

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN22FA119

MATERIALS LABORATORY

Factual Report 23-030

March 15, 2023

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A. ACCIDENT INFORMATION

Location: Olathe, Kansas
Date: February 13, 2022
Vehicle: Piper PA-46-500TP, N2445F
Investigator: John Brannen, ASI-CEN

B. COMPONENTS EXAMINED

Three (3) pieces of left aileron upper and lower balance cables.

C. EXAMINATION PARTICIPANTS

Specialist Donald Kramer, Ph.D.
National Transportation Safety Board
Washington, DC

D. DETAILS OF THE EXAMINATION

Three pieces of left aileron balance cables were submitted to the NTSB Materials Laboratory for examination, as shown in figure 1a. The cables consisted of seven strands with nineteen wires per strand. Two of the cable pieces were attached to the left aileron sector assembly, one being the outboard fragment of the lower cable and the other being the outboard fragment of the upper cable. The third piece appeared to be a continuation of the lower cable. Both lower and upper cables were fractured. The lower and upper cable fractured ends are shown in greater detail in figures 1b and 1c, respectively. The fractured ends were examined with the aid of a stereomicroscope.

The lower cable fracture exhibited features consistent with brittle fracture. Six of the strands had fractured approximately 14 inch from the cable's outboard end and the seventh strand had fractured approximately 3 inch further inboard. While fixturing the cable for imaging with a digital optical microscope, the single long strand cracked at two locations (see figure 1b). Digital optical microscope images of the fractured strands are shown in figures 2a and 2b. The wire fracture surfaces had a shiny granular appearance and there was no apparent necking of the wires. The observations were consistent with post-crash brittle fracture from embrittlement of the cable.

The upper cable fracture exhibited features with overstress separation. The cable strands were splayed apart, as seen in figure 1c. Several strand fractures are shown in figures 3a and 3b. Most of the wires exhibited slanted fractures and/or transverse deformation at the fracture. Some wires exhibited necking at the fracture. The fractured wire ends were dark and oxidized, consistent with exposure to fire. The observations were consistent with a shear separation of the cable.

The cable material was determined using a handheld x-ray fluorescence (XRF) spectrometer. The two primary elements in the spectrum were iron (Fe) and zinc (Zn), consistent with a galvanized steel cable.

Submitted by:

Donald Kramer, Ph.D.
Sr. Materials Engineer

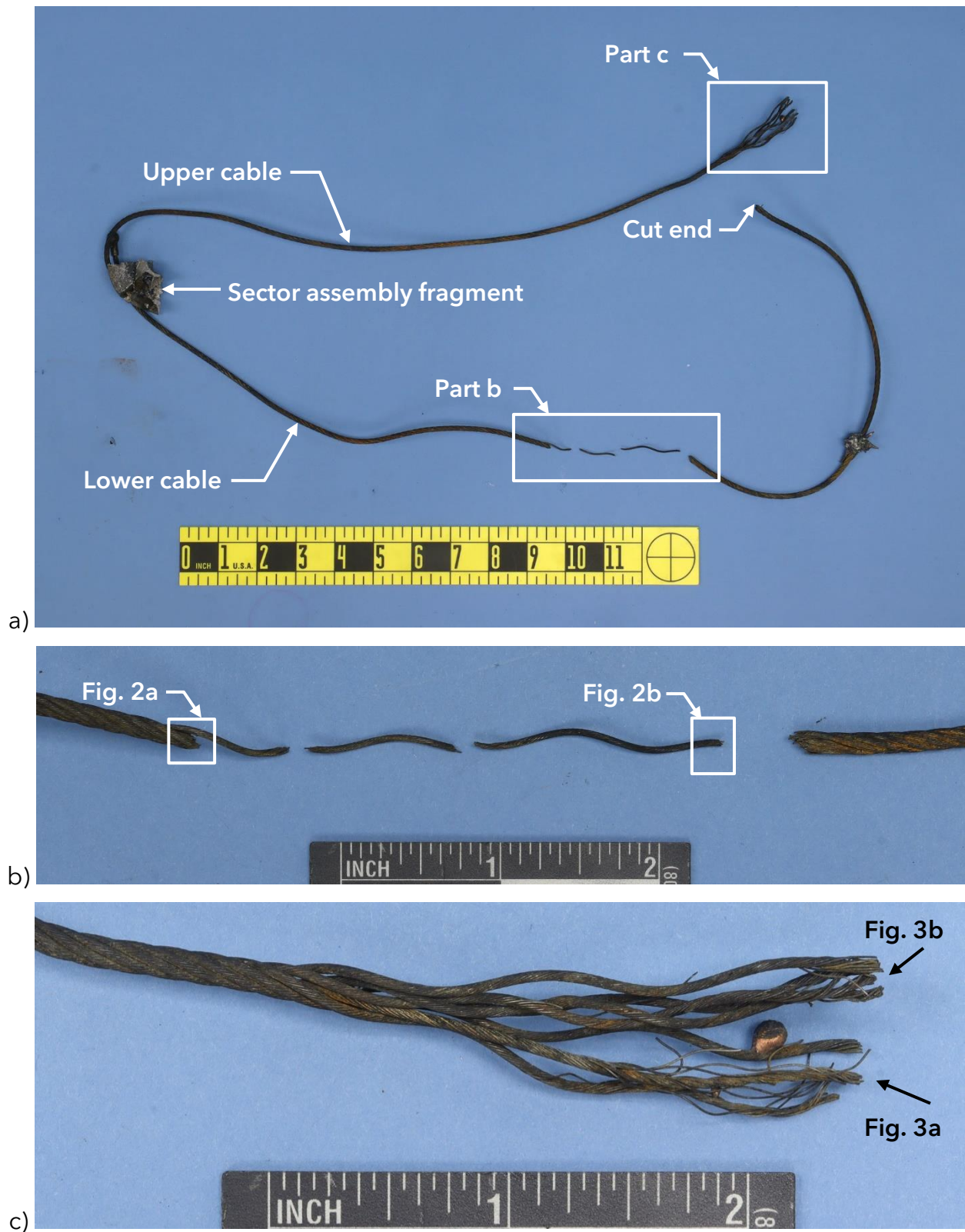


Figure 1. Images of the as-received aileron control cables: a) overview images; b) lower cable fracture; and c) upper cable fracture.

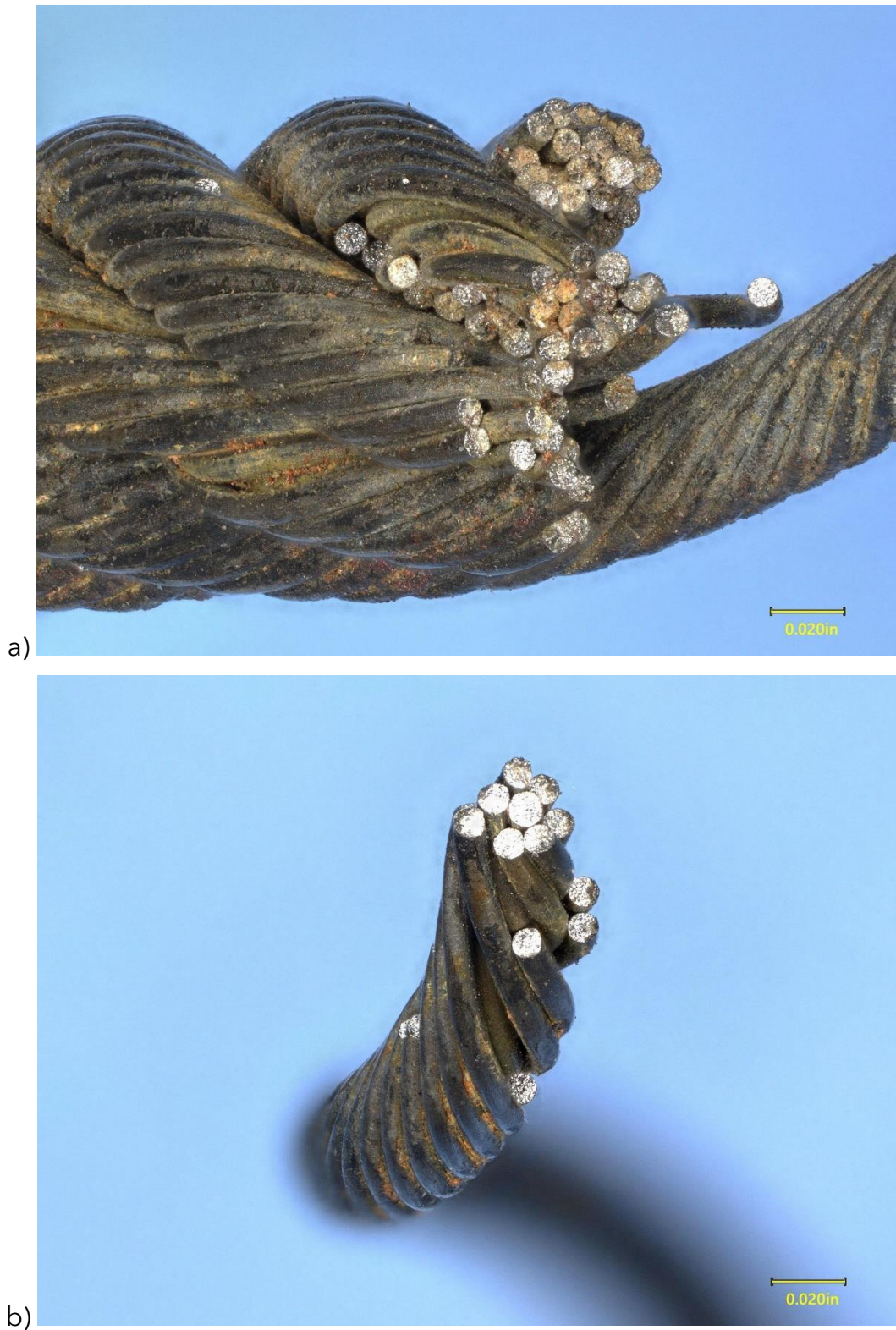


Figure 2. Images of the fractured lower cable: a) six fractured strands, as indicated in figure 1b and b) the seventh fractured strand, also indicated in figure 1b.



Figure 3. Images of the fractured upper cable: a) and b) fractured strands, as indicated in figure 1c.