

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

Log 1724

Related to Log
1454

ISSUED: August 23, 1984

Forwarded to:

Honorable Donald D. Engen
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-84-97

On April 6, 1982, the National Transportation Safety Board issued four Safety Recommendations (A-82-34 through -37) to the Federal Aviation Administration (FAA) concerning cracks in the stage 1 high pressure turbine disks on General Electric CF 6-50 engines. Safety Recommendation A-82-35 recommended that the FAA convene a team of experts in nondestructive inspection technology to review the adequacy of the inspection procedures used by the engine maintenance and overhaul facilities to detect cracks in their initial stages in General Electric CF 6-50 stage 1 high pressure turbine disks. On June 2, 1983, the FAA responded to the effect that a team of experts had been convened, had reviewed the nondestructive inspection techniques, and had found the procedures to be adequate.

The National Transportation Safety Board has placed Safety Recommendation A-82-35 in a "Closed—Acceptable Action" status because the FAA had convened a team of experts in nondestructive inspection technology and had reviewed the inspection procedures for adequacy. However, the Safety Board remains concerned about certain aspects of the nondestructive inspection procedure that the FAA has determined to be adequate. Specifically, the June 2, 1983, response stated that given the state-of-the-art, fluorescent penetrant inspection methods currently available were adequate. The response further stated that surface discontinuities of 0.030 inch and smaller could be detected with this technique in shop applications.

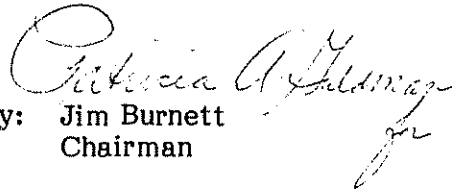
The Safety Board appreciates that a great deal of effort went into the review of the inspection methods used to verify the integrity of high pressure turbine disks. During the 2 or more years that have passed since the issuance of Safety Recommendation A-82-35, we have received additional information on the adequacy of using fluorescent penetrant inspection alone for verification. This method has some limitations that make its effectiveness in detecting tight and shallow cracks questionable. For instance, under laboratory/shop conditions on prepared specimens using Group 6B ultra high sensitivity penetrant on cracks on a flat surface which were open and connected to the surface, it has been found that the minimum crack size detected having a 3 to 1 aspect ratio was 0.015 inch deep and 0.045 inch long. This method has a reliability of 85 percent. The reliability of using the fluorescent dye penetrant inspection method for cracks less than 0.015 inch deep would appear to be even less. The smaller (tighter and shallower) the crack, the poorer the method's reliability. Therefore, the National Transportation Safety

Board believes that an additional method, such as eddy current, may be necessary in addition to the fluorescent penetrant inspection method, because it has been proven that the eddy current method will permit detection of those smaller surface and subsurface cracks, which your analysis suggested could be detected solely by fluorescent penetrant inspection method. Further, the combined methods would increase the reliability of crack detection. Accordingly, to insure the structural integrity of the stage 1 high pressure turbine disks on General Electric CF 6-50 engine, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require that use of a combination of methods, such as the fluorescent penetrant and eddy current inspection methods, to detect cracks in their initial stages in CF 6-50 stage 1 high pressure turbine disks in order to increase the reliability of detecting cracks in these disks. (Class II, Priority Action) (A-84-97)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY and GROSE, Members, concurred in this recommendation.

By: Jim Burnett
Chairman

A handwritten signature in cursive script, appearing to read "Patricia A. Goldman", is written over the typed name "Patricia A. Goldman". The signature is written in dark ink and is somewhat stylized.