

NATIONAL TRANSPORTATION SAFETY BOARD

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



April 6, 2016

MATERIALS LABORATORY FACTUAL REPORT

Report No. 16-037

A. ACCIDENT INFORMATION

Place : Charleston, West Virginia
Date : March 26, 2016
Vehicle : Cessna 172N
NTSB No. : ERA16FA141
Investigator : Daniel Boggs, AS-ERA

B. COMPONENTS EXAMINED

Inboard seat-position lock rod (2 pieces) and outboard forward seat-post piece with lock rod piece from the forward right seat.

C. DETAILS OF THE EXAMINATION

An overall view of the submitted components with a closer view of the fractured inboard seat-position lock rod are shown in figure 1. The pieces were from the forward right seat of the accident airplane. During the emergency response after the accident, the forward and aft outboard seat posts and the aft inboard seat post were reportedly cut, and the seat was reportedly rotated about the remaining inboard leg to facilitate removal of the seat from the airframe. Fire suppression materials were also applied during the emergency response, and the lower piece of the fractured inboard seat-position lock rod was recovered from a puddle of foam. The pin attaching the upper end of the fractured seat-position lock rod to the adjustment handle had been removed from the location indicated in figure 1 to facilitate shipment to the NTSB Materials Laboratory.

Views of the inboard and outboard sides of the inboard seat-position lock rod at the fracture location are shown in figure 2. As assembled, a roll-pin that acts as a stop to limit vertical displacement of the rod is inserted through the stop-pin hole indicated in figure 2. Fracture of the inboard seat-position lock rod intersected the forward and aft sides of the stop-pin hole on slant planes, a feature consistent with overstress fracture.

Close views of the upper and lower surfaces of the fracture in the inboard seat-position lock rod are shown in figure 3. The lower side of the fracture appeared dark gray and was partly covered with red and orange oxides. In contrast, the upper fracture surface was free of visible oxidation. The fracture surface on the upper side of the fracture had uniform matte-gray fracture features consistent with overstress fracture, and the surface showed no accumulation of grease.

The overall deformation pattern adjacent to the fracture in the inboard seat-position lock rod was consistent with bending deformation where the outboard side of the rod was in tension and the inboard side was in compression. The stop-pin hole below the fracture surface on the outboard side of the rod showed necking deformation as indicated in figure 2, whereas the upper side of the hole remained close to its original diameter, consistent with the presence of the stop pin in the upper side of the hole as the lock rod was bent. Contact marks were observed on the lower side of the stop-pin hole at the inboard end of the hole consistent with contact along the roll pin split line on the compression side of the bending fracture.

A close view of the lower piece of the forward outboard seat post is shown in figure 4. The seat-position lock rod moved freely within the wheel housing, and the stop-pin was in place within the lock rod as indicated in figure 4. The lock rod was bent adjacent to the cut surface, and a linear contact mark was present on the seat post piece at the location indicated in figure 4 corresponding to contact with the bent seat-position lock rod. Figure 5 shows the right seat post piece as viewed looking outboard with the seat-position lock rod aligned with the linear contact mark on the forward face of the seat post and with the cuts ends of the lock rod and the seat post aligned to the same plane.

Matthew R. Fox
Senior Materials Engineer

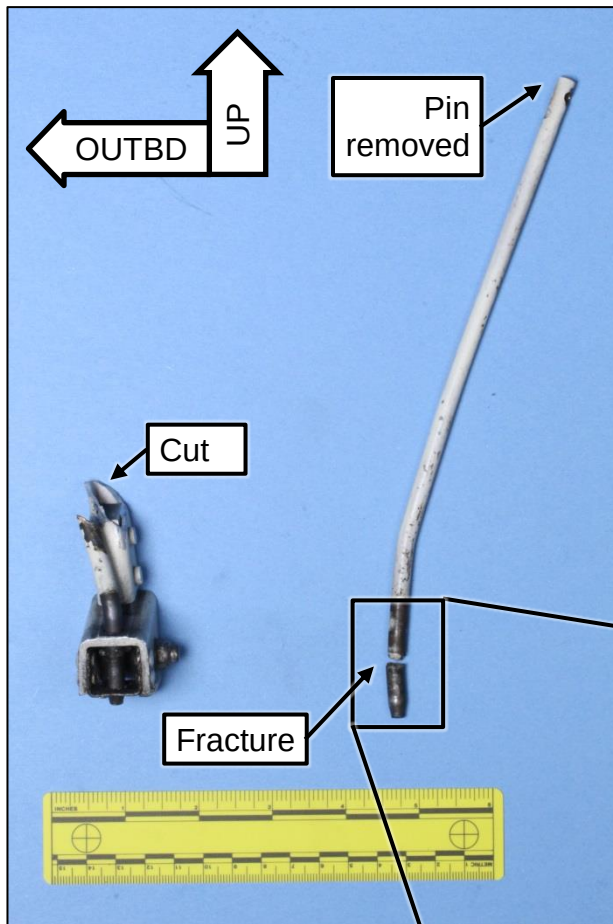


Figure 1. View looking aft showing the fractured inboard seat position lock rod and the outboard seat post piece with seat position lock rod piece.



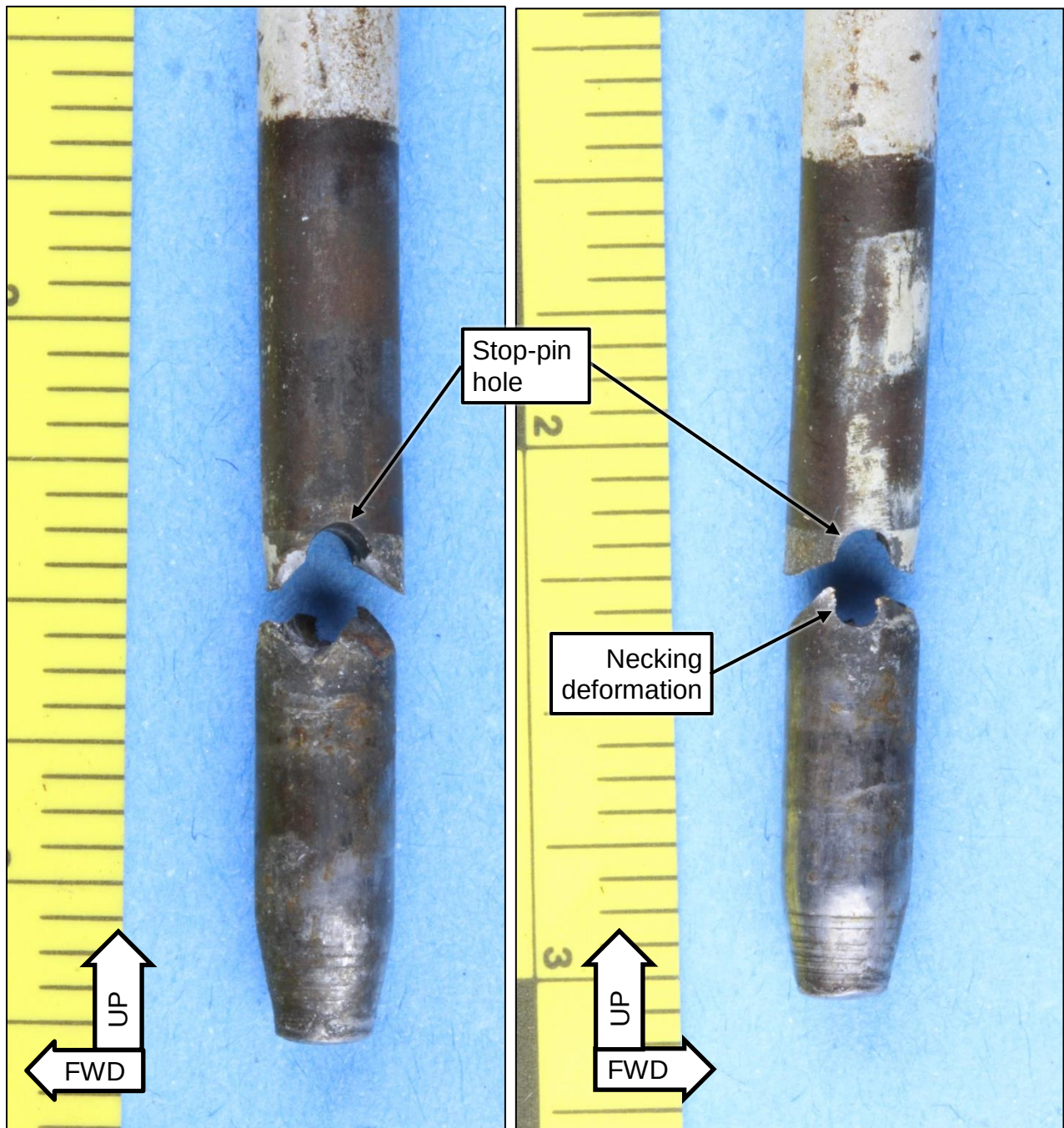


Figure 2. Views of the inboard (left image) and outboard (right image) sides of the inboard seat-position lock rod at the fracture location showing the hole for the stop pin.

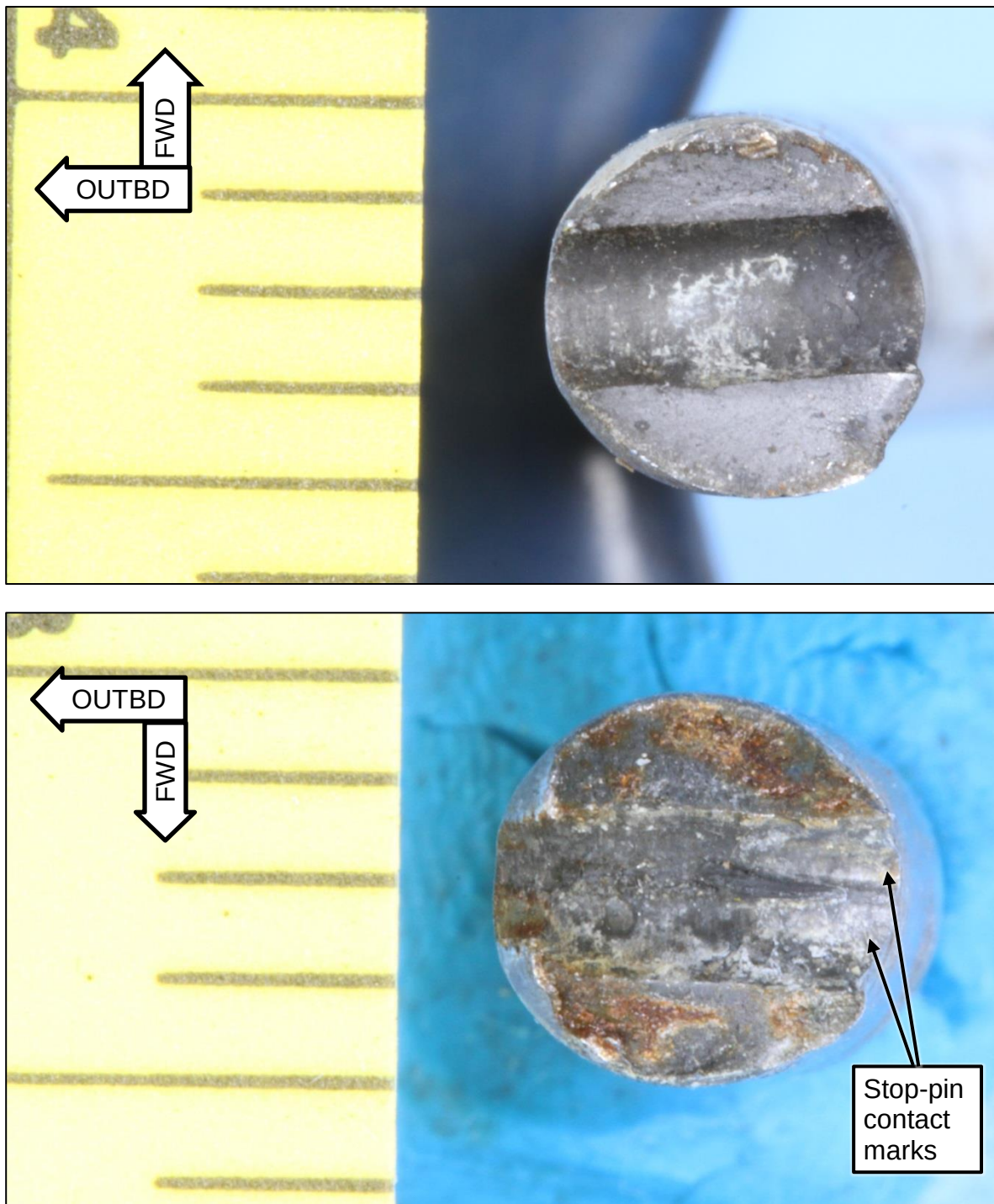


Figure 3. Views of the upper (upper image) and lower (lower image) mating fracture surfaces for the inboard seat-position lock rod.

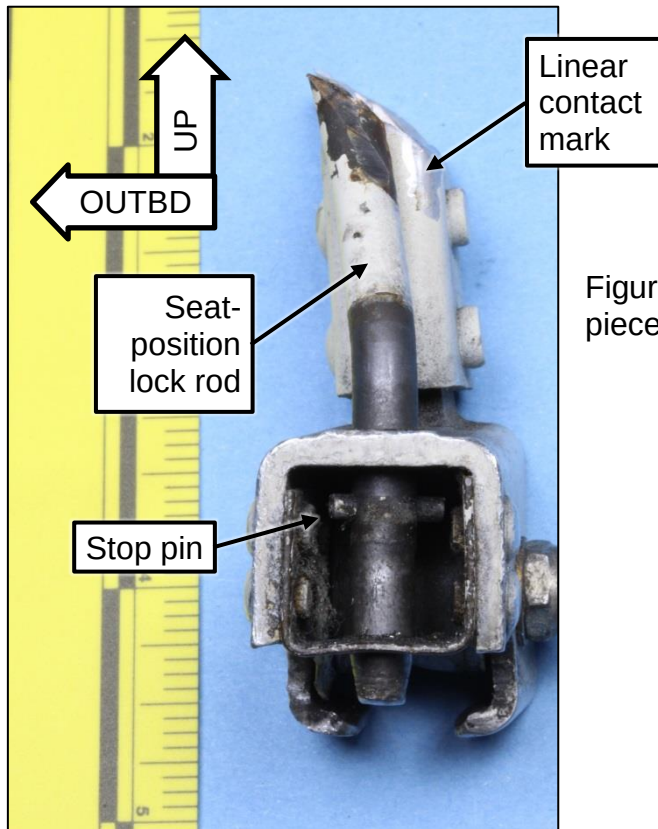


Figure 4. Close view of the outboard seat post piece and seat-position lock rod.

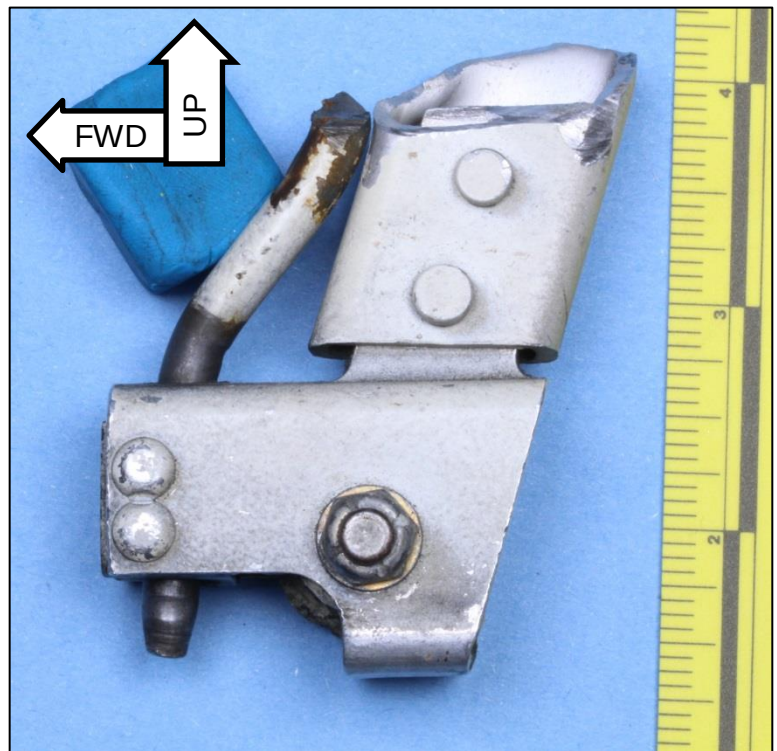


Figure 5. Side view of the outboard seat post piece with the seat-position lock rod positioned adjacent to the linear contact mark and with the cut ends aligned.