

NATIONAL TRANSPORTATION SAFETY BOARD

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



December 18, 2013.

MATERIALS LABORATORY FACTUAL REPORT

Report No. 13-074

A. ACCIDENT INFORMATION

Place : Chesterfield, Missouri.
Date : August 3, 2013.
Vehicle : Cirrus SR22, N225CD.
NTSB No.: CEN13FA456.
Investigator: Jim Silliman.

B. COMPONENTS EXAMINED

1. Horizon Reference Indicator.
2. Directional Gyro.

C. DETAILS OF THE EXAMINATION

The horizontal reference indicator and the directional gyro to be examined for indications of rotation in their respective gyro's are illustrated and identified in Figure 1. The horizontal reference indicator displayed the identification "BF Goodrich Aerospace", "p/n 504-0111-937", "model # 110-28L", and "S/N 504011193725219". The directional gyro displayed the identifications "MID-CONTINENT INSTRUMENT CO., INC", "Model # 4305-128", and "s/n 02211502". The directional gyro was still attached to its base which displayed the identifications "MID-CONTINENT INSTRUMENT CO., INC", "p/n 9011453" and "s/n 01211502 SPEC".

Horizontal Reference Indicator examination.

Preliminary examination of the received indicator revealed that the casing displayed numerous indentations. The electrical connection at the rear consisted of four pins protruding through a soil filled hole. The display housing was loose and its attaching screws were missing. The glass window was cracked and a portion was missing. The display immediately behind the missing portion of window had been deformed inwards.

Due to the indentations, the casing of the horizontal reference indicator was cut longitudinally so it could be removed. The gyro assembly was extracted and disassembled for an examination of the housing and rotor for indications of rotation. The interior surface of the housing is illustrated in Figure 2 with red arrows indicating dark, circumferentially oriented marks and yellow arrows indicating circumferentially oriented scratches where the housing material had been exposed. The housing material was found to be non-magnetic. The rotor extracted from the housing is

illustrated in Figure 3 with a red arrow indicating a circumferentially oriented mark on the surface. The portion of the rotor containing the mark was found to be magnetic.

Directional Gyro examination.

Preliminary examination of the received directional gyro revealed the significant damage and indentation indicated by the yellow arrow in Figure 1 and the outward penetration indicated by the blue arrow.

The base was removed from the gyro and, due to the damage, the casing was cut longitudinally so it could be removed. Examination of the inner workings revealed distortion of the frame and misalignment of the gimbal assembly containing the gyro assembly. The inner workings are illustrated in Figure 4 with the gyro assembly, the gimbal assembly and the frame identified. The black arrow indicates an intact portion of the frame for comparison with the distorted portion indicated by the green arrow. The blue arrow indicated a portion of the gimbal assembly protruding outside of the frame.

Examination of the misaligned gimbal assembly revealed that a bearing at the location indicated by the yellow arrow in Figure 4 had been dislodged. The dislodged bearing is indicated by the yellow arrow in Figure 5 with a red arrow indicating its original location.

The gyro assembly was removed from the gimbal assembly and disassembled for an examination of the housing and rotor for indications of rotation. The inner surface of the housing is illustrated in Figure 6 with yellow arrows indicating circumferentially oriented scratches where housing material had been exposed. The housing was found to be non –magnetic. The rotor extracted from the housing is illustrated in Figure 7 with yellow arrows indicating circumferentially oriented areas where the surface finish had been disturbed to reveal the underlying metal. The portion of the rotor containing the marks was found to be magnetic.

Derek Nash
Mechanical Engineering Technician

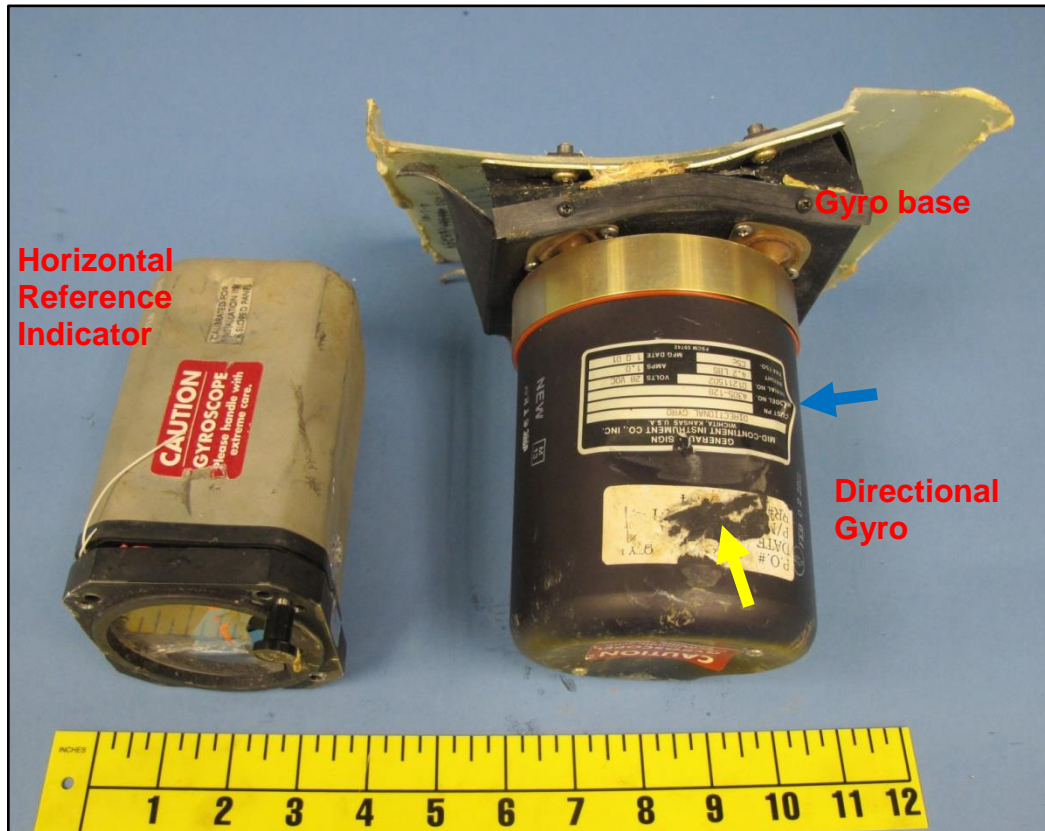


Figure 1. The Horizon Reference Indicator (left) and the Directional Gyro (right) received for examination.

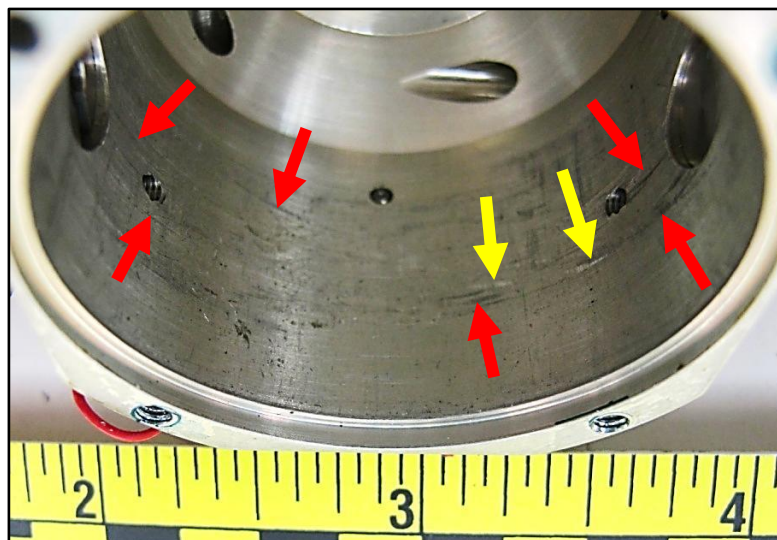


Figure 2. The inner surface of the gyro assembly extracted from the horizontal reference indicator.



Figure 3. The rotor extracted from the gyro assembly housing in Figure 2.

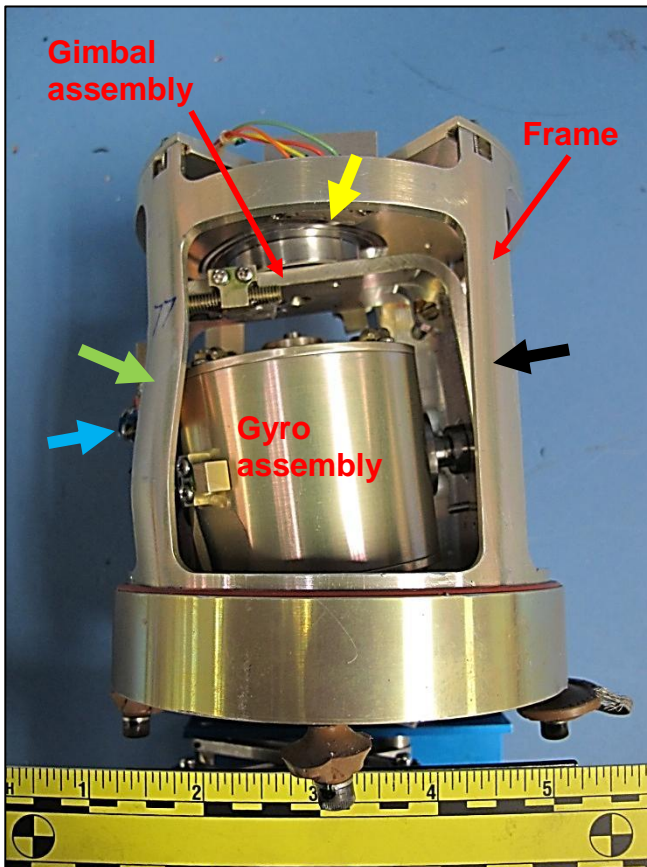


Figure 4. The inner workings of the directional gyro.

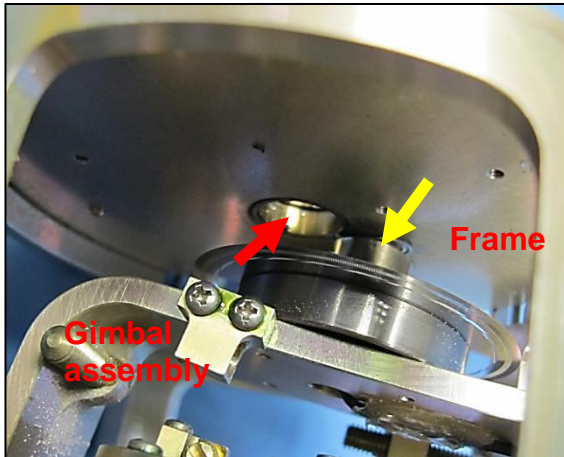


Figure 5. The dislodged bearing in the directional gyro's gimbal assembly.

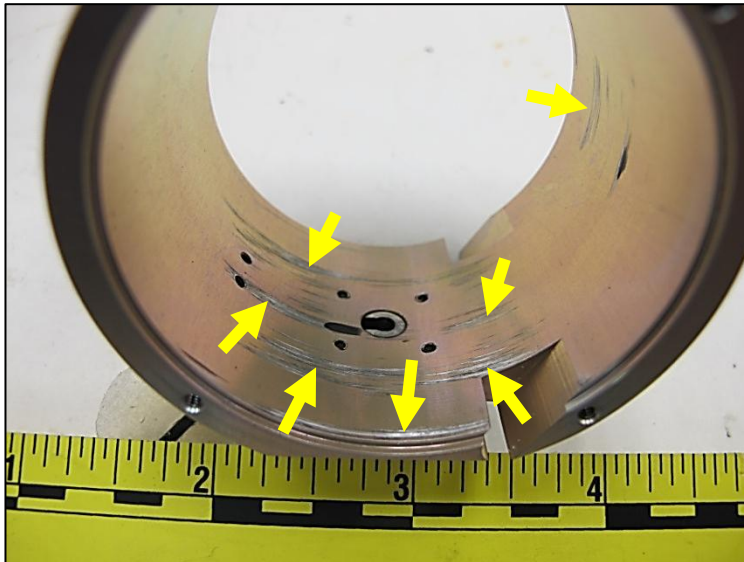


Figure 6. The inner surface of the gyro assembly housing.

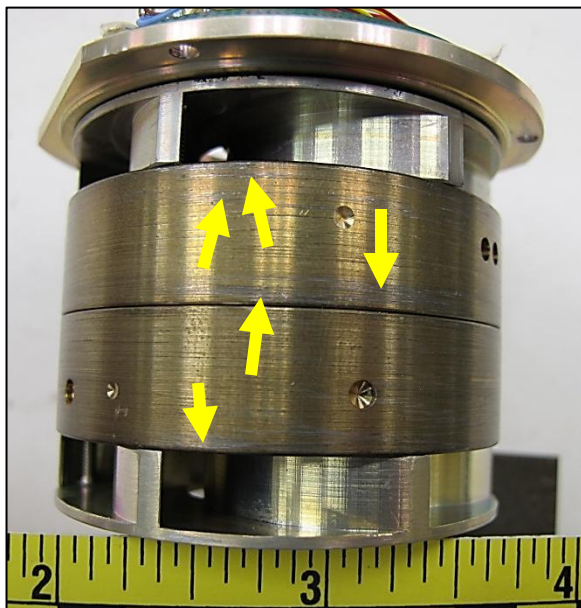


Figure 7. The rotor extracted from the housing in Figure 6.