

# NATIONAL TRANSPORTATION SAFETY BOARD

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



May 17, 2002

MATERIALS LABORATORY FACTUAL REPORT

Report No. 02-046

## A. ACCIDENT

Place : Belle Harbor, New York  
Date : November 12, 2001  
Vehicle : Airbus A300-600  
NTSB No. : DCA02MA001  
Investigator : James Hookey, AS-40

## B. COMPONENTS EXAMINED

Hydraulic pump drive shafts from the #1 and #2 engines.

## C. DETAILS OF THE EXAMINATION

The hydraulic pump drive shaft pieces submitted for examination are shown in an overall view in figure 1. The shaft pieces are oriented in figure 1 with the gearbox end at the top of the photograph and the pump end at the bottom of the photograph. The pieces from the #1 engine are labeled "1A" and "1B", and the pieces from the #2 engine are labeled "2A" and "2B". The 1B shaft from the #1 engine was not fractured, and the unlabeled arrow indicates the reduced section shear point on this shaft. The other three shafts were fractured, each in a different portion of the shaft. Other portions of the shafts were not submitted and are presumed to be lost.

### Shaft piece 1A

Shaft piece 1A fractured just on the pump side of the "O" ring seal. Various portions of the fracture were angled on flat planes, and all portions of the fracture contained smearing marks on linear fracture features indicating that the fracture occurred primarily under direct shear loading conditions. In addition, the splines on the gearbox end contained an imprint pattern (generated by contact with the internal splines on the mating component) indicating excessive bending loading of this end of the shaft.

### Shaft 1B

This shaft was not fractured, and there was no evidence of torsional damage. One of the protruding ends of the roll pin through the splines on the pump end of the shaft was sheared in the longitudinal direction.

**Shaft piece 2A**

The fracture on this shaft was through the reduced section shear point adjacent to the splines on the pump end of the shaft. Most of the fracture was on a slant 45 degree plane and was typical of an overstress bending fracture. One side of the fracture was deformed slightly outward indicating that some amount of torsional loading may have been present as the fracture occurred. The fracture features were not consistent with an overstress torsional fracture, which typically produces a flat fracture (perpendicular to the axis of the shaft) with circumferential smearing damage.

**Shaft piece 2B**

Shaft piece 2B was fractured adjacent to the splines on the gearbox end. Fracture features were typical of an overstress bending fracture. One of the protruding ends of the roll pin through the splines on the pump end of the shaft was bent toward the end of the splines.

James F. Wildey II  
Supervisory Metallurgist

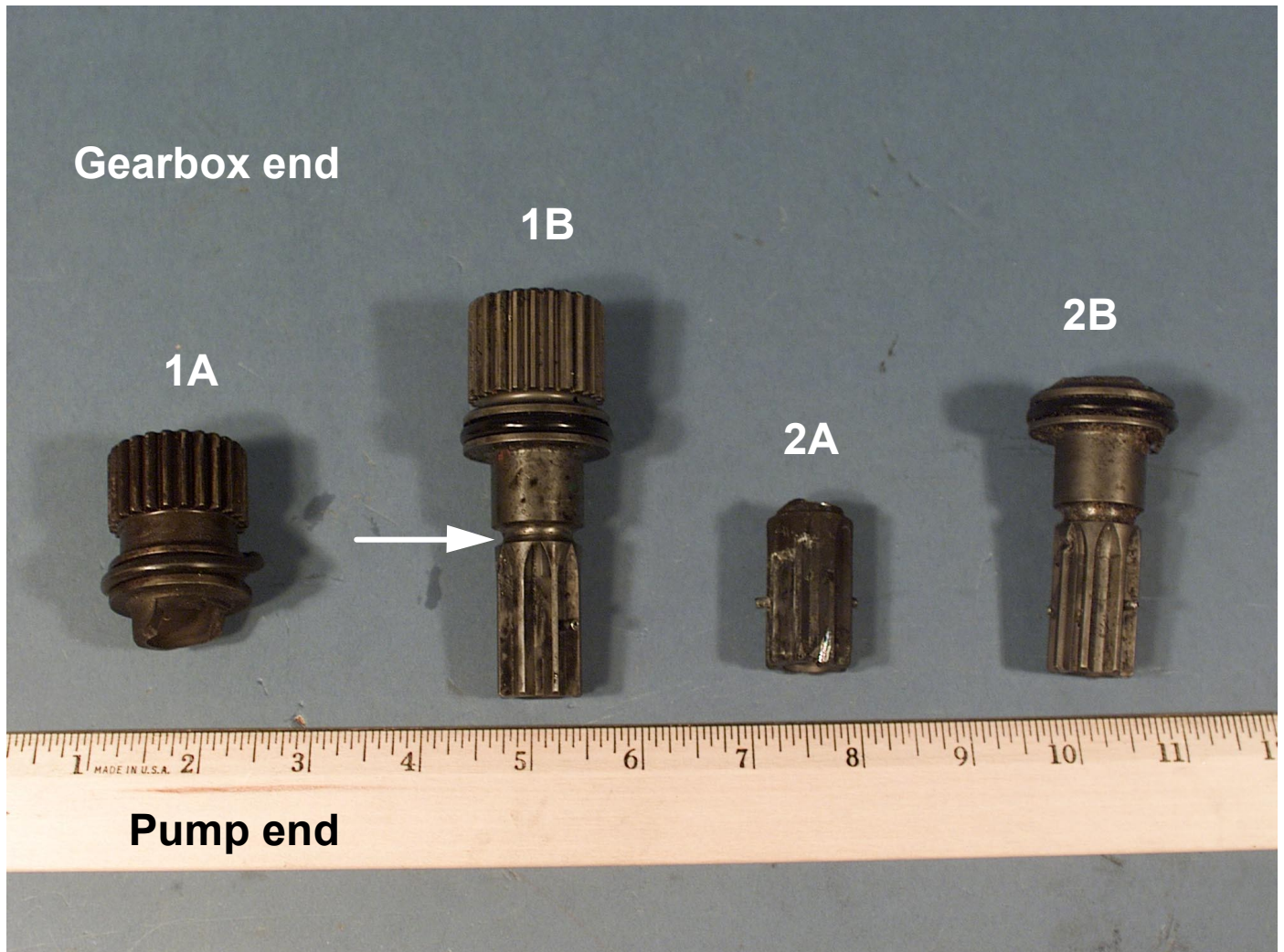


Figure 1. Overall view of the hydraulic pump drive shaft pieces. The unlabeled arrow indicates the reduced section shear point for the 1B shaft.