Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A00C0099

LOSS OF CONTROL—COLLISION WITH LEVEL ICE

HELICOPTER TRANSPORT SERVICES (CANADA) INC.
BELL 206L LONGRANGER (HELICOPTER) C-GJOL
RESOLUTE, NUNAVUT 35 nm SW
20 MAY 2000

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Aviation Investigation Report

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Summary

The Bell 206L LongRanger helicopter, serial number 45065, was on a charter flight, under day visual flight rules, from a site on the sea ice near Lowther Island, Nunavut, to Resolute, about 40 nautical miles east-northeast of Lowther Island. On board were the pilot and two passengers who had been conducting scientific research on the behaviour of polar bears in the sea ice environment. At about 2205 central daylight time, the helicopter lifted off from the sea ice, heading toward Lowther Island to take advantage, during take-off, of the visual reference provided by the island's terrain features. At about 400 feet above the ice and 65 knots, the pilot turned the helicopter to the right toward Resolute. During this turn, he recognized that he no longer had sufficient visual references because of whiteout conditions. He began a left turn back toward Lowther Island and the visual references on the island. In the left turn, the pilot lost control of the helicopter, and it descended and collided with the ice surface. Although the pilot and the passengers were wearing their seat belts and shoulder harnesses, they were all ejected from the fuselage as it disintegrated during the impact sequence. Both passengers sustained fatal injuries; the pilot sustained serious injuries. The helicopter was destroyed.

Ce rapport est également disponible en français.

Other Factual Information

The Bell 206L LongRanger had accumulated 7770 hours since manufacture in 1976. Records indicate that the helicopter was equipped, maintained, and certified in accordance with existing regulations and approved procedures. It was equipped for operations under instrument flight rules, although the operator employed it only under visual flight rules (VFR). The helicopter had no known defects before the flight. The weight and the centre of gravity were within approved limits.

The helicopter contacted the level ice surface in a nose-low, steep left turn and broke up into three large sections and many small pieces. The three main sections of wreckage were the cockpit and forward cabin area, the aft cabin area and fuselage section, and part of the tail boom. The left side of the cockpit and forward cabin section was destroyed and torn away by impact forces. The two outboard tip sections of the main-rotor blades were found about 600 feet north of the main wreckage. The wreckage was distributed along a straight path approximately 600 feet long on a heading of about 220 degrees true. Climatic conditions eliminated or covered any impact scars on the ice and snow before the investigators arrived.

Wreckage examination revealed that all rotor and drive systems showed indications of power at the time of the initial impact. Damage to the main-rotor system was consistent with a rotor blade ground strike. Drive train and flight control continuity were confirmed. There was no indication of any pre-impact aircraft system malfunction or airframe failure.

The 45-year-old pilot held a Canadian Commercial Helicopter Pilot Licence that was restricted to day flying only and valid for several types of helicopters, including the Bell 206L. He held a Class 3 instructor rating issued on 28 March 2000. His Category 1 medical certificate, issued on 07 December 1998, was renewed on 10 April 2000 with no restrictions. He had accumulated 8120 hours of total flying time, mostly on the Bell 206L and similar helicopters. In addition, he had accumulated 15 hours in simulators and received 10 hours of dual instrument instruction during training for his instructor rating in late 1998. He did not have an instrument rating, nor was one required by regulation. During the previous 90 days, he had flown 145 hours, including 87 hours during the previous 30 days.

At 2200 central daylight time (CDT),[1] the weather at Resolute, 35 miles northeast of the occurrence location, was reported as follows: winds 260 degrees true at four knots, visibility 10 statute miles, a broken cloud layer at 900 feet, temperature minus 15 degrees Celsius, dewpoint minus 18 degrees Celsius, and altimeter setting 29.77 inches of mercury. A Twin Otter aircraft had departed from the helicopter's location about 25 minutes before the accident. It was reported that the weather had deteriorated during the Twin Otter's time on the ground and that the local conditions were overcast with a layer of stratus cloud at about 2000 feet, the visibility was about six to eight miles, and there was very little definition to surface features. At the time of the occurrence, the sun was constantly above the horizon, providing 24-hour daylight.

Regulations for VFR flights in uncontrolled airspace required that the aircraft be operated with visual reference to the surface and, for helicopters operating below 1000 feet above ground

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[1] All times are CDT (Coordinated Universal Time minus five hours).

level, that the aircraft be operated in flight visibility of not less than one mile and clear of cloud. When flying VFR, pilots rely on visual orientation cues, such as the natural horizon and surface references, to maintain the desired attitude of the aircraft. The minimum weather conditions specified in the regulations normally permit pilots to see these orientation cues.

Transport Canada's *Aeronautical Information Publication*, section Air 2.12.7, describes whiteout as an extremely hazardous visual flight condition. Whiteout occurs over an unbroken snow cover and beneath a uniformly overcast sky. Because the light is diffused, the sky and terrain blend imperceptibly into one another, obliterating the horizon. The horizon, shadows, and clouds are not discernible, and sense of depth and orientation is lost; only very dark, nearby objects can be seen. The real hazard in whiteout is that pilots do not suspect the phenomenon because they may be in clear air. In many whiteout accidents, pilots have flown into snow-covered surfaces unaware that they have been descending and confident that they could see the surface. Consequently, when pilots encounter the whiteout conditions described above, or even suspect they are in such conditions, they should immediately climb if at low level, or level off and turn toward an area where sharp terrain features exist. Pilots should not continue the flight unless they are prepared to cross the whiteout area using instruments and have the training and qualifications to do so.

A flight itinerary had been filed with the base camp dispatch office in Resolute. The final contact between the occurrence pilot and the base camp was an advisory from the pilot via high-frequency radio that he was planning to return to Resolute, with possible stops en route if another bear was sighted. The dispatch staff unsuccessfully attempted to contact the pilot every hour thereafter. The staff were initially unconcerned because it was not unusual for the helicopter to be out of contact for up to three hours while the scientists worked with a bear. At about 0430 the Rescue Coordination Centre (RCC) received signals via satellites from the emergency locator transmitter (ELT). At about 0500 the dispatch manager initiated a search with locally based aircraft. At 0710 he notified the RCC of the missing helicopter. At 0746 RCC advised him of the ELT signal positions, and he sent aircraft to search those positions. He also notified the local Royal Canadian Mounted Police (RCMP) detachment, and a ground search was initiated. Searchers in a Twin Otter spotted the wreckage and saw the pilot waving but, because of whiteout, were initially unable to land. Another aircraft arrived with a nurse, and at 1542 the pilot was evacuated from the crash site.

The ELT activated automatically; however, search efforts were hindered by the inability of search aircraft to receive usable signals from the ELT, although signals were received by satellites. Four days after the search, the ELT was still transmitting a weak signal that could not be received unless the receiver was within several hundred feet of the ELT. Investigators found the ELT about 100 feet from the cockpit wreckage; it was still attached to a small piece of the fuselage structure. The ELT switch was in the "arm" position, the self-contained antenna was stowed, and a short length of cable was attached to the external antenna connector. The external antenna cable had separated during the crash sequence.

The pilot survived the crash with serious injuries that impaired his ability to move. He was restrained by a seat belt and a shoulder harness and was wearing a helmet and arctic boots but no winter coat. After the crash, he retrieved two sleeping bags, which kept him warm until he was rescued about 17 hours later, and a portable high-frequency radio. The pilot was unable to find the aircraft survival kit. Although he could receive radio transmissions, injuries prevented him from deploying the radio antenna and thereby transmitting.

The aircraft survival kit was found at the crash site by rescuers and brought back to Resolute, where it was turned over to TSB investigators. The kit was examined and opened at room temperature, rather than at the ambient temperature at the crash site. It was a commercially available kit that proved to be very difficult to open by hand because of the multiple steps involved. The outermost layer was a thick clear plastic that was difficult to tear open. Under the clear plastic was a yellow plasticized canvas shell with a lid held closed by four metal snap fasteners and two twist-tie fasteners. Clearance between the lid and the shell was minimal, making it difficult to apply the significant force required to open the snaps. Under the lid were two flaps held closed by two tightly knotted laces. Once the lid and the flaps were opened, another layer of thick clear plastic encasing the survival gear was revealed. This inner container of clear plastic was again difficult to tear open.

The operator's company policy required passengers to fasten seat belts for take-off, as did the *Canadian Aviation Regulations*. Before take-off, it was confirmed that the passengers were wearing their seat belts and that the passenger in the front left seat was also wearing a shoulder harness. The passenger in the front left seat also wore a helmet; the other passenger did not. Both passengers sustained fatal injuries during the crash sequence. An external examination of their bodies was conducted by the RCMP and by medical personnel. Both passengers sustained extensive serious injuries to the head and face; their other injuries were mainly to the hands, legs, and feet.

Analysis

There was no indication of any aircraft system malfunction or airframe failure before impact.

Because the pilot was flying VFR, he relied on visual orientation cues, such as the natural horizon and surface references, to maintain the desired attitude of the aircraft. The existing weather conditions were better than those specified by regulation for VFR operations; however, when external visual cues became obscured by whiteout conditions, the pilot was subject to disorientation with respect to the relationship between the aircraft and the surface because there were no distinguishing features. To counteract this disorientation, it is necessary to revert to flight instruments to determine and maintain aircraft attitude. However, the pilot was not instrument rated, was unable to regain visual reference, and was therefore unable to maintain control of the helicopter.

The survival kit was encased in multiple layers of protective covering. Because of the durability of the coverings and the strength of the fasteners, it would be extremely difficult or impossible for a survivor with hand or arm injuries to open the survival kit, particularly in cold weather.

Findings as to Causes and Contributing Factors

1. Whiteout conditions impaired the pilot's visual reference to the surface. As a result, he was unable to maintain control of the helicopter.

2. The seat belts and shoulder harnesses failed because the fuselage disintegrated.

Findings as to Risk

1. The survival kit would have been extremely difficult or impossible for a survivor with hand or arm injuries to open, especially in the existing cold weather.

2. The emergency locator transmitter (ELT) antenna cable separated during impact, rendering the ELT partially ineffective.

Safety Action

The manufacturer of the survival kit conducted field tests with the kit and has upgraded the survival equipment and made the kit easier to open. The company used velcro on its larger survival kits rather than snap fasteners and is replacing the snap fasteners with velcro on the kit involved in this occurrence. The laces on the inner flaps have also been replaced with velcro. A utility knife attached with a lanyard has been added to permit piercing and cutting of the inner seals, and an instruction card explaining the opening procedure has been included.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 09 May 2001.