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# AVIATION SAFETY LETTER

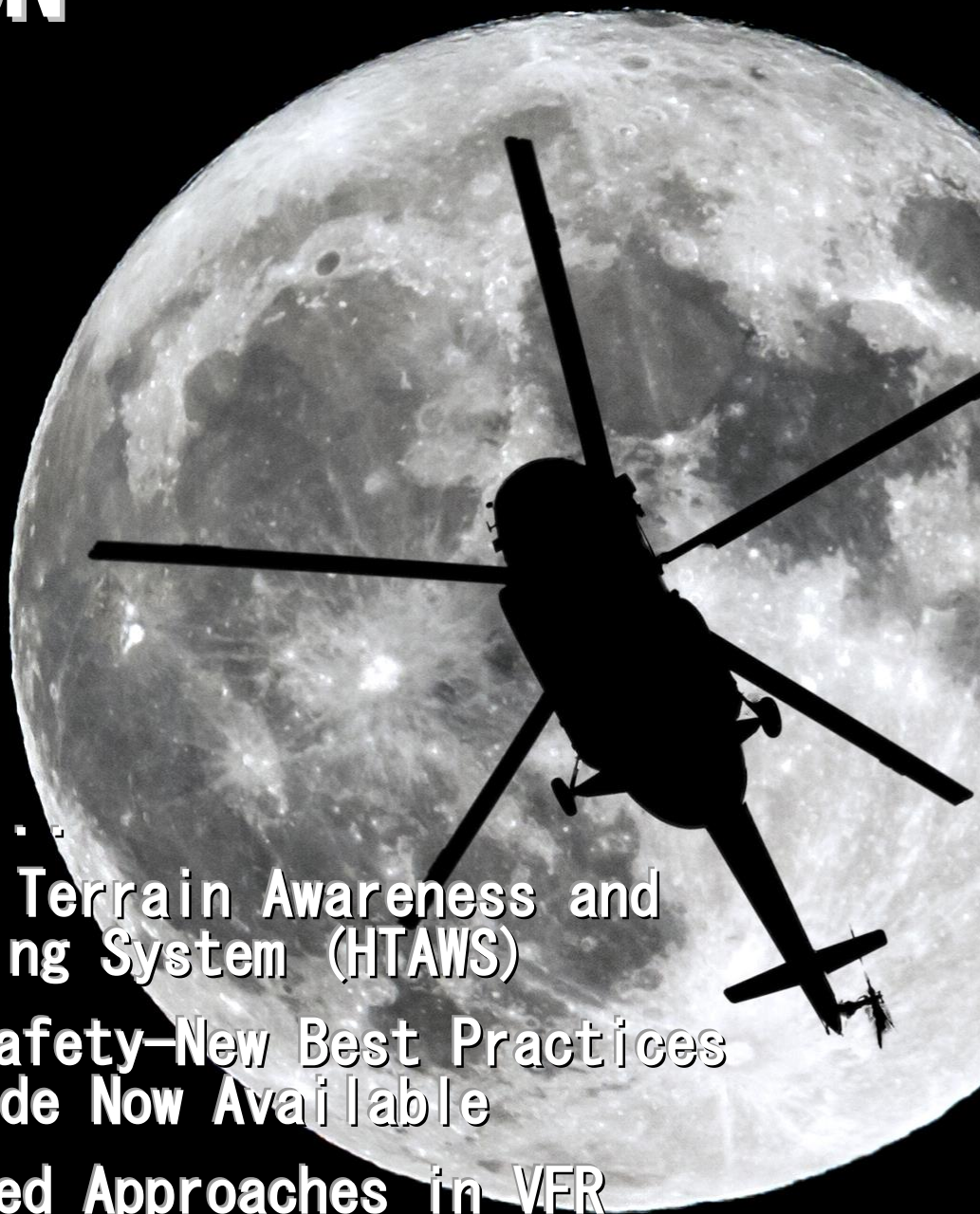
ISSUE 1/2020

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Helicopter Terrain Awareness and  
Warning System (HTAWS)

Ultralight Safety—New Best Practices  
Guide Now Available

Stabilized Approaches in VFR



TP 185E

Canada 

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## ON THE RADAR

### COVID-19 measures

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*by Nicholas Robinson, Director General, Civil Aviation, Transport Canada (TCCA)*

As the impact of COVID-19 is felt across Canada and the world, we hope that all of you and your family and loved ones are staying safe and healthy. We are experiencing an unprecedented time in our industry—a time that is producing great anxiety, questions, and uncertainty. Transport Canada (TC) recognizes this; I myself recognize these feelings. We are confident, however, that by continuing to work together, we will be able to address this unprecedented situation collectively.

We want to thank all of you for your patience as we work collectively to ensure the continued safety and security of our transportation system. The situation is evolving daily, and we are striving to address identified issues as quickly and as efficiently as possible. Your involvement and dedication is instrumental in helping TC complete this task. We would like to thank you all for your cooperation and continued dedication under these challenging circumstances.

For more information on the measures TC is taking, please visit the [COVID-19](#) page. This landing page has the most up-to-date information on TC's response to COVID-19, including guidance for the aviation industry.

Once again, thank you for your involvement in continuing to provide a safe and secure aviation system during these difficult times.

We wish you all the best! Please stay safe. △

### Helicopter terrain awareness and warning system (HTAWS)

---

*by Stuart Doyle, Civil Aviation Safety Inspector, Commercial Flight Standards, Transport Canada Civil Aviation (TCCA)*

#### *Did you know?*

The ground proximity warning system (GPWS) was invented by a Canadian, Mr. C. Donald Bateman of Saskatchewan, in the late 1970s. From that technology evolved what we know today as the terrain awareness and warning system (TAWS), which has been mandated by some civil aviation authorities to reduce the number of controlled flight into terrain (CFIT) accidents.

#### *How does it work?*

HTAWS contains an obstacle and terrain database and, along with positional information from the aircraft global positioning system (GPS), compares the aircraft position to known terrain or obstacles and provides audio-visual caution or warning information when a conflict exists.

### *Where can I get more information?*

The two links below represent good backgrounders on this subject although many others exist. Transport Canada does not endorse any one manufacturer over another.

- [ICAO](#)
- [Flight Safety Foundation](#)

### *Is it in my aircraft?*

Quite possibly. Many manufacturers already supply this technology as part of a global positioning system (GPS), electronic flight instrument system (EFIS), or flight management system (FMS) and if you have any of these technologies, you might already have HTAWS or the ability to add it to your existing installation. How does this affect me?

The Transportation Safety Board (TSB) made a recommendation (A16-10) that Transport Canada mandate the installation of HTAWS in commercial helicopters that are operated at night and in instrument meteorological conditions (IMC). There are no current plans to mandate HTAWS but Transport Canada strongly recommends that helicopter operators operating at night or under IFR consider adding this technology to their aircraft. Eventually, emerging technologies such as enhanced flight vision systems (EFVS) may become more affordable and provide better situational awareness for flight crew members.



*Photo credit: iStock*



*Collision with terrain, TSB report A18Q0186*

### *What should I do?*

HTAWS alone does not prevent controlled flight into terrain (CFIT) or loss of control in-flight (LOC-I) accidents but good planning, execution, and decision-making will go a long way to reducing the number of accidents due to CFIT and LOC-I. △





## TIPS AND TOOLS

## Ultralight safety—New best practices guides now available

by Chris Horsten, Director, [Canadian Light Sport Aircraft Association](#) and member of the General Aviation Safety Campaign (GASC) ultralight working group

It's a privilege to be participating in the [General Aviation Safety Campaign \(GASC\)](#) as a representative and stakeholder for the light sport aircraft (LSA) and advanced ultralight aircraft (AULA) community. It's a community filled with great people and great flying adventures. But the sad reality of any sport is that there will inevitably be accidents. We may deem our aircraft to be safe, but any activity we engage in, including a walk to the mailbox, contains a margin of risk, which we either



*Photo credit: Transportation Safety Board*

deem acceptable or not. As pilots and owners of the least regulated aircraft and licence categories in Canada, it's up to us to understand the weight of the risks we carry and proceed with diligence. As an industry, one of the great challenges we have is identifying how and why these accidents occur. There is always lots of speculation, but without hard evidence we've got little we can use in order to work on prevention. There isn't much research that would permit us to understand whether there are any trends or common causal factors. The Transportation Safety Board of Canada (TSB) has a classification system for ranking incidents and accidents. This is used to decide which resources to deploy and determine how in depth an investigation will go. You can find a complete description of the policy on the [TSB's website](#). Unfortunately, many if not most ultralight accidents don't warrant the same kind of resources as a commercial airline accident, which makes it difficult to uncover trends.

For ultralights, things become even more complicated. Many ultralight incidents and accidents go unreported, especially if there is no injury. Pilots who think their incident isn't worth reporting, or are afraid of possible repercussions of their misadventure, actually do a great disservice to the ultralight community because we don't get to benefit from lessons learned or the discovery of service difficulties that exist in the fleet.

It stands to reason that a better understanding of ultralight accidents would allow for the development of better preventative measures, and therefore, the industry and its regulators need to work together to improve the reporting and analysis of such accidents if we ever hope to gain a deeper understanding and improve the statistics. Consequently, the number of “loss-of-control” findings will likely continue and vary only based on fleet hours.

What we have been able to identify from the limited research are four factors that summarize the major contributors to loss-of-control accidents:

- Pilot proficiency
- Maintenance
- Decision making
- Compliance and regulatory issues

The available research would suggest that most fatal ultralight accidents occur for pilots with less than 40 hours on type. This would suggest that proficiency plays a role in *how* we handle unexpected situations like engine failure. Ultralight maintenance is unregulated. There are numerous examples of accidents in which owners deviated from the manufacturer’s instructions with disastrous consequences. Decision making is another skill whose absence can lead to dire consequences. How many of us have lost a friend or know of someone who has lost their life flying into instrument



*Photo credit: Transportation Safety Board*

meteorological conditions (IMC)? And lastly, regulatory compliance. There are plenty of ultralight pilots who regularly fly without a helmet (it is mandatory when flying in a basic ultralight and strongly recommended in an advanced ultralight), and in some accident cases, it would have saved a life. Passenger carrying is yet another regulatory issue. Cases involving pilots flying aircraft prohibited from passenger carrying have resulted in the death of an unsuspecting passenger.

These four points will be the subject of future articles.

Ultralight pilots can do a lot to lessen their chances of becoming a statistic. The aircraft you fly likely came with a pilot operating handbook (POH). It contains critical information on the aircraft’s performance capabilities, limitations, and care. This is a great place to start. Know your POH inside and out. Make copies and keep them by your night stand, in your hangar, and in your glove compartment in addition to inside your plane. Invest time in understanding everything you can about your plane. The GASC working group has

produced [Ultralight Safety–New Best Practices Guides](#). These guides may seem to state the obvious, but often the obvious gets overlooked when there are distractions or complacency.

From a personal perspective, I began following the many pilots of YouTube. They present a whole variety of aircraft, situations, good and bad habits, and the outcomes. Learning from the mistakes and successes of others is an easy way to stay sharp and vigilant. The bottom line: find something that works for you. The **Ultralight Safety–New Best Practices Guides** are a great resource for any pilot, but they have been specifically compiled for the ultralight pilot. Keep a copy with your aircraft and refer to it every time you plan to fly. By developing and following some good pre-flight habits, you can go a long way in maintaining your privileges to fly, and maybe even save your life. △

### Ultralight Safety–New Best Practices Guides links:

- [Cross-country flight](#)
- [Maintenance](#)
- [Operations](#)

## Stabilized Approaches in VFR

*by Jean-Claude (JC) Audet, VP Operations, [Canadian Owners and Pilots Association \(COPA\)](#)*

Experienced IFR pilots have learned that flying an approach to minima is a high-risk phase of IFR flight. These experienced pilots have also learned that the appropriate risk mitigation for the IFR approach is a stabilized approach. All IFR approaches are designed to guide the pilot over the final approach fix (FAF) to a specific point called the missed approach point (MAP), and from there, to a safe landing or a go-around/missed approach.

The quality, smoothness, and ultimate safety of the approach and landing are significantly influenced by the condition of the aircraft at the FAF. The FAF is the point on the IFR approach procedure where the approach should be stabilized.

This means that the aircraft must be on track, both horizontally and vertically, at the proper power setting, speed, and rate of descent, and with a landing configuration appropriate for the conditions of the day. This ensures that the aircraft does not require any further pilot input, or only some very minimal corrections at most,



*Photo credit: iStock*



to achieve a safe landing. Meteorological conditions such as wind and turbulence, as well as other factors, still require the pilot to remain focused and apply control inputs as required.

Many VFR landing accidents in general aviation (GA), some fatal, are the result of loss of control, usually in flight, but also on the ground following touchdown. Many of these landing accidents are the direct consequence of the pilot failing to achieve a stabilized approach, and in some cases, failing to execute a timely and proper go-around.

In VFR, the circuit serves, among other things, the same purpose as the approach procedure in IFR. The circuit is designed to guide the pilot to a safe landing. As with IFR procedures, the quality, smoothness, and safety of the approach and landing will be directly related to whether or not the aircraft was stabilized prior to, or shortly after, establishing the aircraft on the final approach leg. The attention and accuracy with which the pilot flies, or enters the circuit, especially on a straight-in final, will determine how well the aircraft is positioned for a safe landing.

Transport Canada's [Flight Test Guide—Private Pilot Licence—Aeroplane](#) was recently amended to include a stabilized approach for all approaches to a landing. During the flight test, and at some point on the approach, the candidate is expected to announce whether or not the aircraft is stabilized. That "some point" is not as precisely defined as the FAF in IFR, and it may not be the moment the aircraft turns onto final, as further changes to the aircraft configuration and flight path may still be required. However, it is reasonable to assume that approximately halfway between the base turn to final at 500 feet (ft) above ground level (AGL) and the touchdown point, the pilot would achieve a stabilized approach, with the proper power setting, speed, rate of descent, and landing configuration for the conditions of the day. By 200 ft AGL, the candidate is required to declare whether or not the approach is stabilized. If not, a go-around will be executed.

The [General Aviation Safety Campaign](#)'s Safety Initiatives Team firmly believes that the implementation of a stabilized approach in VFR flying and a timely decision to execute a go-around, when required, will bring about significant reductions in the number of loss-of-control accidents and encourage all pilots to review and apply this technique on every approach.△





# David Charles Abramson memorial (DCAM)—Flight instructor safety award

The prestigious 2019 [David Charles Abramson Memorial](#) (DCAM) Flight Instructor Safety Award was presented to Mr. Jack Proctor, of the Seneca College School of Aviation in Ontario, by Jane and Rikki Abramson, co-founders of the award, at the Air Transport Association of Canada's (ATAC) Annual Canadian Aviation Conference & Tradeshow on 19 November at Fairmont The Queen Elizabeth Hotel in Montreal.

Mr. Proctor has contributed and given back to the industry for many years. A great communicator and mentor, he leads by example, with unsurpassed dedication to instructing. His wealth of experience as a Captain with Air Canada, where he has worked as an instructor and check pilot while also continuing to instruct at the college level, has allowed him to provide students with a wider viewpoint, thus equipping them with the necessary knowledge for today's ever-changing world. A Canadian publication for flight instructors, *Canadian Flight Notes*, formerly known as *The Proctor Notes*, was authored by him.



*Jane Abramson and Mr. Jack Proctor*  
*Photo credit: Mike Doiron*

In his acceptance speech he stated: "The goal of this award is to recognize the important role flight instructors play in making flying safer."

To preserve the historical record of the award, DCAM has the recipient's name engraved on the trophy and entered in the official logbook, both of which are on permanent display at the Canada Aviation and Space Museum in Ottawa.

Thanks were given to the Museum's staff for their custodianship of the trophy.

Acknowledgement was given to the DCAM sponsors: ATAC, Essential Turbines, FlightSafety Canada, Hamilton Watches, *Helicopters* magazine, Seneca College, and *Wings* magazine.

This year's deadline for [submission](#) is September 14, 2020. The successful applicant will be presented with the Award by Jane and Rikki Abramson at ATAC's 86<sup>th</sup> Canadian Aviation Conference & Tradeshow, Westin Bayshore Hotel, Vancouver, BC., November 17-19, 2020.

Our mission: raising the profile of flight instructors by recognizing and honouring exceptional instructors in Canada who have made a significant contribution to the advancement of Canadian aviation safety.△



## RECENTLY RELEASED TSB REPORTS

*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 A17P0170—Visual flight rules flight into deteriorating weather and collision with terrain**

#### *History of the flight*

At 14:22 on 25 November 2017, the privately registered Mooney M20D aircraft (Figure 1) departed from Penticton Airport (CYYF), B.C., with 2 people on board, for a visual flight rules (VFR) flight to Edmonton/Villeneuve Airport (CZVL), Alta. After departure from CYYF, the aircraft climbed to an altitude of approximately 9 800 feet (ft) above sea level (ASL) to cross the Columbia Mountain Range while heading directly toward Revelstoke Airport (CYRV), B.C. At approximately 15:10, while over CYRV, the aircraft made four 360° left turns while descending to approximately 4 200 ft ASL. The aircraft then flew along the Trans-Canada Highway, heading east towards Rogers Pass (Figure 2). While the aircraft was following the highway, its height above ground level (AGL) varied between 1 200 ft and 3 300 ft. At approximately 15:27, the aircraft passed the Jack McDonald Snowshed at 5 200 ft ASL (approximately 2 300 AGL), travelling at 131 knots (kt). The final 2 global positioning system (GPS) track points, which were very close to the accident site, indicated that the aircraft's airspeed had slowed from 147 kt to 82 kt and the aircraft had climbed from approximately 1 710 ft AGL to 2 550 ft AGL in 11 seconds.



*Figure 1. The occurrence aircraft (Source: R. Friesen)*

#### *Search and rescue*

At 22:40, the Joint Rescue Coordination Centre (JRCC) in Victoria, B.C., was notified that the aircraft had not arrived at CZVL and was missing. Search-and-rescue efforts were begun but were hampered by poor weather conditions. When the weather improved, the search-and-rescue operation continued but was called off on 05 December 2017. No signal was received from the emergency locator transmitter (ELT).

On 10 September 2018, a helicopter heading to Kamloops Airport (CYKA), B.C., found the accident site approximately 26 NM northeast of CYRV (Figure 2). The wreckage was located in Glacier National Park, approximately 500 ft north of the Trans-Canada Highway at approximately 3 500 feet ASL, in a heavily forested area.



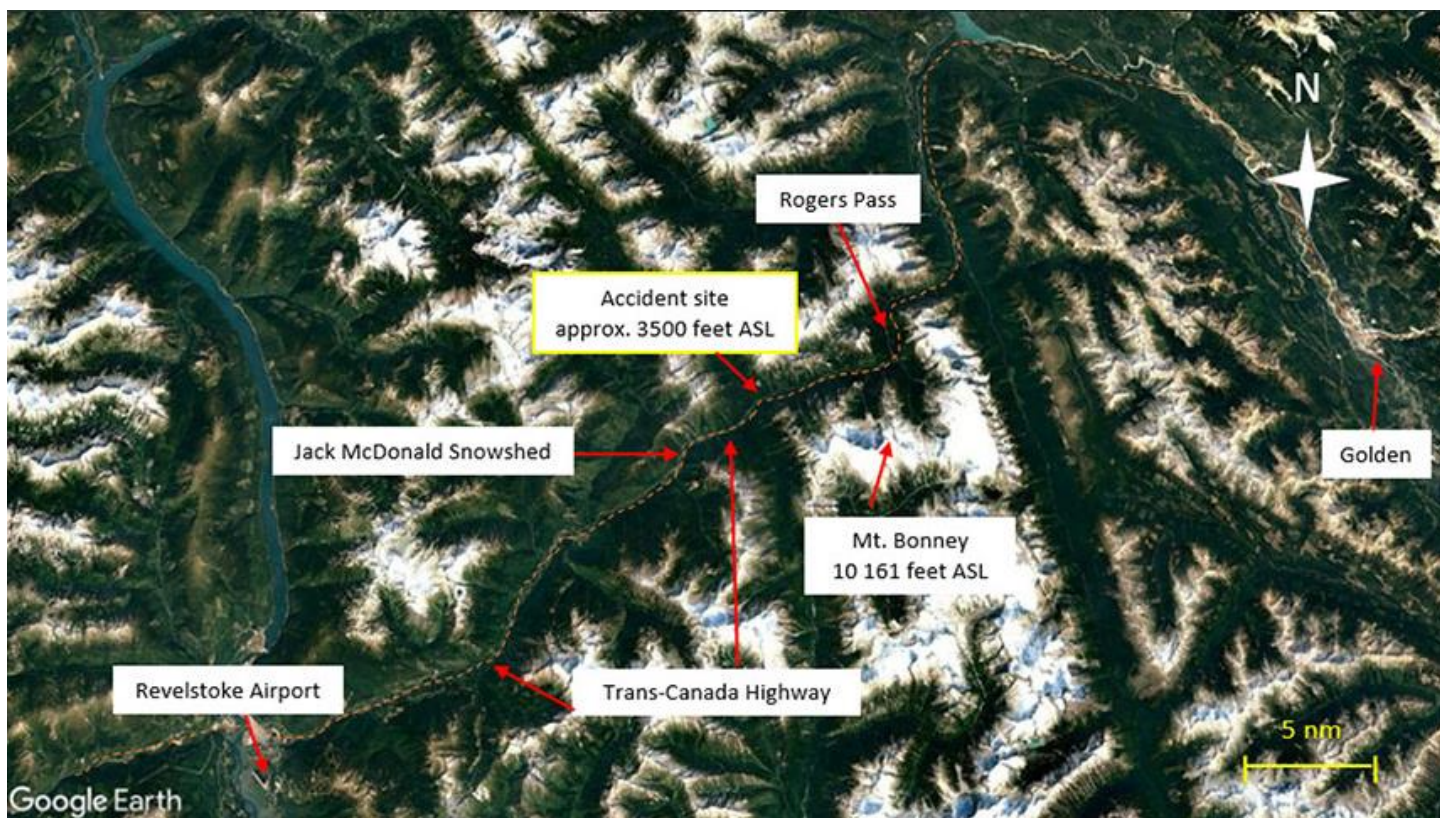


Figure 2. Aircraft's last known position and the accident site (Source: Google Earth, with TSB annotations)

### *Flight planning and navigation*

In the mountainous regions of B.C., VFR routes may be depicted on visual navigation charts (VNC) by diamonds. The occurrence flight path followed the depicted VFR route along the Trans-Canada Highway from Revelstoke toward Rogers Pass. According to the *Transport Canada Aeronautical Information Manual*, AIR 2.13:

“The diamond marks do not imply any special level of facilities and services along the route. Pilots are cautioned that the use of the marked routes does not absolve them from proper pre-flight planning or the exercising of good airmanship practices during the proposed flight. Alternative unmarked routes are always available, and the choice of a suitable route for intended flight and conditions remains the sole responsibility of the pilot-in-command.”

Many of the VFR routes on the Vancouver VNC map include cautions for pilots on the minimum altitude for course reversal. For example,

ROUTE SUBJECT TO RAPID [WEATHER] CHANGE

ALTITUDE SHOULD PERMIT COURSE REVERSAL

[MINIMUM] 5500 [FEET] ASL RECOMMENDED BETWEEN

HOPE AND PRINCETON.



The Calgary VNC, which included the areas along the pilot's intended flight, did not have any cautions for the VFR route from CYRV to Rogers Pass.

The investigation was unable to determine if the pilot had intended to follow the VFR route to CZVL, as the pilot did not file a flight plan with or obtain a weather briefing from NAV CANADA prior to departure.

### *Meteorological information*

The automated weather observation system (AWOS) special aviation routine weather report (METAR) for CYRV indicated the following at 15:01:

- winds: 210° true (T) at 3 kt, varying from 140°T to 300°T
- visibility: 9 statute miles (SM)
- precipitation: light rain
- few clouds at 5 500 ft AGL, scattered clouds at 7 400 ft, broken ceiling at 9 300 ft, and overcast at 11 000 ft
- temperature: 7 °C, dew point 2 °C
- altimeter setting: 30.01 inHg

The AWOS METAR for CYRV indicated the following at 16:00:

- winds: 120°T at 4 kt, varying from 110°T to 170°T
- visibility: 9 SM
- few clouds at 5 500 ft AGL, broken ceiling at 7 100 ft, and overcast at 10 000 ft
- temperature: 6 °C, dew point 2 °C
- altimeter setting: 30.00 inHg

According to the graphical area forecast (GFA) (Figure 3), the forecast for the eastern part of B.C.—within the Rocky Mountains and along the route to CZVL—was as follows: scattered clouds based at 6 000 ft ASL with tops at 8 000 ft ASL; a broken layer of clouds based at 10 000 ft ASL with tops at 22 000 ft ASL; and visibility greater than 6 SM. Also, localized ceilings were forecast at 1 500 feet AGL with light rain. An area near Glacier National Park and Rogers Pass was forecast to have intermittent ceilings at 800 ft AGL with mist and light rain, and the visibility was forecast to vary between 5 SM and greater than 6 SM. Sunset for Revelstoke on 25 November 2017 was at 15:54.

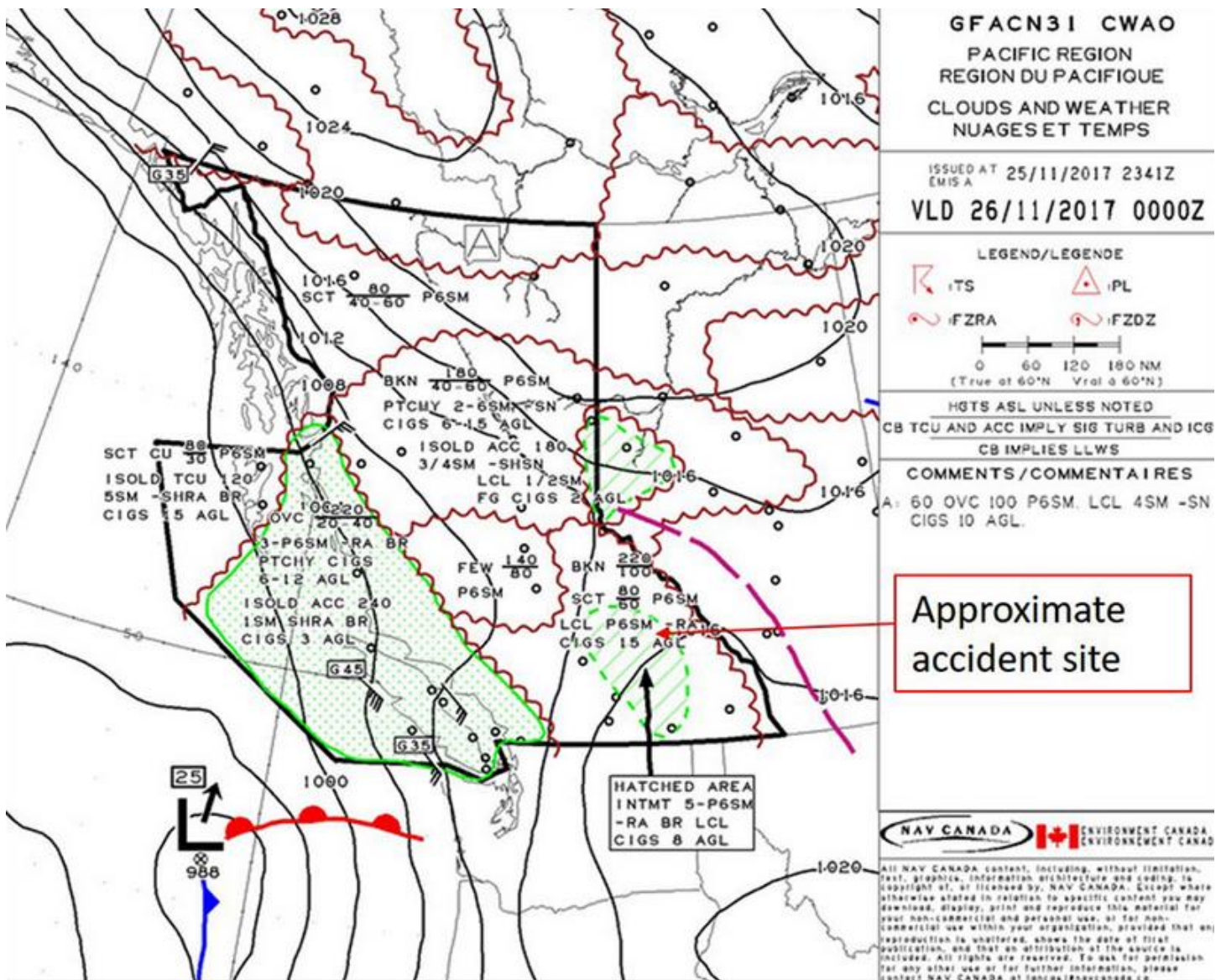


Figure 3. Graphical area forecast (Source: NAV CANADA, with TSB annotations)

At 15:28 on 25 November 2017, local webcam photos depicted low ceilings, fog, and limited visibility due to snow near the occurrence site (Figure 4 and Figure 5).

### Pilot information

Records indicate that the pilot was certified and qualified for the flight in accordance with existing regulations.

### Aircraft information

The occurrence aircraft was manufactured in 1963 and was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

### Accident site

The aircraft was found at approximately 3 500 feet ASL, 500 ft north of the Trans-Canada Highway in a heavily forested area (Figure 6). Examination of the wreckage indicated that the aircraft struck the terrain in a steep,

nose-down attitude. The flaps were found in the fully retracted (up) position. The landing gear was found in the partially extended position; however, the investigation was unable to determine if the landing gear had been selected down or if it had been extended a result of the impact forces.

All flight control surfaces were accounted for. Damage to the propeller was consistent with power being produced at the time of impact.

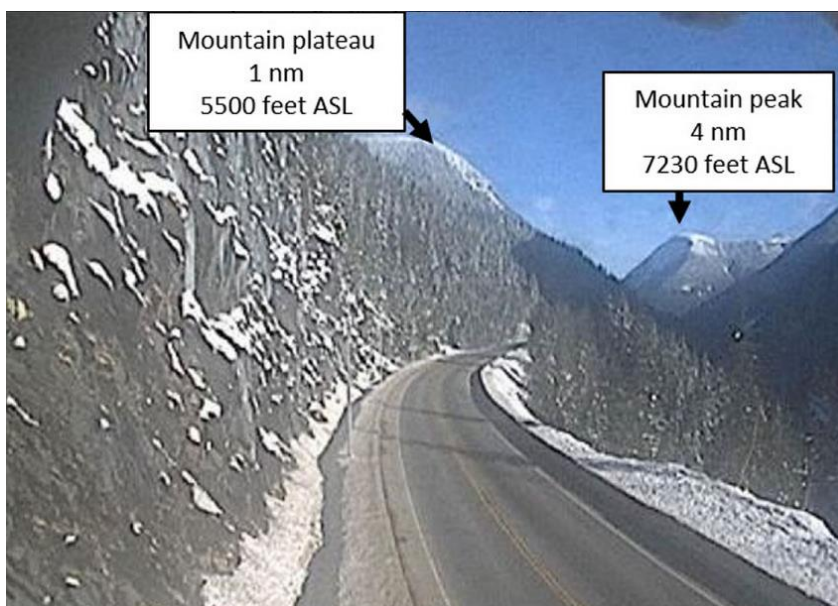
The aircraft's flight instruments were severely damaged. The GPS was recovered and sent to the TSB Engineering Laboratory in Ottawa, Ont., for further examination.

The aircraft's 121.5 MHz ELT was also recovered at the accident site. The ELT's antenna was found detached from the connector, and the batteries had been ejected from the battery enclosure during the impact sequence. When initial power was applied to the ELT, it started to transmit a strong signal, which confirmed that the inertia switch was in the activated state. Due to the absence of the antenna, signal detection would have been limited to a few metres (m). Furthermore, without a battery, the ELT transmission would have ceased immediately.

The aircraft's engine was removed for further examination. The engine was deemed capable of producing power at the time of impact. The left magneto was found to be unserviceable and had been so for a considerable amount of time before the occurrence. This condition would have resulted in a minor reduction in engine performance.



*Figure 4. Northeast view taken at Jack McDonald Snowshed (3 050 ft ASL), 22 NM northeast of CYRV at 15:28 on the day of the occurrence (Source: DriveBC.ca)*



*Figure 5. Northeast view taken at Jack McDonald Snowshed (3 050 ft ASL), 22 NM northeast of CYRV at 10:40 on 19 November 2018 (right) (Source: DriveBC.ca, with TSB annotations)*

### ***VFR flight over mountainous terrain in deteriorating weather conditions***

The hazards associated with continuing VFR flight into instrument meteorological conditions are well documented. According to data collected by the TSB between 2000 and 2014, accidents involving flights that



depart under visual meteorological conditions and continue to a point where pilots lose visual reference with the ground have a high fatality rate. Over the 14-year period, these types of accidents resulted in 74 fatalities.

### *Safety messages*

Flying in deteriorating weather conditions is challenging; the associated risks need to be managed properly before and during flight, especially when flying over mountainous terrain.

Current ELT system design standards do not include a requirement for a crashworthy antenna system. As a result, potentially life-saving search-and-rescue services may be delayed if an ELT antenna is damaged during an accident.

The signal of non-406 MHz ELTs cannot be detected by the Cospas-Sarsat system. As a result, aircraft occupants may be exposed to life-threatening delays in search-and-rescue service following an occurrence.



*Figure 6. Accident site, view looking downhill  
(Source: Royal Canadian Mounted Police)*

## **TSB final report A1900026—Collision with terrain**

### *History of the flight*

On 04 March 2019, the privately registered Robinson Helicopter Company R66 helicopter departed Sudbury Airport (CYSB), Ont., at 18:42 on a visual flight rules (VFR) flight to a private helipad near Fauquier-Strickland, Ont., with the pilot and 1 passenger on board. The helicopter collided with terrain at 20:06, 36 NM south-southeast of its destination (Figure 1).

On the day of the occurrence, the pilot had flown approximately 8 hours (hr) (air time) before the collision with terrain. The occurrence flight was the 4th flight of the day. The previous 3 flights were as follows:

- The 1st flight departed John C. Tune Airport (KJWN), in Nashville, Tennessee, USA, and landed at Springfield-Beckley Municipal Airport (KSGH), Ohio, USA.
- The 2nd flight departed KSGH and landed at London Airport (CYXU), Ont.
- The 3rd flight departed CYXU and landed at CYSB at 18:21.

Because evening civil twilight had ended at 18:44, most of the occurrence flight was conducted under night VFR.

Although the aircraft was equipped with a transponder, it was not recorded on radar after leaving the Sudbury area.

### *Search efforts*

On the morning of 06 March 2019, the police were notified of the overdue aircraft. A large-scale aerial search was initiated by the Joint Rescue Coordination Centre Trenton. Ground search efforts were organized by family and friends of the missing pilot and passenger.

In the afternoon of 11 March 2019, the wreckage was spotted from the air, approximately 18 NM west-northwest of Timmins (Victor M. Power) Airport (CYTS), Ont., in a previously logged area of forest with deep snow coverage. Both occupants had been fatally injured. The emergency locator transmitter (ELT) was not activated.

### *Weather information*

Graphical area forecast (GFA) charts for the time period in which the occurrence flight took place forecasted broken ceilings at 4 000 feet (ft) above sea level (ASL) and localized reduced visibilities as low as 1½ statute miles (SM) in the destination area, which was approximately 20 NM east-southeast of Kapuskasing Airport (CYYU), Ont.

The aerodrome forecasts (TAFs) from CYYU and CYTS for the time of the occurrence flight were nearly identical, indicating light winds from the southwest, visibilities greater than 6 SM, and broken cloud at 4 000 to 5 000 ft above ground level (AGL). Between 12:00 and 03:00, a temporary condition (TEMPO) of 5 SM visibility due to light snow showers with broken ceilings at 2 000 ft AGL was forecast.

An aviation routine weather report (METAR) issued for CYTS at 20:00 (6 minutes before the occurrence) reported a visibility of 15 SM, with light snow showers and overcast cloud at 4 000 ft AGL. The temperature was -16 °C. A METAR observation for CYYU, located 53 NM north-northwest of the occurrence site, reported visibility as 2 SM, with light snow and overcast ceiling at 2 000 ft AGL at the time of the occurrence, and had been reporting light snow as early as 18:35.

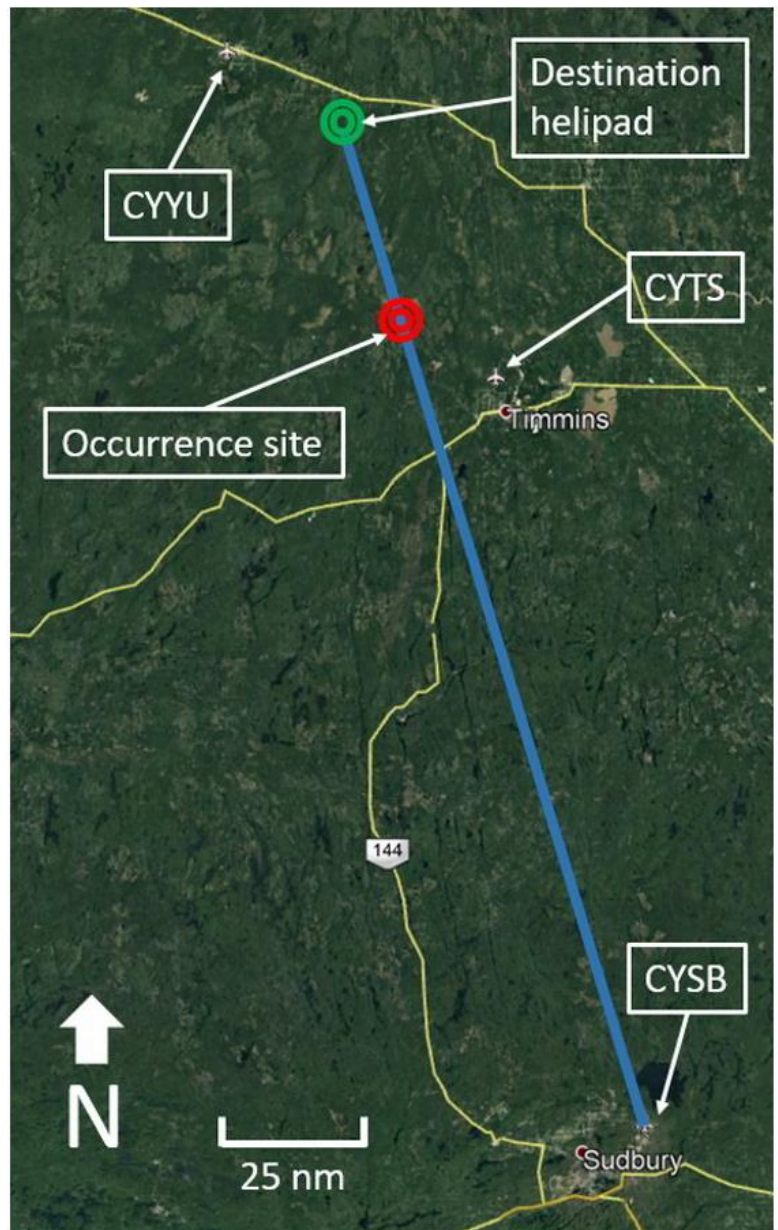


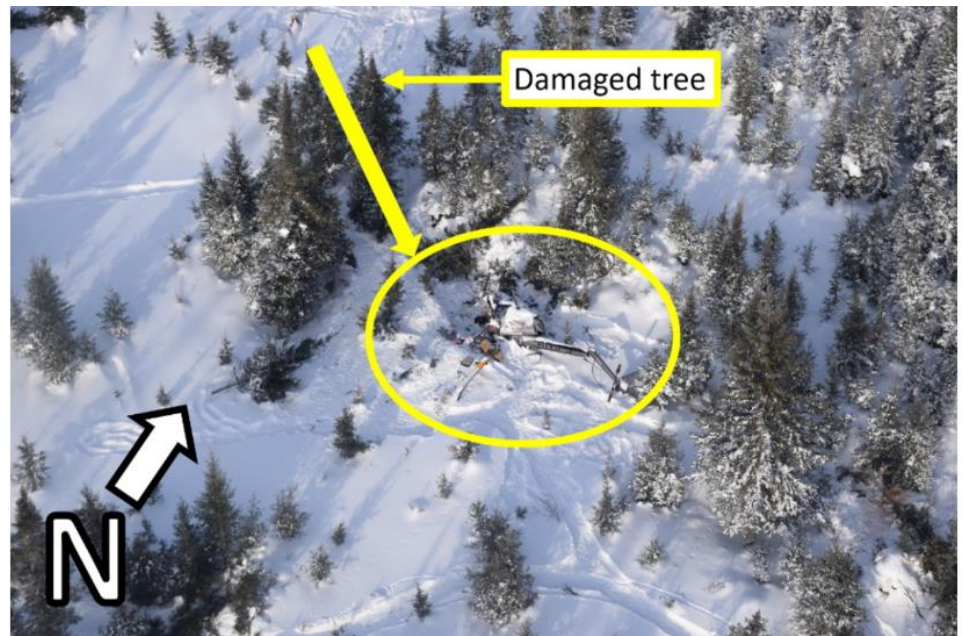
Figure 1. Route of the occurrence flight, showing the intended destination and the occurrence site (Source: Google Earth, with TSB annotations)



### *Pilot information*

The pilot held a Canadian Private Pilot Licence–Helicopter, a night rating, and a valid Category 1 medical certificate; he did not hold an instrument rating. The pilot had accumulated approximately 925 hours (hr) total flight time in helicopters, of which approximately 585 hr were flown in the occurrence helicopter.

According to his personal log, in the 365 days before the date of the accident, the pilot had flown 157.5 hr, with 4.3 of those being flown at night. In that same time period, he had not conducted any night takeoffs, but had conducted 5 night landings, all of which took place more than 6 months before the occurrence flight.



*Figure 2. Accident site, with the aircraft wreckage circled and an arrow showing the direction of impact (Source: TSB)*

### *Aircraft information*

The Robinson Helicopter Company R66 is a 5-seat helicopter with a maximum gross weight of 1 225 kilograms (kg) (2 700 pounds [lb]). The pilot purchased the occurrence helicopter in January 2016. It was equipped with basic flight instruments. The helicopter was not certified to fly under instrument flight rules (IFR) and was not equipped with an autopilot.

There were no pre-impact mechanical failures or system malfunctions identified that would have contributed to this accident.

The investigation determined that the engine was developing power and the rotor revolutions per minute (RPM) was in the normal operating range at the time of the collision with terrain.

### *Accident site and aircraft wreckage information*

The collision with terrain occurred in an area that had been previously logged. The area had some sporadic regrowth, and the trees in the immediate vicinity of the accident site were approximately 6 metres (m) (20 ft) tall. The accident site was covered in at least 1.5 m (5 ft) of snow; a significant amount of snow had fallen during the week between the accident and the discovery of the wreckage. There was tree damage at the top of a coniferous tree located approximately 10 m (33 ft) west-northwest of the impact site (Figure 2). The tree damage and the damage to the helicopter indicated that the aircraft was in a steep nose-down, left-bank attitude when it struck the ground, on an approximate heading of 120° magnetic. The helicopter then pitched over and came to rest on its back.



The occupants were ejected from the helicopter during the impact. There is no evidence that either occupant had been wearing a seatbelt at the time of the occurrence; however, given the damage to the helicopter, the accident was not survivable.

### ***ELT***

During the impact sequence, the plastic mounting bracket for the 406 MHz ELT broke; however, the antenna and the remote switch wiring were still intact. The ELT was found in the OFF position; therefore, it did not activate during the crash or transmit a signal to the search-and-rescue satellite system. The pilot had removed the ELT in January 2019 for recertification and had picked it up from the avionics shop after the recertification was complete. The investigation could not determine who had re-installed the ELT. Because of the orientation of the ELT mounting bracket, the position of the switch cannot be seen once the ELT is installed in the helicopter.

### ***Flight plan or flight itinerary***

The *Canadian Aviation Regulations* (CARs) state that the pilot of a VFR flight must file either a flight plan or flight itinerary for any flight that is conducted more than 25 NM from the departure airport.

The pilot did not file a flight plan or flight itinerary for the occurrence flight. As a result, the occurrence helicopter was not reported overdue until the morning of 06 March 2019, over 36 hr after the occurrence.

### ***Night VFR***

The occurrence flight took place at night over remote areas with almost no ambient or cultural sources of light from the ground. Illumination from the moon was negligible and the nearest major light source was the city of Timmins, which is 18 NM east-southeast of the accident site.

The Robinson R66 Pilot's Operating Handbook states the following regarding night VFR and what happens when outside visual reference is lost:

“[the pilot] loses [...] his ability to control the attitude of the helicopter. As helicopters are not inherently stable and have very high roll rates, the aircraft will quickly go out of control, resulting in a high velocity crash which is usually fatal.

Be sure you NEVER fly at night unless you have clear weather with unlimited or very high ceilings and plenty of celestial or ground lights for reference.”

The principle behind VFR flight is that the pilot uses visual cues outside the aircraft (e.g. the horizon or ground references) to determine the attitude of the aircraft (position of the aircraft along the 3 principal axes of an aircraft—pitch, roll, and yaw—relative to the earth's horizon). Therefore, some basic requirements must be met when conducting a VFR flight, whether it is during the day or at night.

Night flying over featureless terrain, such as bodies of water or remote wooded terrain, is particularly difficult. These conditions are commonly described in the aviation community as a black hole, which refers to not having visual reference to the ground due to the absence of lighting. Under these conditions, it can be difficult or impossible for a pilot to discern a horizon visually, potentially leading to spatial disorientation and loss of control.

According to CARs sections 602.114 and 602.115, an aircraft on a VFR flight must be “operated with visual reference to the surface” regardless of whether it is operated in controlled or uncontrolled airspace. The CARs define surface as “any ground or water, including the frozen surface thereof”. However, the CARs do not define “visual reference to the surface”, which has been widely interpreted by the industry to mean visual meteorological conditions.

Therefore, a flight conducted over an area away from cultural lighting and where there is inadequate ambient illumination to clearly discern a horizon would not likely meet the requirements for operation under VFR (i.e. to continue flight solely by reference to the surface). Instead, such flights would require pilots to rely on their flight instruments to ensure safe operation of the aircraft.

### *Safety messages*

Maintaining adequate visual reference to the ground is crucial to the safety of flight under night VFR. During flight over remote areas with little ambient or cultural ground-based lighting, the conditions whereby visual reference to the ground can be maintained will vary depending on the illumination provided by the moon, cloud cover, and light sources within the aircraft itself. Continued flight in the absence of the required visual references would require the flight to be conducted under IFR. When flying VFR at night, pilots can unexpectedly lose visual reference to the ground even in good weather.

Night currency regulations help ensure the safety of pilots and passengers onboard aircraft operating at night, and it is important for pilots to maintain their regulatory currency.

When planning any VFR flight, pilots should conduct a thorough review of the expected weather and its effects on their ability to maintain visual reference to the ground, taking into account their own level of ability.

Filing a flight plan or a flight itinerary with the appropriate agency or a responsible person increases the likelihood that an overdue aircraft will be reported in a timely manner, and may increase the chance of survival in the event of an accident.

In the event of an accident, an armed and functioning ELT is a key factor in alerting search and rescue services.

## **TSB final report A19C0026—Wing lift strut assembly failure and collision with terrain**

### *History of the flight*

On 30 March 2019, a privately registered, ski-equipped Piper J3C-65 aircraft was conducting a visual flight rules (VFR) flight from Gun Lake, Ont., to Snowshoe Lake, Ont., approximately 53 nautical miles (NM) northwest of Kenora Airport (CYQK), Ont., with the pilot and 1 passenger on board. The purpose of the flight was to transport the passenger to a hunting and fishing outpost lodge to complete some renovations. The passenger was an employee of the pilot, who owned both the aircraft and the lodge.

On arrival at Snowshoe Lake, at approximately 13:19, the pilot conducted a low pass from a north-northwest direction, near the outpost lodge, to advise lodge guests of their arrival. During the low pass, control of the aircraft was lost and the aircraft struck the frozen surface of the lake. Bystanders at the lodge responded immediately and called for emergency services.

The pilot was fatally injured. The passenger received serious injuries and died 6 days later. The aircraft was destroyed. The aircraft was not equipped with an emergency locator transmitter (ELT), though one was required by regulation.

### *Aircraft information*

The occurrence Piper J3C-65 was a single-engine, high-wing, 2-place (tandem) airplane with a conventional landing gear and was manufactured by the Piper Aircraft Corporation in 1946. It had a total fuel capacity of 12 U.S. gallons and was certified for day-VFR operations only.

The occurrence aircraft was subject to U.S. Federal Aviation Administration Airworthiness Directive (AD) 2015-08-04, which required inspection of the main spar wing lift strut assemblies for corrosion. The AD became effective in June 2015 and is required to be complied with every 24 months. A review of the aircraft's maintenance records did not find any record of compliance with AD 2015-08-04.

### *Weight and balance*

A review of the aircraft's empty and operational weight and balance determined that the aircraft was operated within the specified weight and centre of gravity limitations.

### *Pilot information*

The pilot held a Canadian Commercial Pilot Licence–Aeroplane. Information gathered during the investigation indicated he had accumulated approximately 3 000 hours (hr) total flight time, of which approximately 2 500 hr were on the occurrence aircraft. Records indicated that the pilot was certified and qualified for the flight in accordance with existing regulations.

### *Weather information*

The aerodrome routine weather report (METAR) issued at CYQK—the nearest source of aviation weather, located 53 NM southeast of Snowshoe Lake—indicated that the weather at 13:00 (approximately 19 minutes before the accident) was as follows:

- winds from 320° true (T), varying from 280°T to 360°T, at 12 knots (kt), gusting to 19 kt
- visibility 15 statute miles (SM)
- few clouds at 4 300 feet (ft) above ground level (AGL) and broken ceiling at 7 200 ft AGL
- temperature −4 °C

The weather was not considered a contributing factor in the occurrence.

### *Wreckage examination*

The aircraft struck the frozen surface of the lake in an inverted position and at a shallow angle, with a high rate of vertical descent and at high forward speed. The aircraft came to rest in an upright position approximately 125 ft from the initial point of impact, facing north (Figure 1).





*Figure 1. Wreckage site (Source: TSB)*

The pilot flew the aircraft from the front seat and the passenger was seated in the rear of the aircraft. The aircraft was equipped with front and rear lap belts, and did not have the rear passenger seat installed. The investigation determined that the pilot and passenger were not wearing their lap belts at the time of the occurrence.

The aircraft was loaded with miscellaneous items that had not been secured.

An inspection of all flight control cables did not reveal any pre-impact anomalies. Damage to the engine and propeller suggests that the propeller was rotating and that the engine was producing substantial power at the time of impact.

An inspection of the airframe at the site revealed that the left main spar wing lift strut assembly separated near the lower fork end attachment (Figure 2). A visual examination of the wing lift strut assembly revealed excessive corrosion in the area of the separation. The failed wing lift strut assembly was sent to the TSB Engineering Laboratory in Ottawa, Ont., for further analysis.



*Figure 2. Damage on the upper half of the left main spar wing lift strut assembly (Source: TSB)*

### ***Aircraft wing structure***

The wings are attached to the top of the fuselage structure and supported approximately mid-span on each wing by front and rear wing lift strut assemblies. The Piper J3 series of aircraft was originally manufactured with wing lift struts equipped with 3/8-inch (in.) threaded fork ends. However, shortly after, the wing lift strut fork ends were increased in size to 7/16-in. threaded fork ends. Both types of wing lift struts were made of carbon steel and open at either end when the fork ends are removed. The occurrence aircraft was equipped with open-ended wing lift struts and 7/16-in. threaded fork ends.

In 1989, new sealed carbon steel wing lift strut assemblies were manufactured using 5/8-in. threaded fork ends. Installation of the new sealed wing lift strut assemblies terminates the recurring 24-month inspection requirement of AD 2015-08-04.

### ***Wing lift strut examination***

The TSB Engineering Laboratory's analysis of the failed wing lift strut assembly revealed that the failure was initiated by excessive corrosion and thinning of the load-bearing wall inside the wing lift strut, followed by fatigue, and eventual overload failure.

AD 2015-08-04 stipulates that either a punch test method outlined in the Piper Mandatory Service Bulletin (MSB) 528D or an ultrasonic method described in the AD itself may be used to inspect the wing lift strut assemblies to satisfy its requirements. If either of these tests identify significant corrosion, the AD requires that the wing lift strut assembly be replaced. The AD also allows for the replacement of the wing lift strut assembly instead of conducting one of the two permissible inspection methods.

The TSB Engineering Laboratory conducted further examination of the failed wing lift strut assembly and completed the punch test inspection prescribed in the MSB 528D, which states that if the punch test procedure creates a perceptible dent using a punch tester, then the wing lift strut assembly metal is corroded beyond specified limits and the wing lift strut assembly is to be replaced before further flight. If no perceptible dent is evident then the wing lift strut assembly can remain in service.

The alternative inspection method described by the AD is the ultrasonic method. Whereas the typical thickness of an exemplar wing lift strut assembly wall is between 0.034 and 0.041 in., the ultrasonic inspection procedure specifies that wall thickness measurements of 0.024 in. or less require replacement of the wing lift strut assembly prior to further flight. Although an ultrasonic inspection was not completed on the failed wing lift strut assembly, an examination using a scanning electron microscope was accomplished to take accurate measurements of wall thickness. This examination determined the following:

- the heavily corroded area on the lower half of the failed wing lift strut assembly had a remaining wall thickness between 0.002 and 0.019 in., well below the required minimum. Punch tests applied to this area revealed one perceptible dent.
- the corroded area of the upper half of the failed wing lift strut assembly had a remaining wall thickness between 0.021 and 0.031 in.; therefore, some areas were below the required minimum. Punch tests applied to these areas did not produce any perceptible dents.

### *Safety action taken*

On 31 July 2019, the TSB issued a safety advisory to regulators and the manufacturer of the occurrence aircraft advising them of the risk associated with the use of the punch test method mentioned in AD 2015-08-04 and prescribed in the MSB 528D.

### *Safety messages*

Maintaining aircraft in accordance with the required airworthiness standards is important to ensure that they are safe and fit for flight.

Ensuring that aircraft are equipped with a seat for every person on board is one way aircraft owners and operators can enhance the safety of flight. In addition, a restraint system is an important part of the safety equipment installed in aircraft that, when worn, can reduce the risk of injury or death in an accident.

Baggage and cargo carried on board should be properly secured to avoid shifting in flight and possible injury to pilots and passengers.

In this occurrence, eyewitnesses saw the accident happen and called for help immediately. When there are no eyewitnesses to an accident, ELTs are essential to alerting search and rescue organizations quickly.