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AVIATION SAFETY LETTER

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Learn from the mistakes of others;
You'll not live long enough to make them all yourself…

Canada

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Everything is Nothing

by David Donaldson, Great Lakes Gliding Club

A senior pilot/instructor recently commented to me that "everything in aviation is important." While there is an undeniable truth to that statement, there is also a problem with it: if everything is important, then nothing is important. Let's look at how we can balance the concept of everything being important with the concept of not losing focus of the items that are going to make the difference between a safe flight and a statistic.

Photo credit: David Donaldson

Consider the example of the importance of "putting it on the numbers." While we all strive for perfection in our flying, it is the landing, where the majority of accidents occur, that has the greatest need for precision. Precision for many pilots means landing as short as possible, or in other words, "putting it on the numbers." Now, let's balance that with the importance of the safe operation of an aircraft. For example, in a glider, as we strive to be precise in our landing and reduce the need to push back, are we compromising safety by flying a dangerously slow or low circuit? A precision landing is not necessarily on the numbers—it is actually putting the aircraft down precisely where you planned, even if it is 200 metres (m) down the runway. The shorter we land, the less room for error.

While visiting a club and getting checked out so that I could take a friend for a flight, my check pilot wanted me to "put it on the numbers" to avoid having to push the glider back. The runway measured 4 000 feet (ft), so there was lots of space to land, stop, and launch without having to push back to the beginning of the runway. My concern was that there were large rocks at the end of the runway, for drainage. The owner of the facility quietly said to me, "Don't worry about landing long. We can always push back." As a visiting pilot flying a new type, I opted for an increased margin of safety and still executed a precision landing, just a little further down the runway.

There are too many accident reports that are precipitated by an insignificant event that distracts the pilot from the truly important. Scenario: a student progressed to the point of flying the entire flight, takeoff through landing. We were about 50 ft above ground level (AGL) when I noticed the student moving oddly in the front seat and the glider starting to out-climb the tug. "What's going on?" I asked. "My seatbelt has come undone" was the response. "Can you fly the plane without your seatbelt?" My voice had a tone of urgency as I reached for the controls. The student recovered and started to refasten his seatbelt so I repeated my question with the addition of "If you need me to take over, I am happy to." Again, the student recovered control of the glider and as we climbed out we discussed what we could do about this situation. I took control for a few moments while he re-secured his straps, and we completed the flight.

Photo credit: David Donaldson

Ours is a great example of how we can be distracted by an urgent issue that is less important than the current task at hand. While it was important to have our straps securely fastened, it was less important than the safe operation of the aircraft when on tow. Be careful not to falsely inflate the importance of an item or task based on a high sense of urgency you feel at a given moment.

Another time, while I was flying with a friend in his Cessna, I attempted to take a picture of a corn maze that he had directed me to fly over. We were 2 000 ft AGL and as I fished out my phone and initiated a right bank he asked, “Do you want me to fly?” Good idea!

This idea of falsely inflating a task’s importance due to its urgency is known as the squeaky wheel syndrome. It was easy to be distracted by a minor urgent task (taking a picture) and overlook the more important task that was less urgent. Unfortunately, the more we spend our time in the urgent category, the more likely we are to miss something. Let’s use urgent to our advantage and strategically plan to get things done, as much as possible, when they are not urgent. Hence, completing a critical check early or even something as mundane as adjusting the seat before getting onto the flight line for takeoff. I had to cut a flight short one time when I realized that I had not properly adjusted the seat before takeoff. If only I had taken the time when I was not in that urgent mode!

This is what is behind the mantra: *“Aviate, Navigate, Communicate.”* We need to ensure that we are focusing on the most important aspects of the flight that need to be dealt with in a timely manner while not compromising those things that will come up and bite us.

So, what can we do? First, let’s critically prioritize the tasks we need to get done. Focus first on the most important and leverage urgency to our advantage by taking care of what we can when we are not in a high-workload environment and when those tasks are not urgent. Complete the checklist early, give yourself enough time, properly plan what you are going to do ahead of time, and, where possible, rehearse.

Yes, I agree with my esteemed colleague: “Everything in aviation is important.” When managing all of those important items we must prioritize *Aviate, Navigate*, and then *Communicate.*

Fly safe! △

Egress Training

by Bryan Webster, Aviation Egress Systems

For over 40 years now, I have been flying or directly involved with light aircraft as an operator and line pilot serving numerous companies across Northern Canada, Western Canada, and Alaska. I have, in addition, designed and built equipment for egress training, offering programs all over Canada. To date, we have set up at 61 locations since 1998.

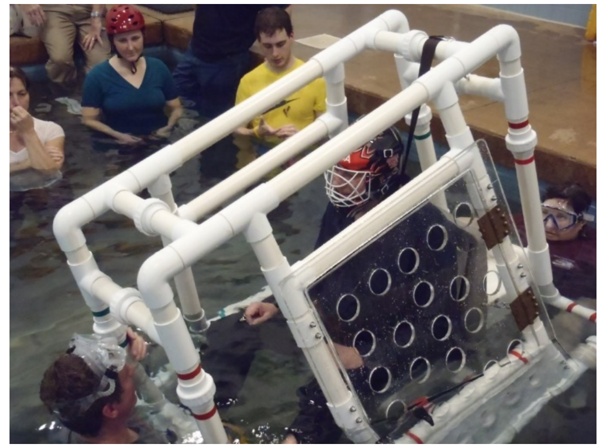

Photo credit: Bryan Webster
In-pool egress training

My career started in 1975 after I experienced a high-speed water impact on wheels as a passenger in a Cessna 150 while the pilot was attempting to avoid unmarked power lines. In spite of that incident, I received my commercial licence including a float endorsement in Whitehorse, Y.T. the following year, and today, I still love flying floatplanes commercially or privately whenever time permits.

With over 12 000 hours in 35 different aircraft, I have had a chance to note and reflect on the changes and improvements made in the aviation industry and, most importantly, on attitudes toward aircraft safety. I am extremely passionate about this topic and thus often describe its serious nature while drawing upon my personal background and my observation of over 6 000 plus egress students and their behaviour during training at aquatic facilities across our country. I have seen it all.

Photo credit: Bryan Webster
In-pool egress training

Explaining how disorientation and panic come into play when you are subjected to an inversion while totally submerged underwater in an aircraft is difficult. First, understand that we do not have the ability to breathe underwater while trapped inside an aircraft and searching frantically for an exit. At this point our survival instincts take control and we tend to panic, often with limited ability to successfully locate the elusive door mechanism. After an impact, followed by the sudden change to a cold-water temperature and foreign environment, this search can often prove overwhelming when time is the enemy and the passing of mere seconds could spell disaster. The best safety advice I can pass on is to attend egress training so that you will understand the perils, recognize them immediately, and have an escape plan should this ever happen to you.

As well, you as a pilot are responsible for your passengers, and you should view this training as you would any other emergency, such as engine failure or electrical fire. Acting swiftly to help save passengers who are no doubt less familiar with the aircraft in general is imperative, which substantiates my statement regarding the necessity of egress training for pilots and crews of any float operation.

Photo credit: Bryan Webster
Gear-down Cessna inversion

All aircraft have a pilot or crew at the controls who would be present at the scene of the accident when it happens and ready to assist—they're not minutes or more away in a boat that would most likely arrive too late for rescue.

Fall 2001 marked the end of my full-time commercial flying career and the beginning of my present occupation as a dedicated egress trainer. This training has since had a remarkable success rate. As of this writing, Aviation Egress Systems (AES) has trained 21 pilots who later found themselves in real-life egress situations. Each and every one managed to egress safely with all of their passengers, a total of 21. Oddly enough, AES has also been in business now for 21 years.

To make it even easier to understand our concept, I have designed and built an online egress training course at www.egresstraining.ca, where you can learn in 3 hours what to expect prior to the in-pool training later on.

Bryan Webster with Cessna Caravan

I have done my absolute best to bring this program to the hometowns of many pilots and passengers interested in egress training—from Inuvik, N.W.T. to Quebec and everywhere in between. This spring, we will again be visiting many Ontario regions before heading back west to Whitehorse, Y.T. and other Canadian provinces then returning to our home base in Victoria, B.C.

Please check out www.dunkyou.com for further information.

–Bry the Dunker Guy△

Transport Canada Fee Inflation—What You Need to Know!

Adjusting Regulatory Fees for Inflation

On April 1, 2019, Transport Canada adjusted its fees according to the Consumer Price Index (CPI), also known as inflation, set by Statistics Canada.

For the period of April 1, 2019 to March 31, 2020, a rate of 2.2% will be applied to most Transport Canada regulatory fees. Since inflation is calculated on an annual basis, our fees will be adjusted every April 1 to reflect the new inflation rate.

Information on the new fees is available to the public on the following web pages:

- ✓ Service Fees which is entitled "Fees under the department's authority": https://www.tc.gc.ca/en/transport-canada/corporate/transparency/corporate-management-reporting/fees-report/fees-under-departments-authority.html
- ✓ Information about the changes to our regulatory fees under the *SFA*: https://www.tc.gc.ca/en/transport-canada/corporate/transparency/corporate-management-reporting/fees-report/changes-regulatory-fees-under-service-fees-act.html

To learn more about this initiative and to share your ideas, visit the Let's Talk Fee Modernization website: https://letstalktransportation.ca/fee-modernization. △

Regulations Amending CARs (Parts I, VI and VII—Seaplane Operations)

The regulations amending the *Canadian Aviation Regulations* (Parts I, VI and VII—Seaplane Operations) were published in Part II of the *Canada Gazette* on March 6, 2019: http://gazette.gc.ca/rp-pr/p2/2019/2019-03-06/html/sor-dors49-eng.html.

The changes require:

- passengers and pilots of commercial seaplanes with nine passengers or less conducting air taxi operations (Subpart 703, on operations) on or over water to wear a flotation device.
- mandatory training for all pilots of commercial seaplanes (both Subparts 703 and 704, on operations) on how to exit an aircraft under water.

Commercial seaplane operators have 18 months from the date of publication of the regulations in *Canada Gazette*, Part II, to implement the new rules requiring passengers to wear a flotation device while on or above water (by September 6, 2020). The pilot egress training must be implemented within 36 months (by March 6, 2022). △

TSB Final Report Summaries

The following summaries are extracted from final reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified. Unless otherwise specified, all photos and illustrations were provided by the TSB. For the benefit of our readers, all the occurrence titles are hyperlinked to the full report on the TSB Web site. —Ed.

TSB Final Report A18P0108—Loss of control and collision with water

History of the flight

On 01 August 2018, following a local flight in the morning, the float-equipped Cessna 180H aircraft (Figure 1) was refuelled. At approximately 12:54, the aircraft departed from Tyax Lodge on Tyaughton Lake, B.C., for a local sightseeing flight to take photographs, with 3 people on board. The pilot-in-command (the pilot) was seated in the front left seat, a passenger was seated in the front right seat, and another company pilot was seated in the rear left seat to provide local geographical knowledge.

Photo credit: Ray Barber
Figure 1. Occurrence aircraft

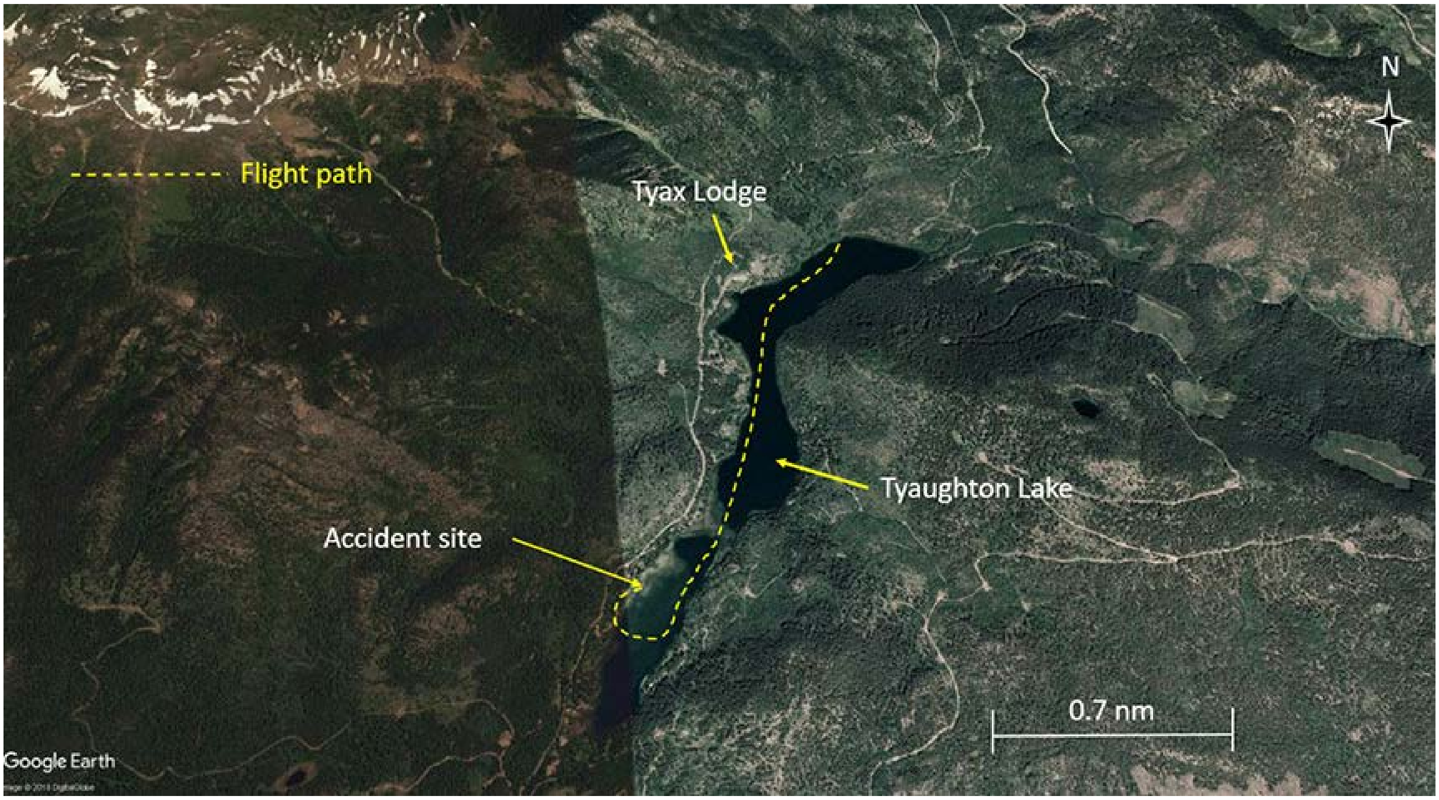

Figure 2. The occurrence aircraft's flight path (Source: Google Earth, with TSB annotations)

Shortly after takeoff, while the plane was climbing through approximately 300 feet (ft), the other pilot seated in the rear seat observed fuel leaking from the left wing and communicated that information to the pilot. The pilot in the rear left seat reportedly told the pilot to turn around and return to land on the lake. Given the local terrain, the pilot reduced the airspeed and banked the aircraft steeply to the right, turning back toward the lake. The aircraft then abruptly rolled further to the right and struck the lake in a near-vertical attitude at approximately 12:55 (Figure 2). The aircraft was substantially damaged on impact and sank.

A local resident on the shore called 911 and initiated the rescue operation. The company pilot in the rear seat and the passenger were fatally injured, and the pilot-in-command sustained serious injuries.

The pilot-in-command and the passenger had been wearing the available lap belt and shoulder harness. The other company pilot had been wearing the available lap belt; no shoulder harness was available in the rear seat. Although personal flotation devices were available in the aircraft during the occurrence flight, none of the occupants were wearing them, nor were they required to by regulation. The aircraft was not equipped with exits that allowed for rapid egress, nor were such exits required by regulation.

Weather information

The Environment and Climate Change Canada weather observation station closest to Tyaughton Lake is located at Pemberton Airport (CYPS), B.C., 38 nautical miles (NM) to the south. The conditions recorded at 13:00 were a temperature of 32.3 °C and a dew point of 14.1 °C.

A local report described the weather conditions at Tyaughton Lake at the time of the accident as clear skies, wind between 9 and 11 km/h from the south-southeast, temperature 24.8 °C, dew point 12.2 °C, and a pressure setting of 30.03 inHg.

The operating density altitude at Tyaughton Lake was calculated at 5250 ft above sea level (ASL), based on the temperature, dew point, and pressure setting.

Density altitude

An aircraft operating at a higher density altitude, as opposed to at sea level, travels at a higher true airspeed while maintaining the same indicated airspeed. A higher true airspeed increases the aircraft's turn radius. Therefore, the aircraft's true airspeed and turn radius are directly proportional to density altitude. In a level, coordinated turn, there would be about a 15% larger turn radius at a density altitude of 5250 ft ASL, compared to a turn at sea level in standard-day conditions, when flown at the same indicated airspeed and bank angle.

Pilot-in-command information

Records indicate that the pilot-in-command was certified and qualified for the flight in accordance with existing regulations. He had received a seaplane rating on 22 April 2018, obtained a Commercial Pilot Licence – Aeroplane on 26 June 2018, and held a valid Category 1 medical certificate. The pilot had accumulated a total of 287.9 flight-time hours (hr), including 98.4 hr on floatplanes. Of the total flight-time hours, 132.7 hr were as pilot-in-command, including 60.7 hr as pilot-in-command on the Cessna 180H.

The pilot had not received egress training, nor was it required by regulation.

Aircraft information

The Cessna 180H float-equipped aircraft has a maximum take-off weight of 1338 kg (2950 pounds [lbs]). The occurrence aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. It had no known deficiencies and was being operated within its weight and balance and centre-of-gravity limits.

Accident site and wreckage information

Tyaughton Lake is approximately 3 300 ft ASL. The aircraft struck the lake in a near-vertical attitude and came to rest inverted, in 10 to 15 ft of water about 50 ft from shore, with the floats partially above the water (Figure 3).

The majority of the wreckage was located near the fuselage. Both floats had severe damage to the tips

Figure 3. Accident site (Source: Royal Canadian Mounted Police)

and showed impact damage resulting from the contact with the water. All of the control surfaces were accounted for. An examination of the flap system indicated that the flaps were in the 20° position at the time of impact. All damage to the airframe was attributable to impact forces. The fuel selector was found to be set to both tanks, which contained sufficient fuel for the remainder of the flight. The left fuel cap had not been replaced after refuelling and was found hanging from its chain. Damage to the engine and propeller were consistent with a high power setting at the time of impact.

Accelerated stall

The airspeed at which a stall occurs is related to the load factor of the manoeuvre being performed. In straight and level flight, lift is equal to weight, and the load factor is 1*g*. However, in a banked level turn, greater lift is required. One way to achieve lift is by increasing the angle of attack (by pulling back on the elevator control), which increases the load factor. As the load factor increases with bank angle, there is a corresponding increase in the speed at which the stall occurs. As a result, steep turns are often accomplished with the addition of engine power to maintain or increase airspeed.

A stall that occurs as a result of a high load factor, such as bank angle greater than 30°, is called an accelerated stall. Accelerated stalls, which occur at higher airspeeds due to the increased load factor on the wing, are usually more severe than unaccelerated stalls and are often unexpected. For example, a stall from a 60° to 70° bank angle will result in rapid departure from controlled flight and a significant loss of altitude before recovery is possible.

The occurrence aircraft was equipped with a stall warning system, but no warning was heard during the flight. The functionality of the system could not be tested due to the damage to the aircraft. The occurrence aircraft had a Horton STOL-Craftkit (STOL stands for “short takeoff and landing”) installed, which included the following modifications to the aircraft: full Camber-Lift leading edges on both wings, stall fences on the top of the wings, droop wing tips, and aileron gap seals. Although Horton does not publish actual demonstrated stall speeds, the supplemental type certificate does indicate that the “stall speeds, takeoff performance and landing performance are equal to or better than the performance of the unmodified airplane.” According to the manufacturer, when the Horton STOL kit is installed, “on average you can expect to get a 4-7 knot reduction in stall speeds.”

In this occurrence, after reportedly being told by the other company pilot to turn and land on the lake, the pilot-in-command began a tight turn, which resulted in a loss of control and the impact with the water.

Safety messages

Pilots must pay particular attention to the aircraft's airspeed and bank angle when manoeuvring at low altitudes. When pilots manoeuvre at high bank angles, the airspeed at which an aircraft will stall is higher than in wings-level flight, and the pilot may not expect the early onset of the accelerated stall.

As density altitude increases, so does the radius of a turn. Pilots must recognize that an increased density altitude affects aircraft performance and turning radius.

Pilots-in-command are ultimately responsible for aircraft handling.

None of the aircraft's occupants were wearing a personal flotation device, the pilot did not have underwater egress training, and the aircraft was not equipped with exits that allowed for rapid egress, nor were any of these required by regulation. In this occurrence, the close proximity of the accident site to the shoreline enabled a quick response and the rescue of the pilot.

TSB Final Report A18Q0100—Collision with Terrain

History of the flight

On 01 July 2018, the de Havilland DHC-2 (Beaver) was conducting a round-trip flight under visual flight rules between Lake Margane, Que. and Jules Lake, Que. located 55 nautical miles (NM) to the northeast (Jules Lake is 44 NM west-southwest of the Manic-Cinq dam), to bring back 3 passengers and their luggage. The weather conditions forecasted for that day were favourable for the flight.

The aircraft took off from Lake Margane at 09:28 with only the pilot on board. At about 10:07, it landed on Jules Lake and was then docked at a cottage on the lake's north shore.

At approximately 10:20, the pilot started the aircraft's engine and taxied east on the water. Soon after, the aircraft was positioned facing south, and the pilot quickly began the take-off run.

Once take-off speed was reached, the pilot manoeuvred to lift the floats off the water. However, the pilot considered that the remaining distance on the lake was insufficient to complete the takeoff and climb safely, and therefore decided to shut off the engine to reject the takeoff. The aircraft continued straight ahead and could not be stopped in time to avoid colliding with trees (Figure 1).

Figure 1. The aircraft after colliding with trees (Source: Air Saguenay)

Neither the pilot nor the passengers were injured, and they were able to evacuate the aircraft without difficulty.

At 10:25, the pilot called the company dispatcher on the high-frequency radio to report the accident.

At 12:00, one of the company's other aircraft landed on Jules Lake to pick up the passengers and the pilot.

After the aircraft returned to Lake Margane, the weight of the aircraft's occupants and luggage was verified. The amount of fuel remaining in the aircraft's tanks was 35 imperial gallons (gal.). According to the TSB's calculations, the aircraft weighed 4 892 pounds (lbs) at the time of the accident, and its weight and centre of gravity were both within the prescribed limits.

Meteorological information

The weather station at Manouane Est, Que., is located about 25 NM northwest of Jules Lake. At 10:00, it indicated a temperature of 20 °C, a dew point of 10 °C, and surface winds from 120° true at 6 knots (kt).

There was nothing to indicate that weather conditions contributed to this occurrence.

Pilot information

Records indicate that the pilot was certified and qualified for the flight in accordance with existing regulations. He had logged 4 50 total flight hours, including 3 505 hours as pilot-in-command. He was hired by the company in 2017, where he completed his aircraft type rating on the DHC-2 and accumulated 387 hours on type.

The pilot's experience at Jules Lake was limited to 2 flights, the week before the accident, to drop off passengers. The 2 takeoffs for the return flights were made while the aircraft was empty. The pilot was not comfortable with these takeoffs because of the short distance available.

Aircraft performance

Records indicate that the aircraft was certified, equipped, and maintained in accordance with existing regulations. There were no anomalies noted in the aircraft journey log, and no technical problems had been reported.

Take-off flight path

Before landing on a lake, seaplane pilots must fly over the area at low altitude to perform visual reconnaissance and determine whether it will be possible to take off from the lake. The pilot will also determine the best take-off flight path based on wind direction and the longest usable distance, and identify a visual reference point to use if the takeoff is rejected when the usable distance is short.

For DHC-2s, the visual reference is generally situated between the halfway point and two thirds of the chosen take-off flight path.

This estimate may vary depending on the type of seaplane. If the aircraft is past this point when the takeoff is rejected, the remaining distance may be insufficient to allow the aircraft to come to a complete stop, resulting in a risk of collision with the shore. In this occurrence, the pilot did fly over the area at low altitude before landing.

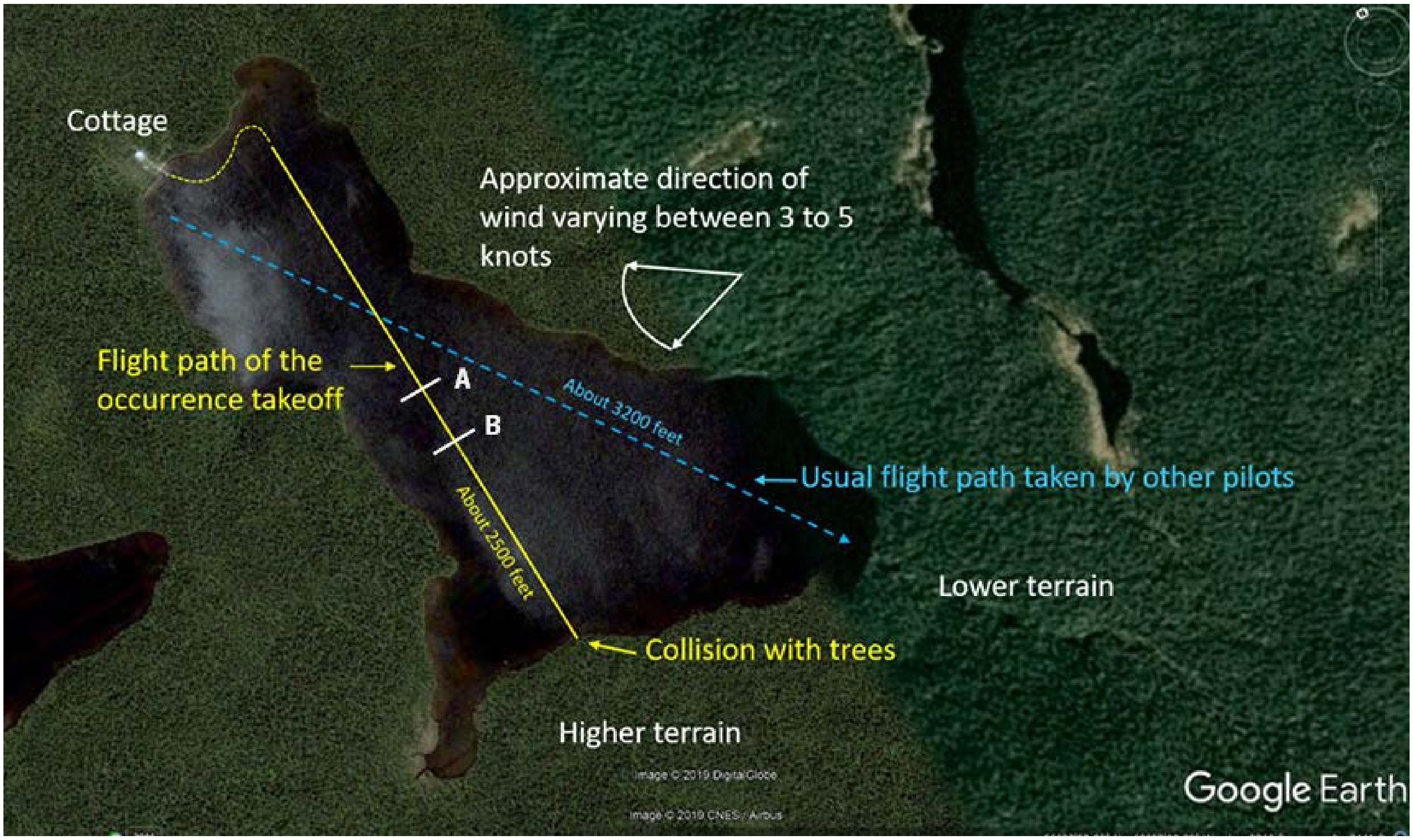

Figure 2. Diagram showing the flight path of the occurrence takeoff on Jules Lake in relation to the usual flight path taken by other pilots, as well as estimates of the minimum distance required for takeoff from the surface of the water (Point A) and the optimal point for a rejected takeoff (Point B) according to the performance tables (Source: Google Earth, with TSB annotations)

Legend
Estimates based on performance tables:
A Minimum distance required for takeoff from the surface of the water (1100 ft)
B Optimal point for a rejected takeoff (910 ft)

In this occurrence, the engine was shut off after the aircraft had passed the rejected-takeoff point, and the aircraft could not be slowed down sufficiently to avoid a collision with the shore and trees.

In this occurrence, the initial intention was to take off in an arc from the bay northeast of the cottage toward the lower terrain. However, according to the information gathered, the actual take-off path was largely in a straight line until the point of impact. The flight path toward the higher terrain required the aircraft to fly over the higher terrain at low altitude or to turn left immediately after takeoff to avoid the higher terrain. Furthermore, a greater take-off distance may have been required because the aircraft was heavier.

Calculations based on the take-off performance chart for an aircraft equipped with floats (as published by the manufacturer, de Havilland Aircraft of Canada Ltd., in the DHC-2 flight manual) indicate that the total take-off distance to clear a 50-foot obstacle is 1 590 feet (ft). About 1 100 ft are with the floats touching the surface of the water (Point A, Figure 2).

According to these calculations, the usable take-off distance was sufficient; however, the chart does not take into account factors such as the rate of climb required to safely fly over higher terrain located along the take-off flight path, or the skills pilots need in order to conduct a short takeoff.

The investigation determined that when the winds are from the southeast, as in this occurrence, the flight path taken by other company pilots is oriented differently to provide a greater take-off distance and fly over the lower terrain, allowing them to avoid having to make a turn during the initial climb (Figure 2).

In case an unexpected situation arises during the take-off run, pilots identify a visual reference point that represents the point where the takeoff will be rejected, taking into account the distance that will be travelled on the water from the moment the engine is shut off to the moment the aircraft comes to a complete stop. This distance can be estimated using the water-landing performance table in the flight manual (Point B, Figure 2). However, this distance may be shorter if drag is increased, for example by orienting the aircraft into the wind or by deliberately shifting the attitude forward to increase the resistance of the floats on the water, while remaining within the prescribed limits.

TSB Final Report A18Q0016—Collision with terrain at night

History of the flight

On 01 February 2018, at 14:19, the privately operated Robinson R44 Raven I helicopter departed Saint-Alexis-de-Montcalm, Que. with the pilot and 2 passengers on board for a flight to Saint-Georges de Beauce, Que., where they were to attend an open house at an educational institution. At around 15:50, the pilot contacted the UNICOM station at St-Georges Airport (CYSG) via radio and flew east over the airport toward the educational institution, where he landed at 15:57.

At 19:09, the pilot called the person responsible for his flight following and indicated that he intended to depart soon and return to Saint-Alexis-de-Montcalm. At about 19:45, the pilot departed with the 2 passengers on board.

At 20:32, the Canadian Mission Control Centre (CMCC) received a distress signal from the helicopter's emergency locator transmitter (ELT).

At 20:41, the Joint Rescue Coordination Centre (JRCC) in Trenton, Ont., received from the CMCC the calculated location of the distress signal from the helicopter's ELT. At 21:06, the Sûreté du Québec (SQ) was notified by a resident of Saint-Joachim-de-Courval, Que. that an aircraft had crashed in his field and a fire had broken out. The municipal fire department and the SQ arrived on scene at about 21:35. All of the helicopter occupants had been fatally injured.

Damage to aircraft

The front of the aircraft was completely destroyed, first by the impact forces, then by the resulting fire.

Personnel information

Transport Canada (TC) records showed that the pilot held the necessary licence and qualifications for the flight, in accordance with existing regulations.

The pilot had received his initial training on a Robinson R22 and held a private pilot licence–helicopter, issued in 2004, along with a valid Category 3 medical certificate. During his initial training to obtain a private pilot licence in 2004, he completed 5 hours (hr) of daytime dual-instrument flight. During the pilot's night rating training in 2006, he conducted 5 additional hr of instrument flight. He received an endorsement for the Robinson R44 on 17 September 2013. The pilot's personal flight log indicated that he had a total of 1 127.5 helicopter flying hr as of 21 January 2018. This included 56.2 hr of night flight, including 46.1 hr as pilot-in-command. Of these 46.1 hr, 20.4 were on the Robinson R44.

Meteorological information

Summary

At 19:00 on the evening of the accident, the centre of a low-pressure system was located north of Quebec and the system was tracking northeast at a speed of 15 to 20 knots (kt). Associated with this system was a cold front extending to the U.S. and moving in a southeasterly direction at a speed of about 15 kt.

Weather forecasts

The graphical area forecasts (GFA) issued at 12:42 and valid at 19:00 (figures 1 and 2) provided the following weather forecasts for the area between the cold front and the north shore of the St. Lawrence River:

- Overcast sky at 3 000 feet (ft) above sea level (ASL) with tops at 16 000 ft ASL;
- Intermittent visibility between 1 and 3 statute miles (SM) in light snow;
- Occasional presence of towering cumulus conducive to snow showers, reducing visibility to ½ SM and ceilings to 600 ft above ground level (AGL);
- Southerly surface winds at 15 kt, gusting to 25 kt;
- Moderate mechanical turbulence possible from the surface to 3 000 ft AGL;
- Moderate mixed icing possible between 3 000 ft ASL and 10 000 ft ASL.

The forecasts for the Saint-Georges de Beauce sector and along the south shore of the St. Lawrence were as follows:

- Overcast at 3 000 ft ASL with tops at 8 000 ft ASL;
- Visibility of more than 6 SM;
- Locally, light snow could reduce visibility to 2 SM and ceilings to 1 500 ft AGL;
- Moderate mechanical turbulence possible from the surface to 3 000 ft AGL;
- Moderate mixed icing possible between 3 000 ft ASL and 10 000 ft ASL.

Estimated weather conditions at the crash site

In order to determine what the weather conditions may have been at the time and place of the accident, the Environment and Climate Change Canada (ECCC) assessment was based on information from the Villeroy weather radar, which was located about 50 SM northeast, and on the observations recorded at the following weather stations located closest to the accident site:

- Saint-Germain-de-Grantham (MSI) (about 12 SM south-southeast);
- Nicolet (WNQ) (about 15 SM north);

- Trois-Rivières Airport (CYRQ) (about 32 SM north);
- Lemieux (MLU) (about 32 SM northeast); and
- L'Assomption (WEW) (about 39 SM west-southwest).

Surface winds in front of the band of precipitation were predominantly from the south, between 10 and 20 kt. Between 19:45 and 20:15, winds shifted to be from the northwest, with wind speed increasing to around 20 kt, gusting to 30 kt, and causing moderate turbulence. The area of precipitation ahead of the front covered the Saint-Joachim-de-Courval sector, and the estimated snowfall rate was 1.5 cm/h to 2 cm/h (Figure 3). The drop in temperature resulting from the approaching cold front lowered the freezing level, which had initially been at 2 200 ft ASL. According to the ECCC assessment, it is possible that precipitation began as rain and/or snow pellets before changing to snow.

Both the freezing level and the change in type of precipitation represent a significant icing risk.

The moisture profile of the surface at 9 000 ft ASL was light and the air mass was unstable, which was favourable to the development of towering cumulus. The presence of towering cumulus is often associated with heavy precipitation and turbulence.

Night flight

General

Night visual flight rules (VFR) flights expose pilots to higher accident risks due to phenomena and characteristics that are specific to this type of flight. The lack of visual cues and the various associated illusions may lead to spatial disorientation. If pilots do not quickly detect and control this spatial disorientation, they can rapidly lose control of the aircraft.

Spatial disorientation

Humans have the ability to discern the orientation of their body (lying down, standing, leaning, etc.) when they are in physical contact with the ground. Humans are not accustomed to the 3-dimensional environment of flight, and conflicts may arise between the senses and illusions that make it difficult or impossible to maintain spatial orientation. Spatial disorientation is defined as the "inability of a pilot to correctly interpret aircraft attitude, altitude or airspeed in relation to the Earth or other points of reference."

Deterioration of weather conditions

Unlike on day VFR flights, weather phenomena are difficult to observe at night because of the low light conditions. It is therefore likely that pilots departing in weather conditions that are favourable for night VFR flight would be unable to observe a deterioration in weather conditions and take the necessary measures before inadvertently entering instrument meteorological conditions (IMC).

To reduce the risks of encountering IMC, pilots should have all of the relevant information for making an informed decision about whether to take off or delay the flight.

In this occurrence, the weather data available to the pilot forecasted weather conditions at certain locations between Saint-Georges de Beauce and Saint-Alexis-de-Montcalm that were below the minima required by the

Canadian Aviation Regulations (CARs) for night VFR flight. The pilot did not contact the flight service station (FSS) for information on the weather conditions along the flight path.

When precipitation appears on the flight path, it reduces the horizontal and vertical visibility. When it snows, vertical visibility can be significantly lower than the visibility forecasted for the surface, below the cloud base. Surface visibility is a measurement of horizontal visibility near the surface of the Earth and differs from the visibility from the cockpit when pilots are looking at the ground during a flight (the slant visual range). Furthermore, at night, there may be only isolated lights from a few buildings, and the intensity of those lights may diminish rapidly with altitude.

Aircraft accidents resulting from flights that depart under visual meteorological conditions (VMC) and continue until the pilot loses visual reference with the ground end in either a loss of control or a controlled flight into terrain. Data gathered by the Transportation Safety Board (TSB) for various types of airplane and helicopter accidents that occurred from 2000 to 2014 show that this accident type resulted in the greatest number of fatalities for all accident types in this period. In these accidents, 74 people died (47 fatalities in airplane accidents and 27 fatalities in helicopter accidents).

The collected data lead to the observation that the total flight experience of pilots is not preventing this type of accident from occurring. For helicopter pilots involved in accidents caused by a loss of visual reference followed by a loss of control in flight, the average total number of flight hours was 2 617 hr. For pilots involved in controlled flight into terrain accidents, the average total number of flight hours was 6 837 hr.

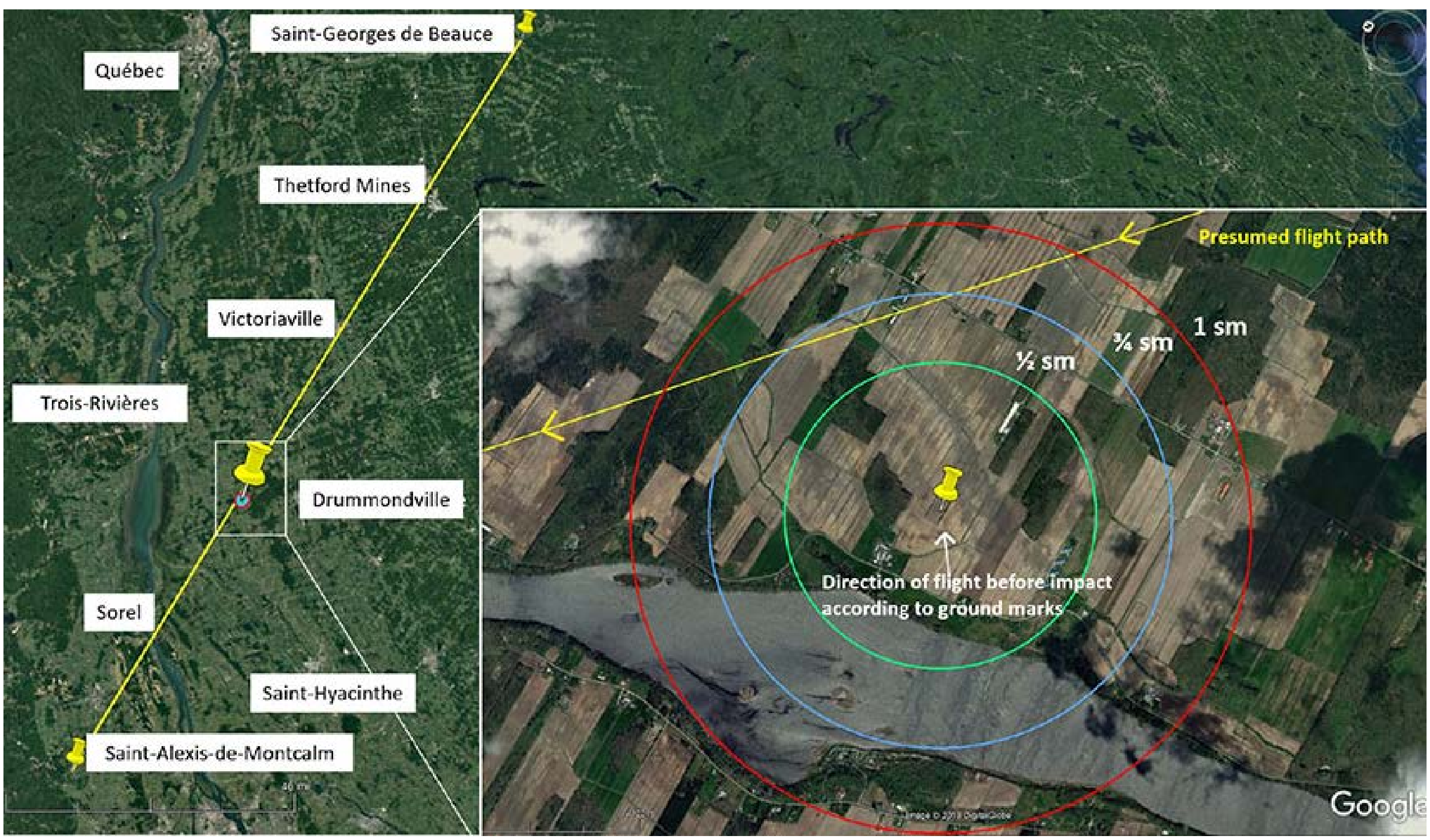

Figure 1. Presumed flight path of the occurrence aircraft, with inset showing the presumed visibility (represented by circles) at the time of the occurrence, and the direction of flight prior to impact, based on ground markings (Source: Google Earth, with TSB annotations)

Analysis

General

The pilot had a valid licence and a night rating. However, the investigation could not confirm whether the pilot was permitted to exercise the privileges of transporting passengers on night flights. There is no indication that the pilot's capacities had been reduced by fatigue or physiological factors. An examination of the wreckage and the aircraft's technical records did not reveal any mechanical problems that could have played a role in the occurrence before or at the time of the accident.

An examination of the instruments combined with the impact dynamic analysis indicate that the aircraft was in a forward pitch attitude and a pronounced right roll at the time of impact. This abnormal flight attitude is likely the result of a loss of control due to spatial disorientation.

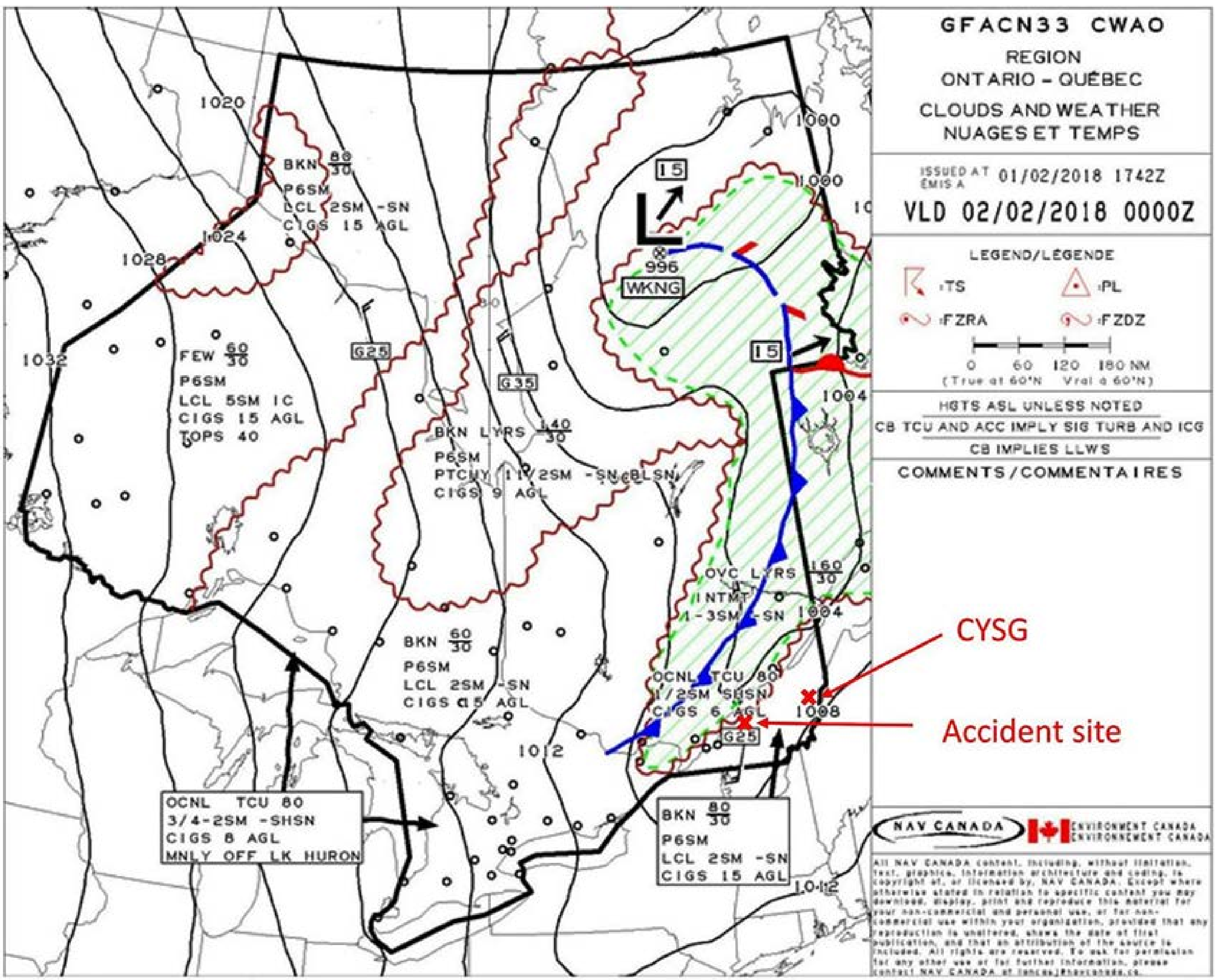

Figure 2. Clouds and weather GFA chart issued at 12:42 on 01 February 2018 and valid at 19:00 (Source: NAV CANADA, with TSB annotations)

Spatial disorientation

After analyzing the weather conditions present in the Saint-Joachim-de-Courval area at the time of the accident, the investigation determined that the surface visibility would have been no more than 1 SM in snow showers. It is very likely that the slant visual range was less than 1 SM. In addition, the risk of frost noted in the weather forecasts meant there was a risk of a layer of frost covering the helicopter's windshield and thus further reducing visibility during flight.

The weather forecasts included moderate turbulence between the surface and 3 000 ft AGL, which would make flying more unstable and require more correction inputs by the pilot to maintain straight and level flight. In addition, because of the inherent instability of this type of aircraft, if a pilot experiences spatial disorientation, an incorrect control input will result in a loss of control if the pilot does not quickly take corrective action by relying on his or her instrument flight skills. This type of situation, combined with moderate turbulence, severely hinders a pilot's ability to fly with instruments.

The unplanned loss of all visual references is a critical situation for a pilot who is relying solely on visual references to the ground, whether during the day or at night. There is a known risk of rapid loss of helicopter control if visual references are lost.

Once a pilot in this situation becomes aware of what is happening, his or her stress level tends to rise rapidly. Maintaining control of the aircraft therefore requires fast reaction times. A pilot without recent knowledge of and practice with instrument flight rules runs the risk of making inappropriate manoeuvres.

Given the established correlation between an abnormal flight attitude and a loss of flight control, it is highly likely that, in this occurrence, the pilot lost control of the helicopter as a result of spatial disorientation.

Limited experience with night VFR flight

Night flight requires pilots to develop additional skills so they can operate in an environment that is different from that of daytime flight. To compensate for the reduced visual acuity, which is the main source of information to maintain spatial orientation, pilots must refer more frequently to their flight instruments on night flights. This skill is initially acquired through adequate training. Although the regulations require pilots to complete a minimum number of hours of night flight and instrument flight before applying to add a night rating to their pilot licence, they are not required to take theoretical ground training on the specifics of night flight, such as spatial disorientation, optical and sensory illusions, night vision, regulations, decision making, or fatigue. The pilot's exposure to these topics is left to the discretion of the instructor delivering the training.

In this occurrence, the pilot had only 56.2 hr of night flight experience, including 46.1 hr as pilot-in-command, over a 12-year period (October 2006 to 01 February 2018). None of the information collected made it possible for the TSB to determine whether the pilot had acquired theoretical knowledge on spatial disorientation during his night flight training. Before the accident, the last night flight recorded in the pilot's personal flight log took place on 09 September 2017—almost 5 months before the occurrence. Given the pilot's total number of flying hours, his training, and his limited night flight experience, it is likely that the pilot did not have the skills needed to handle a significant reduction in visual references to the ground.

Decision making

The investigation was unable to determine whether the pilot was aware of the weather conditions along the flight path. The fact that the flight was made despite the unfavourable weather forecast indicates limited awareness of the weather situation, which led to the decision to proceed with the initial flight plan. Several factors may explain the pilot's decision to take off despite the weather forecast issued for the flight path:

- The return flight was planned for that same evening.
- The weather conditions at the point of departure were favourable for VFR flight.
- The route was familiar.

The flight itinerary that the pilot filed with the responsible person included a planned return that same evening. The tendency to stick to the initial plan is an unconscious cognitive bias that involves continuing with an initial plan of action despite changing conditions. And, if the passengers on board expected to return that same

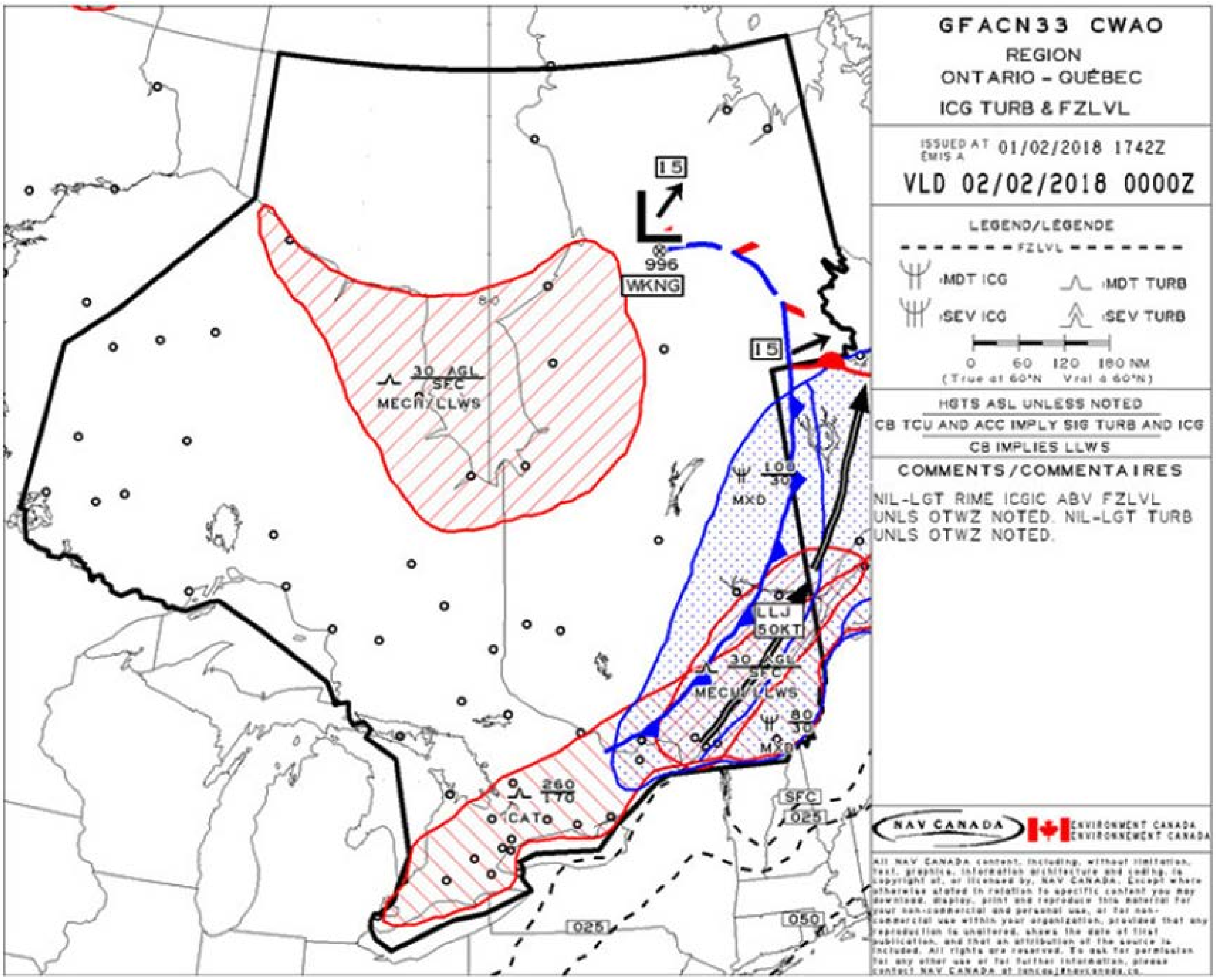

Figure 3. Icing, turbulence, and freezing levels GFA chart issued at 12:42 on 01 February 2018 and valid at 19:00 (Source: NAV CANADA)

evening, they may have exerted real or perceived pressure on the pilot. The fact that the weather conditions before takeoff from Saint-Georges de Beauce were favourable for VFR flight may also have supported the pilot's decision to take off.

The pilot was familiar with the route, having already made the same flight twice during the day, about 8 months before the accident. The pilot therefore had experience flying over the same area at least twice. These 2 positive experiences (in which the results matched the expectations) may have influenced the pilot's perception of the situation. However, a route flown during the day does not have the same characteristics as when it is flown at night. During a daytime flight above a region that is considered to be populated, such as Centre-du-Québec, it can be difficult to imagine that some areas do not have adequate ground lighting when night falls. If visibility is good, well-lit areas may compensate for areas with less lighting. However, if visibility deteriorates during flight to the point where the pilot is unable to see beyond a zone with little ground lighting, the risk of losing visual

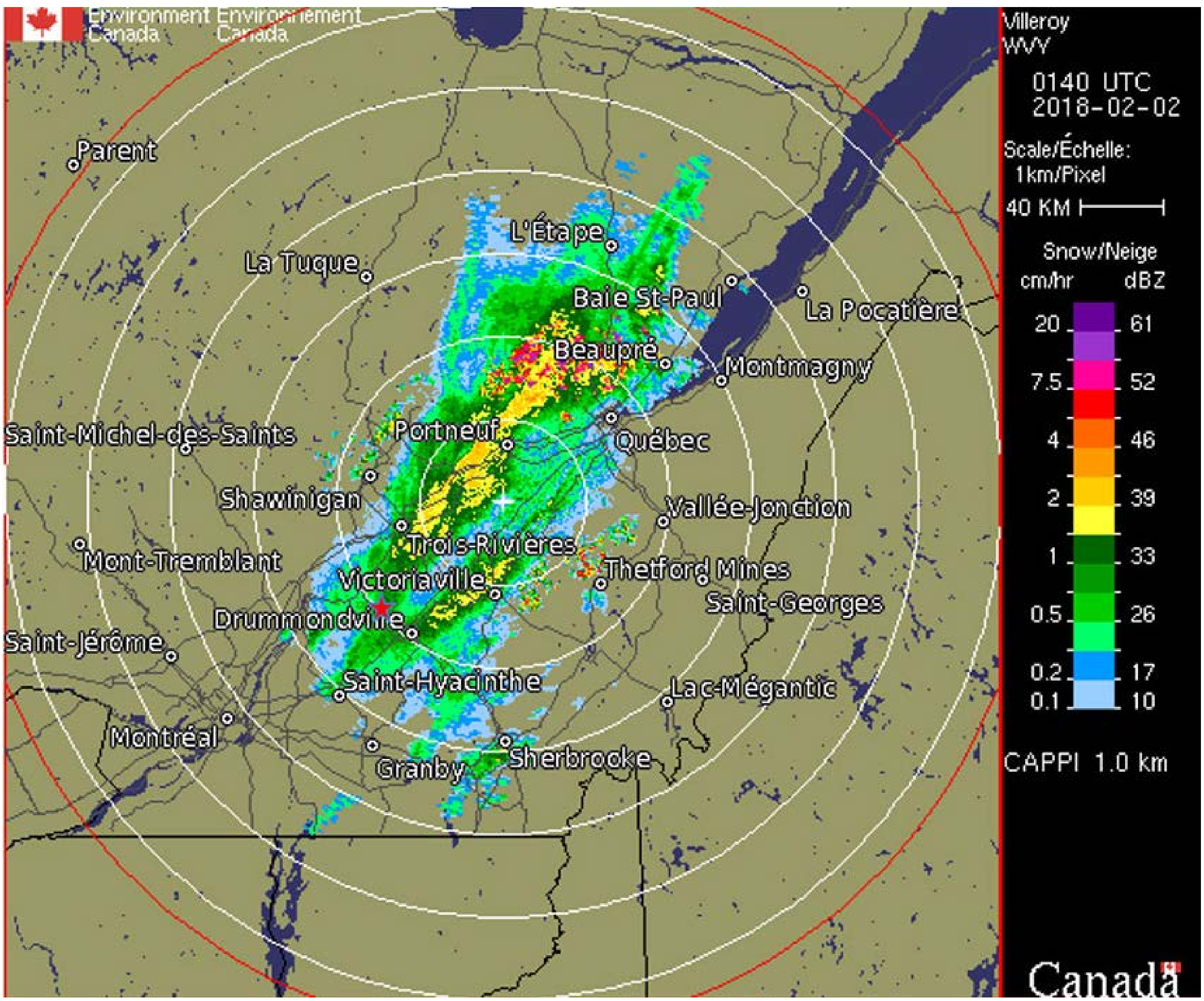

Figure 4. Screen capture of Villeroy weather radar at 20:40 on 01 February 2018 (Source: Environment and Climate Change Canada, with TSB annotations)

Note: The red star indicates the accident site.

references to the surface increases, even in an area that is considered populated. Consequently, the choice of flight route between 2 points may differ depending on whether the flight is made during the day or at night.

During a night flight, given the darkness, it is difficult or even impossible to perceive deteriorating weather conditions. Therefore, a night VFR flight path should be determined in consideration of only those areas that provide the most ground lighting possible, and not necessarily follow a straight line. In straight flight, the risk of losing sight of the visual references required to maintain control of an aircraft is increased.

Findings

Findings as to causes and contributing factors

1. It is highly likely that the pilot encountered unfavourable weather conditions that resulted in a loss of visual references to the ground.
2. It is highly likely that the pilot lost control of the helicopter as a result of spatial disorientation.
3. Given the pilot's total number of flying hours, his training, and his limited night flight experience, it is likely that the pilot did not have the skills needed to handle a significant reduction in visual references to the ground.

Erratum Notice: Electronic Flight in General Aviation

The article entitled "Integration of Electronic Flight Bags in the General Aviation Cockpit" from the Aviation Safety Letter, Issue 1/2019 was edited to address an error in the labelling of features in Figure 2 and its accompanying text. Figure 2 and the two paragraphs that immediately followed have been removed from the originally published article. Figure 2 and the two paragraphs directly below it (including the "Your Turn" sections) should be replaced with the following text:

Preliminary results from the recent study of navigational aids at the ACE Lab suggest that there may be a trade-off involving task performance when hand-held electronic navigational aids are used by pilots with low flight time. For example, while low-experience pilots may see some improvement in altitude and heading maintenance when using the navigational aid, their performance in the communication task suffers when compared to that of low-experience pilots not using the navigational aid.

Your turn: How will using a navigational aid reduce your risks while flying?
Are there any risks that might increase?

SEE AND AVOID TRAFFIC: breaking the myths of glider flying

My FLARM, a traffic alert and collision avoidance system, suddenly warned me about conflicting traffic while I was flying my glider. I spotted a Commander 114 aircraft in straight and level cruise, close enough that I could count its rivets. This happened at 6 500 feet (ft) above ground level (AGL) and about 30 km from the nearest glider club.

It’s up to all of us to see and avoid other aircraft. To do so, it’s helpful to know some facts about gliders.

Myths about gliders

- Glider flights are short, slow and low.
- Gliders are easy to spot.
- Gliders always fly erratically.
- Gliders have no electrics.

Truths about gliders

Glider flights can be long and fast, and at high altitude:

- Glider flights regularly last several hours with some logged flights over 9 hours long.
- Flights ranging 50, 100, or even 500 km away from home base are common in Canada.
- Towing is usually at 2 000 to 3 000 ft AGL but gliders regularly get up to over 8 000 ft AGL in central and eastern Canada, and higher in western Canada.
- Stalling speeds are usually 30 to 40 knots (kt) but gliders can reach speeds over 150 kt (300 km/h).

Gliders are hard to spot in the air:

- A glider’s typical wing span is 50 to 70 ft but their wings are very thin.
- Gliders are very narrow, making them almost invisible straight on.
  - Gliders briefly appear when presenting a “top” view and then disappear when circling.

Gliders do fly straight and level, but spend much of their time circling:

- Gliders will fly straight and level once they have the altitude to make a run.
- Gliders usually circle to climb. Altitude is like fuel for gliders—the higher the glider, the further it can go. Gliders trade that altitude for distance.
- Gliders follow the same standard circuit pattern as powered (air) traffic, except that gliders descend during the downwind leg.

Gliders have some electrics:

- Most gliders in Canada have radios and audio variometers, enabling heads-up instrument reading.
- Many gliders in Canada have moving map GPS and flight computers.
- 160 gliders in Canada have FLARMs, a traffic alert and collision avoidance system (TCAS) designed for gliders.

Conclusion

You’ll find gliders across the country, many miles away from the Glider Operating Area noted on charts, so let’s keep an eye out. If you’re interested in learning more about how gliders work, drop into a glider club (http://sac.ca) and take an introductory flight. You’ll be welcomed and have an enjoyable time. Fly Safe.

canada.ca/general-aviation-safety

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