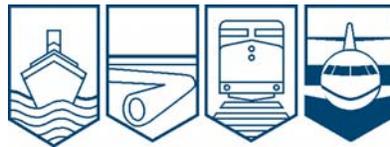




**AVIATION INVESTIGATION REPORT
A05Q0157**



**FLIGHT INTO ADVERSE WEATHER -
COLLISION WITH TERRAIN**

**NORDPLUS 1998 LTÉE
de HAVILLAND DHC-2 BEAVER C-FODG
SCHEFFERVILLE, QUEBEC 20 nm NW
01 SEPTEMBER 2005**

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.

Aviation Investigation Report

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Summary

The float-equipped de Havilland DHC-2 Beaver (registration C-FODG, serial number 205) departed the outfitter base camp at Squaw Lake, Quebec, at 0925 eastern daylight time, with a passenger and a few supplies on board, for a round-trip visual flight rules (VFR) flight to two wilderness camps, Camp 2 and Camp Pons. The weather in Squaw Lake was suitable for visual flight at the time of take-off but was forecast to deteriorate later in the day.

The pilot completed the flights to the two camps and on the way back to Squaw Lake, the weather forced the pilot to make a precautionary landing on Elross Lake, 15 nautical miles (nm) northwest of Squaw Lake. At 1630, he reported to the company via high frequency (HF) radio that he intended to take off from Elross Lake, as there seemed to be a break in the weather. Rescue efforts were initiated in the evening when the aircraft did not arrive at the base camp. The aircraft was located at 1230 the following day, 4 nm from Elross Lake. (See Appendices A and B). The aircraft was destroyed by a post-impact fire. The pilot sustained fatal injuries.

Ce rapport est également disponible en français.

Other Factual Information

The outfitter company has its base of operations at Squaw Lake, 3 nautical miles (nm) from Schefferville, Quebec. The company sells hunting and fishing excursion packages for various sites north of Squaw Lake. NordPlus is an air carrier company that supplies air service to the outfitter by carrying clients, staff, baggage, and supplies to the various camps throughout the outfitter's territory. Most of the work is seasonal, beginning in June and terminating in September. NordPlus operates a Cessna 185, a de Havilland DHC-2 Beaver, and a DHC-3 Otter aircraft. The occurrence flight was conducted in accordance with Subpart 703 of the *Canadian Aviation Regulations* (CARs).

The occurrence aircraft was manufactured in 1952 and had flown a total of 20 900 hours before the accident flight. Records indicate the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The engine, a Pratt & Whitney R-985, serial number JP204274, had accumulated 782.2 hours since overhaul. A 100-hour inspection had been completed on 14 August 2005. The aircraft had flown 50 hours since the inspection, and technical logbooks showed no deferred snags. The aircraft was not authorized for VFR-on-top, night flying or IFR (instrument flight rules) flight.

The pilot worked for NordPlus during the 2004 and the 2005 seasons as pilot on the float-equipped de Havilland DHC-2 Beaver aircraft. He held a valid commercial pilot license with a seaplane endorsement and an instrument rating. His last medical examination was completed on 17 June 2005. Company annual training records show that the pilot had 2550 hours total flying time, 1700 hours of which were completed on seaplanes and 750 hours of which were completed on DHC-2 type aircraft. The pilot knew the area well and was considered to be a hard working, cautious, and professional pilot. Based on the autopsy, toxicology, and medical records, there was nothing found to indicate that the pilot's performance was degraded by physiological factors.

Ground fog persisted on the two previous mornings causing flight delays, which obliged the pilot to spend two nights at one of the outfitter's camps. The camps are comfortable and well equipped and would have provided the pilot with a restful environment to spend the night. He arrived at the Squaw Lake base the morning of 01 September, whereupon the aircraft was fully fuelled and prepared for the planned flight north to Camp 2 and Camp Pons. Although fuel is available at some of the camps, flights are planned so as not to have to fuel en route. There was no indication that the pilot boarded any extra 5-gallon, plastic fuel canisters in the aircraft float compartments.

The hourly observation, taken from the automatic weather station at Schefferville Airport (CYKL) on 01 September 2005 at 0900 eastern daylight time¹, reported the following: visibility 9 statute miles (sm), winds easterly at 17 knots, temperature 15°C, overcast ceiling at 1100 feet above ground level (agl) and no precipitation.

¹ All time are eastern daylight time (Coordinated Universal Time minus four hours).

Prior to departing Squaw Lake, the pilot received the 12-hour forecast for Schefferville. The forecast was for deteriorating weather conditions for Schefferville throughout the day. The weather from 1200 to 2000 was forecast to be as follows: visibility varying between $\frac{3}{4}$ and 2 sm in light rain and fog, winds east-south-east at 20 knots gusting 30 knots, and ceiling varying between 300 and 800 feet agl. Although current weather and forecast information was available at the base, it is not known if the pilot consulted this information. It was his habit to do so.

The flight from Squaw Lake to Camp 2 took just over an hour. The pilot reported having landed at Camp 2 at 1032 by means of radio relay through the company Otter aircraft. The passenger deplaned and the aircraft departed for Camp Pons for a caribou meat pick-up. The pilot's take-off time from Camp 2 for Pons is unknown, as are his arrival and take-off times at Camp Pons. It is not known if the pilot fuelled from the fuel cache at Camp Pons. Given the strong south-east winds, it is estimated that C-FODG would have taken approximately two hours to complete the flight from Camp Pons to Squaw Lake.

The company Otter pilot completed a similar flight from the north to Squaw Lake, leaving shortly after C-FODG left, arriving at Squaw Lake at 1515. The flight took the Otter aircraft just over two hours. Weather had deteriorated significantly while heading south, causing the Otter pilot to deviate from the direct route to maintain visual reference with the ground.

Approximately 20 nm north of Squaw Lake, the Otter pilot estimated the weather to be as follows: visibility approximately $1\frac{1}{2}$ sm (at 300-400 ft agl), winds 18 knots gusting to 25 knots, and moderate turbulence.

Following the occurrence pilot's conversation with the company dispatcher at 1630, the occurrence pilot learned from the Otter pilot that the weather at Squaw Lake was poor and a flight from Elross Lake to Squaw Lake should not be attempted. This was the last radio communication with the occurrence pilot. At no time did he mention having any technical problems with the aircraft. The automatic weather station at the Schefferville airport transmitted the following special weather observation report at 1616: visibility 2 sm, vertical visibility 600 feet, and winds east-south-east at 18 knots.

When C-FODG failed to arrive at the Squaw Lake base camp, rescue efforts were undertaken. Weather continued to be poor until 1830 when the Otter pilot and an observer took off to start a search. The Halifax Search and Rescue Centre was contacted to ascertain if there was any indication of an emergency locator transmitter (ELT) transmission, but no ELT signal had been received. The evening search was unsuccessful and rescue efforts were continued in the morning. The aircraft was located on September 2 at 1230, 11 nm northwest of Squaw Lake and 4 nm east of Elross Lake.

Environment Canada provided a weather analysis of the Schefferville area for the period covering 1400 on 01 September 2005 to 0200 on 02 September 2005. There were no amendments to area forecasts (AIRMET) or significant meteorological information (SIGMET) for that period, nor were there any pilot weather reports (PIREPS). Environment Canada concludes that the weather at the time of the occurrence would have been as follows:

Visibility 2 sm or less, ceiling obscured between 500 and 600 feet agl, surface winds south-east at 15 knots gusting 25 knots, and winds at 1500 ft agl from the south-east at 45 kts. Strong winds at low levels of the atmosphere and an unstable air mass between the surface and 5000 ft agl combined with the terrain in the Schefferville sector most probably caused moderate to severe turbulence and wind shear.

The accident site is located in a valley oriented north-south between two mountain ridges, which extend on either side of the Howells River. Elross Lake is situated within this valley (See Appendix B). When weather is marginal, local pilots normally will attempt to cross over the east side ridge further north where the elevation is lower. The river valley is not normally used as a poor weather route, because it is not very wide and does not provide a comfortable turn radius. Winds were strong from the east-south-east and would have caused updrafts in the valley on the lee side of the east ridge. Given the strong wind conditions, visibility and cloud level, the only reasonable way of exiting the valley would have been to fly south where the terrain flattens out before attempting to fly north-east towards Schefferville.

The aircraft was not equipped with wing tip tanks and had approximately three hours 30 minutes of fuel endurance when it left Squaw Lake in the morning. It was estimated that the aircraft had flown three hours 20 minutes at the time of the occurrence. There was no way to determine the amount of fuel onboard at the time of impact due to the damage incurred to the fuel system. The direct route over the ridge would be shorter than the route south through the valley.

The wreckage site was on the lee side of the east ridge on a heading of 065° magnetic (M). The main cockpit and cabin areas of the aircraft had been consumed by the post-impact fire. All control surfaces were accounted for and all damage to the aircraft was due to the severe impact forces and the fire. Flaps were shown in the zero degrees up position. The fuel selector was selected on the centre tank position. Damage to the propeller confirmed that the engine was at a normal power setting at the time of impact, but the exact engine power setting could not be determined.

Wreckage distribution at the accident site and damage to both wings were consistent with an aircraft in an aerodynamic stall. C-FODG was not equipped with a visible or audible stall warning device nor was it mandatory. The de Havilland DHC-2 aircraft was originally built and certified in accordance with the British Civil Airworthiness Requirements published in 1945. When this DHC-2 was certified in the early 1950s, certification requirements were less stringent than they are today. Newer, single-engine aircraft are certified in accordance with Transport Canada Part 5, Standard 523 of the CARs. According to CAR Standard 523.207, aircraft must be equipped with a stall warning system to warn the pilot clearly and distinctly of an approaching stall. The DHC-2 aircraft flight manual states that with flaps in the up position, the aircraft stall speed is 60 miles per hour (mph).

No information could be derived from the aircraft's global positioning system (GPS) due to the damage from the post-impact fire. The ELT was also consumed by the post-impact fire. The aircraft weight and balance was within limits at the time of the occurrence, and the containers of packed caribou meat on board were properly secured in the rear cabin with the appropriate

cargo net. Although equipped with an HF radio, reception and transmission via HF radio were reported to be very poor that day, making communication difficult between company dispatch and company aircraft.

CAR Standard 723.16, requires air operators to implement an operational control system for the tracking of aircraft location and status. For NordPlus, operational control is delegated to the pilot-in-command who must provide the company with updated reports on the flight's progress. This was done by the occurrence pilot via radio relay to the Otter pilot when the occurrence pilot landed at Camp 2 earlier that morning and again on departure from Elross Lake. Although the pilot succeeded in communicating his intentions, radio transmissions in remote regions can be sporadic. Satellite phones have proven to be a more reliable means of communication in remote regions of the country. A search of the TSB database, covering the period 2000-2005, revealed 21 occurrences, involving 46 occupants, where satellite phone played a key role in the quick rescue and survival of the aircraft occupants.

Analysis

As forecast for the area of Squaw Lake, low ceilings, low visibility in rain showers, strong winds, moderate to severe turbulence, and possible wind shear most likely existed at the time of the occurrence. The pilot had made a precautionary landing on Elross Lake earlier that afternoon because of the poor weather. It is not known why the pilot, familiar with the area and the terrain, chose to navigate into the Howells River valley, which is usually not used as a bad weather route.

While the pilot held a valid instrument rating and had considerable experience in instrument flight, he was not in contact with air traffic control (ATC) and had no IFR clearance. Although the pilot was aware that weather at the Squaw Lake base was poor, he chose to take off from Elross Lake. It is possible that the pilot chose the more direct route to Squaw Lake because the aircraft would have had a low fuel state, especially if the pilot had not taken on more fuel during the day.

The severity and type of the damage and the angle at which the aircraft contacted the terrain indicates the aircraft was in an aerodynamic stall at the time of impact. In an attempt to cross the east ridge of the Howells River valley, the pilot perhaps lost visual reference to the ground and subsequently control of the aircraft and/or he encountered moderate to severe turbulence and strong updrafts causing the aircraft to stall. The low ceiling would have forced the pilot to fly 500-600 feet agl to maintain flight in visual meteorological conditions. The proximity of the aircraft to the ground meant the pilot had little time to recover control of the aircraft once it entered a stalled condition. The accident was not survivable due to the high impact forces and post-impact fire.

Had the pilot been unable to communicate his intentions to depart Elross Lake, search efforts would have needed to cover a much larger search area which in turn would have cost valuable rescue time. Had the pilot survived the accident with serious injury or had he had the responsibility of seriously injured passengers, communication would have been crucial. Where

passengers survive and must attempt to call for help, they may not know how to operate the HF radio. A satellite phone provides a more effective means of communication, particularly in remote regions of the country.

Finding as to Causes and Contributing Factors

1. The pilot attempted to cross the mountain ridge in adverse weather, and the aircraft stalled at an altitude from which recovery was not possible. Loss of visual references, strong updrafts, moderate to severe turbulence and possible wind shear likely contributed to the onset of the aerodynamic stall.

Other Finding

1. Had this been a survivable accident, rescue efforts may have been compromised by a lack of communication. A satellite phone provides a more effective means of communication when in remote areas.

Safety Action Taken

On 03 March 2006, the TSB issued Safety Information Letter A060004-1 – Ineffective Means of Flight Following Communication, to the Director General Civil Aviation. The Safety Letter highlighted the criticality of flight following communication as it relates to search and rescue (SAR) response in remote areas of the country and indicated the effectiveness of alternate means of communication such as satellite phones.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 01 May 2006.

Appendix B – Howells River Valley

