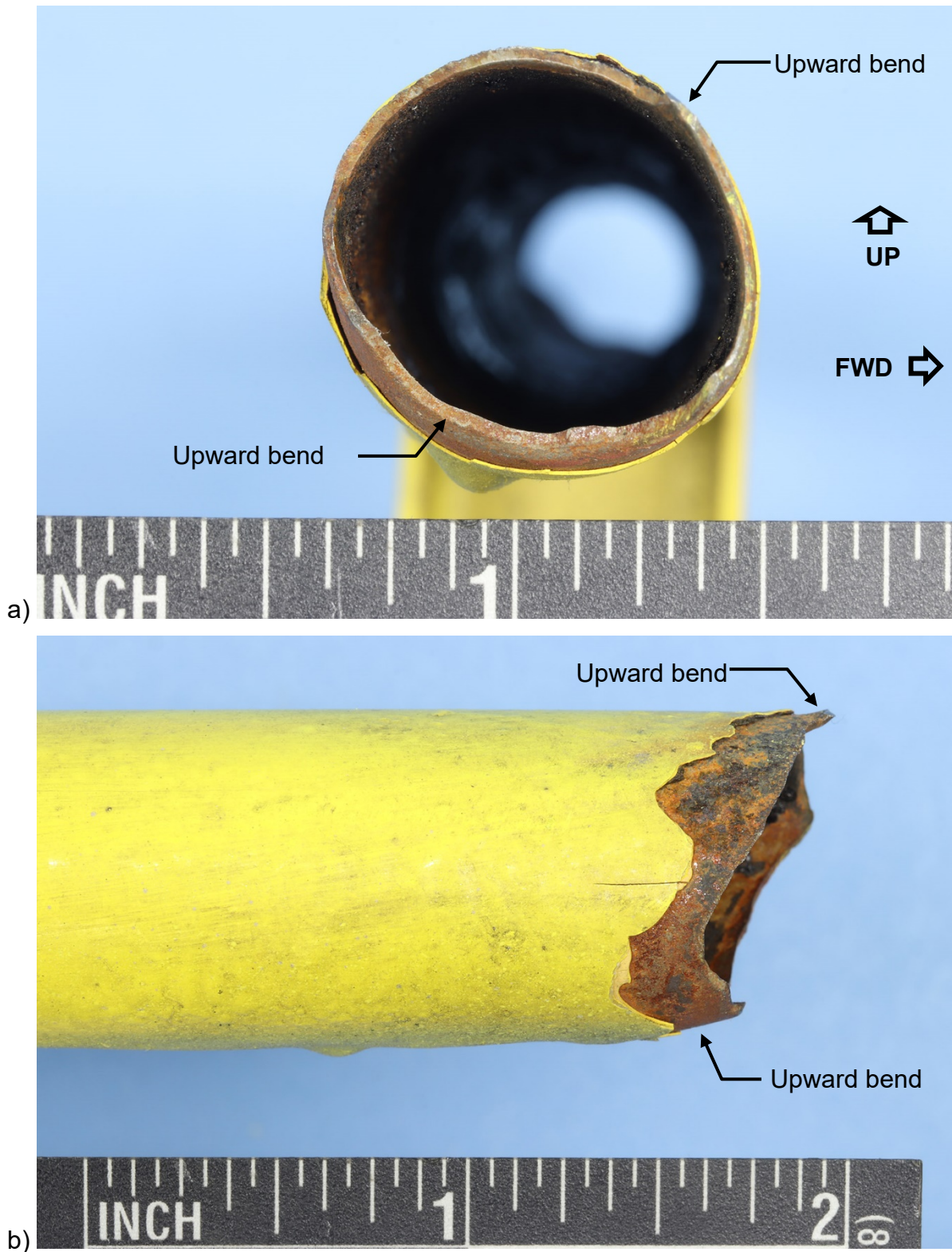


Figure 2: The right-side fracture of the cross-brace tube; a) longitudinal view of the fracture; b) side view showing deformation at the tube end near the fracture. The tube is viewed looking down and forward;



Figure 2 (cont.): and c) image of the mating fracture at the right-side node, showing downward bending of the tube wall along the top and bottom.



Figure 3: The left-side fracture of the cross-brace tube; a) longitudinal view of the fracture; b) side view showing deformation at the tube end near the fracture. The tube is viewed looking down and forward.