

AVIATION OCCURRENCE REPORT

POWER LOSS/HARD LANDING

**NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES
MCDONNELL DOUGLAS 369E C-FGJK
SHUBENACADIE, NOVA SCOTIA
16 JUNE 1996**

REPORT NUMBER A96A0099

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

The helicopter departed the Nova Scotia Department of Natural Resources helicopter base with the pilot and three passengers on board. Approximately two minutes into the flight and at an altitude of 300 feet above the ground (agl), a loud bang was heard, followed immediately by an engine out horn and light. The pilot entered an autorotation and, as he was flying over a forest, extended the glide to reach a road. The main rotor rpm decayed during the extended glide, and the low rotor rpm light and horn were on when the helicopter touched down hard on the road. The helicopter bounced back into the air, moved to the left about six feet, touched down again, and came to rest in an upright attitude. The tail boom was severed by the main rotor blades during the landing. There were no injuries to any of the occupants.

Ce rapport est également disponible en français.

Other Factual Information

A 300-hour inspection of the helicopter was started five days prior to the accident. On the second day of the inspection, the aircraft maintenance engineer (AME) responsible for completion of the inspection was dispatched with two other helicopters on forest fire fighting duties. Another AME was recalled from days off to finish the inspection. The inspection was completed two days prior to the accident, and this was the first flight following the inspection.

Access to the engine inlet area through the engine inlet by-pass door is required to inspect some of the items on the 300-hour inspection sheet. To facilitate working in this area, the maintenance personnel use a make-shift inspection aid to prop open the engine by-pass door. This aid was a cardboard tube 9.5 inches long by 2.75 inches in diameter. There was no flagging attached to the tube that would attract attention to it. The tube was observed in position on the first day of the inspection, but after that no one could recall seeing it there.

When the replacement AME started work he noted that inspection of the mist eliminator screen, which is in the engine inlet area, and the hinge inspection on the by-pass door had not been carried out, as they were not signed off. The by-pass door has to be removed to complete the hinge inspection, so he removed it, carried out the remainder of the inspection items in the engine inlet area, and reinstalled the by-pass door. The AME then carried out a visual inspection for foreign objects, closed and latched the door, and signed off the applicable inspection items. There was no procedure in place to ensure that all tools were removed and accounted for following the completion of an inspection.

During examination of the aircraft after the accident the cardboard tube that was used to prop open the engine by-pass door was found lodged against the compressor inlet. The tube blocked off approximately fifty per cent of the compressor inlet causing the engine to flame out.

The accident flight was a non-revenue test flight. According to the operators Maintenance Control Manual there is no requirement for a test flight to be carried out after a 300-hour inspection. However, there is an informal procedure that gives pilots, who are on a self-dispatch system, the authority to carry out test flights after inspections or after the helicopter has been idle for some time

to verify that all of its systems are serviceable in the event that it is required for operational duties, or for pilots who are scheduled to fly the helicopter and have not flown it recently. On 20 August 1993, the operator issued a memorandum to all its Air Service staff stating that personnel on test flights will be restricted to essential crew and personnel giving or receiving related training. Up to that time authorized passengers were permitted on maintenance test flights when non-critical components were being checked. The operator does not have any directives specifying a minimum safe altitude for these or any other flights.

Analysis

The engine power loss was caused by the make-shift inspection aid partially blocking off the compressor inlet. The analysis will concentrate on the chain of events that resulted in the inspection aid being left in the engine inlet area and the altitude at which the check flight was carried out.

The make-shift inspection aid was likely used to prop open the engine by-pass door by the AME who was dispatched on forest fire fighting duties. Prior to the second AME working in this area, the tube was likely dislodged, coming to rest aft of the door where it was hard to see; the AME did not detect the tube when he carried out the inspection for foreign objects. There was no flag attached to the tube, which would have made detection easier, and there was no procedure in place to ensure that all tools were removed, such as a sign off section on the inspection sheets or a tool shadow board.

The flight was carried out at an altitude of 300 feet agl over a forest. There is no requirement to be at such a low altitude on a check flight. In general, the lower the altitude at which there is a loss of power, the less likely it is that a pilot will be able to reach a suitable landing area and successfully complete an autorotational landing.

Findings

1. An un-flagged, make-shift aid was used to facilitate inspection and was left in the engine inlet area.
2. There was a change of maintenance personnel part way through the inspection.

3. The second AME did not see the make-shift aid when he carried out the inspection for foreign objects; consequently, it was not removed prior to the flight.
4. There was no procedure in place to ensure that all tools were removed and accounted for on the completion of an inspection.
5. The engine flamed out when the make-shift inspection aid partially blocked off the engine compressor.
6. The pilot extended the glide to reach the woods road, and, as a consequence, the rotor rpm decayed resulting in a hard landing.
7. The operator had not issued any directives specifying a minimum safe altitude for test check flights.

Causes and Contributing Factors

The engine flamed out when a make-shift inspection aid, inadvertently left in the engine inlet area, partially blocked off the compressor. Contributing to the occurrence was the use of an un-flagged inspection aid, the absence of a procedure to ensure that all tools were removed and accounted for on the completion of an inspection, and the low altitude at which the flight was conducted.

Safety Action Taken

Following the occurrence, the operator department initiated the following action:

1. A special tool, with a 5-foot red flag attached, was manufactured for holding the engine inlet by-pass door open during maintenance activities.
2. The Maintenance Control Manual was amended to include an inspection for foreign objects following every maintenance action requiring a maintenance release. These will be independent inspections carried out by two AMEs. The pilot and an AME shall complete the inspection when operating away from base.

3. Work sheets were amended to include sign-off sections for the inspection for foreign objects.
4. Completion of the tool shadow board has been made a high priority task, with the materials required to effect tool control procedures on order.
5. All maintenance staff have been briefed on the consequences of inattentiveness.
6. All pilots have been encouraged to conduct their own inspection for foreign objects, and engineers have been instructed to assist any pilot wishing to do so.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, Benoît Bouchard, and members Maurice Harquail and W.A. Tadros, authorized the release of this report on 15 October 1996.