NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

June 23, 2012

MATERIALS LABORATORY FACTUAL REPORT Report No. 12-068

A. ACCIDENT INFORMATION

Place	:	Miami, Florida
Date	:	October 29, 2011
Vehicle	:	Interplane SRO Skyboy, N58784
NTSB No.	:	ERA12FA052
Investigator	:	Jose L. Obregon, AS-ERA

B. COMPONENTS EXAMINED

Elevator trim tab with upper and lower control cables attached.

C. DETAILS OF THE EXAMINATION

The lower surface of the as-received elevator trim tab is displayed in the upper view of figure 1 with a small section of the adjacent elevator attached. The control cable attachments are displayed in the lower view.

The control cables are attached to the trim tab control horn by pins through clevis fittings mounted on cylindrical, soldered cable ends as shown in figure 2. The upper control cable had parted at the clevis fitting as shown in the lower view of figure 2. As-received the clevis was frozen to the pin and the pine was frozen to the control horn and resisted movement by heavy hand pressure.

About 12.7 inches of the upper cable was received extending forward from the cable stop. The aft 11.3 inches of the cable had heavy red rust deposits covering the surfaces as shown in the left view of figure 3. The remaining cable surfaces were clean as shown in the right view of figure 3. No cable lubricant was noted in any area of the cable.

Measurements and close observations determined that the cable had 3/64 inch and was of 7 by 7 construction[1]. X-ray fluorescence spectroscopy[2] in the clean area of cable was typical of zinc coated carbon steel wire. The cable's construction and composition were consistent with "Detail Specification" MIL-DTL-8342M[3] Type I, Composition A wire rope.

[1] 7 strands of 7 wires per strand.
[2] Using a Thermo Scientific Niton XL3t-980 hand held x-ray fluorescence analyzer.
3 MIL-DTL-83420M 1 April 2005 Wire Rope, Flexible, for Aircraft Control, General Specification for.

Close examinations of the cable separation found that all of the individual wire fractures were where the cable passed through the clevis as shown in the left view of figure 4. The cable remain tightly wound at the separation with no fraying or significant spreading of the wires or strands, as shown in the right view of figure 4. High magnification (~50X to ~100X) optical viewing uncovered only a few wires with clean identifiable fracture faces. The separated ends of the vast majority of the wires were obscured by red and black rust deposits and fractures were not visible. The clean fractures are denoted by arrows in the left view of figure 4.

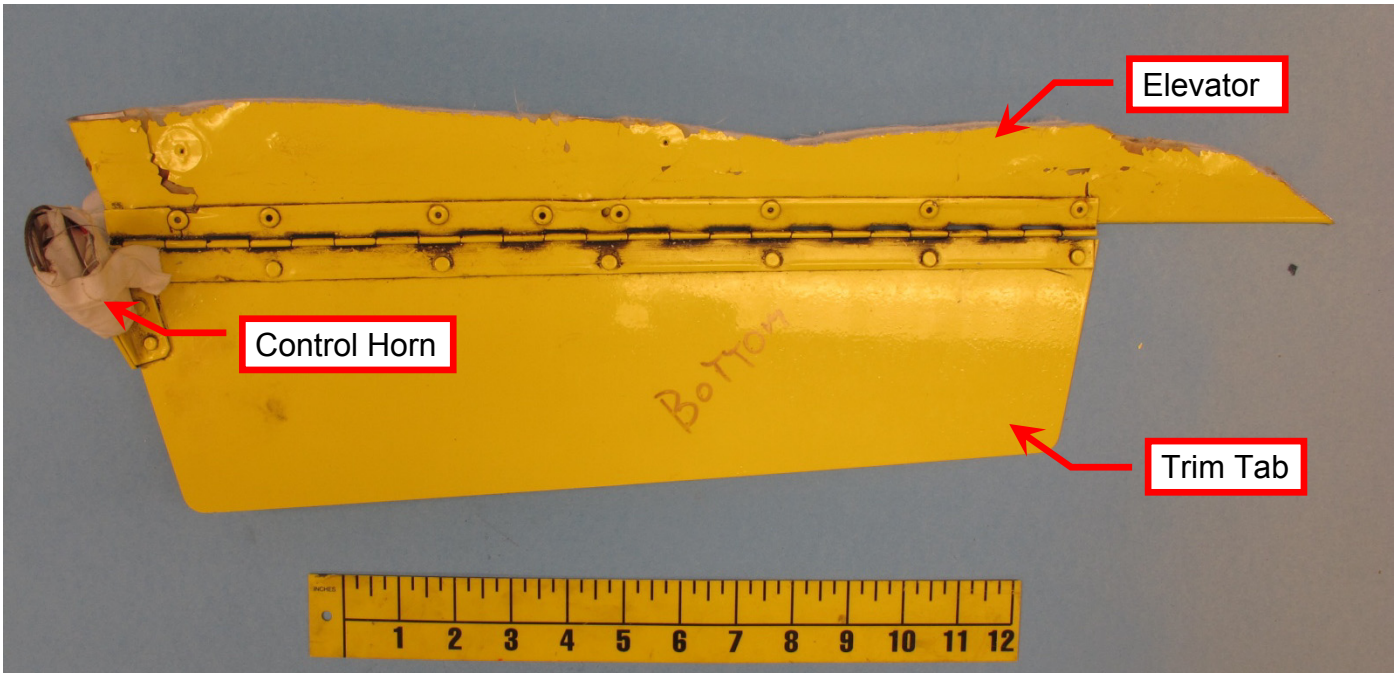
Ultrasonic cleaning in acetone removed much of the red rust deposits but not the darker deposits. The cable was restrained with a swag fitting and cut about 1 inch forward of the separation then cleaned in a commercially available deoxidizing solution[4]. The individual strands were then partially unwound for better viewing. Examinations with a scanning electron microscope (SEM) revealed severe corrosion damage of the wires adjacent in the area of the separation, as shown in the views of figure 5.

SEM examinations of the wire ends found that most were obliterated by corrosion and no features remained. The few wires where features remained were typical of overstress separations as shown in figure 6.

The lower trim tab cable also displayed corrosion on the surfaces. The corrosion was apparent along approximately the same length of the lower cable as the upper cable but did not appear to be as widespread. Close examination of the cable found that its diameter was reduced as it passed through the clevis.

Joe Epperson
Senior Metallurgist

[4] Evapo-Rust Patent Pending manufactured by Harris International Laboratories



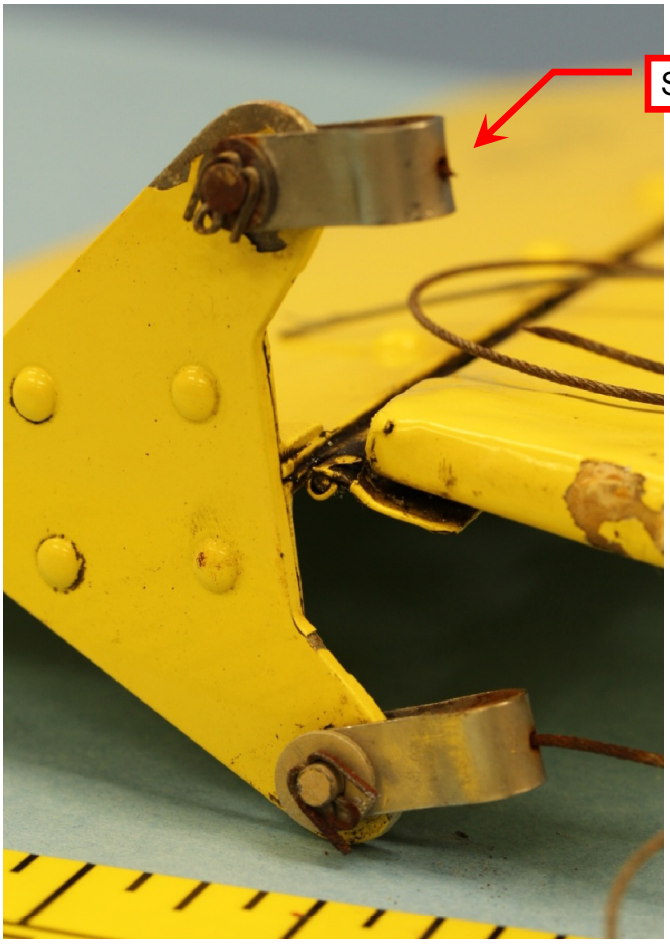


Figure 1. At top, the lower side of the as-received trim tab with control horn at left and adjacent elevator section. At left, a closer view of the tab's control horn with separated upper cable.

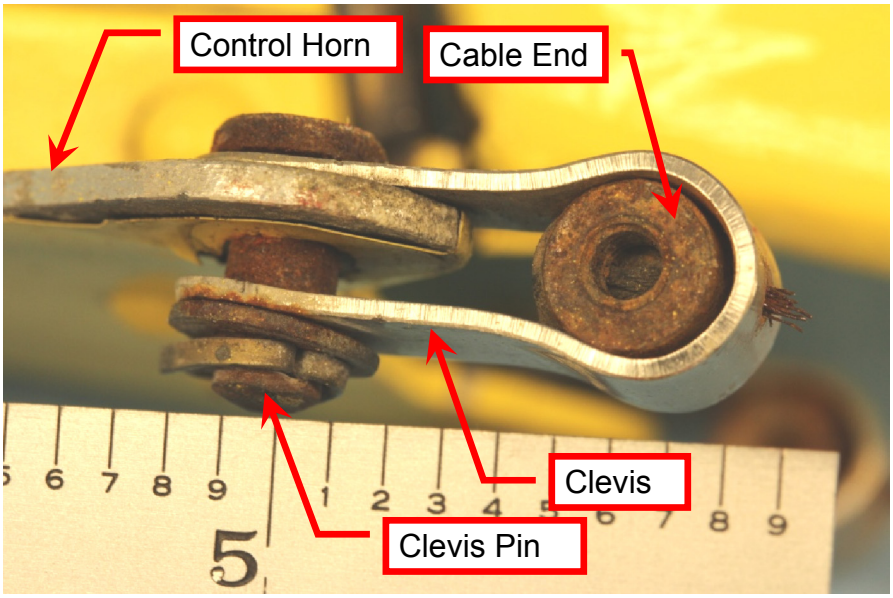
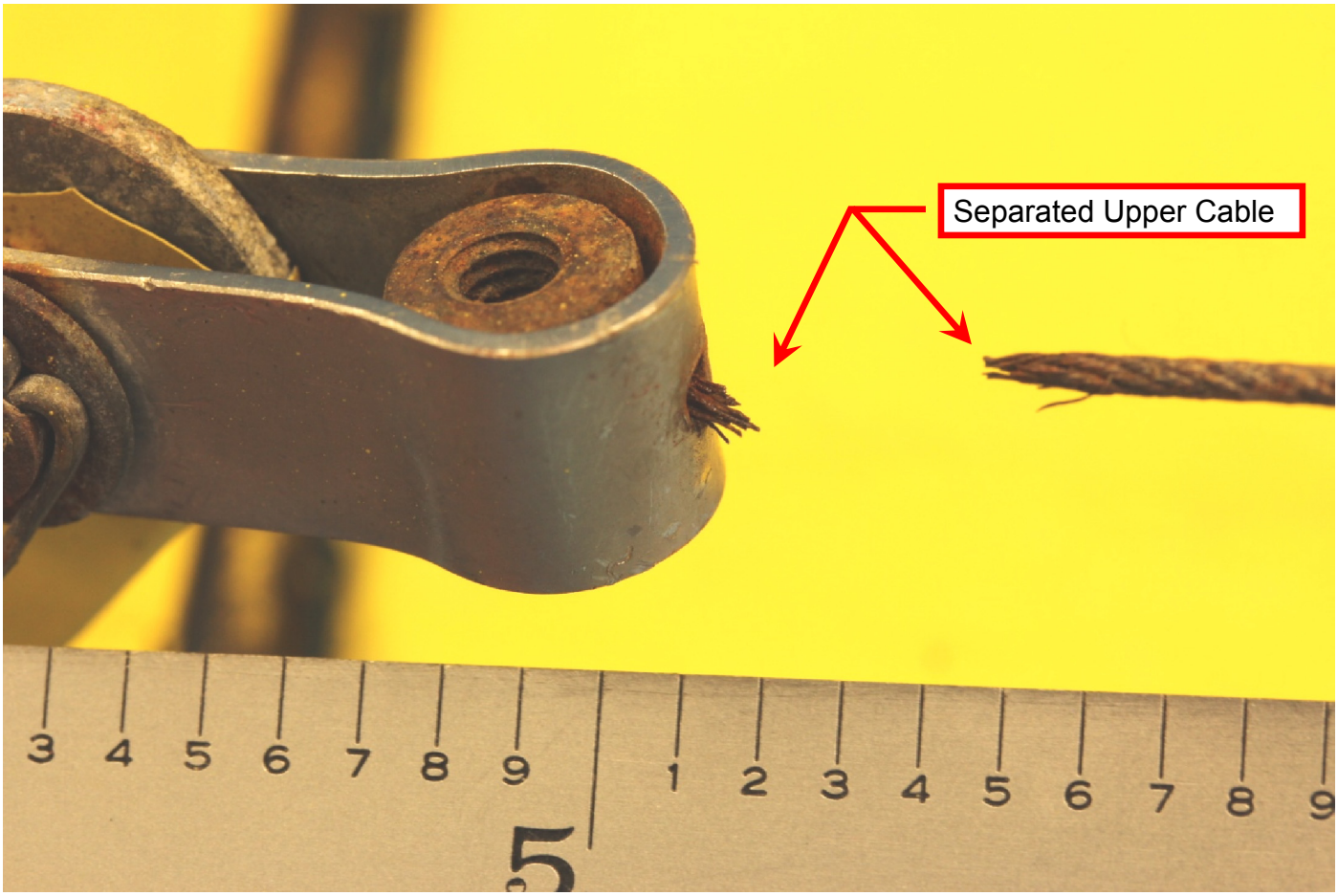


Figure 2. The upper control cable attachment to the horn at left with a closer view of the separated cable below.



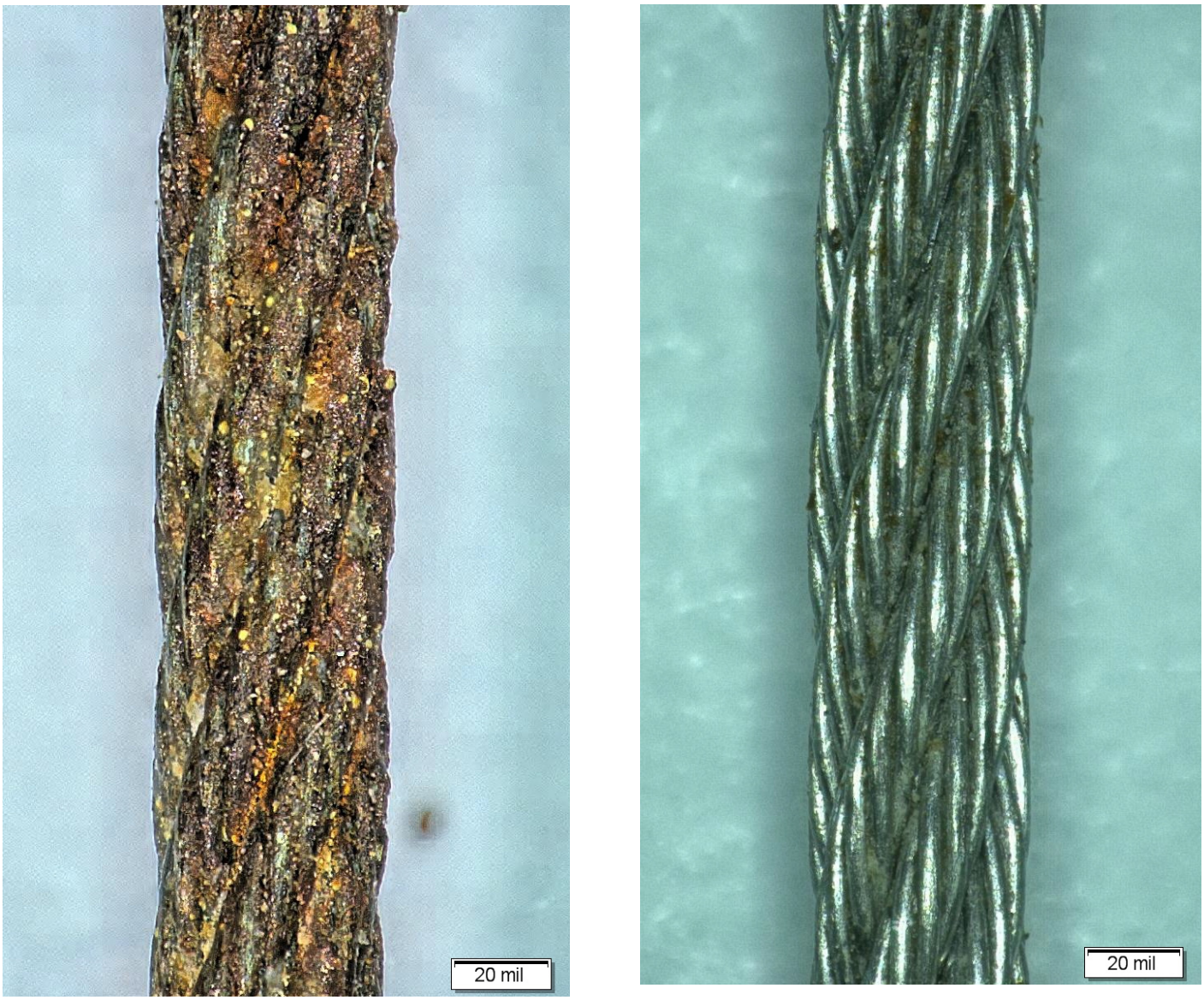


Figure 3. The surface of the upper cable in the corrosion area (left) and the clean area (right).

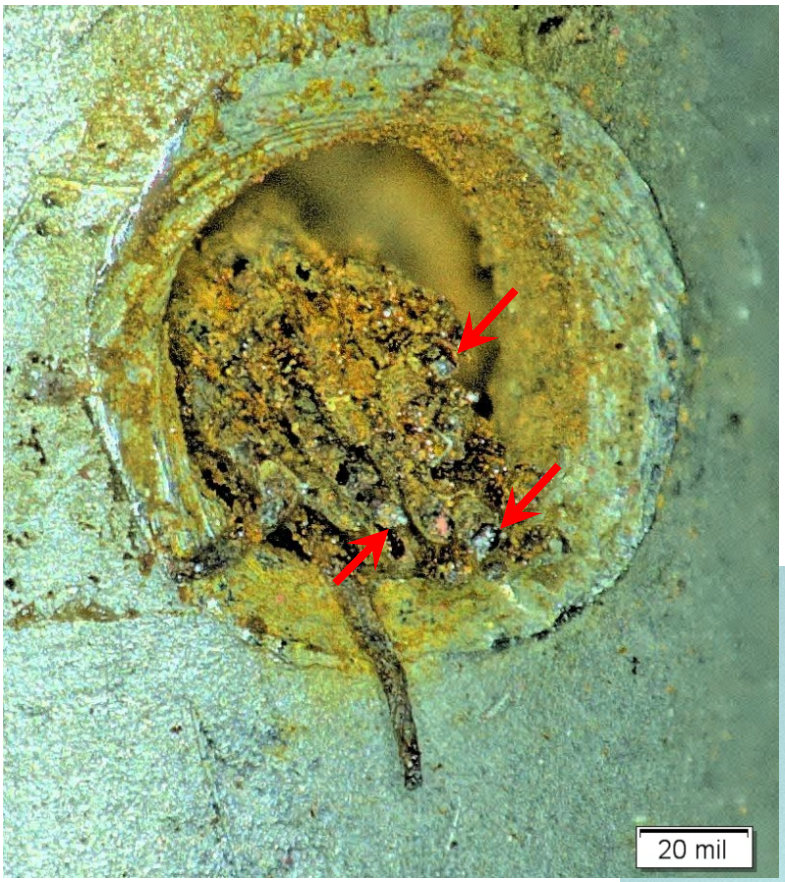


Figure 4. The two side of the separated upper cable. At left, the aft side as the wires pass through the clevis. Arrows denote clean identifiable wire fractures. The forward wire separations are shown below.

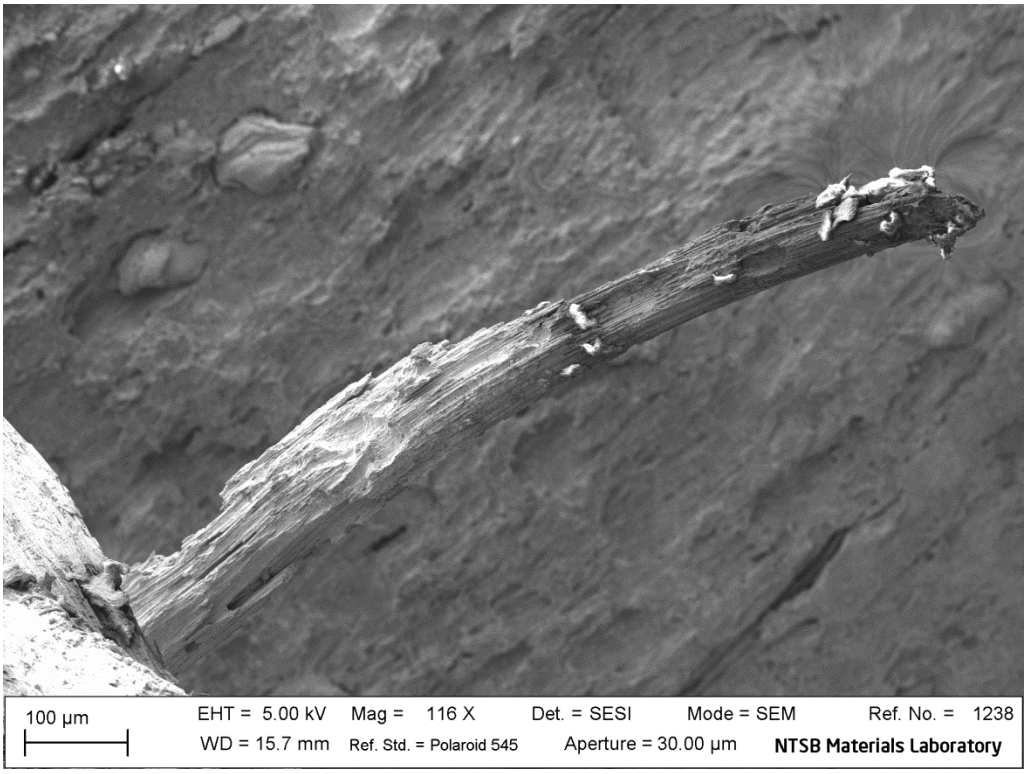


Figure 5. SEM views of typical corrosion damage to individual wires.

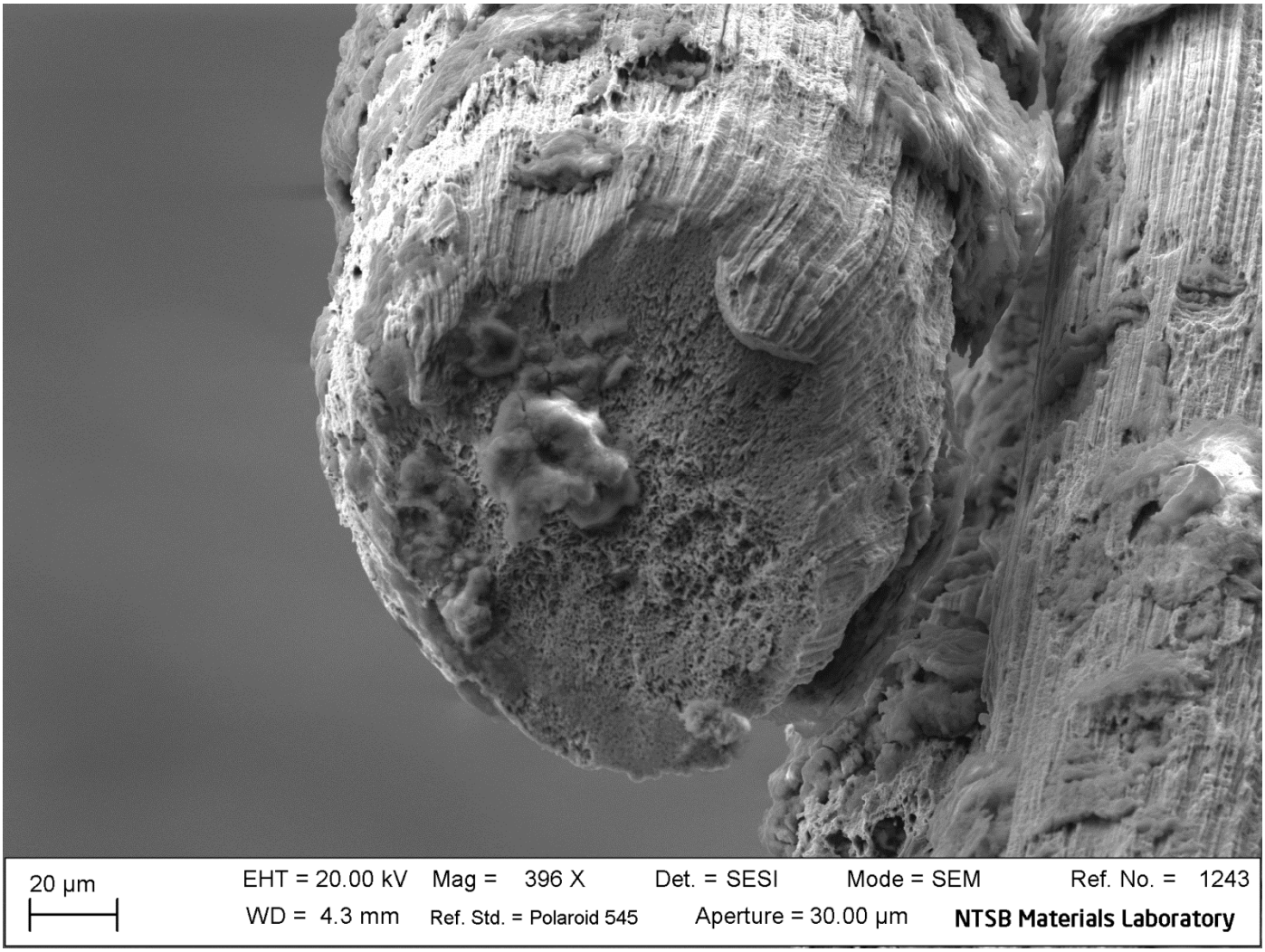


Figure 6. SEM view of one of the few wires with identifiable overstress fracture features.