

NATIONAL TRANSPORTATION SAFETY BOARD

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



February 2, 2018

MATERIALS LABORATORY FACTUAL REPORT

Report No. 18-014

A. ACCIDENT INFORMATION

Place : Page, AZ
Date : July 12, 2017
Vehicle : Cessna U206F, N71001
NTSB No. : WPR17LA144
Investigator : Samantha Link (AS-WPR)

B. COMPONENTS EXAMINED

Throttle control cable

C. DETAILS OF THE EXAMINATION

The throttle control cable was submitted with the wire strands separated, as shown in Figure 1. The two cable halves were labeled End A and End B, with End A associated with the longer length of cable and End B associated with the cable inside the rod end piece. The separation of the strands was in-line with one end of the rod end piece. Figure 2 shows the location of the separation.

Digital microscope images of diametrically opposite sides of the rod end piece are shown in Figure 3. The end opposite the rod end is shown, which was internal to the cable assembly. Two circumferential bands of wear were visible on the end, as indicated by the black brackets. The bands were heavier on one side of the piece, and the band closest to the end had less damage compared to the other band. Corresponding wear was observed on the inner surface of the mating guide piece.

The wire strands of End B are shown in Figure 4, while the wire strands of End A are shown in Figure 5. The fracture surfaces were flat and perpendicular to the axes of the strands. No necking or thinning of the individual strands consistent with overstress separation was observed.

Several wires were sectioned from End A and examined using a Zeiss Auriga 40 field emission (FE) scanning electron microscope (SEM). Figure 6 shows the fracture surface on one exemplar wire. Post separation impact damage obscured the fracture surface features on the wires. Some mushrooming of the fracture surface edges consistent with hammering of the ends was observed, likely resulting from contact of the mating fracture surfaces after separation. A few areas of pitting consistent with corrosion were observed on top of the smearing damage on the fracture surfaces.

The flat fracture surfaces on the wires and their perpendicular orientation to the wire axes, along with the lack of necking or other deformation, is consistent with a progressive fracture mechanism such as fatigue. Consequently, the throttle control cable likely failed due to fatigue.

Adrienne V. Lamm
Materials Engineer

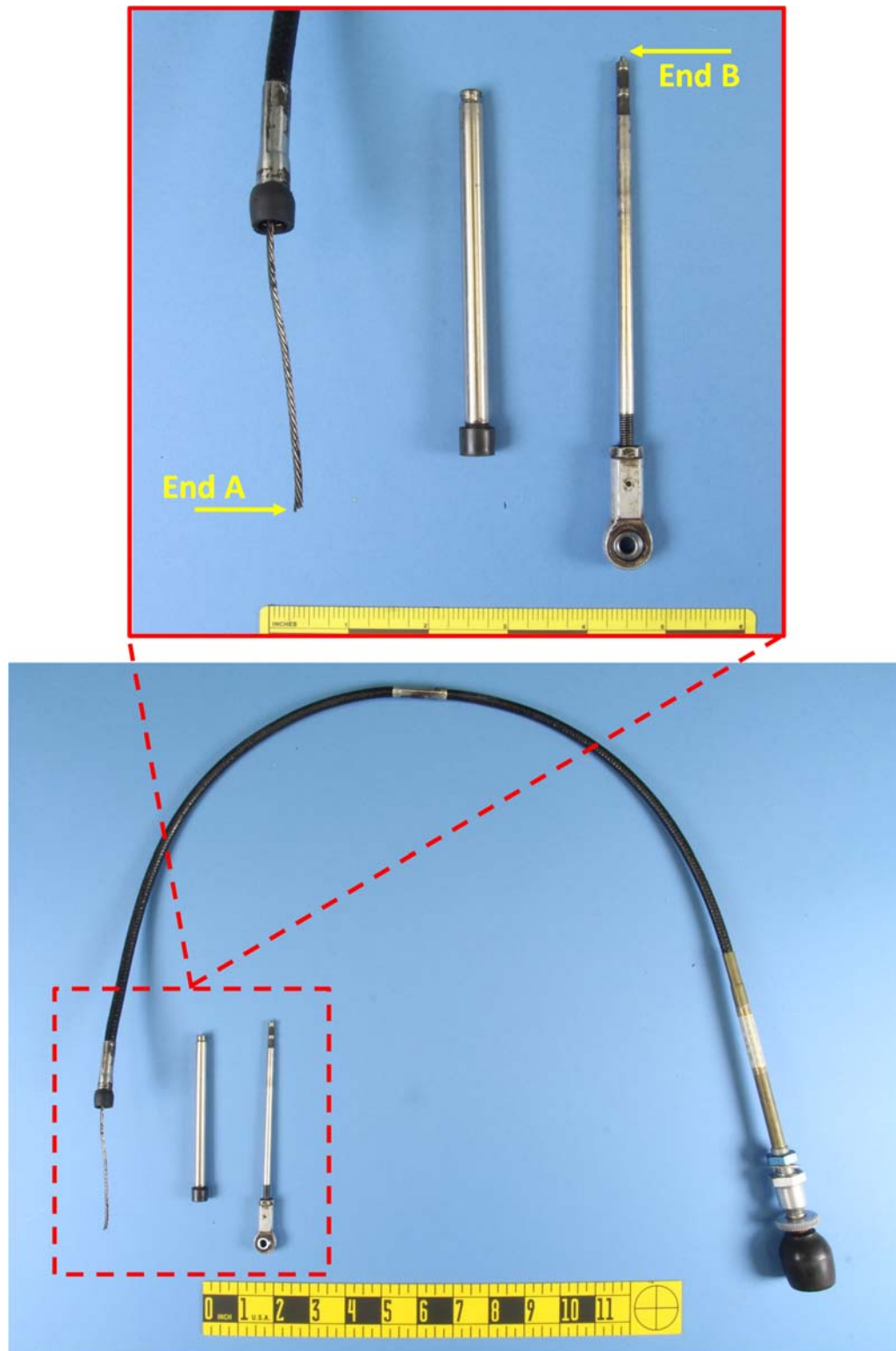


Figure 1: Overall (bottom) and close-up (top) photos of the separated throttle control cable. The two ends were labeled End A and End B, as shown.

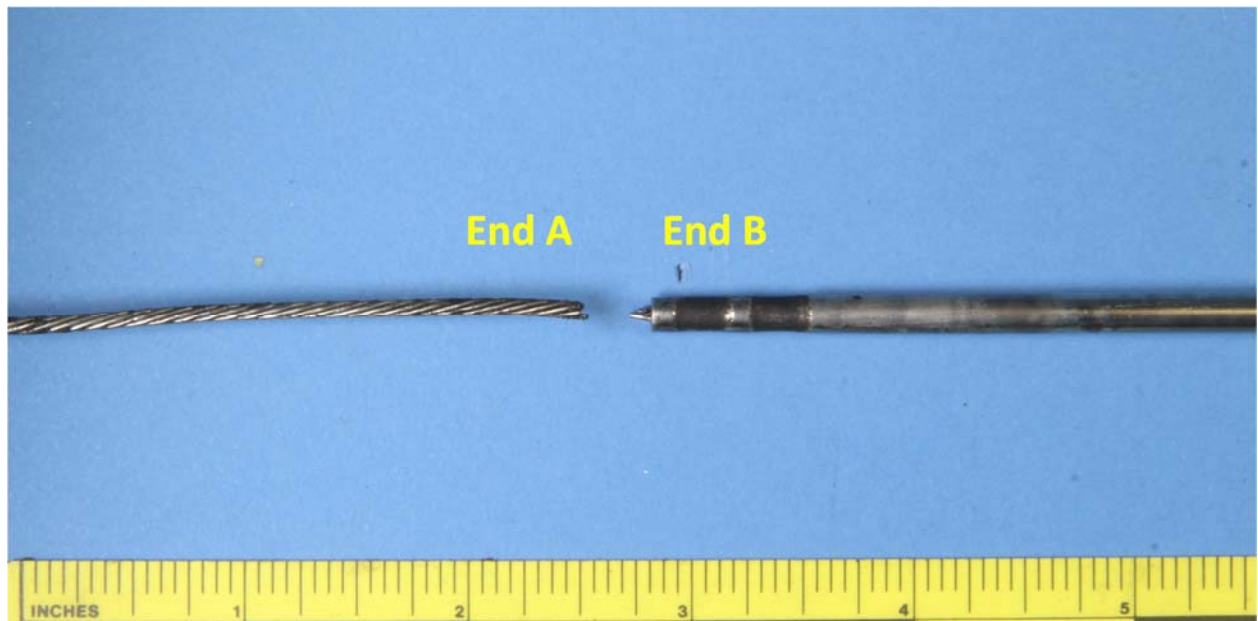


Figure 2: Close-up photo showing the location of the throttle control cable separation was in-line with one end of the rod end piece.

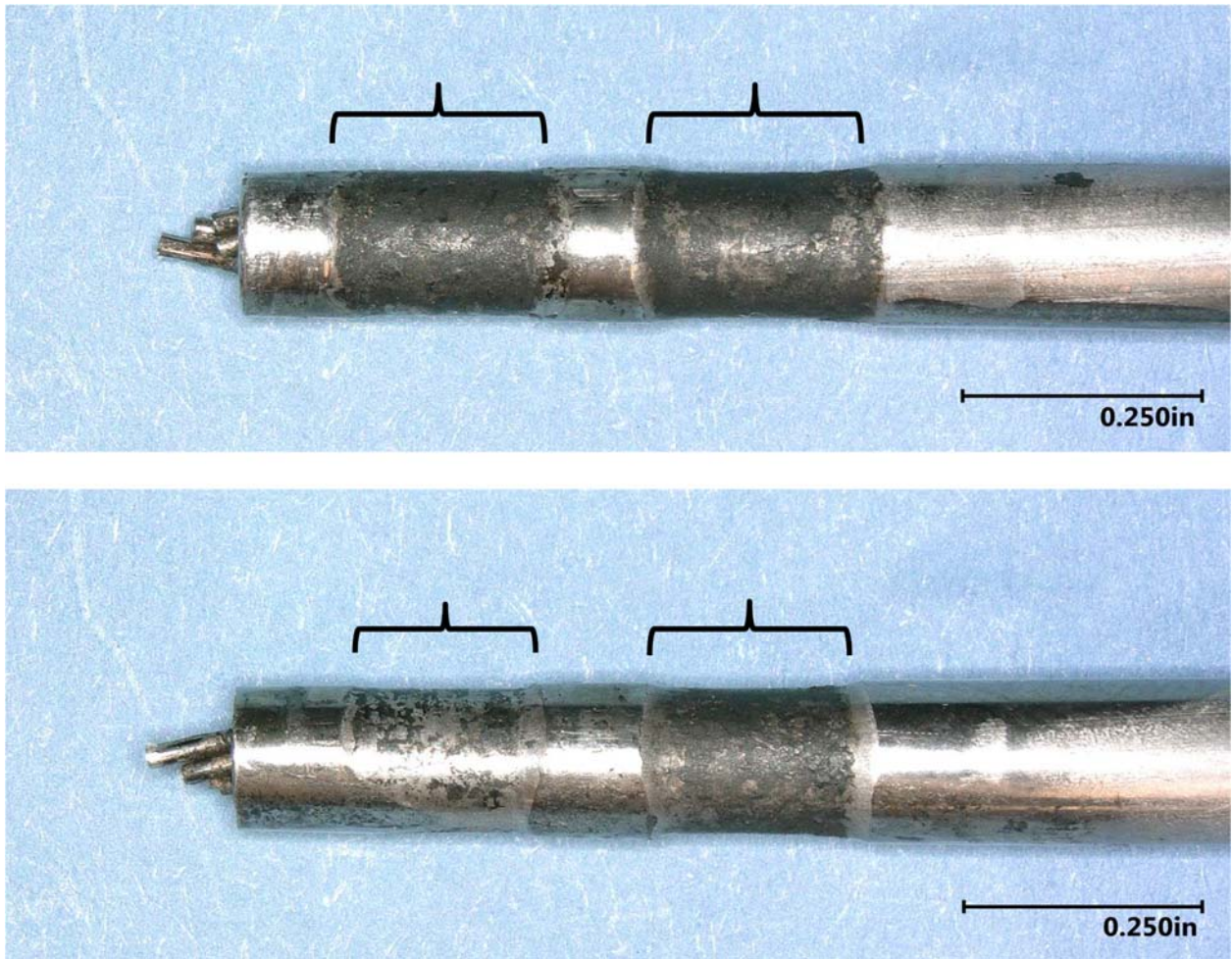


Figure 3: Digital microscope images of two circumferential bands of wear (black brackets) on the rod end piece. The views shown are diametrically opposite each other.

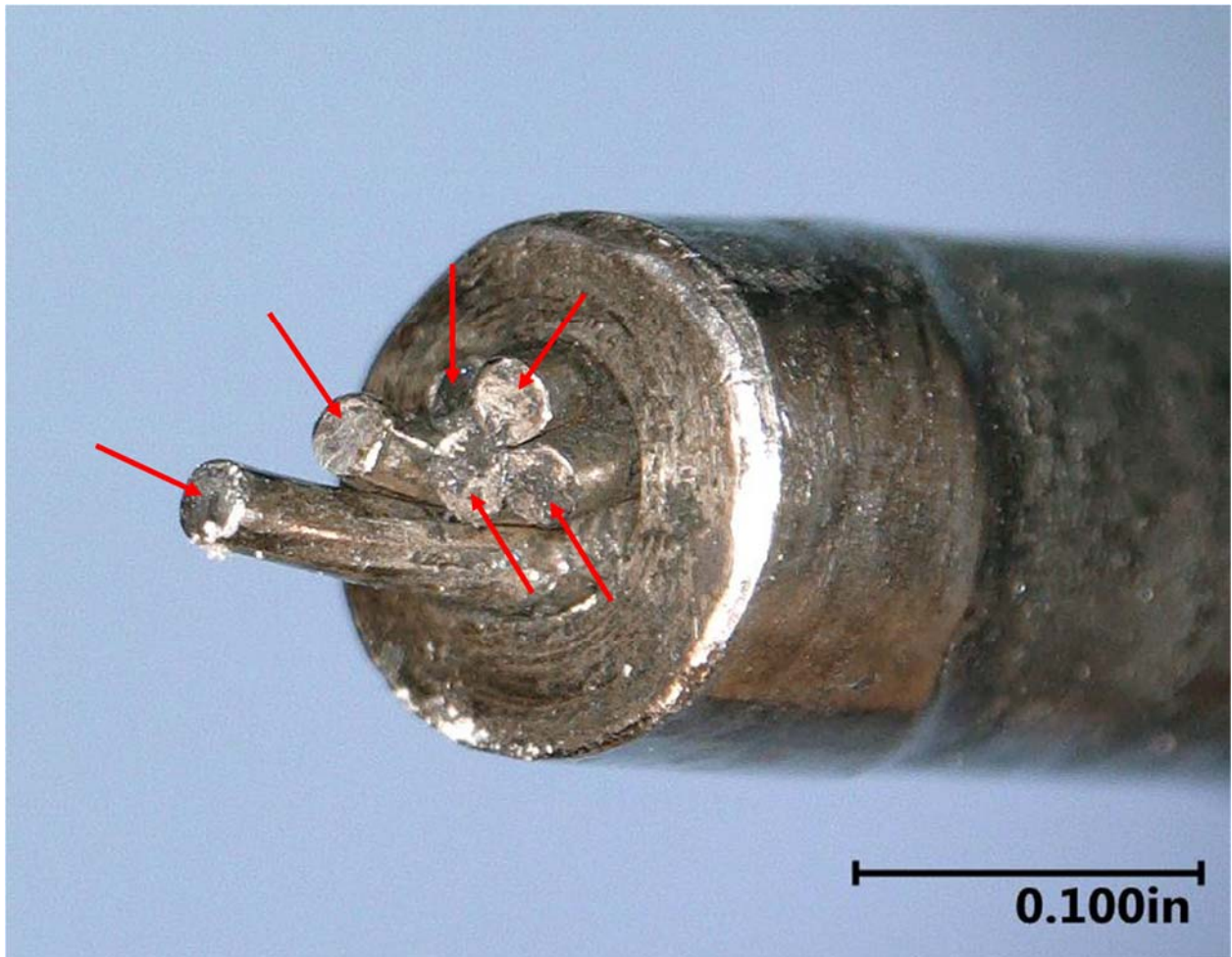


Figure 4: Digital microscope image of the separated wires (red arrows) on End B as viewed at an angle.

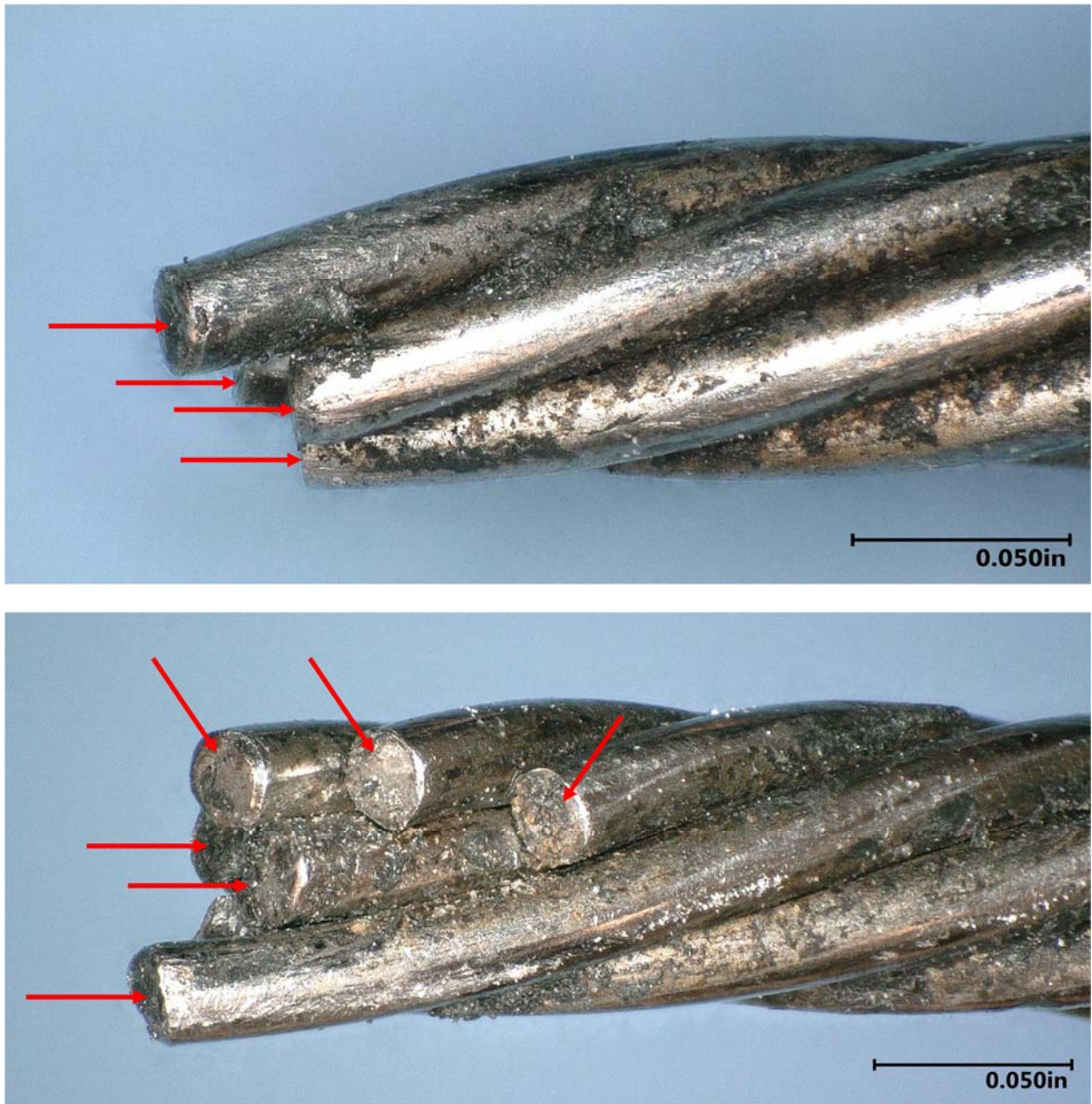


Figure 5: Digital microscope images of the separated wires (red arrows) on End A as viewed perpendicular (top) and at an angle (bottom).

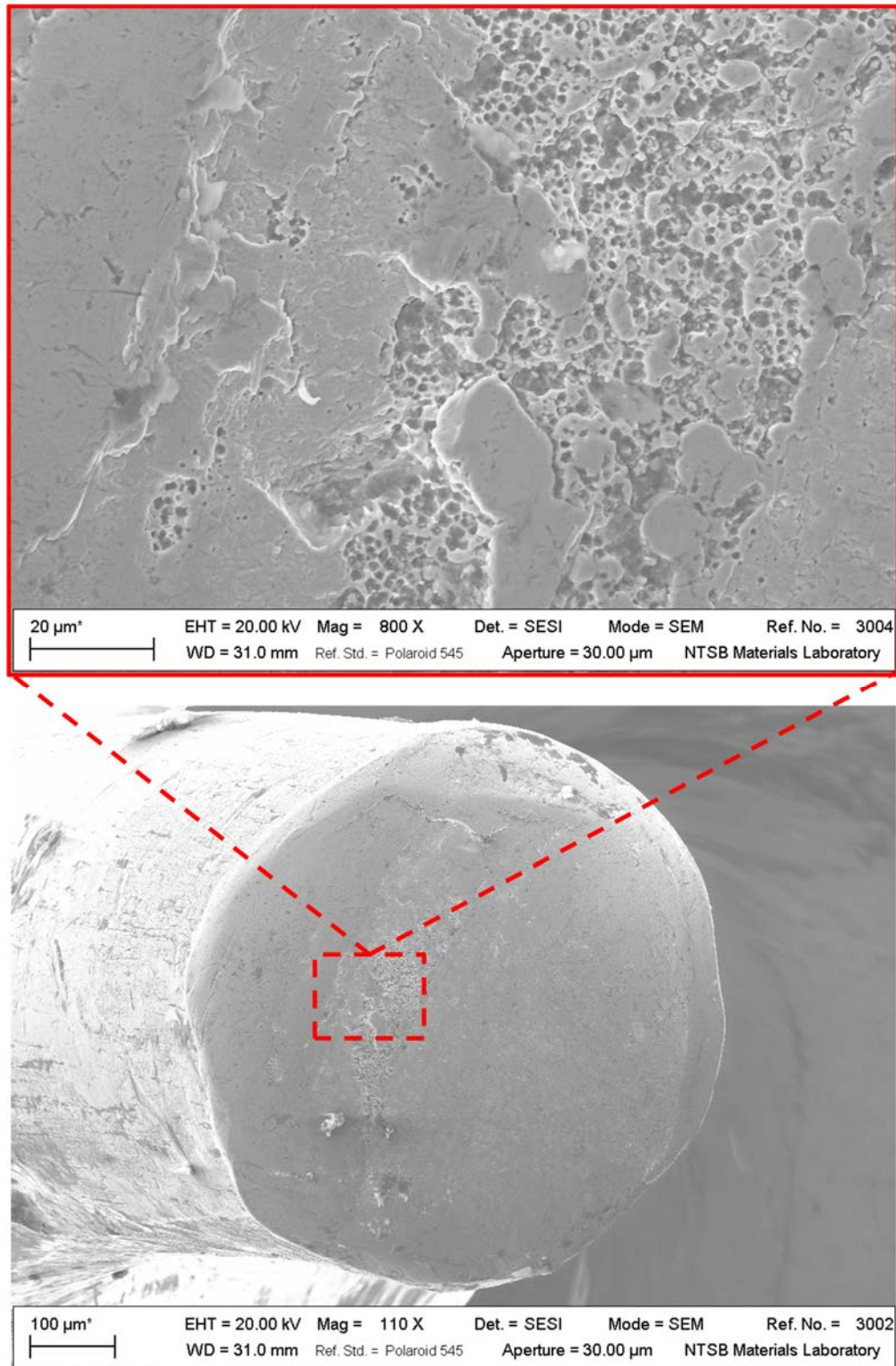


Figure 6: SEM images of an exemplar separated wire sectioned from End A.