DTG 1471

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 18, 1982

Forwarded to:

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

SAFETY RECOMMENDATION(S)

A-82-53 through -55

On March 11, 1982, a Nord 262, N26210, operating as Allegheny Commuter Flight 98, departed Newark International Airport, Newark, New Jersey, for Providence, Rhode Island. At 7,000 feet, the right engine began to shake, after which the engine fire warning light illuminated, and smoke was observed coming from the right engine. The pilot shut down the engine and discharged the fire extinguisher; however, the propeller would not feather and the engine continued to vibrate. The pilot made an emergency landing at La Guardia Airport without further incident.

Preliminary examination of the right propeller revealed that one blade of the three-bladed propeller had separated approximately 17 inches outboard of the propeller hub. Four of the five engine mount attachments had failed in overload, and several electrical wires had been severed. The engine cowl was missing and the starter generator had separated from its mount. None of the separated parts was recovered.

The propeller, model FH146, was manufactured in France by Ratier-Figeac. The failed propeller blade, P/N 106-22, S/N 13700, had accumulated a total time of 1,435 hours since new. The blade is life-limited to 8,000 hours.

Metallurgical examination indicated that the aluminum alloy propeller blade contained an extensive fatigue crack, which began from pitting corrosion in an area covered by the electrical deicing boot. The boot over the fatigue origin was burned and numerous chloride-rich particles covered the corrosion cavity and initial fatigue crack. Fractographic examination showed that the origin stemmed directly from the corrosion cavity. Hardness, microstructure, and chemical content of the blade appeared normal for the specified material.

The burned area in the deicing boot was near an end of a heating element loop on the face of the blade near the yellow electrical lead-in braided wire. This was in a region where the heating element loop would normally be connected to the braided wire; however, because the outboard portion of the blade was not recovered, it is not known whether this lead-in wire was involved. Examination of the heating wire bundles in the area of the origin disclosed areas of wire kinks molded through the crisscross network of fibers used to strengthen the boot. Such kinks, if severe enough, could place the wire close to the inner surface of the boot and near the aluminum alloy blade.

The evidence related to the burned boot suggests that an electrical short had occurred in the area of the fatigue origin. This short may have been caused by the heating wire touching the aluminum alloy blade or by a localized increase in resistance caused by separation of some of the wires in the heating element.

The chloride-rich particulates in the fatigue origin area were similar in composition to that of the polychloraprene layers of the inner boot, suggesting that the boot deteriorated as a result of overheating which produced chlorides in the region of the base metal of the blade. Chlorides in an ionic form are corrosive to aluminum alloys and will promote pitting of unprotected aluminum alloy surfaces.

Ratier-Figeac has issued service instructions, including information in Chapter 5 of its Propeller Maintenance Manual, which reiterate the importance of periodically testing the electrical resistance of the boot insulation and the heating elements on these propellers. As a result of this incident, Ratier-Figeac issued a red alert telex requesting immediate testing of the boot insulation and heating wire electrical resistance on all FH 146 propeller blades. However, the Safety Board believes that these tests should be required by Airworthiness Directive on a periodic basis and that the tests described in the maintenance manual may not be adequate to assure detection of an area of localized electrical overheating. Therefore, in view of the potentially catastrophic results of a propeller blade failure, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive requiring appropriate repetitive tests or inspections of deicing boots on the Ratier-Figeac model FH 146 propellers at intervals which will preclude failure of blades by fatigue cracking arising from localized overheating of the boot material. (Class I, Urgent Action) (A-82-53)
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> Review the deicing boot resistance testing procedures specified in the Ratier-Figeac maintenance manual for model FH 146 propellers to determine the adequacy of the testing procedures to detect faults in the deicer boots which could cause localized overheating. If the testing procedures are not adequate, develop in conjunction with the manufacturer improved procedures that will ensure detection of faults in the deicer boots. (Class II, Priority Action) (A-82-54)
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> Review the design of the Ratier-Figeac model 146 propellers for compatible composition of the deicing boot, its adhesive material, and the propeller blade material in the event it is exposed to excessive heat. If corrosive byproducts are produced by excessive heat, require modification of the boot to eliminate corrosive byproducts when the boot is overheated. (Class II, Priority Action) (A-82-55)

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

By: Jim Burnett
Chairman