

NATIONAL TRANSPORTATION SAFETY BOARD

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



September 7, 2018

MATERIALS LABORATORY FACTUAL REPORT

Report No. 18-072

A. ACCIDENT INFORMATION

Place : Agua Dulce, California
Date : February 11, 2018
Vehicle : Cirrus Design VK-30, N52TH
NTSB No. : WPR18FA088
Investigator : Jack Vanover, AS-WPR

B. COMPONENTS EXAMINED

Tail housing, aft coupling, propeller extension drive shaft, slip joint, forward coupling, and spacer.

C. DETAILS OF THE EXAMINATION

Components of the propeller drive assembly including the tail housing, aft coupling, propeller extension drive shaft, slip joint, forward coupling, and spacer were submitted for examination as shown in figure 1. The Cirrus Design VK-30 is designed with the propeller located at the aft end of the fuselage. As assembled on the airplane, the propeller flange (see figure 1) is located at the aft end of the tail housing, and the spacer attaches to an adapter ring on the engine. As indicated in figure 1, the drive shaft was fractured forward of the aft coupling, and the drive shaft had been cut at the location indicated to facilitate shipment to the NTSB Materials Laboratory.

A closer view of the fracture in the drive shaft is shown in the lower image in figure 1. The fracture around most of the circumference was in a transverse plane with secondary fractures extending longitudinally. On the forward side of the fracture, the shaft wall was bowed inward adjacent to the fracture and slightly outward within approximately $\frac{1}{2}$ inch of the fracture. Around approximately $\frac{1}{3}$ of the circumference, the shaft wall was folded over on itself and bent forward and outward.

A transverse cut was made through the shaft aft of the fracture location to facilitate an examination of the aft side of the fracture, and views of the aft side of the fracture are shown in figure 2. The shaft was folded and bent inward, and multiple impacts corresponding to contact with the mating side of the fracture were observed. A closer view of a relatively protected area of the fracture is shown in the lower image in figure 2. No evidence of circumferential scoring was observed on the surface adjacent to the fracture.

Fracture surfaces on the forward and aft sides of the primary fracture in the transverse plane were examined. However, the fracture surfaces on both sides of the fracture were obliterated by smearing and post-fracture contact damage.

A view of the forward coupling with the attached slip joint and the mating face of the spacer is shown in figure 3. Gouges were observed on the spacer at locations indicated with unlabeled arrows in figure 3. The location and shape of the gouges was consistent with heavy impact with bolt heads on the slip joint.

Matthew R. Fox, Ph.D.
Senior Materials Engineer

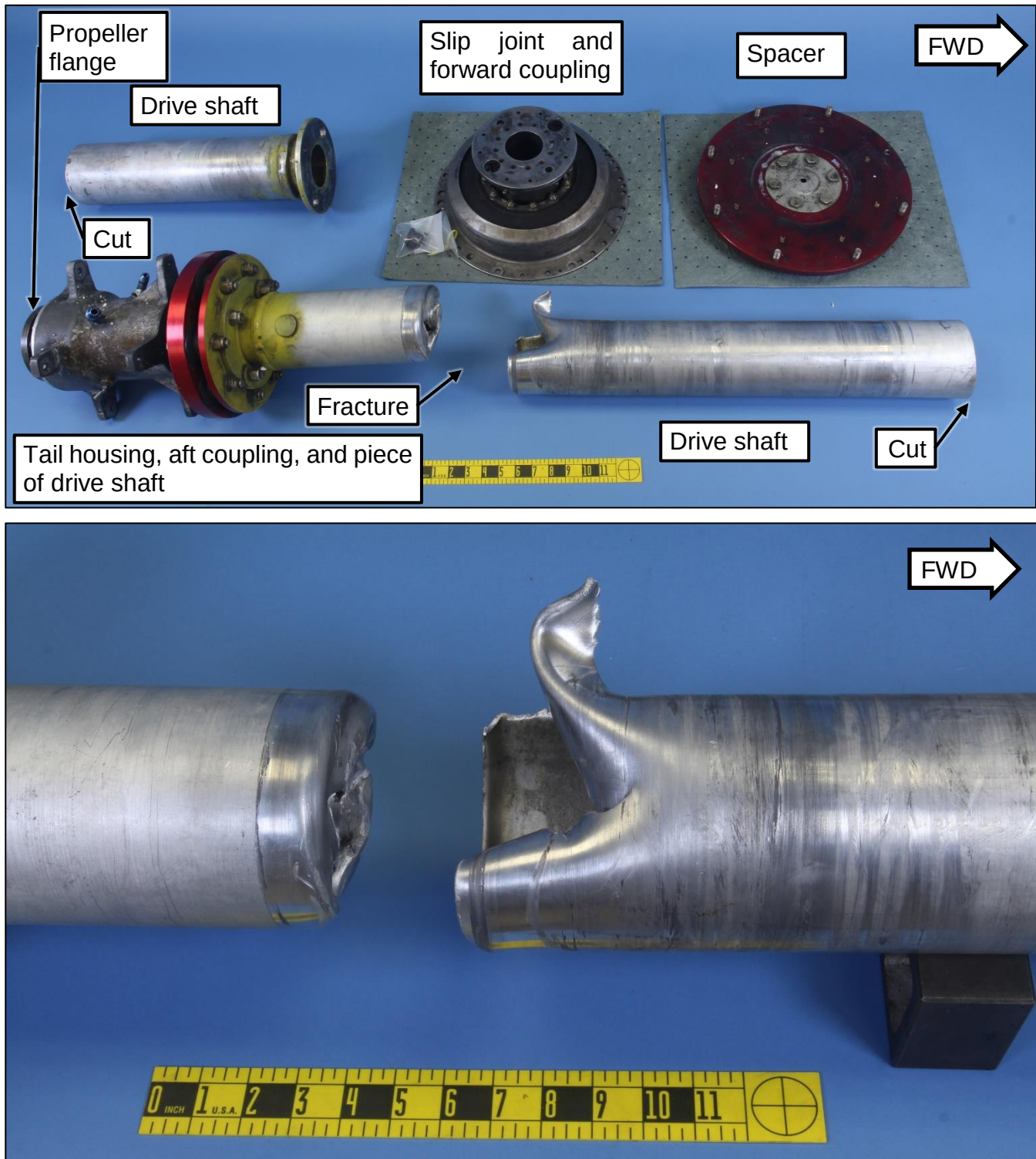


Figure 1. Overall view of the submitted components (upper image) with a closer view of the drive shaft fracture (lower image).

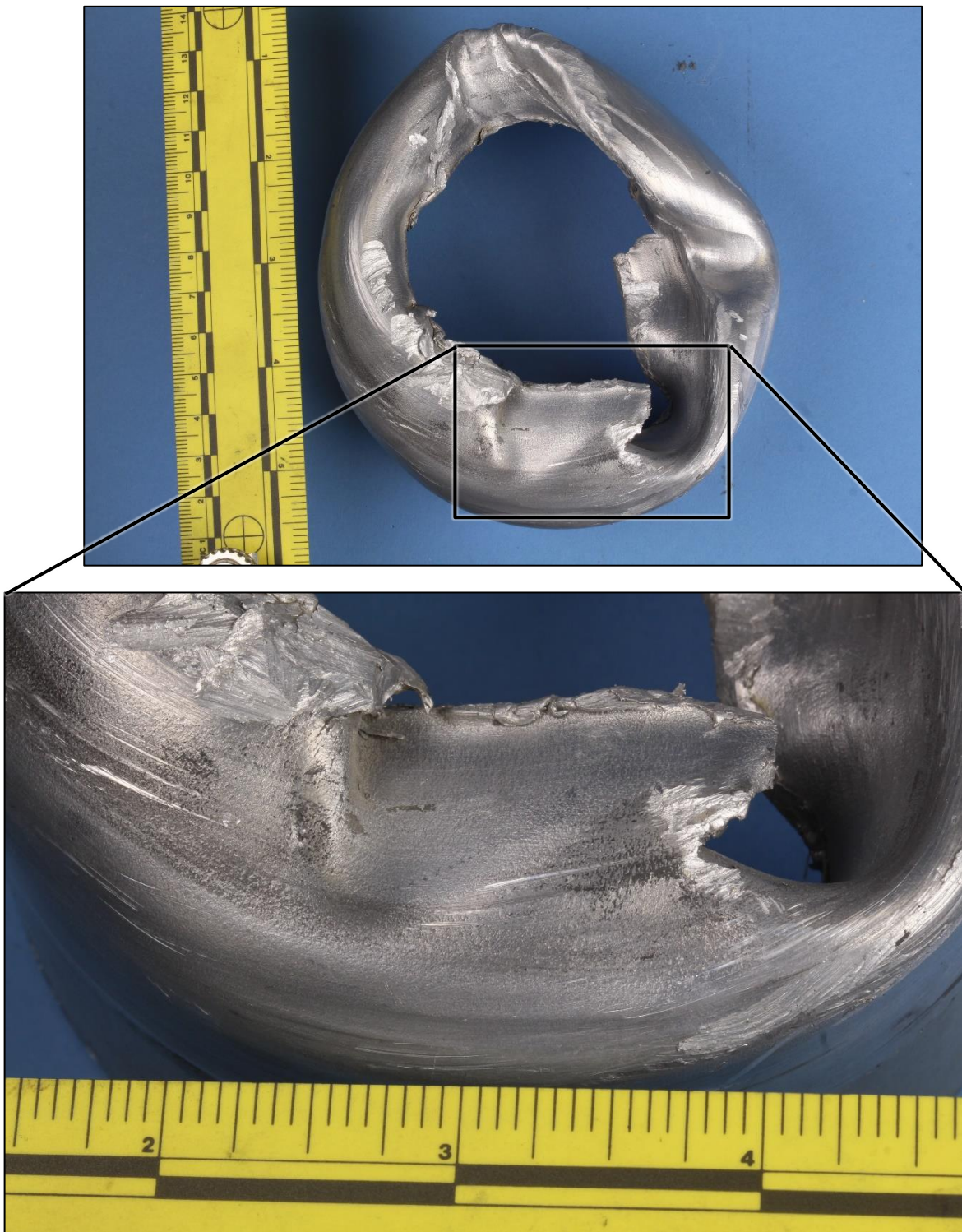


Figure 2. Overall view of the aft side of the fracture after sectioning from the rest of the drive shaft (upper image) with a closer view of the surface adjacent to the fracture where the wall was folded inward (lower image).

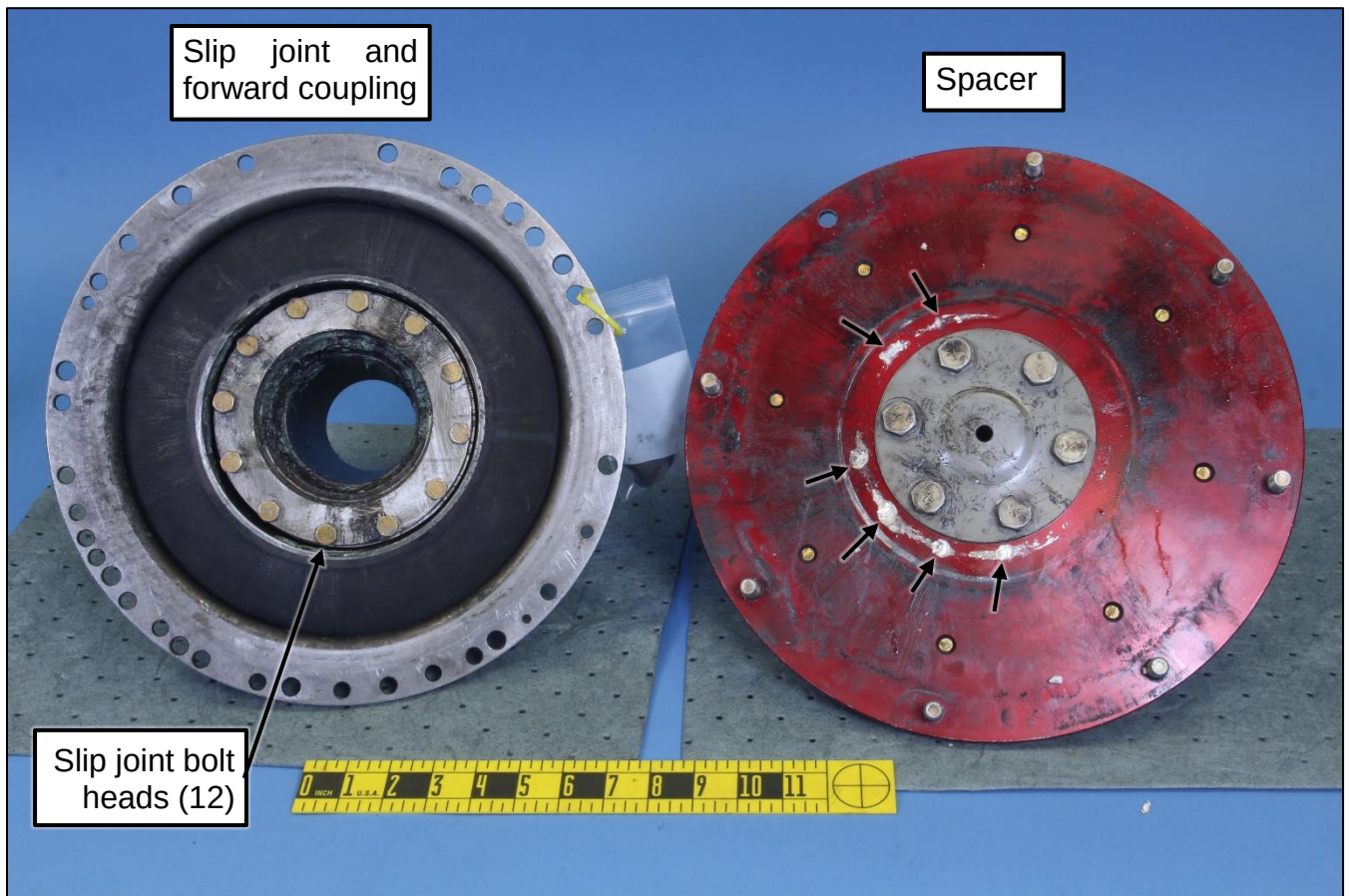


Figure 3. Overall view of the aft side of the slip joint and forward coupling and mating forward side of the spacer. Unlabeled arrows indicate impact marks on the spacer corresponding to heavy contact with bolt heads on the slip joint.