Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A10Q0111

CONTROLLED FLIGHT INTO TERRAIN AT CRUISING SPEED

AIR SAGUENAY (1980) INC.
DE HAVILLAND DHC-2 C-GAXL
LAKE PÉRIBONKA, QUEBEC, 12 NM WSW
16 JULY 2010

Canada

Aviation Investigation Report

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Synopsis

The float-equipped de Havilland Beaver DHC-2 Mk.I (registration number C-GAXL, serial number 1032), operated by Air Saguenay (1980) Inc., was flying under visual flight rules from Lac des Quatre to Lac Margane, Quebec, with 1 pilot and 5 passengers on board. A few minutes after take-off, the pilot reported intentions of making a precautionary landing due to adverse weather conditions. At approximately 1117, Eastern Daylight Time, the aircraft hit a mountain, 12 nautical miles west-south-west of the southern part of Lac Péribonka. The aircraft was destroyed and partly consumed by the fire that broke out after the impact. The pilot and 3 passengers were killed; 1 passenger sustained serious injuries and 1 passenger sustained minor injuries. No ELT signal was received.

Ce rapport est également disponible en français.

Other Factual Information

History of the Flight

The return flight from Lac Margane, Quebec, lasting approximately 40 minutes, had the purpose of bringing back a group of 5 cottagers whom the pilot had left at Lac des Quatre on 11 July 2010. The pilot was supposed to pick up the passengers early in the morning. The pilot had another flight scheduled that day, at around 1600 EDT.[1] These flights were carried out under Subpart 3 of Part VII of the *Canadian Aviation Regulations* (CARs).[2]

There was one pilot at the controls of the DHC-2, and the flight was carried out according to visual flight rules (VFR) in uncontrolled airspace. Low clouds were expected in the area, but the weather conditions at the time of the departure from Lac Margane were above the VFR weather minima..

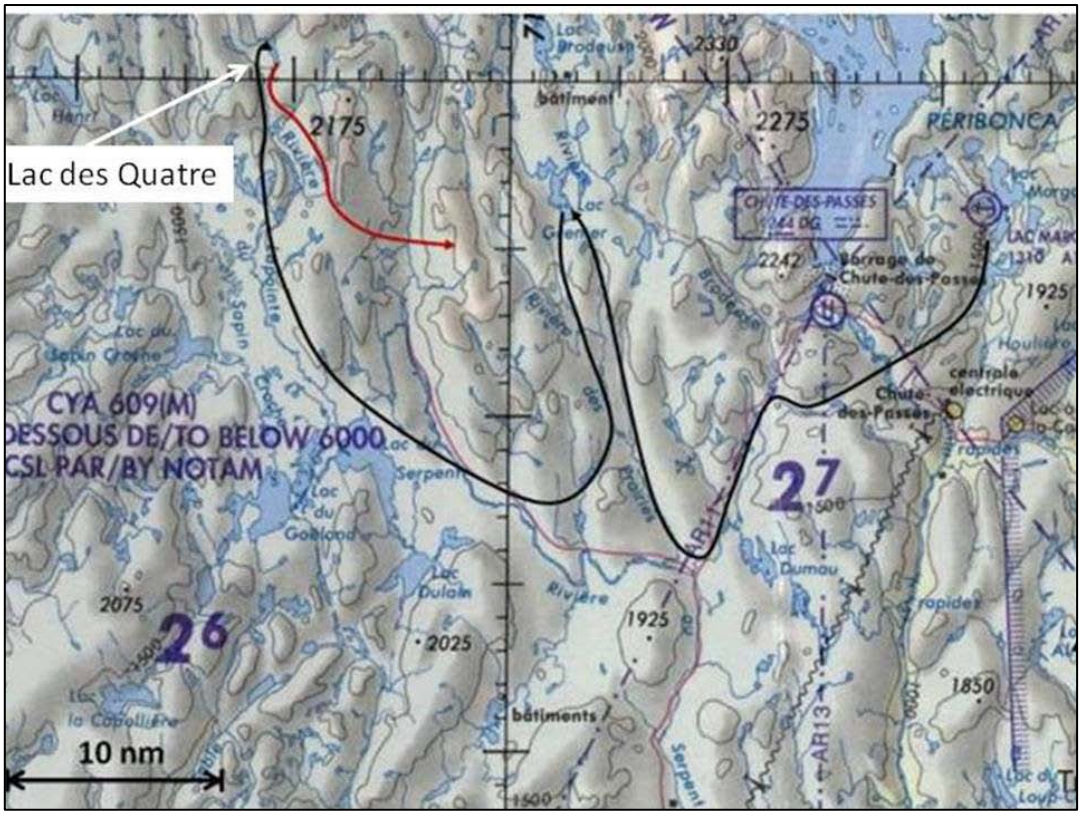

Figure 1. Estimated trajectory

At 0740, C-GAXL took off from Lac Margane with the intention of assessing the weather conditions en route and making a precautionary landing should it prove impossible to continue

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1 All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

2 Air taxi operations.

the flight under VFR. This practice is common in the area, since weather observations are limited and conditions can vary considerably from one valley to another. Moreover, the existence of numerous lakes in the area makes this practice convenient (see Figure 1).

At 0813, the pilot landed at Lac Grenier due to adverse weather and notified the base at Lac Sébastien by radio. The linear distance between Lac Margane and Lac Grenier is 13 nautical miles (nm) and the flight time to travel this distance in a straight line is less than 10 minutes. However, due to the weather conditions, the flight in question took 33 minutes.

Given the presence of mist on Lac des Quatre, the passengers expected that their return flight would be delayed. They contacted the carrier by satellite telephone to report the adverse weather conditions and arrange a new, approximate departure time. At that point, the passengers learned that the aircraft had left Lac Margane, but that due to the weather, it had landed on a lake to wait for the weather conditions to improve.

At 0950, the pilot took off from Lac Grenier and landed on Lac des Quatre after a flight lasting approximately 30 minutes. When it arrived at Lac des Quatre, the aircraft seemed to emerge from the clouds before landing on the lake. The linear distance between the 2 lakes is 10 nm, and the normal flight time, in a straight line, is less than 10 minutes.

The luggage was loaded and the passengers boarded the aircraft. The passenger in the rear position sat on a plastic chair. The pilot helped secure the rear passenger using the anchors located on the floor of the aircraft.

At around 1110, the aircraft took off heading south, and the pilot reported the take-off to the base at Lac Sébastien. The ground visibility had improved somewhat, with light drizzle conditions, but the base of the clouds was below the peak of the mountains surrounding the lake. A few minutes after take-off, the pilot informed the base and the passengers that due to adverse weather conditions, the pilot was unable to proceed to Lac Margane and had to land. According to the information that was collected, the visibility at the front of the aircraft was nil. The ground could only be seen by looking directly downwards through the side windows, and it was frequently obstructed by the clouds. At around 1117, the aircraft hit the wooded mountainside.

Wreckage and Impact

The aircraft hit the side of the mountain while flying straight and level, on a 100° magnetic heading, at an altitude of 2100 feet above sea level (asl), approximately 100 feet below the mountain peak (see Photo 1). The slope of the mountainside is approximately 25°. The wings, empennage, floats and engine all became detached from the fuselage from the force of the impact with the trees and the ground. The gasoline tanks located in the lower part of the fuselage broke, and the fuel quickly caught fire.

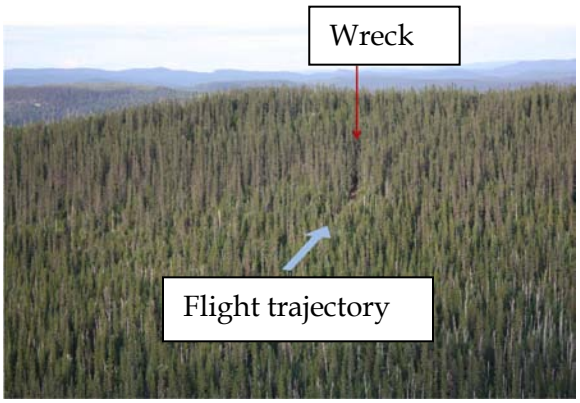

Photo 1. Flight trajectory and position of the wreck on the side of the mountain

The pilot and the front passenger both perished from the force of the impact, while the other

3 occupants seated behind them survived. One of the passengers managed to get the other 2 survivors out, but one of them succumbed to injuries a short time after being removed from the aircraft. The passenger who was in the chair at the rear was ejected from the fuselage and suffered fatal injuries. Most of the cabin was consumed by fire.

Search and Rescue

The personnel at the Lac Sébastien base knew that the pilot was busy doing a precautionary landing in adverse weather conditions. After a reasonable period of time, they attempted to contact C-GAXL to check whether it had landed safely on a lake, but could not reach it.

The company's Operations Manual indicates that the Joint Rescue Coordination Centre (JRCC) must be notified if an aircraft is more than an hour overdue. During this event, the personnel mistakenly believed that the aircraft had succeeded in landing. It was not until around 1500 that the Trenton JRCC was notified, approximately 3 hours 40 minutes after the crash. At that point, a Cessna 185 belonging to the company took off from Lac Sébastien heading towards Lac des Quatre in an attempt to find C-GAXL. At 1640, the aircraft was found in the woods on the side of the mountain, and one survivor was visible.

The JRCC dispatched a Hercules from its Trenton base and 2 search and rescue technicians were parachuted to the site to care for the survivors. The JRCC then sent several helicopters to the accident site to extract the passengers and the pilot from the woods by helicopter hoist, after which they were transported to the hospital in Chicoutimi. The 2 survivors arrived at the hospital at 2120.

Pilot Information

The company's records indicate that the pilot was certified and qualified for the flight in accordance with existing regulations. A review of his medical files at Transport Canada revealed no medical or pathological conditions that would be likely to affect the performance of his duties. The pilot obtained his professional pilot's license in June 1977 and had some 11 500 flight hours to his credit, including 9000 hours on a DHC-2. The pilot had been working in the area for approximately 15 years, including 10 years with Air Saguenay (1980) Inc.

In May 2010, the pilot took the regular annual training on surface contamination, transportation of hazardous materials and ground and air training on DHC-2 aircraft. The DHC-2 pilot proficiency check was completed on May 18, 2010.

In the week before the flight in question, the pilot did approximately 7 hours of flying and had 3 days of rest. The pilot was starting his third day of work after having time off and had had 14 hours of rest when the pilot reported for work on the day of the accident. There is no indication that the pilot suffered from fatigue due to lack of sleep or any health problem.

Aircraft Information

The C-GAXL was equipped with EDO 58-4580 floats. At the time of the accident, it had logged a total of 17 204 flight hours since it was built in 1959. The technical records were examined. They showed that the aircraft was certified and maintained in accordance with prevailing

regulations. There is no indication of any defect in the airframe or of any system malfunction during the flight.

The weight and balance form for this flight was not found. According to the Tranporation Safety Board's assessment, the weight and balance of the aircraft were in compliance with the manufacturer's prescribed limits.

The aircraft was equipped with an emergency locator transmitter (ELT) transmitting on the 406 MHz and 121.5 MHz frequencies. It was installed just behind the door on the right side and was eventually completely consumed by the fire. The antenna located on the fuselage was torn off, and the COSPAS-SARSAT[3] system did not receive any ELT signal from C-GAXL.

C-GAXL could carry 7 people: 1 pilot and 1 passenger on the front seats, 3 passengers on a centre seat and 2 more people on a folding seat at the extreme rear. However, when luggage is loaded at the rear, the folding seat cannot be used. Consequently, a chair was installed at the rear, along with the luggage, for the benefit of the fifth passenger.

The DHC-2 was built and certified under the British Civil Airworthiness Requirements (BCAR) published in 1945. According to the BCAR, aircraft seats must be of an approved type, and one of the requirements is that they be fastened to the structure of the aircraft. In order to be authorized, a seat must be mentioned on the aircraft's equipment list.

The passenger at the rear was seated on a plastic chair whose metal legs had been shortened. It had been used in another seaplane on the outbound journey and had been left on the cottage-owners' dock for the return flight. However, this chair is not shown in C-GAXL's equipment list.

Weather Information

On the morning of the flight, the Lac Margane and Lac des Quatre area was affected by a nearby warm front and an approaching cold front moving eastwards at a speed of 20 knots. The graphical area forecast (GFA), valid at 0800, shows a cloudy area with ceilings at 800 feet above ground level (agl). Isolated cumulonimbus clouds with tops of up to 32 000 feet were forecast which could reduce the visibility to 2 statute miles in rainshower and thunderstorm conditions (see Appendix A). West of that area, scattered ceilings at 600 feet agl were also forecast. The base at Lac Margane is equipped with a computer and Internet access that can be used to obtain weather information. The investigation was unable to determine whether the pilot had checked the weather information before his departure.

The radar image at 0700 shows echoes indicating a band of precipitation covering the area. As the cold front approached, the band of precipitation moved off well to the east, indicating that the showers had stopped. Thus, it is very unlikely that thunderstorms were present at the time of the accident.

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3 International satellite system for search and rescue.

At the time of departure from Lac des Quatre, there were light drizzle conditions. The base of the clouds covered the peak of the mountains located on the lakeshore opposite the cottage, at a distance of approximately 600 metres. The end of the lake located at approximately 1 statute mile from the cottage could be seen. Because of the mountains surrounding the lake, it was not possible to see beyond the end of the lake. The mountain peak is approximately 250 feet above the surface of the lake, so the ceiling was less than 250 feet agl and the visibility was at least 1 statute mile. No AIRMET[4] or SIGMET[5] signal was issued for the flight area between 0800 and 1400, on 16 July 2010.

Global Positioning System (GPS)

Due to the post-impact fire which consumed the interior of the aircraft, it was not possible to determine whether a navigational map was on board.

The pilot used his own portable global positioning system (GPS) [6] attached to the dashboard (see Photo 2). The GPS enables the pilot to improve the accuracy of navigation or to carry out a diversion efficiently. The GPS complements the maps; it cannot replace up-to-date maps. It lets the pilot know his position at all times.

Photo 2. Similar installation of a GPS on the dashboard

However, the fact remains that flying in conditions of reduced visibility entails greater risk of controlled flight into terrain (CFIT).[7]

Air Saguenay (1980) Inc. does not provide specific training on the use of GPS, and the regulations do not require it. GPSMAP® 296 offers a "Terrain Page" viewing mode that shows the terrain and obstacles below. The colour of the zones indicates the height of the terrain or obstacles that are beneath the aircraft. By default, a yellow zone is at less than 1000 feet, while a red zone is at less than 100 feet. An alert window occupying approximately 1/6 of the screen is automatically superimposed on the displayed page to inform the pilot of the proximity of terrain and obstacles when they are less than 100 feet below the aircraft's position. An "X" appears when the aircraft is heading towards a possible point of impact.

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4 Airman's Meteorological Advisory.

5 Significant in-flight weather warning message.

6 Garmin GPSMAP® 296.

7 *Aeronautical Information Manual* (AIM), COM 3.16.16, Proper Use of GNSS.

A few moments prior to the impact with the trees, an "X" on a red background was observed on the screen of the GPS attached to the dashboard.

Company Information

Air Saguenay (1980) Inc. mainly uses DHC-3 (Otter) and DHC-2 (Beaver) aircraft equipped with floats under Subparts 2 and 3 of Part VII of the CARs. The main operating base is located at Lac Sébastien. Air Saguenay (1980) Inc. also uses secondary bases, including the one at Lac Margane.

According to the company's Flight Operations Manual (FOM), the operations manager must authorize all flights prior to departure through the flight follower. Flight authorization is granted when the pilot-in-command (PIC) has determined, among other things, that the flight can be made in accordance with CARs. The operations manager then delegates control of the flight's operation to the PIC, while retaining responsibility for all flights. Air Saguenay (1980) Inc. uses a self-dispatch system, so the pilots take care of planning and preparing their own flights.

Air Saguenay (1980) Inc. uses a type D flight monitoring system, which consists in monitoring the progress of a flight and notifying search and rescue authorities if the flight is late or reported missing. The PIC is responsible for flight monitoring. High Frequency (HF) band radios are used to monitor the flights. Normally, pilots report in when taking off from, and landing on, lakes that are far away from the operations bases. This is why the company's personnel knew that, on the return journey, the weather was adverse and the pilot had reported his intention of doing another precautionary landing, again, due to the adverse weather. These communications are not recorded, and the CARs does not require it.

The company's FOM states:[8] "Pilots must comply with minimum weather conditions in accordance with the CARs." As per the CARs,[9] "no person shall commence a VFR flight unless current weather reports and forecasts, if obtainable, indicate that the weather conditions along the route to be flown and at the destination aerodrome will be such that the flight can be conducted in compliance with VFR." According to Subpart 3 of Part VII of the CARs[10] governing the operation of an air taxi, apart from takeoffs and landings, it is prohibited to operate an aircraft in VFR flight in the daytime, at less than 300 feet agl or at a horizontal distance of less than 300 feet from any obstacle.

The flight took place in uncontrolled airspace, without the benefit of air traffic control services. For a VFR flight within uncontrolled airspace, the CARs[11] requires that flight visibility be not less than 2 statute miles when the aircraft is flying at less than 1000 feet agl. In addition, the pilot must maintain visual reference to the surface and the aircraft must be clear of cloud.

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8 FOM 3.4.2 b, VFR Flight Operation Requirements.

9 CARs 703.29, VFR Flight Weather Conditions.

10 CARs 703.27, VFR Flight Obstacle Clearance Requirements.

11 Article 602.115 of the CARs.

Transport Canada Monitoring of Compliance with VFR Minima

The issue of flying in bad weather was discussed in a report produced by the Safety of Air Taxi Operations Task Force (SATOPS).[12] This report, published by Transport Canada in 1998, presents recommendations intended to reduce the number of accidents by identifying the culture, attitudes, problems and practices relating to safety in the air taxi industry. Many of the report's recommendations have to do with the need for increased oversight and stricter enforcement by Transport Canada.

One of the task force's recommendations concerns pilot training on decision-making. However, that training is only required if the operator wishes to take advantage of an operations specification allowing flight in reduced visibility conditions of 1 statute mile for daytime VFR flights in uncontrolled air space at less than 1000 feet agl. Air Saguenay (1980) Inc. does not hold that operations specification.

Pilot Decision Making (PDM)

Pilot Decision Making (PDM) is a critical aspect of flight safety. PDM can be defined as a 4 step process: gathering information; processing information; making a decision based on the possible options; and acting on that decision.[13] Evaluating the available options includes a subjective evaluation of risks based on experience and knowledge.

Pilot decisions may be influenced by a great many factors including the perception of the situation and their experience. A successful experience in the past, in similar conditions, may increase risk tolerance and induce the pilot to continue the flight in adverse conditions.

With time and experiences of successful outcomes in adverse conditions, the pilot becomes accustomed to this flight environment which no longer offers the safety margin established by regulatory restrictions. This gradual adaptation to conditions below the limits prescribed by the regulations, and the resulting deterioration of safety, have no visible or immediate negative consequence as the flight eventually reaches the planned destination, sometimes with a few stops along the way. Consequently, as time goes by, the pilot no longer perceives the increased risk and threat to safety that results.

According to the Rasmussen risk management framework,[14] the real safety limit is usually invisible and people do not know whether the system as a whole is on the verge of disaster, or far from it. A shift in work methods, such as flying in conditions below prescribed weather thresholds, can continue and evolve over years without mishap. That is, until the real safety limit is reached and an accident occurs.

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12 Transport Canada, *Safety Study on Risk Profiling the Air Taxi Sector in Canada.*

13 Transport Canada, *Pilot Decision Making – PDM*, TP 13897.

14 Rasmussen, J. (1997). "Risk management in a dynamic society: a modelling problem." *Safety Science* 27 (2/3), pp. 183–213.

Passengers and Pilot Decision Making

The American Federal Aviation Administration (FAA) has recognized that regulations aimed at pilots and operators were not sufficient to reduce accidents. Believing that passengers also have a role to play in bad weather flight safety, the FAA has introduced a program[15] designed to inform travellers about the weather conditions required for VFR flight and the minimum altitudes for VFR flight, among other things.

VFR Flight Accidents under Instrument Meteorological Conditions (IMC)

TSB data show that continuing a VFR flight in bad weather presents a serious safety threat. Although VFR accidents in IMC constitute only a small proportion (less than 10%) of all accidents reported, approximately 55% of those VFR accidents in IMC are fatal, compared with just 10% of all other accidents.

Controlled Flight into Terrain (CFIT)

A controlled flight into terrain (CFIT) occurs when an airworthy aircraft that is under the pilot's control is inadvertently flown into the ground, water or an obstacle. In these cases, the pilots are not aware of the danger until it is too late. This type of accident often occurs in poor visibility, at night or in bad weather. These conditions reduce the pilot's awareness of the surroundings and make it difficult to recognize that the aircraft is flying too close to the ground.

In March 2010, based on its investigations, the TSB published a Watchlist of the safety problems that pose the greatest risk to Canadians. In each case, the measures taken so far are insufficient, and concrete steps must be taken by the industry and the regulatory agency to eliminate those risks. One of the safety problems identified in the Watchlist includes collisions with land and water.[16]

From 2000 to 2009, 129 accidents of this nature occurred in Canada, causing 128 deaths. Collisions with land and water account for 5% of accidents, but for nearly 25% of all losses of life. The TSB has investigated numerous collisions with land and water[17] and has pinpointed shortcomings, drawn conclusions and prepared recommendations.

Analysis

The examination of the wreck and the aircraft components revealed nothing that would indicate a structural defect, malfunctioning of controls or loss of power that might have caused the

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15 Federal Aviation Administration, *Circle of Safety program and aviation guides*.

16 Transportation Safety Board of Canada, *Air Fact Sheet: Collisions with Land and Water,* and the TSB watch list, March 2010.

17 Recent TSB investigations of collisions with land and water: A07O0273, A08O0029, A08O0036, A08Q0110, A08W0162, A08Q0231, A08W0244, A08O0333, A08P0353, A09C0012, A09Q0111, A09Q0203.

accident. The aircraft hit the side of a mountain at approximately 100 feet from the peak during level flight, in adverse weather conditions. Consequently, this analysis will focus on the decision to carry out this VFR flight in bad weather, and on the survival of the occupants.

At the time of the take-off from Lac Margane to go pick up the passengers, the weather conditions met the VFR weather minima.. Given the lack of weather observations in the area, it is customary to take off and then assess the conditions while airborne. Given the numerous lakes in the area, it is easy to make a precautionary landing should the weather conditions make it necessary to discontinue the flight.

The air mass was humid, the winds were calm and a band of precipitation had hit the region in the early morning. When the cold front moved in, the wind shifted from the south to the southwest, but the air mass remained humid. An air flow from the southwest in the Chute des Passes area is considered to be flowing upwards. This type of circulation, combined with very humid air, promotes persistent low ceilings. Consequently, although light drizzle conditions prevailed in the area, it was not raining at the time of the accident. A substantial mass of clouds covered the flight area. At the time of departure from Lac des Quatre, the base of the cloud layer was at a height of less than 250 feet above the surface of the lake, and the visibility was such that the end of the lake could be seen.

The prolonged flying times between Lac Margane and Lac Grenier, and between Lac Grenier and Lac des Quatre, indicate that considerable detours had to be made before the flight arrived at its destination. It is therefore likely that the adverse weather conditions forced the pilot to follow the valleys and possibly to divert a few times. Moreover, the scope of these extended flight times suggests that it is quite likely that the weather conditions were below the thresholds prescribed by the CARs.

Once the aircraft had arrived at Lac des Quatre, no pressures of an operational nature were forcing the pilot to expedite the return to the base on Lac Margane, since the pilot's next flight was scheduled for 1600. Consequently, it is reasonable to believe that the pilot was convinced of being able to return to the base in the existing weather conditions, since the pilot had just flown over the area.

Although the ceiling and the visibility forcasted in the GFA were, respectively, 800 feet agl and 2 miles, the ceiling was below 300 feet since the base of the clouds covered the peak of the mountains located on the shore of Lac des Quatre, whose elevation is approximately 250 feet above the surface of the lake. Consequently, the weather conditions at the time of the take-off from Lac des Quatre were below the minimum prescribed by the CARs for VFR flights.

The pilot had over 10 years of experience in the area, on this type of seaplane. The decision to take off in weather conditions below the minimum prescribed by the CARs was probably influenced by confidence the pilot had gained from successful past flights in similar conditions and from the fact that the pilot had just flown over the area. Since there is no direct communication between the operations manager and the pilot, the decision to take off from Lac des Quatre rested primarily on the pilot's judgment.

The pilot could not validate his decision to take off with another pilot or a colleague. The pilot made the decision on his own, based on the situation, his subjective evaluation of the risks, his knowledge and his experience. Some experienced pilots are not always concerned about flying

close to rising terrain in limited visibility conditions. They do not feel that the safety margin is reduced to the point of reaching the real limit where a CFIT accident will occur.

Passengers can influence, for better or worse, the safety decisions that pilots make. Educating passengers on the risks associated with flying in adverse weather conditions, as is done through the program that the FAA has adopted, could have the same effect as has been achieved by educational initiatives regarding surface contamination. Nowadays, passengers are less hesitant about questioning a pilot who decides to take off without first having the wings de-iced. The FAA's education program for travellers is designed, among other things, to inform them of the minimum weather conditions for VFR flight, and even provides a list of questions that they can ask the pilot prior to take-off.

In this case, the important decision, as far as safety was concerned, was whether to take off or not. It is possible that a question from a passenger as to the legality or the necessity of taking off in such conditions might have encouraged the pilot to delay the departure, since the weather conditions would have improved in the next few hours. After take-off, the pilot was confronted with conditions that were no longer suitable for VFR flight. The pilot decided to make a precautionary landing and notified the passengers as well as the base at Lac Sébastien that the aircraft would land.

The GPS warning alerts of ground proximity at less than 100 feet are of limited usefulness when the entire flight is carried out at low altitude, because such alerts are frequent. Consequently, during a low-altitude flight, the pilot does not have time to analyze the numerous alerts and decide, in a timely fashion, whether a manœuvre to avoid collision needs to be performed.

During a flight in adverse weather conditions, the pilot focuses his attention on maintaining visual reference with the surface and sometimes through the side window, thereby reducing his attention to the GPS screen. There is reason to believe that the pilot did not see the "X" on the GPS screen, since the pilot did not perform any avoidance manœuvre.

Upon impact, the pilot's and front passenger's cabin area was compressed, giving them no chance of survival. The 3 passengers in the middle seats were held secure in their seats and initially survived the impact. The passenger seated at the rear was ejected from the aircraft. Since the passenger did not have a properly compliant seat, one that was attached to the structure of the plane, it is possible that movement of his chair prevented the safety belt from holding the passenger securely in place. In these circumstances, being ejection outside of the cabin increased the risk of injury and reduced his chances of survival.

The emergency locator transmitter (ELT) located on the fuselage was damaged upon impact, and the COSPAS-SARSAT did not receive any signal. Although the company's FOM stipulates that the JRCC must be notified if an aircraft has been missing for one hour, the call was not made until 1500. Given the absence of an ELT signal, and no call from the operator, search efforts were initiated more than 3 ½ hours after the accident. This additional time had no impact on the survival of the occupants. However, delay in administering first aid does have a significant bearing on the consequences of injuries.

Findings as to Causes and Contributing Factors

1. The pilot took off in weather conditions that were below the minimum for visual flight rules, and continued the flight in those conditions.

2. After a late decision to carry out a precautionary alighting, the pilot wound up in instrument meteorological conditions (IMC). Consequently, the visual references were reduced to the point of leading the aircraft to controlled flight into terrain (CFIT).

3. The passenger at the rear of the aircraft was not seated on a seat compliant with aeronautical standards. The passenger was ejected from the plane at the moment of impact, which diminished his chances of survival.

Findings as to Risk

1. The lack of training on pilot decision-making (PDM) for air taxi operators exposes pilots and passengers to increased risk when flying in adverse weather conditions.

2. In view of the absence of an ELT signal and the operator's delay in calling, search efforts were initiated more than 3 ½ hours after the accident. That additional time lag can influence the seriousness of injuries and the survival of the occupants.

Other Finding

1. Educating passengers about the flight conditions allowed by regulations could encourage them to question the pilot's decision to undertake a flight in weather conditions below the minima prescribed by regulations.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 29 November 2011.

Visit the Transportation Safety Board's website (www.bst-tsb.gc.ca) for information about the Transportation Safety Board and its products and services. There you will also find links to other safety organizations and related sites.

Appendix A – Graphical Area Forecast (GFA)