AF-4
Log 1470

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 13, 1982

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-82-77 and -78

On May 1, 1982, a Robinson R-22 helicopter experienced a loss of directional control while performing a practice autorotative descent to the St. Lucie County Airport, Florida. The helicopter was damaged substantially during the ensuing landing. The student and the instructor pilots were not injured.

Examination of the helicopter revealed that the 140-inch tail rotor driveshaft had separated at the forward flexible drive coupling and the single shaft vibration damper had separated from its support bracket; there was a single bend in the shaft forward of the damper and a double bend aft of the damper. Also, the tail cone bulkheads had been damaged from contact with the flailing shaft.

In a similar accident on August 6, 1981, in Cincinnati, Ohio, an instructor pilot reported an excessive vibration during a partial power descent in a Robinson R-22 helicopter. The helicopter was landed successfully. Examination of the tail rotor driveshaft revealed that the vibration damper had separated at the support bracket and the tail cone bulkheads had been damaged by the shaft.

Since 1980, the manufacturer has recognized the importance of inspecting the tail rotor driveshaft to verify that it rotates about a common center along its entire length. The Robinson Helicopter Company requested operators, through Service Letters and Service Bulletins, to assure that the shaft "run-out" does not exceed 0.030 inch. The most recent, Service Letter No. 14, recommends a dial indicator reading at five locations along the shaft every 100 operating hours. The helicopter involved in the August 1981 incident was inspected in February 1981 and found well within limits (0.012 inch). The run-out measurement on the accident helicopter was not reported.

The Safety Board is aware that the manufacturer is undertaking a redesign of the tail rotor driveshaft installation for retrofit on an expedited basis. However, we are concerned that until the redesign is approved and installed similar failures could occur. These two occurrences suggest that the tail rotor driveshaft is susceptible to resonance in flight conditions (autorotative descent) which result in shaft speeds in excess of the normal operating rpm.

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

> Issue an Airworthiness Directive applicable to all Robinson R-22 helicopters to require an initial and a prescribed periodic inspection of the tail rotor driveshaft installation for excessive run-out in accordance with Robinson Helicopter Service Letter No. 14 and take appropriate action as required. (Class II, Priority Action) (A-82-77)
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> Review the Robinson R-22 tail rotor driveshaft design and verify, through ground dynamic testing, that the installation provides an adequate margin of safety against resonance. If a resonant condition is identified, expedite approval and retrofit of the manufacturer's proposed redesign. (Class II, Priority Action) (A-82-78)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and McADAMS and BURSLEY, Members, concurred in these recommendations.

Jim Burnett

By: Jim Burnett
Chairman