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NATIONAL TRANSPORTATION SAFETY BOARD WASHINGTON, D.C.

ISSUED: May 23, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-39 and -40

On August 17, 1979, a Bell 47G-3-B-1 helicopter, powered by a Lycoming turbo-charged engine, crashed near Rico, Colorado, killing the pilot and his passenger. The accident investigation disclosed that tail rotor thrust was lost during flight because the drive gear (P/N 47-620-568-1) failed. The gear is located within the main rotor transmission.

Metallurgical examination of the parts indicated that damage to the gear teeth resulted from axial misalignment of the gear. The misalignment was caused by a deep groove worn into the gear shaft. The shaft acts as the inner race for a roller bearing (P/N 47-620-605-1) located immediately aft of the damaged gear teeth. The operating time on the main transmission since the last overhaul was 822 hours. However, the gear assembly and bearing are not life-limited components and are replaced based on their condition. The Safety Board, therefore, was not able to determine the total operating time on the failed gear.

Four additional gears (P/N 47-620-568-1) in various stages of deterioration were submitted to the Safety Board's Laboratory for metallurgical examination. Two bearings (P/N 47-620-605-1) remained installed on the gear shafts which had been removed from main rotor transmissions on Bell 47 model helicopters powered by turbocharged engines. The service history on the gears was not available. The damage to the gear shafts ranged from light spalling to severe wear, similar to that found on the gear shaft from the accident aircraft. Metallurgical examination of all five gear shafts indicated that they complied with the engineering drawing requirements for surface hardness in the worn areas.

The helicopter manufacturer reported that, after 1968, Bell Model 47 main transmissions were produced with an improved roller bearing (P/N 47-620-929-1) designed to provide a more uniform load distribution on the shaft. It was also reported that this bearing was used in the 200-hour qualification testing of the helicopter power train during certification of the turbocharged engine installation.

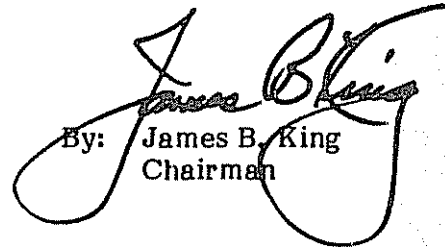
Based on its examination of the components, the Safety Board believes that the higher average thrust loading on the tail rotor systems of Bell 47 helicopters equipped with the turbocharged engine can cause deterioration of the tail rotor driven gear shafts in those main transmissions with the older, unimproved bearings installed.

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

Issue an Airworthiness Directive to require replacement of bearing (P/N 47-620-605-1) with the improved bearing (P/N 47-620-929-1) at the next scheduled or unscheduled removal of the main transmission on Bell 47 model helicopters equipped with turbocharged engines. (Class II, Priority Action) (A-80-39)

Review and evaluate the need to replace the older bearing (P/N 47-620-605-1) with the improved bearing (P/N 47-620-929-1) on all Bell 47 model helicopters. (Class II, Priority Action) (A-80-40)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.


By: James B. King
Chairman