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TP 185E
Issue 1/2010

AVIATION SAFETY LETTER

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Flying for Money!

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

TC-1003452

Canada

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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-SAN

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Fax: 613-991-2081
Internet: www.tc.gc.ca/Transact

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

ISSN: 0709-8103
TP 185E

Publication Mail Agreement Number 40063845

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GUEST EDITORIAL

Martin J. Eley

"Let our collective ideas take flight"

A message from the Director General, Civil Aviation

It's my pleasure to contribute to this issue of the *Aviation Safety Letter*, as it provides me a means to formally introduce myself. Although I have tried to attend association meetings and other gatherings over the last few months, I have not had the opportunity to speak with some of you. This piece gives me the chance to say hello and give you an idea of who I am, where I come from, and where I see us going together.

I feel that it is worthwhile to begin with a few highlights from my journey in aviation up until now. I began my career in 1972 as an undergraduate apprentice with the British Aircraft Corporation at Weybridge in Surrey—at a time when the last of the production Concordes were being completed. After graduating from aeronautical engineering at the University of London in 1977, I moved to Warton in Lancashire to work on the application of composite materials to Jaguar and Tornado military aircraft at British Aerospace.

In 1982, I moved to Canada to join Transport Canada as a structures engineer in the former Airworthiness Branch. As a senior engineering program manager from 1985 to 1994, I was responsible for the type certification of many Canadair/Bombardier aircraft and various other foreign products. I went on to become the chief of engineering and was involved in the type certification of the majority of Canadian products and a variety of foreign products before becoming the director responsible for aircraft certification in 2001. In that role, I was very proud to be part of Viking's initiative to take over the type certificates for the de Havilland (Bombardier) legacy products.

On May 4 of this year, I was appointed to the position of Director General, Civil Aviation. And with new leadership comes change. It is inevitable that I will do some things differently than they have been done in the past, but I would like to assure you of a few things as we begin this journey together. The benefits of introducing and implementing safety management systems (SMS) in the aviation industry and our own Integrated Management System (IMS) within Transport Canada are already clear. We have made the right choice and are on the right track. I am committed to seeing through the full implementation of both systems, while recognizing that in a culture of continuous improvement, adjustments will be made along the way based on the experience we gain. I also believe that the reorganization of the Civil Aviation Directorate is necessary for us to meet the needs of the current and future aviation environments.

> *"The benefits of introducing and implementing safety management systems (SMS) in the aviation industry and our own Integrated Management System (IMS) within Transport Canada are already clear."*

One of my personal objectives over the next few months is to solidify and establish positive working relationships with our many stakeholders. This is fundamental to keeping the lines of communication open and helping with the resolution of issues as they arise. Our stakeholders include: the users and operators of the civil-aviation system and industry associations; Transport Canada employees at Civil Aviation in Ottawa and the Regions and the unions that represent them; and colleagues throughout Transport Canada, other government departments, and foreign authorities. These partnerships are critical in this industry, and emphasis must be placed on their role in our collective success.

Transport Canada's aviation safety work over the coming years will be guided by our directorate's next strategic plan, which is currently being developed and is expected to "take flight" later this year. I have received ideas from many of you about the way forward, and your suggestions continue to be very valuable to me. When our existing plan, *Flight 2010*, was first released in 2005, it gave a description of our goals and where we expected to be as an organization five years down the road. The clear vision and strategy outlined in *Flight 2010* has helped us to make great strides in the development of civil aviation in Canada. Although much of the material in *Flight 2010* remains relevant, we must examine it with fresh eyes to ensure that our strategy for the Aviation Safety Program continues to be pertinent and valuable over the next five years. By looking ahead with a clear strategic plan, we will be better equipped to face whatever comes our way. Forward thinking provides us with the strong direction and commitment necessary for our future achievements.

One of my personal objectives over the next few months is to solidify and establish positive working relationships with our many stakeholders.

The pioneers of aviation took risks. Big risks. They had a vision—a dream that guided them to build a contraption and have it take flight. They couldn't know then if an airplane would even lift off the ground, let alone stay in the air. But their perseverance paid off. The same holds true for the risks we take today. We have the advantage of tools that help us take a structured approach to managing the risks inherent during times of change.

Today, we have a robust civil-aviation system that we can be proud of, and I am confident that, together, we can meet the challenges of taking the aviation industry to higher levels of success and safety.

Martin J. Eley
Director General
Civil Aviation

Canadian Aviation Safety Seminar

Over the last few years, safety information has become more readily accessible through reputable Web sites, aviation seminars and conferences launched by industry partners in Canada and around the world. Industry stakeholders continue to acquire new skills and insights, and to benefit from the sharing of best practices through these and other forms of training and communication activities.

For those reasons, Transport Canada has decided to discontinue the Canadian Aviation Safety Seminar (CASS) to focus resources on the activities necessary to address current safety-awareness, -education, and -promotion issues. This will be achieved through Transport Canada's specialized seminars, oversight activities, Web site and publications.

Transport Canada will continue to be involved in promoting aviation safety by providing targeted interventions that correspond to the needs of the industry, and effectively educating the audience about relevant safety issues.

For more information, please visit www.tc.gc.ca/CASS.

National Aviation Day—February 23

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An Ounce of Prevention…SMS Implementation Update

by Cliff Marshall, Technical Program Manager, Technical Program Evaluation and Co-ordination, Standards, Civil Aviation, Transport Canada

This column is the first in a series of articles to inform the reader on various aspects of safety management systems (SMS). The old adage "An once of prevention is worth a pound of cure" really captures the essence of SMS. If we can prevent or decrease the incidence of unsafe acts through consideration of procedures, processes, and human and organizational factors, we will improve safety and proactively address safety concerns. This series of articles will explore the role of SMS and highlight best practices by using different information sources, including industry.

This first article has been designed to familiarize the reader with where we are now and where we are going. Transport Canada Civil Aviation (TCCA) is applying a four-phased approach to SMS implementation. Currently, large air carriers and associated maintenance organizations are the only certificate holders to have completed all four implementation phases. These organizations are now having their SMS assessed by TCCA. This assessment will determine not only regulatory compliance but also SMS effectiveness.

In addition, Group One airports (international) and air traffic service providers are entering phase three of their implementation. Phase three requires that these groups record and utilize relevant documented policies and procedures for proactive processes and training for personnel assigned SMS duties.

Group Two airports are entering phase two. At this stage, they are required to document and implement policies and procedures for reactive reporting, investigation techniques, risk management, and training for personnel assigned SMS duties relevant to these processes.

By 2015, all certificate holders will have completed SMS implementation. The next segments of the Canadian aviation community scheduled to adopt SMS are the remaining maintenance organizations, commuter operators, air taxi operators, and aerial work operators. This list represents a sizable number of organizations that are watching closely for the publication of their respective SMS regulations. TCCA is monitoring the ongoing assessments of large carriers and their associated maintenance organizations to gain additional information that will assist in planning implementation activities for this next group. Based on this information and feedback from front-line employees, TCCA is adjusting the SMS implementation schedule and refining the project plan and effective dates accordingly. Flight training units (FTU) and manufacturers will follow the aforementioned organizations, leaving only the heliports, water airports, and aircraft certification groups to enter the SMS world.

TCCA has implemented an SMS regulatory framework over a relatively brief period. It should be noted that SMS implementation is being conducted globally because the International Civil Aviation Organization (ICAO) has mandated that its member states implement SMS regulations. An organization's culture shift from reactive to proactive hazard-identification and risk-mitigation methodology may seem daunting. However, some industry groups that have implemented SMS are already reporting that this new requirement makes good business sense. A safe company attracts more clients, which equates to success. The competitive marketplace encourages other organizations to follow suit. This positive attitude is gaining attention and respect.

For additional information, including the implementation schedule and guidance material, please visit TCCA's SMS homepage at www.tc.gc.ca/CivilAviation/SMS/menu.htm. The next "dose" of *An Ounce of Prevention*… will discuss performance measurement in an SMS context. △

Important reminder: Aviation Document Booklet

The deadline for holders of air traffic controller licences, flight engineer licences, private pilot licences, commercial pilot licences, or airline transport pilot licences to have received the new Aviation Document Booklet has been extended to June 30, 2010. For other licences and permits, the deadline remains December 31, 2010. For more information, contact a regional Transport Canada licensing office.

Flight Service Information Management System Implemented at Flight Information Centres

by Ann Lindeis, Manager, Safety Management Planning and Analysis, NAV CANADA

The Flight Service Information Management System (FIMS) has been implemented at NAV CANADA's flight information centres (FIC).

FIMS provides information and functionality for flight service specialists to deliver services associated with flight planning, VFR alerting, weather briefing, flight information service en route (FISE), and aeronautical information (NOTAMs). FIMS is an integrated system that allows for the centralization of flight information while providing each specialist with access to the information necessary to perform pre-flight, en-route, VFR alerting, and communication searches.

Customer benefits

The introduction of FIMS improves service delivery from FICs by providing the specialist with the added functionality needed to retrieve and display weather and aeronautical information, and also by supporting an automated environment for flight-planning and alerting services.

FIMS automates the sorting and display of information in a user-friendly interface, specifically designed for each FIC operation. Specialists can easily access data, provide information or update flight data based on the pilot's requirement.

FIMS allows each FIC to organize the information presented to the specialist based on the services provided, meaning that each FIC configures FIMS to meet the needs of the aviation community. An example of this is the North Bay FIC, which provides services in northern Canada. Its FIMS is designed to support flights requiring co-ordination with the Department of National Defence for Canadian air defence identification zone (CADIZ) identification.

Quality assurance

Entered and received flight-plan data and NOTAMs are subject to a high degree of data validation. Improved data means better information within all NAV CANADA aeronautical systems for use by pilots, specialists, and controllers. With this high degree of data validation and quality assurance incorporated into FIMS, pilots are assured that the information received from the specialist will enhance the safe planning and completion of their flight.

FIMS incorporates various validation requirements associated with flight-plan messages, NOTAM formatting, and other types of messages to assist the specialist in completing information fields as required. If information that FIMS cannot validate is received or entered, a specialist is alerted via an alarm message indicating that a specific field cannot be validated or may be incomplete.

Better, faster access to data

FIMS simplifies routine tasks such as entering and updating NOTAMs and flight plans. Specialists can access existing information and can modify and process it, rather than having to enter tombstone information each time. Improved weather data and NOTAM recall functions allow for more efficient pilot briefings. For example, a specialist can enter a flight route and the system automatically brings up the weather and NOTAMs required to brief the pilot. Because FIMS requires less manual data input, service to the aviation community is improved.

Technical advantages

NAV CANADA developed and now maintains FIMS in-house. The system operates on a Linux-based platform, using a modern, scalable hardware platform that also allows for the addition of software applications and integration with other NAV CANADA systems. The stability and reliability of FIMS ensures that information is available from the FICs for pilots to plan and complete a safe flight.

Implementation

The need for a modern, scalable alpha-numeric weather, flight-planning, and aeronautical-information system was identified in the FIC Project. NAV CANADA created the FICs and has now implemented FIMS to meet the requirements of providing quality information to pilots at the pre-flight and en-route phases of flight, thereby ensuring that information necessary for a safe flight is available to pilots. △

The First Defence*: *Effective Air Traffic Services-Pilot Communication

As part of the effort to increase awareness of the risks associated with non-standard communication, the Air Traffic Services-Pilot Communications Working Group has developed an awareness campaign called **First Defence**.

Watch *The First Defence: Effective Air Traffic Services-Pilot Communication* video at www.navcanada.ca.

Pre-flight

COPA Corner: Temporary Flight Restrictions (TFR) in Canada

by Kevin Psutka, President and CEO, Canadian Owners and Pilots Association

CANADIAN OWNERS AND PILOTS ASSOCIATION

Bob Grant's article "I'll just sneak through here…they'll never see me if I stay low", published in Aviation Safety Letter *(ASL) 3/2009, reminded us all of the need to know the interception signals. This condensed version of a previous editorial in* COPA Flight *magazine explains how TFRs are developed. This hindsight is useful to understand the TFRs that will be issued for the upcoming Olympics and G8 Summit. —Ed.*

Temporary flight restrictions (TFR) are commonplace in the U.S. They cover everything from short-term pop-up TFRs such as for sporting events, to extensive ones such as the permanent Washington, D.C., no-fly zone that effectively extends out to 60 NM. Canada is more reasonable, but we have seen several TFRs, including: the G8 Summit in Kananaskis, Alta., a visit by President George Bush to Ottawa, a TFR spillover into Canada when President Bush attended a baseball game in Detroit, Mich., the G7 Summit in Montebello, Que., the Francophonie Summit in Quebec City and, most recently, President Barack Obama's Ottawa visit.

There are two more TFRs in the works for 2010. Firstly, the Winter Olympics will cause various restrictions, from the need to file a flight plan and squawk a discrete code to a complete prohibition on any flying in certain areas. The affected airspace will extend 30 NM around Vancouver Airport and Whistler Resort. Our sector of aviation will likely be affected by significant restrictions or prohibitions from January 29 to March 24, 2010—from before the Olympics begin until after the Paralympics have concluded.

The second TFR in the works is for the G8 Summit being held at the Deerhurst Resort in Ontario (CDH1) from June 25 to 27, 2010. This TFR will likely be similar to the one for Kananaskis— which extended 80 NM— and could reach down to the very busy Toronto area. It is important to note that the no-fly zone will affect a significant number of floatplanes based at several lakes in the area.

Determining the size and duration of an airspace restriction is a complicated process involving several government agencies. Normally, the Royal Canadian Mounted Police (RCMP) is tasked with overall security and relies on input from the Department of National Defence, Transport Canada, and NAV CANADA to develop a plan.

The authorities have learned from past events that it is also necessary to consult with those affected by the restrictions. Historically, relying on the NOTAM system alone has been insufficient to ensure that everyone knows about and understands the restrictions. Representatives from associations and industry have a role to play in developing the restrictions and disseminating information. To the greatest extent possible, COPA has been involved in the planning of all events since September 11, 2001.

To illustrate how the plan comes together and what role industry plays, I will use the Kananaskis G8 Summit as an example. It started out as a 20-day prohibition extending 80 NM. After consultation, the period was reduced to four days (two days for the event plus one day on either side for the arrival and departure of VIPs), but the 80-NM zone remained. Given the massive size of the restricted area, COPA pushed for an early announcement of restrictions; a general plan was disseminated, followed by the final plan issued by NOTAM seven days prior to the event.

Each time a TFR is being planned, a meeting or meetings take place with the industry. In the case of the upcoming Olympics, several committees are in place and a number of meetings have been held over the past few years. Early in the process, key stakeholders from the Salt Lake City Winter Olympics were on hand to discuss lessons learned.

During the Francophonie Summit, there were 22 airspace incursions, with several intercepts. In one case, an aircraft was directed to land by an intercepting aircraft but took off again and had to be directed to land a second time. Although the NOTAM was highlighted by COPA and other organizations, it appears that relying solely on NOTAMs is an ineffective way to ensure that the public knows about TFRs.

Restrictions are now the norm for any significant international event held in Canada. TFRs can occur at any time, extend further in space, and be longer in duration than you might expect. Therefore, it is more important than ever to check NOTAMs every time you fly. △

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Mid-Air Collision Avoidance While Flying

by Dave Loveman. This excellent article is courtesy of www.ultralightnews.ca, reprinted with permission.

Picture yourself flying along at about 500 ft over a 60-mi. long lake, after a nice long leisurely weekend of cross-country flying. There isn't a cloud in the sky, the sun is setting, you have your helmet on and your CD player playing through the ear muffs.

Then, all of a sudden, you hear this God-awful roar and at the same time hear a screeching sound like metal on metal, your ultralight aircraft pitches forward and down, something hits your rudder, and you see a set of conventional-size floats pass by the top of your windshield. On landing, you find that your king post has been damaged, and your rudder fabric torn.

Now, picture yourself coming in for a landing in your little Buccaneer Amphibian after a nice relaxing flight over your local lake, and setting up to land back on your mile-long sod field. At about 300 ft in the air, you hear a scratching sound like something is moving along the bottom of your hull, then your plane pitches over to the left.

As it pitches, you apply full power and climb out, glancing over to see a Quicksilver MX in the process of taking off, the pilot unaware that his king post has just scratched the bottom of your hull!

The above are only two of a number of incidents that have happened in real life. Add to that, last year I lost a friend and fellow pilot due to a mid-air collision between his Kitfox and a conventional aircraft.

The skies we fly in are not nearly as dangerous as the roads we drive on, but unlike roads, our routes are not confined to the area between the lines in one direction or the other. There is no aspect of our day-to-day life that can prepare us for locating things in the sky as we fly.

Our eyes have been trained to take in the stop lights, brakes lights, turn signals, on-coming traffic, and if you are a motorcyclist, the car coming up to a stop sign from the side road, or the car just about to enter the passing lane. But in the air, our eyes have none of this to relate to, and instead of a path that is 35 ft wide with no depth or altitude, they now have to contend with a path 20-mi. wide and thousands of feet both above and below.
It is interesting to note that in studying ultralight accidents over the last 30 years, and cross-referencing them to my own experiences, I have found that most of our ultralight accidents involving mid-air collisions or close calls are in the area of our home bases, and happen during the day, in good VFR conditions.

Why? Because that is when we fly our little planes, and that is when and where we are most likely to encounter other aircraft taking off or flying in a defined circuit or pattern. Another problem is that most of us fly to relax, to get away from all the noise, traffic, and congestion, so our guard has been let down!

Another interesting fact is that most of our accidents happen when two speeds of aircraft are either landing or taking off in the same direction. That is, a slower plane is landing as a faster and higher plane is also landing.
In the case above, I was landing in my Buc while the Quicksilver was taking off. I was unaware he was taking off—he was unaware I was landing. In the case of the conventional floatplane, I was cruising along below him, unaware that he was preparing to land.

So, what can we do to help prevent these kinds of close calls and accidents? Well, the first step is to train our eyes on how to look for other aircraft when flying. In training, students encounter problems when they continually glance at their instruments as they land, and then back out at the runway—they lose "focus."

That is, the pilot looks at something near to him, adjusts for light, depth (while the brain adjusts for familiarity, the pilot knows what he is looking for on the dash) and then he looks out into the distance where the eye has to refocus with really no depth perception—that is, there is no dash to focus on, just 20 mi. of sky.

If the student continually watches the instruments, he looses his "perception" of speed, altitude and distance. Studies show that it can take two seconds or longer for the eye to adjust every time this happens.

Photo : Michael Wimmer

The first step is to train our eyes on how to look for other aircraft when flying.

At 60 mph, you are covering a mile a minute, nearly 100 ft per second. Now add in the reaction time that would be needed to avoid a collision—say 10 or 12 seconds (to first recognize then react)—and you have traveled over 1 000 ft.

Let's look at some of the problems our poor old eyes face when we fly.

We've talked about the problem the eyes and brain have adjusting to things near and far. But what else will affect our "collision avoidance judgment"? The following are some examples:

- weather conditions—clear days versus hazy days;
- windshield condition—clean versus dirty or scratched. Remember when you look at a plane in the distance, it will first appear as a "spot" on the windshield. But if you already have a number of "spots," you may not catch the one that is closing in on you at 150 mph;
- where the sun is—a sun glaring in the windshield makes seeing distances impossible;
- pilot's eye condition—wearing glasses or even sun glasses;
- optical illusions—how many times have you been flying, and seen something shiny in the distance that looks like a large aircraft coming at you, only to have it turn out to be the sun reflecting off a building? How many times have you seen what looks to be another plane doing aerobatics in the distance, only to have it turn out to be a model plane just in front of you?
- aircraft design—many aircraft have blind spots. They must be recognized and compensated for;
- some pilots do not properly "fit" their aircraft, that is, they do not have a good view over the dash because their seats are too low, or the windshield area restricted;
- stress, alcohol, fatigue;
- distractions—an engine that is not running right, or an engine gauge that suddenly starts to move into the danger zone;
- daydreaming;
- colour of the planes—picture two white planes over a frozen, snow-covered lake, or two dark colored planes just before dusk;
- a dark aircraft below you over a dark field, or set of buildings.

But is there one good way to scan? If there is, I haven't found it. Each plane I have flown is different. Each has its own little blind spots, which only seem to become evident the more the plane is flown. Thus, the pilot who is "married" to his plane will be able to "find that certain way of doing it" that is comfortable for him and his "partner." Also, each phase of flight generally requires a different kind of scan.

The following are some techniques that all pilots should start from and then build on:

- Don't glance quickly!
- Don't stare at one area for long periods of time.
- When you look at an area, look at the area up and down in a specific area. This area should be about 10 to 15° up-down-left-right looking for movement, then move over a little, and repeat. This may sound like it will take a long time—in fact it takes relatively little time when practiced.
- Look first to the area that poses the most danger to you for the phase of flight you are in. If you are turning onto base, take a good look ***before*** the turn, ***during*** the turn, and ***ahead of the turn***. As well, look over to the area that other planes might be coming in at you on *if their circuit were to be further out than yours*.
- If you have radios, clear yourself before all turns.
- While on approach, especially on the downwind leg, look for shadows of aircraft on the ground. By practicing this, you will get in the habit of looking down while landing—and a plane that is hard to see above or below you will usually cast a shadow to one side or the other.
- A good practice to get into is doing gentle "S" turns while climbing out or landing.
- Ultralight pilots should aim to touch down one-third of the way down the runway. Why? Because conventional pilots generally aim for the numbers at the end of the runway—thus, your higher approach will make you visible to the conventional plane below you, take you farther

down the field with more time to react, and in the case of an engine out, you can still make the field.

- If you are at altitude and flying cross-country, then a scan 60° to the right and left from a centre line and 10 to 15° up and down should allow the eyes to catch movement all the way over to the side windows.

Hopefully the above will help you fly safely, and so will the addition of strobe lights on your wing tips and fuselage, and a landing light or landing lights on the nose or wing struts. Aircraft colours such as yellow or other contrasting colours to the sky and clouds will also help in making your plane more visible in the sky (this from a man who is totally colour blind).

Here are a couple of questions you should be able to answer, if not—hit the books!

When two aircraft are converging head on, what should each pilot do?

How do you properly overtake a slower aircraft?

For more information on safe ultralight tips and news, visit www.ultralight.ca.

During a three-year study of mid-air collisions involving civilian aircraft, the U.S. National Transportation Safety Board (NTSB) determined that:

1. The occupants of most mid-air collisions were on a recreational flight with no flight plan filed.
2. Nearly all mid-air collisions occurred in VFR conditions during weekend daylight hours.
3. The majority of mid-air collisions were the result of a faster aircraft overtaking and hitting a slower aircraft.
4. No pilot is immune. Experience levels in the study ranged from initial solo to the 15 000 hr veteran.
5. The vast majority of mid-air collisions occurred at uncontrolled airports below 3 000 ft.
6. En route mid-air collisions occurred below 8 000 ft and within 25 mi. of the airport.
7. Flight instructors were onboard one of the aircraft in 37 percent of the mid-air collisions.

Almost 50 percent of mid-air collisions result in at least one death. Naturally, mid-air collision avoidance (MACA) is an important aviation safety topic. With the sky becoming more and more congested, the threat of a mid-air collision is increasing.

According to the NTSB, the most probable cause of mid-air collision is the "pilot-in-command failed to see and avoid other aircraft." Aircraft speeds today challenge our ability to "see and avoid."

Here are a few more facts about mid-air collision:

1. Mid-air collisions generally occur during daylight hours; 56 percent of the accidents occurred in the afternoon; 32 percent of the accidents occurred in the morning; 12 percent of the accidents occurred at night, dusk, or dawn.
2. Most mid-air collisions occur under good visibility.
3. Flight fatigue (fatigue resulting directly from flight-related operations) was not a major factor in mid-air collisions. The average flight time prior to the collision is 45 min. This time varies from takeoff to over seven hours; 60 percent of the pilots on the mishap flight had been airborne 30 min or less; only 6 percent had been flying longer than two hours. △

Sequential Operation and RNAV (GNSS) Approaches to Intersecting Runways in an Uncontrolled Environment

by Patrick Kessler, Civil Aviation Safety Inspector, System Safety, Transport Canada, Civil Aviation, Quebec Region

The Kuujjuaq airport, in northern Quebec, is located in uncontrolled airspace. It has a mandatory frequency (MF) area with a radius of 5 NM and a vertical limit of 3 200 ft above sea level (ASL). The airport has a flight service station (FSS) that provides advisory service. Pilots must follow the reporting procedures for IFR (*Canadian Aviation Regulation* [CAR] 602.104) or VFR (CAR 602.101) aircraft, as applicable.

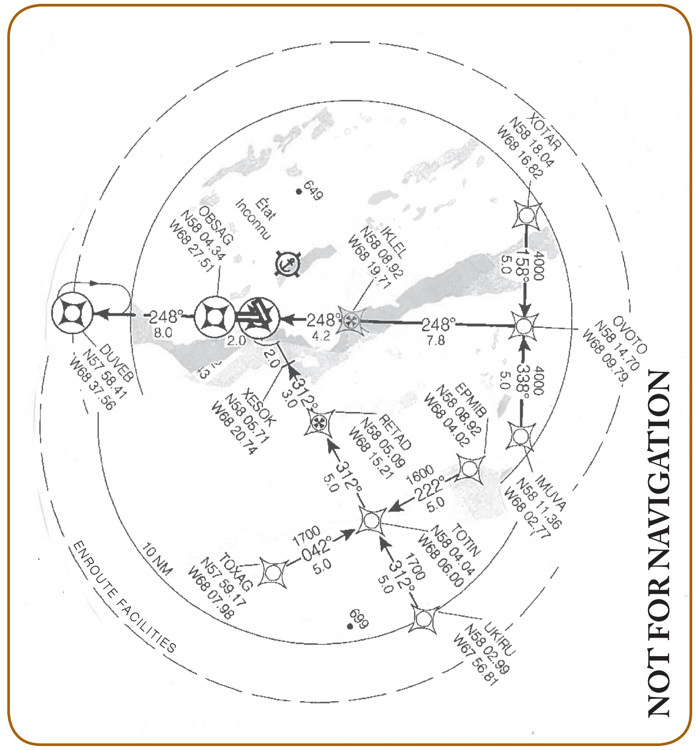
Runways 07/25 and 13/31 have nine different approaches, four of which are RNAV (GNSS) approaches. These include waypoints, flight paths, a final approach fix (FAF) and a missed approach path, which are shown only on the landing chart of the runway being used.

The radio navigation aids—non-directional beacon (NDB), VHF omnidirectional range (VOR) and instrument landing system (ILS)—are indicated on approach charts, and most are also indicated on enroute IFR charts and VFR navigation charts (VNC). Most pilots using this airport are familiar with the names and locations of these aids.

A recent incident highlighted the complexity of this environment when a number of aircraft with estimated times of arrival (ETA) within a short period headed to intersecting runways using different approaches.

The crossing altitudes can be equal to or higher than the sector altitude and this decision is left to the discretion of the pilot. The track of one of the aircraft heading toward a waypoint in order to initiate the approach can intersect the path of another aircraft.

The RNAV (GNSS) approaches for runways 25 and 31 at Kuujjuaq are shown on the same illustration, right, which demonstrates the proximity of waypoints "EPMIB" and "IMUVA".



Superimposition of RNAV (GNSS) approaches for runways 25 and 31 at Kuujjuaq

Most of the time, pilots do not have equipment that could provide this kind of composite illustration. They have to be able to situate themselves mentally in the air in order to ensure separation from other aircraft.

Proper, effective and concise communication should reduce conflicting traffic situations. The use of a traffic alert and collision avoidance system (TCAS) and transponders contributes to improved safety. △

Whiteout Claims Life of Inexperienced Helicopter Pilot

On March 19, 2008, a Bell 206B III helicopter was departing Réservoir Gouin, Que., on a private visual flight rules (VFR) flight to the pilot's cottage located 42 NM to the east-southeast. Shortly after takeoff, at 08:37 Eastern Daylight Time (EDT), the aircraft struck the frozen, snow-covered surface of the lake. The pilot, the sole occupant on board, was fatally injured. The helicopter was destroyed. This article is based on the Transportation Safety Board of Canada (TSB) Final Report A08Q0054.

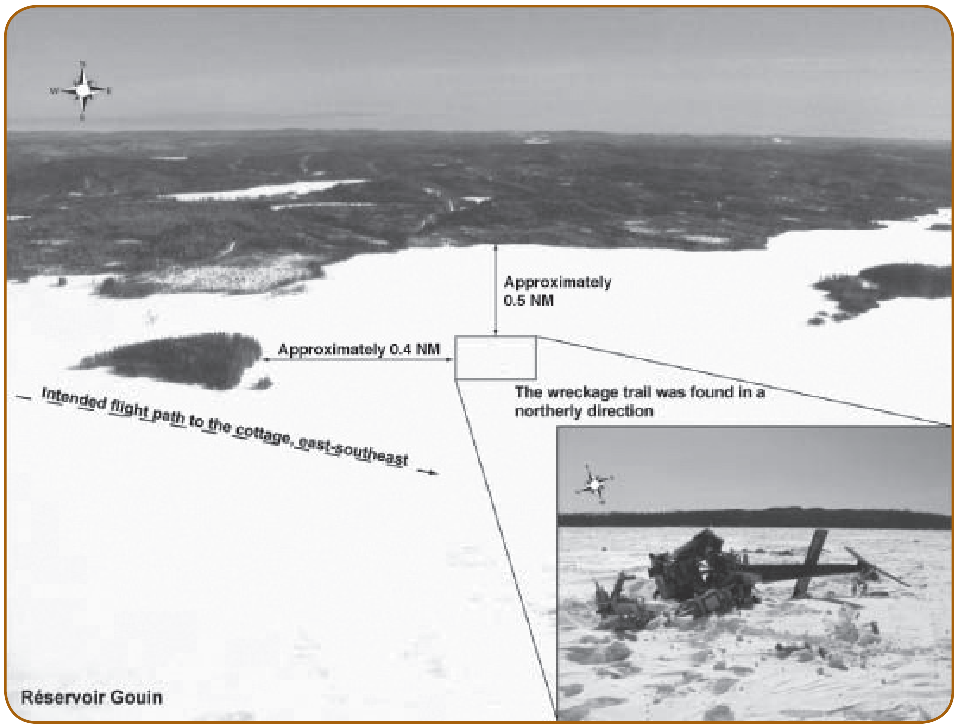
The aircraft was owned by a commercial helicopter company based in Alma, Que. The pilot was a friend of the company's co-owner and would occasionally borrow the Bell 206 for private use when it was available. The occurrence flight was a private flight. The company's co-owner, himself a fixed-wing and rotary-wing private pilot, also privately operates a Cessna 206 fixed-wing aircraft.

At 07:00 EDT, the Cessna pilot and the Bell 206 pilot called the company operations in Alma from the Bell 206 pilot's cottage via satellite telephone to get the weather conditions and forecast. It was partly sunny in Alma, 67 NM to the east; however, snow was expected by mid-morning. The weather at the cottage at that time was estimated to be one and a half to three miles visibility in light snow showers, with a ceiling at approximately 800 ft above ground level (AGL). The Bell 206 was preflighted and the two pilots took off for Réservoir Gouin at approximately 07:42 EDT to retrieve the Cessna, which had been stuck in the soft snow and slush-covered surface of the reservoir for over a week. They landed and shutdown behind the parked Cessna at approximately 08:07 EDT.

The Cessna, flown by the company's co-owner, took off for Alma at 08:25 EDT in weather conditions considered to be instrument meteorological conditions (IMC). Under IMC, pilots are required to operate in accordance with instrument flight rules (IFR). The Cessna arrived in Alma at 09:37 EDT. At 10:00 EDT, when the Bell 206 pilot did not return to his cottage as planned, the operator was notified.

The operator uses a Guardian SkyTrax (SkyTrax) flight-following system to track its helicopter fleet, and the helicopter accident site was found at 14:09 EDT, 1.2 NM east of its take-off point on the flat, frozen, snow-covered surface of Réservoir Gouin. The pilot was fatally injured and the helicopter was destroyed. The weather at the time of the search was as follows: estimated ceiling at 1 500 ft AGL, vertical visibility approximately 800 ft, and horizontal visibility approximately 1 mi., at times one-half mile in constant moderate snow showers.

The helicopter struck the snow-covered surface of Réservoir Gouin on a northerly heading, in a 45° nose-down, left-side-low attitude. The helicopter struck the lake surface while in a high rate of descent. The main rotor blades struck the lake surface and the front cabin. The helicopter then tumbled, destroying the cabin sections and rupturing the fuel cell. The engine compressor and turbine casing deformation revealed signs of power at the time of impact.



Aerial view of accident trajectory

Examination of the helicopter did not reveal any pre-existing mechanical abnormalities that could have contributed to the occurrence. The accident was not survivable because of the total destruction of the cabin area. The emergency locator transmitter (ELT) was damaged on impact, eliminating the possibility to transmit a distress signal and the wreckage location. There was no indication that incapacitation or physiological factors could have affected the Bell 206 pilot's performance.

The graphic area forecast (GFA) weather charts showed a low-pressure system moving eastwardly across Quebec, which would have affected the weather in the Réservoir Gouin area by early morning on March 19, 2008. Other aviation weather reports surrounding the region indicated marginal to below-VFR conditions with poor visibility and snow showers. (*For more on those weather reports, please read the full occurrence report on the TSB Web site.*)

The *Canadian Aviation Regulations* (CARs) applicable to minimum visual meteorological conditions (VMC) for VFR flight within uncontrolled airspace state that no person shall operate an aircraft in VFR flight within uncontrolled airspace unless the aircraft is operated clear of clouds and with visual reference to the surface. Where the aircraft is a helicopter and is operated at less than 1 000 ft AGL during the day, flight visibility should not be less than 1 SM, except if otherwise authorized in an air operator certificate (AOC) or a flight training unit (FTU) operator certificate—helicopter.

Réservoir Gouin is a large, irregularly shaped body of water extending 55 NM east-west and 40 NM north-south. It is situated in Class G uncontrolled domestic airspace. The irregularly shaped shoreline made up of multiple inlets, fingers, and islands makes it particularly difficult to navigate, especially in poor weather. The weather at the time of the occurrence was fluctuating between VMC and IMC. The environment was conducive to whiteout conditions where the degree of contrast was low due to the overcast, obscure sky, flat light, reduced visibility in snow showers and the snow-covered reservoir. Upon taking off in an easterly direction, the pilot had a finger of trees as a reference below the helicopter and the expanse of the white snow-covered reservoir surface in front of him.

Flight in whiteout conditions may result in a poorly defined visual horizon that will affect the pilot's ability to judge and stabilize aircraft attitude, or reduce the pilot's ability to detect changes in altitude, airspeed, and position. If visual cues are sufficiently degraded, the pilot may lose control of the aircraft or fly into the ground or surface of the water.

A search of the TSB database for the period from January 1998 to the end of December 2007 revealed 18 helicopter occurrences involving collision with terrain in whiteout conditions. These 18 occurrences involved 45 persons, 13 of whom were fatally injured and 23 of whom were injured. Studies have indicated that a majority of whiteout condition occurrences happen during VFR weather conditions where the pilot is justified in initiating the flight or chosen route, but where visual cues are limited due to flat light, restrictions in visibility, overcast sky conditions and snow-covered terrain. In most cases, the pilot is unaware of a loss of visual references and a loss of control of the aircraft happens insidiously. The study did not indicate that low-time pilots were more at risk of being involved in this type of occurrence in comparison with high-time pilots.

The pilot in this occurrence obtained a Canadian private helicopter pilot licence in May 2005. His helicopter training was conducted on Robinson R22 helicopters and he was endorsed on the Bell 206 helicopter in November 2005. He did not hold an instrument rating. The pilot's Category 3 aviation medical certificate was valid at the time of the occurrence; he was restricted to day flying only, with operational two-way radio communications. It was not possible to confirm the pilot's experience on rotary-wing aircraft, but it is estimated that he had approximately 130 hr total time, 85 of which were completed on the accident helicopter. The pilot also held a private fixed-wing licence, obtained in May 2001. The total number of hours on fixed-wing aircraft is unknown, but at the time of obtaining his helicopter licence, he had approximately 65 hr on fixed-wing aircraft.

Both the fixed-wing and helicopter training included five hours of instrument flight training, including unusual attitudes flight training. Flying in whiteout conditions is discussed during ground school training, and if weather conditions permit, is demonstrated during dual instruction on the helicopter. Because the Bell 206 pilot's training took place from March to May, it is likely that whiteout conditions could not have been demonstrated; however, this could not be verified during the course of the investigation.

On March 13, 2008, a similar helicopter occurrence (TSB occurrence A08Q0053) took place at dusk in whiteout conditions over a large, frozen, snow-covered expanse of water. The pilot survived the accident with minor injuries; the helicopter was destroyed.

Analysis

The weather at the time of the occurrence was reported to fluctuate between VMC and IMC. The minimum visibility for operating VFR in uncontrolled airspace below 1 000 ft is 1 SM. The pilot had little experience flying in marginal weather. It is possible that the pilot's decision to take off in low visibility and low ceilings was affected by fluctuating weather conditions and that the Cessna pilot had taken off in similar conditions just minutes before.

Whiteout conditions existed at the time of the occurrence, reducing the visual cues available to the pilot to maintain control of the aircraft. The pilot had little exposure to helicopter flight in whiteout conditions and may not have known to fly close to shore in order to use the trees and shoreline as contrasting cues against the white snow of the frozen lake. Inadequate ground references prevented the pilot's accurate perception of the helicopter height and attitude in reference to the surface. It is likely that the pilot lost control of the helicopter while flying in whiteout conditions over the vast snow-covered frozen surface of Réservoir Gouin.

The SkyTrax tracking system installed on the occurrence helicopter was programmed to record the helicopter's last known position every 2 min, which helped reduce the search area and locate the helicopter in a timely manner.

In its findings as to causes and contributing factors, the TSB concluded that the pilot likely encountered whiteout conditions, making it difficult to maintain visual reference and causing disorientation, which resulted in impact with the frozen snow-covered lake.

In closing, the TSB mentioned in the safety action taken section that Transport Canada published the article "Coming Soon to a Theatre Near You: Whiteout" in issue 4/2008 of the *Aviation Safety Letter* (ASL). We sincerely hope that the article in ASL 4/2008 and this new one will serve their intended purpose: *to promote awareness and prevention*. △

Massive headache prevention for helicopter pilots: Wear a helmet!

Takeoff in Conditions of Freezing Drizzle and/or Light Freezing Rain (Fixed-Wing Airplanes)—Part II

by Paul Carson, Flight Technical Inspector, Certification and Operational Standards, Standards, Civil Aviation, Transport Canada.
This is the second of a two-part article on this critical subject. Part I appeared in Aviation Safety Letter *(ASL) 4/2009.*

Background

During the winter of 2005–2006, a Transport Canada Civil Aviation (TCCA) inspector observed a number of airplanes operated by various air operators taking off in conditions of freezing drizzle (forecast and actually reported). The inspector considered that the operations were in contradiction of *Canadian Aviation Regulations* (CARs), specifically CAR 605.30:

> ***De-icing or Anti-icing Equipment***
>
> **605.30** No person shall conduct a take-off or continue a flight in an aircraft where icing conditions are reported to exist or are forecast to be encountered along the route of flight unless
>
> *(a)* the pilot-in-command determines that the aircraft is adequately equipped to operate in icing conditions in accordance with the standards of airworthiness under which the type certificate for that aircraft was issued; or
>
> *(b)* current weather reports or pilot reports indicate that icing conditions no longer exist.

Subsequent discussion identified that air operators and flight crews have insufficient information when faced with conducting a takeoff in these conditions. These discussions also identified that nothing in the current regulations and standards authorizes, nor strictly prohibits, takeoff during conditions of freezing drizzle and/or light freezing rain.

Hazards associated with in-flight operation in supercooled large drop (SLD) icing conditions

Start of contamination

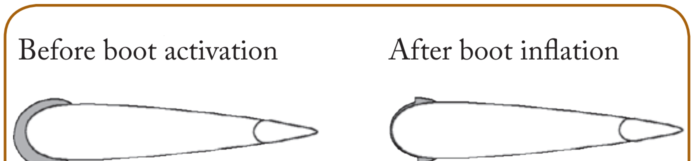
Anti-ice fluids are designed to flow away from the aerofoil critical leading edge region and off the trailing edge as airspeed increases. Although this behaviour will differ for different fluids, different airfoils, different temperatures, etc., a reasonable assumption is that the critical leading edges will be free from all fluid at rotation. Once again, approval of flight in icing conditions includes demonstration of satisfactory performance of the ice protection systems (IPS) as well as demonstration of satisfactory handling qualities and a measurement of the performance degradation with the ice expected on both the unprotected surfaces and any residual ice on the protected surfaces resulting from proper operation of the IPS. Although not just limited to taking off in freezing drizzle and/or light freezing rain, approval also includes other conditions in U.S. *Federal Aviation Regulation* (FAR) 25, Appendix C, one being the assumption that ice accretion on surfaces begins at liftoff.

Impingement limits

With SLD icing conditions, the droplets are larger and have greater momentum due to the higher mass. The droplets will impact the leading edge of an airfoil section over a greater chord-wise extent than the smaller droplets associated with FAR 25, Appendix C conditions. In addition, SLD droplets may splash and break up into smaller fragments, which may run back prior to freezing. IPS that have been designed to prevent ice build up (anti-icing systems) or remove accreted ice (de-icing systems), have not been demonstrated to be effective in SLD icing conditions.

Pneumatic boot operation in SLD icing

A problem has been identified in the design of pneumatic boot de-icing systems on some aeroplanes where the chord-wise extent of the boot-protected area did not consider SLD icing conditions, thus resulting in ice accretion aft of the protected area. This accretion has been particularly hazardous when a residual ridge of ice is left just aft of the boot on the upper wing after boot operation to break off ice. Flight tests on several different aeroplanes, using a tanker airplane to simulate in-flight SLD icing conditions, have shown that a ragged, span-wise ridge forms just aft of the protected area.



Residual icing ridge formed aft of boot-protected surface due to boot inflation

One effect of this ridge can be non-linear hinge-moment characteristics on trailing edge controls. For unpowered controls, hinge-moment anomalies at the surface can result in pulsing of the pilot's control, and in the extreme, a reversal in the direction of the pilot's force can occur. That is, the control can self-deflect to an extreme position, and excessive pilot effort can be required to return the control to a neutral position.

One accident and two incidents in SLD icing conditions

The section below describes one accident and two incidents where encounters with SLD have been documented. There are other encounters that have been documented in various databases where SLD was suspected, but much of the information was collected for other reasons, not specifically for SLD icing conditions.

ATR 72 accident at Roselawn (31 October 1994)

The National Transportation Safety Board (NTSB) in the United States concluded that this accident occurred due to ice accretion on the wing upper surface just aft of the leading edge pneumatic boot and in front of the trailing edge ailerons. The airplane was in autopilot control during a hold at approximately 8 000 ft with the flaps partially extended. The flaps were then retracted. The increase in the wing angle of attack (AOA) due to the flap retraction caused a flow separation at the wing tip due to the ice accretion. The flow separation caused a hinge-moment discontinuity at the aileron, which in turn caused the ailerons to self deflect to full deflection. The autopilot was unable to correct the overbalance and the airplane had a lateral departure from which recovery was not accomplished.

The icing conditions identified in this accident included SLD icing conditions. Much of the aircraft accidents in SLD conditions deal with the arrival phase, long holds at slow airspeeds similar to this accident.

Transportation Safety Board of Canada (TSB), Aviation Investigation Report, Roll Oscillations on Landing, Airbus A321-211, Toronto/Lester B. Pearson International Airport, Ontario, December 7, 2002, Report Number A02O0406

At approximately 16:07 Eastern Standard Time (EST), an Airbus A321-211 airplane was on approach to Toronto/Lester B. Pearson International Airport (LBPIA), Ont., with 123 passengers and 6 crew on board. At approximately 140 ft above ground level (AGL), on final approach to Runway 24R with full flaps selected, the airplane experienced roll oscillations. The flight crew leveled the wings, and the airplane touched down firmly. During the approach, the airplane had accumulated mixed ice on areas of the wing and the leading edge of the horizontal stabilizer that are not protected by anti-ice systems.

Approximately three hours later on the same day, another Airbus A321-211 airplane, with 165 passengers and 7 crew on board was on approach to Runway 24R at LBPIA. At 18:59 EST and approximately 50 ft AGL, the airplane experienced roll oscillations. The flight crew conducted a go-around, changed flap settings, and returned for an uneventful approach and landing. At the gate, it was noted that the airplane had accumulated ice on areas of the wing and the leading edge of the horizontal stabilizer that are not protected by anti-ice systems. There was no damage to the airplane or injury to the crew or passengers.

Given the similarities between these two occurrences, the TSB concluded (1) "It is likely that the icing conditions encountered by both aircraft were outside the *Federal Aviation Regulation* 25, Appendix C envelopes used for certification of the A321," and (2) "Drizzle droplet size ranged from 100 to 500 microns. *Federal Aviation Regulation* (FAR) 25.1419, Appendix C envelope for certification of flight in icing conditions has maximum mean effective drop diameter between 40 and 50 microns."

The full report can be found at the following Web site: www.tsb.gc.ca/en/reports/air/2002/A02O0406/A02O0406.asp.

Meteorology measurement criteria forecasting/reporting freezing drizzle and/or light freezing rain vs. FAR 25, Appendix C

Weather forecasts are not made in terms of FAR 25, Appendix C parameters such that they would match the certification icing environment. Also, pilot reports (PIREP) of icing conditions are unique to the airplane from which they are reported—light icing to a Boeing 727 could be heavy icing to a Beech Baron.

Appendix C is not adequate for freezing drizzle and/or light freezing rain given that the maximum droplet size in the appendix is 40 microns for stratiform droplets and 50 microns for cumuliform droplets, whereas the smallest probable drizzle droplet size is 100 microns, and raindrops begin at 500 microns. Furthermore, any cumulus cloud that has a vertical extent that is greater than its horizontal base may include "appreciable numbers" of droplets that are larger than 50 microns.

A minor point, but it should be noted that maximum drop size in FAR 25, Appendix C is 40 microns (or 50 microns) median volume diameter (MVD) or mean effective diameter (MED), not absolute diameter droplet size. The "smallest" freezing drizzle and/or light freezing rain drops are actually measured in absolute diameter terms, not MVD or MED.

Transport Canada Civil Aviation Requirements

Icing certification

In general, TCCA follows the same certification requirements as the Federal Aviation Administration (FAA). These requirements include use of FAR 25, Appendix C as a definition of the in-flight icing atmosphere. TCCA does have additional guidance material on how compliance must be demonstrated for performance and handling qualities. This guidance has led to different limitations and/or configurations of IPS for many foreign airplanes, mainly turbopropeller powered airplanes. In some cases, other authorities have subsequently adopted these additional measures after accidents.

Operational requirements in CARs Part VI and Part VII

The relevant operational regulations relating to flight in icing conditions are contained in CARs Part VI—*General Operating and Flight Rules* and in Part VII—*Commercial Air Services*. The following extracts are pertinent:

(a) CARs Part VI, Subpart 2—*Operating and Flight Rules*
602.07 No person shall operate an aircraft unless it is operated in accordance with the operating limitations

(a) set out in the aircraft flight manual, where an aircraft flight manual is required by the applicable standards of airworthiness.

(b) CARs Part VI, Subpart 5—*Aircraft Requirements*
605.30 No person shall conduct a take-off or continue a flight in an aircraft where icing conditions are reported to exist or are forecast to be encountered along the route of flight unless

(a) the pilot-in-command determines that the aircraft is adequately equipped to operate in icing conditions in accordance with the standards of airworthiness under which the type certificate for that aircraft was issued; or
(b) current weather reports or pilot reports indicate that icing conditions no longer exist.

It should be noted that there is a proposal to change the content of CAR 605.30 contained in Notice of Proposed Amendment (NPA) 1998-252 to read as follows:

605.30 No person shall conduct a take-off or continue a flight in an aircraft under IFR where icing conditions are reported to exist or are forecast to be encountered along the route of flight or under VFR into known icing conditions unless

(a) the pilot-in-command determines that the aircraft is adequately equipped to operate in icing conditions in accordance with the standards of airworthiness under which the type certificate for that aircraft was issued; or
(b) current weather reports, pilot reports, or briefing information relied upon by the pilot-in-command indicate that the forecast icing conditions that would otherwise prohibit the flight will not be encountered during the flight because of changed weather conditions since the forecast.

The intent of the proposed change is to permit more flexibility in operating in reported icing conditions. However, it does not clarify the situation with respect to taking off in freezing drizzle and/or light freezing rain. In addition, the present status of the NPA is with the Regulatory Unit (RU) of TCCA pending publication in *Canada Gazette,* Part 1.

(c) CARs Part VII, Subpart 4—*Commuter Operations*
704.63(1) No person shall conduct a take-off or continue a flight in an aircraft when icing conditions are reported to exist or are forecast to be encountered along the route to be flown unless the aircraft is equipped to be operated in those conditions and the aircraft type certificate authorizes flight in those conditions.

(d) CARs Part VII, Subpart 5—*Airline Operations*
705.69(1) is identical to **704.63(1)**.

Interpretation of operational requirements

As noted above, the aircraft flight manuals (AFM) of currently certified airplanes do not contain any specific limitations prohibiting takeoff in SLD icing conditions. The Type Certificate may or may not reflect the wording in the AFM, but will specify whether the certification basis includes the applicable FAR paragraphs relating to ice protection. Also, the Type Certificate is not a document that is generally familiar to air operators and flight crews. It is possible through a Supplemental Type Certificate (STC) to have an IPS (more frequently seen for small airplanes) added to airplanes that would include additional limitations regarding flight in icing conditions.

The AFMs of some airplanes do contain a limitation indicating that if severe icing conditions occur (as identified by various visual cues), the airplane must immediately exit these icing conditions. Severe icing is noted as including freezing drizzle and/or light freezing rain. The differences in measurement criteria between FAR 25, Appendix C and aviation meteorological reports remain.

Conclusion

TCCA continues to collect and analyze data in consultation with other authorities worldwide in an effort to enhance present day knowledge regarding the safety of flight in conditions of freezing drizzle and/or freezing rain.

References:

1. *J. C. T. Martin, Transport Canada Aircraft Certification Flight Test, Discussion Paper No. 41, The Adverse Effects of Ice on Aeroplane Operation, Issue 2, 4 July 2006.*
2. *J. C. T. Martin, Transport Canada Aircraft Certification Flight Test, Discussion Paper No. 50, Takeoff in Conditions of Freezing Drizzle or Freezing Rain (Fixed-Wing Aircraft), Issue 2, 29 September 2006.* △

Author's note: Part 1 of the above article was published in the ASL 4/2009. It contained the following conclusion.

Takeoff into known freezing drizzle and/or light freezing rain is outside of the flight envelope for which any airplane currently operating today is certificated. Not only is it unwise to operate in such conditions, it is also unsafe, and based on the best information available at this time, also illegal.

Transport Canada (TC) has undertaken a review of the current practice of taking off in freezing precipitation to assess potential hazards and determine whether any regulatory or safety action is required. TC has not reached a final conclusion on this issue, but after reviewing current practices, it has identified important safety information to share in this ASL article and the previous one.

The article is intended to inform operators and flight crews of the potential hazards of taking off in conditions of freezing drizzle and light freezing rain. This article stresses the importance of understanding the hazards associated with operating in icing conditions and the limitations associated with the certification of airplanes for flight into known icing conditions.

At this time, TC has not drawn any firm conclusions on the safety of taking off in freezing drizzle or light freezing rain. However, TC is of the opinion that taking off in freezing drizzle and light or greater intensity freezing rain may be hazardous and, in the case of moderate or heavy freezing rain conditions, these fall outside the protection afforded by de-icing and anti-icing fluids. TC will consult the aviation industry to consider the effectiveness of current regulations and standards.

TC therefore retracts the last sentence of the conclusion and replaces it with a reiteration of the current guidance on this subject. Specifically, operation of an aircraft in conditions of freezing drizzle or freezing rain should be avoided whenever possible.

MAINTENANCE AND CERTIFICATION

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Suspected Unapproved Parts (SUP)

by Ganesh Pandey, Civil Aviation Safety Inspector, Aircraft Maintenance and Manufacturing, Standards, Civil Aviation, Transport Canada

This article focuses on the effect of SUPs on aviation safety and how Transport Canada Civil Aviation (TCCA) communicates with internal and external SUP stakeholders. Yes, SUPs do still exist. However, TCCA-approved distributors, maintenance and manufacturing organizations, and individuals in general aviation work in partnership to maintain our high safety levels. This is achieved by controlling the parts used in aircraft by means of an approval system that aims to eliminate the potential risk posed by the entry of unapproved parts into the Canadian aviation community.

Parts that meet the requirements of the *Canadian Aviation Regulations*—Part V, Subpart 71 (CAR 571) are approved parts and acceptable/eligible for installation. When it is not clear whether a part meets CAR 571 requirements, it becomes an SUP. From that point on, it is a shared task to remove the suspicion by identifying it as either approved or unapproved. In CAR 591, the definition of an unapproved part is as follows:

> "unapproved part"—means any part installed or intended for installation in a type certified aeronautical product, that was not manufactured or certified in accordance with the applicable regulations of the state of production or that is improperly marked or that is documented in such a manner as to mislead with regard to the origin, identity or condition of the part.

Based on this SUP definition, parts that have been maintained or repaired and returned to service by CAR-authorized persons or facilities but that have been subjected to sub-standard maintenance (e.g. incorrect

The thrust bearing on the left was determined to be unapproved during a routine inspection. The correct bearing is shown on the right.

or missing processes, etc.) are not considered SUPs. Although considered unairworthy parts, they should not be reported to TCCA as SUPs. However, they should be treated as unairworthy, and appropriate action should be taken to correct the circumstances leading to the sub-standard maintenance. The SUP Program traces an SUP to its supply-line point of origin at which its certification or approval was issued and corrects the circumstances that created the SUP or allowed the part to enter the system.

Reporting the SUP is the first step in the process. In Canada, the mechanism for reporting an SUP is through the Service Difficulty Report system—as outlined in CAR 591. At present, CAR 591 requires that an SUP be reported for each specific occurrence. The aviation industry is responsible for reporting an SUP using TCCA Form 24-0038 ("Service Difficulty Report") or through the Web Service Difficulty Reporting System (WSDRS) at: www.tc.gc.ca/wsdrs.

When an SUP report is made, care should be taken to identify the person(s) or organization(s) where the part was obtained, which should in turn lead to where the part was certified. There may be several sources in a supply chain; however, there should be only one at the origin, which will be the focus of follow-up activities. The SUP shall be removed from service, isolated, and quarantined for further follow-up and corrective actions, as necessary.

Once TCCA has received the report, the Transport Canada Centre is responsible for following up on SUPs submitted under its jurisdiction. This follow-up is co-ordinated through TCCA Headquarters, particularly when it involves multiple regions or international organizations. Normally, the follow-up is a routine function within Canada; however, many SUP follow-ups require coordination with stakeholders outside Canada.

When the SUP source and origin are outside Canada, TCCA Headquarters forwards a detailed report and supporting investigative materials to the appropriate foreign civil-aviation authority to investigate. TCCA Headquarters will ensure that follow-up action is completed and closures are made. Since the Canadian aviation industry buys a large portion of its aviation-related equipment and parts from suppliers in the U.S. that fall under the authority of the Federal Aviation Administration (FAA), TCCA maintains a close relationship with FAA SUP counterparts. When the source of an SUP is American, TCCA provides all the supporting materials along with FAA Form 8120-11 ("Suspected Unapproved Parts Notification") to the FAA SUP Program Office so that it can investigate. The Canadian aviation community can also use this form for voluntary reporting directly to the FAA. It can be found on the FAA SUP Program Office's Web site at: www.faa.gov/avr/sups.htm.

TCCA does not list unapproved parts discovered through the program. Instead, once an SUP has been confirmed as an unapproved part, action is taken for the specific case and may vary from taking corrective action with the responsible organization, to issuing a service difficulty alert or an airworthiness directive, to notifying Canadian operators and maintainers, with the level of notification depending on the nature of the SUP.

Some foreign civil aviation authorities utilize an unapproved parts notifications system, as does the FAA. These systems may be used to inform TCCA about unapproved parts. In these cases, the information is normally received and forwarded to Transport Canada Centres via the applicable regional office to further inform Canadian organizations. The FAA does publish its unapproved parts notifications on its Web site (see address below). At present, some selected unapproved parts notifications are published as a courtesy in the TCCA publication, *Feedback*. However, not all of the FAA unapproved parts notifications are published in *Feedback*; therefore, it is always advisable to review the FAA Web site directly at: www.faa.gov/aircraft/safety/program/sups/upn/.

Communications and partnering are key to eliminating SUPs from the Canadian aviation system. While the aviation community continues to report SUPs, and provide information for follow-up, TCCA will continue to chase down leads, identify the source of unapproved parts, and remove them from the system. As it evolves through reorganization, TCCA plans to improve its communications with new Web site structures and more effective requirements.

All aeronautical products subject to maintenance and parts modification and/or replacement must conform to the type design and allow for safe operation. △

Major Modifications to Amateur-Built Aircraft

An Aviation Safety Advisory issued by the Transportation Safety Board of Canada (TSB)

On May 13, 2009, at approximately 12:00 Eastern Standard Time (EST), an Aventurier—an amateur-built, float-equipped Bush Caddy replica—took off from Lac Bouchette, Que. for a local visual flight rules (VFR) flight. The aircraft was heading south when it was observed rolling from left to right. At that moment, the aircraft turned left toward Lac au Mirage, Que. where it crashed, approximately 8 km from Lac Bouchette. Shortly afterward, residents spotted the aircraft upside down on Lac au Mirage; only the floats were visible. No one saw the aircraft crash. Its two occupants sustained fatal injuries. A TSB investigation into this occurrence (A09Q0071) is ongoing.

The aircraft was transported to the TSB's engineering laboratory in Ottawa. The preliminary report (LP075/2009) confirms that the right wing broke in flight, at the guy-line anchor site. Unlike the left wing, the right wing had not been reinforced at the wing-strut attachment point. In addition, the front and back spars had a thickness of 0.040 in. The wing-extension splice thickness was 0.016 in., which corresponds to the construction requirements for wings used on ultralight aircraft, for which the maximum allowable take-off weight is 1 232 lbs. The Aventurier had a maximum allowable take-off weight of 2 200 lbs.

The new owner purchased the aircraft in September 2005. In 2007, he had the wings lengthened by 75 cm on either side. The person who carried out the work had already built several aircraft but had no qualifications in aeronautics, and regulations do not require them. In addition, the investigation revealed that no technical entry had been made in the logbook and Transport Canada had never been informed of these major modifications, as regulations require.

On September 20, 2003, an amateur-built Bush Caddy crashed at Lac Manouane, Que., (A03Q0149). The two people on board perished. In accordance with the TSB Occurrence Classification Policy, the circumstances of this accident were evaluated and it was classified as a Class 5 occurrence. As a result, the TSB's role was limited to data collection for conducting safety analyses. The wreckage was recovered, but the left wing was never found. When comparing the damage to this aircraft with that sustained by the Aventurier, a number of similarities were noticed. In addition, since the wing was not found with the wreckage, we can assume that the wing may have broken in flight.

On April 28, 2009, an advanced ultralight Explorer Ecoflyer crashed in the United States (A09F0074). The pilot was the only person on board and sustained fatal injuries. Preliminary information provided by the U.S. National Transportation Safety Board (NTSB), which is responsible for the investigation, indicates that a wing broke during flight. The NTSB investigation is ongoing.

On June 28, 2009, an amateur-built Bush Caddy sustained a broken right wing in flight. The pilot was able to land the aircraft at the Drummondville, Que., airport. No one was injured. The front and back spars had a thickness of 0.050 in., and the wings were constructed based on plans and estimates from the Club Aéronautique Delisle Inc. (CADI). The wing was transported to the TSB engineering laboratory, and the preliminary report concluded that the wing had folded due to tension. Based on the theoretical calculations conducted, these wings can withstand a load factor of less than 3.0 g, which is much less than that of a normal-category aircraft (5.7 g) or an advanced ultralight (6.0 g). Although this was a Class 5 occurrence (A09Q0098), the TSB will take steps to determine the factors that contributed to the broken wing.

During the construction of an amateur-built aircraft, a Minister's Delegate—Recreational Aviation (MD-RA) must inspect the aircraft twice. The responsibility of the MD-RA is limited to the inspection of the quality of work during construction and not the inspection and confirmation of calculations carried out to determine the maximum load factor a wing can withstand. This responsibility is attributed directly to the owner/builder, even if this person has no technical or engineering knowledge. The investigation also revealed that, much like the owner of the Aventurier, other owners were making major modifications to their aircraft or having others do so without asking for guidance and without informing the Department. As a result, the probability of detecting any construction defects is greatly reduced. These anomalies represent a significant risk to users.

CADI—the Bush Caddy-construction company located in Delisle, Que.—ceased operating, and its rights were transferred to Canadian Light Aircraft Sales and Services Inc. (CLASS) in Vaudreuil-Dorion, Que. In total, approximately 150 kits were sold across the world, including in North America, France, Australia, and New Zealand. Among these aircraft, some were basic or advanced ultralight with a maximum allowable weight of 1 232 lbs. and others were amateur-built with a maximum weight greater than 2 200 lbs. The number of ultralight

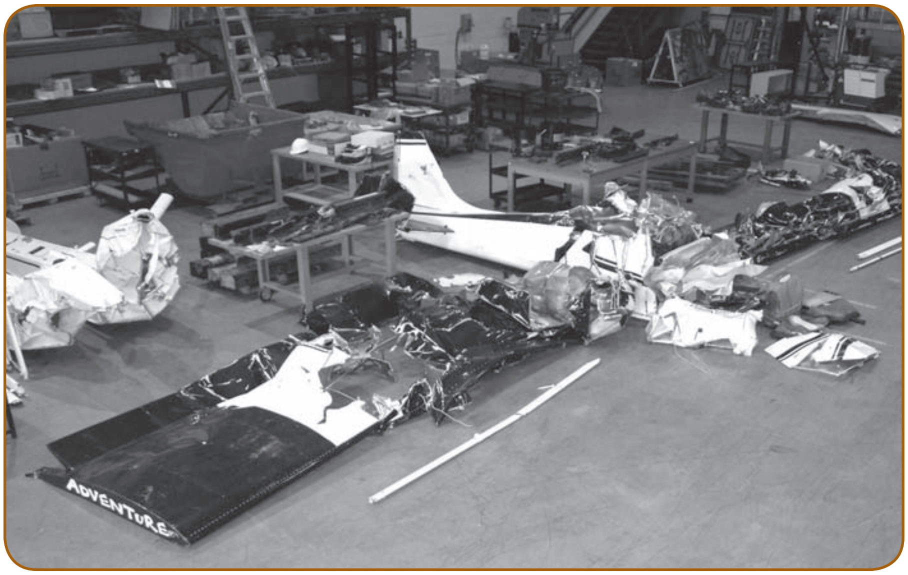


Photo of accident aircraft undergoing technical investigation at theTSB

wing kits that have been installed on amateur-built aircraft still in use is unknown.

CLASS is currently studying the possibility of contacting Bush Caddy owners to inform them of the situation. Unfortunately, some of these owners did not notify the manufacturer of their change of address or the sale of their aircraft to new owners, and some of them do not reside in Canada. Since his acquisition of the company, the new president conducted a destructive test on a wing and decided that the current spars need to be replaced by new ones with a thickness of 0.080 in. on all amateur-built Bush Caddy models.

The Canadian Civil Aircraft Register indicates that there are 3 557 amateur-built and over 6 000 ultralight (basic and advanced) aircraft in the country. Recently, Transport Canada removed amateur-building criteria limitations on take-off weight and the number of seats, which were fixed at 3 968 lbs. and four seats, respectively. As a result, there may be an increase in the number of users who risk exposure to an accident involving an amateur-built aircraft.

The previous information suggests that in-flight wing breakages could occur not only with the Bush Caddy but also on other amateur-built aircraft models (the Aventurier, for example) and other advanced ultralight aircraft (the Explorer Ecoflyer, for example). Given that the MD-RA's responsibility is limited only to inspecting the quality of work and that major modifications to wings are sometimes carried out by individuals without qualifications in aeronautics or without informing the Department, the risk of a wing breaking in flight due to poor construction remains and therefore exposes users to fatal injuries.

In light of the previous information, Transport Canada may wish to inform owners, builders, and manufacturers of the risk associated with installing wings designed for ultralight aircraft on amateur-built aircraft such as the Bush Caddy. Transport Canada may also wish to inform all builders and owners of amateur-built aircraft of the risk associated with all major modifications made to their aircraft without the approval of competent individuals and to remind them of the importance of notifying the Department. △

Fatigue Risk Management System for the Canadian Aviation Industry: Policies and Procedures Development Guidelines (TP 14576E)

*This is the fifth of a seven-part series highlighting the work of the Fatigue Risk Management System (FRMS) Working Group and the various components of the FRMS toolbox. This article briefly introduces TP 14576E—*Policies and Procedures Development Guidelines. *Intended for managers, this guide proposes a policy structure and provides examples and guidelines to help organizations through the process of designing fatigue risk management policies and procedures. The complete FRMS toolbox can be found at* www.tc.gc.ca/civilaviation/SMS/FRMS/menu.htm. *—Ed.*

How to use TP 14576E

A fatigue risk management system (FRMS) is an integrated set of management policies, procedures, and practices for monitoring and improving the safety and health aspects related to fatigue within your organization. This guide is intended to help you to build an effective fatigue risk management policies and procedures manual tailored to your specific operational requirements. Such a manual should provide both the overall governance policy for fatigue risk management and a detailed framework for how to manage fatigue on a day-to-day basis within the workplace.

Implementing an FRMS does not mean you need to create another set of documents. Some aspects of the policy may already be covered in your safety management system (SMS) manual. If this is the case, just cross-reference or copy the information in your FRMS manual.

In accordance with the *Canadian Aviation Regulations* (CARs), the FRMS manual must clearly define:

- the level of senior management commitment;
- the purpose and goals of the FRMS;
- the responsibilities of all employees for managing fatigue risk;
- the training requirements;
- the reporting procedures for fatigue-related hazards;
- the fatigue-reporting policy (any punitive actions that may be taken as a result of non-compliance, for example); and
- a procedure for the evaluation and continuous improvement of the FRMS.

This approach is in line with Transport Canada's (TC) guide to implementing an SMS: *Safety Management Systems for Flight Operations and Aircraft Maintenance Organizations—A Guide to Implementation* (TP 13881E)[1].

Each section of TP 14576E has three components:

- *Introduction*—information about the purpose, theory, and framework of the given FRMS policy component;
- *Points to consider*—a summary of the main points to be covered in that section of the manual. These have been framed as questions that can be used as a framework for discussing the core components of an FRMS in consultation workshops; and
- *Sample text*—examples of what might be included in the given policy-component section. These examples have been provided so that organizations can see the style of phrasing and content acceptable to TC. Each section of your policy manual should be tailored to the specific needs of your organization.

Each section of the FRMS guide is labelled as either *mandatory* or *recommended*:

- *mandatory* sections must be included in your document. The sample text provided in the guide should be reviewed and modified appropriately to suit your operation.
- *recommended* sections should be discussed with employees or your FRMS committee to determine whether they are appropriate and how they should be adapted to meet your operational requirements.

The guide follows the same organizational structure recommended for the FRMS policies and procedures manual.

1 This document has since been replaced by Advisory Circular 107-001—*Guidance on Safety Management Systems Development*, which can be found at: www.tc.gc.ca/civilaviation/managementservices/referencecentre/acs/100/107-001-toc.htm.

Preamble (mandatory)

The FRMS manual should include clearly defined policies, procedures, and practices to ensure that the risk of fatigue-related error is reduced as much as possible. The FRMS should be tailored to your operation. To ensure its maximum effectiveness, the manual must reflect what you actually do.

The aim of implementing an FRMS is to effect change in organizational culture that results in enhanced flight safety and a safer working environment. Organizations must take the time to write their own FRMS policy statements and not simply paraphrase generic ones. The FRMS manual should be used as the primary means of communicating to employees the FRMS policies and procedures to be followed during regular operations.

You should review and update the FRMS manual one year after implementation and on a set schedule thereafter (e.g. every two years). You will need to include a control process for amending documentation as per the CARs documentation requirements.

Points to consider

- Why is the organization implementing an FRMS?
- Who will be affected by FRMS implementation?
- What are the basic responsibilities of employees within the FRMS?
- How often will the FRMS policy be reviewed and updated?

Document control (mandatory)

All Canadian civil aviation certificate holders are required by the CARs to amend the FRMS manual when necessary. You should systematically create, circulate, and record any amendments to the FRMS policy. You may choose to use your current procedure for this or the one described in the sample text included in TP 14576E. This text provides a basic amendment process for a simple FRMS manual. You may wish to add extra controls suitable for the size or complexity of your operation.

Points to consider

- How will amendments to the FRMS policy be recorded?
- How will employees be informed of FRMS policy amendments?
- How will employee understanding of FRMS policy amendments be recorded?

We conclude this overview of TP 14576E by encouraging our readers to view the entire document at www.tc.gc.ca/CivilAviation/SMS/pdf/14576e.pdf. △

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. We encourage our readers to read the complete reports on the TSB Web site. For more information, contact the TSB or visit their Web site at www.tsb.gc.ca. —Ed.

TSB Final Report A06P0087—Collision with Terrain

On May 18, 2006, a Cessna T207A departed from the Pemberton, B.C., airport, at about 15:00 Pacific Daylight Time (PDT) on a visual flight rules (VFR) flight to Edmonton, Alta. The aircraft initially climbed out to the east and subsequently turned northeast to follow a mountain pass route. The pilot was alone on this aircraft repositioning flight and had been conducting air quality surveys for Environment Canada's Air Quality Research Section in the Pemberton area. The aircraft was operating on a flight permit and was highly modified to accept various types of probes in equipment pods suspended under the wings, a camera-hatch-type provision in the centre belly area, and internal electronic equipment. About 30 min after the aircraft took off, the Coastal Fire Service responded to a spot fire and discovered the aircraft wreckage in the fire zone. A post-crash fire consumed most of the airframe, and the pilot was fatally injured. The accident occurred at about 15:06 PDT.

Aerial view of impact area (circle) into rising terrain. The majority of the aircraft fuselage was consumed by fire.

Findings as to causes and contributing factors

1. The pilot entered the valley at an altitude above ground that did not provide sufficient terrain clearance given the aircraft's performance.
2. The pilot encountered steeply rising terrain, where false horizon and relative scale illusions in the climb are likely. Realizing that the aircraft would not likely be able to out-climb the approaching terrain, he turned to reverse his course.
3. The aircraft's configuration, relatively high weight, combined with the effects of increased drag from the equipment, density altitude, down-flowing winds, and manoeuvring resulted in the aircraft colliding with terrain during the turn.

Findings as to risk

1. A detailed flight plan was not filed and special equipment, such as laser radiation emitting devices and/or hazardous substances were not reported. The absence of flight plan information regarding these devices could delay search and rescue efforts and expose first responders to unknown risks.
2. Transport Canada (TC) does not issue a rating or endorsement for mountain flying training. There are no standards established to ascertain the proficiency of a pilot in this environment. Pilots who complete a mountain flying course may not acquire the required skill sets.
3. There was no emergency locator transmitter (ELT) signal received. The ELT was destroyed in the impact and subsequent fire. Present standards do not require that ELTs resist crash damage.
4. "Flight permits—specific purpose" are issued for aircraft that do not perform as per the original type design but are deemed capable of safe flight. Placards are not required; therefore, pilots and observers approved to board may be unaware of the limitations of the aircraft and the associated risks.
5. The TC approval process allowed the continued operation of this modified aircraft for sustained environmental research missions under a flight permit authority. This circumvented the requirement to meet the latest airworthiness standards and removed the risk mitigation built into the approval process for a modification to a type design.

Other findings

1. The fuel system obstruction found during disassembly was a result of the post-crash fire.
2. The aircraft was operated at an increased weight allowance proposed by the design approval representative (DAR). Such operation was to be approved only in accordance with a suitably worded

flight permit and instructions contained in the proposed document CN-MSC-011; however, this increased weight allowance was not incorporated to any flight authority issued by TC.

Safety action taken

TC issued *Aviation Safety Letter* 1/2007 with an attached leaflet, titled "Take Five...for safety—Flying VFR in the Mountains" to provide some mountain flying guidance to pilots.

TSB Final Report A06C0204—Cargo Door Opening on Takeoff

On December 13, 2006, a Boeing 727-227 departed from Regina, Sask., on a scheduled cargo flight to Hamilton, Ont. Shortly after rotation, the crew noticed that the aft-cargo-door warning light was illuminated, and irregular indications for the No. 3 engine followed. The crew decided to shut down the No. 3 engine and divert to Saskatoon, Sask., at an altitude of 10 000 ft. The aircraft landed safely at 07:10 Central Standard Time (CST) with aircraft rescue and fire fighting (ARFF) on standby. The aft cargo door was found open, with the door handle stowed in the locked position. There were no injuries. The aircraft sustained minor damage to the aft-cargo-door hinges. There was no damage to the door structure or latching mechanism.

Aft cargo door open with the handle stowed in the locked position

Findings as to causes and contributing factors

1. The aft cargo door was most likely closed but not locked before takeoff, and it opened after departure due to aerodynamic forces.
2. The ground crew did not check the aft cargo door for security before takeoff, and as a result, the door was not locked.
3. The flight crew members did not discover the unlocked aft cargo door during the walk-around inspection, nor did they notice the aft cargo door warning light before departure.

Findings as to risk

1. The ramp attendants were not required by their procedures to ensure that the cargo doors were properly closed.
2. The instructional placard on the aft cargo door describing how to lock the door contained misleading instructions.

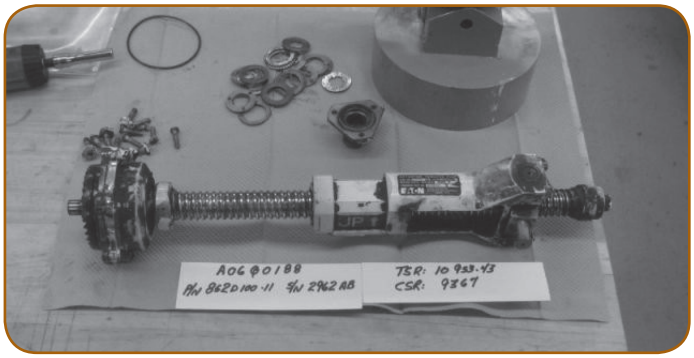
Safety action taken

After the occurrence, the operator amended its ramp operations manual by introducing a checklist that requires ramp attendants to ensure the security of cargo doors. The checklist is required to be initialled by ramp personnel after the completion of each aircraft loading operation.

On February 27, 2007, the TSB issued two occurrence bulletins concerning the instructions on the cargo door placard, and the cargo door closing procedures. The purpose of occurrence bulletins is to apprise Transport Canada and others in the aviation community in a timely manner of certain information that may raise potential operational or technical concerns.

TSB Final Report A06Q0188—Low-fuel Emergency

On November 21, 2006, a Bombardier CL-600-2B19 with 49 passengers and 3 crew members on board was conducting a scheduled flight from Vancouver, B.C., to Prince George, B.C. At about 15:14 Pacific Standard Time (PST), the aircraft was cleared for a non-precision approach on Runway 33 at the Prince George airport. While established on final approach, the flight crew was informed of a special weather observation, indicating conditions below the published minima. The flight crew continued the approach and set the flaps to 45°. Upon reaching the final approach fix (FAF), the flight crew conducted a missed approach and noted that the flaps remained jammed at 45°. The flight crew members diverted to their alternate airport: Grande Prairie, Alta. The aircraft was cleared to maintain 15 000 ft and vectored toward Grande Prairie. At 15:37 PST, the flight crew requested radar vectors to Fort St. John, B.C.—about 155 mi. away—and declared an emergency due to a low fuel prediction at destination. At 16:16 PST, the aircraft landed without further incident at Fort St. John with about 500 lbs of fuel remaining—equivalent to less than 10 min of flight. There were no injuries.



One of the flap system actuators being analyzed by the TSB

Findings as to causes and contributing factors

1. The maintenance program for Bombardier CL-600-2B19 flap system actuators in place at the time of the occurrence did not allow for the detection of problems in the flap actuators at an early enough stage to prevent flap failure.
2. The flaps failed at the 45° position, increasing drag significantly. The subsequent increase in fuel consumption required the crew to declare an emergency and divert to Fort St. John, which was a closer airport, landing with less than 10 min of fuel remaining.
3. A thorough knowledge of the flap system and consistency in the maintenance documentation would have allowed the maintenance personnel to identify and solve the problem sooner.
4. Repetitive flap failures on the occurrence aircraft were the consequence of faulty actuators caused by contamination such as water.

Findings as to risk

1. Water ingress into the flap system, combined with cold weather operations, is the leading cause of flap system failure on CL-600-2B19 aircraft.
2. The quick reference handbook (QRH) does not take into consideration the impact of flap failures at 45° following a missed approach. Consequently, the flight crews are not fully aware of the impact it would have on the aircraft climb performance for obstacle clearance or the impact on fuel consumption.
3. There is no cruise performance data available with flaps extended. Therefore, the flight crew could not determine the optimum altitude and speed to attain the best fuel economy.

Other finding

1. The practice of recycling a circuit breaker to rectify a problem has inherent risks; however, in this occurrence, it was a reasonable action on the part of the crew.

Safety action taken

On December 1, 2006, the operator issued a flight operations memo to its pilots, titled *CRJ Fuel Policy Adjustment*. A risk-based assessment was completed and eight airports were identified to be isolated enough to warrant an extra 30 min of fuel contingency when the forecast weather is less than 1 000 ft and the visibility is 3 mi. This memo was effective immediately and is now part of the company fuel policy for flight planning purposes. The operator initiated a conference with Air Canada Technical Services (ACTS), Eaton Aerospace, and Bombardier to discuss the design, operation, and support of the recent flaps and actuator issues. Shortly after, Bombardier announced the formation of a flap working group, including six operators, whose mandate is to work with Eaton Aerospace and Bombardier to complete a system redesign to remove the high seasonal failures of the flap system.

The operator has been an active participant in the flap working group and has assisted in the creation of the maintenance task currently being applied to the entire fleet via the Airworthiness Directive (AD) and Service Bulletin (SB) 601R27-150.

At the beginning of January 2007, the operator formalized a process where any Canadair Regional Jet (CRJ) 100/200 that experienced a flap failure would require senior management approval before the aircraft was returned to service.

On February 14, 2007, the TSB issued Aviation Safety Advisory A06Q0188-D2-A1 (*Potential Fuel Exhaustion Due to a CL-600-2B19 Flap Failure*) to Transport Canada (TC). The Safety Advisory suggests that TC may wish to advise other Canadian CL-600-2B19 operators and those foreign regulatory authorities that administer CL-600-2B19 aircraft of the circumstances of this occurrence and the possible impact of flap system failures on fuel management.

As a result of this Safety Advisory, Bombardier Aerospace issued All Operators Message (AOM) 1047, dated March 10, 2007, to alert all operators of this incident and the possible impact of flap system failures on fuel management.

TC drafted a document outlining CRJ flap operational issues and considerations. This document will be offered to Bombardier for its review and awareness. The document will be transmitted to all affected operators of Canadian-registered aircraft, as well as foreign civil aviation authorities, by way of a Service Difficulty Advisory.

On February 16, 2007, the TSB issued Board Concern A06Q0188-D1-C1 (*Bombardier CRJ Flap Failures*) to the Minister of Transport. The Board Concern states that, despite best efforts by the industry and regulators to reduce the number of flap failures in the CRJ fleet, that number is increasing. The Board requested that the Minister advise the Board of its action plan, both short and long term, to substantially decrease the number of flap failures on CRJ aircraft.

The Minister advised that short- and medium-term actions will include increasing awareness through Bombardier Aerospace AOMs and aircraft flight manual revisions. Long-term solutions will include a full system review to increase flap reliability through design and maintenance requirement changes.

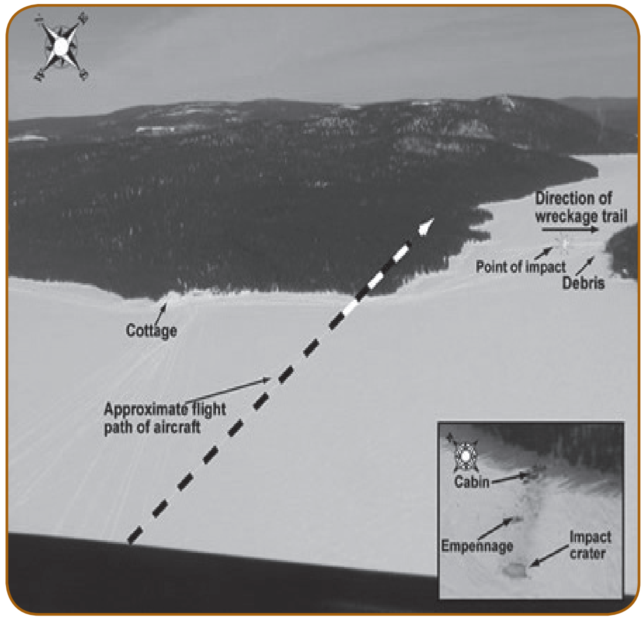
On March 1, 2007, the TSB issued Aviation Safety Advisory A06Q0188-D3-A1 (*Maintenance Intervals on Bombardier CRJ Flap System Actuators*) to TC. The Safety Advisory states that, since 2005, there has been an increasing number of flap failures experienced by CRJ aircraft and suggests that TC, in conjunction with the manufacturers and operators, may wish to initiate a review of maintenance requirements for the actuators on CRJ aircraft.

As a result of this Safety Advisory, Bombardier Aerospace and TC Engineering are reviewing the existing certification maintenance requirements (CMRs) for the CRJ flap system, including the overall system design.

On July 18, 2007, TC issued AD CF-2007-10 addressing the Bombardier CL-600-2B19 aircraft flap failures. The AD became effective on 31 July 2007 and includes both the operational and maintenance requirements.

TSB Final Report A07Q0063—Loss of Control and Collision with Terrain

On April 1, 2007, a Piper PA31-350 Navajo was on a visual flight rules (VFR) flight from Sept-Îles, Que., to Wabush, N.L. The pilot, who was the aircraft's sole occupant, took off around 06:30 Eastern Daylight Time (EDT). Shortly before 07:00 EDT, the aircraft turned off its route and proceeded to Grand Lac Germain to fly over the cottage of friends. At approximately 07:00 EDT, the aircraft overflew the southeast bay of Grand Lac Germain. The pilot then overflew a second time. The aircraft proceeded northeast and disappeared behind the trees. A few seconds later, the twin-engine aircraft crashed on the frozen surface of the lake. The pilot was fatally injured, and the aircraft was destroyed by impact forces.



Aerial view of the accident site

Finding as to causes and contributing factors

1. The aircraft stalled at an altitude that was too low for the pilot to recover.

Findings as to risk

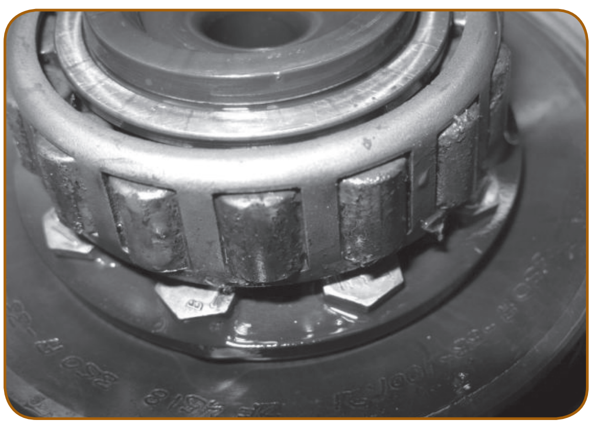
1. The aircraft was flying at an altitude that could lead to a collision with an obstacle and that did not allow time for recovery.
2. The steep right bank of the aircraft considerably increased the aircraft's stall speed.
3. The form used to record the pilot's flight time, flight duty time, and rest periods had not been updated for over a month; this did not allow the company manager to monitor the pilot's hours.
4. At the time of the occurrence, the company operations manual did not make provision for the restrictions on daytime VFR flights prescribed in section 703.27 of the *Canadian Aviation Regulations* (CARs).

Other findings

1. The fact that the aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR) limited the information available for the investigation and limited the scope of the investigation.
2. Since the aircraft was on a medical evacuation (MEDEVAC) flight, the company mistakenly advised the search and rescue centre that there were two pilots on board the aircraft when it was reported missing.

TSB Final Report A07C0114—Power Loss—Collision with Water

On July 1, 2007, a Eurocopter AS 350 B-2 helicopter with the pilot and one passenger on board was being ferried to Points North Landing, Sask., from a fuel cache located approximately 42 NM to the southwest. An electronic flight notification was sent by the passenger to another member of his survey company based at Points North Landing, indicating an arrival time of 19:05 Central Standard Time (CST). When the helicopter did not arrive, the survey company initiated emergency procedures at 19:45 CST. Debris was found the following day in Bernick Lake, approximately 25 NM southwest of Points North Landing. The helicopter was found at the bottom of the lake with extensive damage. Both occupants sustained serious injuries upon water impact and drowned when the helicopter sank.



Corrosion pitting as found in No. 3 bearing (see the on-line version of the ASL for colour photo)

Findings as to causes and contributing factors

1. The No. 3 bearing of the engine's power turbine failed and engine power was automatically reduced to about ground idle, requiring the pilot to conduct an autorotation. The bearing likely failed when corrosion pitting occurred during a period where the required storage procedures were not followed.
2. The pilot conducted a forced landing into the lake because the en route altitude selected was too low to permit an autorotation to shore, because the pilot's response to the engine power loss slowed the establishment of an effective autorotation toward the shore, or because he was attempting to land near the shoreline of the lake in response to the first indication of the impending bearing failure.
3. The pilot likely misjudged the height of the helicopter above the water and executed the flare and landing prematurely. Premature initiation of the flare would result in the loss of the kinetic energy of the main rotor blades at a height from which the pilot would have been unable to control the water landing.

Finding as to risk

1. Although regulations require pilots to fly the helicopter at a distance and height that would enable an autorotation to shore, there is no information provided in the basic flight manual with respect to glide ratios.

Other finding

1. Although not a factor in this occurrence, the pressure in the hydraulic accumulators was below specification.

Safety action taken

The company is reviewing its long-term storage procedures.

TSB Final Report A08O0035—Runway Overrun

On February 17, 2008, a Boeing 737-700 was carrying 86 passengers and 6 crew members on a scheduled flight from Calgary, Alta., to Ottawa, Ont. The aircraft had been cleared for an instrument landing system (ILS) approach to Runway 07 at Ottawa's MacDonald Cartier International Airport. The crew was advised of a considerable tailwind on approach, but that this tailwind decreased to nil by touchdown. Braking action was variously reported as poor and fair. At 22:58 Eastern Standard Time (EST), the aircraft touched down but was unable to stop before the end of the runway. The aircraft came to rest approximately 200 ft off the departure end of Runway 07. There were no injuries to the passengers or crew and there was no damage to the aircraft.

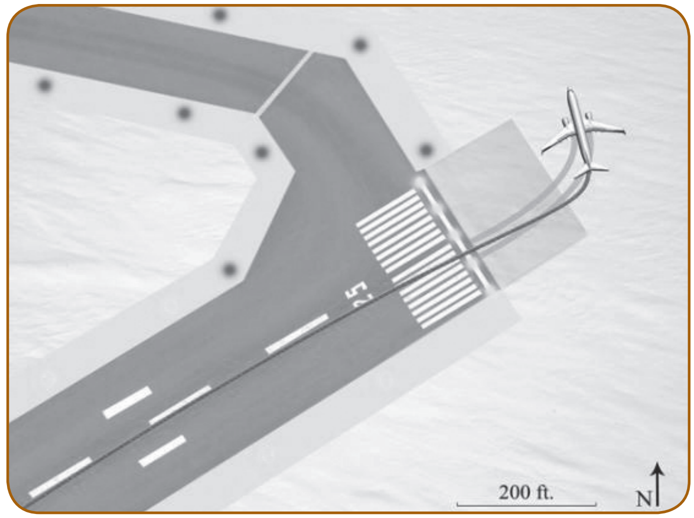
Findings as to causes and contributing factors

1. The crew had difficulty with aircraft energy management due to the strong tailwind for the revised runway, and this resulted in an unstabilized approach.
2. The captain became task saturated while coaching the first officer during the final stages of the approach.

He did not make an assessment that the approach was unstabilized at either the 1 000-ft above field elevation or, subsequent to that point, when conditions indicated otherwise.

3. The runway was more slippery than reported and, combined with the long and fast landing, resulted in an increase to the required landing distance. This increase in the required landing distance was in excess of the remaining runway available and this resulted in the overrun.

4. The speed brakes were not armed and their late activation added marginally to the stopping distance.



Site diagram

Findings as to risk

1. Contrary to the NAV CANADA *Air Traffic Control Manual of Operations* (ATC MANOPS), the braking action report did not include the aircraft type and time. This reduces the usefulness of a braking report, as crews cannot put the information into context with their own aircraft and expected landing time.

2. Misinterpretation of weather information by ATC personnel to determine runway use could result in inappropriate operational decisions.

3. Errors in automatic terminal information service (ATIS) generation could result in a situation where flight crews are making in-flight decisions based on incorrect or missing information.

4. Airport grid maps were available in both the tower and ground vehicles, but were neither required nor used to provide co-ordinates for the aircraft's position. This could result in confusion as to aircraft position and delays in rescue response in other occurrences.

5. The operator's flight operations manual performance charts for Canadian Runway Friction Index (CRFI) restricted runways are predicated on an autobrake setting of Max, but the flight operations manual does not define a CRFI restricted runway. It is possible that the flight operations manual description of autobrake settings 2 or 3 could lead crews to use those settings where the use of autobrake setting Max would be more appropriate.

Other finding

1. The Ottawa MacDonald Cartier International Airport decelerometer equipment was not checked following the occurrence to determine calibration status.

Safety action taken

NAV CANADA

NAV CANADA issued direction in the form of an operations letter to remind controllers of the ATC MANOPS requirement to use the proper format when issuing runway conditions and braking action reports. This operations letter was the subject of a mandatory verbal briefing. In addition, the Winter Operations Bulletin, issued nationally, contains a clear reminder to use techniques and phraseology in accordance with the ATC MANOPS and the NAV CANADA *Flight Services Manual of Operations* (FS MANOPS) to enhance positive, effective two-way communications.

On February 25, 2008, an operations bulletin was published, stating "upon receipt of an Airfield Condition Report, Clearance Delivery shall make two copies of the report and provide one copy to ground control and one copy to airport control." Local Procedures, paragraph 200.1j, were amended accordingly. This measure ensures that as soon as a report is received via fax, the controllers are made aware of it.

The Ottawa tower conducted a thorough review of airfield condition reports using a database covering a two-month (winter) period to identify discrepancies between the English and French vocabularies stored in the system. Digital ATIS functionalities have been reviewed and the necessary corrections have been made to the English/French vocabulary. The controllers have also been provided with instructions on how the vocabulary can be amended locally, if required.

Operator

Minimum equipment list (MEL) 78-1 thrust reverser inoperative has been amended to read: "When calculating landing distance required, 20 percent shall be added to flight landing distance calculations." The baseline calculated landing distances do not give credit for reverse thrust.

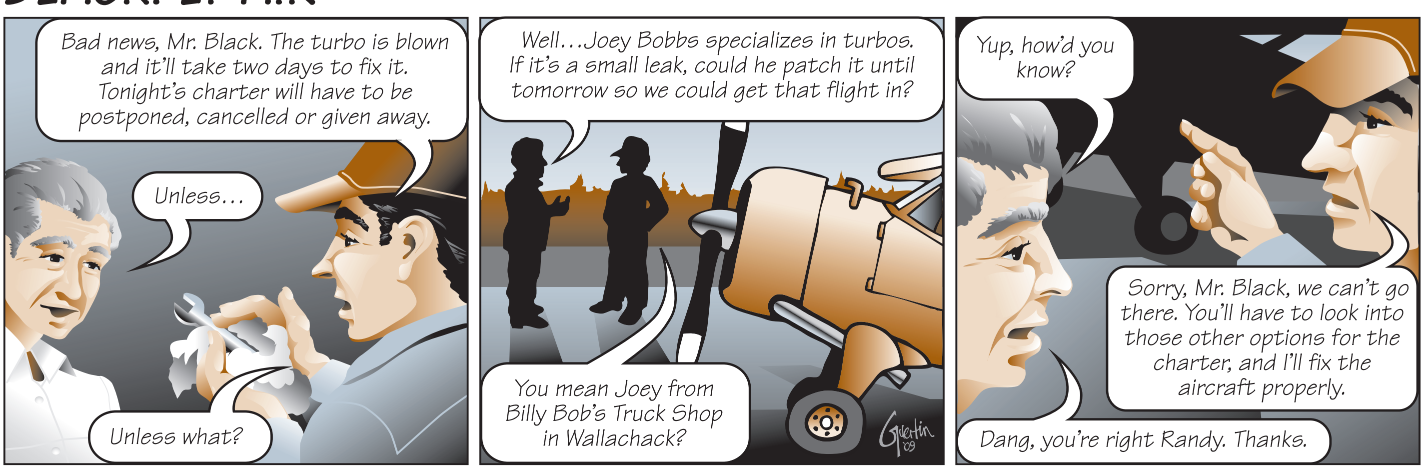
An aircraft communications addressing and reporting system (ACARS) landing distance calculator for landings in normal conditions has been added. The ACARS can be used in conjunction with braking reports or CRFI information. When a CRFI is entered, the calculations are based on Max autobrake.

In consultation with the aircraft manufacturer (sections 10A, 10B, and 10C—Landing Performance Data), the note advising the autobrake setting to be used when landing on runways with CRFI information available has been revised. Until now, autobrake settings less than Max were permitted if "optimum conditions" were present. This has been removed, as accurate landing distance information is not always available for landings on runways with CRFI information available for autobrake settings less than Max. As a result, regardless of other conditions, the autobrake will now always be set to Max when landing on a runway with CRFI information available.

The 2009 recurrent ground training will refer to this incident in regards to overload, fixation, and strategies to recognize and mitigate those conditions. The discussion will be organized around the flight data animation of the flight as it progressed, with specific focus on:

- initial plan, briefing and performance calculation (CRFI/runway surface condition);
- runway change and process followed to accommodate that change, including landing performance;
- flight profile and strategy employed in energy management and configuration;
- stable approach criteria and threat associated with continuing an unstable approach;
- phenomenon of workload and the resultant "fixation" and "single channel of attention" as it applied to this crew (missed 1 000-ft call, speed brake not armed):
    - o reference to accidents at Burbank and Chicago Midway airports and impact of fixation,
    - o reference information gathered by the operator's gatekeepers in pilot unstable approach debriefs (flight data monitoring [FDM] program),
    - o how to recognize and manage the phenomenon of fixation/single channel; and
- actual excursion and management of ATC, aerodrome emergency services, flight attendants, and passengers will be discussed in joint crew resource management (CRM). △

BLACKFLY AIR



Accident Synopses

Note: All reported aviation occurrences are assessed by the Transportation Safety Board of Canada (TSB). Each occurrence is assigned a class, from 1 to 5, which indicates the depth of investigation. A Class 5 consists of data collection pertaining to occurrences that do not meet the criteria of classes 1 through 4, and will be recorded for possible safety analysis, statistical reporting, or archival purposes. The narratives below, which occurred between May 1, 2009, and July 31, 2009, are all "Class 5," and are unlikely to be followed by a TSB Final Report.

— On May 13, 2009, a **Bell 206L-1 helicopter** was conducting a training flight at the Lachute, Que., airport with an instructor and pilot on board. Following an autorotation with power recovery, the aircraft conducted a rough landing. The helicopter bounced, and the main rotor blades cut the tail-rotor drive shaft. After spinning, the aircraft landed on its skids. The two occupants were unhurt. The aircraft sustained considerable damage. *TSB File A09Q0070.*

— On May 14, 2009, a **Cessna A185F equipped with amphibious floats** was departing Runway 22, a grass-covered runway at Orillia, Ont. Shortly after takeoff, the aircraft experienced gusty wind conditions with possible wind shear. Control of the aircraft was lost, it impacted the grass runway with the left wing low, and cartwheeled. The aircraft came to rest approximately three-quarters of the way down the runway. The aircraft was substantially damaged and the pilot, the only occupant, received minor injuries. *TSB File A09O0084.*

— On May 14, 2009, a **Glaser Dirks DG-808C powered glider** took off from the Hope, B.C., airport, using its engine, for a local flight. When the aircraft was returning to the Hope airport from the west with a strong westerly wind, its engine was deployed but was not operating. The aircraft's right wing tip struck trees about 1 NM west of the button of Runway 07, continued on a heading of approximately 090°, struck another stand of trees, then collided with a telephone pole. The pilot, the sole occupant, was fatally injured. The glider was substantially damaged. *TSB File A09P0116.*

— On May 17, 2009, a **Rans S-6S Coyote II advanced ultralight** was taking off from Runway 25 at King George Airpark, B.C., for a training flight with an instructor and student on board. The student was flying. During the take-off roll, the aircraft went over a bump in the turf runway and briefly became airborne. The student pulled back on the stick and the aircraft nosed up. The instructor was unable to overpower the student's aft stick force. When the aircraft left ground effect, it stalled aerodynamically, the left wing dropped, and the aircraft struck the ground. The aircraft was destroyed. There was no fire. The student suffered minor injuries and the instructor was uninjured. *TSB File A09P0128.*

— On May 19, 2009, a **Beechcraft 200** was on a flight to the Edmonton City Centre Airport, Alta. The aircraft was conducting the localizer/back course approach for Runway 16. When the runway became visible, full flaps were extended and power was reduced. The aircraft entered a low-power, high-drag situation during the last 200 ft of the descent, resulting in the activation of the ground proximity warning system (GPWS) aural warning regarding the descent rate. The subsequent hard landing resulted in substantial damage to the right propeller tips, right landing gear and right-wing root. There were no injuries to the two crew and four passengers. *TSB File A09W0082.*

— On May 21, 2009, the pilot of an **AS-350B2 helicopter** was landing on a snow-covered surface approximately 20 NM northeast of Kitimat, B.C., and lost visual reference. A landing skid dug into the snow and the helicopter rolled over. There were no injuries to the four occupants; however, the helicopter was substantially damaged. *TSB File A09P0124.*

— On May 29, 2009, a **float-equipped, amateur-built Timber Wolf** took off from Lac Morency, Que., for Lac en Coeur, Que. While turning during the initial climb, the pilot felt the rudder pedals shake. Since Lac en Coeur was close by, he decided to continue toward it. On final, the shaking decreased and the approach was completed without incident. Conditions were excellent, with a light wind of 5 mph, and light waves on the lake's surface gave the pilot a good idea of the aircraft's height. During the water landing, the aircraft nosed over. The deceleration was fast but not rough. The aircraft was equipped with shoulder harnesses, and even though they weren't used, the aircraft's occupants were unhurt. The aircraft sank but did not overturn. The pilot and passenger were able to evacuate the aircraft and were immediately rescued by local residents. Upon recovery of the aircraft, its two floats were tilted to the left. The front spacer bar was found torn from the left float, the front of which was completely smashed. The damage suggests that the sheet metal under this float might have been partially detached when the water landing was conducted and the pressure of the water entering the interior completely opened the front portion. In the week preceding the flight, the aircraft was positioned on an incline, with the left float resting on the wharf and the other on the water, in order to correct watertightness problems. This position, combined with strong storm winds, may have resulted in stress on the spacer bar's left front attachment. Since the water rudders are connected to the rudder cables, any float instability would likely result in the rudder pedals shaking. *TSB File A09Q0077*.

— On June 1, 2009, the pilot of a **J3C-65 Piper Cub** had just started the engine (by hand) for a local recreational flight near Elkhorn, Man., and was climbing into the back seat (the normal position for solo flight) when the pilot's foot inadvertently struck the throttle. The aircraft moved forward and the right wing struck a farm building, causing substantial damage to the wing and right landing gear. There were no injuries. *TSB File A09C0128*.

— On June 4, 2009, a **Bell 206L helicopter** with one pilot and three passengers on board was on a sightseeing flight approximately 84 NM southwest of Gander, N.L. The helicopter was landing beside a cabin when the tail rotor struck a tree. The aircraft landed hard and came to rest with the tail boom and main rotor blades detached. All four occupants received serious but non-life-threatening injuries. *TSB File A09A0035*.

— On June 5, 2009, a **Stinson S-108** landed at the Rouyn-Noranda, Que., airport with crosswinds at 40° in relation to the landing runway and gusts from 15 to 29 kt. The aircraft's tail spun to the side and the pilot countered the yawing motion, but the aircraft tipped forward. The propeller hit the ground, and the aircraft came back on its wheels. The aircraft left the runway under its own power with slight difficulty. No one was injured. *TSB File A09Q0084*.

— On June 6, 2009, the new owner of a **Rans Courier S-7 ultralight** was taxiing the aircraft on Sinkut Lake, B.C., with no intention of flight. The aircraft inadvertently became airborne and climbed to about 40 ft whereupon the engine (Rotax 582) stopped. The aircraft stalled, and the nose dropped and impacted the lake surface. The aircraft was destroyed. The pilot sustained minor injuries. *TSB File A09P0145*.

— On June 9, 2009, the pilot of a **Beech 55 Baron** had departed Calgary, Alta., for a planned round-robin flight of six local airports. During the first landing at Drumheller Muni, Alta., the landing gear was not extended, and the aircraft landed on the lower fuselage. The pilot was the sole occupant and was not injured, although the aircraft sustained substantial damage. *TSB File A09W0097*.

— On June 11, 2009, a **Genesis XL advanced ultralight** was taking off from Runway 31 at Duncan, B.C., for a local instructional flight. As the ultralight was lifting off, the right wing folded up and over to the left side. The ultralight remained on the ground, but veered to the left and came to a stop. The instructor and student were uninjured, but the aircraft was substantially damaged. An examination revealed that the right-wing lower strut bracket had broken. The fitting had been installed without washers, which caused a fatigue failure of the fitting. *TSB File A09P0153*.

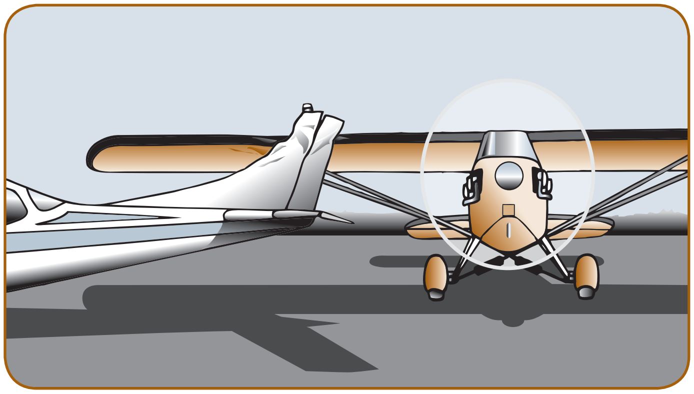
— On June 13, 2009, a pilot was conducting a straight-in approach in a **Piper PA-28R-200** to a private strip in the vicinity of Starbuck, Man. The landing gear was not selected down for landing and the aircraft touched down before the pilot recognized that the gear warning horn was sounding. The pilot usually flies a circuit and approach for landing. The pilot was not injured; however, the aircraft sustained substantial damage. *TSB File A09C0085*.

— On June 13, 2009, a **Piper Aztec** was doing circuits (touch-and-goes) on Runway 24 at the St. Catharines, Ont., airport. As take-off power was re-applied following the landing rollout, the landing gear handle was inadvertently raised and the nose gear collapsed, causing both propellers and the nose of the aircraft to strike the ground. The aircraft was substantially damaged; however, both occupants were uninjured. *TSB File A09O0107*.

— On June 16, 2009, a **Lancair Legacy FG** was departing Runway 13 at Regina, Sask. After liftoff, the canopy opened partially, the pilot lost control, and the aircraft landed hard near Taxiway A. The pilot sustained minor injuries and the aircraft was substantially damaged. The canopy had not been secured prior to departure. The manufacturer advises that an open canopy disrupts airflow over the tail. *TSB File A09C0088*.

— On June 25, 2009, a **Eurocopter AS350D** was on approach to land at Némiscau, Que., when the pilot manoeuvred to avoid striking birds. The tail rotor hit some tree branches. The aircraft landed normally. The aircraft was inspected, and only the tail rotor needed replacement. *TSB File A09Q0101*.

— On June 24, 2009, a **Cessna 172N** was taxiing to Runway 26 at the Kitchener/Waterloo, Ont., airport. The aircraft stopped at the displaced threshold as instructed by tower. Behind the Cessna 172 was a Wag-Aero Cuby taildragger, also taxiing to Runway 26. The pilot of the Cuby was steering the aircraft in S-turns to maintain forward vision. During one of the S-turns, the aircraft



Poor forward visibility while taxiing in a tail-dragger will increase the risk of a collision.

struck the stationary Cessna 172. The impact resulted in substantial damage to the two aircraft. There were no injuries to the occupants. *TSB File A09O0124.*

— On June 26, 2009, a **Beechcraft A23** aircraft was taking off from the Alexandria, Ont., aerodrome with the pilot and three passengers. The aircraft did not become airborne, overran the end of the runway and came to a stop in a farm field. The aircraft was substantially damaged, but there were no injuries to the occupants. No mechanical faults were reported. *TSB File A09O0128.*

— On June 28, 2009, an **amateur-built Bush Caddy** was conducting a flight between the Sherbrooke, Que., airport and Drummondville, Que. While the aircraft was in cruise flight approximately 10 NM from Sherbrooke, the pilot heard a thud and immediately noticed that the aircraft's right wing had folded upward at the wing-strut attachment point. Because there was no safe area to land, the pilot decided to continue on to Drummondville, where the aircraft landed safely. *TSB File A09Q0098.*

— On June 29, 2009, a privately owned **EUROPA XS amateur-built** aircraft was doing circuits at the Kitchener/Waterloo, Ont., airport. During the crosswind turn after the second touch-and-go, the aircraft entered a very steep bank, followed by a near vertical descent. The aircraft impacted the ground and was destroyed by fire. The sole occupant was fatally injured. *TSB File A09O0125.*

— On July 3, 2009, the window of a **Cessna 185 on floats** opened during the take-off run from Lac Manouane, Que. The pilot attempted to shut the window during the take-off roll, but realized the aircraft had departed the intended take-off path, and chose to abort the takeoff. Upon reducing power, the aircraft nosed over and ended up on its back. The pilot evacuated the aircraft via the right passenger door and swam to shore. He was not injured and was rescued the next day when the aircraft became overdue. The aircraft was substantially damaged. *TSB File A09Q0118.*

— On July 11, 2009, an **amateur-built Hummel Ultracruiser ultralight** was on its second post-construction flight from Winters Aire Park, Alta., and had successfully completed two circuits. While on departure, at approximately 100 ft above ground level (AGL), the right wing failed at the wing root. The aircraft crashed onto the runway. The pilot, who was the sole occupant, was seriously injured. There was no post-impact fire. Four weeks before this incident, the left main landing gear had failed during taxi trials. *TSB File A09W0126.*

— On July 15, 2009, the pilot of a **Cessna 337** took off from the Miramichi, N.B., airport bound for Valcartier, Que. The advisory service had notified the pilot that the last 1 200 ft of Runway 22, which is 3 100 ft in length, were closed with signage to that effect. The open part of the runway measured 1 900 ft. The pilot conducted a reconnaissance flight, attempted landing, and then pulled up. During landing, the aircraft landed long and entered the closed part of the runway. The aircraft came to a stop in a ditch. The pilot sustained serious injuries. *TSB File A09Q0108.*

— On July 15, 2009, a **Eurocopter 350BA** took off from pylon 648 for Némiscau, Que. During takeoff, the main rotor and tail rotor hit a pylon strut. The aircraft started turning to the right and tipped forward. It came to a stop on its right side, almost upside down. The pilot and passenger sustained minor injuries. *TSB File A09Q0109.*

— On July 16, 2009, a **Cessna 172P** was on a VFR flight from Tofino, B.C., to Victoria, B.C. During the flight down the west coast of Vancouver Island, the pilot encountered fog along the coast and diverted inland. In the vicinity of Cowichan Lake Village, B.C., the engine sputtered and lost power. The pilot transmitted a MAYDAY call on 121.5 MHz and made a forced landing on the highway, midway between Lake Cowichan Village and Youbou, B.C. While on short final for the road, the pilot saw power lines crossing the road and elected to go under them. The aircraft touched down hard, bounced, and the left wing hit a hydro pole. The aircraft went off the left side of the road, into a ditch, and nosed over. The aircraft was substantially damaged but the three occupants were uninjured. Although the ambient temperature was high, conditions were conducive to the formation of carburetor ice. When the aircraft was recovered, it was determined that both fuel tanks were dry. No evidence could be found of fuel draining out of the tanks (no smell of fuel or sign of fuel spilled on the ground). The aircraft had flown 2.7 hr since leaving Victoria with 30 U.S. gallons of fuel on board. *TSB File A09P0201.*

— On July 16, 2009, a **de Havilland DHC-2 Beaver** had departed the Cambridge Bay, Nun., water aerodrome for Surrey River, Nun. Upon turning out of Ferguson Lake, Nun., to follow the river, the flight immediately encountered thick fog. The pilot attempted to turn around and in the process struck terrain. The aircraft was substantially damaged, but the pilot only received minor injuries. *TSB File A09W0131*.

— On July 20, 2009, an **Aerostar S-57A hot air balloon** was on a sightseeing flight near Windsor, Ont., with a pilot and two passengers on board. When the balloon descended to land, a wind shift resulted in it being unable to land in the intended field. After the balloon touched down on an adjacent golf course, it continued to drift until the envelope was blown into a tree. There were no injuries; however, several panels of the balloon envelope were torn either by the initial penetration by tree branches or when attempting to free it from the trees. There was also some burn damage at the mouth of the envelope. *TSB File A09O0144*.

— On July 21, 2009, a **Beech King Air 100** was on a visual approach to Runway 02 at the Edmonton International Airport, Alta., behind an arriving Boeing 737. The crew planned to remain above the approach path of the Boeing 737 and full flap was selected on the base leg. The landing gear was not lowered and the landing gear warning horn sounded during the flare. Power was applied to initiate a go-around; however, the right propeller contacted the runway, the nose of the aircraft pitched up, and the go-around was aborted. The aircraft touched down on the cargo pod, slid approximately 1 500 ft, and came to rest on the infield to the right of the runway. The aircraft sustained substantial damage. The seven occupants were uninjured. *TSB File A09W0134*.

— On July 31, 2009, a **Glaser Dirks DG-500 dual-seat glider** was being towed for flight at Rockton, Ont. When the aircraft was approximately 200 ft above ground level (AGL), the pilot in the forward seat was adjusting his position in the seat when he inadvertently struck the glider release mechanism. The glider released from the tow aircraft and the pilot turned the glider in an attempt to land at the airport. During the touchdown, the right wing tip struck the ground and the glider ground looped, resulting in substantial damage to the wing and tail structure. There were no injuries to the occupants. *TSB File A09O0160*. △

The Civil Aviation Medical Examiner and You

Refractive Eye Surgery

by Dr. Jim Pfaff, Senior Consultant, Policy and Standards, Civil Aviation Medicine, Civil Aviation, Transport Canada

Civil Aviation Medicine receives a lot of questions regarding the visual requirements to be a pilot. Contrary to popular belief, perfect uncorrected vision is not a requirement to be a pilot or an air traffic controller. Glasses, contact lenses and refractive surgery are all (with certain limitations) acceptable ways to correct visual acuity problems. This article will address the expanding realm of refractive surgery as an approach to achieving better vision.

Technological changes and medical experience has brought forward a proliferation in the availability and options in eye surgery directed at improving visual acuity. Civil Aviation Medicine has monitored the progress and has adapted the medical guidelines regarding certification for flight to reflect the growing body of knowledge and experience in this important area.

Which procedure does Transport Canada (TC) recommend?

TC's position in this regard is that refractive surgery is an elective procedure, i.e. a voluntary personal decision entered into after careful consideration of the risks and benefits, and discussions between the pilot and their attending physicians.

While there are many techniques available, some earlier methods are dropping out of favour while others are evolving rapidly both in technical precision and popularity. The list includes clear lens extraction, Radial Keratotomy (RK), Astigmatic Keratotomy (AK), Automated Lamellar Keratoplasty (ALK), Photorefractive Keratectomy (PRK), Laser-assisted in-situ Keratomileusis (LASIK), Laser Thermokeratoplasty (LTK) and Intrastromal Corneal Rings (ICR), to name only a few. The details of these procedures are beyond the scope of this article; further information is available from the ophthalmology community.

Which surgical centre does TC recommend?

TC's medical advisors cannot direct prospective candidates to a specific service provider. There are many providers available who use a variety of techniques and have a wide range of experience and success. Anyone considering a procedure should spend some time investigating the procedure and the provider. The watchword should be *caveat emptor*—buyer beware.

Why does TC have concerns about this procedure?
While the advances in this area of surgery have been impressive and the outcomes have improved in terms of fewer complications and shorter period of incapacitation, there are still issues that have a serious potential to affect safety in flight. The most important risks from an aviation standpoint are loss of best corrected visual acuity, undercorrection or overcorrection, fluctuation in vision at different times of the day, glare, "halo" or "starburst" effect due to corneal haze, loss of contrast sensitivity, loss of low contrast visual acuity, and regression or return towards pre-operative refractive levels.

It is, therefore, quite important that these concerns be adequately addressed in the post-operative period before a return to active operational flying or air traffic controller duties is permitted.

Who needs to know when this surgery has been done?
You need to inform the eye centre that you are a pilot or air traffic controller. They have an obligation to report your situation to TC Civil Aviation Medicine. You should inform your Civil Aviation Medical Examiner (CAME), as they need to update your file and ensure that you are aware of your obligations with respect to grounding yourself. While there is no requirement to inform the regional Civil Aviation Medicine office directly, you might want to consider it if you are in a career situation where return to authorized flying activities is a priority. This would alert Civil Aviation Medicine and help to expedite the re-certification when the reports are ready.

Failure to inform TC Civil Aviation Medicine about this surgical procedure could lead to enforcement action, should the circumstances come to light in the future. "Miraculous" improvements in visual acuity found at renewal medical examinations with your CAME will be pursued.

Non-disclosure to aviation employers will undoubtedly result in a similar dim view of the situation. The majority of carriers and employers will accept these procedures if TC has approved the medical certificate. For those thinking about a flying career in the Canadian Forces, it would be prudent to check the military's current medical policy for aircrew entry and activity.

What documents do I need to submit in order to reinstate my licence after undergoing this procedure?
Submit a report 30 days (4 weeks) post-surgery to the local office of your Regional Aviation Medical Officer (RAMO), using the Refractive Surgery form found on the TC Civil Aviation Medicine Web site (www.tc.gc.ca/civilaviation/cam/eyesurgery.htm).

If ophthalmic medications (eye drops or oral) are still being used to control pain or other symptoms, then the report should be delayed until medications have ceased. This does not apply to the so-called "artificial tears."

The report can be from the attending ophthalmologist or an optometrist and should include information concerning:

- the pre-operative visual acuity,
- the date of the surgery,
- the type of procedure,
- the size of the ablation zone (area of surgery),
- the post-surgery visual acuity, and
- any comments regarding side-effects, such as haze, glare, night vision problems, or contrast-sensitivity issues.

Will I need any other reports?
TC Civil Aviation Medicine is currently requesting a follow-up report if there are any post-operative complications that arise beyond the initial assessment period. You can use the same form as the original reports. An ophthalmologist or an optometrist can complete this report.

What about "touch-ups"?
Generally speaking, a "touch-up" is a repeat procedure to improve upon the original surgery. In these cases TC Civil Aviation Medicine would need another report 30 days (4 weeks) after the touch-up procedure to confirm the visual acuity and lack of side effects.

How long does one have to wait before returning to flying or air traffic controller activities?
Your return to flying must be delayed until TC Civil Aviation Medicine has reviewed the results of the surgery. A follow-up report should be submitted 30 days after the procedure. You can fax or mail the report to your local RAMO and you should receive prompt notification that you can return to flying if all is satisfactory.

What about the restrictions printed on my current medical certificate referring to glasses or contact lenses?
Refractive surgery usually results in a change in visual acuity that permits flying without corrective lenses. If this is the case, your file will be re-assessed and you will be issued a new medical certificate or a label (for the new Aviation Document Booklet) that reflects the change. △

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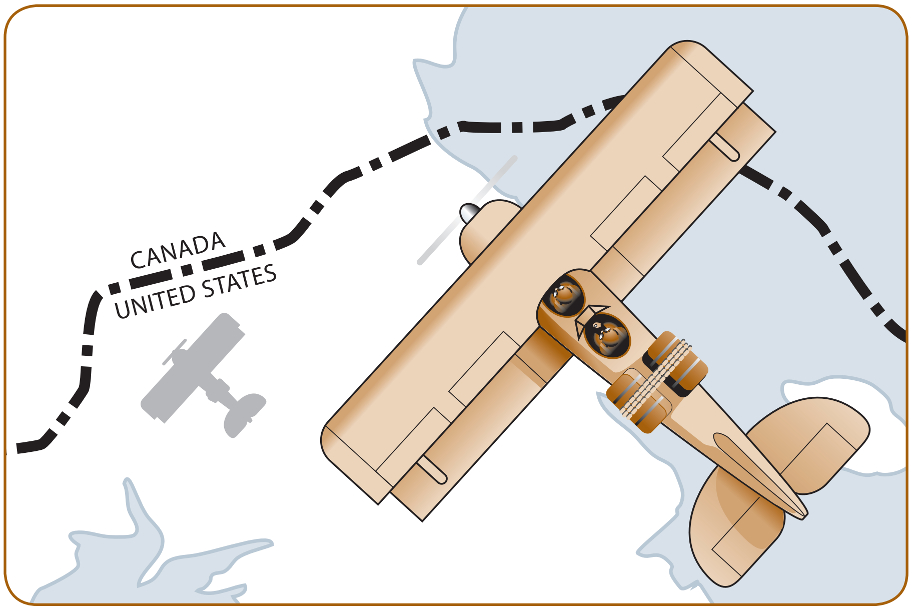
Transborder Flights: If You Want Alerting Service, You Need to Know How to Get It!

by Roberta Sprague, Civil Aviation Safety Inspector, ANS Operations Oversight, National Operations, Civil Aviation, Transport Canada

On November 26, 2008, Frank Smith left his home in Winnipeg, Man., and flew to Minneapolis, Minn., in his C172 for a week-long business meeting.[1]



The meeting ended early, so Frank decided to surprise his family, who were vacationing in Sioux Lookout, Ont. He filed a VFR flight plan with an American automated flight service station (AFSS) in accordance with the regulations, checked the weather, jumped in his C172, and headed to Sioux Lookout. He would be a bit pushed for fuel, but the weather was okay and he would have a bit of a tail wind.

About 30 min north of the border, the weather started to close in and by the time he reached the 80-miles-to-go point, he was flying at tree-top height. Skill and luck combined was not enough…he clipped a wing and cart-wheeled through the trees. He was ejected from his plane—which saved his life, as there was an immediate post-crash fire that consumed what was left of the C172, including the emergency locator transmitter (ELT). His left leg and right wrist were broken. His injuries would not have been fatal if he had been rescued quickly—and he should have been, as he was on course according to his GPS just before impact—but Frank died five days later of exposure. No one knew he was overdue in Sioux Lookout, and no search had commenced because his flight plan had not been activated, so it had not been transmitted to Canadian air traffic services (ATS). No one in Canada knew he was coming.

Sadly, this type of event happens all too often with flights coming to Canada from the United States. A flight plan that gets filed but not activated is a completely avoidable occurrence and should not happen; ***yet, from August 1 to December 31, 2008, it happened at least 78 times***.

The number of instances where VFR alerting service is not provided to pilots entering Canada from the United States continues to grow. The main reason for this is lack of awareness on the part of the pilot, who assumes that the flight plan has been activated upon departure from the United States, just as it would be in Canada.

There is one key difference between American and Canadian regulations regarding flight plan activation, and as a pilot, you must understand this difference if you conduct a transborder flight. ***A flight plan filed in Canada will be activated automatically at the proposed time of departure*** (unless otherwise specifically requested), commonly known as "assumed departure". ***A flight plan filed in the United States must be activated by the pilot***. After filing a flight plan, the pilot needs to contact an American flight service station (FSS) to activate it (unless otherwise specifically requested). A pilot can also ask a control tower to activate his flight plan, but this procedure should be avoided at busy airports.

If the pilot does not ask for VFR flight plan activation, it will be held by the American FSS until 1 hr after the proposed departure time, and then it will be discarded. This is equally true for flights that are completed wholly within the United States.

The subject of flight plan requirements was addressed in an article published in *Aviation Safety Letter* (ASL) 1/2007, which can be found on the Civil Aviation Web site, at www.tc.gc.ca/CivilAviation/publications/tp185/menu.htm. The article, titled "Transborder Flights Without a Flight Plan—Revisited," provides information derived from the

1 The occurence is real. Names and places have been changed.

Federal Aviation Administration's (FAA) *Aeronautical Information Manual* (AIM) and the *Canadian Aviation Regulations* (CARs) regarding the different regulatory requirements.

Filing a flight plan to fly VFR from the U.S. and land in Canada is not only a regulatory requirement; it is a procedure designed to protect your life and that of your passengers. The successful completion of your flight is linked in large part to your competence as a pilot. However, should anything happen en route, your filed flight plan won't do you or your passengers any good if the activation process was not triggered. When you depart VFR from the U.S., that trigger is you! Your life might depend on it.

Alerting service is valuable. Activate that flight plan! △

Enforcement Considerations When Flying Across the Border

by Jean-François Mathieu, Chief, Aviation Enforcement, Standards, Civil Aviation, Transport Canada

Data shows that every year there are a significant number of aircraft that cross the Canada/U.S. border without an active flight plan. This constitutes a violation of *Canadian Aviation Regulation* (CAR) 602.73(4), which consequently requires Transport Canada's Aviation Enforcement Division to take action.

In Canada, CAR 602.73(4) requires that pilots file a flight plan before operating an aircraft between Canada and a foreign state. In the U.S., Federal Aviation Administration (FAA) regulations require that pilots conducting flights between Canada or Mexico and the United States file and activate a flight plan, communicate with the air traffic services (ATS) unit at the time of the border crossing, and squawk an assigned discrete transponder code [*Federal Aviation Regulation* (FAR) 91.707].

When crossing the Canada/U.S. border, ATS from both sides of the border are involved with the pilots. Data suggests that ATS units are very rarely accountable for occurrences of transborder flights without active flight plans. ATS system failures or transmission problems contributed to a certain increase of occurrences for a brief period. However, the ultimate responsibility for assuring a flight plan is filed and activated always rests with the pilot.

Some pilots may believe that customs request procedures automatically arrange for the filing of a transborder flight plan. However, this is incorrect, as these are two separate processes. Two articles published in *Aviation Safety Letter* (ASL) 2/2009 are excellent complements to this article and are definitely recommended reading. The first one, by NAV CANADA, titled "The Life of a Flight Plan", addressed the importance of filing a flight plan, and imparted insight on the progression of flight plan information for ATS planning. The second one, titled "Border-Crossing Procedures Revisited", was written by the Canadian Owners and Pilots Association (COPA) and focused specifically on the new customs requirements. It clarified any ambiguity concerning the "how to" of flying to a foreign state.

For example, when crossing the border from Canada to the United States, and as clearly explained in the aforementioned COPA article, a pilot must access the Electronic Advance Passenger Information System (eAPIS) to complete the U.S. Customs and Border Protection Agency (CBP) border-clearance process. Introduced in May 2009, eAPIS is an on-line customs-reporting tool—an Internet portal for use by pilots flying into or out of the U.S. Electronic submission is mandatory. However, this is not your flight plan, it is simply the customs arrangement.

In Canada, the monetary penalty for contravening CAR 602.73(4) can be as high as $1,000 for the first offence. The responsibility rests solely with the pilot to comply with this regulation. Moreover, pilots need to be aware that not filing and activating a flight plan means alerting service is not provided, which, in the unfortunate event of a missing aircraft or an accident, could result in delayed search and rescue activity, or no search and rescue activity at all.

Pilots are reminded to file their flight plans, and to ensure that they activate them both to and from a foreign state.

The objective of the Transport Canada Aviation Enforcement Program is to promote compliance with aviation regulations in Canada and in international airspace under Canadian jurisdiction. We encourage open communication between the aviation community and Transport Canada in order to enhance and maintain the evolving safety culture. △

Flying for Money!

by the Advisory and Appeals Division, Policy and Regulatory Services, Civil Aviation, Transport Canada

As some of you may know, Canadian aviation law makes an important distinction between private and commercial aviation, the latter being subject to both elevated standards and increased regulatory scrutiny, resulting in an exceptionally high level of aviation safety.

To this end, a definition of "hire or reward" has been created in the legislative framework. That definition is set out in subsection 3(1) of the *Aeronautics Act*, as follows:

> "hire or reward" means any payment, consideration, gratuity or benefit, directly or indirectly charged, demanded, received or collected by any person for the use of an aircraft;

Courts have consistently given a broad, expansive and liberal interpretation to the term "hire or reward". The scenarios that follow illustrate this point.

In two older court cases, two operators of remote fishing or hunting camps had offered a fly-in service to guests at no extra charge. In other words, the rate charged for accommodations and guide services was the same whether the customers chose to use the fly-in service offered by the camp operators, or whether they decided to pay someone else to transport them to the camps. The hunting camp operators argued that, because they received no additional fee for the offered flights, there was no "hire or reward" situation. The courts in both cases rejected this argument and found that the free flights provided each operator a clear, albeit indirect, benefit. Therefore, the flights in question were "hire or reward" flights and the operators were found to have been operating a commercial air service without the appropriate licence.

In another, more recent, court case, a pilot was the director of Company A and Company B. Company A was the registered owner of the aircraft flown by the pilot. Company A rented the aircraft to Company B, and Company B was paid for bringing equipment, persons or other things to different sites. The Federal Court decided that, since Company A was the registered owner of the aircraft and had received an indirect benefit from the flights, it was required to have an air operator certificate (AOC) as set out in subsection 700.02(1) of the *Canadian Aviation Regulations* (CARs).

There are situations where a person may operate for "hire or reward" and not require an AOC. One situation is covered by subsection 700.02(3) of the CARs, which allows farmers who own their own planes to use them to spray herbicides within a 25-mi. radius from their farm centre.

Another situation, covered by subsection 700.02(4) of the CARs, concerns sightseeing flights conducted by flight schools. This type of activity is permitted, without the requirement for an AOC, if the various conditions set out in the CARs are met: specifically, the pilot must hold a flight training unit (FTU) operator certificate and a flight instructor rating, the flights must be conducted in accordance with visual flight rules (VFR) in a single-engine aircraft with no more than nine passengers, and for the purpose of sightseeing.

Another situation where someone could conduct an operation for hire or reward without an AOC would be if the Minister issued an exemption. Pursuant to subsection 5.9(2) of the *Aeronautics Act*, the Minister can issue exemptions from the application of any regulation, should the Minister be of the opinion that such exemptions are in the public interest and not likely to adversely affect aviation safety or security. For example, situations involving charity flights, where pilots have been reimbursed only for fuel costs, have been issued exemptions in the past.

Another twist to the above concepts can be found if we look at section 401.28 of the CARs. This section deals with the reimbursement of costs incurred in respect of certain flights, by private pilots, in very specific circumstances.

Subsection 401.28(2) allows private pilots, who own their own aircraft, to receive reimbursements from passengers towards the operational costs of running the aircraft. Subsection 401.28(3) allows the private pilot to be reimbursed by his employer (who does not normally employ the person as a pilot). Subsection 401.28(4) allows private pilots to receive reimbursement when the flights are conducted for a "charitable, not-for-profit or public security organization", on a volunteer basis. The three scenarios above are available only when certain specified criteria or conditions are met.

So, as we can see, the term "hire or reward" can be difficult to apply. Each situation must be looked at carefully in light of the case law and regulations that apply. △

The First Defence

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TAKE FIVE... for safety

Five minutes reading could save a life

HOW TO STAY CURRENT

The *Canadian Aviation Regulations* (CARs) tell us that, in addition to having a valid licence or permit and a valid medical certificate, there are some things that pilots need to do every five years, every two years and every six months if they wish to exercise the privileges of their licences or permits.

Every five years, pilots must fly as pilot-in-command or co-pilot at least once in a category of aircraft for which they are licensed. Pilots who do not meet this requirement must successfully complete a flight review with an instructor and pass the Student Pilot Permit or Private Pilot Licence for Foreign and Military Applicants, Air Regulations (PSTAR) examination.

Every two years, pilots must complete a recurrent training activity. In order to satisfy this requirement, pilots can choose one of the following activities:

- complete a flight review with an instructor;
- attend a Transport Canada safety seminar;
- participate in a Transport Canada approved recurrent training program;
- complete the self-paced study program available each year in the *Aviation Safety Letter*;
- complete a training program or pilot proficiency check (PPC) required by Part IV, VI or VII of the CARs;
- complete the requirements for the issue or renewal of a licence, permit or rating; or
- complete the written exam for a licence, permit or rating.

Every six months, pilots who wish to carry one or more passengers must complete at least five takeoffs and five landings in the category and class of aircraft in which the passenger is carried. "Category" refers to whether the aircraft is a glider, airplane, helicopter, balloon, gyroplane, etc.; "class" refers to whether the aircraft is meant for land or sea, whether it is single-engine or multi-engine, etc.

Pilots wishing to carry passengers at night must complete five takeoffs and five landings at night every six months. Glider pilots have the option of completing two takeoffs and landings with an instructor. Although balloons are not allowed to land at night, if part of a balloon flight carrying passengers is to take place at night (in other words, if the flight departs just before dawn with the plan to land in the daylight), the pilot must have completed at least five takeoffs during the day and five takeoffs at night in a balloon during the last six months.

For more details about these specific requirements, visit www.tc.gc.ca/civilaviation/regserv/affairs/cars/part4/standards/421.htm#421_05.

Beyond meeting the recency and currency requirements, pilots must ensure that their Aviation Document Booklet has not expired. The booklet's expiry date is indicated on the identification page. Pilots who don't yet have an Aviation Document Booklet should consider applying for one by contacting their regional Flight Crew Licensing office.