SP-205

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 8, 1985

Forwarded to:

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

SAFETY RECOMMENDATION(S)

A-85-118 and -119

On October 23, 1985, a Canadian-registered Bell 214ST helicopter broke apart in flight and crashed near Edmonton, Canada. The helicopter reportedly was conducting a flight test where simulated electrical system faults were being introduced and their effects on the helicopter's operation were being observed. The in-flight breakup included separation of the main transmission and the main rotor system, as well as the severance of the tail cone. The two occupants were killed.

The accident investigation is continuing under the direction of the Canadian Aviation Safety Board (CASB), and the National Transportation Safety Board is participating. Preliminary investigation has revealed that one of the mechanical flight control components installed on the accident helicopter may have been defective. The component, a collective sleeve assembly, PN 214-010-411-001, SN A19-00236, was found to be fractured during the initial on-site examination of the wreckage. The sleeve is a cylindrical steel tube, approximately 18 inches high and 5 inches in diameter with varying wall thickness, and is an integral part of the flight control system. The sleeve transfers motion from the pilot controls to the mechanism that varies main rotor blade collective pitch. Near the base of the sleeve is a chrome-plated area for a bearing set that is part of the swashplate support assembly. The fracture, which was circumferential, occurred just above the chrome-plated area at a location where the wall thickness was 0.063 inch.

Detailed examination of the fractured surface in the CASB Metallurgical Laboratory in Ottawa, Canada, revealed over 100 subsurface "fish-eyes," some as large as .040 inch in diameter. This condition is indicative of hydrogen embrittlement and generally is associated with an improper heat-treating procedure following the chrome-plating process during manufacture. The "fish-eyes" covered about 30 percent of the fractured surface. Some of these "fish-eyes" exhibited a small amount of fatigue propagation; the remainder of the fracture was typical of overstress.

The significance of the failed sleeve as it pertains to the accident sequence is not clear yet, but the Safety Board believes that the matter warrants immediate attention. In February 1984, the Federal Aviation Administration (FAA) issued Airworthiness Directive (AD) 84-05-51 that required a magnetic particle inspection (MPI) of all collective sleeve assemblies, PN 214-010-411 (all dash numbers), that had a serial number prefix of A19. The AD was issued after one in-flight failure which required a pilot to make a successful emergency landing. The AD prescribed the following inspection schedule based on component operating hours: 0 to 500--inspect prior to further flight; 500 to 1,000--inspect within the next 100 hours; 1,000 or over--inspect at the regularly scheduled overhaul interval of 2,500 hours. As a result of the AD inspection, collective sleeves on four helicopters were found to be cracked. All the cracked sleeves had A19 (vendor identification) serial number prefixes. However only the one vendor's sleeves were inspected. Therefore, the condition of sleeves manufactured by other vendors remains unknown.

The sleeve on the accident helicopter to which the AD applied reportedly had 1,200 hours at the time the AD was issued, but the operator elected to have the sleeve inspected at that time rather than wait for the overhaul interval. However, evidence indicates that the MPI was not performed exactly in accordance with specified procedures of the Bell Helicopter Company (Bell). Total operating time on the sleeve when it failed was 2,039 hours.

Since the accident, Bell has issued Alert Service Bulletins to 214B and 214ST operators recommending that collective sleeve assemblies with the A19 serial number prefix be magnetic particle inspected, regardless of operating time, prior to further flight and that this inspection be repeated every 250 hours. The Safety Board believes that the service bulletin inspection requirements should be made mandatory to prevent further failures of the collective sleeve assembly, PN 214-010-411-001. Furthermore, the Safety Board believes that the inspection requirements should apply to all collective sleeve assemblies regardless of serial number prefix. There are about 50 Bell 214B/214ST helicopters operating worldwide.

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

> Issue a telegraphic Airworthiness Directive to require that an immediate magnetic particle inspection of all collective sleeve assemblies on Bell 214B/214ST model helicopters be accomplished prior to further flight, in strict accordance with specified procedures of the Bell Helicopter Company and, based on the inspection results, determine the need for establishing a periodic inspection interval based on operating hours. (Class I, Urgent Action) (A-85-118)
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> Notify appropriate foreign civil aviation authorities of the action taken by the FAA to precribe inspection requirements for the Bell 214B/214ST collective sleeve assemblies. (Class I, Urgent Action) (A-85-119)

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

By: Jim Burnett
Chairman