



Transport
Canada

Transports
Canada



TP 185E
Issue 2/2014

AVIATION SAFETY LETTER

In this issue...

National Civil Aviation Security Program

CPDLC Improves Safety in Canadian Airspace

A Good Flight Plan May Be Your Saving Grace

How Safe Is DANGEROUS?

Floatplane Operators Association (FOA) Best Practices

Airport Paper Chase

Certificate of Registration

TSB Final Report Summaries

Take Five... Gear Down and Locked

*Learn from the mistakes of others;
you'll not live long enough to make them all yourself ...*

Canada

The *Aviation Safety Letter* is published quarterly by Transport Canada, Civil Aviation. The contents do not necessarily reflect official government policy and, unless stated, should not be construed as regulations or directives.

Letters with comments and suggestions are invited. All correspondence should include the author's name, address and telephone number. The editor reserves the right to edit all published articles. The author's name and address will be withheld from publication upon request.

Please address your correspondence to:

Paul Marquis, Editor

Aviation Safety Letter

Transport Canada (AARTT)

330 Sparks Street, Ottawa ON K1A 0N8

E-mail: paul.marquis@tc.gc.ca

Tel.: 613-990-1289 / Fax: 613-952-3298

Internet: www.tc.gc.ca/ASL

Copyright:

Some of the articles, photographs and graphics that appear in the *Aviation Safety Letter* are subject to copyrights held by other individuals and organizations. In such cases, some restrictions on the reproduction of the material may apply, and it may be necessary to seek permission from the rights holder prior to reproducing it. To obtain information concerning copyright ownership and restrictions on reproduction of the material, please contact the *Aviation Safety Letter* editor.

Note: Reprints of original *Aviation Safety Letter* material are encouraged, but credit must be given to Transport Canada's *Aviation Safety Letter*. Please forward one copy of the reprinted article to the editor.

Electronic distribution:

To subscribe to the *Aviation Safety Letter* e-Bulletin notification service, visit: www.tc.gc.ca/ASL.

Print-on-Demand:

To purchase a Print-on-Demand (POD) version (black and white), please contact:

The Order Desk

Transport Canada

Toll-free number (North America): 1-888-830-4911

Local number: 613-991-4071

E-mail: MPS1@tc.gc.ca Fax: 613-991-2081

Internet: www.tc.gc.ca/Transact

Sécurité aérienne — Nouvelles est la version française de cette publication.

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Transport (2014).

ISSN: 0709-8103

TP 185E

TABLE OF CONTENTS

section	page
Guest Editorial.....	3
Pre-Flight.....	5
Flight Operations.....	9
Maintenance and Certification	14
TSB Final Report Summaries.....	16
Accident Synopses	34
Take Five... Gear Down and Locked.....	Tear-off
Everything Moves At An Airport. Be Alert!.....	Tear-off



Emilia Warriner

National Civil Aviation Security Program

It goes without saying that aviation is a key enabler of our economy. The aviation industry in Canada transports 80 million passengers and \$110 billion worth of goods a year while employing 91 000 people. With annual passenger growth forecasted at 3%, the importance of aviation to the Canadian and the global economies will only continue to increase.

Recognizing its economic importance, terrorists continue to view aviation as an attractive and high value target and have continued to develop new attack methods. The attacks of September 11, 2001, demonstrated terrorist tradecraft evolution by moving from hijacking and bombings to commandeering an aircraft to use as a weapon. In 2006, a disrupted attempt sought to use liquid explosives in coordinated attacks on transatlantic flights. In the 2009 attempted bombing of Northwest Airlines Flight 253, a body-borne improvised explosive device was the weapon of choice. And then, in 2010, terrorists attempted to use explosives hidden in air cargo.

Simply put, terrorist tactics keep changing and governments and the aviation industry need to stay ahead of these threats. The challenge is developing regulatory frameworks that are flexible enough to adapt to new threats. This requires a multilayered approach to aviation security that better integrates the efforts of regulators, law enforcement, intelligence and industry.

Aviation security in Canada is a shared responsibility. Transport Canada, the Canadian Air Transport Security Authority, law enforcement, intelligence agencies, and industry partners all play important roles mitigating security risks. While our civil aviation system is one of the safest and most secure in the world, we need to be vigilant in order to detect, prevent, prepare for and respond to new and emerging threats.

As a road map for the way forward, Transport Canada published the National Civil Aviation Security Program (NCASP) in 2013. Released in response to the Commission of Inquiry into the Investigation of the Bombing of Air India Flight 182, the NCASP details the risk-based principles that inform Transport Canada's development of aviation security regulations, policies and programs.

The NCASP provides industry partners with a measure of predictability in the future direction of Canada's aviation security policies and regulations, while at the same time aiming to balance security with efficiency and fiscal responsibility.

To achieve this balance, the following principles guide our decision-making and program development: risk management; industry and government engagement and partnership; continuous improvement; and international compatibility.

The first principle recognizes it is impossible to prevent and deter all risks; the only way to eliminate all security risks to civil aviation is to not let planes fly, period. Rather, our focus should be on integrating our efforts to manage and mitigate risks.

To that end, Transport Canada developed a systematic way to share and assess threat and risk information with industry stakeholders, allowing them to develop programs tailored to the risks they face. On an annual basis, Transport Canada engages federal and industry partners to share and assess threat information. This practice guides and informs industry security practices and processes that are undertaken to meet regulatory responsibilities.

We recognize that we cannot develop aviation security policies and regulations in isolation from the industry partners we regulate and with whom we cooperate. As a result, Transport Canada undertakes consultations with industry partners ensuring their perspectives, capabilities and expertise are taken into account in program and policy development. We also adopt the same approach with other federal departments and agencies that have a role in aviation security. This wide-ranging engagement ensures our regulatory and policy frameworks are not developed in isolation and serves to facilitate implementation by industry and government partners.

Due to the changing nature of aviation threats, Transport Canada supports ongoing improvement and flexibility in the way our stakeholders meet their regulatory requirements and manage their risks. We are moving our policies and regulations from a prescriptive, “one-size-fits-all” basis to being focused on performance and security outcomes. Performance-based regulations, evidenced in new regulatory frameworks released last year, allow stakeholders to meet their regulatory goals and manage their risks in the manner that best fits their operating conditions and threat environments.

Working towards international compatibility involves promoting risk-based principles internationally. There are two ways of achieving this: by promoting these principles in policy and regulatory discussions at the International Civil Aviation Organization; and through bilateral mutual recognition agreements with individual countries.

On a multilateral basis, Transport Canada promotes outcome- and performance-based regulatory frameworks in the development of international aviation security standards and recommended practices.

Bilaterally, there are several risk-based initiatives deserving mention. In 2012, under the *Canada-U.S. Beyond the Border Action Plan*, we concluded an agreement with the USA, the highest volume destination for Canadian air travelers, allowing Canadians to use their NEXUS program membership for expedited screening at participating U.S. airports.

Under the same agreement, we are also working toward bilateral recognition of our hold baggage screening programs so that Canadian travelers transiting through U.S. airports would not need to have their baggage re-screened in the USA. In addition to addressing a major industry irritant and lowering operating costs, these agreements will facilitate the over 500 daily flights between our two countries.

We are also examining the possibility of developing similar agreements that would facilitate travel between Canada and key destinations, by mutually recognizing security regimes and practices. This would allow regulators to eliminate redundant security layers that incur costs and lead to travel inefficiencies.

To conclude, adopting a risk-based approach to aviation security aims at balancing security with efficiency and fiscal responsibility. It also means integrating the efforts of governments, law enforcement and industry to create a multilayered system able to identify and address new aviation security threats. By engaging and integrating our efforts with industry partners, we are better able to manage risk and reduce duplication of security processes. This not only facilitates legitimate trade and travel, but also lowers operating costs for our industry partners, whose security expertise and culture have matured over the past decade.



Emilia Warriner
Director, Aviation Security Policy
Aviation Security Directorate
Transport Canada



PRE-FLIGHT

<i>CPDLC Improves Safety in Canadian Airspace.....</i>	<i>5</i>
<i>A Good Flight Plan May Be Your Saving Grace.....</i>	<i>6</i>
<i>Consolidation of Civil Aviation Online Applications and Services Under New Web Portal</i>	<i>7</i>
<i>2014 Transport Canada Aviation Safety Award</i>	<i>8</i>

CPDLC Improves Safety in Canadian Airspace

by the Safety Planning, Performance and Promotion Division, NAV CANADA

Controller-pilot data link communications (CPDLC) is now in place in Canadian Domestic Airspace (CDA) above FL 290. The national rollout of CPDLC began with the Montréal flight information region (FIR) in December 2011, and by February 2013, it had been deployed in six out of the seven FIRs, representing over 90 percent of Canada’s 15 million square kilometres of domestic airspace.

At the time of writing, the final piece of the puzzle was scheduled to be put in place later this year, when high level air traffic controllers at the Toronto area control centre (ACC) start using data link to communicate with pilots flying in the Toronto FIR—the busiest of the seven managed by NAV CANADA. With that final piece, Canada will become the first—and to date, only—country in the world to have CPDLC capability in the entirety of its domestic airspace.

CPDLC enables controllers in ACCs and pilots in cockpits to communicate via data link or text-based messages instead of voice. Text-based messages initiated by either the pilot or controller can be related to altitude, speed and route clearances; change requests; frequency assignments; or any related air traffic service information.

Communicating by text message has multiple advantages over voice, but it is the improvement to safety that is the focus of this article. With data link there is no need to read back and hear back instructions, which in some cases need to be repeated several times because of poor radio reception or voice quality due to interference.

Miscommunication can be a serious problem, but there is much less chance of pilot-controller communication errors when both the pilot and the controller have the ability to read, or even print, their messages. This is especially advantageous for ATC communication with pilots whose first language is not English, a frequent occurrence as many intercontinental flights transit Canadian skies.

NAV CANADA has already seen a significant drop in communication errors where CPDLC is used. This applies not only to read-back hear-back errors, but also to miscommunications that may arise where aircraft have similar sounding call signs.



The fact that pilots and controllers have a direct line of communication with each other is also a factor in reducing communication errors, as clearances are going to the right aircraft. There is no call sign confusion between Air Transat 115 and Air Canada 115, eliminating the chance of an aircraft getting the wrong clearance. It’s like moving from an analogue “party line” to direct digital communication.

Another safety benefit is in Canadian Northern Domestic Airspace (NDA), where most of the remote VHF radio frequencies don’t offer coverage redundancy in the event of a failure. CPDLC covers for frequency outages or maintenance, allowing controllers and pilots to stay in contact.

Furthermore, CPDLC eliminates a lot of noisy chatter in the operations room at the ACC and reduces the sound of constant radio communications in the cockpit. And a quieter workplace improves concentration.

How does CPDLC work?

CPDLC employs a series of standardized text messages for most routine communications. These include over 200 “uplink messages” (from ATC to the cockpit) and more than 100 “downlink messages” (from the flight crew to controllers). Pilots and controllers also have the option of sending free-text messages.

For the most part, CPDLC works with the click of a mouse. Controllers have drop-down menus on their screens with the standard messages. Menus are divided into different categories to make the appropriate message easier to find. Each ACC can modify their drop-down menus and choose which messages are contained in each message group.

For instance, the *Maintain (Alt)*, *Climb to and Maintain (Alt)*, *Descend to and Maintain (Alt)*, and *At (POS) Climb to and Maintain (Alt)* would likely go under the *Altitude* drop-down

menu. Other common drop-down menus are *Radio*, *Route*, *Speed*, and *Free text*. There are also quick-response buttons for *Unable*, *Roger*, *Negative*, *Standby* and *Deferred*.

For downlink messages that require a response, the controller just has to click on that message and the appropriate drop-down menu, and the response is highlighted in green (as opposed to white), making the messages easier to find.

Usage and equipage


The number of monthly CPDLC contacts in domestic airspace has almost tripled in the 14-month period from November 2012 to December 2013: from just under 18 000 to nearly 53 000.

Those numbers are expected to continue to rise as the CPDLC equipage rate increases.

The percentage of CPDLC-equipped flights in Canada's domestic high level airspace varies according to geographical

location, from 27 percent in the central Canadian FIRs, to 79 percent near the country's east coast.

In addition to the many safety enhancements, CPDLC adds an important efficiency benefit. As the need for voice communications decreases, the problem of radio frequency congestion becomes less of an issue. CPDLC also has a multiplier effect on alleviating frequency congestion when you calculate the number of flights using CPDLC. If one data link message can eliminate even 30 seconds of airtime, that can translate to 15 or more hours per day of voice communications taken off the airwaves.

And finally, for those of you who are wondering about the safety of pilots "texting while flying", it is always the pilot monitoring (PM) who sends and receives the messages. 

A Good Flight Plan May Be Your Saving Grace

by Captain Jean Houde, Aeronautical Coordinator, Joint Rescue Coordination Centre Trenton

Our last contribution to this newsletter covered the close relationship between your ELT and the SAR system, more specifically the abundance of false alarms mainly due to beacon mishandling.

To reduce the rate of false ELT alarms, our recommendation was for all aircrew to dial 121.5 MHz on their radio prior to shutdown, notify ATC as soon as they notice an inadvertent activation and very seriously consider purchasing a 406 MHz beacon if they have not already done so. Strangely enough, we have noticed a slight reduction in such incidents over the last year. Is the message getting through?

In this issue, let's focus on the number two cause of SAR system activation: the flight plan. The flight plan is sometimes filled out in haste and with little thought as to how crucial it may become a few hours later. But aviators should realize that it circulates deep within NAV CANADA after it is submitted.

Once a VFR or IFR flight plan is activated, it remains open until you close it through an ATC agency at your arrival aerodrome. If a flight plan is not closed within 60 min, it is categorized as an overdue aircraft situation which activates the SAR system. When that happens, many people and agencies are pulled into the picture including ATC, the Joint Rescue Coordination Centre (JRCC), local police and airport operators.

The JRCC aeronautical coordinator is notified the moment an aircraft is deemed overdue and creates a new SAR case file, which entails initial search planning and mission coordination.

Preliminary investigation work includes ramp checks at the departure and arrival airports, often conducted by local police in the middle of the night. Emergency contacts are notified, the flight plan is analyzed, the route is verified, possible alternates are considered, weather throughout the proposed flight ascertained, a communication search is conducted and so on.

If the situation cannot be resolved quickly, SAR resources are tasked to commence the search.

When you complete your flight plan, it is vital that the route you file is accurate. Deviations from your filed plan are made at your own peril because, should you run into trouble, your flight plan indicates where we begin our search.

If you must deviate from your flight path, report to ATC directly or via relay through any passing aircraft above you. The crew of a commercial airliner at FL410 will hear your transmission up to 250 NM away because they monitor 121.5 MHz. Providing regular reports to ATC along your route will help us to determine how far you have progressed along your track. This information will ultimately help us better focus SAR assets and increase your chances of being found sooner.

Unlike the old days of watch-map-ground, most pilots rely on GPS to take them safely to destination so we tend to find most missing aircraft in close proximity to the filed track.

Always use Zulu time instead of local time to mark your departure. Pilots often use local time which can cause considerable

confusion. Be precise in calculating your endurance as it helps us determine how far you could have flown and ultimately determines the size of the search area.

Do not list yourself as the emergency contact if you are the one flying the aircraft. Ensure that your emergency contacts can be reached and have information regarding your whereabouts and/or your aircraft.

Once safely arrived at destination, remember that no job is finished until the paperwork is done. Make sure your flight plan is closed and check your ELT before shutdown. Tie a string on your thumb, if you have to, as a reminder before you leave the hangar and head home.

Even though it is not mandatory to file a flight plan when you fly within 25 NM of an aerodrome, let a responsible person know where you are going and have them call the JRCC or any ATC agency should they feel uneasy regarding your whereabouts. A 25-NM radius around an aerodrome is a larger search area than you think. In the absence of a flight plan with a clear proposed route, we have to search in ALL directions from the aerodrome and as far as your endurance can possibly take you. Imagine the size of the search!


Prepare for the elements

No one expects to spend one or several nights in the wilderness after taking off. But it happens, so you should be prepared.

Dress for the occasion and in accordance with the outside weather in the region you are flying; bring survival gear, warm clothing, signaling equipment, matches, non-perishable food, water, etc. Since everyone carries a cell phone these days, carry yours with a full battery and leave it on throughout the flight. You would be amazed how many search areas were significantly reduced simply through cell phone pinging.

Better yet, because cell phones can be so helpful in resolving cases, bring a spare charged battery with you. Stay with the aircraft unless it puts you in danger; too many people walk away and this makes it even more difficult to find them. If your radio still works, make regular broadcasts on 121.5 MHz. If you can, start a fire and keep it going during the night. A fire stands out for many kilometres when seen from the air.

If you are in distress, ensure your ELT is activated—keep it activated until you are safely rescued. Leaving your beacon on even after you've been spotted by air is one more way you can help us help you.

All this to say: please be diligent in completing your flight plan, provide us with a means to contact a responsible person who can give us answers, stick to your filed route, expect the unexpected and call ATC after you land. The SAR service is here for you, but we need your help to find you in the most expeditious way. Safe flying! 

Consolidation of Civil Aviation Online Applications and Services Under New Web Portal

Please note that external Web site access to the following Civil Aviation applications and systems can now be found at a single portal:

- Approved Aircraft Simulators and Flight Training Devices (AASFTD)
- Approved/Accepted Organizations (AO)
- Authorized Person—Flight Crew Licensing (AP FCL)
- Delegates Information System
 - Airworthiness Engineering Organization (AEO)
 - Approved Check Pilot (ACP)
 - Design Approval Organization (DAO) [*This includes the authorized person(s) within the DAO.*]
 - Design Approval Representative (DAR)
- Flight Training
- Minister's Delegate—Maintenance (MDM)
- Operator List Search (OLS)

This change was necessary to ensure that Civil Aviation conforms fully to the Web Content Accessibility Guidelines (WCAG) and allowed for the decommissioning of six external Web portals. As part of the move towards a consistent layout for Government of Canada Web sites, stakeholders are able to find search utilities more easily via the new Web portal.

This new external Web portal was launched in May 2014. Anyone accessing the old Web portals will be redirected to the new site with a recommendation to change their bookmarks to the new Web portal address. Please note that redirection to this new site will only be in place for six months.

The new Web portal address is <http://wwwapps.tc.gc.ca/Saf-Sec-Sur/2/CAS-SAC/>. 



Left to right: Gilles Lapierre, President, Aviateurs et pilotes de brousse du Québec; Martin Eley, Director General of Civil Aviation, Transport Canada; Jean-Pascal Légaré, Regional representative, Québec region, Transport Canada; Bernard Gervais, Vice-President, Member Services, Aviateurs et pilotes de brousse du Québec; and The Honourable Lisa Raitt, Minister of Transport.

The Transport Canada Aviation Safety Award acknowledges the recipient's sustained commitment and exceptional dedication to Canadian aviation safety over an extended period of time. For 2014, the award was presented to the *Aviateurs et pilotes de brousse du Québec* (APBQ) for their outstanding contribution to aviation safety.


The not-for-profit organization's mission is to bring together and represent Quebec aviators in order to promote recreational aviation and bush flying; protect the right to fly; promote flight safety and accessibility; facilitate discussion among members; and provide access to assistance, training and information resources.

A passion for aviation and bush sports unites APBQ's members, who come from diverse backgrounds. Founded in Montréal in 1979 as the *Association des pilotes de brousse du Québec*, the APBQ now has nearly 1 800 members, primarily in Quebec, but also in other parts of Canada and the world. While it was

originally an organization of bush pilots, today the majority of APBQ members are pilots of all types, with qualifications ranging from recreational permits to airline pilot licences.

Bush pilots were vital to the discovery and early development of Canada's natural resources. Canada would not be the strong and vibrant country it is today without those aviation pioneers, or without John Alexander Douglas McCurdy whose first flight we celebrate on National Aviation Day, February 23. In the same way, those represented by the APBQ are intrinsic to Canada's internationally recognized aviation safety record.

The APBQ continues to act as a leader and role model in innovation, training and advancement, striving towards greater aviation safety in Canada and around the world.

Transport Canada encourages you to nominate an individual or group who deserves recognition for next year's Aviation Safety Award. For more information, please visit www.tc.gc.ca/aviation-safety-award. 

Worth Watching—Again! AOPA's *No Greater Burden: Surviving an Aircraft Accident*

The story of Russ Jeter and his son Jacob

Produced by the Air Safety Institute division of the Aircraft Owners and Pilots Association (AOPA) Foundation, this powerful video brings home a very important message for all of us. Click on the linked title above to view. It is time well spent!



How Safe Is DANGEROUS?.....	9
Floatplane Operators Association (FOA) Best Practices	11
Airport Paper Chase.....	12

How Safe Is DANGEROUS?

by Scott Tyrrell, International Helicopter Safety Team (IHST) member
Article republished with the kind permission of the IHST.



In the 1979 courtroom drama film titled *And Justice For All*, an eccentric judge played by actor Jack Warden takes a lawyer played by Al Pacino for a hair-raising ride in his personal Bell 47 helicopter over the Baltimore harbour and Fort McHenry. The judge laughs as he tests how far they can possibly go without running out of fuel, while

Pacino’s character, his terrified passenger, begs him to land the helicopter immediately. The judge is a veteran of the Korean War, is possibly suicidal, keeps a rifle in his chambers at the courthouse and a 1911 pistol in his shoulder holster, and eats his lunch on the ledge outside his window four stories up.

There are many who believe that reality mirrors film and that some films mirror reality; but certainly this type of dangerous behavior doesn’t exist in the world of aviation where professionalism, rules, regulations and extensive training are required prior to entering the cockpit. The actual facts, however, may be surprising.

The International Helicopter Safety Team (IHST) was formed in 2005 to lead a government and industry cooperative effort to address factors that were affecting an unacceptable helicopter accident rate. The group’s mission is to reduce the international civil helicopter accident rate by 80% by 2016.

Human factors and pilot decisions

An IHST subcommittee of helicopter experts, from government and industry, called the U.S. Joint Helicopter Safety Analysis Team worked from 2006 to 2011 to complete an in-depth analysis of three years (2000, 2001, 2006) of U.S. helicopter accident data. The analysis team used 15 different industry categories to categorize each of the 523 accidents.

In describing why each accident happened, the analysis team organized their findings from each accident into standard problem statements. The team arranged the standard problem statements according to a continuum of detail that ranged from high level (Level 1), to more detailed (Level 2) and to the most specific level of detail (Level 3). Pilot Judgment & Actions was noted as a Level 1 standard problem in 969 instances within the

523 accidents studied. This indicates that there were many cases where Pilot Judgment & Actions was cited multiple times in the same accident.

Within the area of Pilot Judgment & Actions, the IHST analysis team also noted that the Level 2 standard problem of Human Factors—Pilot’s Decision occurred frequently across a high number of accidents. Finally, the Level 3 area associated with Human Factors—Pilot’s Decision resulted in the following table:

Standard Problem Statement	Count	Percentage of ALL Occurrences
Level 3 for Human Factors—Pilot Decision		
Disregarded cues that should have led to termination of current course of action or manoeuvre	92	8.6%
Pilot decision-making	45	8.6%
Willful disregard for rules and SOPs	32	6.1%
Failed to follow procedures	28	5.4%
Pilot misjudged own limitations/capabilities	25	4.8%
Willful disregard of aircraft limitations	11	2.1%
Disregard of rules and SOPs	11	2.1%
Management disregard of known safety risk	9	1.7%
Not in possession of valid airman/medical certificate	8	1.5%
Sense of urgency led to risk taking	6	1.1%
Failure to enforce company SOPs	4	0.8%
Pilot disabled warning system	2	0.4%
Human factors—Pilot’s decision—Other	1	0.2%

If the pilots had chosen a different decision or operation to follow, this could have led to the elimination of a number of these accidents and would have certainly been a step in the right direction towards the IHST goal of an 80% reduction in the accident rate.

Possible preventions

To describe how each accident could have been prevented, the team organized their analysis from each accident into intervention recommendations.

They are included in the following tables:

Level 1 Safety Management Systems Level 2 Risk Assessment/Management Level 3 Intervention Recommendations	Count	Percentage of ALL Occurrences
Use Operational Risk Management Program (Pre-flight and In-flight)	62	11.8%
Personal Risk Management Program (IMSAFE)	53	10.1%
Mission-Specific Risk Management Program	41	0.7%
Establish/Improve Company Risk Management Program	5	0.1%

Level 1 Training/Instructional Level 2 Safety Training Level 3 Intervention Recommendations	Count	Percentage of ALL Occurrences
Training emphasis for maintaining awareness of cues critical to safe flight	47	8.9%
Risk assessment/management training	28	5.4%
Aeronautical decision-making training	26	5.0%
Flight training on common operational pilot errors	19	3.6%
Pilot judgment training risk assessment	15	2.9%
Crew resource management training	14	2.6%
Training emphasis on techniques for maintaining visual alertness	10	1.9%

Rogue behavior

Recent National Transportation Safety Board (NTSB) accident reports have revealed that these types of accidents are still occurring in today's environment of aviation professionals. Examples of helicopter pilots exceeding their presumed flying qualifications or level of expertise can be found in recent news headlines:

"Helicopter pilot killed trying to herd plastic-wrapped bull"

"Helicopter crashes while flying out of hangar"

Former pilot and internationally recognized expert in the field of aviation human error, Tony Kern, explains this issue succinctly:

"Failures of flight discipline can—in a single instant—overcome years of skill development, in-depth systems knowledge and thousands of hours of experience."

The aviation community must demand accountability at all levels so that full adherence to the highest level of flight discipline will ensure the safest flying environment. At risk behaviour—a behaviour in which an individual is willing to assume *unnecessary risks* while performing a particular task in his or her everyday life—along with rogue management, operations, pilots, aircrew and maintainers have no place in the profession of aviation.

Ignoring the rules

A clear example of at risk behaviour occurred on October 15, 2002, when a chief flying instructor (CFI) was providing night VFR cross-country instruction to a student in a Schweizer 269C helicopter. They had discussed their low-fuel situation, but elected not to stop and refuel because neither had a credit card.

On the last leg of their flight, the low-fuel light illuminated, followed a few minutes later by complete loss of engine power. During the autorotation, the helicopter was substantially damaged when it struck trees and the tail boom separated from the airframe. Miraculously, neither pilot was injured.

This is not the first accident of this kind and, unfortunately, probably will not be the last. The IHST analysis team's data revealed 12 occurrences of the standard problem *unaware of low fuel status leading to fuel starvation/exhaustion*, and this accounted for 2.3% of all accident occurrences. A quick FAA Rotorcraft Accident Database query of "fuel exhaustion", during the five calendar years from 2007 to 2011, results in 14 accidents with six fatalities.

During that helicopter scene in the movie *And Justice For All*, after a low level flight under a bridge and in close proximity to other structures, the judge reaches the infamous halfway point for his fuel. After repeated requests from Pacino, the judge finally

turns the helicopter and heads back to the heliport. Pacino is terrified that they will not make it back and the judge tells him to trust his instincts. Shortly thereafter, however, the engine experiences fuel exhaustion and quits. The judge enters into an autorotation manoeuvre and lands short in shallow water. He says, “almost right on the button. I told you that I had good instincts. Another 90 ft and we would have made it. Let’s swim to the shore.”

What’s the lesson to be learned? It’s simple. The “Rules of Aviation” may sometimes appear unintelligent, arbitrary or irritating. But only dumb luck will help you if you break them.

Scott Tyrrell, a former U.S. Air National Guard officer, is a Continued Operations Specialist and Accident Investigator in the FAA Rotorcraft Directorate. His previous experience includes over 20 years in aircraft maintenance, including extensive knowledge of C-130 aircraft maintenance, as Commander of an Aircraft Maintenance Squadron and Mission Support Group. △

Floatplane Operators Association (FOA) Best Practices

by Tim Parker, Treasurer, Floatplane Operators Association and Operations Manager, Pat Bay Air Seaplanes

Commercial floatplane travel is an every day occurrence on the West Coast, but not all of that travel is the same. Some operators fly tree fallers into camp, others fly tourists to fishing lodges. Commuters and business travellers fly to and from Victoria and Vancouver.

For the Floatplane Operators Association (FOA), this varied market creates challenges when designing best practices—the FOA’s core mandate. Best practices need to be clear and concise because members need to understand the rationale behind each best practice. With this understanding, members can agree on what is required.



The FOA’s membership runs the gamut from large floatplane airlines that employ hundreds of people and operate in a very public sphere, to smaller companies that operate in remote locations, far away from the public. Float flying is also a segment of the industry that is often the entry point for new commercial pilots who may be influenced by the actions of their peers. Because of the variety in operator and pilot experience, it was felt necessary to implement a standard level of professionalism in an aviation segment that has sometimes been portrayed as having a cavalier attitude toward safety and rules.




The idea is that FOA member pilots will adhere not only to the *Canadian Aviation Regulations* (CARs) but also to FOA best practices. In many instances, these best practices go beyond the CARs or include concepts not yet addressed in regulations. A perfect example of a best practice not covered by regulation is the practice of not flying after sunset. It’s perfectly legal to fly until grounding time, but scheduling a flight between sunset and grounding time uses up any cushion for unexpected delays. Furthermore, when it comes to training and technology, regulations often just can’t keep up due to the complex process of creating and promulgating new regulations. FOA best practices include requiring pilots to have underwater egress training and floatplanes to be equipped with a satellite tracking device. These requirements are not in the CARs which means a FOA member adhering to the best practices is safer than an operator who just follows the CARs.

So how does the FOA create these best practices? We have a board that is truly representative of member operators—from single-plane outfits to the biggest floatplane operator in the land. The board can draw on a breadth of knowledge going back decades and spanning the country. At the board level, we share what each member does to increase safety and reliability for their organization. What in the past would have been considered proprietary information belonging to a particular company is now readily shared. This information can help us learn what flight following device works best for a company of a given size and how to go about creating a segmented weight system for an airline. It can also improve delivery of pilot decision making (PDM) and underwater egress training by including pilots from

different companies in a single class. This is especially useful for smaller operators. This sharing of information makes it easy to write a fairly simple best practice that all members can follow.

But at its core, the idea of best practices requires the *buy in* of the membership. If they don't see a benefit in being members

or adhering to best practices, the whole exercise is futile. For our members the *buy in* is that the existence of the FOA enhances the credibility of floatplane travel as a safe, professional and efficient means of transportation in Canada. For more information about the FOA, visit www.floatplaneoperators.org. 

Airport Paper Chase

by Michael Oxner. This article was previously published in the March-April 2013 issue of *Canadian Aviator* magazine and is republished with permission.

Recently, I rejoined the ranks of current pilots. After a while out of the cockpit, I knew I had more to do than just “kick the tires and light the fires.” Part of being a good pilot is being prepared, and part of being prepared is getting set up with charts.

Have current information
before you taxi

Controllers talk to pilots who don't have current publications—or fly with no publications at all—with unfortunate regularity. Sometimes, it's a matter of an unscheduled stop in a region that the flight simply isn't planned for. Other times, it's a variety of other possibilities ranging from thinking we know all we need to know to just not thinking about that one aspect of the flight.

Something that struck me while taxiing on my flight was just how far my mind had come from the airport environment in those few years. Happily, I was flying at an airport that I knew fairly well, since I had flown there in the past and since I serve that airport in my regular air traffic control duties. In fact, most airports I have flown out of are either very simple (one runway and one taxiway, for example) or are places that I became familiar with for other reasons in the past before flying there. Because of this, a chart of the airport wasn't high on the list of needs in my mind.

That said, runway incursions are a serious concern. It was identified that some pilots are unfamiliar with the airports they were operating out of, and that airport information had to be made available to pilots. There are well-designed airport charts in the *Canada Air Pilot* (CAP), which include all the standard instrument departures (SIDs), standard terminal arrivals (STARs) and instrument approach procedures. Not many VFR

pilots would think of carrying such a chart collection since these are primarily targeted at IFR pilots. But those airport diagrams would be very useful indeed for VFR pilots.

NAV CANADA has made the airport diagrams from the CAP available to pilots free of charge on their Web site. A pilot with internet access can visit <http://www.navcanada.ca> and, from the menu options on the left-hand side, select “Aeronautical Information Publications” and then “Canadian Airport Charts” from the sub-menu that loads afterward¹. This link will allow you to download a PDF version of these charts that can be printed out and taken with you in the cockpit as a reference.

Just make sure you have the current charts before your flight. When you receive instructions from ATC while taxiing, you will have a reference map if you need one. Signs are posted around the airfield, for reference on the move. The charts can be used when ATC is issuing taxi instructions so you can visualize your assigned route, plan ahead and see where the “hot spots” are. These potentially tricky areas are highlighted on the charts to call a pilot's attention to the areas identified at the airport where traffic conflicts can occur. ATC is also aware of these places and they tend to keep a close eye on them, but an alert pilot can help keep these hot spots cold.

If you don't happen to have a copy of the airport chart handy and are unfamiliar with the aerodrome, letting ATC know that fact can be helpful. Controllers have a lot of things to do, both on and off the radio, and when a pilot acknowledges instructions, it is expected that the pilot will taxi as instructed. Sometimes, though, a pilot can take a wrong turn. If a wrong turn is made, make sure the ground controller knows—the sooner, the better.

An unfamiliar pilot can also request progressive taxi instructions². This takes a little extra effort from the ground controller, but usually ATC would rather make this effort than have you end up somewhere you shouldn't be—especially if

- 1 The NAVCAN Web site was updated since the original publication of the article, and the [Canadian Airports Charts](#) are now in the Related Links section of the Aeronautical Information Products page.—Ed.
- 2 It should be pointed out that the “progressive taxi” procedure is not formally defined or used in MANOPS, nor in the TC AIM. It remains a discretionary service that ground controllers may or may not be able to offer.—Ed.

it's an active runway. Progressive instructions would include “turn-by-turn guidance” as the global positioning system (GPS) designed for driving would call it these days and it can help if you forget your charts.

As useful as these airport charts are, they're not a complete list of essentials for pilots. The *Canada Flight Supplement* should be carried as well, as it includes VFR Terminal Procedures Charts and the critical details of various airfields. Also, a current VFR navigation chart (VNC) has areas of interest plotted, like restricted areas and airspace boundaries related to ATC (such as control zones, terminal areas, etc.).

Again, a pilot may wind up in a situation unexpectedly and need information that isn't being carried. In such a case, a call to ATC or FSS can yield the needed information since staff there have copies of the same publications. As long as you know who to call and how to get a hold of them, ATC and FSS personnel can help. It's a good idea to sit down, peruse the charts to see where this information can be found and become familiar with the locations along your route of flight during the planning stage.

Sometimes it's hard to break down and ask for help. After all, we're trained as pilots to be cool and prepared, so admitting you're not isn't fun. But ATC is just a call away if this kind of help is needed. Flight safety is their job, and if they can help, they will. △

TC AIM Snapshot: Flight Operations in Sparsely Settled Areas of Canada

“Sparsely settled area” is no longer a defined area. As such, the pilot/operator must decide what survival equipment is to be carried on board the aircraft in accordance with the regulations.

CAR 602.61, “*Survival Equipment—Flights Over Land*”, regulates the survival equipment required for aircraft operations over land in Canada. The regulation requires a pilot to carry on board the aircraft survival equipment sufficient for the survival on the ground of each person on board, taking into consideration the geographical area, the season of the year, and anticipated seasonal climatic variations. The survival equipment must be sufficient to provide the means for starting a fire, providing shelter, providing or purifying water, and visually signalling distress. The AIR Annex contains a Table that is a useful guide in helping pilots and operators choose equipment to ensure that they are operating within the regulations.

Experience has shown that pilots who are not familiar with the problems associated with navigating as well as other potential dangers of operating aircraft in sparsely settled areas of Canada tend to underestimate the difficulties involved.

Some pilots assume that operating in this area is no different than operating in the more populated areas. This leads to a lack of proper planning and preparation that can result in pilots exposing themselves, their crew, passengers and aircraft to unnecessary risks. This in turn can lead to considerable strain being placed on very limited local resources at stop-over or destination aerodromes. It has resulted in lengthy and expensive searches that could have been avoided with careful planning and preparation. Also, it has resulted in unnecessary loss of life.

Sparsely settled areas of Canada require special considerations for aircraft operations. For further information, please refer to the [Transport Canada Aeronautical Information Manual \(TC AIM\)](#), Section AIR 2.14.



Certificate of Registration

by Brian Clarke, Program Manager, Operational Airworthiness, Standards Branch, Civil Aviation, Transport Canada

Aircraft owners and operators go to considerable trouble and expense to ensure that their aircraft is airworthy and that their Certificate of Airworthiness remains valid. An aircraft's Certificate of Registration sometimes needs attention too.

A Canadian Certificate of Registration includes the registered owner's name and address. That means that, as an aircraft owner, when you move, you have to change the address on your Certificate of Registration. In fact, you're obliged to do so by Canadian Aviation Regulation (CAR) 202.51—[Change of Name or Address](#).

As a service to owners and operators, the Continuing Airworthiness section of Transport Canada Civil Aviation (TCCA) sends Airworthiness Directives (AD) to the registered owner's address as it's recorded in the [Canadian Civil Aircraft Register \(CCAR\)](#) database. A percentage of each mailing comes back as undeliverable, and that's a concern. What if the aircraft owner, who is responsible for the maintenance of the aircraft and AD compliance, never hears about an AD and doesn't arrange for compliance with it? At best, the Certificate of Airworthiness is rendered invalid; and at worst, a tragedy happens. While an owner can perform a search for applicable AD on the [Continuing Airworthiness Web Information System \(CAWIS\)](#), TCCA has an obligation to send out ADs by mail so it makes sense to keep your information up to date.

Please check the address on your Certificate of Registration.

There is no fee to reissue a Certificate of Registration for a change of address.

To change the address on your Certificate of Registration, go to our [Aircraft Registration and Leasing Web Page](#), and under the "How Do I?" section, click on "[Change My Address on My Certificate of Registration? \(TP13305\)](#)", and follow the procedure as indicated. Alternatively, you can contact your new TCCA regional office.

If you've lost your certificate, you can get a [replacement](#). If you need to keep flying while waiting for the replacement, you can apply for a temporary certificate. (CAR 202.25—[Issuance of a Certificate of Registration](#))

Changing the address on your Annual Airworthiness Information Report (AAIR) does not change the address on your Certificate of Registration.

Changing your address in other TCCA databases (pilot or engineer licence, etc.) does not change the address on your Certificate of Registration.

You can initiate the change of address process via the [General Aviation Licensing & Registration On-Line \(GALRO\)](#) system; however, the Certificate of Registration is a fundamental and important document and regional officers cannot change the name or address on a Certificate of Registration unless the requirements set out in the CARs are fulfilled. Similarly, they can't process a change based *solely* on an e-mail or telephone message.

If you operate a leased aircraft, TCCA would like to remind you that when your lease is up, your Certificate of Registration is automatically cancelled. If you renew a lease, please let your regional office know. (CAR 202.57—[Conditions Where Certificate of Registration Is Cancelled](#))

Where custody and control of an aircraft changes, the registered owner has an obligation to inform TCCA. Amongst other provisions, see CAR 202.35—[General](#), CAR 202.38—[Exporting an Aircraft](#) and CAR 202.58—[Notification Regarding Destroyed or Missing Aircraft](#).

If you need additional information, please contact your regional office. [△](#)

Understanding Tools and Equipment Equivalency

The Boeing Company *AERO* magazine recently published an excellent article on tooling by Giday Girmay titled "Understanding Tools and Equipment Equivalency". Recommended reading for our maintenance audience! It can be found at www.boeing.com/commercial/aeromagazine/articles/2010_q3/5/



SMS

WORKING TOGETHER FOR THE SAFETY OF EVERYONE

This safety poster was created by Pete and Andrew Laitinen and is reprinted with the kind permission of [Metro Aviation](#), Shreveport, Louisiana



The following summaries are extracted from final reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include the TSB's synopsis and selected findings. Some excerpts from the analysis section may be included, where needed, to better understand the findings. Unless otherwise specified, all photos and illustrations were provided by the TSB. For the benefit of our readers, all the occurrence titles below are now hyperlinked to the full TSB report on the TSB Web site. —Ed.

TSB Final Report A10Q0148—Loss of Visual Reference—Collision With Trees

On September 1, 2010, at 15:29 EDT, a Eurocopter AS350 B-2 departed on the 85-NM VFR flight from a worksite to the Hydro-Québec helicopter base near Chibougamau, Que., with the pilot and three passengers on board. Approximately 20 NM northwest of the destination, the pilot deviated from the direct route to make a precautionary landing due to reduced visibility in heavy rain and thunderstorms. On final approach to land, and at approximately 70 ft AGL, the pilot lost all visual reference. The aircraft collided with trees coming to rest on its left side. The pilot and the passenger seated in the front were seriously injured. The two passengers seated in the rear suffered minor injuries. The aircraft sustained substantial damage. There was no post-crash fire. The ELT activated on impact. *The TSB authorized the release of this report on December 12, 2011.*



Analysis

As no aerodrome forecast (TAF) for Chibougamau (CYMT) was available when the pilot was flight planning early in the morning, the graphic area forecast (GFA) was consulted. The GFA available to the pilot at the time of planning did mention the probability of isolated cumulonimbus clouds with tops to 40 000 ft ASL, 2 SM visibility in thunderstorms, rain and mist. The pilot was aware that the cold front was expected to move through the Chibougamau area around 16:00.

Except for the line of thunderstorms that passed through the worksite at approximately 14:30, visual meteorological conditions (VMC) prevailed throughout most of the day between Chibougamau and the worksite. The pilot did not feel it necessary to obtain a weather update during the day though there were opportunities to do so—at 11:01 when refuelling or at anytime using the satellite telephone. Obtaining a weather update before departing or while en route for the return flight at 15:30 would have made the pilot aware of the significant meteorological information (SIGMET) issued at 14:40 indicating the presence of thunderstorms in the Chibougamau area.

The pilot delayed departure from the worksite until approximately 30 min after the passage of the thunderstorms and associated heavy rain. The speed of the helicopter, however, allowed it to catch up with the front between 40 and 20 NM from destination, where visibility started to decrease: first in light rain, then in moderate rain and, finally, in heavy rain.

When visibility decreased to approximately 1 mi. in moderate rain, the pilot elected to deviate from the direct GPS route toward a blueberry field to execute a precautionary landing and wait for better conditions. At no time prior to this did the pilot think it necessary to change course and fly out of the line of thunderstorms. The pilot knew the terrain well and therefore, at that point in the flight, did not perceive any risk in continuing. When visibility decreased further in heavy rain, the pilot was compelled to land immediately on the gravel road. The pilot was aware that the rain was intensifying as the aircraft approached its destination; however, the pilot was surprised by the suddenness of the decrease in visibility as the decrease had been gradual over the last 20 to 30 NM and the cloud ceiling had remained VMC. Visual reference with the ground and trees was lost while manoeuvring at low speed, on final approach to the road. While in a hover over the trees, 75 ft from the road side, the helicopter descended vertically without the pilot realizing it and struck the trees and then the ground. The helicopter was not equipped with windshield wipers which might have been useful in this phase of flight and in the weather conditions encountered. The decision to deviate out of the weather and land was taken too late.

Some aviation weather forecast products mentioned the thunderstorms in the Chibougamau area but did not specify their location and displacement. There was a noticeable lack of information on the probability of thunderstorms in the CYMT TAF issued at 14:00 and on the displacement of the line of thunderstorms in the SIGMET issued at 14:40. Notwithstanding, the line of thunderstorms associated with the passage of the cold front was noticeable over a period of several hours on satellite imagery, the Canadian Lightning Detection Network (CLDN) and weather radar images. Chibougamau falls outside the coverage area of those radars and any thunderstorms within 40 SM of Chibougamau Airport would not appear on the weather radar imagery.

Although injuries sustained by the two front occupants were serious, they were not life threatening. Rapid rescue response is essential to survivability, especially when occupants are injured. The safety briefings received by passengers prior to flying were useful in providing them with essential information on the ELT, survival equipment, satellite phone and first aid kit. The passengers' ability to quickly communicate with the operator enabled both the company and first responders to react rapidly: a company helicopter was on site within 40 min of the occurrence and two ambulances were on site within an hour.

Findings as to causes and contributing factors

1. Although the pilot was aware of the passage of a cold front forecast for the time of the return flight, a weather update was not obtained as weather at the worksite was VMC throughout most of the day.
2. The pilot had not anticipated catching up with the line of thunderstorms which had previously passed over the worksite. The decision to deviate and/or land prior to encountering conditions of reduced visibility in heavy rain was made too late.
3. While attempting to execute a landing on a gravel road to wait for the weather to improve, the pilot lost all visual references in conditions of reduced visibility in heavy rain; consequently, the helicopter collided with the trees and ground.

Other finding

1. The pre-flight safety briefings received by the passengers allowed them to quickly communicate their situation and location to the company and first responders. They made use of the survival equipment, satellite phone and first aid kit. The pilot was able to ensure the ELT was ON. Rapid response is crucial to survivability.

Safety action taken

Hydro-Québec

1. Following this occurrence and another fatal occurrence (TSB A10Q0132) involving Hydro-Québec (HQ) employees and flight in poor weather, HQ's flight safety department conducted a risk assessment of its overall flight operations. The review of its occurrence data highlighted four main safety concerns in its contracted helicopter flight operations. These are:
 - flight in poor weather;
 - flight within the height–velocity curve;
 - takeoff in overweight configuration; and
 - operation at less than 11 m from structures.
2. HQ has organized information sessions at various HQ locations in order to address the four concerns raised during its risk assessment exercise. These concerns will be addressed with contract helicopter operators as well as HQ users (employees). The objective is not only to discuss HQ's concerns but also to educate the users by emphasizing their role as passengers and how they may negatively or positively influence the safe outcome of a flight. The first information sessions were held on April 21, 2011 and July 13, 2011. More sessions will be organized in the future.

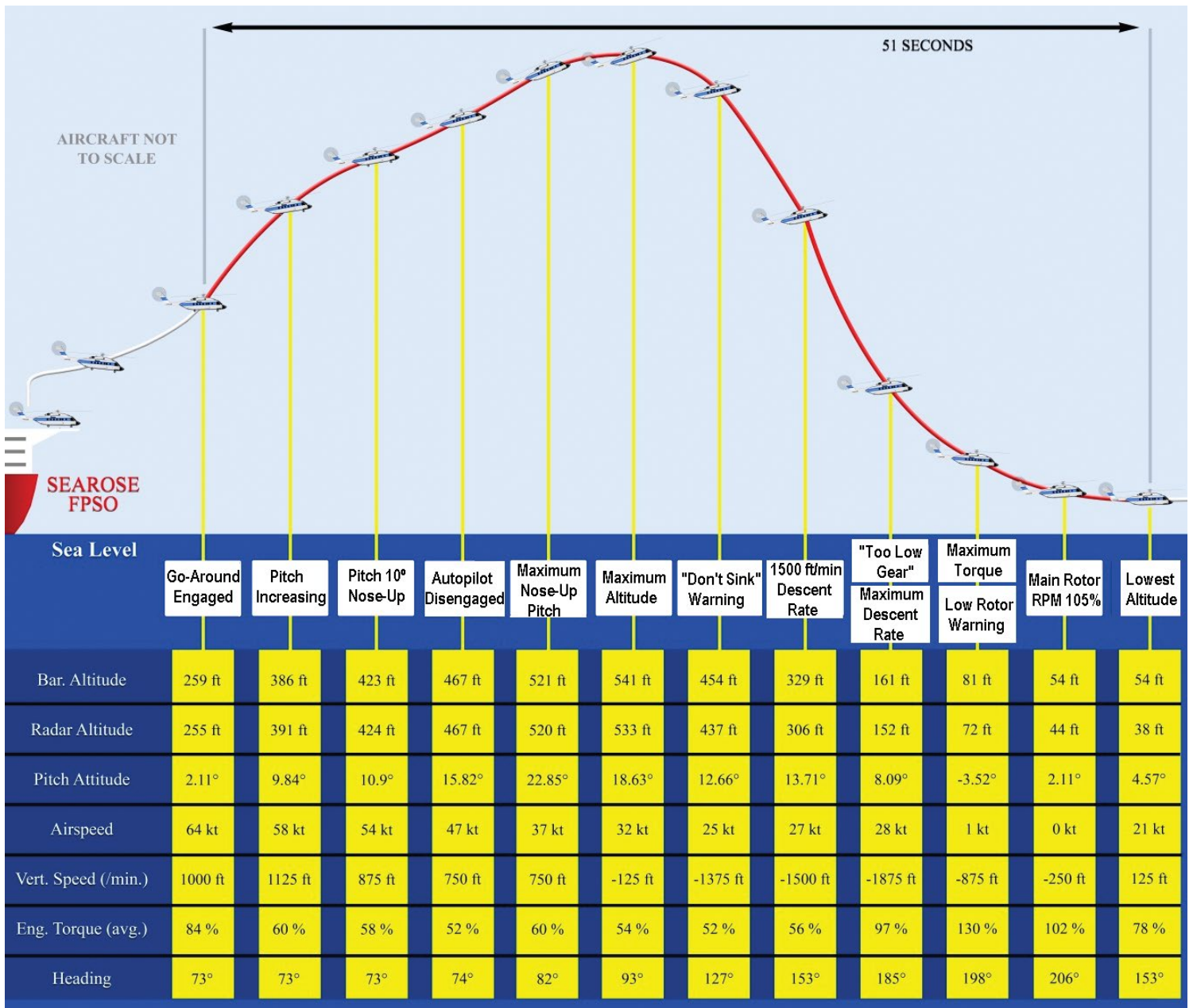
Operator

1. The operator has modified the content of the annual pilot training syllabus in order to address safety with regard to pilot decision-making training and inadvertent IMC/low visibility training.

TSB Final Report A11H0001—Inadvertent Descent During Departure

Note: The TSB investigation into this occurrence resulted in a significant report with extensive discussion and analysis on many issues such as controlled flight into terrain (CFIT), helicopter flight data monitoring, enhanced ground proximity warning systems, automation, pilot incapacitation and spatial disorientation, unusual attitude recovery, go-around (GA) procedures, crew resource management (CRM) training, organizational and management information, safety management systems (SMS), crew pairing policy, "just culture", non-punitive reporting and more. Therefore we could only publish the summary, findings and safety action in the ASL. Readers are encouraged to read the full report, hyperlinked in the title above. —Ed.

On July 23, 2011, at 14:57 NDT, a Sikorsky S-92A helicopter departed the Sea Rose floating production, storage, and offloading vessel, with 5 passengers and 2 flight crew members



Departure profile (derived from flight data recorder (FDR) data)

on board, for St. John's International Airport (CYYT), N.L. After engaging the GA mode of the automatic flight control system during the departure, the helicopter's pitch attitude increased to approximately 23° nose-up while in instrument meteorological conditions (IMC). A rapid loss of airspeed occurred. After reaching a maximum altitude of 541 ft ASL (534 ft radar altitude), the helicopter began descending towards the water in a nose-high attitude at low indicated airspeed. The descent was arrested 38 ft above the surface of the water. After approximately 5 s in the hover, the helicopter departed and flew to St. John's. The helicopter's transmission limits were exceeded during the recovery. There was no damage to the helicopter and there were no injuries. *The TSB authorized the release of this report on June 26, 2013.*

Analysis

The initial portion of the departure from the SeaRose was hand flown by the captain, who made a rapid application of forward cyclic, at a rate of almost 7°/s, to adopt the accelerating attitude. As the helicopter accelerated through the takeoff safety speed (V_{TOSS}), the captain made a large aft cyclic input at an average rate of 5.6°/s, which caused the helicopter to enter a nose-high, decelerating pitch attitude. As the pitch attitude passed through 2.4° nose-up with airspeed and vertical speed increasing, the captain released the cyclic force trim release button and then engaged the GA mode. The airspeed at the time was 64 kt indicated airspeed (KIAS). Following GA mode engagement, the captain released hand pressure on the cyclic stick, believing

that the helicopter would adopt a wings-level, 750 ft per minute (fpm) climb out in accordance with the standard GA profile.

Once the nose-high unusual attitude was recognized, the captain attempted to correct the problem by momentarily depressing the cyclic force trim release button. However, the captain did not set an appropriate attitude, as per the operator's standard operating procedures (SOPs), to recover from the nose-high unusual attitude that had developed as a result of the initial aft cyclic input. When the captain released the cyclic force trim release button, the helicopter's airspeed re-referenced to 56 KIAS and it continued to decelerate as a result of the aft cyclic stick position, and, to a lesser extent, as a result of the aerodynamic forces associated with blowback. As the airspeed of the helicopter decreased to within 5 kt of the minimum control speed in IMC (V_{MINI}), the captain momentarily pressed the cyclic force trim release button and made an aft cyclic input. This caused the helicopter's airspeed to decrease below V_{MINI} and the helicopter entered a 23° nose-high unusual attitude.

As the helicopter descended towards the water, the captain attempted to recover from the nose-high unusual attitude that had developed following GA mode engagement. However, even though the captain's attention was focused primarily on the attitude indicator, the captain did not correct the excessive nose-up attitude and did not recognize the severity of the descent until the helicopter descended below the clouds.

In addition, despite the sounding of the aural "don't sink" alert, there was no initial attempt to arrest the descent, which reached a maximum value of 1 880 fpm, while yawing to the right. It is likely that the captain had difficulties processing the information that was presented on the flight instruments because it was not what the captain was expecting to see. The captain, subtly incapacitated, possibly due to spatial disorientation, did not lower the nose of the helicopter and apply collective in a timely manner to recover from the nose-high unusual attitude. This contributed to the excessive amount of altitude that was lost during the inadvertent descent.

As the helicopter descended below the base of the clouds, its rate of descent peaked at 1 880 fpm, at an altitude of 156 ft above the water. At that rate of descent, the helicopter was less than 5 s from impacting the water. In response to the rapidly approaching water, the captain aggressively pulled on the collective to arrest the descent. The rapid application of collective in order to arrest the inadvertent descent resulted in the transmission torque limits being exceeded. As designed, the occurrence helicopter's full authority digital engine control (FADEC) system went into blowaway when the rotor speed (Nr) decreased below 100%, with both engines operating. By going into blowaway, the pilots

had more power available to them to arrest the descent before water impact. During the rapid application of collective, neither pilot realized that transmission operating limitations had been exceeded during the recovery, and the flight continued back to CYYT.

Findings as to causes and contributing factors

1. During the departure procedure, the captain made a large, rapid aft cyclic input just before the cyclic trim button was released and the go-around (GA) mode was engaged, which caused the helicopter to enter a nose-high, decelerating pitch attitude.
2. The S-92A's GA mode is designed with reduced control authority. As a result of this reduced control authority, the helicopter experienced difficulties recovering from the nose-high pitch attitude which occurred following the GA mode engagement.
3. As the airspeed of the helicopter decreased to within 5 kt of the minimum control speed in IMC (V_{MINI}), the captain momentarily pressed the cyclic force trim release button and made an aft cyclic input. This caused the helicopter's airspeed to decrease below V_{MINI} , and the helicopter to enter a 23° nose-high unusual attitude.
4. The captain, subtly incapacitated, possibly due to spatial disorientation, did not lower the nose of the helicopter and apply collective to recover from the nose-high unusual attitude. This contributed to the excessive amount of altitude that was lost during the inadvertent descent.
5. Contrary to what is stated in the two-challenge rule in the operator's *SK-92 Helicopter Standard Operating Procedures*, the first officer did not take control of the helicopter when appropriate action was not taken to recover from the inadvertent descent.

Findings as to risk

1. If cockpit and data recordings are not available to an investigation, this may preclude the identification and communication of safety deficiencies to advance transportation safety.
2. The S-92A's enhanced ground proximity warning system provides no warning of an inadvertent descent at airspeeds below 40 KIAS with the landing gear down. As a result, there is increased risk of controlled flight into terrain (CFIT) during those phases of flight.
3. If there are delays initiating the CFIT avoidance procedure in response to an enhanced ground proximity warning system alert, there is an increased risk of CFIT.
4. If pilots of automated aircraft do not maintain their hands-

- on visual and instrument flying proficiency, there is increased risk that they will be reluctant to take control and that they will experience difficulties recovering from unexpected flight profiles that require pilot intervention.
5. If S-92A pilots do not consult the top portion of the primary flight display to confirm proper autopilot engagement, they may not recognize that the system is degraded or not engaged.
 6. The *S-92A Rotorcraft Flight Manual* (RFM) is misleading in that it states that the GA mode can be used to recover from an unusual attitude. The GA mode will not function below 50 KIAS and it is limited in how fast it can make attitude and power changes. As a result, pilots and passengers are at increased risk of collision with terrain if pilots attempt to use the GA mode to recover from an unusual attitude at low altitude.
 7. If the GA mode is engaged at 55 KIAS, in accordance with the operator's *SK-92 Helicopter Standard Operating Procedures*, there is increased risk that the GA mode will disengage as a result of a transitory decrease in airspeed below the V_{MINI} .
 8. There is no standard procedure at the operator for the use of the cyclic force trim release button during departures. This could lead to difficulties if a rapid transfer of control is required during a departure.
 9. The lack of standard callouts for pitch deviations increases the likelihood of miscommunication during unusual attitude recoveries.
 10. There was no formal process in place at the operator to ensure adherence to crew pairing restrictions. As a result, the occurrence first officer was paired with pilots who were not qualified training pilots. Therefore, any possible reduction in risk as a result of this risk control measure was not realized.
 11. If flight crews do not receive recurrent training in unusual attitude recoveries, they are more likely to experience difficulties recovering from unusual attitudes.
 12. If flight crew members are not trained to recognize and respond to subtle incapacitation, they may not have the confidence to take control from a more experienced pilot.
 13. If CRM strategies are not practiced during simulator and flight training, there is increased risk that flight crews will experience breakdowns in CRM that could reduce safety margins.
 14. If autopilot modes are engaged while one pilot is preoccupied with other duties, that pilot will not be able to properly perform the pilot monitoring functions. This increases the risk that deviations from the standard flight profile will go undetected or will not be detected in a timely manner.
 15. If actions taken by a company are perceived by employees to be inconsistent with its non-punitive reporting and just culture policy and processes, there is a risk that employees will not report safety occurrences for fear of reprisal.
 16. If reportable incidents are not reported to the TSB, there is increased likelihood that opportunities to advance Canadian transportation safety will not be realized.

Other findings

1. The rapid application of collective in order to arrest the inadvertent descent resulted in transmission torque limits being exceeded.
2. During the rapid application of collective, neither pilot realized that transmission operating limitations had been exceeded during the recovery, and they continued the flight back to CYYT.
3. The operator was unaware that the cockpit voice recorder is privileged under the *Canadian Transportation Accident Investigation and Safety Board Act*.

Safety action taken

Operator

Following this occurrence, the operator:

- published guidance for its crews on S92 autopilot functions, pilot incapacitation, unusual attitude and recommended recovery procedure;
- made several amendments to its S92 standard operating procedures;
- enhanced its simulator training by including more specific exercises focused on the basic unusual attitude recovery technique, including situations where the pilot flying responds to cues from the pilot monitoring, but does not carry out the correct physical actions to rectify the situation;
- developed a process for ensuring that crew pairing restrictions are followed;
- provided training to all first officers on escalation strategies for communicating concerns to captains;
- established a chief training pilot position; and
- provided training to all employees on a *Just Culture* program.

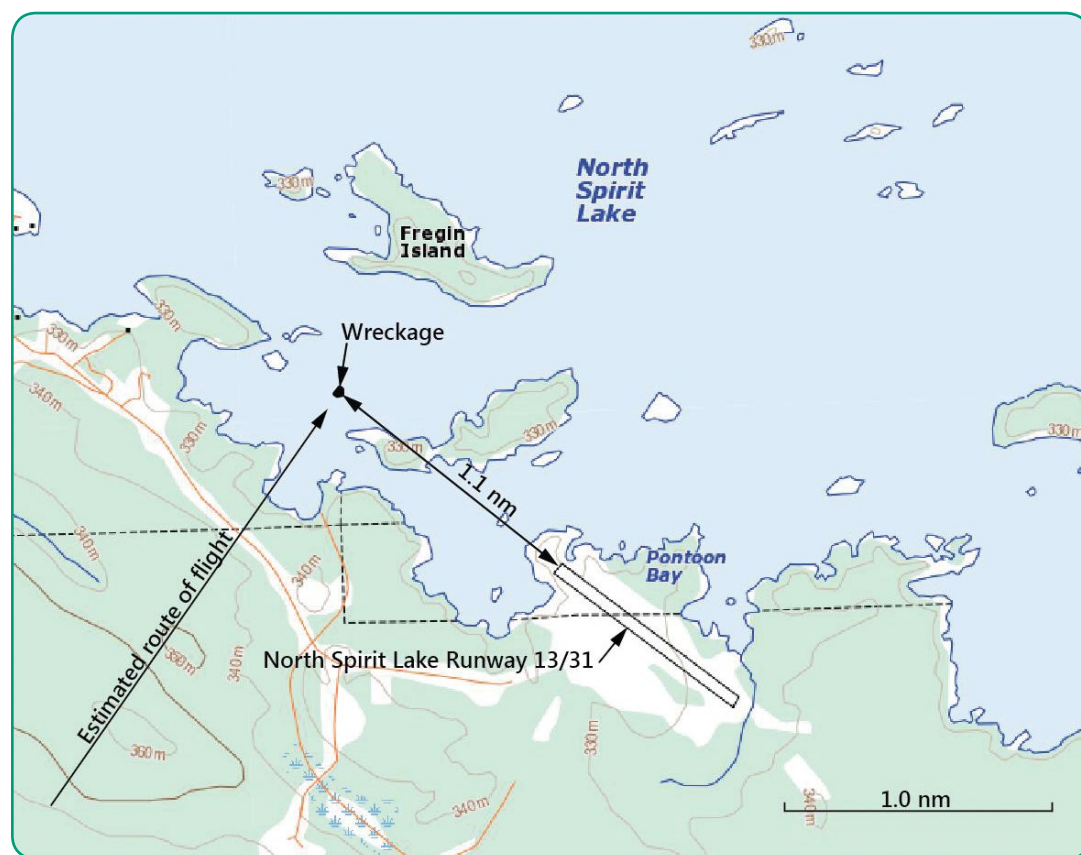
Sikorsky Aircraft Corporation

In 2013, Sikorsky issued Temporary Revision 11 to the S-92A RFM. This revision required S-92A operators to add information to the RFM concerning the use of the coupled flight director and information related to the GA function.

TSB Final Report A12C0005—Loss of Control and Collision with Terrain

Note: *The TSB investigation into this occurrence resulted in a significant report with extensive discussion and analysis on many issues such as communications, aids to navigation, flight recorders, post-impact fires, organizational and management information, self-dispatch, pilot experience, pilot decision-making (PDM), crew resource management (CRM), threat and error management (TEM), aircraft icing and more. Therefore we could only publish the summary, selected parts of the factual information, analysis, findings and safety action in the ASL. Readers are encouraged to read the full report, hyperlinked in the title above. —Ed.*

On January 10, 2012, a Piper PA31-350 Navajo Chieftain departed the Winnipeg/James Armstrong Richardson International Airport (CYWG), Man., en route to North Spirit Lake (CKQ3), Ont., with 1 pilot and 4 passengers on board. At 09:57 CST, on approach to Runway 13 at CKQ3, the aircraft struck the frozen lake surface 1.1 NM from the threshold of Runway 13. The pilot and 3 passengers sustained fatal injuries. One passenger sustained serious injuries. The aircraft was destroyed by impact forces and a post-impact fire. After a short period of operation, the ELT stopped transmitting when the antenna wire was consumed by the fire. *The TSB authorized the release of this report on September 19, 2013.*



Wreckage location

History of the flight

The pilot arrived at CYWG at approximately 05:30 to prepare for a 07:30 departure. The flight departed CYWG for CKQ3 at 07:51 on an IFR flight plan. The planned routing was from CYWG to Deer Lake (CYVZ), Ont., with an en route stop in CKQ3 to drop off a passenger. The remaining 3 passengers were then to be flown onward to CYVZ for meetings. En route, the aircraft flew just above the cloud tops at an altitude of 9 000 ft ASL.

The flight arrived in the CKQ3 area at about 09:30, and the pilot broadcast a traffic advisory on the CKQ3 aerodrome traffic frequency (ATF). The airport foreman, who was plowing the runway, advised the pilot that snow clearing was underway and would be completed in about 10 min. The pilot replied indicating intention to delay the landing until snow clearing was completed. The aircraft was heard flying overhead CKQ3 for several minutes, and sounded near and low, but could not be seen due to heavy snow and cloud cover.

Ice was accumulating on the aircraft's windshield during the delay. The pilot called again several minutes later to ask whether snow clearing was completed. The airport foreman advised the pilot that approximately 60% of the runway had been cleared and that the equipment was in the process of exiting the runway. The pilot commenced the approach. During the approach, the aircraft banked to the left and then steeply to the right before it struck the ice at about 09:57.

Aids to navigation

CKQ3 is not serviced by any ground-based navigational aids. Navigation to CKQ3 was accomplished by the operator's pilots using their global positioning system (GPS).

The low level airspace in the vicinity of CKQ3 is uncontrolled. The area minimum altitude (AMA) in the vicinity of CKQ3 is 2 700 ft ASL. This altitude is designated to provide terrain clearance for aircraft operating in uncontrolled airspace. Under normal circumstances, pilots operating under IFR are not authorized to descend below the AMA, except in accordance with an approved instrument approach

procedure or when operating in visual meteorological conditions (VMC). At an airport with no instrument approach procedure and with the ceiling below AMA, the pilot has the option of diverting the aircraft to an airport that does have an instrument approach or diverting to an area where visual flight rules (VFR) exist.

CKQ3 did not have an approved instrument approach procedure. There was no indication that either the pilot or the operator had developed an improvised instrument approach to CKQ3.

Wreckage and impact information

TSB investigators arrived on scene approximately 26 hr after the accident. The aircraft struck the frozen surface of the lake in a right wing-low attitude at both a high rate of descent and forward speed. Contents of the aircraft, such as baggage and cargo, were found strewn halfway up the wreckage trail, indicating an early breakup of the cockpit and cabin area. The wreckage trail was generally aligned with the extended centreline of the runway. It was approximately 380 ft long, and the aircraft had come to a rest in an upright position, facing a southeasterly direction (Photo 1). Damage to the propellers suggests that the engines were producing power at the time of the impact. A post-impact fire consumed a majority of the aircraft.



Photo 1. Wreckage on site

An approximate 4-ft section of the right wing leading edge containing the stall warning vane was torn off and found approximately halfway down the wreckage trail. This section of leading edge was not affected by the fire and exhibited some clear and mixed ice that was approximately $\frac{3}{8}$ in. thick (Photo 2). The stall warning vane was not heated and exhibited hard packed ice inside the stall warning housing, trapping the vane in a downward position (Photo 3).

The left horizontal stabilizer leading edge was also not affected by the fire and exhibited ice accumulation (Photo 4).



Photo 2. Leading edge ice

Many of the aircraft de-ice system components were consumed by the post-impact fire. Other components that were recovered had suffered burn damage to the point that examination and bench testing were inconclusive. The vacuum pumps were recovered along with the engines, and no anomalies were found. An examination of the remaining de-ice boots and plumbing that were not damaged did not reveal any anomalies. Due to the extent of fire damage, it could not be determined whether the aircraft de-ice system had been functioning normally. An inspection of the remaining aircraft wreckage did not reveal any pre-impact anomalies.



Photo 3. Stall warning vane



Photo 4. Ice on the horizontal stabilizer leading edge

Pilot decision-making (PDM)

PDM can be described as making the right choice at the right time and avoiding circumstances that can lead to difficult choices. Many decisions are made on the ground, and a well-informed pre-flight choice avoids the need for a much more difficult in-flight decision.

An important component of PDM is good situational awareness, which requires a pilot to align the reality of a situation with his or her expectations. Inadequate or ineffective PDM can result in operating beyond an aircraft's capability or a pilot's abilities.

When conditions are particularly good or bad, the decision to depart is an easy one. However, the decision can become complicated when conditions become marginal. Complicating factors, such as economics, customer commitments and professional obligations, compounded by conditions that do not clearly argue against departing, can interfere with even the most safety-conscious pilot's decision making.

Klein's¹ expectation-primed decision-making is a mature model that describes how skilled professionals make rapid decisions in complex environments. Less experienced crews have fewer prior experiences to draw upon and will have fewer linkages between the current context and their prior experience. Consequently, documented procedures and decision criteria become even more valuable to less experienced crews.

Threat and error management (TEM)

To better understand the role of the crew in managing risk during normal operations, the NASA University of Texas, Human Factors Crew Resource Project has developed the TEM model.

1 G.A. Klein, "The Recognition-Primed Decision (RPD) model: Looking back, looking forward", in C.E. Zsombok and G. Klein (Eds.), *Naturalistic Decision Making* (1997), pages 285-292.

The model is based on the premise that, in every flight, hazards that must be handled by the crew will be present. These hazards increase the risks during a flight and are termed "threats" in the TEM model. Threats include such things as weather conditions, traffic, aircraft serviceability issues, unfamiliar airports, etc. Provided that the crew members have an opportunity to handle the threat, effective management of the hazard leads to a positive outcome with no adverse consequences. However, mismanagement of the threat can lead to crew error, which the crew must also manage. Mismanagement of crew error may lead to an undesired aircraft state, which can lead to an accident. At any point, effective management of the situation by the crew can mitigate the risk, and the situation may be inconsequential.

The TEM model has been widely adopted as the foundation for modern CRM training courses. CRM courses are intended to provide flight crews with practical tools to help them avoid, trap or mitigate threats and errors that are typical in commercial aviation operations. A typical CRM course also includes the core elements of PDM training and expands on those concepts to include a broader understanding of decision-making.

Analysis

Pilot

The majority of the pilot's flying experience was in a training environment, either as a student or an instructor, in VFR weather conditions with less complex aircraft.

At the company, the pilot successfully completed the required training, pilot proficiency check (PPC) and line indoctrination training in excess of that required by the company operations manual (COM). However, transitioning to a job as a pilot with this operator, a *Canadian Aviation Regulations* (CARs) Subpart 703 air taxi operator, put the pilot in new and more challenging flying environments while operating a more sophisticated aircraft type. Operating single-pilot IFR would have increased the workload and would have made it more difficult to formulate effective solutions to problems as they arose.

The pilot's multi-engine and instrument flight times on arrival at the company, together with the times accumulated during line indoctrination training, satisfied both the company and CARs experience requirements for single-pilot, multi-engine flight into instrument meteorological conditions (IMC). An analysis of the applicable weather information for the pilot's flights after completion of line indoctrination training was completed. But because the aircraft's en route altitudes were not recorded, the investigation could not determine an accurate profile of the pilot's flight time in IMC or the pilot's experience in icing conditions while employed at the company.

The flights from December 20, 2011, to January 8, 2012, were conducted to a large extent in uncontrolled airspace and outside of ATC radar coverage. The weather conditions for most of the flights were such that flight into IMC would not have been required. On some flights, ceilings would likely have required flight into IMC and some exposure to icing conditions was likely as well. Overall, the pilot had accumulated flight experience in clouds and icing conditions, but would not have encountered icing conditions as severe as those on the accident flight.

PDM, CRM and TEM training

The operator's initial pilot training did not include any PDM, CRM or TEM training. Without such training applied to relevant examples of the company's flight operations, the company's initial training left inexperienced pilots not always prepared for self-dispatch. Under the current regulations, CARs 703 and 704 operators are not required to provide CRM training. As a result, there is an increased risk that crews operating under CARs 703 or 704 will experience breakdowns in CRM.

The operator's PA31-350 pilots were uncertain as to the aircraft's certification or capability to fly into icing conditions, and as a result, likely did not pass on an understanding of these issues to the occurrence pilot.

Self-dispatch

The flight departed from the operator's base in CYWG, where the operator relied on the pilot for operational decisions and self-dispatch. The operator does not have² any company procedures or tools in place to aid the pilot in deciding whether or not to depart, or to support the pilot by providing information regarding runway conditions. The nature of a self-dispatch system leaves the pilot with the decision as to whether the flight should depart, based on the pilot's training, experience and operational pressures. The pilot was relatively new to the Piper PA31-350 aircraft type, passenger flights to remote airports and winter operations in icing conditions. This lack of familiarity and experience increased the risk that the flight would depart into conditions beyond the capabilities of the aircraft and the pilot.

Accident scenario

The available information indicates that the aircraft was certified and equipped for dispatch and that the pilot met the minimum requirements for dispatch on the accident flight. However, the runway at CKQ3 had not been cleared, and the weather conditions in the area presented significant challenges for single-pilot flight with an aircraft not equipped for continuous flight in icing conditions. Moreover, these challenging conditions arose at or near the destination, making a diversion back to

Winnipeg seem a less feasible option once the aircraft had started its descent and had started to accumulate ice.

The most likely scenario is that the flight proceeded normally until the aircraft started its descent into the North Spirit Lake area. During the descent, the pilot learned that the flight would have to hold until the runway was cleared of snow. The aircraft began to accumulate ice, and its ability to climb back on top of cloud would have diminished.

The pilot, anxious to complete the flight successfully, likely did not appreciate the extent of the aircraft's limitations in icing conditions, and believed that the best option was to continue to CKQ3 and hold, then land once the runway was clear.

As the descent continued below the AMA, the aircraft would have continued to accumulate ice, especially on areas such as the wing root sections that did not have the benefit of de-ice capability. The pilot, occupied with the hold and approach, likely no longer had the situational awareness to fully consider the other options of diverting the flight to either CYRL or CYVZ, and continued in a gradually deteriorating flight situation.

By the time the runway was clear, the aircraft would have accumulated a significant amount of ice. As the aircraft manoeuvred onto final approach, the turns and changes in the aircraft configuration likely added enough drag to cause the aircraft to stall at an altitude from which recovery by the pilot was not possible.

Findings as to causes and contributing factors

1. The pilot's decision to conduct an approach to an aerodrome not serviced by an IFR approach in adverse weather conditions was likely the result of the pilot's inexperience and may have been influenced by the pilot's desire to successfully complete the flight.
2. The pilot's decision to descend into cloud and continue in icing conditions was likely the result of inadequate awareness of the Piper PA31-350 aircraft's performance in icing conditions and of its de-icing capabilities.
3. While waiting for the runway to be cleared of snow, the aircraft held near North Spirit Lake (CKQ3) in icing conditions. The resulting ice accumulation on the aircraft's critical surfaces would have led to an increase in the aircraft's aerodynamic drag and stall speed, causing the aircraft to stall during final approach at an altitude from which recovery was not possible.

Findings as to risk

1. Terminology contained in aircraft flight manuals and regulatory material regarding "known icing conditions,"

² at the time of the investigation

“light to moderate icing conditions,” “flight in,” and “flight into” is inconsistent, and this inconsistency increases the risk of confusion as to the aircraft’s certification and capability in icing conditions.

2. If confusion and uncertainty exist as to the aircraft’s certification and capability in icing conditions, then there is increased risk that flights will dispatch into icing conditions that exceed the capability of the aircraft.
3. The lack of procedures and tools to assist pilots in the decision to self-dispatch leaves them at increased risk of dispatching into conditions beyond the capability of the aircraft.
4. When management involvement in the dispatch process results in pilots feeling pressure to complete flights in challenging conditions, there is increased risk that pilots may attempt flights beyond their competence.
5. Under current regulations, *Canadian Aviation Regulations* (CARs) 703 and 704 operators are not required to provide training in CRM, PDM or TEM. A breakdown in CRM or PDM may result in an increased risk when pilots are faced with adverse weather conditions.
6. Descending below the area minimum altitude while in instrument meteorological conditions without a published approach procedure increases the risk of collision with terrain.
7. If on-board flight recorders are not available to an investigation, this unavailability may preclude the identification and communication of safety deficiencies to advance transportation safety.

Safety action taken

NAV CANADA

NAV CANADA has published an approved instrument approach procedure for the North Spirit Lake aerodrome in the April 2012 revision of the *Canada Air Pilot*.

Operator

1. The operator has revised its operations manual and implemented a multi-crew policy that applies to all IFR flights.
2. The operator has amended its flight training record keeping procedures by changing the training forms to make it easier and more efficient to prove that all required training has been completed. The operator has updated the

captain’s trip report form to include provisions for progressive fuel-state monitoring.

3. The operator has revised its operational flight plan form to include the calculated landing weight and landing centre of gravity.

TSB Final Report A12O0071—Loss of Control and Collision With Water

On May 25, 2012, a de Havilland DHC-2 Mk.1 Beaver floatplane departed Edgar Lake, Ont., with two passengers and 300 lb of cargo on board. The aircraft was destined for the company’s main base located on Lillabelle Lake, Ont., approximately 77 mi. to the south. On arrival, a southwest-bound landing was attempted across the narrow width of the lake, as the winds favoured this direction. The pilot was unable to land the aircraft in the distance available and executed a go-around. At 14:08, EDT, shortly after full power application, the aircraft rolled quickly to the left and struck the water in a partially inverted attitude. The aircraft came to rest on the muddy lake bottom, partially suspended by the undamaged floats. The passenger in the front seat was able to exit the aircraft and was subsequently rescued. The pilot and rear-seat passenger were not able to exit and drowned. The ELT activated on impact. *The TSB authorized the release of this report on September 19, 2013.*



Lillabelle Lake

Analysis

The investigation determined that the aircraft was maintained and operated in accordance with existing rules and regulations. The analysis focuses on the pilot, the particular circumstances that led to the aircraft impacting the water and the underlying systemic safety issues within the floatplane industry.

The wind at the time of the occurrence was very strong and gusty. While these conditions were known to the pilot, changes in wind speed and direction, as well as the mechanical turbulence caused by the wind's passage over obstacles on the windward side of the approach, would have made for challenging landing conditions.

There likely was an increase in headwind, which in turn increased the float time of the aircraft while in the landing flare. As the available landing distance was used up in this landing flare, the pilot decided to conduct a missed approach, applied power and increased the aircraft angle of attack. It is possible that the pilot inadvertently allowed the aircraft speed to bleed off, or perhaps a change in the headwind component due to gusty winds (wind shear) resulted in a sudden drop in airspeed below the stall speed. The rapid application of full power caused the aircraft to yaw to the left, and a left roll quickly developed. This movement, in combination with a high angle of attack and low airspeed, likely caused the aircraft to stall. The altitude available to regain control before striking the water was insufficient. The aircraft was not equipped with a stall warning system, which might have given the pilot additional warning of an impending stall.

The rear-seat passenger did not have an upper body restraint and suffered a serious head injury when the aircraft struck the water. This injury rendered the passenger unconscious, which resulted in drowning. This passenger was seated next to the only operational exit. Even though this door was operational, the physical obstacle of the unresponsive passenger might have made this exit unusable.

Due to the damage to the pilot's door, significant torque on the handle was required to open it. As well, the original small recessed rotary interior door handles on this aircraft had not been replaced with ones that are more accessible and easier to operate. Either of these factors might have prevented the pilot from opening the door. The pilot survived the impact, but was unable to exit the aircraft, possibly due to difficulties finding or opening an alternate exit. The pilot subsequently drowned. Commercial seaplane pilots who do not receive underwater egress training are at increased risk of being unable to exit the aircraft following a survivable impact with water.

The pilot did not provide a full safety briefing to the passengers before takeoff, possibly because they were frequent travellers.

However, the passengers were not aware of the location of the life preservers, and the front-seat passenger was not aware of the shoulder harnesses. The injuries received by the front passenger were likely aggravated by the fact that the available shoulder harness was not worn. Not wearing a shoulder harness can increase the risk of injury or death in an accident.



The floatplane, shown here after being removed from the water, was heavily damaged in the crash.

Findings as to causes and contributing factors

1. On the windward side of the landing surface, there was significant mechanical turbulence and associated wind shear caused by the passage of strong gusty winds over surface obstructions.
2. During the attempted overshoot, the rapid application of full power caused the aircraft to yaw to the left, and a left roll quickly developed. This movement, in combination with a high angle of attack and low airspeed, likely caused the aircraft to stall. The altitude available to regain control before striking the water was insufficient.
3. The pilot survived the impact but was unable to exit the aircraft, possibly due to difficulties finding or opening an exit. The pilot subsequently drowned.
4. The rear-seat passenger did not have a shoulder harness and was critically injured. The passenger's head struck the pilot's seat in front; this passenger did not exit the aircraft and drowned.

Findings as to risk

1. Without a full passenger safety briefing, there is increased risk that passengers might not use the available safety equipment or be able to perform necessary emergency functions in a timely manner to avoid injury or death.
2. Not wearing a shoulder harness can increase the risk of injury or death in an accident.

3. Not having a stall warning system increases the risk that the pilot might not be aware of an impending aerodynamic stall.
4. Commercial seaplane pilots who do not receive underwater egress training are at increased risk of being unable to exit the aircraft following a survivable impact with water.

Safety action taken

Operator

Following the occurrence, the company began providing a printed graphic area forecast (GFA) to pilots each morning. All pilots are required to sign the printed weather report and verify that conditions are suitable for the planned flight.

Safety action required

Underwater egress training for commercial flight crews

Seaplane travel is common in Canada, particularly in British Columbia. In the Vancouver Harbour area alone, there are about 33 000 floatplane movements per year, carrying approximately 300 000 passengers.

The Transportation Safety Board of Canada (TSB) has found that the risk of drowning for occupants involved in seaplane accidents is high. TSB and British Columbia Coroners Service data show that, over the last 20 years, about 70% of the fatalities resulting from accidents where aircraft crashed and were submerged in water were attributed to drowning. Half of the deceased were found in the submerged wreckage. While it could not be determined in all cases, some investigations found that the occupants were conscious and able to move around the cabin before they drowned. These past occurrences validate the probability that able-bodied persons can be trapped in sinking aircraft and drown as a result.

This investigation concluded that the pilot survived the impact, but was unable to locate a suitable exit and drowned. Pilots who receive underwater egress training have a greater probability of escaping from the aircraft and a greater chance of surviving the accident.

Transport Canada (TC) has recognized the critical importance of underwater egress training; however, such training remains voluntary. TC indicated that a process is currently underway to initiate the drafting of new regulations requiring underwater egress training using an accelerated procedure, but it did not provide a timeframe for these actions.

The TSB is concerned that pilots who have not received training in underwater egress may not be able to exit the aircraft and subsequently help passengers to safety. Therefore, the Board recommends that:

The Department of Transport require underwater egress training for all flight crews engaged in commercial seaplane operations. (A13-02)

Transport Canada Response

Transport Canada is currently drafting a proposed regulation that will introduce mandatory emergency underwater egress training for flight crews of commercially operated fixed wing seaplanes (Subpart 703 and 704) by amending current mandatory emergency training set out in the Standard 723 Aeroplanes and Standard 724 Aeroplanes of the *Canadian Aviation Regulations*.

The proposed regulation makes egress training mandatory for initial training, with recurrent training required every 3 years thereafter on an ongoing basis.

The proposed regulation is anticipated to be pre-published in the *Canada Gazette* Part I in summer 2014.

Passenger shoulder harnesses

The TSB has found that the risk of serious injury or death is increased for occupants of light aircraft who are not wearing upper-torso restraints or shoulder harnesses. The results of previous safety studies completed by the TSB (Aviation Safety Study SA 9401, TP 8655E) have been more recently supported by a Federal Aviation Administration (FAA) study into fatal and serious injury accidents in Alaska.

A significant portion of the commercial floatplane fleet in Canada was manufactured before shoulder harnesses were required for passenger seats and remains in this configuration today.

In the event of a seaplane accident, the occupants of the aircraft may drown if they are unconscious; loss of consciousness is normally caused by head trauma. If restrained and protected during the impact sequence, occupants might maintain consciousness and stand a better chance of successfully exiting a sinking aircraft. The use of a three-point safety restraint (safety belt and shoulder harness) is known to reduce the severity of upper body and head injuries and more evenly distribute impact forces.

The TSB has previously recommended (A94-08, A92-01) that small commercial aircraft be fitted with seatbelts and shoulder harnesses in all seating positions. Following these recommendations, changes to regulations were made to require shoulder harnesses in all commercial cockpits and on all seats in aircraft with 9 or fewer passengers manufactured after 1986. This regulatory change did not address the vast majority of the commercial floatplane fleet, which was manufactured prior to 1986.

The TSB considers that, given the additional hazards associated with accidents on water, shoulder harnesses for all seaplane passengers will reduce the risk of incapacitating injury, thereby improving their ability to exit the aircraft. Therefore, the Board recommends that:

The Department of Transport require that all seaplanes in commercial service certificated for 9 or fewer passengers be fitted with seatbelts that include shoulder harnesses on all passenger seats. (A13-03)

Transport Canada Response

Transport Canada has devoted significant effort to seaplane safety. In 2006 a risk assessment team met to analyze the risks associated with egress from submerged aircraft and identify potential risk reduction measures. The team considered the option of making shoulder restraints available to all occupants. The team's analysis showed that this option would not reduce the risks by any significant factor.

On August 22–25, 2011, TC inspectors, floatplane industry representatives, and aircraft manufacturers formed a Focus Group which undertook a risk assessment and discussed TSB recommendations to determine what would be the best mitigation strategy to improve levels of safety for commercial seaplane operations in an effective and sustainable way. The group discussed the use of shoulder harnesses but concluded other measures offered more promise than mandating shoulder harnesses.

Most commercially-operated seaplanes in Canada are in the normal/utility category. The cabin designs and configurations of most of these likely do not readily lend themselves to installation of shoulder restraints for all passengers without substantial aeroplane redesign and/or structural modification. Most of the aircraft structures are not robust enough to support shoulder restraints in a crash and may hinder egress. Mandating the retrofitting of shoulder restraints for all occupants is not feasible. Each application to install shoulder harnesses would need to be assessed on a case by case basis.

Since fleet-wide installation of shoulder harnesses is not feasible, Transport Canada will continue its efforts at safety education and promotion.

In December 2013, Transport Canada published a Civil Aviation Safety Alert (CASA) on Safety Belts, and an article in the *Aviation Safety Letter* (ASL) Issue 4/2013 titled “*Shoulder Harnesses and Seat Belts– Double Click for Safety*”. Transport Canada will also be revising Advisory Circular (AC) 605-004 *Use of Safety Belts by Passengers and Crew Members*, to align with Federal Aviation Administration (FAA) AC No.21-34.

Safety concern

Stall warning systems for DHC-2 aircraft

Current regulations require that aircraft certified in the normal, utility, aerobatic, or commuter category be designed with a clear and distinctive stall warning. The stall warning may be furnished either through inherent aerodynamic qualities of the airplane or by a device that gives clearly distinguishable indications.

When the DHC-2 was certified, a stall warning system was not included as it was determined that the aircraft had a natural aerodynamic buffet at low airspeeds and high angles of attack, and that this was a clear and distinctive warning of an impending stall. Therefore, if a pilot does not recognize or misinterprets buffeting as turbulence while at a low airspeed or high angle of attack, there is a risk that the warning of impending stall will go unrecognized. A stall warning system providing visual, aural or tactile warning can give pilots a clear and compelling warning of an impending stall.

A large number of DHC-2 aircraft continue to operate in Canada. The TSB has determined that the frequency and consequences of DHC-2 aircraft accidents following an aerodynamic stall are high.

Stalls encountered during critical phases of flight often have disastrous consequences. Therefore the Board is concerned that the aerodynamic buffet of DHC-2 aircraft alone may provide insufficient warning to pilots of an impending stall.

TSB Final Report A12P0079—Loss of Visual Reference and Collision With Terrain

On June 1, 2012, a Eurocopter AS350-B2 helicopter departed Terrace Airport (CYXT), Terrace, B.C., at 7:54 PDT for a local mountain training flight, with two pilots and one aircraft maintenance engineer (AME) on board. At 8:41, the helicopter struck the snow-covered side of a mountain ravine in daylight conditions at about 4 000 ft ASL. The 406 MHz ELT activated on impact, resulting in the initiation of search activities. A local commercial helicopter operator located the accident site about 1 hr 50 min later. There was no fire. The aircraft was destroyed, and there were no survivors. *The TSB authorized the release of this report on November 6, 2013.*

History of the flight

The sole base pilot for the operator at Terrace was preparing to take some leave. In preparation, a training flight was planned to provide a relief pilot with some familiarity with the local area, as well as hover-exit (allowing passengers to exit a helicopter while it is hovering close to the ground) and mountain-flying training. The relief pilot arrived in Terrace the evening before



An aerial view of the crash site on the mountainside: the tail-end of the helicopter appears as a small dark line on the snow of the mountain valley.

The helicopter turned to the southwest again up the ravine and proceeded in a climb, while the ground speed was declining, following the terrain contour along the left side of the ravine.

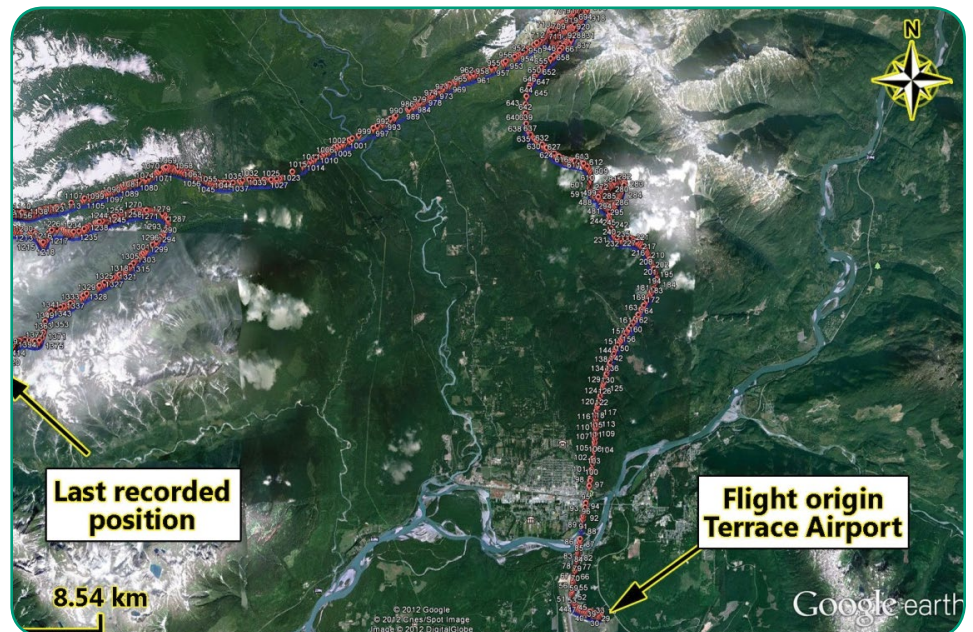
The helicopter was climbing at about 1 000 ft/min until it quickly leveled off at about 4 500 ft ASL and 45 kt ground speed. It commenced a right-hand turn near the top end of the ravine. As the helicopter turned, it maintained 4 500 ft for about 9 s before it began descending at an accelerating rate, with increasing ground speed and tightening radius of turn. Recovered data recorded at 1-s intervals showed that the helicopter completed a turn of about 285° in 25 s and descended the last 220 ft to the accident site in 3 s (4 400 ft/min). It struck the 30°-inclined, snow-covered slope in a slightly left-of-centre, frontal collision at about 4 000 ft ASL at 8:41.

the training flight. The base pilot's leave was to commence the day after the training flight.

A company flight itinerary was filed with the operator dispatch office in Fort Saint John, B.C., and included the company aircraft maintenance engineer (AME) as a passenger. The flight departed CYXT at 7:54. The helicopter remained within 15 NM of Terrace and proceeded north along the east side of the Kitsumkalum River Valley. Recorded global positioning system (GPS) data from three different on-board units showed some manoeuvres at two locations before the helicopter proceeded westbound across Kitsumkalum River. On the western side of the valley, the helicopter entered a ravine heading southwest and flew along the right-hand or south-facing side of the ravine. Near the top end of the ravine, at about 3 800 ft ASL, the helicopter made a 180° left turn and proceeded part of the way back, in a descent, along the north-facing slope of the ravine. The helicopter then made a right-hand turn, crossed over a ridge and descended into another parallel ravine.

Analysis

The aircraft systems were examined, and no indication of a malfunction was found. The pilots were both experienced, and the training pilot had knowledge of the local area. Neither fatigue nor physiological factors were considered



Plot of GPS data from the occurrence flight
(Image: Google Earth, diagram added by TSB)

contributory. Therefore, this analysis will focus on the events, conditions and underlying factors that caused or contributed to pilot decision-making (PDM).

The training flight occurred when it did because it was the only opportunity for the relief pilot to receive some additional mountain-flying and hover-exit training, along with a familiarization flight in the local area, before the training pilot left for vacation. It is unusual for a third person to be on board for a pilot training flight. However, given the intent to include hover-exit training, someone was required to perform the exit and entry while the helicopter was in a hover.

Weather/low-visibility operations

Terrace weather conditions and forecasts were suitable for a VFR flight. The pilots were likely aware that the forecast indicated temporary restrictions to ceiling and visibility and potential airframe icing conditions for the area.

As the helicopter climbed, the nature of the snow-covered terrain near the top end of the ravine would have provided fewer and fewer visual references to aid in a pilot's depth perception. It is probable that the mountain ridges were obscured by overcast ceilings, resulting in whiteout conditions of flat lighting and little or no horizon reference. The records of the flight path indicate a right-hand turn commencing at 4 500 ft ASL as a steady, uniform arc, which is consistent with the flight path of an aircraft entering a spiral dive. The relatively low engine power demand and the lack of any indication of icing on the airframe following the accident suggest that airframe icing was not a factor.

The company and the pilots were authorized to conduct low-visibility operations in uncontrolled airspace. By approving this exception, Transport Canada (TC) authorizes VFR flight operations in instrument meteorological conditions (IMC) at reduced visibilities. Many helicopter operators hold this operations specification, and it is usually applied as an operating standard. In accordance with the conditions of this authorization, the operator had policies, procedures and training in place to serve as defences against weather-related risks. The required pilot training is primarily aimed at PDM skills as a method of avoiding a loss of visual reference. Minimum VFR weather conditions include a minimum visibility requirement as a safety defence against a loss of visual reference.

Operating in conditions with visibility reduced to 0.5 SM increases the risk of inadvertent loss of reference. The low-visibility operations specification allows the visibility to be reduced from 1 SM to 0.5 SM, provided that the pilot has appropriate experience and training and that the helicopter is operated at reduced speed. But it does not require instrument

flight proficiency for pilots or the use of aircraft certified for flight in IMC. Research and statistics show that without basic instrument flight training and proficiency, the average time prior to loss of control for VFR pilots can, in most cases, be measured in minutes.

Currently, the risks associated with VFR flight into adverse weather remain substantial, and TC has not indicated that it plans any action to reduce the risks associated with allowing a non-instrument-rated commercial helicopter pilot's basic instrument flying skills to deteriorate as described in Recommendation A90-81³.

Pilot decision-making

In accordance with the company operations manual (COM), the reduction in ground speed as the helicopter climbed up the ravine could indicate that poor visibility conditions were encountered. However, continuing to climb at 1 000 ft/min is not consistent with that hypothesis. The records of the flight path show that the helicopter maintained a relatively steady height above the terrain directly below, but the engine parameters did not indicate that the pilot was demanding any of the excess power available to out-climb the terrain gradient. The rate of climb to



The rotor and tail-end of the crashed helicopter, protruding from the snow of the mountainside

4 500 ft ASL would suggest that the pilots did not assess the conditions they were in as being particularly hazardous. However, the quick level-off at 4 500 ft, coincident with initiating a right-hand turn, would suggest that conditions changed and could indicate that the pilots unexpectedly lost sight of the ground. As soon as sight of the ground is lost, the pilot's priority would be to regain visual reference by descending, turning or both, while maintaining control of the helicopter. The subsequent flight path of the helicopter indicates that a turn and slow

³ Recommendation A90-81 read as follows : The Department of Transport require verification of proficiency in basic instrument flying skills for commercially-employed helicopter pilots during annual pilot proficiency flight checks.

descent were attempted. But during this manoeuvre, the non-instrument-trained pilot flying became disoriented, lost control of the helicopter and collided with the snow-covered terrain.

Fire

The remote location of the aircraft battery in the tail boom, combined with the routing of high amperage cables behind and over the cabin, likely mitigated the risk of ignition of the spilled fuel.

Findings as to causes and contributing factors

1. The helicopter likely entered IMC, resulting in the pilot losing visual reference with the ground and becoming disoriented, which resulted in a loss control of the helicopter and collision with terrain.
2. Neither pilot held an instrument rating or had any recent instrument flight training, nor was the helicopter equipped for instrument flying, which contributed to the loss of control of the helicopter while flying in IMC.

Finding as to risk

1. Operating in conditions with visibility reduced to 0.5 SM increases the risk of inadvertent loss of visual reference.

Other finding

1. The remote location of the aircraft battery in the tail boom, combined with the routing of high amperage cables behind and over the cabin, likely reduced the risk of ignition of the spilled fuel.

Safety action taken

Operator

The operator has made the following changes:

- suspended the use of its TC-issued Operations Specification that allows low-visibility operations;
- developed and implemented a pre-flight risk assessment that must be completed before all flights;
- developed a flight-training policies and procedures manual (essential crew only for all training flights);
- implemented a flight data monitoring system;
- purchased an AStar flight simulator, with a main focus on controlled flight into terrain (CFIT) and inadvertent meteorological condition training;
- added a CFIT training course to its annual ground school;
- created a quality assurance position within the flight operations department;

- implemented human factors training, which includes annual decision-making workshops and crew resource management for flight and maintenance personnel;
- increased standard operating procedures to 1-mi. visibility, 500-ft ceiling, and clear of cloud; and
- continued to educate its customers on the risk of flying in low-level or low-visibility operations.

TSB Final Report A12W0121—Loss of Control and Collision With Terrain

On August 26, 2012, a Cessna 172M departed Springbank Airport (CYBW), Alta., on a VFR flight to conduct a pipeline patrol to the south, through foothill terrain. While the aircraft was circling a pipeline stream crossing on Chaffen Creek, approximately 22 NM west-northwest of Claresholm, Alta., near the Chain Lakes Reservoir, it entered a spin, descended steeply, and collided with terrain at 17:34 MDT. The pilot, who was the sole occupant of the aircraft, sustained fatal injuries. The aircraft was destroyed by impact forces, and there was no post-impact fire. The 406 MHz ELT activated on impact. The accident occurred during daylight hours. *The TSB authorized the release of this report on July 17, 2013.*



Analysis

There were no indications that any aircraft systems contributed to the loss of control of the aircraft and its subsequent collision with the ground. Therefore, this analysis will focus on aircraft handling and the environment in which the flight was conducted.

Pipeline reconnaissance at the operator involved photography by a single pilot/observer, which often required that the aircraft be placed in a left turn to give the pilot the best, unobstructed view of a location of interest. Angles of bank during this manoeuvring were often in the area of 45° and at times exceeded

50°. The pilot would have been viewing the outside world through a handheld camera at a time when the aircraft was in a critical phase of flight. At this time, the pilot's attention would have been distracted from control and monitoring of the aircraft.

There are no data to identify the spin characteristics of the Cessna 172 with the additional fuel tanks. Flight conditions during the stream-crossing reconnaissance and photography were conducive to stall and subsequent spin entry. These conditions would have been a relatively low airspeed/high angle of attack, steep bank angle to the left, moderate engine power and possible excessive left rudder application. The steep descent, short wreckage trail and low ground speed point to a loss of control at low altitude due to aerodynamic stall. Ground scars indicated that the spin rotation had been stopped; however, insufficient height remained to arrest the high rate of descent.

The pilot was highly experienced both in the Cessna 172 and in the pipeline patrol environment, and was familiar with manoeuvring in steep turns at low altitude while inspecting and photographing ground features. The conduct of single-pilot, low-level pipeline patrols that include the additional task of photography can increase the potential for distraction from

primary flying and increase the risk of loss of control. However, there are no definite explanations for the loss of control on this flight.

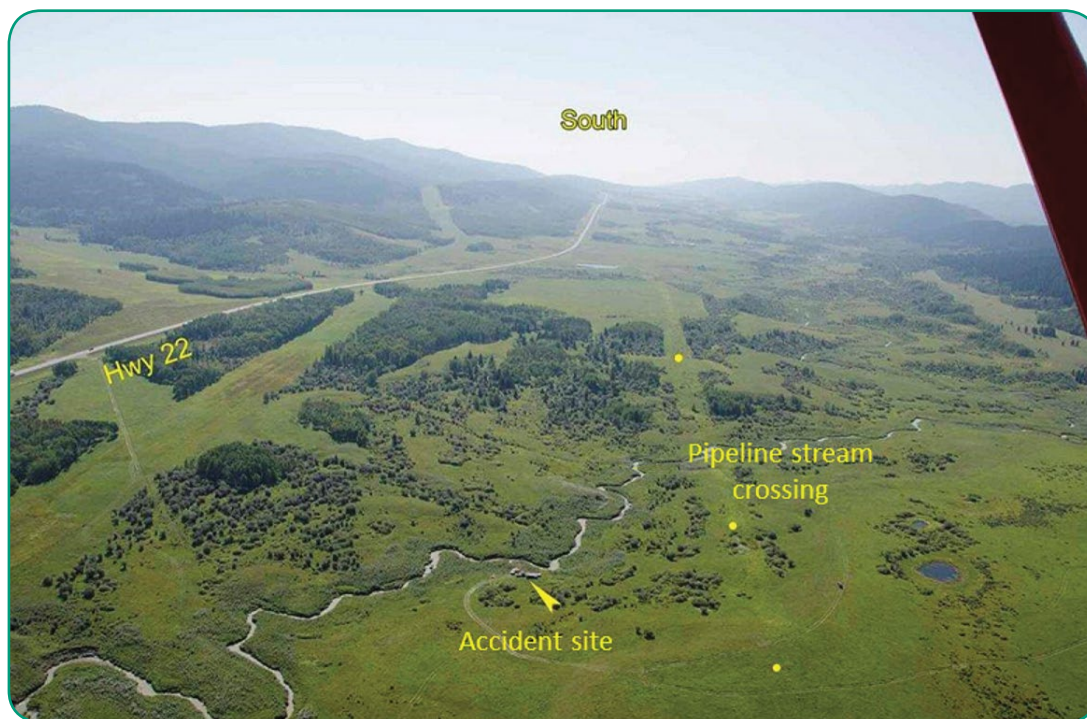
The reason for the change in engine noise as the aircraft entered the stall could not be determined. The engine appeared to have operated normally during descent, and there were signatures of high power application on impact. It is unlikely that a power interruption would have caused the pilot to lose control.

Findings as to causes and contributing factors

1. For undetermined reasons, while manoeuvring during low-level pipeline reconnaissance, control was lost and the aircraft entered an aerodynamic stall and spin.
2. Although the pilot was able to arrest the spin, the low altitude of the aircraft prevented recovery from the stall before the aircraft struck the ground.

Finding as to risk

1. The conduct of single-pilot, low-level aerial inspection flights that include additional tasks beyond flying the aircraft, such as photography, increases the risk of loss of control. △



Aerial photograph of the accident site

JUDGMENT

YOUR DECISION...

T



CAN YOU LIVE WITH IT?

ACCIDENT SYNOPSES

Note: The following accident synopses are recent Transportation Safety Board of Canada (TSB) Class 5 events. These occurrences do not meet the criteria of classes 1 through 4, and are recorded by the TSB for possible safety analysis, statistical reporting, or archival purposes. The narratives may have been updated since publication. Unless otherwise specified, photos are provided by the TSB. For more information on any individual occurrence, please contact the TSB.

— On July 21, 2013, a **Bell 206L-1** helicopter was being used in support of forest fire operations in and around Sherridon, Man. The pilot had fueled the helicopter at the fueling pad in Sherridon and had just lifted off. Approximately ¼ mi. away, the left boost pump caution light illuminated. The pilot initiated a return to the pad when the engine suddenly flamed out. The pilot conducted an autorotation into a clear area near the shoreline of a lake. The pilot landed as close to shore as possible, but didn't feel the skids touch the bottom of the lake; so as a precaution, he rolled the helicopter onto its right side. This puts the advancing blade into the water and clears the cabin of a possible blade strike. There were no blade strikes and they were able to exit in shallow water without injury. The operator is in the process of recovering the helicopter and will transport it back to their main base for an examination of the fuel system. *TSB File A13C0086.*

— On July 25, 2013, a **Cessna 185B** was flying from Billy Bishop/Toronto City Airport (CYTZ), Ont., to Orillia Airport (CNJ4), Ont. While en route, the engine stopped. The pilot made a forced landing in a farm field and the aircraft came to rest inverted. When the aircraft was righted, the right fuel cap was found hanging from the attaching chain. Six L of fuel was recovered from the tanks. The aircraft was substantially damaged; however, the pilot was uninjured. *TSB File A13O0142.*



TSB File A13O0142

— On July 29, 2013, an **advanced ultralight Norman Aviation J6 KARATOO** was conducting a VFR flight from Rivière Thompson, about 4 NM west of Val-d'Or Airport (CYVO), to Rivière Harricana, about 15 NM north-northwest of CYVO. The pilot was alone on board. While the aircraft was pulling up after a third fly-over the landing area, it appears to have entered a spin and hit the ground at a marked nose-down angle. A fire started immediately after impact and the aircraft was destroyed. The pilot was fatally injured. *TSB File A13Q0132.*

— On August 1, 2013, a **Cessna 305C** taxied on the grass south of St-Jean Airport (CYJN), Que., during glider operations with only the pilot on board. The main landing gear got caught in a rut, and the aircraft nosed over and came to a stop on its nose. The aircraft sustained damage to the propeller and engine. The pilot was not injured. *TSB File A13Q0135.*

— On August 1, 2013, an **amphibious float-equipped, amateur-built Altima Eagle XT** (modified Cessna 206) departed Cooking Lake (CEZ3), Alta., for Hastings Lake, Alta., to practise water takeoffs and landings. During the first landing attempt in glassy water conditions, a hard landing was experienced which collapsed the front float strut and resulted in the propeller contacting the floats and the wing tips contacting the water. The aircraft remained upright and the pilot sustained no injuries. A local boater attended the scene and took the pilot to shore. *TSB File A13W0112.*

— On August 1, 2013, a **Piper PA32-300** was on a flight from Villeneuve, Alta., to Whitehorse, Y.T. In the vicinity of Telsin, Y.T., the flight encountered an area of thunderstorms. While attempting to manoeuvre around the thunderstorms, the aircraft inadvertently became engulfed within the associated cumulonimbus cloud. The pilot lost control of the aircraft, but was eventually able to recover when the aircraft dropped out of the cloud. The aircraft continued to Whitehorse and later returned to Villeneuve, where a subsequent inspection revealed significant structural damage to the aircraft. *TSB File A13W0142.*

— On August 2, 2013, an **amateur-built Smith PA-18 Replica seaplane** took off from Lac-Huron, Que., for Lac-aux-Sables, Que., on its first flight with only the pilot on board. During the

initial climb, the aircraft moved erratically along the longitudinal axis. Shortly after takeoff, at about 200 ft, the aircraft nosed down. The pilot shut off the engine and applied aft pressure on the yoke. The seaplane crashed into the trees. The pilot was not injured. The information obtained indicates that the aircraft had taken off with an anchor attached to its tail. *TSB File A13Q0136.*

— On August 2, 2013, an **amateur-built Rotorway Exec 162F** helicopter landed on sloped terrain approximately 8 NM southeast of Chilliwack, B.C., and the right skid sank into a rut resulting in the helicopter rolling to the right. The main rotor and tail boom struck the ground resulting in substantial damage. There were no injuries to the two people on board. *TSB File A13P0200.*

— On August 5, 2013, the pilot of a **Bestoff Nynja advanced ultralight** was preparing for a flight from Maniwaki, Que. After two unsuccessful attempts to start the engine, the pilot, alone on board, pushed the throttle forward and put the choke control in the *ON* position. When the engine started, the rpm increased and the aircraft started rolling and hit a parked car. The aircraft and the vehicle were damaged, but no one was injured. *TSB File A13Q0149.*

— On August 5, 2013, a **Cessna 337** was inbound for Runway 06 at Stony Rapids Airport (CYSF), Sask. The aircraft subsequently landed on the runway with the landing gear retracted. The aircraft came to rest on the runway, and the crew evacuated the aircraft without injury. The aircraft sustained damage to its belly and front propeller. The aircraft had no mechanical anomalies and the landing gear was not extended prior to landing. *TSB File A13C0090.*

— On August 5, 2013, a **Quad City Challenger II advanced ultralight on floats** was taking off from Six Mile Lake, Ont., in the Georgian Bay area, when the aircraft stalled and crashed into the lake. The aircraft was substantially damaged and the pilot sustained minor injuries. *TSB File A13O0147.*

— On August 6, 2013, an **amateur-built Dragonfly** was conducting a local flight at St-Jean-sur-Richelieu Airport (CYJN), Que., in VFR conditions with the pilot and one passenger on board. When landing on the runway after conducting touch-and-gos, the aircraft porpoised, deviated from its course and went off the runway. The left landing gear leg was torn off and the propeller blades and the left wing tip were damaged. The pilot and his passenger were not injured. It was later determined that the aircraft had been caught by a lateral wind gust during landing. *TSB File A13Q0145.*

— On August 6, 2013, an **AS-350-B2** helicopter landed approximately 5 NM west of Forrest Lake, Sask., to drop

off some passengers. After touching down, two of the three passengers got out of the helicopter while the engine and rotor were still running. The passenger on the right removed his gear from the cargo bay and proceeded to the front of the helicopter where he was struck by the rotating rotor blade. The passenger on the left was not injured. The helicopter was located on a soft muskeg helipad facing into the sun. The front of the skid gear had sunk further into the muskeg than the rear due to the bear paws, resulting in a less than 6-ft clearance between the ground and the rotor disc. The passengers were briefed on safe departure procedures prior to egress. The injured passenger sustained serious injuries and was transported to a hospital in Fort McMurray for treatment. *TSB File A13C0091.*

— On August 9, 2013, an **amateur-built Smith Cub 18 (tailwheel)** was landing in Quesnel (CYQZ), B.C., on the grass beside the runway and ended up inverted. One of the two persons onboard suffered minor injuries. Both were wearing shoulder harnesses which they believe prevented more serious injuries. *TSB File A13P0217.*

— On August 13, 2013, an **Air Tractor AT401** was departing Quill Lake, Sask., on an application flight. During the takeoff run, the engine (Pratt & Whitney R-1340) sputtered and lost power. The pilot rejected the takeoff, but could not stop the aircraft on the runway. The aircraft continued 200 feet past the end of the runway into a canola field, and overturned. The pilot suffered minor injuries and the aircraft sustained substantial damage. Some of the chemical (Silencer) and some avgas was released from the overturned aircraft. The aircraft operator is recovering it for repair. *TSB File A13C0096.*



TSB File A13C0096 (RCMP photo)

— On August 13, 2013, a **Cessna 188A AgTruck** was spraying about 5 NM north of Indian Head, Sask. While manoeuvring, a wing tip entered the crop and the aircraft flew into the terrain. The aircraft sustained substantial damage. The pilot was uninjured and there was no fire. *TSB File A13C0097.*

— On August 15, 2013, an **amateur-built Van's RV4** with the pilot on board was leaving Mascouche Airport (CSK3), Que., for Lac-à-la-Tortue Airport (CSL3), Que. During the takeoff run on Runway 29, the aircraft deviated to the left and veered off the runway, ending up in the grass some 50 ft from the runway edge. The right landing gear leg was substantially damaged. The pilot was not injured. *TSB File A13Q0147.*

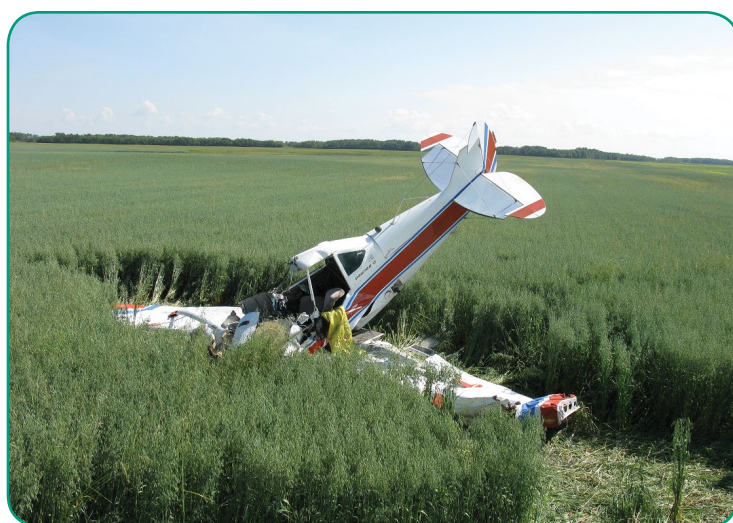
— On August 15, 2013, a **Bell 204B** helicopter departed Pelican Narrows (CJW4), Sask., on smoke patrol cruising at 2 500 ft ASL. The aircraft encountered turbulence, followed by porpoising, accompanied by left and right yawing and strong vibrations. The pilot initiated a descent to an open area near a lake. During the descent, the aircraft began to yaw to the right. The aircraft landed at the shoreline with the front of the skid gear and nose in the water. The helicopter was shut down and evacuated. Inspection revealed that a bolt securing the pitch change link to the pitch change horn of one tail rotor blade had failed. The blade had struck the side of the vertical stabilizer (pylon). Inspection of the failed bolt indicated that it had failed due to fatigue. There were indications that the bolt had been loose at some time in the past. The operator is changing their maintenance practices to ensure that the bolts are replaced at each tail rotor installation. Bolts will also be replaced if they are subsequently found to be loose during service. *TSB File A13C0099.*

— On August 16, 2013, a **Grumman G-164A** was engaged in aerial application of Lorsban insecticide ½ NM west of Aylsham, Sask. When performing an eastward application pass into the sun, the pilot lost ground reference. The aircraft descended into the canola crop and impacted the ground. The pilot was wearing a helmet and was secured with a four-point harness. The pilot was able to exit the aircraft and was uninjured. The aircraft was substantially damaged. An ELT signal was not detected. Some of the chemical was released. *TSB File A13C0100.*

— On August 16, 2013, a **Cessna 182M** departed Springbank Airport (CYBW), Alta., for a sightseeing trip to the Kananaskis area. While in cruise flight near Mt. Allan, at approximately 8 500 ft ASL, the pilot noticed that the oil pressure indication had decreased to zero. Engine performance had not degraded, but the pilot decided to divert toward a local highway in case a precautionary landing was required. During the descent, the engine performance degraded rapidly and smoke was observed in the cabin. A “Mayday” was transmitted on 121.5 MHz and a forced landing was planned for Highway 40, south of the Trans-Canada Highway. During the approach, an oncoming vehicle was noticed, leaving the roadway ditch as the pilot’s only option. The adjacent field was ruled out due to traversing power lines. The aircraft landed beside the highway and collided with

signage, resulting in substantial damage to the right wing and minor damage to the left wing tip. There were no injuries to the pilot or sole passenger. *TSB File A13W0119.*

— On August 16, 2013, a **Piper PA-25-235 Pawnee** departed Rose Valley, Sask., on an aerial application flight. The aircraft wreckage was discovered in a grain field, and the pilot had sustained fatal injuries. The aircraft was substantially damaged, but there was no post-crash fire. TSB investigators were deployed to the site. An inspection of the wreckage revealed both fuel caps were missing and both fuel cells contained residual fuel only. First responders and TSB investigators did not notice any evidence of a fuel leak or spill in the surrounding area. Investigators searched the crop in the surrounding area and the aircraft operating areas at the departure point but did not locate either fuel cap. *TSB File A13C0102.*



TSB File A13C0102



Both fuel caps were missing and could not be found.

TSB File A13C0102

— On August 18, 2013, an **amateur-built Van's RV7** was on a VFR flight from St-Jean Airport (CYJN), Que., to a private runway about 2 km east of Inverness, Que., with the pilot and one passenger on board. After several attempts to land in crosswind conditions, the aircraft touched down, took off and touched down again. The aircraft then went off the runway on the east side, crossed a road and flipped over into a ditch. The pilot and the passenger were not injured. The aircraft sustained substantial damage, but there was no post-impact fire. *TSB File A13Q0148.*

— On August 18, 2013, an **amateur-built Kitfox V** aircraft was carrying out low-and-over flights at the pilot's newly constructed airstrip near Barss Corner, N.S. During the third flight, the aircraft was on a left-base-to-final turn when it pitched over and entered a right-hand spin. The aircraft impacted the ground in a near-vertical attitude. A post-crash fire ensued which destroyed the aircraft. The pilot, who was the sole occupant, was fatally injured. *TSB File A13A0097.*

— On August 23, 2013, an **amphibious Cessna A185F** departed Fort McMurray, Alta., at 13:23 MDT. At 14:13 MDT, an overflying aircraft spotted the floatplane overturned in a lake 24 NM south of Fort McMurray. The pilot, who was the lone occupant, was fatally injured. The wheels were found in the down position. *TSB File A13W0125.*

— On August 25, 2013, a **Pioneer II glider** was being towed at the London Soaring Club, 3 NM west of Embro, Ont. The glider began to oscillate laterally shortly after takeoff. The glider released from the towline at approximately 250 ft AGL and began to bank to the left. The bank continued with the glider contacting the ground at a steep nose down attitude. The pilot, the sole occupant, was fatally injured. *TSB File A13O0160.*

— On September 1, 2013, an **amphibious Volmer VJ-22 Sportsman** was departing from the water at Cowichan Lake, B.C., with two persons on board. During the take-off run the aircraft struck a boat wake, nosed over and sank. Both occupants were wearing personal floatation devices and egressed with minor injuries. *TSB File A13P0213.*

— On September 4, 2013, a **Cessna A185E** was on a flight from Eleanor Lake, Ont., to Remi Lake, Ont. The aircraft experienced a power loss and the pilot attempted a forced landing on Newfeld Lake, Ont. On approach to the lake, the aircraft encountered a crosswind and landed in trees along the shoreline. The 406 MHz ELT was activated. The pilot, who was wearing a shoulder harness, escaped without injury. *TSB File A13O0167.*

— On September 8, 2013, an **amateur-built Bushby Mustang MII**, with two people on board, was flying from a private airport in St-Benoit-de-Mirabel, Que. Shortly after taking off from

Runway 33, the aircraft struck the ground and flipped over to the right of the runway. The two occupants were sent to hospital. The aircraft was substantially damaged. *TSB File A13Q0157.*

— On September 10, 2013, a **Boeing B75N1 Stearman** was en route from Regina, Sask., to St. Andrews, Man., with a stop for fuel in Brandon, Man. Upon takeoff and initial climb from Runway 26 at Brandon, one of the propeller blades failed at the blade root (Hamilton Standard 5404) and departed the aircraft. A severe vibration ensued which broke the Continental W670 engine from the engine mounts, causing the engine to fall off in flight. The aircraft pitched up and became uncontrollable. The aircraft struck the runway in a nose down attitude and both occupants sustained serious injuries. There was no fire and both occupants were taken to hospital. *TSB File A13C0116.*



TSB File A13C0116

— On September 10, 2013, the owner of a newly acquired **amphibious hull-equipped Osprey-2 amateur-built** aircraft was conducting touch-and-gos on Black Sturgeon Lake, Ont., north of Kenora Airport (CYQK), Ont. During a takeoff attempt, the aircraft began to porpoise and became prematurely airborne. The left wing stalled and the aircraft contacted the water and cartwheeled while remaining upright. The pilot sustained minor injuries and the aircraft incurred substantial damage to its right wing. The winds were light and the water was calm at the time of the occurrence. *TSB File A13C0118.*

— On September 12, 2013, a **Cessna 180K** took off from Lac Manouane, Que., along with two other aircraft. On takeoff, the pilot heard a slight popping sound coming from the engine and decided to circle the lake while communicating with a mechanic who was piloting one of the other two aircraft, a Cessna 180B. Reassured about his aircraft's condition, the pilot of the C180K resumed his planned heading and, by doing so, found himself converging with the C180B, which had modified its path to the

right to take advantage of a higher ceiling. Seeing the imminent impact, the pilot of the C180K banked the aircraft sharply to the right while lowering the nose as far as possible. The left wing tip struck the bottom of the C180B's float. The pilot lost control of the aileron but managed to stabilize the aircraft. He then skimmed the treetops to slow down and crashed in the forest. The gas in the wing tanks spilled on the slightly-injured pilot, who managed to exit the aircraft by breaking the side window with his feet. The pilot found shelter and was rescued by a team on the ground 3 hr later. The aircraft that was struck (the C180B) sustained minimal damage to one float and remained above the crash site for 90 min to maintain visual contact of the pilot and to organize the rescue. *TSB File A13Q0159.*

— On September 26, 2013, a **Weatherly 620B spray** aircraft was being photographed in flight at Hnatko Farms (Westlock) Aerodrome (CHF3), Alta. During a low pass, the photographer on the ground was struck by the aircraft's left wing tip and suffered serious injuries. The left wing tip fairing detached during the collision; however, the pilot was able to control the aircraft and return for a landing. *TSB File A13W0145.*

— On September 28, 2013, an **American Aviation AA-5A** was taxiing at St. Catharines/Niagara District Airport (CYSN), Ont., in preparation for a flight to London (CYXU), Ont., when the aircraft's right wing tip struck a perimeter fence. The aircraft came to rest with the nose section penetrating the fence. The aircraft was substantially damaged. The pilot, the sole occupant, was uninjured. *TSB File A13O0188.*

— On October 1, 2013, a **Piper PA12 on floats**, operating VFR from Fermont, Que., to Lac Louise, Que., flipped over while landing on the glassy water of Petit Lac Paradis, Que. The pilot misjudged the height of the aircraft above the water. He was able to evacuate the submerged aircraft and was rescued by witnesses

in a nearby boat. He was not injured. The aircraft was substantially damaged and was later towed closer to shore for salvage. *TSB File A13Q0170.*

— On October 3, 2013, after a hard landing at Lac Magpie, about 100 NM northeast of Sept-Îles, Que., a **Maule M-7-260** sustained substantial damage to its float attachments and its propeller struck the surface of the water. The pilot and the passenger were not injured and were able to evacuate the aircraft which, despite the damage, was still floating on its floats. The aircraft was left unsupervised for a few days near the shore before being found partly submerged in about 4 ft of water. *TSB File A13Q0204.*

— On October 11, 2013, an **amateur-built SPORTRAINER** landed on the grass south of Runway 23 at Bromont Airport (CZBM), Que. Once on the ground, the pilot backtracked on Runway 23 towards the air terminal with flaps lowered. Wanting to accelerate the taxiing to free up the runway for another aircraft in the circuit as quickly as possible, the pilot increased the power. That was when he lost control of the aircraft. The aircraft exited the runway, fell into a ravine and came to rest on its nose. During the loss of control, the left wing touched the ground. The aircraft sustained substantial damage to the propeller. The pilot, alone on board, was not injured. *TSB File A13Q0176.*

— On October 16, 2013, a **Cessna U206F** was having the prop turned over by hand due to the cold temperature. The magnetos had inadvertently been left on and the engine started with no one at the controls. The pilot attempted to get in and control the aircraft but was not able to do so. The aircraft ran out of control into trees and down an embankment where it came to rest. There was substantial damage to the wings and propeller; the nose gear collapsed. *TSB File A13W0159.* △



TAKE FIVE...

TP 2228E-40
(07/2014)

for safety

Five minutes reading could save your life!

GEAR DOWN AND LOCKED...

GEAR DOWN AND LOCKED...

GEAR DOWN AND LOCKED...

We often hear that “there are those who have landed wheels up, and there are those who will”.

Each year, pilots take their expensive, retractable landing gear-equipped aircraft and land with the wheels up. Why does this happen? How can we prevent it?

Why does it happen?

Some of the reasons are:

1. **Distraction:** Pilots flying retractable landing gear aircraft may get distracted and forget to select the landing gear down. By concentrating too much on communicating with ATC or passengers, they forget to fly the aircraft and skip checklist items.
2. **Unstabilized/rushed approach:** Pilots multitask, fall behind the aircraft and often end up in an unstabilized or rushed approach. They focus on correcting the flight path while dealing with radio communications and traffic, and they forget the retractable gear.
3. **Limited flight training in retractable gear operation:** Some pilots may not have been taught useful retractable gear operational techniques, such as prioritization of landing gear checklist items or positional imprinting, where pilots select visual or positional markers to remind them to confirm that the gear is down.

How to prevent it?

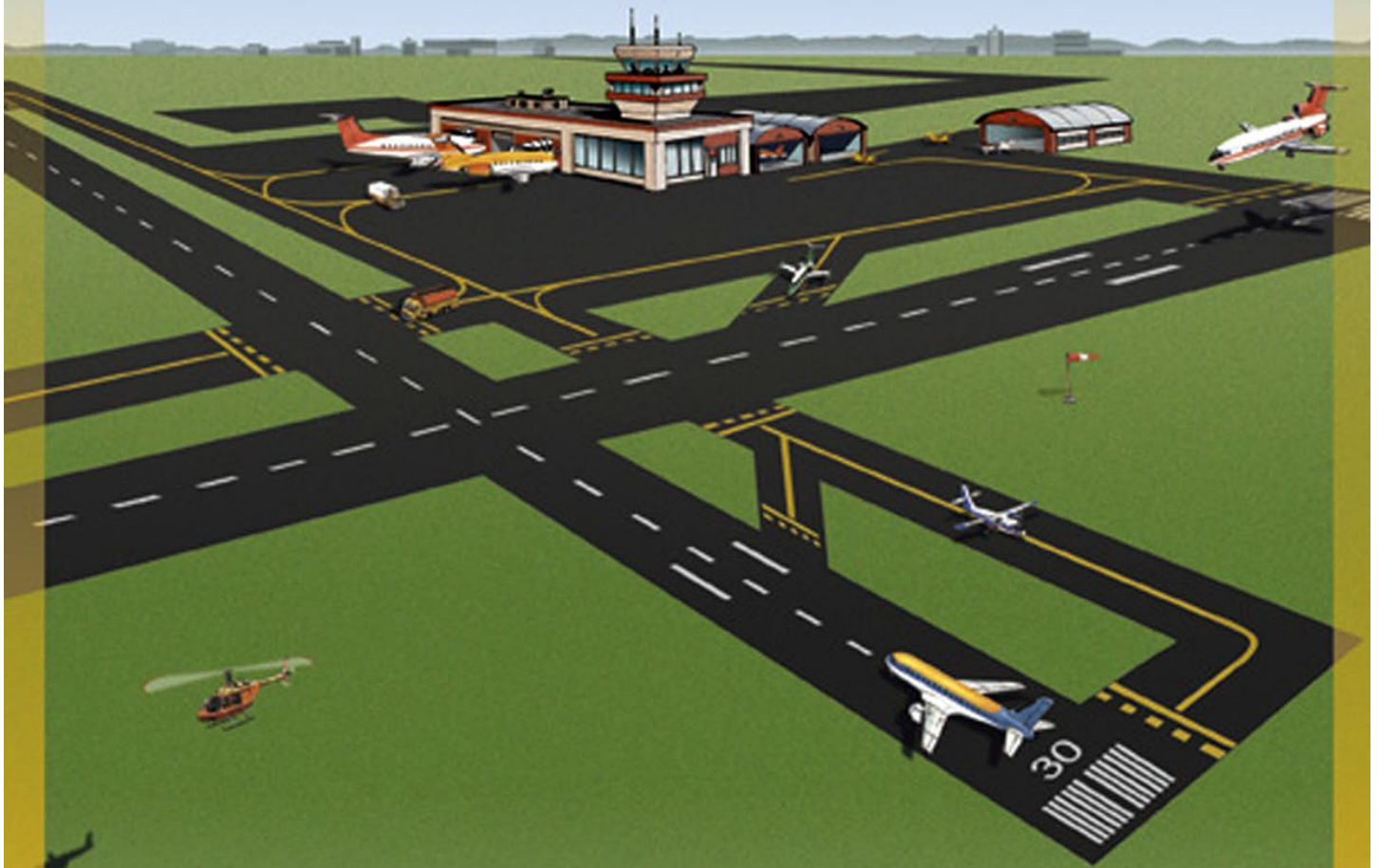
Three things to remember when operating a retractable gear aircraft:

1. **Always use the checklist:** This is self-explanatory. However, aircraft operational tasks and associated checklist items don't all have the same value. Items related to retractable gear operations are high priority. If your checklist includes the **G.U.M.P.S.** mnemonic, remember that the G stands for “gas” and the U stands for “undercarriage”!
2. **Always fly a stabilized approach:** Pilots who consistently fly stabilized approaches are much less likely to forget critical steps, such as lowering the landing gear. The key to achieve consistency is through practice, repetition and by flying the same stable approach all the time.
3. **Always confirm GEAR DOWN AND LOCKED 3 TIMES:** Confirm a minimum of **three** times that your retractable landing gear is down and locked. These three times may differ depending on aircraft, checklist, position and situation. This is where you can “imprint” in your mind at least three moments to check the gear. The constant remains to always **CHECK GEAR DOWN AND LOCKED 3 TIMES.**

When to go around? Common guidance is that if you cannot have the aircraft stabilized, properly configured and ready for landing a **half-mile back**, then you should seriously consider overshooting.

To view the complete *Take Five* list, please click [here](#).

EVERYTHING MOVES AT AN AIRPORT. BE ALERT!



RUNWAY INCURSIONS ARE REAL!



Transport Canada Transports Canada



TP 14010E



(11/2003)

Canada