

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN16LA154

MATERIALS LABORATORY

Factual Report 26-008

March 6, 2026

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A. ACCIDENT INFORMATION

Location: Kilbourne, Louisiana
Date: April 18, 2016
Vehicle: Air Tractor AT-502, N301LA
Investigator: Jennifer Rodi (AS-CEN)

B. COMPONENTS EXAMINED

Vertical Stabilizer

C. EXAMINATION PARTICIPANTS

Group Chair	Adrienne Lamm, Materials Engineer National Transportation Safety Board Washington, D.C.
Specialist	Jennifer Rodi, Deputy Regional Chief, AS-CEN National Transportation Safety Board Aurora, Colorado
Specialist	Laura Abraham, Air Safety Investigator, AS-CEN National Transportation Safety Board Aurora, Colorado
Group Member	Kyle Schroeder, Director of Engineering Air Tractor, Inc. Olney, Texas

D. DETAILS OF THE EXAMINATION

On April 18, 2016, the subject aircraft impacted terrain during spray operations, fatally injuring the pilot and destroying the airplane. The accident was investigated with the wreckage recovered at the time, and the case was closed with a published report on June 5, 2018. In January 2026, the NTSB was contacted about a possible recovery of additional wreckage in the location of the accident. Investigators determined the wreckage was the vertical stabilizer from the subject aircraft, which was subsequently submitted for examination to the NTSB Materials Laboratory in Washington, D.C.

A group exam of the recovered vertical stabilizer with the above listed personnel occurred on February 3, 2026. An exemplar aircraft of the same make and model is shown in Figure 1 with the vertical stabilizer identified (red arrow).

1.0 Group Exam Work

1.1 Non-Destructive Examination

Overall photos of the right and left sides of the recovered vertical stabilizer are shown in Figures 2 and 3, respectively. Both lobes of the stabilizer fin attach plate of the forward fitting were fractured (Figures 4-6). The outboard halves of the fractures on both lobes were flat and roughly in-line with the paint line demarking the top of the mating fuselage structure; the right lobe fracture continued in a straight line through the length of the lobe while the left lobe fracture curved downwards and intersected the attachment hole (Figure 7).

In accordance with the terminating action of Air Tractor SL 155 and Federal Aviation Administration Airworthiness Directive 2003-07-04, a doubler should be attached to the forward spar assembly; no doubler was present and no evidence that one had been previously installed was observed. The forward fitting attached to forward spar measured approximately 0.25 inches thick, which is in original as-delivered condition for this serial number aircraft.

The remainder of the vertical stabilizer body was intact but had several types of damage in numerous places. Plastic deformation consistent with impact was observed along the leading and trailing edges (yellow arrows, Figure 8). A large area of buckling caused by one impact was observed at approximately mid-length on the leading edge (Figure 9). All the impact marks were bent towards the left, consistent with the right side of the stabilizer impacting first.

Additional contact marks were observed in several locations. There were white transfer marks on the left side base (Figure 10). Blue paint smears were visible in some of the leading-edge impact marks and on the top surface of the right side (Figure 11). The rear spar was twisted, with the right side shifted aft (Figure 12).

A doubler was observed at the base of the stabilizer along approximately a third of the chordwise length of the stabilizer (red dotted line, bottom photo, Figure 13). The doubler was assembled on the inner surface of the leading-edge skin and extended aft, with two rows of unevenly spaced rivets on either side of the stabilizer (white dashed boxes, top image, Figure 13). The doubler was a non-standard modification, with the purpose and date of installation unknown.

Both rudder attachment points at the trailing edge of the stabilizer were present and intact (Figure 14). The terminal from the wire deflector cable had fractured but was still assembled to the top of the stabilizer (Figure 15).

1.2 Post-Sectioning

The bottom portion of the forward spar and fin attach plate assembly were sectioned, then further sectioning isolated the lobe fracture surfaces for further examination. The fracture surfaces were cleaned with mild detergent and a soft plastic bristle brush, then soaked in ethanol ultrasonic bath and finished with an ethanol rinse.

After cleaning, the lobe fracture surfaces were examined using a 5x-to-50x stereomicroscope and a 20x-to-200x digital microscope. Digital microscope images of the fracture surfaces are shown in Figures 16 and 17.

Both fracture surfaces had extensive post-fracture smearing damage. Thumbnail shaped areas were visible in the flat portions of both fracture surfaces (red dotted lines). Macro features within the thumbnails were consistent with fatigue cracking. The fatigue emanated from the forward face of the attach plate, approximately 0.25 inches and 0.10 inches inboard from the outboard edges of the right and left lobes, respectively (red brackets). Secondary fatigue cracking on parallel planes was observed adjacent to the main plane of fatigue cracking on both fracture surfaces (orange dotted lines). An uneven ridge of worn material was visible along the forward edge of the fracture surface on the right lobe, but could not be determined to have occurred pre or post fatigue initiation.

2.0 Post Group Exam Work

The lobe fracture surfaces were examined using a Thermo Scientific Apreo 2 field emission scanning electron microscope (SEM). SEM images of the right and left lobe fracture surfaces are shown in Figures 18-19 and Figures 20-21, respectively. River marks on the fracture surfaces were consistent with fatigue emanating from the forward faces of the lobes (red brackets, Figures 18 and 20). No distinct anomalies were observed at the origins of the fatigue cracking on either lobe. Smearing damage obscured most of the finer features on the fracture surfaces, but fatigue striations were observed within a few undamaged areas (Figures 19 and 21).

Per the manufacturer, the forward fitting is specified as 2024 aluminum alloy in the T351 heat treated condition. A sample sectioned from the fitting was prepared and tested for composition, conductivity, and hardness. X-ray fluorescence (XRF) analysis determined the sample was 2024 aluminum alloy. The electrical conductivity of the sample measured 23.6%IACS (International Annealed Copper Standard). The average hardness of the sample was 54.2 HRB.

The nut and bolt at the top of the vertical stabilizer were disassembled and the wire deflector terminal was removed for examination. The terminal was cleaned with

mild detergent and a soft plastic bristle brush, then soaked in ethanol ultrasonic bath and finished with an ethanol rinse and examined using a 20x-to-200x digital microscope. Digital microscope images of the fracture surface and profile of the terminal are shown in Figure 22.

The surfaces of the terminal were heavily degraded, with extensive corrosion deposits. The separated terminal end had a reduced diameter (red dashed lines) from necking, consistent with plastic deformation during tensile overstress.

The terminal fracture surface was examined using a SEM (Figures 23 and 24). Corrosion deposits and secondary smearing damage obscured a significant amount of finer fracture surface features. Undamaged areas on the fracture surface had ductile dimples consistent with tensile overstress.

Submitted by:

Adrienne V. Lamm
Materials Engineer



Figure 1. Overall photo of an exemplar aircraft of the same make and model with a red arrow pointing to the vertical stabilizer.

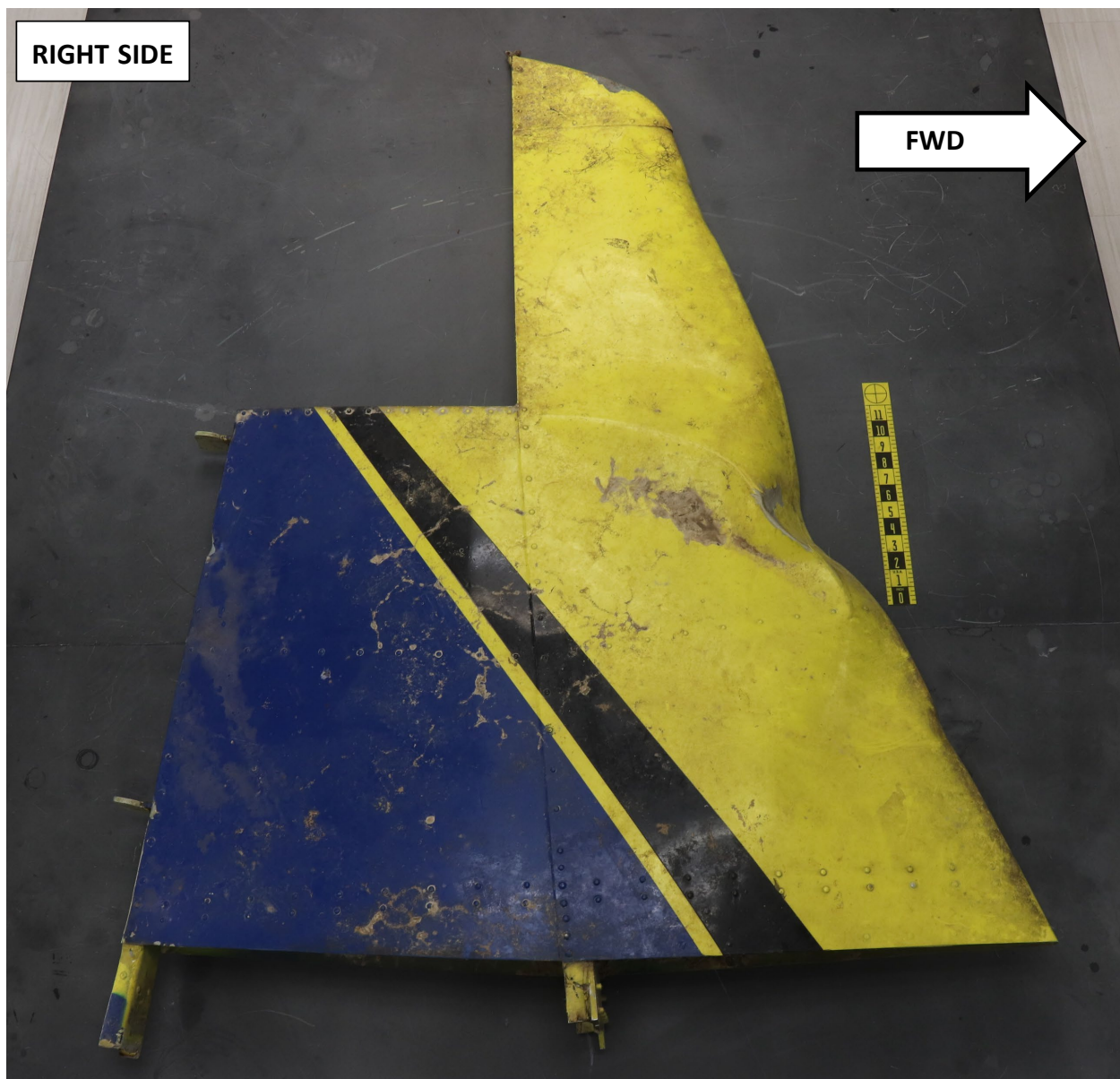


Figure 2. Overall photo of the right side of the vertical stabilizer.

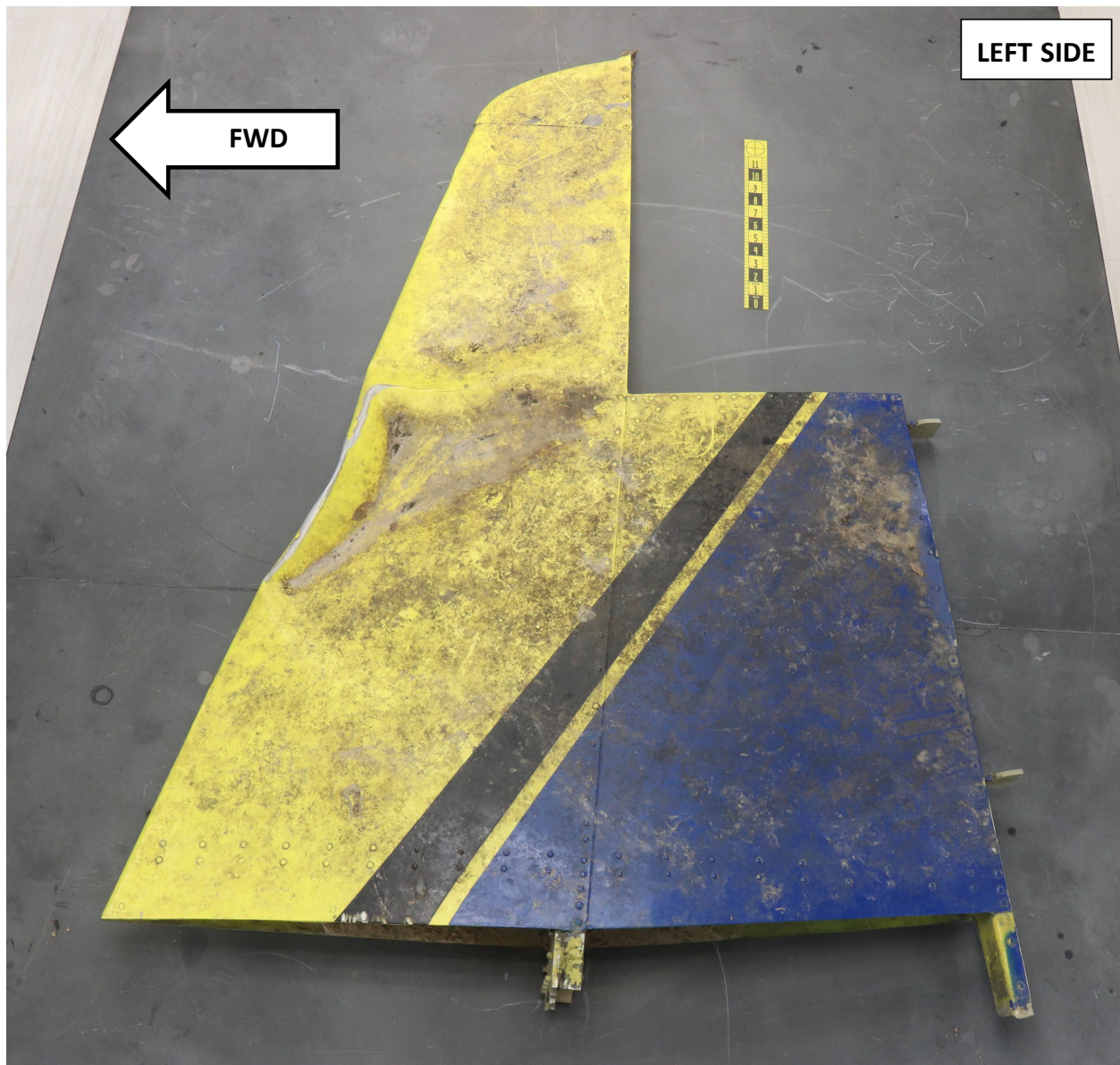


Figure 3. Overall photo of the left side of the vertical stabilizer.

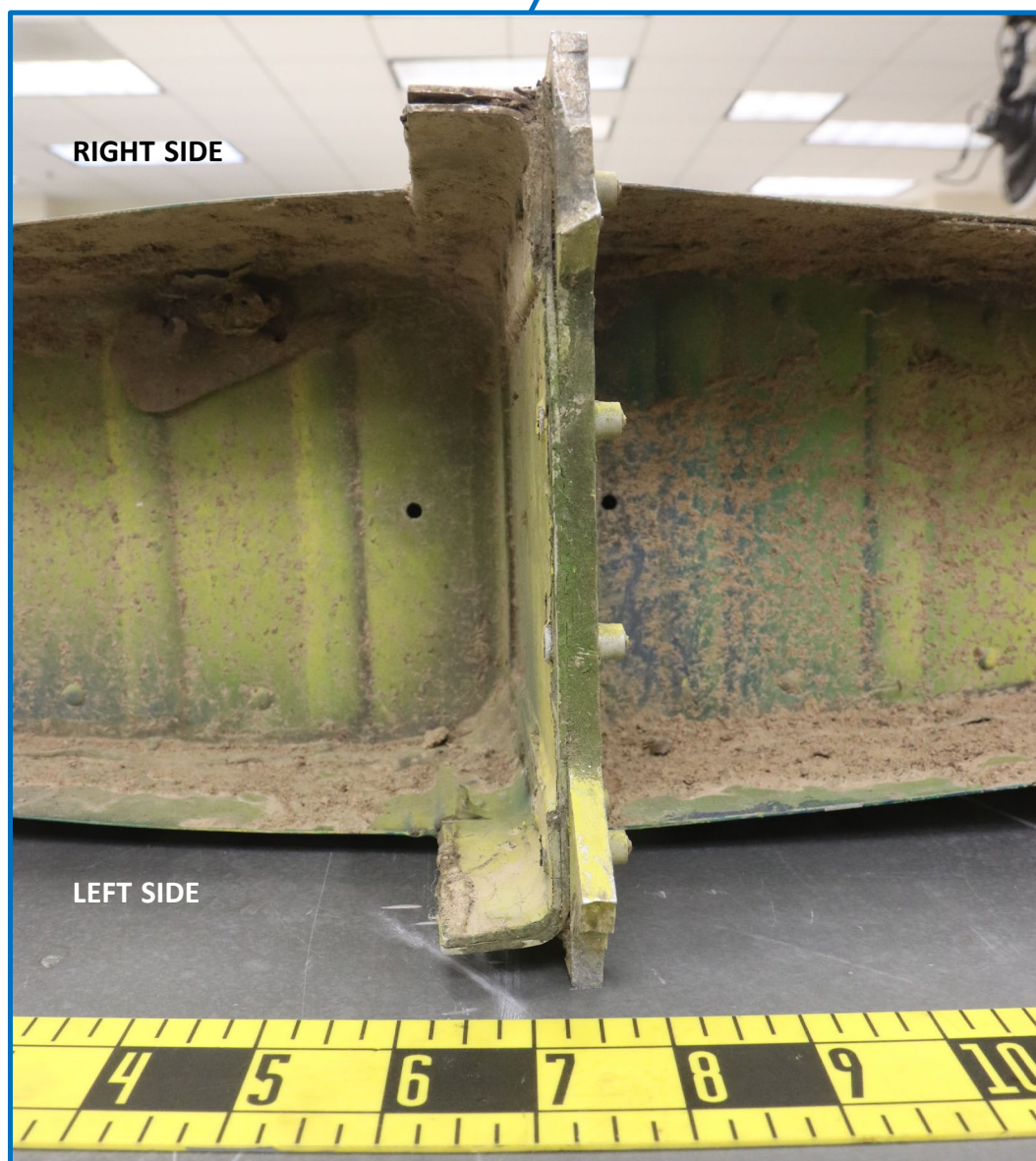


Figure 4. Macro photos of the fractures on the stabilizer fin attach plate.

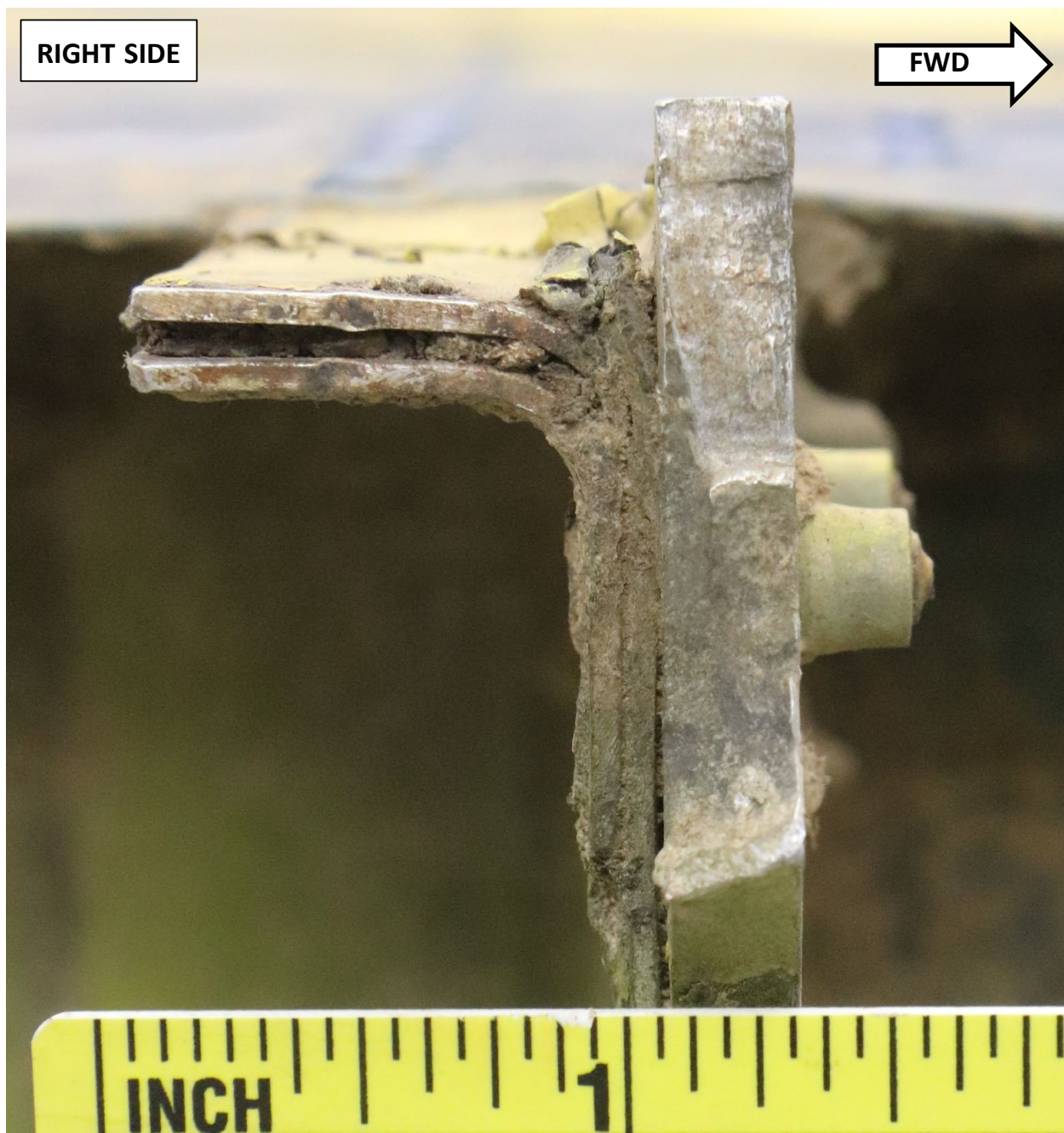


Figure 5. Close-up photo of the fracture surface on the separated right lobe of the stabilizer fin attach plate.



Figure 6. Close-up photo of the fracture surface on the separated left lobe of the stabilizer fin attach plate.



Figure 7. Macro photos of the stabilizer fin attach plate as viewed from the forward and aft directions.

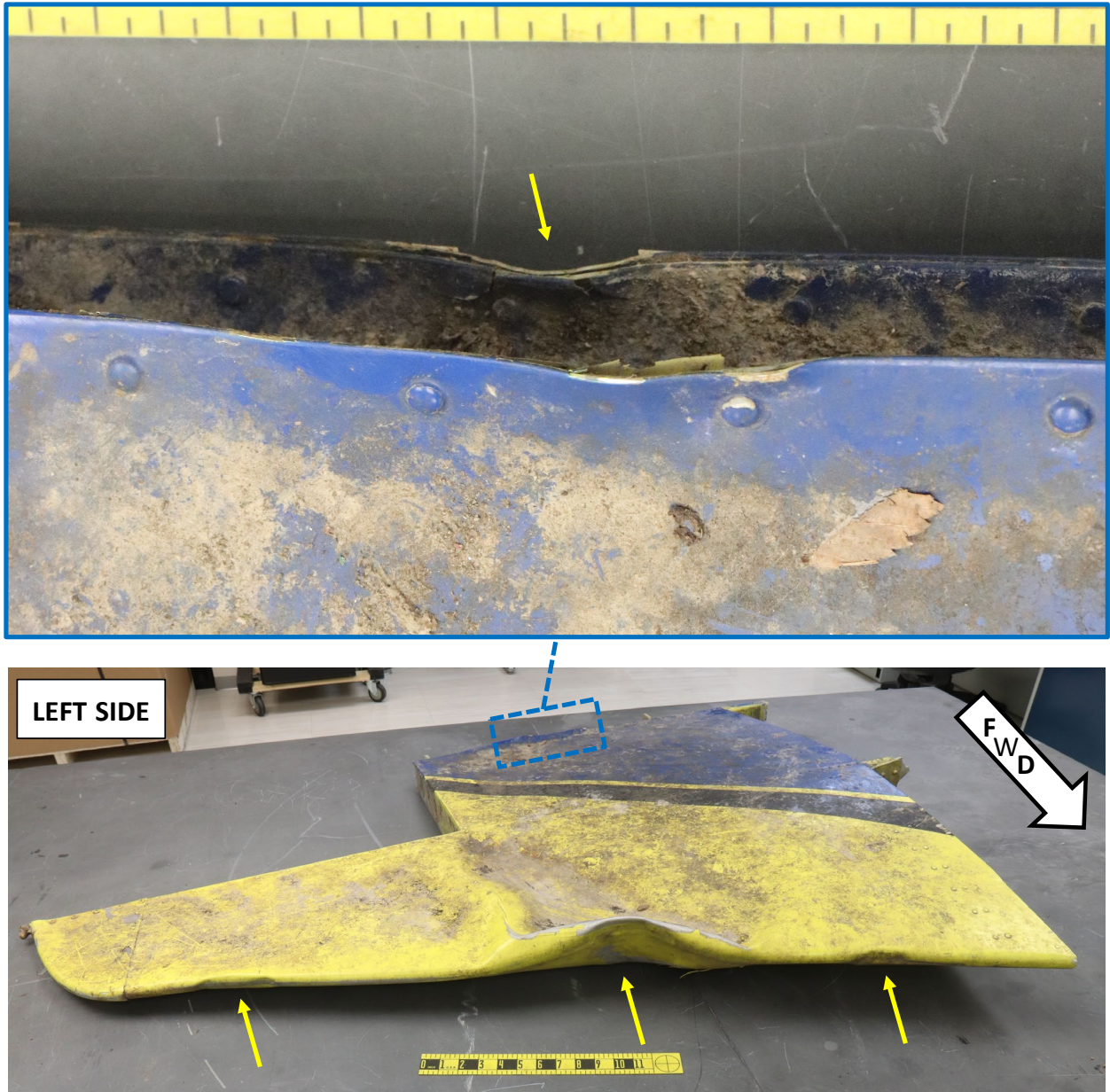


Figure 8. Macro and close-up photos of areas with plastic deformation on the leading and trailing edges of the stabilizer (yellow arrows).



Figure 9. Close-up photo of a large area of buckling at approximately mid-length on the leading edge of the stabilizer.

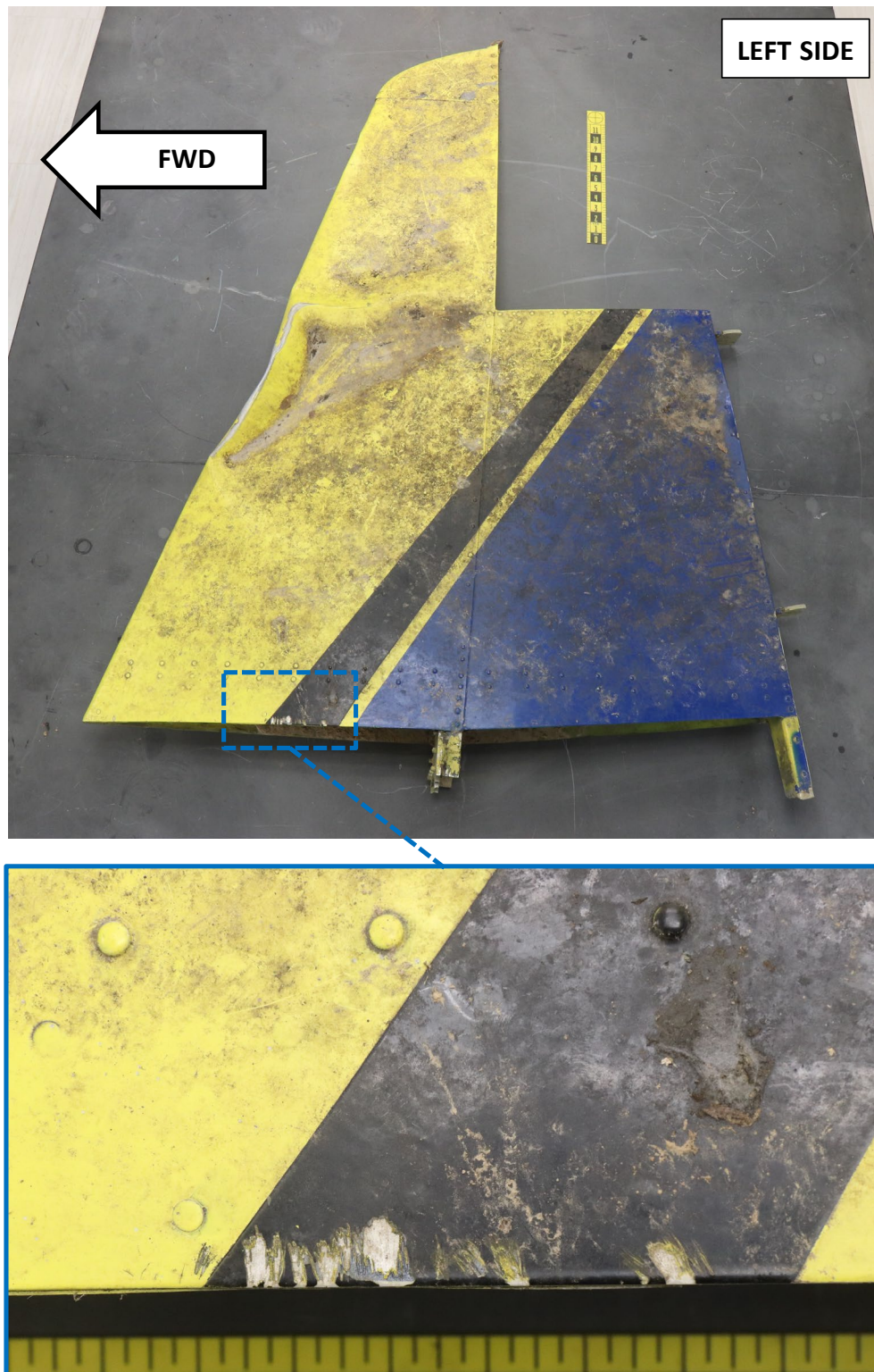


Figure 10. Macro and close-up photos of white transfer marks at the base of the stabilizer on the left side.

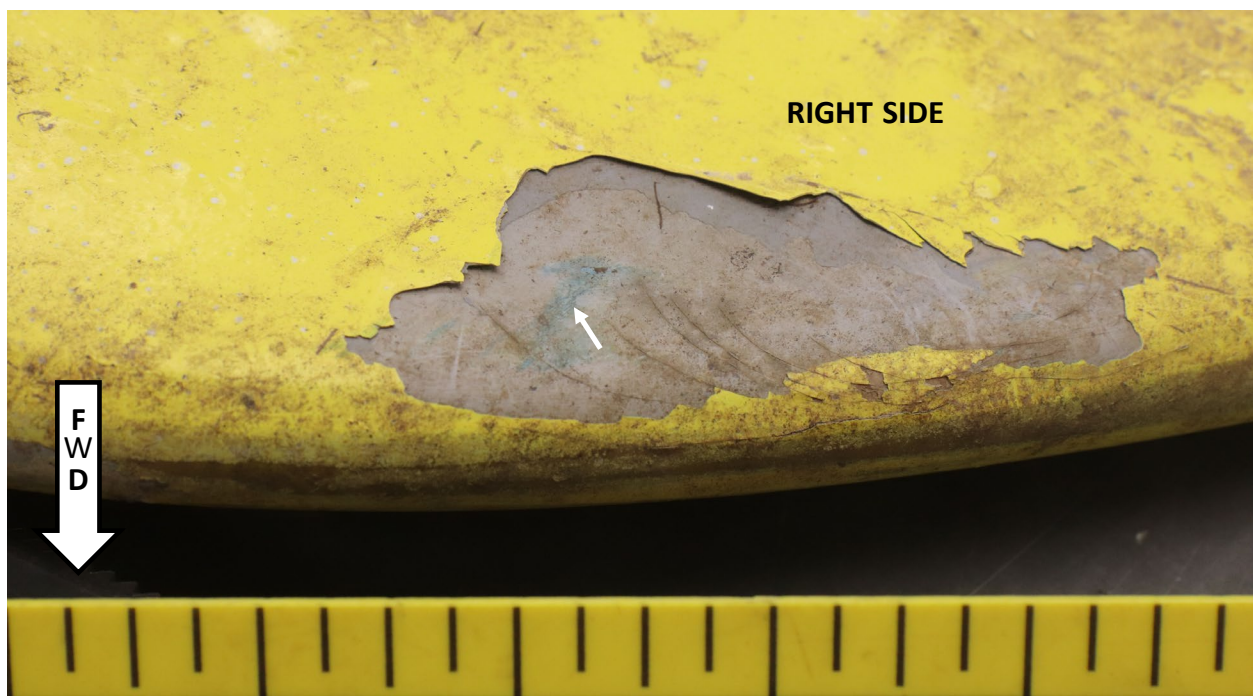
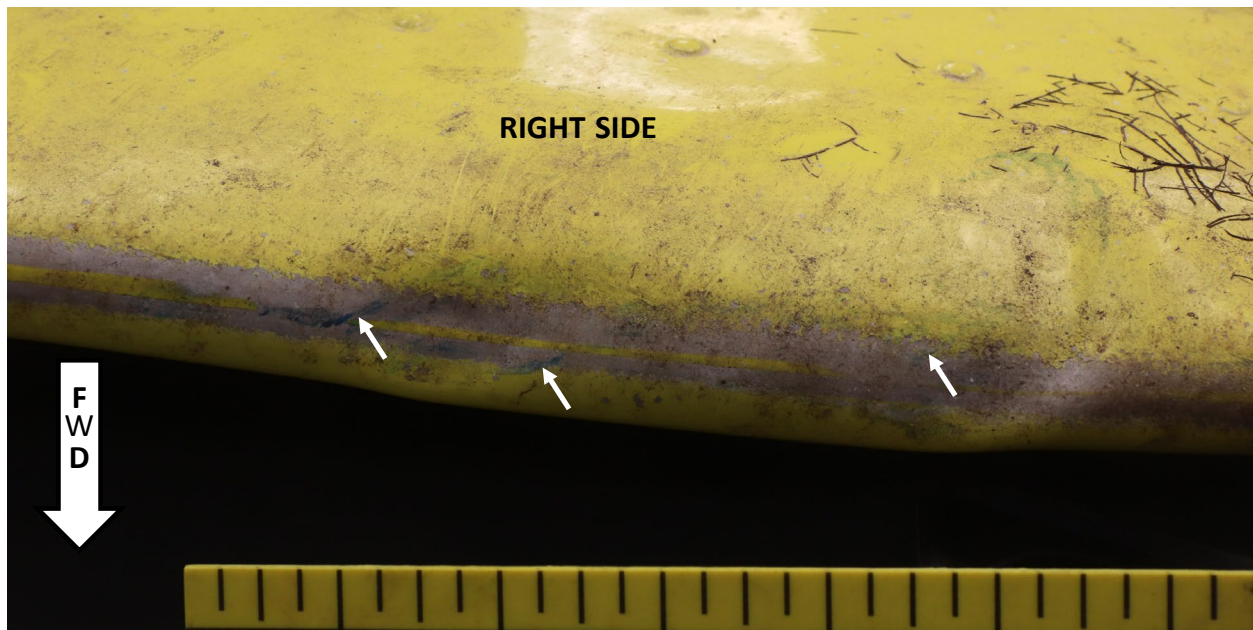


Figure 11. Close-up photos of blue paint smears in some of the leading-edge impact marks and on the top surface of the right side of the stabilizer.



Figure 12. Close-up photo showing twisting of the rear spar of the stabilizer.

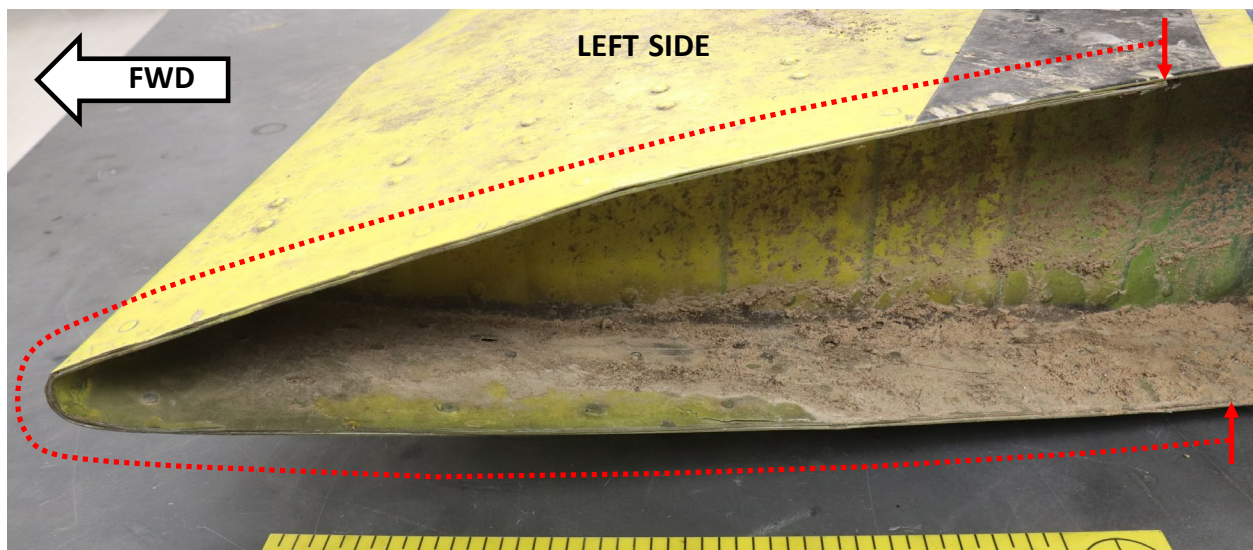
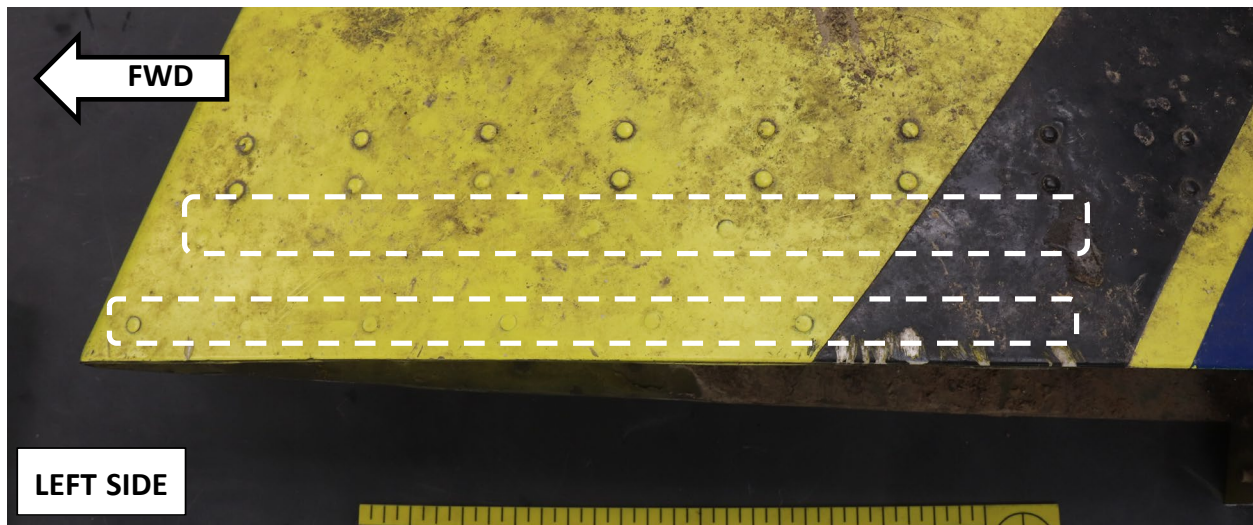


Figure 13. (Bottom) Close-up photo of a doubler at the base of the stabilizer along approximately a third of the overall depth of the stabilizer (red dotted line). (Top) Close-up photo of the two rows of unevenly spaced rivets on the left side of the stabilizer (white dashed boxes).

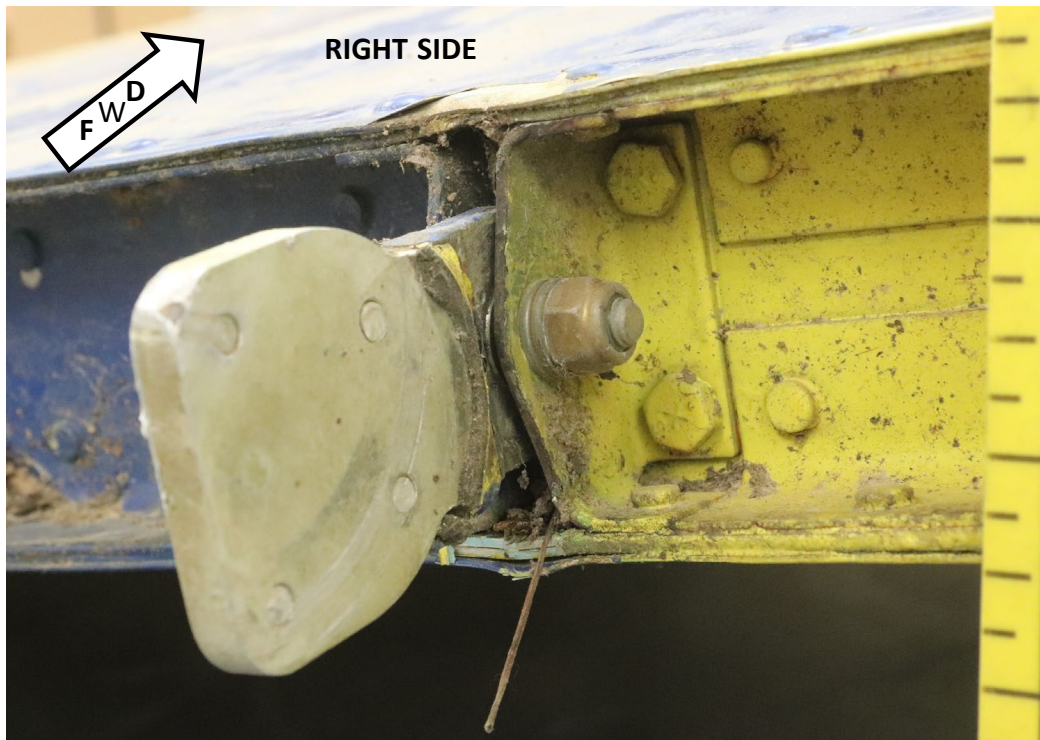
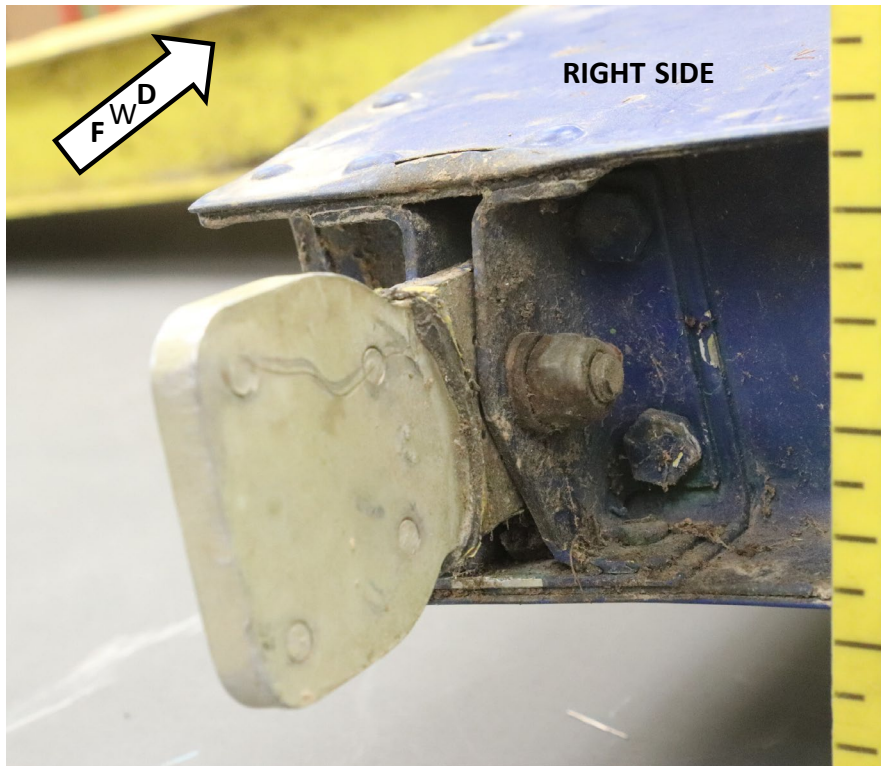


Figure 14. Close-up photos of the rudder attachment points at the trailing edge of the stabilizer.

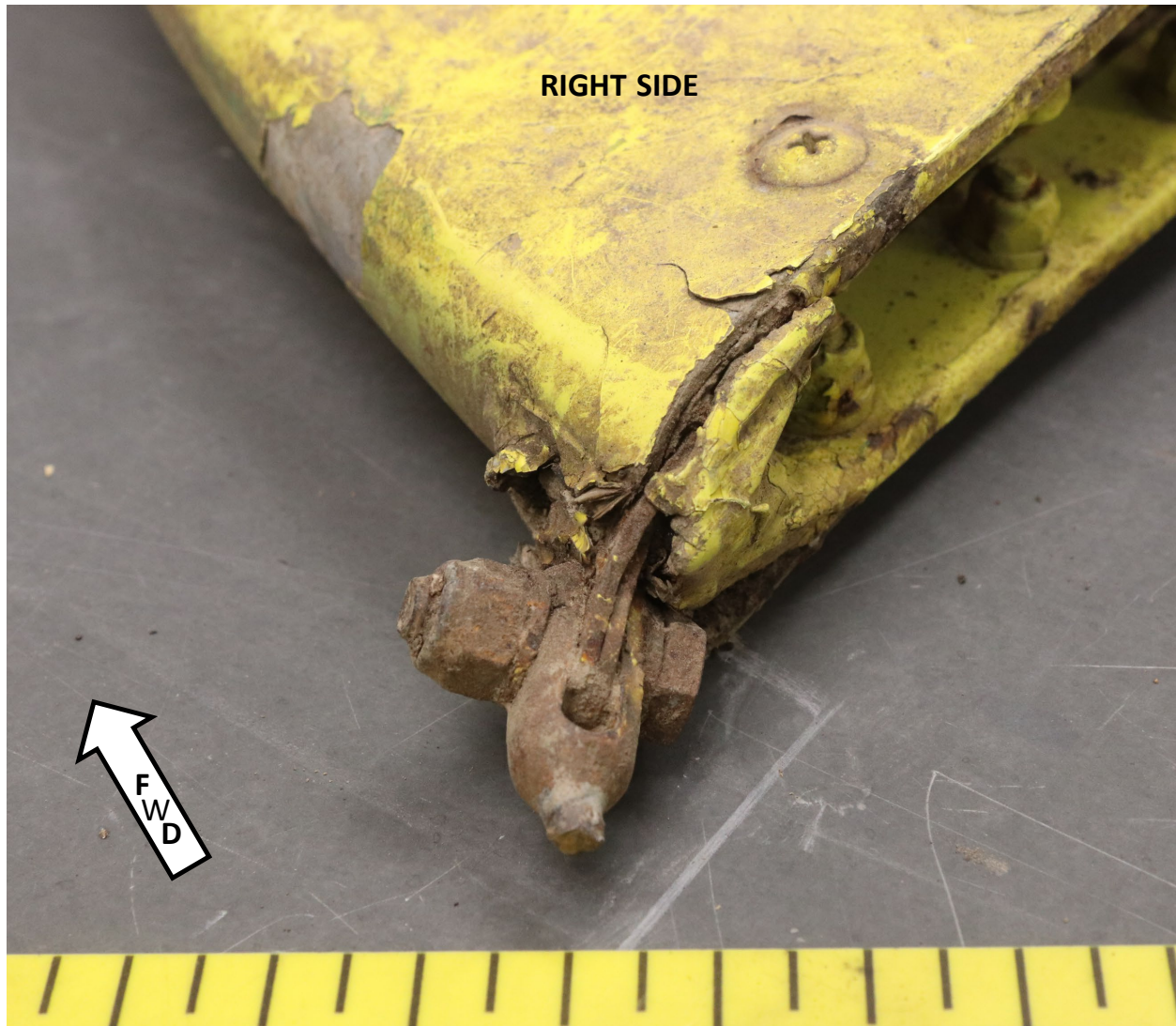


Figure 15. Close-up photo of the fractured terminal from the wire deflector cable of the stabilizer.

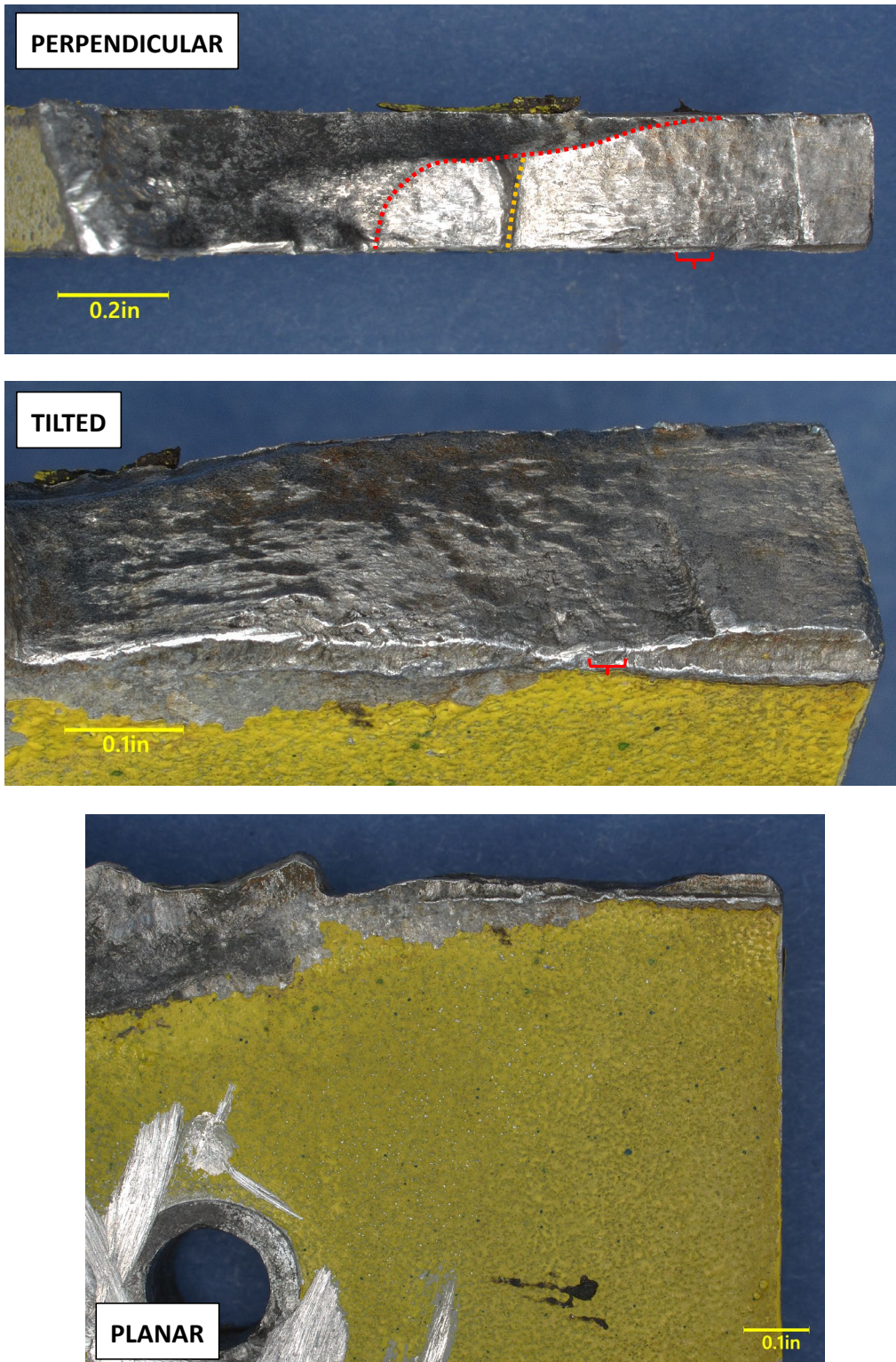


Figure 16. Digital microscope images of the fractured right lobe of the stabilizer fin attach plate. The red and orange dotted lines outline thumb-nail-shaped fatigue regions on the fracture surface. The red brackets indicate the location at the forward face of the attach plate from which macro features of fatigue emanated.

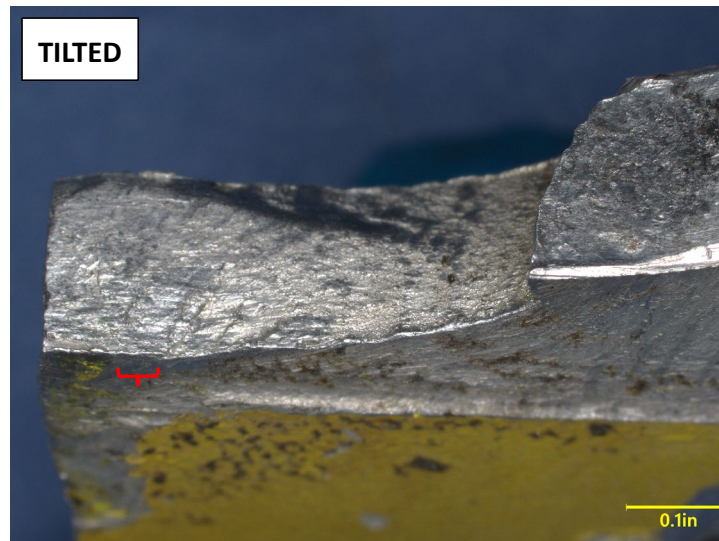
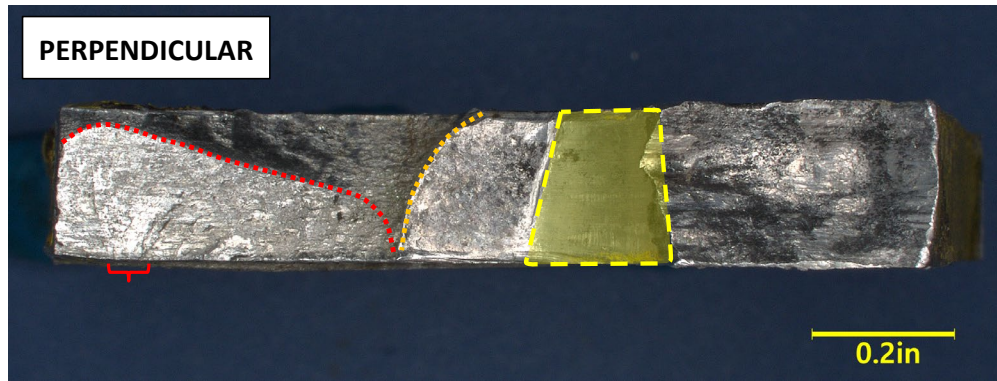


Figure 17. Digital microscope images of the fractured left lobe of the stabilizer fin attach plate. The red and orange dotted lines outline thumbnail-shaped fatigue regions on the fracture surface. The red brackets indicate the location at the forward face of the attach plate from which macro features of fatigue emanated. The yellow dashed lines indicate the edges of the attach hole.

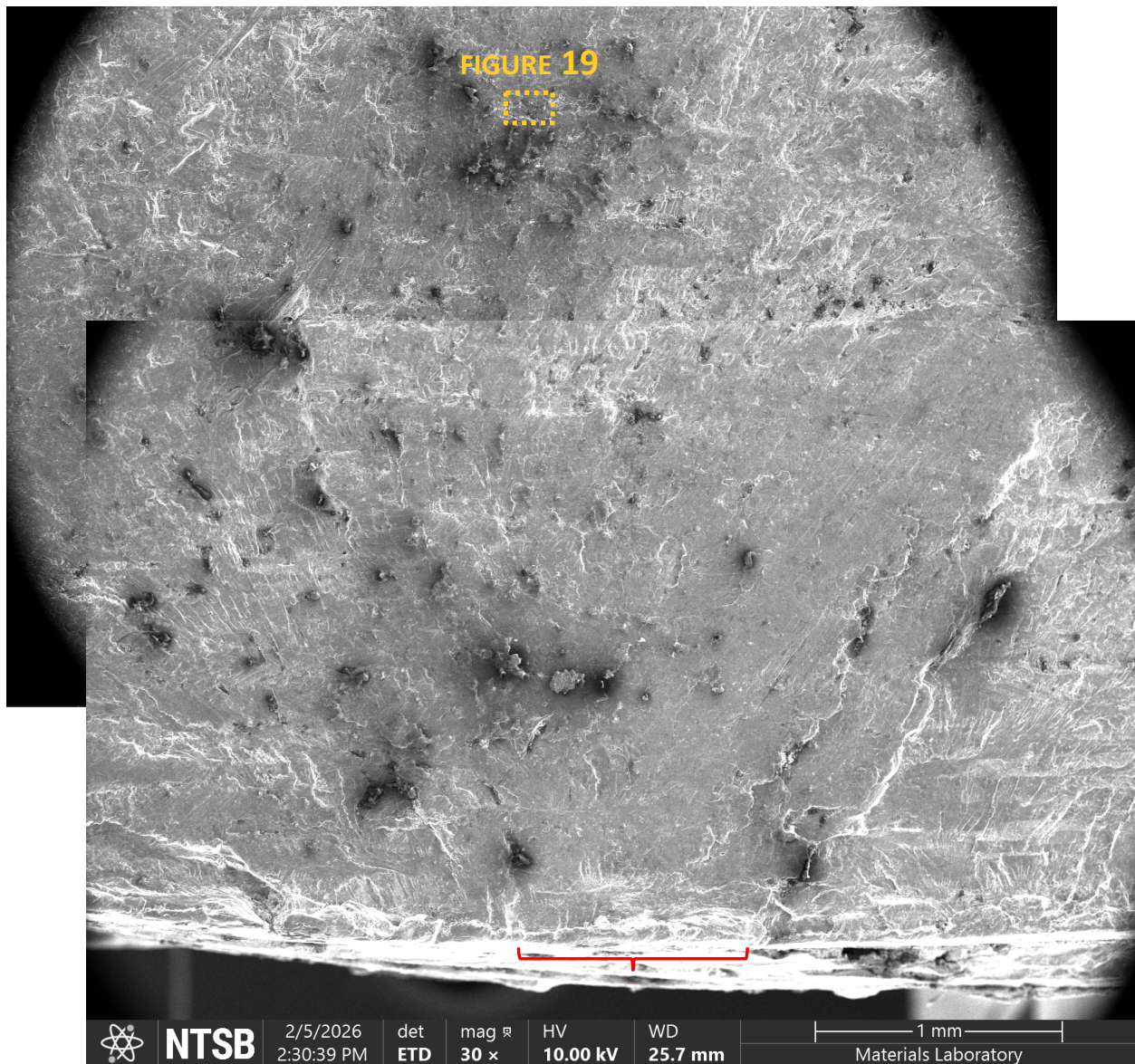


Figure 18. Secondary electron SEM images of the fractured right lobe of the stabilizer fin attach plate. The red bracket indicates the location at the forward face of the attach plate from which fatigue features emanated.

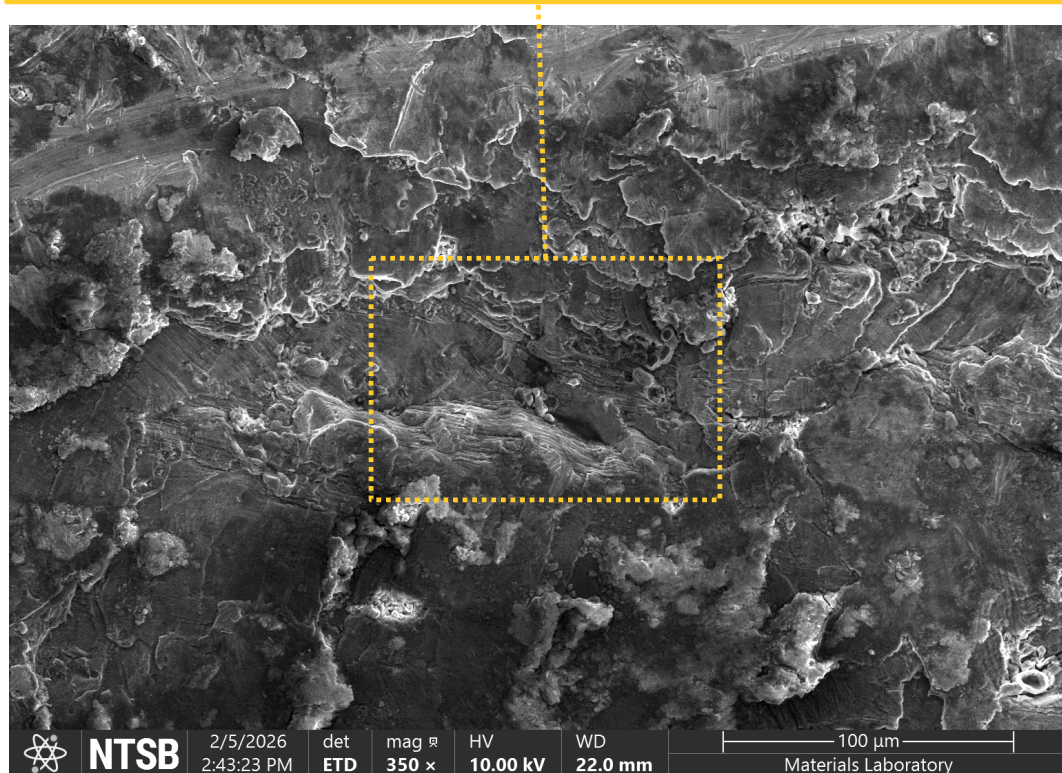
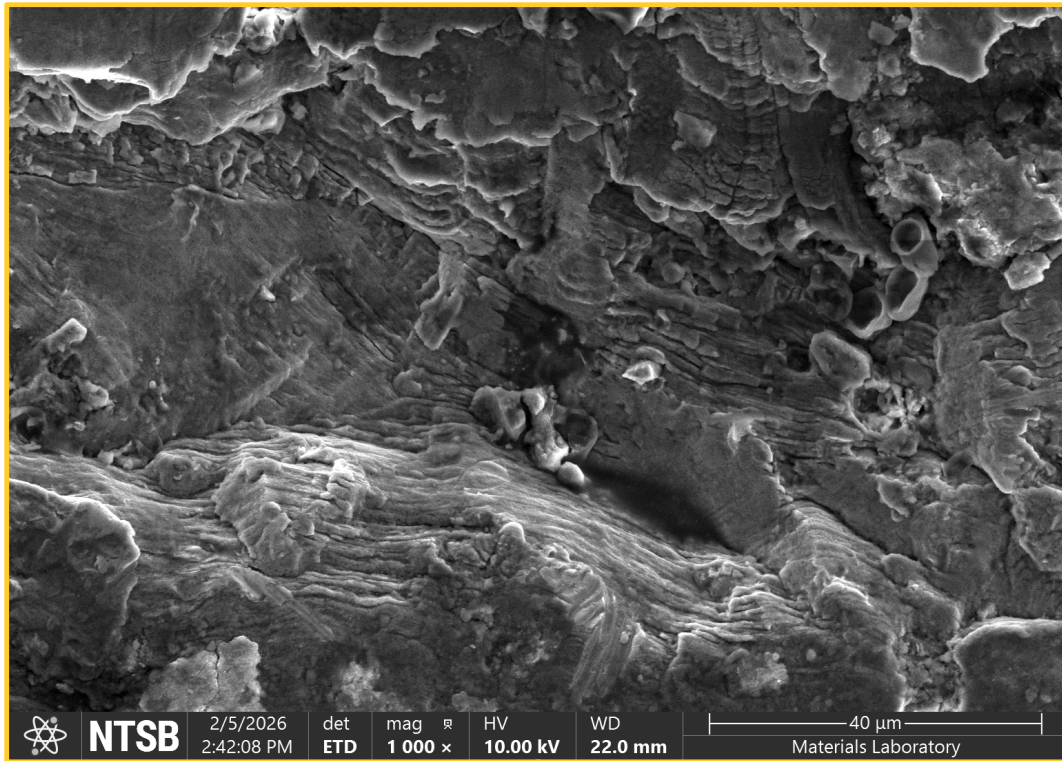


Figure 19. Secondary electron SEM images of fatigue striations observed on an undamaged area of the fractured right lobe of the stabilizer fin attach plate in the location indicated in Figure 18.

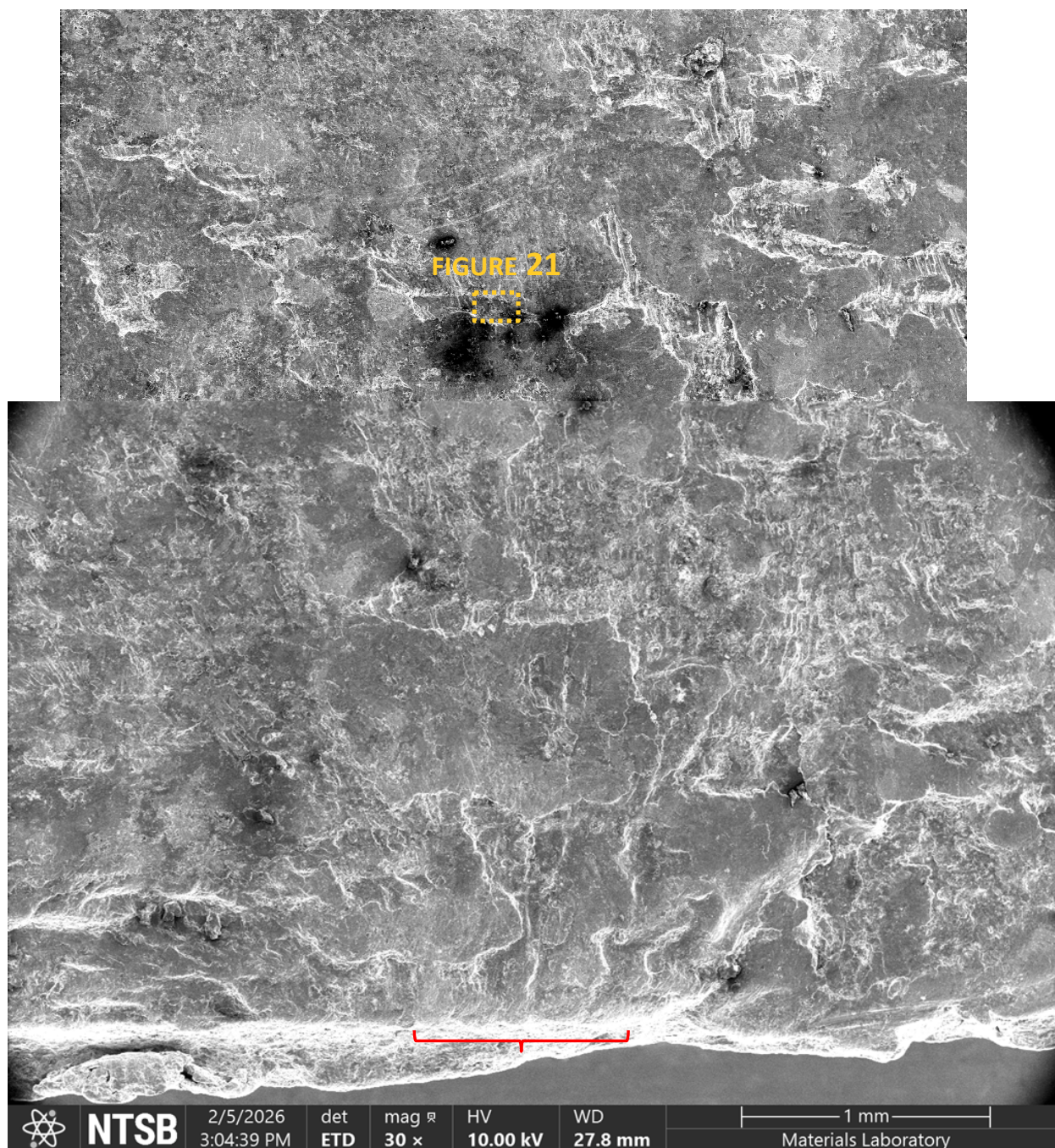


Figure 20. Secondary electron SEM images of the fractured left lobe of the stabilizer fin attach plate. The red bracket indicates the location at the forward face of the attach plate from which fatigue features emanated.

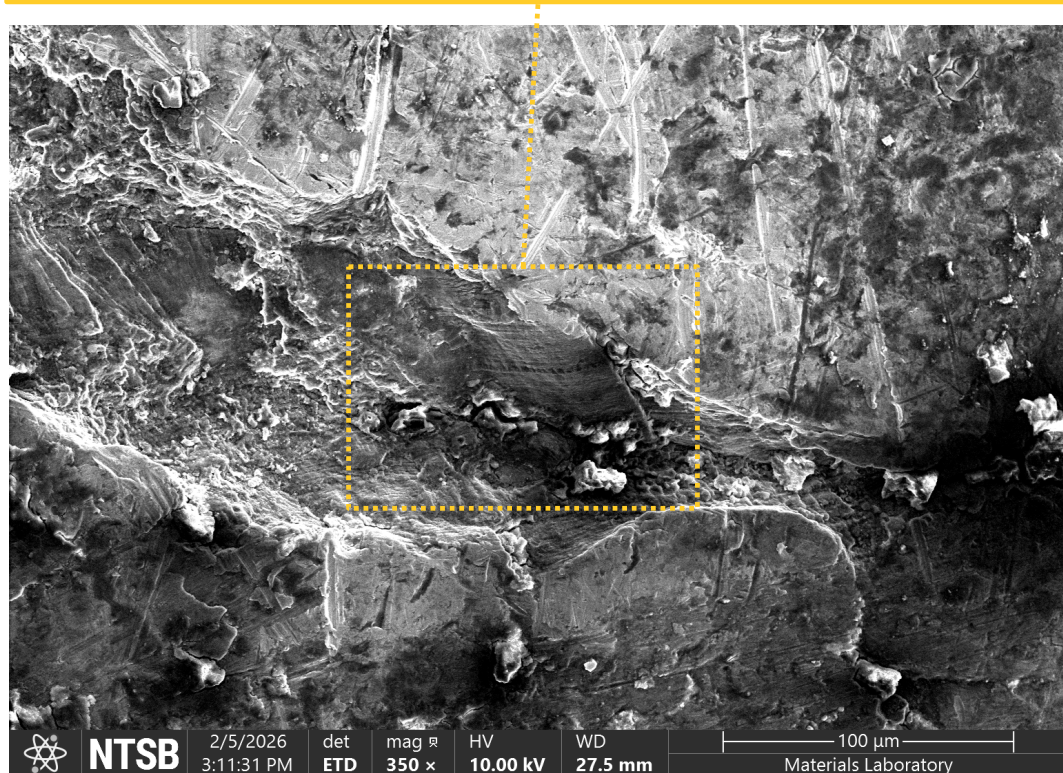
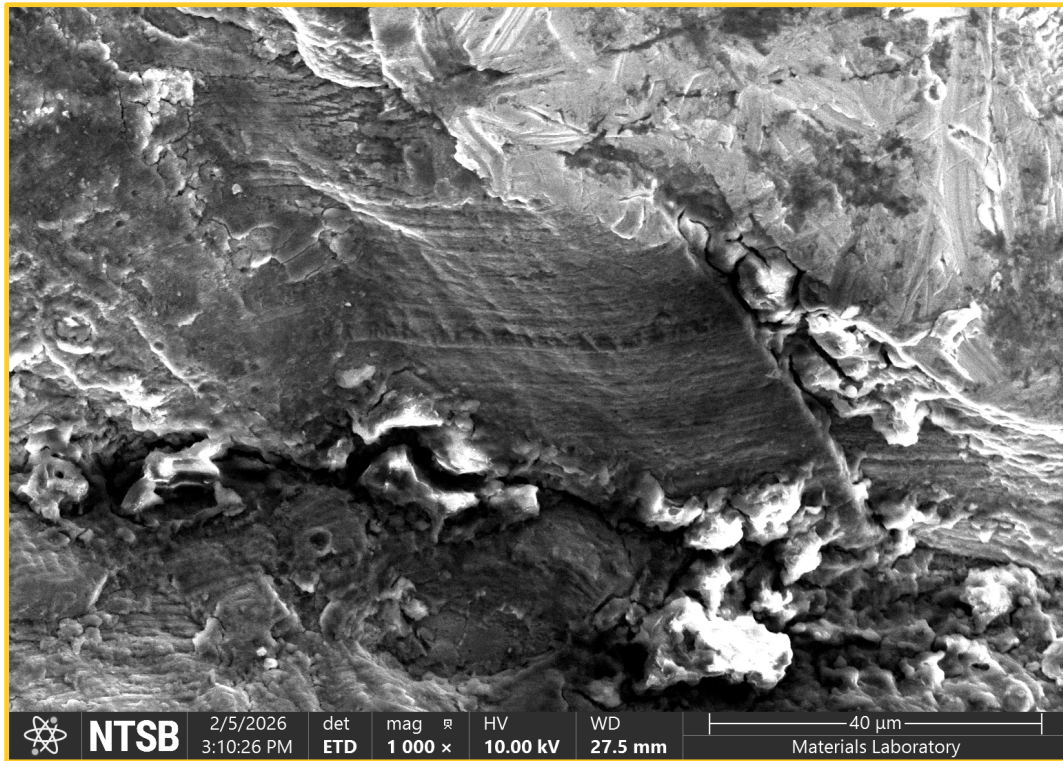


Figure 21. Secondary electron SEM images of fatigue striations observed on an undamaged area of the fractured left lobe of the stabilizer fin attach plate in the location indicated in Figure 20.



Figure 22. Digital microscope images of the fracture surface and profile of the separated deflector cable terminal end. The red dashed lines indicate the reduced diameter from necking of the terminal end.

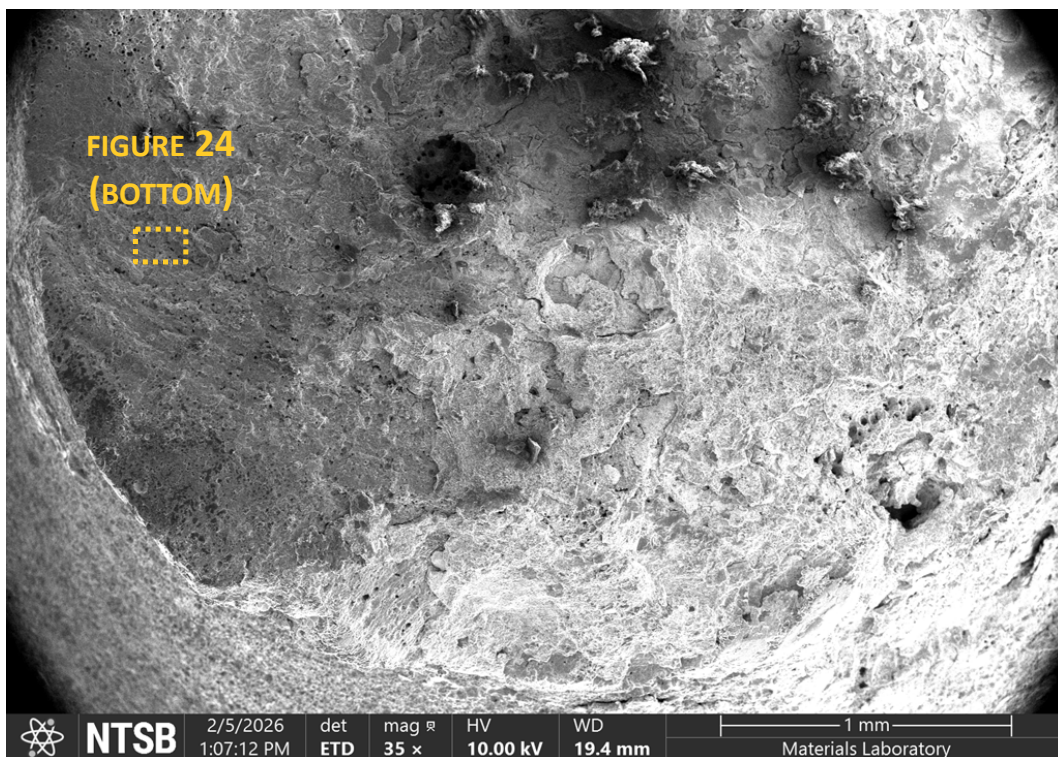
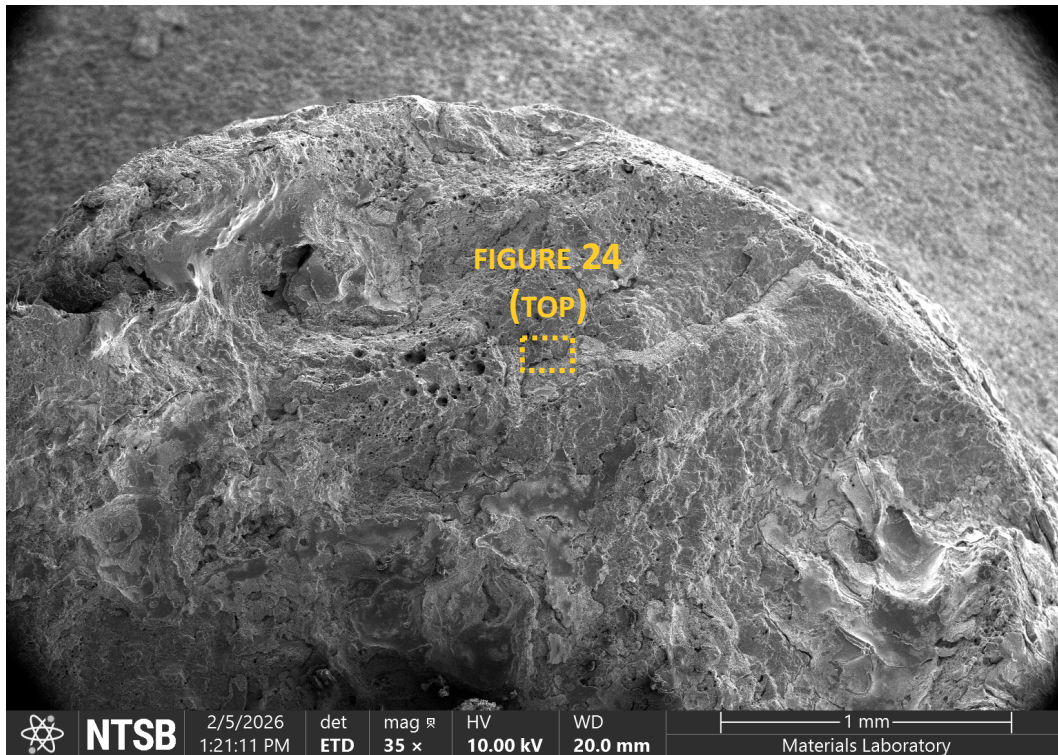


Figure 23. Secondary electron SEM images of the fracture surface on the separated deflector cable terminal end.

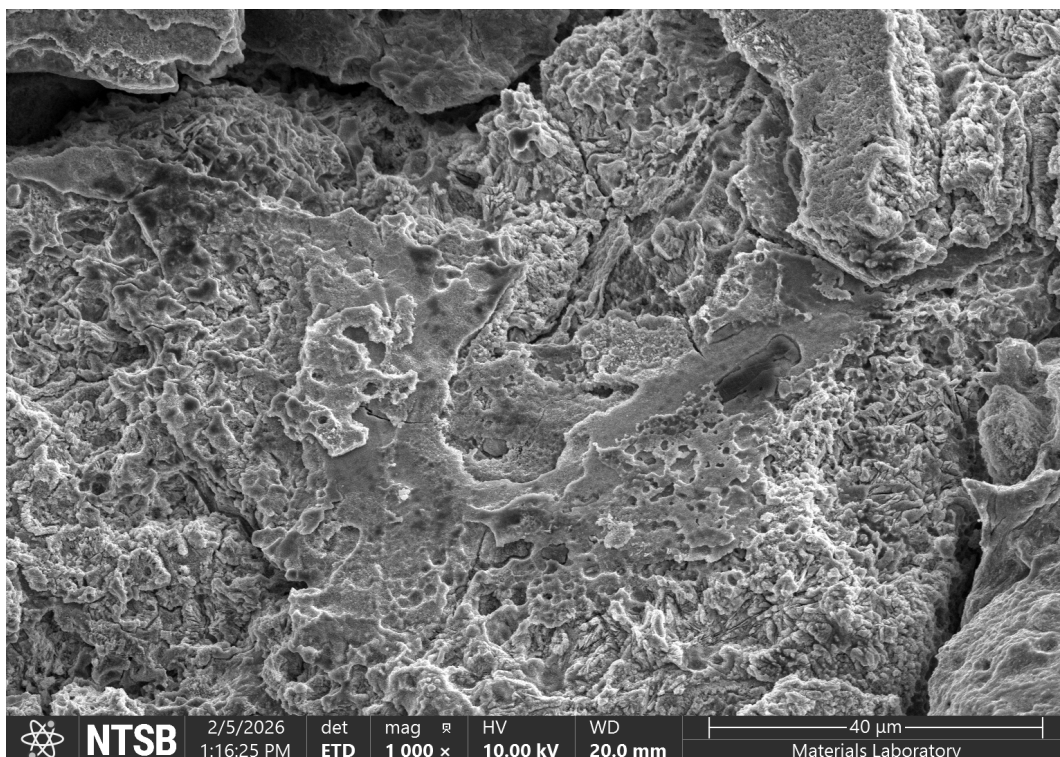
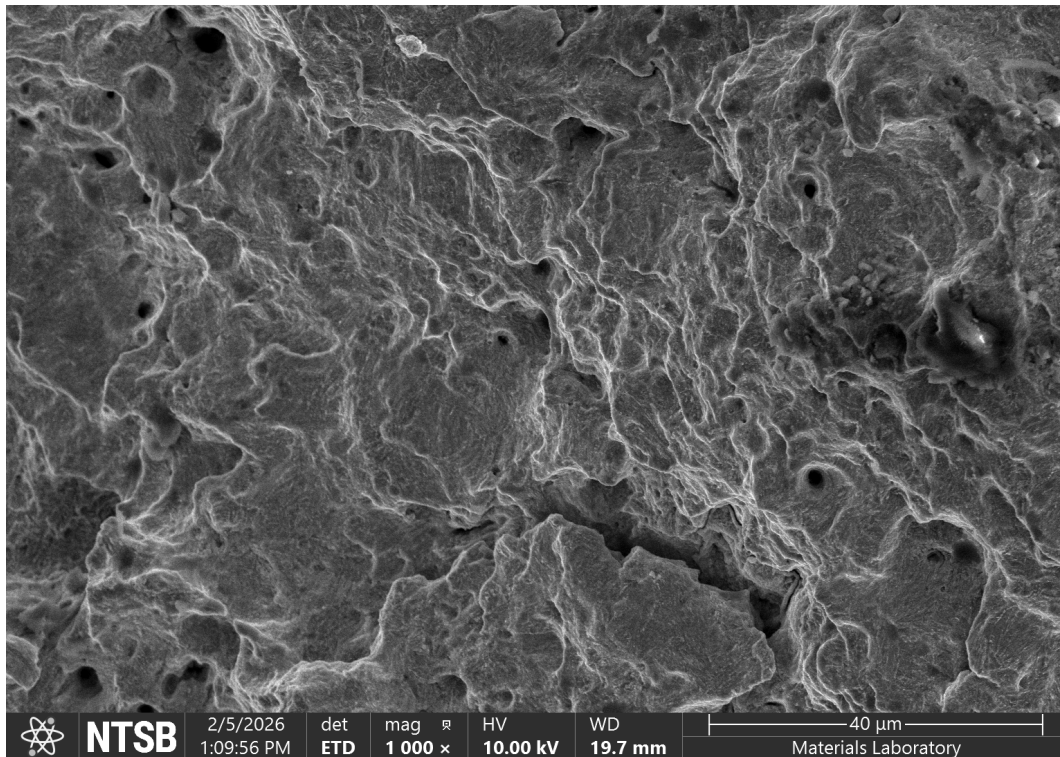


Figure 24. Secondary electron SEM images of ductile dimples on the fracture surface on the separated deflector cable terminal end in the locations indicated in Figure 23.