

Transportation Safety Board of Canada Bureau de la sécurité des transports du Canada



# AIR TRANSPORTATION SAFETY INVESTIGATION REPORT A24A0019

## **COLLISION WITH TERRAIN**

Custom Helicopters Ltd. Bell 206L (helicopter), C-FYHN Goose Bay Airport (CYYR), Newfoundland and Labrador, 75 NM N 02 May 2024

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## History of the flight

On 28 April 2024, the occurrence pilot arrived at Goose Bay Airport (CYYR)<sup>1</sup> and was scheduled to conduct a visual flight rules (VFR) flight in the Custom Helicopters Ltd. (Custom Helicopters) Bell 206L helicopter (registration C-FYHN, serial number 45050) to Pangnirtung Airport (CYXP), Nunavut. The purpose of the flight was to position the helicopter and commence contracted flying in support of scientific research as part of the Polar Continental Shelf Program on Baffin Island, Nunavut.

On each of the next 3 days, the pilot planned to conduct the 860 nautical mile (NM) flight; however, after each daily review of the weather conditions along the planned route, he assessed the conditions to be unsuitable.

<sup>&</sup>lt;sup>1</sup> All locations mentioned in the report are in Newfoundland and Labrador, unless otherwise stated.

On 02 May 2024, the pilot reviewed NAV CANADA's weather forecast products<sup>2</sup> in preparation for the flight and checked the weather forecast on his cellphone using the Windy weather app. Despite reduced visibility and cloud ceilings due to ongoing light snowfall at CYYR, the pilot assessed that conditions on the overall route were suitable to conduct the flight. The pilot planned fuel stops along the route, the first one being at Nain Airport (CYDP).

At 0806,<sup>3</sup> the pilot, who was the sole occupant of the helicopter, requested and received authorization from air traffic control to depart in accordance with special VFR flight rules.<sup>4</sup> The pilot immediately flew a direct route toward Hopedale Airport (CYHO) because he determined visibility would improve along coastal Labrador in that area. Falling snow and low ceilings required the pilot to fly the helicopter at reduced airspeed (about 70 knots ground speed) and at about 300 feet above ground level to maintain visual reference to the ground.

About 75 NM north of CYYR, the visibility decreased to about ½ statute miles (SM) because of increasing snowfall, and the pilot decided to further reduce the helicopter's speed and head northeast toward Postville Airport (CCD4) where he hoped visibility would improve. When the visibility continued to decrease, he conducted a 180° turn toward the southwest. Visibility improved slightly, and the pilot made another attempt to head to CCD4. Again, visibility decreased below ½ SM and, again, the pilot made a 180° turn to avoid the reduced-visibility conditions.

The pilot decided to attempt a precautionary landing to wait for visibility to improve. He turned the helicopter south and came upon a frozen lake where he decided to land. He turned northeast to land into the wind and began a descent near the north shoreline of the lake. The poor visibility caused the pilot to misjudge his height above ground in the descent and, at about 0920, the helicopter struck the frozen surface of Lewis Lake (54°33.85' N, 060°16.22' W) while travelling parallel to, and about 700 feet from, the north shoreline of the lake (Figure 1).

The helicopter rolled after striking the frozen lake surface and came to rest inverted. The pilot was able to egress through the right front door and used a portable satellite communicator to initiate search and rescue (SAR) services. The pilot received minor injuries. The 406 MHz emergency locator transmitter (ELT) activated upon impact.

<sup>&</sup>lt;sup>2</sup> See the *Weather information* section of this report.

<sup>&</sup>lt;sup>3</sup> All times are Atlantic Daylight Time (Coordinated Universal Time minus 3 hours).

<sup>&</sup>lt;sup>4</sup> Transport Canada, SOR/96-433, Canadian Aviation Regulations, subsection 602.117(1).

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Figure 1. Occurrence flight track with inset image showing detail of the final track (Source of both images: Google Earth, with TSB annotations)

## Weather information

Before departure, the pilot reviewed the graphic area forecast for the area along the route of the occurrence flight valid at the time of the occurrence. The graphic area forecast Clouds and Weather Chart for the area issued at 0225 and valid at 0300 included ceiling and visibility information that indicated:

- a broken layer of cloud at 16 000 feet above sea level (ASL) with tops at 20 000 feet ASL;
- an overcast layer at 3000 feet ASL with tops at 6000 feet ASL; and
- visibility greater than 6 SM with localized visibility of 2 SM in light snow and ceilings of 700 feet above ground level (AGL).

The graphic area forecast Clouds and Weather Chart for the same area issued at 0225 and valid at 0900 included ceiling and visibility information that indicated that:

- along the initial portion of the route, visibility was expected to be 2 to 5 SM in light snow, with isolated altocumulus castellanus clouds with tops at 24 000 feet giving <sup>3</sup>/<sub>4</sub> SM visibility in light snow showers and ceilings of 600 feet AGL, north of which an area with isolated altocumulus castellanus clouds with tops at 20 000 feet giving 1<sup>1</sup>/<sub>2</sub> SM visibility in light snow showers and ceilings of 800 feet AGL was expected.
- further north along this route there would be a scattered layer of cloud at 16 000 feet ASL with tops at 20 000 feet ASL, a broken layer at 3000 feet ASL with tops at 7000 feet ASL; visibility greater than 6 SM with localized visibility of 2 SM in light snow and ceilings of 500 feet AGL.

The CYYR surface weather observation from the aerodrome routine meteorological report issued at 0800 indicated:

- winds from 010° true at 13 knots;
- visibility of 3 SM in light snow and mist;
- a broken ceiling at 800 feet AGL, a broken cloud layer at 1200 feet AGL, and an overcast cloud layer at 2500 feet AGL;
- temperature of 1 °C and dew point of 0 °C; and
- altimeter setting of 30.32 inches of mercury.

#### Minimum altitudes and distances for visual flight rules flights

Regarding meteorological conditions for VFR flight in uncontrolled airspace below altitudes of 1000 feet AGL, the *Canadian Aviation Regulations* (CARs) require that a helicopter must maintain visual reference to the surface, remain clear of cloud, and, during the day, ensure that flight visibility is at least 1 SM.<sup>5</sup>

However, Custom Helicopters is authorized by Transport Canada (TC) via an operations specification to operate in reduced-visibility conditions down to 1/2 SM in uncontrolled airspace in accordance with specific procedures outlined in its *Company Operations Manual*. The specific procedures include directions such as not to fly over snow- and ice-covered surfaces with poor visual reference to the ground—such as in whiteout conditions—and to reduce airspeed in reduced-visibility conditions (to provide the pilot an adequate opportunity to see and avoid obstacles and to allow the pilot to safely conduct a 180° turn and land before entering an area where visibility is further reduced).<sup>6</sup>

## **Pilot information**

The pilot held the appropriate licence and rating for the flight in accordance with existing regulations. He had accumulated over 11 000 total flight hours, with about 7500 hours on the occurrence aircraft type and had completed training on reduced-visibility and low-level flight operations. Fatigue was not considered a factor in this occurrence.

The pilot did not have an instrument rating.

## **Company information**

Custom Helicopters is based in Manitoba and began operations in 1977. It has a fleet of more than 30 aircraft. It provides helicopter support for activities such as tourism, mining, forestry, and environmental research under CARs subparts 702 (Aerial Work) and 703 (Air Taxi Operations). The occurrence flight was conducted under CARs Subpart 703.

<sup>&</sup>lt;sup>5</sup> Ibid., section 602.115.

<sup>&</sup>lt;sup>6</sup> Custom Helicopters Ltd., *Company Operations Manual*, Revision No. 4 (15 February 2022), section 4.1.29(2)(f) VFR Weather Minima, pp. 86-87.

## **Aircraft information**

The Bell 206L is a single-engine, 7-seat, single-pilot, turbine-powered helicopter with a maximum take-off weight of 4000 pounds. It has a single main rotor system with 2 main rotor blades in a semi-rigid configuration. The pilot flies from the front-right seat. The occurrence helicopter was manufactured in 1976 and had accumulated 24 963 airframe hours. There was no indication of an aircraft system malfunction contributing to this occurrence. The investigation determined that the aircraft's weight at takeoff was more than 300 pounds in excess of the maximum take-off weight.<sup>7</sup>

The pilot was navigating using VFR navigation charts displayed on his tablet using the ForeFlight app in the moving map viewing mode. The terrain and obstacle hazard alert feature was selected off by the pilot to prevent nuisance alerts that he expected to occur due to the low cruising altitude for this flight. The aircraft had a Sentry Plus portable automatic dependent surveillance—broadcast receiver on board that incorporated a global positioning system receiver and an attitude and heading reference system; however, the pilot did not turn it on or pair it to the tablet.

The helicopter was also equipped with a flight following and satellite communications system manufactured by SkyTrac (model ISAT-200A). The ISAT-200A enables global flight following, voice, messaging, and data transfer capabilities. The helicopter departed with the ISAT-200A unit in an unserviceable condition. This system is not required by TC regulation and is considered additional flight safety enhancement equipment.

The occurrence aircraft was not equipped with a flight data recorder or a cockpit voice recorder, nor was it required to be by regulation.

#### Wreckage and impact information

The helicopter sustained substantial damage when it struck the frozen lake and rolled to an inverted position; the main landing gear skids bent, the main rotor assembly and tail boom separated from the helicopter, and both front windscreens and chin bubbles shattered.

<sup>&</sup>lt;sup>7</sup> The investigation used actual weights of survival equipment and cargo provided by company personnel during the recovery, as well as known values, to determine the weight at takeoff.



Figure 2. Occurrence helicopter during the rescue (Source: Halifax Joint Rescue Coordination Centre)

#### **Survival aspects**

The helicopter impacted an area where the ice surface had an accumulation of water under about a foot of snow. The aircraft cabin and cockpit remained largely intact. The pilot was wearing the available 4-point safety belt and was able to egress through the right front door. The pilot noted that the instrument panel-mounted remote switch for the ELT<sup>8</sup> was flashing, indicating that the ELT had activated. As a precaution, the pilot ensured that the ELT was selected ON directly at the transceiver unit.

The pilot brought a Zoleo portable satellite communicator on the flight but had not paired it with his smartphone and, therefore, could not use the Zoleo smartphone app to message company operations regarding the crash. However, the Zoleo unit did have an SOS feature that allowed the pilot to send a preprogrammed emergency message to the company operations department.<sup>9</sup>

The occurrence ELT initially transmitted a hexcode that was detected by the Canadian Mission Control Centre (CMCC) at 0944; however, the hexcode did not correspond to any known aircraft.

<sup>&</sup>lt;sup>8</sup> Kannad Aviation model Kannad 406 AF-Compact ELT (part number S184051-01, serial number LX1100459290).

<sup>&</sup>lt;sup>9</sup> The emergency message was received by Custom Helicopters as a notification from Zoleo at 0958. Zoleo followed up with a phone call to Custom Helicopters at 1010.

At 1058, the ELT transmitted a hexcode that the CMCC detected as being registered to C-FYHN.<sup>10</sup> The CMCC notified the Halifax Joint Rescue Coordination Centre at 1106.

The initial hexcode received at 0944 was detected as the manufacturer's maintenance test code. It could not be determined why the ELT hexcode was initially detected as a maintenance hexcode as opposed to the one registered to the helicopter; however, according to the CMCC, this discrepancy has reportedly occurred on several different occasions with other operators using similar ELT models.<sup>11</sup>

While waiting for the SAR services, the pilot changed out of his wet clothes, putting on dry clothes he had with him, and sheltered in the wreckage. The SAR helicopter dispatched by the Joint Rescue Coordination Centre arrived at the occurrence site at 1530 and the SAR team administered first aid to the pilot for head and hand injuries. The pilot was transported to a medical facility in Goose Bay for assessment and released later that day.

The pilot had not been wearing a helmet during the occurrence flight.

## Continuing a visual flight rules flight into instrument meteorological conditions

The hazards associated with continuing a VFR flight into instrument meteorological conditions (IMC) are well documented. Accidents involving flights that depart under VFR conditions and continue to a point where pilots lose visual reference to the surface have a high incidence of fatalities. According to data collected by the TSB, these types of flights have resulted in 122 accidents and 135 fatalities in Canada from 1999 to 2023.

TC's *Helicopter Flight Training Manual* provides guidance for VFR helicopter pilots when they encounter IMC:

By far the safest and most expedient procedure for a VFR pilot is the time honoured 180 degree turn back to VMC [visual meteorological conditions]. This procedure is the most appropriate for VFR flights at VFR altitudes, night flights that encounter IMC, or where IMC is a local phenomena, e.g. fog, blowing snow or ice crystals.<sup>12</sup>

In 2019, the TSB published Safety Issue Investigation Report A15H0001.<sup>13</sup> The Safety Issue Investigation examined air-taxi operations in Canada, including helicopter accidents that occurred during VFR flights where a loss of visual reference occurred and resulted in controlled flight into terrain. It was found that accidents of this type have some common characteristics. They involved flights that departed in visual meteorological conditions, then encountered reduced visibility (owing to encountering cloud, precipitation, whiteout, illusion, darkness, or smoke) that caused

<sup>&</sup>lt;sup>10</sup> Each 406 MHz ELT must have its unique hexcode registered with the Canadian Beacon Registry before it is installed on a Canadian-registered aircraft.

<sup>&</sup>lt;sup>11</sup> The TSB laboratory examined the occurrence ELT and only the programmed hexcode registered to C-FYHN was transmitted during activation tests.

<sup>&</sup>lt;sup>12</sup> Transport Canada (TC), TP 9982E, *Helicopter Flight Training Manual*, Second edition (June 2006), Exercise 30—Instrument flying, p. 120.

<sup>&</sup>lt;sup>13</sup> TSB Air Transportation Safety Issue Investigation Report A15H0001, Raising the bar on safety: Reducing the risks associated with air-taxi operations in Canada (07 November 2019), at www.tsb.gc.ca/eng/rapports-reports/aviation/etudes-studies/a15h0001/a15h0001.html (last accessed on 12 March 2025).

pilots to lose visual reference to the ground and resulted in collisions with terrain. One of the risk factors that was most commonly identified in these accidents was pilots not having an instrument rating. The Safety Issue Investigation found that the pilots involved in this type of helicopter accident had an average of 6837 hours total flight time.

#### **TSB** laboratory reports

The TSB completed the following laboratory reports in support of this investigation:

- LP068/2024 NVM Data Recovery—ISAT-200A, ForeFlight, and Sentry
- LP091/2024 Aircraft Track Superimposed Over Terrain
- LP101/2024 ELT Analysis

## Safety action taken

Following this accident, Custom Helicopters developed several simulator training scenarios for VFR pilot training that emphasize pilot decision making in reduced-visibility conditions. Custom Helicopters also implemented a checklist designed for a pilot's first flight in a duty sequence with a particular helicopter that includes prompts for the pilot to ensure Zoleo and SkyTrac functionality.

## Safety messages

VFR flights that continue into IMC often result in a collision with terrain or a loss of control due to a loss of visual references. Pilots are reminded to plan ahead, consider strategies to avoid adverse weather, and have alternate plans should such weather be encountered.

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 12 March 2025. It was officially released on 25 March 2025.

Visit the Transportation Safety Board of Canada's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the key safety issues that need to be addressed to make Canada's transportation system even safer. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

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