NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: December 28, 1973

Forwarded to:

Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-73-113 thru 115

The National Transportation Safety Board's investigation of a recent fatal accident involving a Hughes helicopter, Model 269C, N9628F, indicates that corrective action is necessary to reduce the possibility of similar accidents. The aircraft crashed and burned on October 2, 1973, at Oakland, California, while it was on a routine police patrol. The pilot and the passenger received fatal injuries.

Our field investigation of the accident indicated that the aircraft lost main rotor torque because of an in-flight failure of the main rotor gear drive shaft, P/N 269A5180. An examination of the gear drive shaft by our metallurgists disclosed a fatigue fracture in excess of 5 inches in length along the fractured surfaces of the failed shaft. The fatigue fracture began where the lower bearing cup, P/N 269A5051-9, was seated against the shaft and propagated up to the area where the P/N 269A5112 coupling was fastened to the gear drive shaft. There, the shaft failed transversely. The bearing seat, where the fatigue fracture originated, was fretted and worn severely by the lower bearing cup.

Electron fractographic examination and metallographic cross-section examination of the area where the fatigue originated disclosed a zone containing an unusual microstructure at the origin, which may be related to a material defect. The zone, as it appears on the fracture surface, is approximately 0.1 inch wide and extends to a maximum depth of 0.02 inch from the bearing seat. The appearance of the structure suggests that chemical segregation might have occurred in the part during its manufacture or that the part was subjected to an unusual environment during service, which resulted in a phase transformation of the original microstructure. Metallurgical tests to determine the origin of this zone are continuing.

Records show that the transmission and failed-gear drive shaft had a total service time of 3,868 hours and had been overhauled 1,820 hours before the accident.

The Safety Board is concerned that the findings named above may exist in other Hughes 269 main rotor drive shafts now in service.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

1. Require an early inspection for cracks or severe wear on all Hughes 269 main rotor gear drive shafts, P/N 269A5180, in the area where the lower bearing cup seats against the shaft.

2. Require that such inspections be repeated at appropriate intervals, possibly coinciding with the 1,000-hour interval for the removal and replacement of the pinion shaft bearings.

3. Establish an appropriate service life for this part.

Personnel from our Bureau of Aviation Safety offices will be made available if any further information or assistance is desired.

REED, Chairman, McADAMS, THAYER, BURGESS, AND HALEY, Members concurred in the above recommendations.

By: John H. Reed
Chairman

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THE CONTENTS OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.