

NATIONAL TRANSPORTATION SAFETY BOARD

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



September 30, 2022

MATERIALS LABORATORY FACTUAL REPORT

Report No. 22-072

A. ACCIDENT INFORMATION

Place : Seiling, Oklahoma
Date : 07/12/2021
Vehicle : WSK PZL Mielec M-18A Dromader (N9310R)
NTSB No. : CEN21FA314
Investigator : Tim Sorenson

B. COMPONENTS EXAMINED

1. Center right-wing main spar piece with portion of outboard wing attachment fittings.

C. DOCUMENTS REVIEWED

1. Service Bulletin E/02.170/2000, Polskie Zakłady Lotnicze Co. Ltd. 08.03.2000. Procedure for dealing with corrosion, when reaming or replacing (centerwing-to-outboard wing) attachment joints.
2. Federal Aviation Administration Airworthiness Directive AD 2000-18-12, ; Polskie Zakłady Lotnicze Sp. z o.o. Models PZL M18, PZL M18A, and PZL M18B Airplanes.
3. Service Letter No. M18/034/2016, Polskie Zakłady Lotnicze Sp. z o.o. 02.22.2016: Paying attention during the inspection of joints attaching the outer wing with the centerwing according to the Service Bulletin No. E/02.170/2000.

D. DETAILS OF THE EXAMINATION

Multiple views of the as-received evidence are shown in Figure 1 with the upper and lower attachment fittings identified. As received, the attachment fitting areas were examined under UV light using an UltraLite ALS inspection system with UV head at 400 nm/250 mW to identify the presence of any deposits from a fluorescent magnetic particle inspection. No positive indications of fluorescent deposits were observed on the lug portions of the upper and lower attachment fittings (see Figure 2 for example images).

The right lower attachment fitting piece was removed from the lower yoke by disassembling the lower expansion mandrel assembly (cotter pin, castellated nut, washer, retention bolt, and tapered plug) and tapping out the split mandrel with a 1/8 inch diameter drift punch. Figure 3 shows the disassembled pieces in an exploded-view fashion. Side views of the lug portion of the right lower attachment fitting are shown in Figure 4 in the as-disassembled condition. The location of the slot in the split mandrel is annotated on

the image (Figure 4a) and on a closer oblique image in Figure 6. The lower attachment fitting piece was inspected under UV light using an UltraLite ALS inspection system with UV head at 400 nm/250 mW to identify the presence of any deposits from a fluorescent magnetic particle inspection. No positive indications of fluorescent deposits were observed on the lug (see Figure 5 for example images).

Detailed images of the as-disassembled split mandrel, tapered plug, and retention bolt are shown in Figures 7-9. As observed in Figures 7 and 8, the expansion mandrel components had a brittle and crumbling brown coating, consistent with an aged or degraded corrosion inhibitor coating such as DINITROL AV-30 or ADROX AV 30. Normally such corrosion inhibitor coatings are non-hardening and pliable as shown in an exemplar in Figure 10. Figures 7 and 8 show a line with residue where the slot in the split mandrel was present on the tapered plug and retention bolt. Faint marks were present on the tapered plug and retention bolt about 180° from the residue line.

Side views of the lug portion of the right lower attachment fitting are shown in Figure 11 in the acetone-cleaned condition. The location of the slot in the split mandrel is annotated on the image (Figure 11a). Using a 5X to 50X stereo-zoom microscope the surface of the lug bore was examined for indications of corrosion, pitting, and cracks. Close views of the bore surface along the lower lug are shown in Figures 12-13. Pitting indications are shown in Figure 13. No crack indications were observed.

Michael Budinski
Chief, Materials Laboratory Division

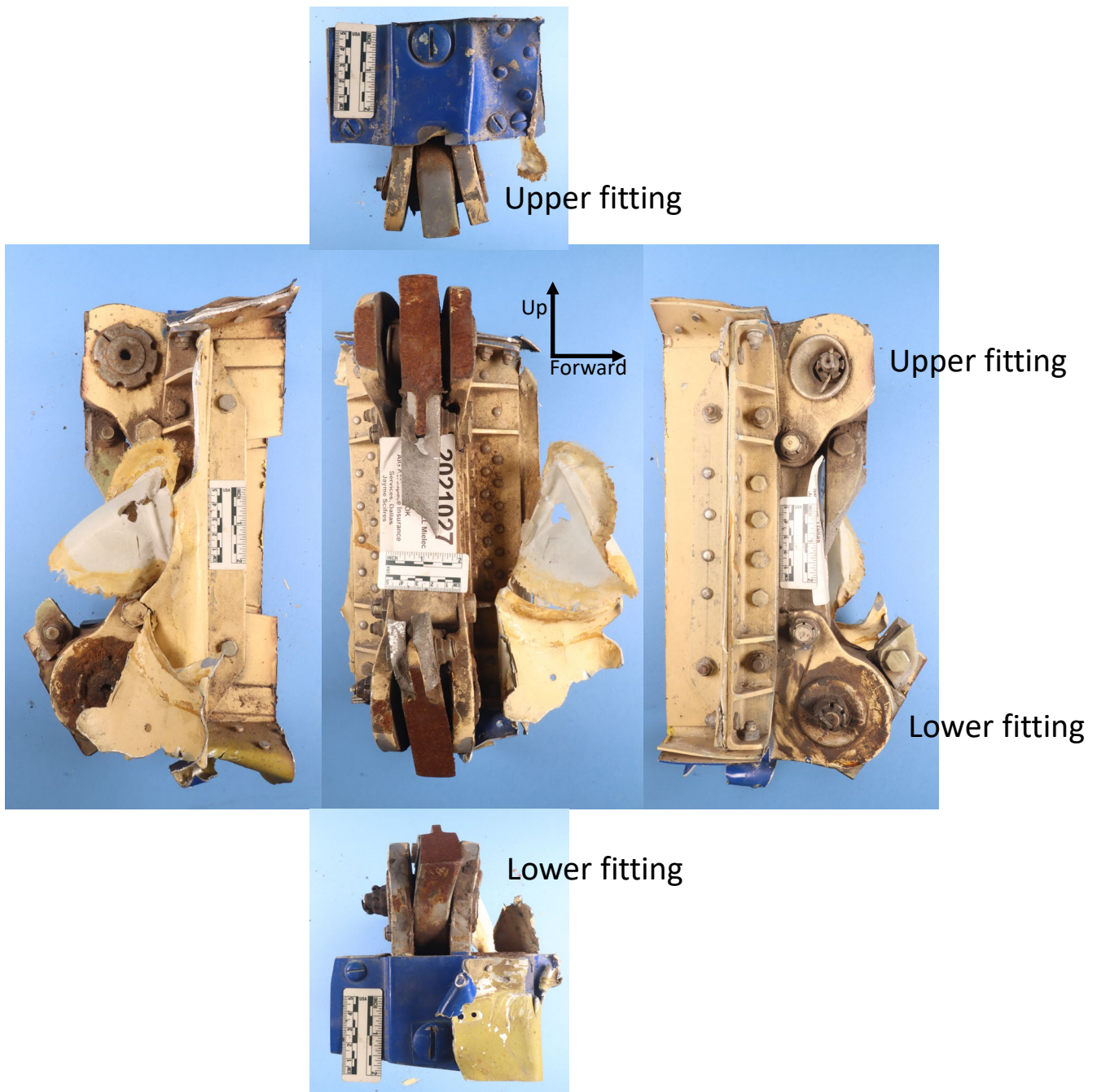
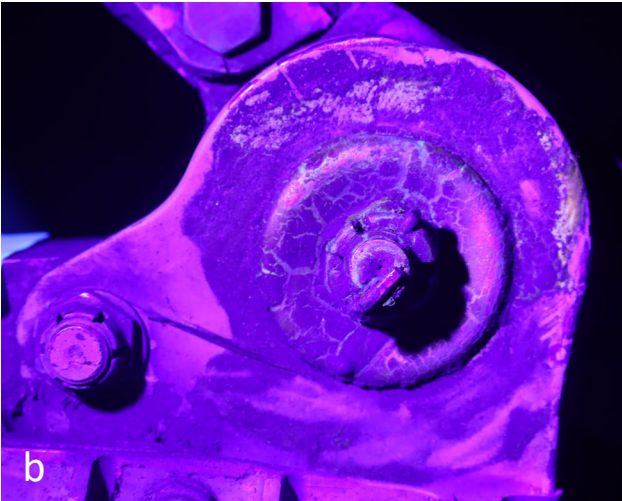
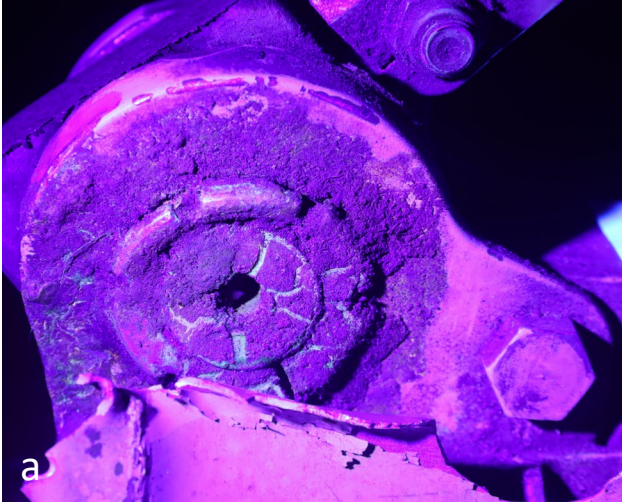


Figure 1 Orthogonal views of the right center wing spar piece with right wing attachment yokes and portions of the wing attachment fittings.

Lower fitting



Upper fitting

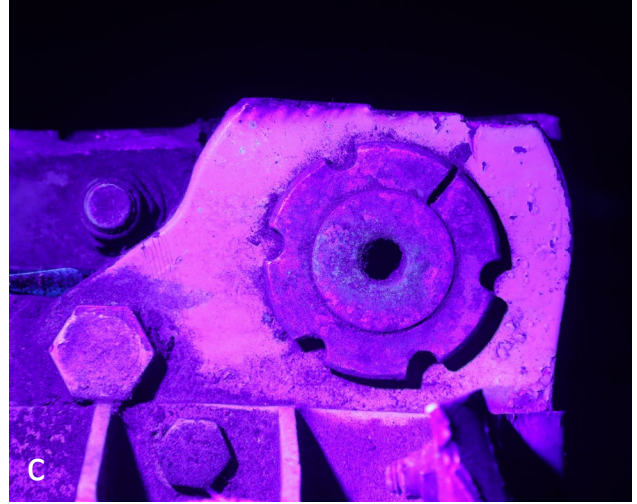


Figure 2 Side views of the attachment yokes under UV lighting conditions.

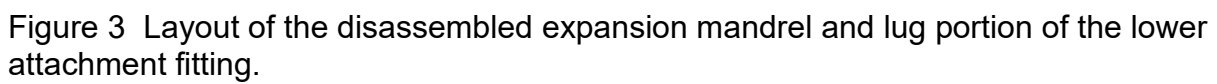




Figure 4 Images of the right outboard lower attachment fitting after disassembly from the lower yoke showing the aft (view a) and forward (view b) sides.

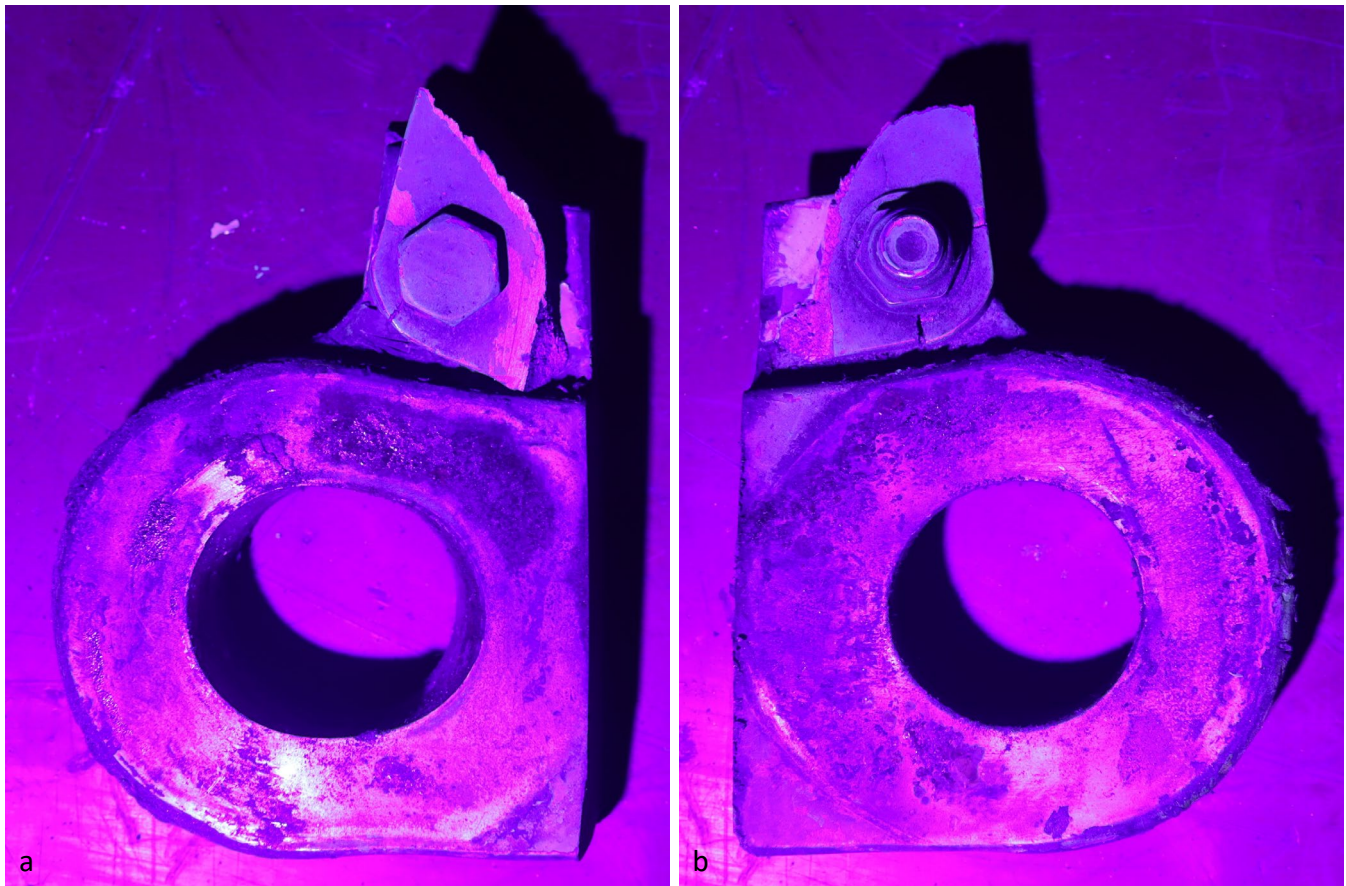


Figure 5 Images of the right outboard lower attachment fitting under UV lighting after disassembly from the lower yoke showing the aft (view a) and forward (view b) sides.

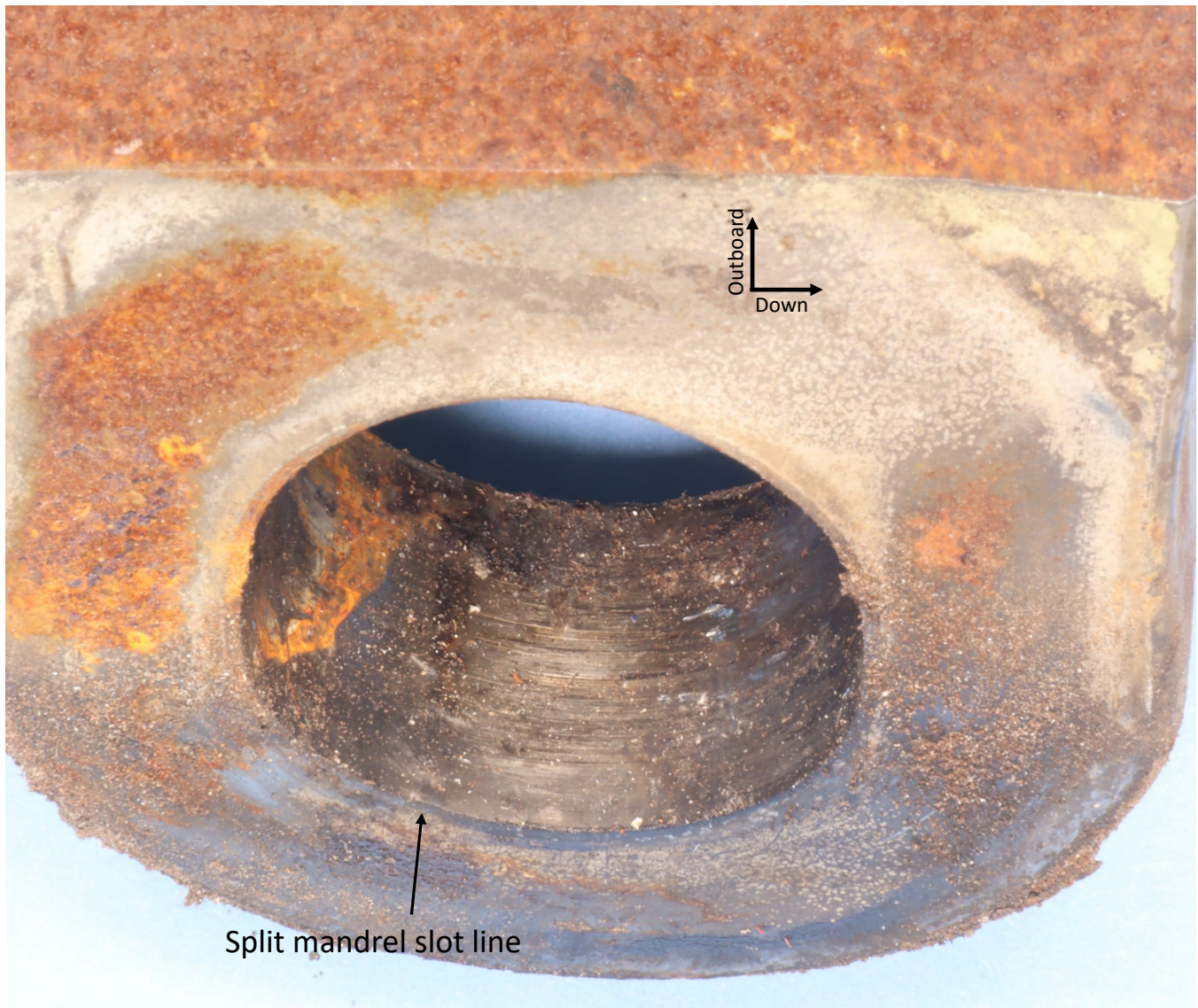


Figure 6 View of the right lower attachment fitting bore showing a witness line from the slot in the expansion mandrel.



Figure 7 Image of the split mandrel and the retention bolt. A deposit of brittle coating is present on the ends of the parts. A witness mark on the tapered portion of the retention bolt is from the slot in the split mandrel.



Figure 8 Image of the split mandrel, the retention bolt and tapered plug. A deposit of brittle coating is present on the ends of the parts. Witness marks on the tapered portion of the retention bolt and the tapered plug is from the slot in the split mandrel.



Figure 9 Image showing faint witness marks on the tapered portion of the retention bolt and the tapered plug.

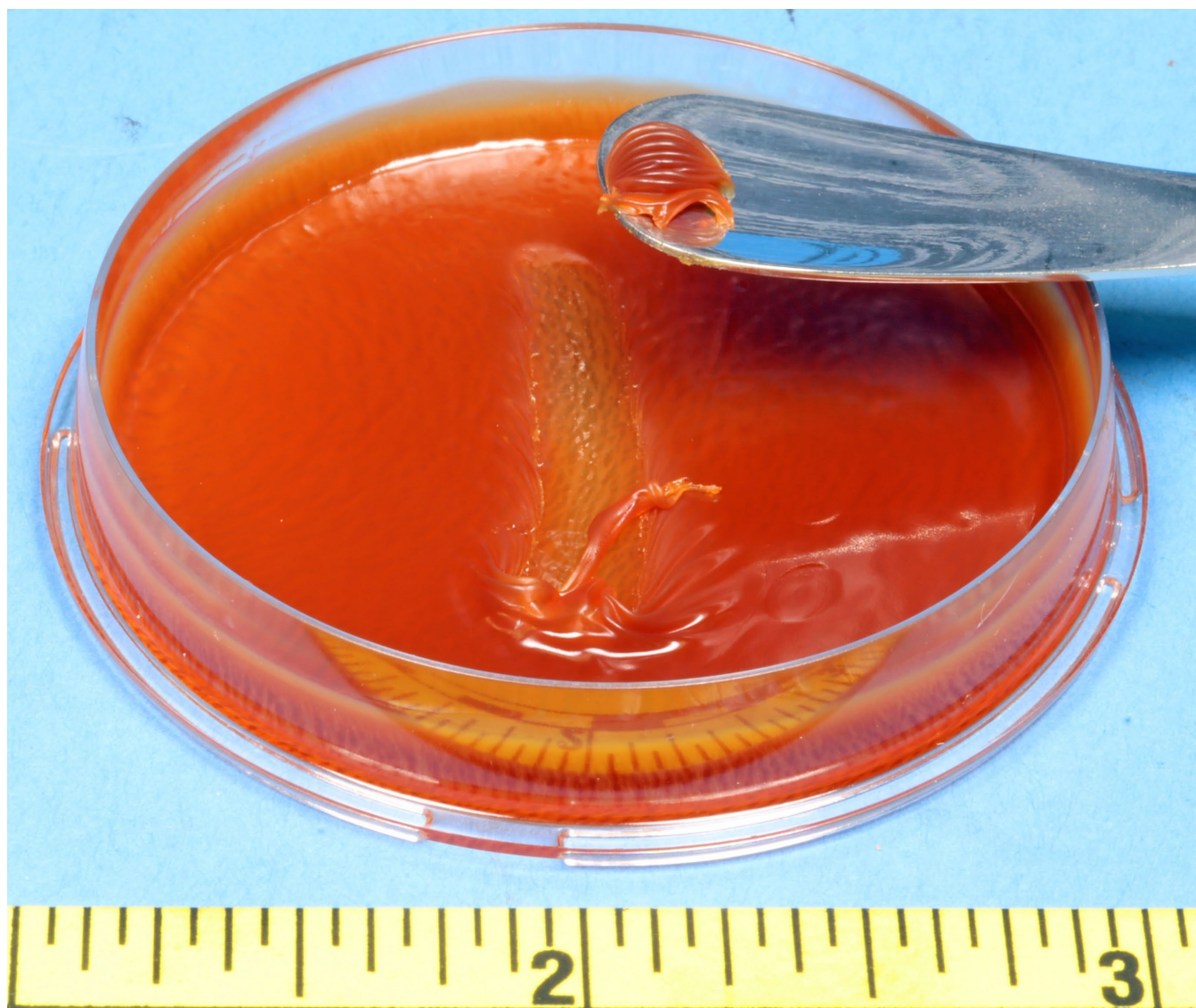


Figure 10 Image of a dish with a thick layer of dried ADROX AV 30 showing its non-hardening and pliable characteristics.



Figure 11 Images of the right outboard lower attachment fitting after cleaning in acetone showing the aft (view a) and forward (view b) sides.

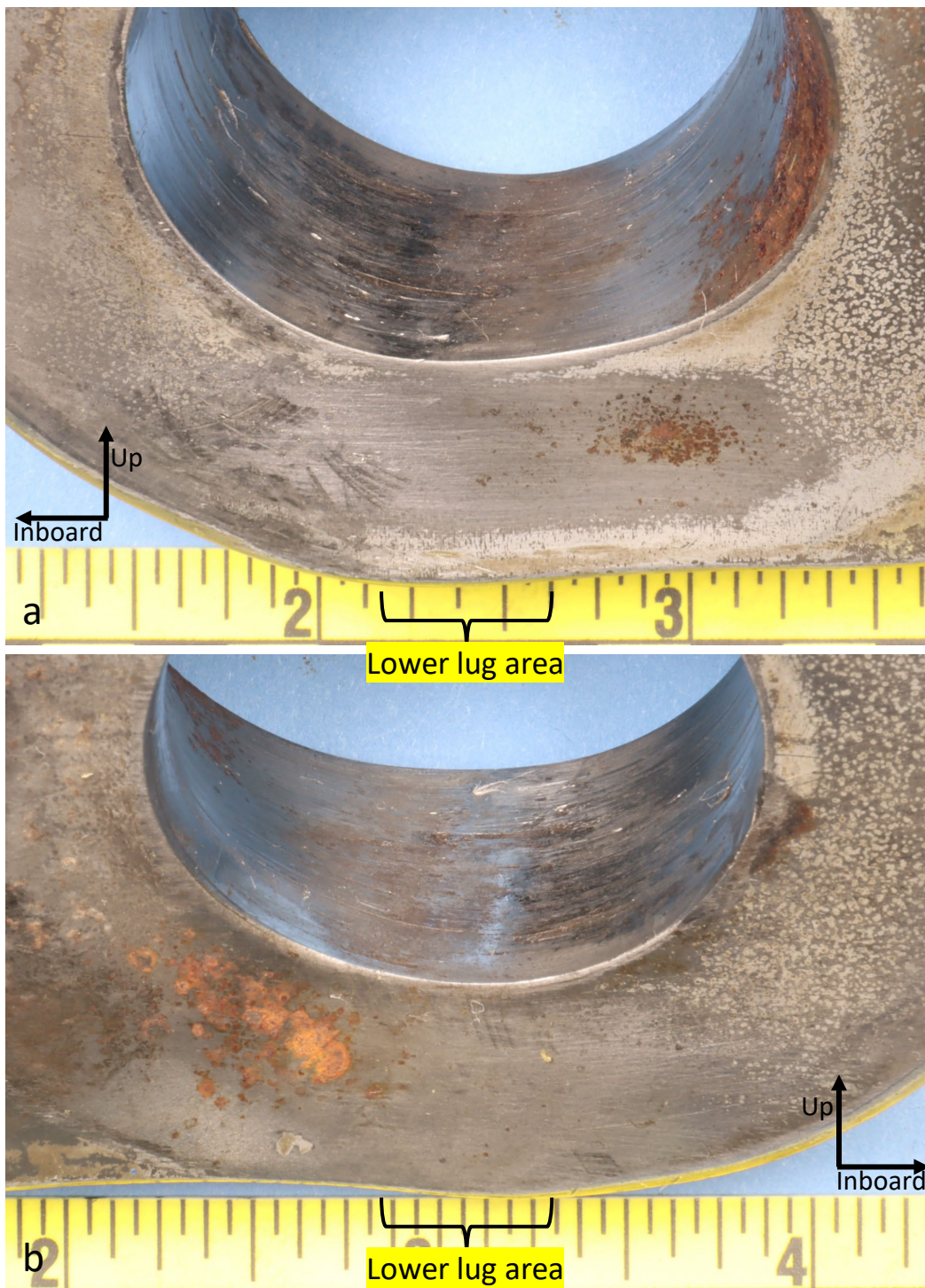


Figure 12 Views of the right lower attachment fitting bore at the lower lug. View a is an image of the lower lug bore area looking forward. View b is an image of the lower lug bore area looking aft. A closer image is shown in Figure 13.

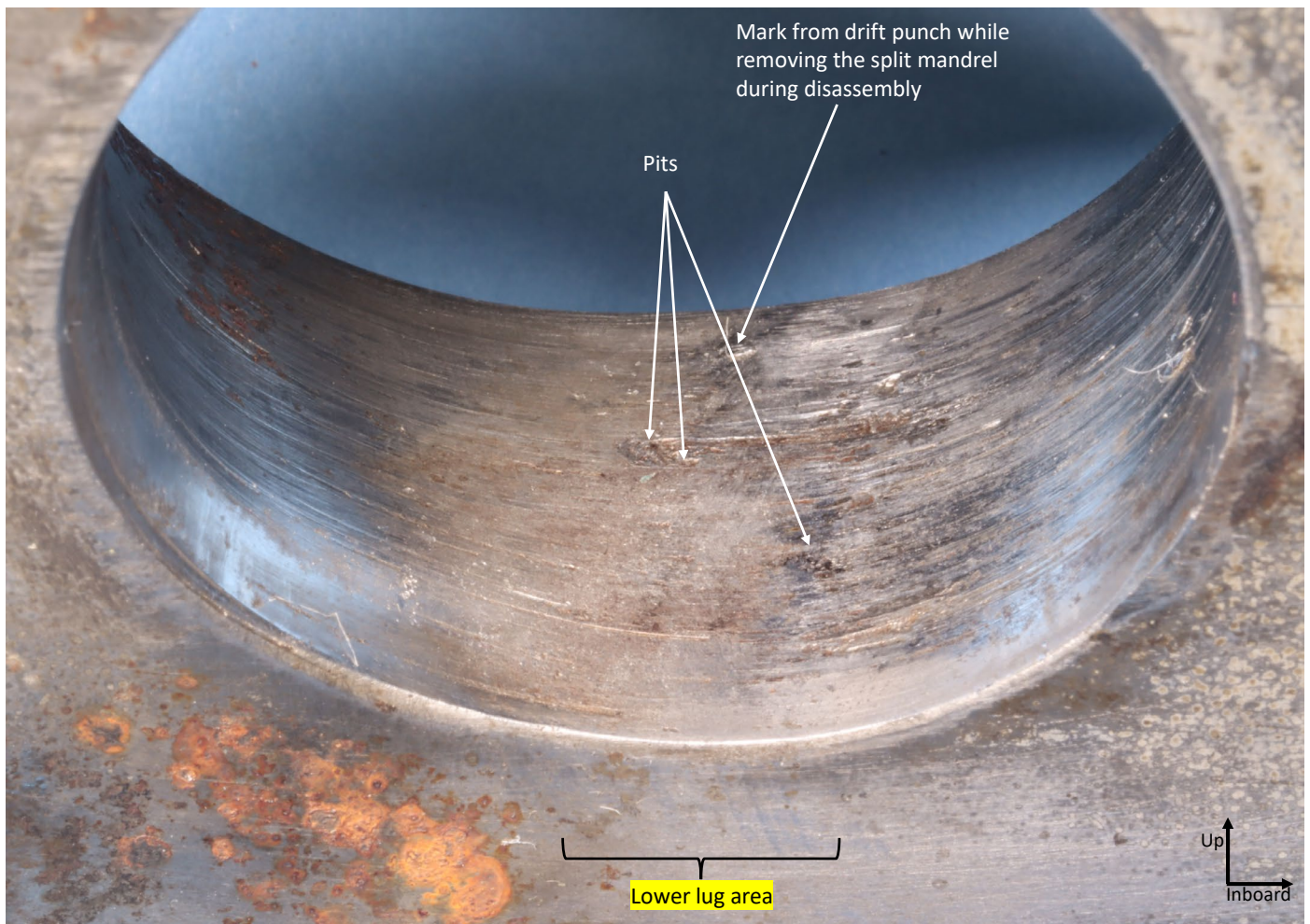


Figure 13 View of the right lower attachment fitting bore at the lower lug (see Figure 12b). Deep pits are present along with numerous circumferential marks or scratches.