

NATIONAL TRANSPORTATION SAFETY BOARD

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



August 4, 2011

MATERIALS LABORATORY FACTUAL REPORT

Report No. 11-090

A. ACCIDENT INFORMATION

Place : Altavista, Virginia
Date : April 22, 2011
Vehicle : Cessna 210D
NTSB No. : ERA11FA258
Investigator : Alex Lemishko (ASI-ERA)

B. COMPONENTS EXAMINED

Rotor from Directional Gyro, Turn and Bank Indicator, Vacuum Pump

C. DETAILS OF THE EXAMINATION

The received components are displayed in figure 1.

Only the rotor and cap were received from the directional gyro, the gyro was pneumatically powered. The cap was heavily dented inward and distorted on one side as shown in the left view of figure 2. Removal of the cap revealed a mating dent and deformation in the end of the gyro rotor as shown in the right view of figure 2. Close optical examinations did not reveal rotational marks on either the rotor or cap.

The case of the turn and bank indicator was partially crushed and the indicator face was not received. The case was cut open to reveal the interior components. The indicator contained an electrically-powered gyroscopic weight. The gimbal structure surrounding the gyro was intact with little or no damage. Disassembly of the gyro revealed light rotational marks on the exterior of the stator (non-rotating) and on the interior of the rotor consistent with normal operation, see figure 3.

The vacuum pump was severely distorted and damaged. Both end caps of the pump were missing and the housing was crushed onto the rotor. The pump vanes were mostly intact. The input drive shaft and reduced shear section were intact and continuous to the pump rotor. The pump housing was longitudinally cut and the rotor released. Magnified examinations uncovered dents and scuff marks to the end of the rotor consistent with non-rotating impacts, as indicated in figure 4.

Joe Epperson
Senior Metallurgist



Figure 1. Overall view of the as-received components.

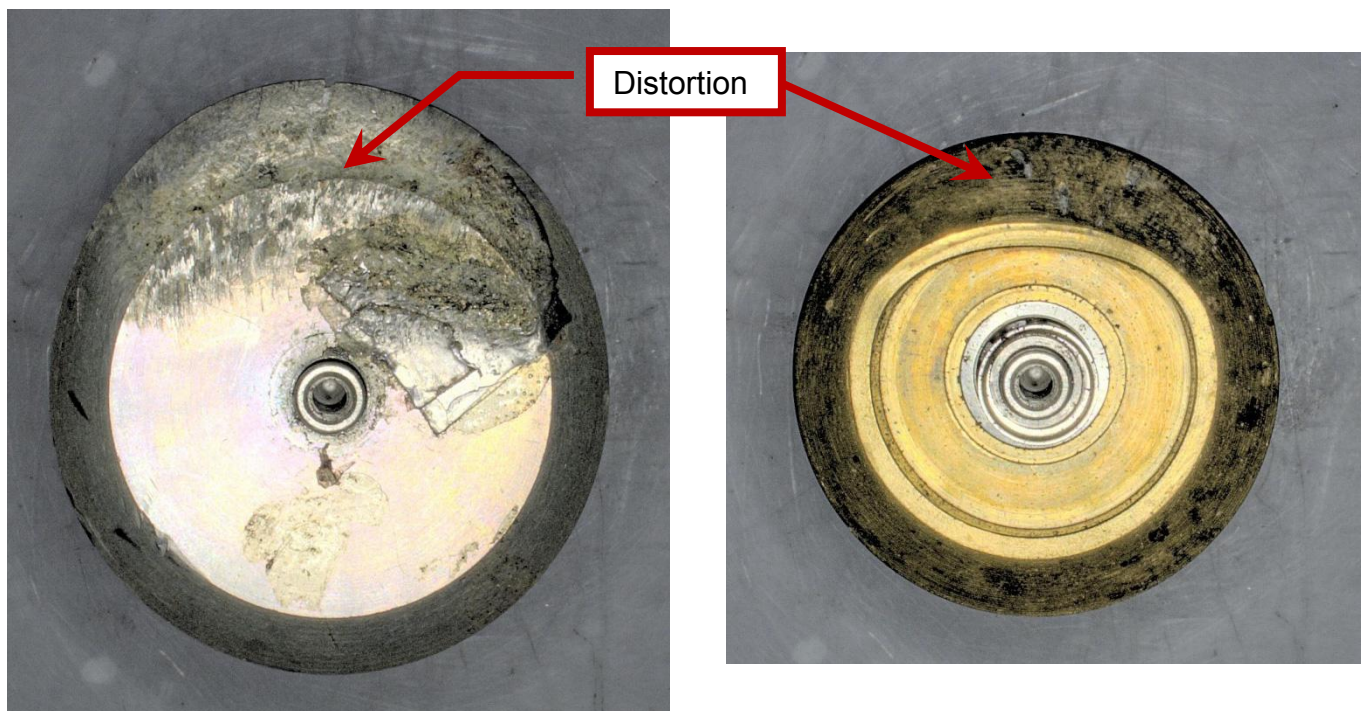


Figure 2. Left view shows the exterior of the rotor cap with distortion in the upper half. Right view shows the matching dent in the end of the rotor.

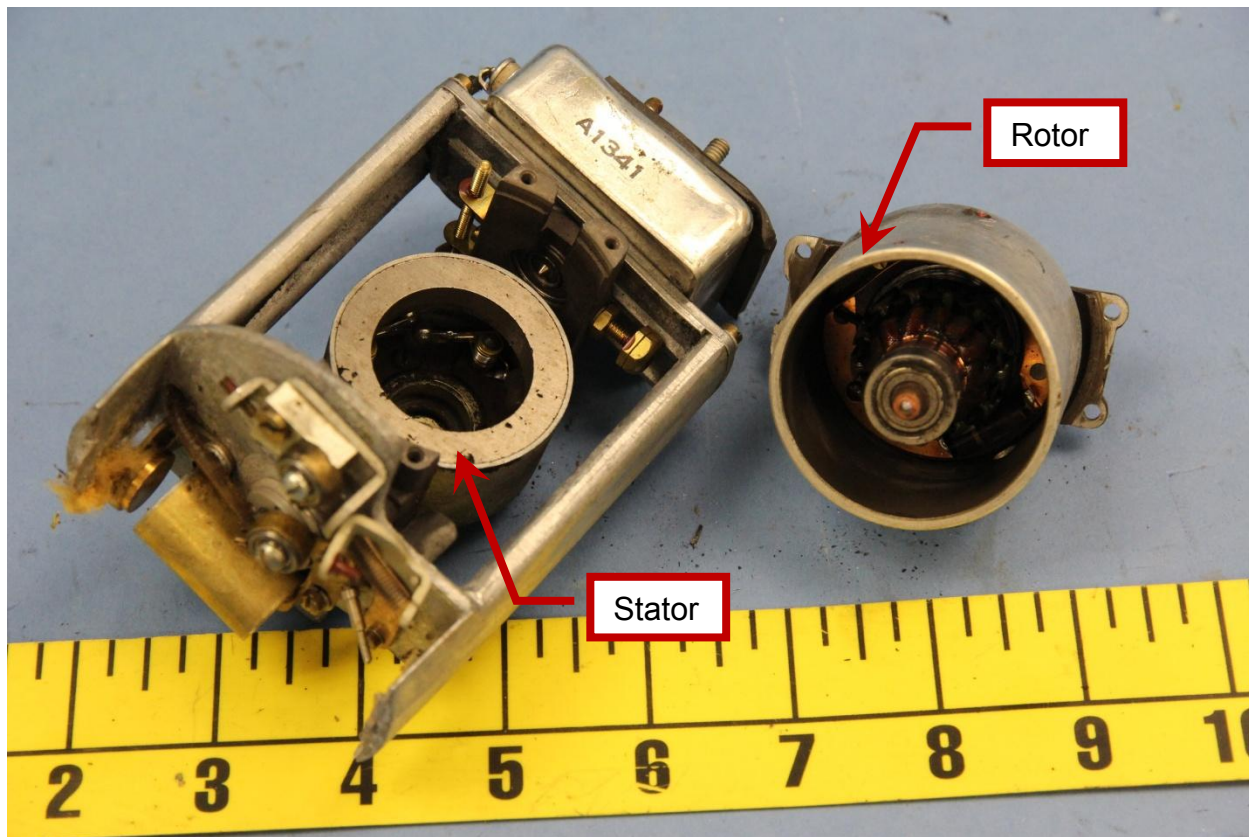


Figure 3. The intact gimbal structure with gyro disassembled.



Figure 4. The end face of the pump rotor showing non-rotational damage, dents and scrapes.