AVIATION INVESTIGATION REPORT
A00W0267

COLLISION WITH TREES

AIRBORNE ENERGY SOLUTIONS LTD.
HUGHES 500D HELICOPTER C-GXQI
FOX CREEK, ALBERTA, 45 NM WEST
31 DECEMBER 2000

Aviation Investigation Report

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Summary

The Hughes 369D (500D), C-GXQI, was being used to reposition seismic bags from one seismic line to another with a 100-foot line and carousel. The operation on December 31 had begun at approximately 0845 Pacific standard time with the pilot transiting from his base camp to the work area, then slinging two barrels of fuel to a selected staging site near the seismic lines. He then began repositioning bags, carrying five bags per lift, with each lift taking about 30 minutes to complete.

During the third lift, at about 1245, the bag runner, responsible for hooking the bags to the carousel, noted that the helicopter had not returned. He alerted company personnel, who then attempted to contact the pilot by radio. When no response was received from the pilot, three helicopters working nearby were called to conduct an airborne search. The helicopter was found at about 1330 in a heavily wooded area. The helicopter was substantially damaged, and the pilot was seriously injured.

Ce rapport est également disponible en français.

Other Factual Information

The pilot has a grand total flying time of approximately 770 hours. He received his initial training and checkout on the Hughes 500 helicopter on 21 and 22 December 2000, flying 3.6 hours. On December 28, a company check pilot accompanied him to a seismic operation and flew with him for 1.5 hours. The pilot accumulated an additional 8.4 flight hours before the day of the accident and had completed about 150 bag transfers. On December 31, the day of the accident, he flew approximately two hours. The pilot has no recollection of the events of that day.

The weather at the time of the accident was described as overcast with light westerly winds. The terrain was hilly and covered with approximately 100-foot-high spruce trees. The aircraft wreckage was found in a ravine that was 30 feet deep and 75 feet across at the top. The helicopter came to rest on its left side facing opposite the direction of flight, about 15 feet from the carousel, with the engine exhaust resting against the ravine bank. The carousel came to rest almost on the seismic drop marker at the bottom of the ravine.

The marker was about 125 feet from the tops of the trees, and the bags were about 110 feet from the bottom of the helicopter. The area over the ground marker was clear of trees and would have required the pilot to descend vertically beside several large trees. A burned area directly behind the exhaust showed that the engine was running after impact.

The tail-rotor assembly and a section of the tail boom were found near the airframe, and the tail boom showed that it had separated because of a main-rotor blade strike. All five of the main-rotor blades separated from the rotor hub before ground impact and showed signs of impact damage through their entire lengths. Several trees bordering the descent path showed main-rotor strikes, with one tree broken about 90 feet above the ground where the tree diameter was about five inches. All five main-rotor blades were found, and all the blade breaks were impact-related. Most of the rotor blade pieces were found at the top of the ravine. The sling line had been manually released before impact and was wound around the main-rotor hub. An examination of the helicopter after it was recovered did not reveal any pre-impact deficiencies.

The seismic ground lines are cut through the trees. The cleared area is normally one metre wide at ground level. Depending on the equipment being used, ground marks are placed at set intervals to indicate where the equipment bags are to be placed. These marks are often difficult to see from the air and require that the pilot manoeuvre to a position directly over the marker and descend vertically. The bags are dropped from the carousel by operating an electrical release from the cockpit. On this operation, the pilot had been working in areas where the trees were 40 to 80 feet high. He was gradually working into areas of higher trees until he reached the area where the trees were uniformly about 100 feet high.

The seismic operation was in a protected wildlife area, and all activity was to stop on 16 January 2001. Anecdotal evidence from several pilots who have been involved in seismic operations suggests that pilots face continual pressure to move equipment faster and to place all the bags exactly on the target markers. Discussions with the seismic ground foreman and with the pilot did not reveal any overt pressures being placed on the pilot in an attempt to increase his productivity.

Analysis

All indications at the accident scene were consistent with the engines and the main rotor developing power as the helicopter descended into the trees. When the main-rotor blades contacted the trees, the blades deflected and severed the tail boom. The main-rotor blades then separated from the helicopter, and the helicopter descended almost vertically. As indicated by the burned area behind the exhaust and the sling lanyard wrapped around the main-rotor hub, the engine was running after ground impact.

The pilot does not have any recollection of the events immediately before or after the accident. Based on observations at the accident site, it is possible that the pilot was attempting to lower the seismic bag onto the exact spot marked by the ground survey crew. The marker's location at the bottom of the ravine made it necessary for the pilot to descend vertically beside several large trees. Any lateral movement while doing so would have resulted in the main-rotor blades contacting the trees.

It is also possible that, during the vertical descent from about 250 feet above ground, the helicopter entered a vortex ring state.[1] Entry into a vortex ring state can be insidious. The pilot, who was concentrating outside and below the helicopter, may not have recognized the condition until the helicopter was entering the trees. Recovery from a vortex ring state usually requires that the airspeed be increased by moving the cyclic forward, which, in the conditions surrounding this occurrence, probably would not have been possible.

Findings as to Causes and Contributing Factors

1. The helicopter descended vertically into the trees while under power.

2. While the helicopter was descending into the trees, the main-rotor blades struck trees, and control was lost.

Findings as to Risk

1. The pilot had limited experience in seismic operations and on the Hughes 500 helicopter.

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[1] *Vortex ring state* is a condition of flight where the helicopter settles into its own downwash. In these conditions, the helicopter may descend at a high rate, exceeding the normal downwash-induced flow rate of the inner blade sections. As a result, the airflow of the inner blade sections is upward relative to the disk, resulting in an unsteady, turbulent flow over a large area of the disk. This causes loss of rotor efficiency even though power is still supplied.

Safety Action Taken

Airborne Energy Solutions Ltd., the operator, implemented new programs for heightened safety standards as follows:

a. They increased training resources and awareness.
b. They conducted discussions with their pilots restating their relief system from the field and methods for dealing with client pressures.
c. They applied an action plan for educating seismic clients and crews of marker bag placement.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 16 January 2002.