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Issue 3/2008

AVIATION SAFETY LETTER

In this Issue...

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

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Canada

The *Aviation Safety Letter* is published quarterly by Transport Canada, Civil Aviation. It is distributed to all holders of a valid Canadian pilot licence or permit, to all holders of a valid Canadian aircraft maintenance engineer (AME) licence and to other interested individuals free of charge. The contents do not necessarily reflect official government policy and, unless stated, should not be construed as regulations or directives.

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

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GUEST EDITORIAL

According to the Transportation Safety Board of Canada (TSB) statistics, the aviation accident rate in Canada has been in steady decline. More specifically, aviation safety in the air taxi sector has shown marked improvement. These gains are likely a direct result of a number of initiatives bringing an improved safety culture to our industry. Initiatives such as the Safety of Air Taxi Operations (SATOPS)[1]—initiated by Transport Canada in 1996—have brought forward changes to the way in which air operators and approved maintenance organizations are conducting their day-to-day operations.

While Canada has an enviable aviation safety record, I can't help but feel a responsibility in particular to the recreational aviation community. In spite of the fact that over the last decade the number of hours flown by this sector has been steadily decreasing, there has been no downward trend in accidents according to TSB statistics. Ontario is home to over one third of all aviation activity in Canada and nearly 40 percent of the recreational aviation fleet resides within its borders.

In an *Aviation Safety Letter* (ASL) article written last year [2], author Adam Hunt suggests that "…if you [*the pilot*] are rusty, invest wisely in a checkout with an instructor and make sure you fly regularly to maintain your skills." This conclusion comes from a report into the findings of a review of insurance claims submitted to the Canadian Owners and Pilots Association (COPA) aviation insurance program. An analysis revealed that 33.9 percent of accidents reviewed were due to skill-based errors and 6.5 percent were the results of poor decision making. Furthermore, 10 percent of the accidents surveyed were the result of engine failure, leading the author to question if owners are "…getting their planes properly serviced when they should." Mr. Hunt's article—in my opinion—delivers sound advice and poses a fair question!

How can we work together on improving safety records? Could the principles of safety management systems (SMS) permeate the flying clubs, the associations and the recreational pilots themselves? Could an initiative such as SATOPS realize the same level of success in this sector? What steps can the recreational aviation community take to significantly improve its safety performance?

Clearly, to improve the safety record of recreational aviation in Ontario and throughout Canada we must focus on some key initiatives. A collaborative environment between the regulator and the industry is essential. Improving safety can only be achieved if the recreational aviation community is able to identify the issues and work on solutions between themselves and with Transport Canada.

In Ontario, I have had opportunities over the last three years to attend Monthly Aviation Safety Seminars (MASS), where my regional staff meet regularly with 150 to 200 recreational pilots and owners to discuss exactly these kinds of issues, and share best practices. An inspector has been identified as the point of contact at each Transport Canada Centre (TCC) in Ontario and I have assigned one of our superintendents as the regional champion for recreational aviation. The Ontario Region has created an e-mail address specifically for the use of this community (RecAvOnt@tc.gc.ca) of which many people have taken advantage. These are just a few examples of ways in which we are trying to engage the recreational aviation community.

Let's work on this together. Talk to your local TCC or send your suggestions directly through the Civil Aviation Issues Reporting System (CAIRS) at www.tc.gc.ca/CAIRS. Your suggestions, comments and issues will be viewed as opportunities to build a more collaborative relationship between yourselves and Transport Canada Civil Aviation. Improvements in the safety culture of your community can only happen with your participation.

Michael R. Stephenson
Regional Director
Civil Aviation
Ontario Region

[1] SATOPS - www.tc.gc.ca/civilaviation/systemsafety/pubs/tp13158/menu.htm

[2] ASL - www.tc.gc.ca/CivilAviation/publications/tp185/1-07/Pre-flight.htm#COPA

Detection of Water in Fuel Drums—Use of Filters and/or Dipstick

Dear Editor,

Recently, one of our base pilots discovered an accumulation of water in the fuel tank and filter of his Bell 206. The previous day, he had refuelled from a drum near Stewart, B.C. Approximately one litre of water was discovered in the fuel filter—almost enough to cause engine failure. The chief pilot examined the fuel filter and discovered that it would allow the entry of water up to one percent of the fuel flow rate before shutting off the fuel flow. With a fuel flow rate of 25 gallons per minute, the filter would allow 0.25 gallons or one litre of water. That is practically the full capacity of the airframe fuel filter. I have been in the industry for over 30 years and was not aware of this. I am sure that many other pilots are also not aware of this.

Part of the problem is that this particular filter unit is in a casing with no glass sediment bowl; therefore, the pilot cannot perform a visual check of the fuel as it starts to pump. Older filters equipped with a glass sediment bowl were more effective for detecting water visually.

I have noticed over the years that when there is a small quantity of water in a drum, it can be spotted using a flashlight, since water separates from the fuel and can be seen even if the water is clean. However, I once encountered a drum that had enough clear water to cover the bottom of the drum, even when tilted over for inspection. In this case, the water could not be seen. I am now convinced that the only sure-fire way to detect water is to use water-finding paste on a dipstick. I keep a lightweight dipstick made of white plastic, and use it with a bit of water-finding paste on the end to check for water.

Name withheld on request.

Selection of Precautionary Landing Site

Dear Editor,

I am an air traffic controller currently working at the Abbotsford Airport, B.C. I am writing you today with regards to a particular accident synopsis, published in the *Aviation Safety Letter* (ASL) 4/2007. The article mentions the sequence of events regarding a Cessna 177RG returning to the airport with partially deployed landing gear. The pilot tried unsuccessfully to deploy the gear and ended up landing gear-up on Runway 19. I was working at the Air position that day and remember the event quite well.

What wasn't mentioned was that the pilot initially insisted on landing in the grassy area adjacent to Runway 19. A fly-by was conducted in accordance with our *Manual of Operations* and our *Unit Operations Manual*, and also to buy us some time. I remembered a conversation regarding precautionary landings with a fellow controller who was also an experienced pilot. We had discussed that landing in long or wet grass, or on any other soft surface, involved a risk of digging into the soft ground and the potential of cart-wheeling, or having a wing dig in, resulting in more severe injuries or structural damage. During the fly-by, we confirmed to the pilot that his gear was partially deployed, and that all of the controllers present suggested that the best course of action would be to land on the hard surface.

The airport firefighter responding to the incident also recommended the hard surface because it had rained quite a bit during the previous week. Not only would it be trickier for the aircraft, but the soft ground presented an additional risk that the fire truck might get stuck. After relaying this information back to the pilot, he agreed to land on the runway. All resources were deployed in the staging area; the pilot landed the aircraft on Runway 19 and walked away unharmed. Teamwork played an important role in this incident. As a result, I understand that the Airport Manager and other interested parties are discussing the feasibility of making precautionary landings on the hard surface mandatory.

I would like to see an article in the ASL regarding the best choice to be made under different circumstances where a precautionary or forced landing is required. I have witnessed several incidents over the years, and a recurring theme seems to be a desire to minimize damage to the aircraft.

Pascal Liebault
Chilliwack, B.C.

Thank you, Mr. Liebault. Your comments do provide for good discussions between pilots, controllers, flight service station (FSS) specialists, and rescue personnel. In this particular event, you and your colleagues were able to assist a pilot in a period of elevated stress, with a most favourable outcome. The publication of your letter should raise the level of awareness on this issue, and encourage pilots to discuss it with their peers, particularly with their instructors. —Ed.

The CBAA Column: Audits, Audits, Audits, Audits, Audits

by Peter Saunders, Manager, Private Operator Certificate (POC) Program, Canadian Business Aviation Association (CBAA)
This article was previously published in CBAA Newsbrief *#118. Reprinted with permission.*

At the recent CBAA Safety Seminar held in Montréal, Que., the words "audits, audits, audits, audits" resounded in the room. Mr. Gordon Graham, renowned expert on organizational and operational risk management, was the speaker. Mr. Graham was addressing the way an organization can truly understand and quantify its overall operational health. An internal audit process provides the means of checking and rechecking all of the policies and procedures that are in place to support the direction and mandate of the responsible executive.

Private operator certificate (POC) holders are required to develop, implement and operate a safety management system (SMS) that is sound, appropriate and effective for their operation. An integral evaluation tool of SMS is the operator risk profile that, when completed, provides the operator with an understanding of their exposure to operational risks. The operator's risk profile forms the framework for developing processes and policies to address day-to-day operational requirements and to mitigate identified areas within the risk profile.

What needs to be understood is that, by nature, an effective SMS is essentially a live, ever-evolving system that needs to be routinely reassessed, challenged and revised where necessary. Whenever revisions are made to the SMS, they are initially evaluated to ensure that the changes are sound, appropriate and effective. Over time, the operator's profile should evolve, creating the need to make additions or amendments to the SMS. To ensure that this is done appropriately and effectively, a system of checks and balances needs to be utilized.

So, how do we know that what has been implemented through policy and procedures is indeed appropriate for the identified situations? The simplest, most effective method is to conduct internal audits. Initially, a POC holder engages a CBAA-accredited auditor to evaluate the operator's SMS. Following the initial certification audit, and in conjunction with the operator's risk profile, a predetermined periodicity for the reoccurring audit is determined, which shall not exceed three years. But those are the required audits.

More and more organizations are discovering the multiple benefits of implementing ongoing internal audit systems. One cannot underestimate the business efficiencies realized by compliance with operational and regulatory standards.

Internal audits, if properly implemented, can:

- demonstrate an operation's credibility;
- minimize the gaps between required audit cycles;
- demonstrate due diligence regarding liabilities;
- improve staff understanding of the systems in place in the organization;
- ensure that everyone is following policies and procedures;
- provide motivation for ongoing improvement and streamlining of systems; and
- demonstrate to external parties that the policies and procedures are sound, appropriate and effective.

Ongoing internal audits do not have to be complex, lengthy or involved. They can be structured to focus on a single department, a single area of responsibility or a single item of the business aviation safety standards. An audit implementation plan can be developed, illustrating an internal audit schedule that is a gradual, phased approach over a period of time. An internal audit can focus on areas that require the most attention and can be dealt with on a priority and frequency scale over the course of the internal audit schedule.

By undertaking an internal audit process, operators will have an up-to-date understanding of their operation's position; the hidden unknowns will have been identified and resolved long before a formal external audit takes place. Best practices indicate that ongoing internal audits enable companies to operate consistently at peak performance, as risk management becomes the way of doing business. △

Understanding Altitude Deviations

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

Altitude deviations[1] are serious events which, if undetected, can lead to losses of separation and the potential for collision with both aircraft and terrain. Figure 1 shows the altitudes where deviations were reported through NAV CANADA's aviation occurrence reporting (AOR) system for the last two years for which complete data is available. The figure is broken down by altitude and shows, not surprisingly, that most altitude deviations take place in the lower altitudes, where aircraft are involved in making step climbs and descents.

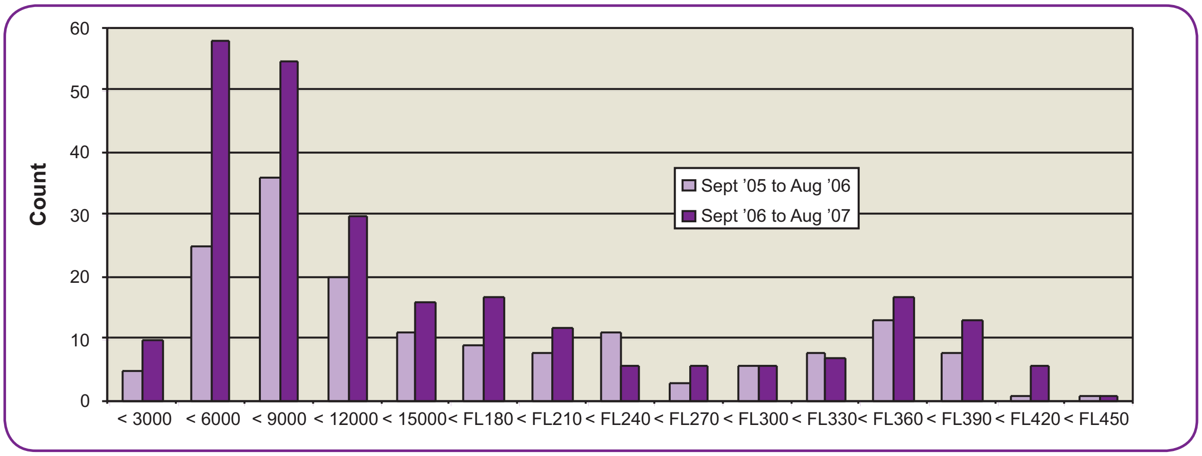


Figure 1

Figure 2 shows the number of altitude deviations reported over the last two years, broken down by flight information region (FIR), and demonstrates that this issue is pertinent across Canada.

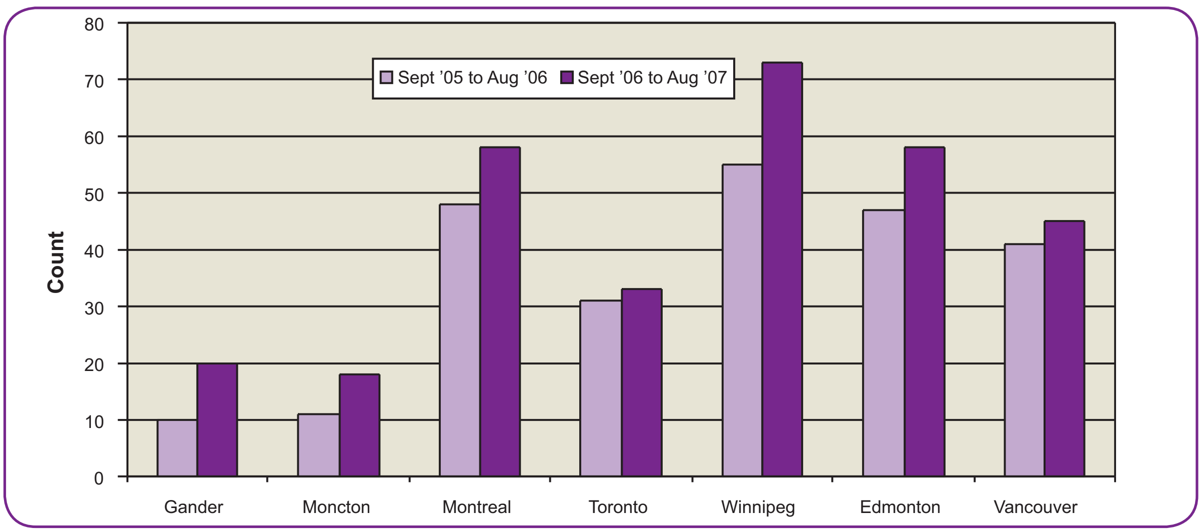


Figure 2

Pre-flight

These data were presented and discussed at NAV CANADA safety forums held recently in Toronto, Ont., and Vancouver, B.C. This initiative was described in a previous *Aviation Safety Letter* (ASL) article (issue 3/2007), and provides an opportunity for NAV CANADA to discuss specific safety issues with customers. The discussions led to a clear understanding that altitude deviations are a concern to both operators and NAV CANADA, and that decreasing the safety risk they represent will require an integrated approach. Some of the potential contributing factors leading to altitude deviations, which were discussed, include:

- The challenges of complying with late descent clearances in modern, highly-automated aircraft when the aircraft is relatively high and close to the airport;

[1] Altitude deviations include events where the aircraft deviated from an assigned or designated altitude. This may include deviations due to turbulence or other weather events. Flights may be conducted under instrument flight rules (IFR) or visual flight rules (VFR). For the purposes of this analysis, these do not include standard instrument departure (SID) deviations, as these are analyzed separately.

- The increased numbers of altitude clearances received when aircraft are vectored off the standard terminal arrival (STAR);
- The fact that most altitude clearances come in the terminal environment when the crew are in a period of high workload;
- The potential for communication problems in receiving altitude clearances (see related article in ASL 2/2008 on communication errors).

If you or your organization are interested in working with NAV CANADA to better understand and mitigate the problem of altitude deviations, please contact Ann Lindeis at lindeia@navcanada.ca or 613-563-7626. △

COPA Corner—Those Darn Charts: How Do We Update Them?

by John Quarterman, Manager, Member Assistance and Programs, Canadian Owners and Pilots Association (COPA)

As pilots, we are all aware from our flight training that we are required by regulation to equip ourselves with up-to-date charts, databases, the *Canada Flight Supplement* (CFS), weather information and NOTAMs before we take off. This requirement is stipulated in the following sections of the *Canadian Aviation Regulations* (CARs):

> **602.71** The pilot-in-command of an aircraft shall, before commencing a flight, be familiar with the available information that is appropriate to the intended flight.
>
> **602.72** The pilot-in-command of an aircraft shall, before commencing a flight, be familiar with the available weather information that is appropriate to the intended flight.

Most pilots are diligent and make a credible effort to achieve this standard on each flight. We obtain weather information and NOTAMs from the NAV CANADA Web site. We contact the flight information centre (FIC) for a last-minute update, then grab our flight bag full of the latest (or nearly latest) visual flight rules (VFR) navigation charts (VNCs) and recent CFS. We often include our VFR global positioning system (GPS), which most pilots update once a year. Then we go flying—usually with great success. Adding to the implicit safety factor is the fact that we normally fly locally, and local conditions are passed on throughout the pilot population by word-of-mouth, without necessarily referring to official sources. Pilots often receive informal reports about local aviation information, even critical NOTAMs, from other pilots. Of course, there is nothing wrong with passing on information to each other, provided we do not stop reading and updating the official sources of information that we are required to use.

So, we are safe…right? Of course, the local grapevine in the flying club or flight school that helps pilots stay informed may obscure the fact that a pilot has become somewhat lax about their sources of aviation information. We all know, or have heard of, pilots who carry a two-year-old CFS, or who fly with 1969 highway maps, or who use the Weather Network as their weather source. Fortunately, this does not always show up as a problem, as long as these individuals stick close to home; however, it can lead to disastrous circumstances when pilots travel far from their home base.

CANADIAN OWNERS AND PILOTS ASSOCIATION

The informal system that pilots sometimes get away with locally certainly breaks down as soon as pilots wander away from their familiar haunts, territory and airspace. Now the pilot has no word-of-mouth sources, and suddenly has to revert back to basics and use official sources. This requires a bit of understanding on how aeronautical charts are updated.

Since May 2003, NAV CANADA has been selling and distributing aeronautical publications. In March 2007, they became responsible for all aeronautical publications, including VFR charts, which had previously been published by Natural Resources Canada (NRCAN). VFR charts include aeronautical VNCs, aeronautical VFR terminal area charts (VTA) and world aeronautical charts (WAC). VTAs are published once a year and VNCs are revised on a one-year, two-year or five-year cycle. This means, for example, that a one-year chart revised in January can be expected to be revised again at approximately the same time the following year. The same applies to two- and five-year charts. WACs are on a similar cycle, but have not been updated in many years. NAV CANADA will begin updating them in 2008. All VFR charts include an edition number, the month and year that they are issued, and the effective date for airspace amendments. Changes to a VFR chart, after it has been published, are compiled throughout the year(s) for inclusion in the next edition (see below for more information). The current VFR chart list is available on NAV CANADA's Aeronautical Publication, Sales and Distribution Unit (AEROPUBS) Web site: www.navcanada.ca/NavCanada.asp?Language=EN&Content=ContentDefinitionFiles%5CPublications%5CAeronauticalInfoProducts%5CCharts%5CAeroCharts%5CListOfVFR.xml.

The last word—VFR chart updating data

Most pilots consider an up-to-date chart as the last word in aviation data, along with pertinent NOTAMs. Many do not know that this is not quite the last word. In fact, the CFS, which is issued every 56 days, has a section called Planning (Section C). If you look up the table of contents under the Planning section, you will find a heading called "VFR Chart Updating Data." In this subsection, the latest changes to VFR charts are listed by province. Under Ontario, for example, the heading "ONTARIO – DANGER, RESTRICTED & ADVISORY AREAS" might provide you with information such as:

> CYA532(A) Lake Simcoe – Time of Designation changed to Ocsl (*Occasional*) by NOTAM."

If a change is listed in the CFS, it means that the information on the (current) chart is out of date, and a notation and correction need to be made to the chart. Of course, the longer a chart circulates before it is replaced, the longer the potential list of corrections to the chart. Many of these changes may be critical to flight safety, such as a new antenna that creates an obstruction close to an airport. Normally, a NOTAM that lists a correction or addition to a chart is cancelled when the information is added to CFS Section C, so until a new chart is issued, the CFS is the only place where the information is available.

It is not appropriate for NOTAMs to communicate temporary changes that will be in effect for a long period (three months or longer) or information that is relevant for a short period, which contains extensive text or graphics. In these instances, the changes shall be published as *AIP Canada (ICAO)* supplements, which are available on the NAV CANADA Web site on Aeronautical Information Products.

What, then, is the correct approach to planning and flying VFR (even for local flights)?

Obtain, read and carry the latest CFS and the latest chart.

Familiarize yourself with corrections from CFS Section C and transcribe them onto the VNC chart.

Check and incorporate the following into your planning, before you decide to take off:

1. NOTAMs;
2. aviation information circulars and supplements (www.navcanada.ca/ContentDefinitionFiles/Publications/AeronauticalInfoProducts/AIP/Current/PDF/EN/part_5_aic/5aic_eng.pdf);
3. weather information.

With proper planning and the right information to plan with, every flight will be that much safer! Have a great flight. For more information on COPA, visit: www.copanational.org. △

Cabin Safety: Did You Know…

by Pascale Lachance, Program Manager, Cabin Safety Standards, Standards, Civil Aviation, Transport Canada

Travelling by plane for a ferry flight or to reach a holiday destination is probably commonplace for those of you who work in the field of aviation. Since travelling this way is a part of your life, it is natural that you feel very comfortable in an airplane, and you probably pay less attention to your surroundings, as well as the instructions and safety tips given by the flight crew. Although some of their instructions may not seem to matter much, especially after you've heard them so many times before—perhaps even told them to others—all information pertaining to safety on an aircraft is governed by regulations and must be stated upon each takeoff and landing, and whenever turbulence is encountered, etc. In addition, although the instructions may appear to be the same, they are actually different from one airplane to the next, since most aircraft are different. For instance, you will find variances in the location of emergency exits, as well as the safety features card and the life jackets used.

Did you know that the law requires that passengers obey the instructions given throughout a flight? It's true. It is your responsibility, as a passenger, to pay attention to the standard safety briefing given by the flight attendants and to follow their instructions, otherwise you could be held accountable in a court of law, just like any other passenger.

Checked luggage and carry-on baggage

When it comes to packing a suitcase, most people like to have the same personal items that they are used to, whenever they travel. This can make packing an arduous task. Also, with the new security rules in effect, at times you may feel totally lost when it comes to choosing which items to include in carry-on baggage and which ones to stow in checked baggage. Take care not to include any non-permitted items in your carry-on baggage, so that you are not delayed when going through security. Some items are permitted when they are carried by a working member of the flight crew, but not permitted when flight crew members travel as passengers.

Did you know that some products that we use regularly are considered to be dangerous goods when carried on board an aircraft? Did you know that matches are not permitted in carry-on baggage?

Photo: CATSA

Pre-boarding security screening goes smoothly for educated and prepared passengers.

Did you know that different types of aircraft have different size and weight limitations for carry-on baggage? It is therefore important to check with your airline to determine their carry-on baggage allowances, since they may be different from what you are used to.

Travelling with children

Travelling with young children can present additional challenges. Although restraint systems are not mandatory for children under two, and infants may be held in an adult's arms, it is strongly recommended that you use an approved child restraint system on board an aircraft. These devices are much safer than simply holding the child in your arms. It is recommended that child restraint systems be used upon takeoff and landing, whenever turbulence is encountered, and whenever the "fasten seatbelts" light is turned on.

Did you know that child restraint systems purchased abroad, with the exception of the United States, are not approved in Canada and cannot be used on board Canadian aircraft? Only child restraint systems made in Canada, that meet *Canadian Motor Vehicle Safety Standards* (CMVSS) 213 or 213.1 are accepted for use on board an aircraft. A statement of compliance label must be affixed to the restraint system, indicating that the device complies with CMVSS 213 or 213.1 and may be used on board an aircraft.

Some child restraint devices made in the United States are also accepted on board aircraft if they meet certain criteria. However, it is important to note that child restraint systems made in the United States are not approved for use in Canadian automobiles. In either case, it is important to double-check that the proper label is affixed to the child restraint system.

Note also that CARES™ child aviation restraint system is now accepted on aircraft through a global exemption. Since airlines have a choice of whether or not to take advantage of this exemption, it is a good idea to check with your airline to find out if they accept the restraint system. You will find more information on the CARES™ child restraint system by visiting the appropriate link below.

Disorderly conduct

All passengers and crew members have the right to fly in a safe and secure environment. Disorderly conduct such as harassment, intimidation, verbal or physical abuse, refusal to comply with flight crew instructions, and consumption of personal alcoholic beverages, are all examples of behaviour that is not tolerated on an aircraft. Passengers displaying such behaviour are liable to a fine or imprisonment under the *Criminal Code of Canada* and the *Aeronautics Act*.

Indeed, if any of these behaviours are observed on an aircraft, the flight crew may decide to divert the aircraft, if deemed necessary, and the person(s) involved may be arrested, detained and tried when the aircraft lands, or once they have returned to their point of origin. A new regulation on unruly passengers and interference with a crew member was published in May 2007 in the *Canada Gazette*, Part I.

Your health is very important and small gestures or changes in habits can make your trip much more enjoyable. Did you know that alcohol, tea and coffee are diuretic beverages that actually have a dehydrating effect on you? The air circulating in an aircraft is very dry. It is therefore vital that you drink plenty of water or juice. Also, as a passenger, you are much more sedentary than you would be if you were working as a flight attendant. It is therefore important that you try to exercise a bit on the plane, especially during long flights. This also applies to the flight crew members working in the cockpit. You can easily do exercises in your seat without having to get up and move around. Simple movements like rotating your ankles, head and shoulders will improve your circulation and prevent problems such as deep vein thrombosis (DVT).

Listed below are several links where you will find detailed information on the topics discussed above, which might prove very useful for your next trip. Have a good flight!

Transport Canada's Cabin Safety Standards Web site:
www.tc.gc.ca/CivilAviation/commerce/CabinSafety/menu.htm

Passenger T.I.P.S. (Travelling In Planes Safely) and FAQ:
www.tc.gc.ca/CivilAviation/commerce/CabinSafety/tips/menu.htm#tips

Tips for Travellers—Air:
www.tc.gc.ca/aboutus/travel/travellerinfo.htm#air

Canadian Transportation Agency (CTA):
www.cta.gc.ca/air-aerien/index_e.html

Canadian Air Transport Security Authority (CATSA)
www.catsa-acsta.gc.ca/english/

Info on dangerous goods in carry-on or checked baggage:
www.tc.gc.ca/CivilAviation/commerce/DangerousGoods/RegOverview/PassLugg/menu.htm

Permitted and Non-Permitted Items:
www.catsa.ca/english/travel_voyage/list.shtml

Flying with children links:
www.tc.gc.ca/CivilAviation/commerce/circulars/AC0177.htm;
www.kidsflysafe.com

New regulations on unruly passengers and interference with crew members:
http://canadagazette.gc.ca/partI/2007/20070519/html/regle2-e.html;
www.tc.gc.ca/mediaroom/releases/nat/2002/02_gc001e.htm △

Aviation Document Booklet

by the Flight Crew Licensing Division, General Aviation, Civil Aviation, Transport Canada

This is a follow-up to the article "Transport Canada Update—Personnel Licence Booklet," published in Aviation Safety Letter *(ASL) 1/2007.*

It's here!

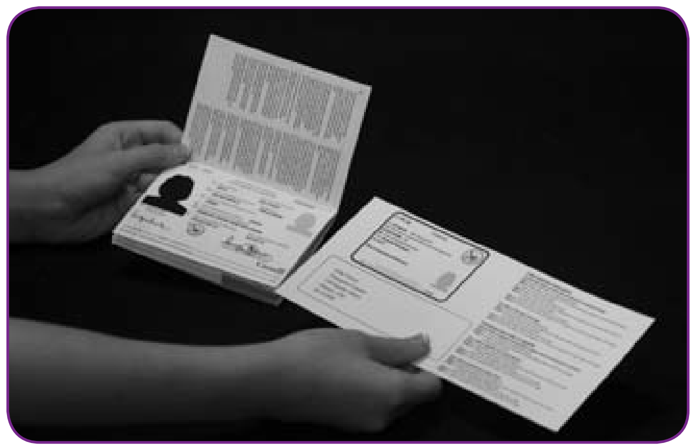
Transport Canada Civil Aviation is proud to present the new Aviation Document Booklet for all holders of Canadian air traffic controller licences and flight crew licences and permits.

The new Aviation Document Booklet will now incorporate a photograph of the holder, machine-readable security features and the International Civil Aviation Organization's (ICAO) language proficiency requirement. During the life of the booklet, the status of individual licences, permits, ratings and medical certificates is likely to change. Adhesive labels, similar to the stickers provided by many provinces for motor vehicle licence plate renewals, will be provided to reflect changes in licensing status. These labels must be affixed to the booklet in order for the licence or permit to be valid.

Transport Canada has begun replacing existing licences and permits with the new Aviation Document Booklet. The first documents to be replaced are those with the greatest potential for international use. Transport Canada has already started issuing new booklets to holders of airline transport pilot licences (ATPL) and commercial pilot licences (CPL) who have submitted the required application.

Moving towards the new booklet

Eventually, all holders of Canadian air traffic controller licences and flight crew licences and permits will receive the Aviation Document Booklet. Transport Canada licensing offices will continue to administer all licensing action for flight crew and air traffic controllers.



All new applicants for licences and permits will be issued an Aviation Document Booklet.

Replacement of existing licences and permits in the current format will be phased in over a three-year period. A schedule for replacing existing documents with the new Aviation Document Booklet can be found in Advisory Circular (AC) **400-001**, which is available on the Transport Canada Flight Crew Licensing Web site listed below.

Replacement of ATPLs and CPLs with the Aviation Document Booklet format will be completed by early 2009. Private pilot, air traffic controller, and flight engineer licences will be replaced through 2009. The remaining pilot licences (glider and balloon) and all permits will be replaced by the end of 2010.

Please visit the Transport Canada Flight Crew Licensing Web site for more information:
www.tc.gc.ca/civilaviation/general/personnel/changes.htm. △

Houston, Transport Canada Is on the Line...

by Denis Brunelle and Sarah Jardine, Civil Aviation Contingency Operations, National Operations, Civil Aviation, Transport Canada

The National Aeronautics and Space Administration (NASA) began flying its current space shuttles in April 1981. Having flown only 120 times, some would still consider the orbiter to be an experimental vehicle. Safety is of paramount concern to those involved in the space program, where every item is checked with painstaking care to ensure the success of each mission. Procedures and backups are put in place to help the crew and give them options in the event of an emergency.

Apart from the highly acclaimed "Canadarm," Canadian astronauts participate in various shuttle missions; but Canada also participates in another important role: providing a suitable, safe landing site in case of an emergency. Personnel from Transport Canada's Civil Aviation Contingency Operations (CACO), a division of the National Operations Branch in Ottawa, Ont., participate in all space shuttle launches to the International Space Station, and remain on standby until the shuttle is in orbit.

Transport Canada has been involved in the space program since 1995, when NASA formally requested the use of selected airports along the Canadian east coast in the event of an aborted shuttle launch, because the shuttle's trajectory runs along the east coast of Canada. Today, because of their strategic locations and available facilities, Gander, N.L., St. John's, N.L., Stephenville, N.L., Goose Bay, N.L., Halifax, N.S., and, on occasion, Greenwood, N.S., airports are the designated sites. Additionally, the Halifax joint rescue co-ordination centre (JRCC) provides search and rescue capability in the event the astronauts have to bail out over the Atlantic Ocean. Transport Canada, in conjunction with NASA, the Canadian Department of National Defence (DND) and NAV CANADA, has developed and tested the procedures that would be used if a shuttle was forced to land at one of these sites.

CACO acts as the Canadian co-ordination facility during a launch. Two hours prior to lift-off, using pre-determined criteria, CACO officers begin their detailed operational assessment on the suitability of each of the designated Canadian landing sites, and report their status to NASA. CACO initiates a communication link with the designated airports, NAV CANADA, Halifax JRCC, the Canadian Space Agency and the Government Operations Centre. Live communication is then established with mission control at the Johnson Space Centre (JSC) in Houston, Tex., approximately 30 min before lift-off, and remains operational until the window for an east coast abort landing (ECAL) has passed.

The window of exposure for an ECAL implicating the Canadian east coast landing sites comes during an 80-s timeframe, approximately 6 to 8 min after takeoff. Should a problem develop, a quick decision would have to be made to select the most suitable airport, based on weather and operational conditions. If the shuttle were unable to land at one of the airports, the crew would have to bail out into the Atlantic Ocean, triggering a rescue response from Halifax JRCC.

Within 8 to 10 hr of an emergency landing, NASA would deploy their rapid response team from the Kennedy Space Centre (KSC) and their crew recovery team from the JSC to begin recovery operations. In addition to the safing and reconfiguration of the shuttle for transportation back to the KSC in Florida, the extensive recovery process involves diplomatic co-ordination and co-operation between various Canadian and U.S. government departments and agencies, as well as the airport and local community.

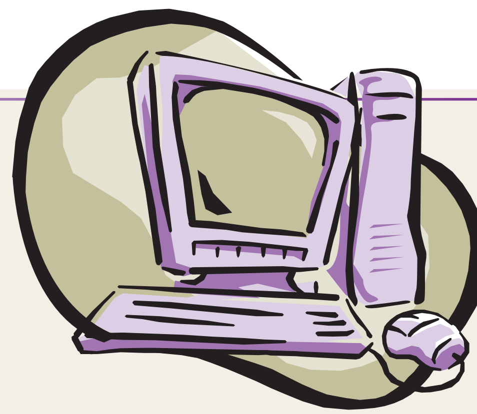
In total, recovery operations would take some 400 NASA personnel up to 40 days—requiring approximately 19 flights utilizing C5 and C17 aircraft. Finally, the shuttle would be loaded onto NASA's Boeing 747 and flown back to KSC in Florida.

The airport authorities are keenly aware of the important role they play in providing support to the NASA program, and have developed contingency plans for an ECAL. Recently, representatives from NASA and Transport Canada visited each Canadian site, provided an updated technical briefing on shuttle hazards for their emergency response and management personnel, and presented them with a commemorative montage, which included a Canadian flag that was previously flown in space. During the presentation, Marty Linde, Landing Support Officer, JSC, indicated the montage was a small token of appreciation from everyone at NASA, in particular the astronauts, who felt more comfortable knowing that should a problem occur they have options to land in Canada rather than having to bail out.

By the end of 2007, Transport Canada and the Canadian airports had supported 33 launches. The shuttle program is scheduled to end in 2010. Until that time, CACO will continue to play a role in each launch, as part of the international effort to explore space—an extraordinary achievement that, due to all the activity behind the scenes, almost seems routine. △

Keith Collins, President and CEO of the St. John's International Airport (centre), having received a commemorative montage from Dennis Gagen, Director Ground Operations, Kennedy Space Centre (left) and Marty Linde, Landing Support Officer, Johnson Space Centre (right).

General Aviation On-Line Services



The General Aviation Branch now offers a variety of services on-line. To access the General Aviation On-Line Services site, you must have a Government of Canada epass account. Click on www.tc.gc.ca/GeneralAviationServices, and it will direct you to the epass sign-in page.

If you already have an epass account for other government services, simply sign in to that account and you will be re-directed to the General Aviation On-Line Services site. If you do not have an epass account, you will be directed to the epass page where you can obtain an epass user ID and password. Epass will then re-direct you to the General Aviation On-Line Services site.

When you enter the General Aviation site for the first time, you must submit a new user request to obtain an activation key that will allow access to your records. This activation key will be mailed to you at the address on file with Transport Canada. Once you receive your activation key, you can sign-in, enter the activation key and access your records.

Registered aircraft owners will be able to:

- view marks, registrations, and leasing activities;
- reserve registration marks;
- renew a mark reservation;
- submit a notification of a change of ownership;
- change their address; and
- submit a Leasing Advisory (LF-5).

Holders of flight crew licences and permits will be able to:

- view flight crew licensing information (including the status of their new language proficiency assessment);
- change their address; and
- access licensing application forms. △

New! Fatigue Risk Management System Toolbox!

Take a few minutes to explore the Fatigue Risk Management System (FRMS) toolbox for Canadian aviation at: www.tc.gc.ca/civilaviation/SMS/frms/menu.htm.

See, Hear, Comply and Avoid—Maintaining Separation at Uncontrolled Aerodromes

by Mike Paddon, Civil Aviation Safety Inspector, System Safety, Atlantic Region, Civil Aviation, Transport Canada

A search of the aviation investigation reports published by the Transportation Safety Board of Canada (TSB) indicates that there have been several instances of in-flight collision and risk of collision in Canada in recent years. The consequence of aircraft occupying the same location in time and space rarely yields results that are less than tragic. Many in the aviation community may harbour vivid recollections of close encounters with other aircraft in otherwise unremarkable or outright benign circumstances.

The range of potential scenarios is extensive and, on occasion, the occurrence venue is airspace in close proximity to uncontrolled aerodromes. There are recorded instances of aircraft departing from or arriving at uncontrolled aerodromes under VFR, or under IFR in visual meteorological conditions (VMC), and unexpectedly finding themselves in close quarters with other traffic. Aircraft in the VFR traffic circuit have been known to conflict with one another even when operating with the benefit of air traffic services (ATS). Fixed-wing and rotary-wing traffic operating in relatively remote settings have historically found themselves in close quarters, both in the field and at nearby community aerodromes typically served by aerodrome traffic frequency (ATF) communication procedures. Examples of periods of heightened activity in terms of traffic volume would include major forest fire fighting efforts and the initial stages of natural resource development projects.

The predominant failing that arises in the vast majority of in-flight collisions is the failure to ***see and be seen*** as well as ***hear and be heard*** (i.e. avoid). So, what can be done to alleviate or mitigate the risk of collision? Does the answer lie in maintaining vigilance in our visual scanning, being alert to rapid and unacceptable loss of separation, and reacting well in advance of a deteriorating traffic situation; or in adherence to established regulations and procedures and communicating with other aircraft that we share airspace with? The answer likely rests in a combination of each of these defences.

In general, pilots will agree that visually detecting other aircraft can sometimes be very difficult. Most cockpits present challenges to effective visual scanning and the ability to search for and detect other aircraft. Impediments to the process include vision-obstructing struts, posts, doorframes, glareshields, and perhaps a fellow pilot or passenger. In addition, dirty, fogged, scratched and bug-splattered windshields, as well as flight in reduced visibility due to weather, or other obscuring phenomena such as smoke, can further complicate the task, as can vibration, fatigue and workload. Increased attention to cockpit automation and instrumentation can take away from time spent scanning the surrounding airspace for threats to safe separation. Accessibility of sunglasses to combat glare and choice of headgear are also part of the equation. A peaked ball cap may shade the eyes, but it might also restrict peripheral vision in the vertical plane; a factor of particular relevance when operating aircraft that, by virtue of cockpit design, would otherwise provide for enhanced peripheral vision in the vertical axis. Even detection of aircraft in a clear sky can be hindered by what is known as "empty-field myopia." Shari Stamford Krause, PhD[1], herself a pilot, describes this as a condition whereby, in the absence of a visual stimulus (for example, empty space), the muscles in the eye relax, preventing the eye from focusing. This creates a problem for a pilot who is attempting to scan for traffic in a clear, featureless sky. Because the eye cannot focus on empty space, it remains in a state of unfocused, or blurred, vision.

Maintaining vigilance in our visual scanning is critical to the see and be seen (or see and avoid) concept.

In an unrelated but pertinent study conducted by the Lincoln Laboratory[2] during traffic alert and collision avoidance system (TCAS) flight testing, data showed that a pilot alerted to the presence of other aircraft visually acquired the other aircraft in 57 of 66 cases; the median range of visual acquisition was 1.7 NM. In cases where the pilot was not alerted to the presence of the other aircraft, visual acquisition of the other aircraft was achieved in only 36 of 64 encounters. In the successful encounters, the median acquisition range dropped to 0.99 NM. These studies showed that verbal guidance as to where to look increased the acquisition probability for the pilots, and found that a pilot who had been alerted to the presence of another aircraft was eight times more likely to see the aircraft than the pilot who had not been alerted. The test aircraft involved in the study were light twin-engine aeroplanes. Radio advisory calls, TCAS, if fitted, and strobe/landing lights are all means of communicating an aircraft's position to other traffic.

As pilots, we have a responsibility to read and know the *Canadian Aviation Regulations* (CARs). Procedures in place for effectively maintaining separation around uncontrolled aerodromes can be found in the Transport Canada *Aeronautical Information Manual* (TC AIM). This publication is available in print and on-line at: www.tc.gc.ca/CivilAviation/publications/tp14371/menu.htm. The published procedures are, in fact, regulations and adherence is required. Traffic that complies with the prescribed procedures will have the expectation that other aircraft are acting in a similar manner. It should be noted that the *Aeronautics Act* defines an **aerodrome** as:

"A pilot alerted to the presence of other aircraft visually acquired the other aircraft in 57 of 66 cases."

Any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith.

CAR 602.19(10) states that:

No person shall conduct or attempt to conduct a take-off or landing in an aircraft until there is no apparent risk of collision with any aircraft, person, vessel, vehicle or structure in the take-off or landing path.

Mandatory frequency (MF) vs. aerodrome traffic frequency (ATF)…What's the difference?

The following extract is taken from the RAC section of the TC AIM and is summarized for easy reference in the General section of the *Canada Flight Supplement* (CFS) under the Communications (COMM) sub-section.

Note: Although lengthy in content, it is considered to be in the interests of aviation safety to reproduce the pertinent references.

4.5.4 Mandatory Frequency

Transport Canada has designated [an MF] for use at selected uncontrolled aerodromes, or aerodromes that are uncontrolled between certain hours. Aircraft operating within the area in which the MF is applicable (MF area), on the ground or in the air, shall be equipped with a functioning radio capable of maintaining two-way communication. Reporting procedures shall be followed, as specified in CARs 602.97 to 602.103 inclusive.

An MF area will be established at an aerodrome if the traffic volume and mix of aircraft traffic at that aerodrome is such that there would be a safety benefit derived from implementing MF procedures. There may or may not be a ground station in operation at the aerodrome for which the MF area has been established. When a ground station is in operation, for example, an FSS [flight service station], an RCO [remote communications outlet] through which RAAS [remote aerodrome advisory service] is provided, a CARS [community aerodrome radio station], or an approach UNICOM, then all aircraft reports that are required for operating within, and prior to entering an MF area, shall be directed to the ground station. However, when the ground station is not in operation, then all aircraft reports that are required for operating within and prior to entering an MF area shall be broadcast. The MF will normally be the frequency of the ground station which provides the air traffic advisory services for the aerodrome.…

4.5.5 Aerodrome Traffic Frequency

An [ATF] is normally designated for active uncontrolled aerodromes that do not meet the criteria listed in RAC 4.5.4 for an MF. The ATF is established to ensure that all radio-equipped aircraft operating on the ground or within the area are listening on a common frequency and following common reporting procedures. The ATF will normally be the frequency of the UNICOM where one exists or 123.2 MHz where a UNICOM does not exist.…The designation of an ATF is not limited to aerodromes only. An ATF may also be designated for use in certain areas other than the area immediately surrounding an aerodrome, where VFR traffic activity is high, and there is a safety benefit to ensuring that all traffic monitor the same frequency. For example, an ATF area could be established along a frequently flown corridor between two uncontrolled aerodromes.…

4.5.7 VFR Communication Procedures at Uncontrolled Aerodromes with MF and ATF Areas

(a) Radio-equipped Aircraft: The following reporting procedures shall be followed by the pilot-in-command of radio-equipped aircraft at uncontrolled aerodromes within an MF area and should also be followed by the pilot-in-command at aerodromes with an ATF:

(i) Listening Watch and Local Flying [CAR 602.97(2)] Maintain a listening watch on the mandatory frequency specified for use in the MF area. This should apply to ATF areas as well.

(ii) Before Entering Manoeuvring Area (CAR 602.99) Report the pilot-in-command's intentions before entering the manoeuvring area.

(iii) Departure (CAR 602.100)

(A) Before moving onto the take-off surface, report the pilot-in-command's departure intentions on the MF or ATF frequency. If a delay is encountered, broadcast intentions and expected length of delay, then rebroadcast departure intentions prior to moving onto the take-off surface;
(B) Before takeoff, ascertain by radio on the MF or ATF frequency and by visual observation that there is no likelihood of collision with another aircraft or a vehicle during takeoff; and,
(C) After takeoff, report departing from the aerodrome traffic circuit, and maintain a listening watch on the MF or ATF frequency until clear of the area.

(iv) Arrival (CAR 602.101)

(A) Report before entering the MF area and, where circumstances permit, shall do so at least five minutes before entering the area, giving the aircraft's position, altitude and estimated time of landing and the pilot-in-command's arrival procedure intentions;
(B) Report when joining the aerodrome traffic circuit, giving the aircraft's position in the circuit;
(C) Report when on downwind leg, if applicable;
(D) Report when on final approach; and,
(E) Report when clear of the surface on which the aircraft has landed.

(v) Continuous Circuits (CAR 602.102)

(A) Report when joining the downwind leg of the circuit;
(B) Report when on final approach; stating the pilot-in-command's intentions; and,
(C) Report when clear of the surface on which the aircraft has landed.

(vi) Flying Through an MF Area (CAR 602.103)

(A) Report before entering the MF or ATF area and, where circumstances permit, shall do so at least five minutes before entering the area, giving the aircraft's position and altitude and the pilot-in-command's intentions; and,
(B) Report when clear of the MF or ATF area.

NOTE: In the interest of minimizing possible conflict with local traffic and minimizing radio congestion on the MF or ATF, pilots of en-route VFR aircraft should avoid passing through MF or ATF areas.

(b) NORDO: NORDO [no radio] aircraft will only be included as traffic to other aircraft and ground traffic as follows:

(i) Arrival: from five minutes before the ETA [estimated time of arrival] until ten minutes after the ETA, and
(ii) Departure: from just prior to the aircraft departing until ten minutes after the departure, or until the aircraft is observed/reported clear of the MF area.

Carrying and referring to updated charts and a current copy of the CFS will help to ensure that correct frequencies for flight in the vicinity of uncontrolled aerodromes are selected on the aircraft radio. Relying on memory to recall MFs and ATFs for specific uncontrolled aerodromes can be problematic, especially at times of increased workload, and in light of the fact that frequencies may be subject to change. Global positioning system (GPS) data cards can provide a great deal of information at the push of a button, but that information can be a contributing factor to disaster if it is not accurate, hence the need for a current data card.

In conclusion, it is perhaps realistic to note that operational and self-imposed pressures to meet timelines and objectives can sometimes influence and cloud our perception of the airspace environment around us and how we fit into it. Risk factors associated with flight in the vicinity of uncontrolled aerodromes can be greatly reduced with the application of acute visual and aural awareness combined with familiarity with, and adherence to, the established rules and procedures. Used in conjunction with timely position reports and the communication of intentions between aircraft, these defences build and reinforce situational awareness and, ultimately, serve to assist aircraft in their avoidance of one another. △

References:
1. *Shari Stamford Krause, PhD,* Flight Safety Digest, *May 1997.*
2. *J.W. Andrews, "Modeling of Air-to-Air Visual Acquisition,"* The Lincoln Laboratory Journal, *Volume 2, Number 3, 1989, p.478.*

Back to Basics: Weight and Balance

by Jay Wischkaemper

This article is an authorized reprint from the November/December 2001 issue of Southwest Aviator Magazine. *This and many other excellent safety articles can be found on their Web site at* www.swaviator.com.

It's confession time. Let's see the hands of everyone who will not leave the ground without doing a proper weight and balance. About one in 20? That's about what I thought. Now, let's see the hands of everyone who has ever seen another pilot perform a weight and balance before the flight. Let's see. One out of 300. That's about right. Now, let's see the hands of all those who would be dead if someone put a gun to their head and said they were going to shoot them if they couldn't show them the proper way to do a weight and balance. About four out of five of you should admit to that one.

While it may be covered under that ubiquitous [U.S. *Federal Aviation Regulation* (FAR)] concerning doing everything to make sure the flight can be conducted safely, it's safe to conclude that weight and balance is one of the most overlooked aspects of flying. There are some who might pay more attention to it than others. I understand that pilots of V-Tail Doctor Killers had better pay attention. I've also read that pilots of 182s and Cherokee-Sixes don't need to be as concerned. But let's face it. You can load any airplane wrong and it will crash. Seems like the pilots of a 707 learned that in Miami, Fla., a few years ago.

Shortly after Dr. Tim Williams became a partner in our Bellanca, he called me and said, "I've been doing a weight and balance on this plane, and it appears that if you have four people on board and full fuel, you'll be beyond the aft [centre of gravity (CG)]. Is that right?" "Beats me," I told him, "I've never done one. What I do know is that I've had four big folks on board with full fuel and it flew." And it did. I've done it several times with no clue as to what the charts would show. I don't think we were too far off, but I didn't know for sure on the [CG]. Addition and subtraction are easy enough, so I was pretty sure on the weight, but balance? That's another matter. The guy we bought the plane from told me it would be ok, and I believed him.

One of the problems with doing a weight and balance is that the things are so complicated. Moment and arm and datum. What is all this stuff? If somebody would just simplify the process. You say something like, "If Bubba is the pilot, and he weights 250, and Charlie is in the right seat, and he weighs 220, and if Martha and Myrtle are in the back seat, and they weigh 375 together, and you have 100 pounds of luggage, and you try to fly that bugger, you better make sure your will is current, because you're about to use it." That language I can understand. It makes much more of an impact than all those charts and graphs and lines. With all the computer technology that's out there, you'd think that at least the manufacturers of new airplanes would come up with an automated system. They could put an electronic scale in each seat. Same with the luggage. Fuel sensors detect how much fuel is on board and where. Everything is calculated by a computer, which plays "Lord, I'm Coming Home" if the airplane won't fly. That should get people's attention.

It's probably a good thing that I took my check ride with old Earl Sharp in a Cessna 150. It's good because Earl wasn't too strict anyway, and it's also good because there's not a lot of [CG] questions you can ask about weight and balance on a 150. Seems to me like he asked something about whether or not I had checked the weight, but at

If you get the feeling that your aircraft is near or above its weight and balance limits, you are probably right.

least the question about how much weight we could put in the back seat was moot, and he didn't ask about luggage. Gratefully, he also didn't ask me to do a weight and balance problem for him. If he had, I'd probably still be a student pilot.

Now don't get me wrong. I have done a weight and balance. About a year and a half ago, Robin, John and I were going to Houston, Tex. Robin was kind of short on experience and confidence in the plane, so he invited along some company. Robin was flying, because he was paying for the gas, or rather one of his clients was. John was riding front seat to keep us all safe from Robin, and I was relegated to the back. Sitting there, I noticed the operations manual in the seat back in front of me, and since it had been a while since I had perused it in detail, I decided to do so. I came across the section on weight and balance, and decided to try to do one. Pulling out my trusty pocket calculator, I plugged in the numbers, only to find out that when we took off, we were 100 pounds over gross, and a couple of inches past the aft [CG], assuming I knew what I was doing, which might be questionable. I didn't bother Robin with my newfound knowledge. It would have just depressed him.

That's not to say that I've never had [CG] concerns. About a year ago, my daughter and two of her friends went on a "road trip" to Waco, Tex. On the way back, in the little town of Clifton, Tex., a little old lady on her way to church ran a stop sign and hit them. Nobody was hurt, but that car wasn't driving home. Clifton is about six hours from Lubbock, Tex., so for someone to drive to get them would have been a long adventure. The obvious solution was for me to fly down.

Since it was a Sunday, I knew that the probability of fuel being available in a town like Clifton was iffy at best. Even if it hadn't been a Sunday, it would have been iffy. Accordingly, I topped off every tank before I left. I climbed out on the left, burned the 15-gal. [auxiliary] tank for one hour, which should have almost burned it dry, and landed on the right.

There are a couple rules of flying etiquette that need to be mentioned here. Rule number one is that when daddy is the pilot, you always get to ride shotgun. Rule number two is that you never ask a big woman to do anything that would reveal that you noticed how big she is, at least not if you value your health.

There are times in life when you can't win. You see, Susan is a big girl. She's not fat. She's just big. Put another 30 pounds on her and she can play middle linebacker. I had this gut feeling that Susan should be up front with me, but she dutifully climbed in the back where any passenger who isn't related to the pilot is supposed to be. Trying to justify taking off with her there, I reasoned that Lisa and Sara were about the same weight, and that hopefully I weighed about the same as Susan, or at least close. That should balance, I thought. The [auxiliary] tank, which sits under the rear seat, was empty. They hadn't taken a lot of luggage with them. We should be ok.

Having flown the plane with weight in the back before, I was expecting the plane to fly differently. I had a little extra nose down trim cranked in. The pull on the yoke to make it fly would be a lot less. I was ready.

Liftoff was smooth and the plane flew normally. I had told myself that if anything at all didn't feel right, I was setting it back down, but everything was fine. The climb was slow due to the load and the 90°F temperature, but otherwise normal. The fun began when I started to trim the nose down to level off. The trim tab, which is on the top of the cabin in a Bellanca, stopped turning after a couple of turns. My immediate thought was that the trim mechanism had jammed, but when I looked up at the ceiling, I noticed the problem was something quite different. The trim tab was at its full nose down stop. There was nothing wrong with the trim. I had just run out of it.

I pushed forward on the yoke, and the nose came down and stayed down. Everything was still under control, and the closer we got to home, the more normal the trim became.

I had flown the plane before with four big people on board, but never with two little people and two big people. My assumption that everything would be the same wasn't true. Everything turned out ok, but it could have been a recipe for disaster.

So, have I started doing a weight and balance before every takeoff? Of course not. Most of the time, I'm the only person on board, and it hardly seems necessary. Even with two on board, I'm not sure I would learn a lot. But the next time I have four on board? Well, I might be more prone to dusting off that old book and seeing if I can figure out some of those graphs. △

"Did you know?" The arrival of civil aircraft flying VFR from the United States without search and rescue (SAR) being activated is a concern. Differences between Canada and the United States can lead pilots to believe their flight plans have been opened. These differences are highlighted in the article "Flight Planning Issues," published in *Aviation Safety Letter* (ASL) 2/2007. One of the differences discussed in the article is that after filing a flight plan in the United States, you need to activate it with an American flight service station (AFSS). The article can be found on-line, at www.tc.gc.ca/CivilAviation/publications/tp185/2-07/Operations.htm#Flight…it's worth reading!

MAINTENANCE AND CERTIFICATION

New Manufacturing Regulations

by Brian Whitehead, Chief, Policy Development, Standards, Civil Aviation, Transport Canada

On December 1, 2007, the new *Canadian Aviation Regulations* (CAR) 561 came into effect. This is a major milestone in the introduction of the CARs and one of the final stages in the replacement of the old *Airworthiness Manual* with the new CARs. The new requirements are very similar to those of the earlier *Airworthiness Manual* but, being regulations, they are more formal in structure, and unlike the *Airworthiness Manual*, are directly enforceable. Many of the sections have been identified as designated provisions, with maximum penalties established for both individuals and corporations.

Along with the introduction of CAR 561 itself, there was an associated standard (STD 561) and changes in Part I of the CARs to enable the application of safety management systems (SMS) to manufacturers. Changes to the definitions of "maintenance" and "manufacture" should eliminate any conflict between the application of CARs 561 and 571. Essentially, CAR 561 will apply to any work performed on an aircraft prior to the first issuance of a standard certificate of airworthiness or export airworthiness certificate. Following the issuance of either of those certificates, CAR 571 will apply. For example, the making of a repair part under CAR 571.06(4) will be exempt from any of the provisions of CAR 561.

The privilege of a manufacturer certificate is not actually to manufacture aeronautical products—anyone may do that—but rather, to authorize the issuance of a statement of conformity attesting that the products conform to approved data, and are in condition for safe operation. CAR 571, in turn, prohibits the installation of parts (other than commercial or standard parts, and parts made during the course of a repair) unless they have been certified with such a statement. The statement in question usually takes the form of the familiar *Authorized Release Certificate* (form 24-0078, soon to be retitled *Form One*). The repair parts mentioned above may not be released on a *Form One*, but instead are certified by means of the maintenance release covering the repair for which they were created.

The new regulations follow the same general format as the approved maintenance organization (AMO) requirements of CAR 573. They provide for separate production control and quality audit systems, and include requirements for training and record keeping. Issuance of a manufacturer certificate is directly tied to the applicable aeronautical product type certificate. Applicants must either hold the type certificate personally, or have entered into a licensing agreement with the holder. A limited approval may be granted if the type certificate has not yet been issued, or where the licensing agreement is still being negotiated; however, in such cases, the finished products may not be released until the type certificate provisions have been fully met.

The regulations specify a manufacturer's responsibility for the control of suppliers, and make a clear distinction between the oversight of suppliers who are approved in their own right, and suppliers who work under the umbrella of the prime manufacturer. This should facilitate the control of "direct delivery", which may only be authorized in conjunction with a release certificate.

Manufacturer facilities may be located in a foreign state, subject to the agreement of the foreign authority, but the applicant must undertake the responsibility to allow Transport Canada inspectors access to the foreign facilities, and pay for the expenses incurred.

The manufacturer's means of compliance with the various requirements must be set out in a manual that is signed by the accountable executive and approved by the Minister.

Unlike the introduction of some previous CARs, such as those relating to air operators and AMOs, there will be no grace period enabled by exemption. When earlier chapters were incorporated into the CARs, the new requirements were published as soon as they were available, and a general exemption was issued to enable certificate holders to transition to full compliance over a period of time, in accordance with a predetermined implementation program. In this instance, the process has been reversed. Existing approval holders were notified of the new requirements some two years in advance of the effective date, and they must be in full compliance with them on that date.

With the introduction of CAR 561, the implementation of airworthiness-related CARs is almost complete. The final major piece of the puzzle will be CAR 563, applying to distributors of aeronautical products. That chapter is expected to be incorporated into the CARs later in 2008. △

Icing in Fuel Injection System Distribution Manifolds

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

On November 30, 2007, an Aero Commander 500B departed from Dryden, Ont., en route to Geraldton, Ont., with a crew of two and one passenger. Approximately 40 min after departure, the crew observed an abnormal right engine fuel flow indication. Shortly thereafter, the right engine's RPM and fuel flow began to decrease. The crew diverted towards Armstrong, Ont. A short time later, the left engine RPM and fuel flow began to decrease and the aircraft could no longer maintain level flight. The crew made a forced landing into a marshy wooded area 20 NM southwest of Armstrong. The captain sustained serious injuries and the co-pilot and passenger sustained minor injuries. The aircraft sustained substantial damage. The investigation into this occurrence (TSB File A07C0225) is ongoing.

An examination of the Lycoming I0-540-B1A5 engines determined that there was a blockage in the fuel supply to both engines. The left engine had a partial blockage with no fuel supply to the forward cylinder nozzles; the right engine had a complete blockage with no fuel supply to any of the cylinder nozzles. The blockage was determined to be within the fuel distributor valve(s) because fuel pressure was present upstream of the valves. The right engine fuel distributor valve was removed and examined. There was ice found adhering to the internal main metering well surface. Ice formed from super-cooled water droplets was also found adhering to the servo bleed screen, fully covering and blocking the return-to-tank bleed orifice.

The aircraft had been stored in a heated hangar and had been fully fuelled from a commercial fuel supplier, approximately two months prior to the occurrence. The fuel tanks and strainers were drained during the pre-flight inspection and no visible water was noted. The aircraft was operated without a fuel additive icing inhibiter.

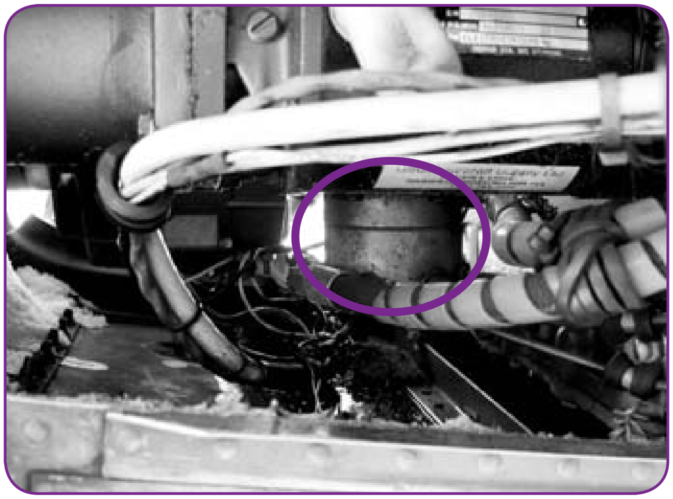


Figure 1: Fuel distributor valve installation in the lower front engine area

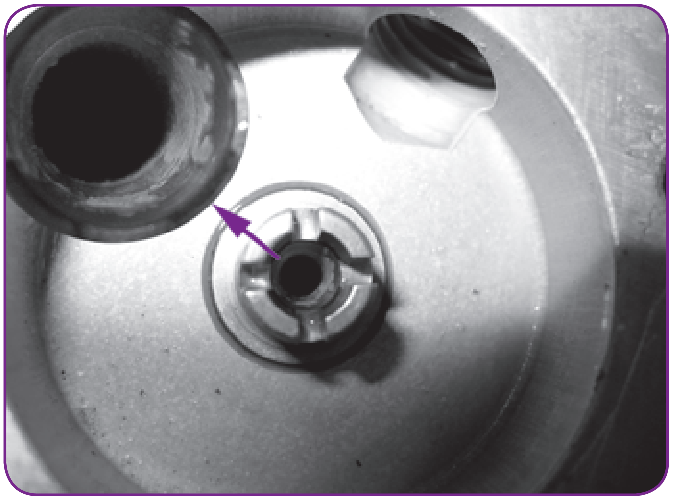


Figure 2: Ice on main metering well

Figure 3: Super-cooled droplet ice-formation on the servo bleed screen

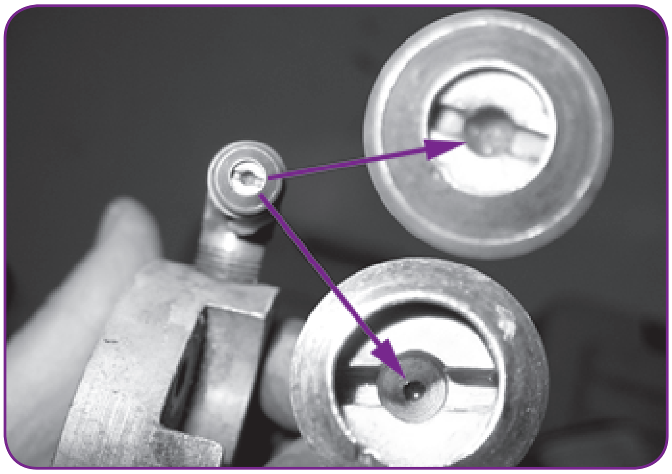


Figure 4: Return-to-tank bleed orifice (shown frozen and thawed for comparison)

High-altitude testing of piston engines on pressurized aircraft was carried out by a major aircraft manufacturer during the early 1970s[1]. This testing found that numerous partial and isolated total engine power losses were experienced. The tests concluded that as an aircraft climbed to the colder altitudes, dissolved water in the fuel precipitated out of solution, due to agitation of the fuel as it passed through the fuel pump and/or vapour separator.

The precipitated moisture in the form of super-cooled water droplets emerged from the pump and was carried through the fuel injection metering unit to the fuel distributor valve. A significant reduction in flow velocity occurred at the bottom of the distributor valve plunger well. This, combined with a reduced fuel distributor valve surface temperature (due to the cooling air blast against the forward face of the valve), promoted the formation of ice crystals. These ice crystals continued to capture the super-cooled water droplets until the ice build-up blocked the forward fuel injection lines, causing a reduction in engine power. In extreme cases, all the nozzle ports could become blocked, causing a complete loss of engine power. Small ice formations were also observed at the bottom and side surfaces of the fuel distributor plunger (main metering) well. When melted, the ice accumulation represented less than two drops of water. This ice blockage phenomenon was considered capable of affecting most fuel injection systems in service at the time, and was eliminated in part by the adoption of fuel additive icing inhibiters.

The TSB is concerned about the possibility of aircraft engine power loss at low ambient temperatures. Some issues, such as the compatibility of the available fuel icing inhibitors with various aircraft types, have not yet been fully resolved. This investigation is still in progress and findings as to causes and contributing factors have yet to be determined by the Board. Nevertheless, the investigation to date has shown that the freezing of dissolved water, precipitated out of solution in fuel injection system distribution manifolds and related areas, can endanger life and property. Therefore, the aviation community should be aware of the effect of ice in aircraft engines' fuel systems during winter operations.

Transport Canada may wish to remind operators of the possibility of engine power loss due to icing in fuel systems, and of the importance of following the procedures and precautions contained within aircraft and engine operating manuals for the prevention of fuel system icing in cold weather environments. △

[1] *Aviation Gasolines, a Candid Appraisal*: a paper presented at the SAE Committee AE-5 Aerospace Fuel, Oil and Oxidizer Systems Meeting No. 51 at Monterey, California, on October 31, 1979.

Top-Level Inspections!

by John Tasseron, Civil Aviation Safety Inspector, Aircraft Evaluation, Standards, Civil Aviation, Transport Canada

This is the third and last of three articles on the topic of inspection levels.

Having dealt with the first level of inspection (general visual inspection [GVI]) and the second level (detailed inspection [DET]) of an aircraft maintenance schedule in earlier articles, we are now ready to look at the last and highest level, namely the special detailed inspection, or SDI. Since only a small percentage of the total number of inspection tasks in an aircraft maintenance schedule fall into the SDI category, and since these tasks are typically performed long after the aircraft has entered service, SDIs are not well known. Luckily, we have the Air Transport Association of America (ATA) definition to help us out:

> *"An intensive examination of a specific item, installation or assembly to detect damage, failure or irregularity. The examination is likely to make extensive use of specialized inspection techniques and/or equipment. Intricate cleaning and substantial access or disassembly procedure [sic] may be required."*

If we compare the above definition to that of a detailed inspection, we see that the first sentences are identical. The word "intensive" clearly translates into "looking for small irregularities." The rest of the definition is completely different. No mention is made of lighting requirements. Instead, the emphasis is on "extensive use of specialized inspection techniques and/or equipment," "intricate cleaning" and "substantial access or disassembly." Some of this terminology needs explaining.

Historically, the SDI label has been attached to inspections that require the application of non-destructive inspection (NDI) methods (penetrant, magnetic particle, eddy current, ultrasonic and radiographic inspection). The rationale was (and still is) that these methods are done in accordance with specialized inspection techniques. In the NDI world, the term "techniques" is used to describe the procedure that must be followed to apply the inspection method. Another rationale used was to "reserve" the acronym SDI for any inspection task that required the work to be done by an NDI-certified specialist.

On the surface, this logic seemed practical, given that virtually all NDI inspection preparation includes cleaning requirements and the use of specialized equipment as well. "Substantial access or disassembly" applies occasionally, and could perhaps be replaced by "substantial preparation" (aircraft jacking, de-fuelling, radiation safety precautions, etc.).

Currently, some newer inspection technologies also appear to qualify for SDI status. These often fall outside of the traditional NDI realm and do not require the use of specially-certified personnel. The most prominent one of these involves procedures that include the application of borescope technology. Borescope inspection falls somewhere between visual inspection with the naked eye and inspection done with complex specialized test equipment. In some cases, during the construction of an aircraft maintenance schedule to ATA standards, the working groups doing the maintenance analysis made decisions to allocate the DET level to all borescope inspection tasks, while in other cases, these tasks were deemed to be SDIs. The logic supporting classification to a DET included the fact that borescope inspections usually concentrated on small areas; the logic supporting an SDI classification came from the fact that special procedures and training of specialists were required. The discussion is still on-going.

It matters little what inspection level is assigned to the task, as long as it is clearly spelled out what must be done. If a borescope inspection is classified as an SDI or a DET, and is then performed by a person who has no borescope inspection training or special instructions, the level of inspection performed may be no better than that of a GVI. Incidentally, new initiatives are underway to apply the latest borescope technologies to large-area (GVI-type) inspections of inaccessible areas, such as the internal surfaces of flight controls. Perhaps some new ideas, such as a new inspection level with its own term and definition, may appear (remote visual inspection, or RVI?). Again, there will be room for argument, and it will be necessary to ensure that whatever is chosen will be clearly explained. In the meantime, the understanding of the currently-used terms and definitions will have to be relied upon to maintain consistency. △

Issues with FDR and CVR Data Identified as a Result of TSB Reviews

by Dave White, Civil Aviation Safety Inspector, Aircraft Maintenance and Manufacturing, Prairie and Northern Region, Civil Aviation, Transport Canada

Annual requirements to maintain cockpit voice recorder (CVR) and flight data recorder (FDR) systems are not being consistently and effectively applied. Sometimes the previous intelligibility test (CVR) and correlation check (FDR) results are not available from the aircraft records. This lack of information is usually not discovered during an annual review of company records or during an aircraft import process. In all cases, data available to the investigators from the black boxes at the time of an accident or incident may not be as readable or ultimately useful as it could be. To address this data issue, let us look at these two very different—but related—black box system annual inspection requirements.

CVR Issue: Transportation Safety Board of Canada (TSB) investigations following accidents and incidents have revealed discrepancies with available CVR recordings. These issues are often related to the quality of the recording channels—an element that could have been previously identified and rectified through the annual inspection requirements.

Canadian Aviation Regulations **CARs Standard 625 Appendix C 15(d)** states that:

> "d) An intelligibility check shall be performed by means of a test procedure which, when completed under operational conditions, shall enable verification of intelligible recorded audio information from all the various input sources required by the regulations:
>
> (i) upon initial installation;
> (ii) at every 3,000 hours, or 12 months, whichever comes first."

Background

The purpose of the CVR intelligibility test is to ensure "intelligible recorded audio information from all the various input sources." With this in mind, it is the aircraft sources and their interconnection, as well as the black box, that affect the intelligibility. Often, the discrepancies are with the peripherals and the interconnection, as opposed to the unit (black box) itself. Examples include: poorly-positioned area microphones that are covered in the actual day-to-day operations of the aircraft; crossed microphone wires that will not noticeably affect the microphone performance but will cause cancelling on the CVR summing amp; and less-than-acceptable performance of channels that does not get rectified even after identification.

Since this inspection is not based solely on the CVR unit itself, but rather the state of the recordings, it is important to have a test procedure that addresses all areas of the inspection:

- an easy-to-follow descriptive checksheet;
- a means of scheduling the test to ensure that sufficient time is allowed to have the recording verified before the next 12-month intelligibility check is due;
- a means of ensuring timely communications with the readback facility to quickly identify issues with the system;

- a two-part process to ensure that issues identified during the playback of the recording, as well as issues with the CVR unit, are addressed through the company defect rectification system;
- a means to ensure that issues requiring rectification are addressed and an intelligibility test is completed to verify that all parameters are recording as required at the end of the process.

FDR Issue: TSB investigations following accidents and incidents have revealed discrepancies with the FDR data available. These issues are often related to missing or unreadable parameters of the FDR system that should have been previously identified and rectified through the annual correlation check requirements. Sometimes the previous correlation test results were not available or attained during the import process.

CARs Standard 625 Appendix C 17—*FDR Maintenance Schedule* states in part:

Correlation check to ensure all required parameters are being recorded and usable.	3,000 flight hours, or 12 months, whichever occurs first

Background

The purpose of the FDR correlation check is to ensure "all required parameters are being recorded and usable." With this in mind, it is the aircraft inputs, their interconnection and the black box itself that affect the usability of the data. Often, the discrepancies are with the peripherals and the interconnections, as opposed to the unit (black box) itself. Additionally, continued correlated positions and data readout for known flight control position or other input position must be ensured on FDR readings. For example, position transmitters can be moved from their previous null value during flight control maintenance. Following the maintenance, the flight control continues to operate normally; however, the associated position readings are no longer accurate for previously recorded data. There are some incidents of parameters not being recorded at all due to various malfunctions. In extreme cases, the annual correlation, which was needed to determine the serviceability of the parameters, was not being conducted at all. The purpose of this correlation is to determine the observed relationship between the annual readings and those taken at the time of installation of the devices.

Since this inspection is not based solely on the FDR unit itself, but rather the state of the inputs, it is important to have a test procedure that addresses the following issues:

- an easy-to-follow descriptive maintenance procedure which includes a procedural checksheet;
- access to the tools required to complete the tasks for the inputs;
- access to the last correlation readout; an original installation correlation report may be appropriate here, but be aware—some changes may have occurred since the installation;
- access to the original installation readouts and tolerances allowed;
- a process to ensure that issues identified during the reading of the download, as well as issues with the FDR unit, are addressed through the company defect rectification system;
- a means to ensure that input issues requiring rectification are addressed and a complete correlation check is completed to ensure that all parameters are recording prior to the required 12-month due date.

Regulations are in place governing the requirement to maintain CVR/FDR systems. This brief overview of the purpose and means of conducting an "intelligibility" test and a "correlation" check will hopefully prompt you, as an operator or maintainer, to revisit your last CVR/FDR results. If these results are not available or contain discrepancies, such as unclear CVR channels or non-functioning FDR parameters, do your part to ensure that black box systems meet the CARs requirements by locating these results or redoing the test without delay. Also, remember that when importing an aircraft, you must ensure that the appropriate data was recorded and is available, and that the systems meet the current requirements. △

Heads Up! Airplane Design and Operations in Icing Conditions

by Michael Hamer, Senior Engineer, Powerplants and Emissions, Engineering, National Aircraft Certification, Civil Aviation, Transport Canada

Engine icing due to ice crystal and mixed phase conditions

When certifying an airplane for flight in icing conditions, many design, flight performance and handling characteristics need to be addressed, including those that apply to the powerplant. The design standards in Chapter 525 of the *Airworthiness Manual* (AWM) include a definition of the atmospheric icing conditions (in Appendix C[1]), which are defined by the variables of the cloud liquid water content (LWC), the mean effective diameter (MVD) of the cloud drops, and the ambient air temperature (from 0˚C to -40˚C). The limits of Appendix C include liquid water drops up to 50 microns MVD in size and typically at altitudes of up to 22 000 ft. In Chapter 533 of the AWM, additional design standards are specified for engine certification to conditions such as rain and hail.

In 1994, an accident involving an Aerospatiale Model ATR-72 series aircraft, near Roselawn, Indiana, resulted in significant icing-related safety recommendations being issued by the U.S. National Transportation Safety Board (NTSB). These recommendations focused on the need to improve airplane designs and operations for icing conditions. The NTSB concluded that the ATR-72 accident occurred in icing conditions that exceeded the icing certification envelope. These conditions have been commonly termed super-cooled large drops (SLD) and may include freezing drizzle (100–500 microns MVD) or freezing rain (above 500 microns MVD). The U.S. Federal Aviation Administration (FAA) response to the NTSB recommendations was to provide a mandate to its Aviation Rulemaking Advisory Committee (ARAC) to form a government and industry committee, the Ice Protection Harmonization Working Group (IPHWG), to examine airplane and engine design and operation in an icing environment that includes SLD and mixed phase/ice crystal conditions.

Mixed phase conditions occur when super-cooled liquid water drops, or SLD, as referred to in Appendix C, and ice particles co-exist in a cloud, often around the outskirts of a deep convective cloud formation. Ice crystal icing exists when all of the liquid water drops in the cloud have frozen into ice particles, typically occurring at the higher flight altitudes. Mixed phase/ice crystal conditions are also outside the present Appendix C icing environment.

Ice crystal/mixed phase icing threat to engines— In-service events

In support of the IPHWG mandate, the engine subgroup of the government and industry committee, the Engine Harmonization Working Group (EHWG), studied over 60 large transport airplane engine power loss events that occurred between 1988 and 2005 due to engine icing in ice crystal with mixed phase conditions. The engines exhibited various symptoms, including vibrations, flameout, rollback, surge and core blade damage. Over two-thirds of the events occurred at altitudes between 22 000 and 39 000 ft. At these high altitudes, water is most likely to exist in the form of frozen ice particles or crystals rather than super-cooled liquid water drops. In general, these engine events occurred near convective clouds at ambient temperature warmer than the International Standard Atmosphere (ISA) and outside the current Appendix C of Chapter 525 of the AWM certification envelope. These events affected multiple models of airplanes and engines. The events occurred in climb, cruise and descent.

The ice crystal or mixed phase icing threat to engines is a major concern since engines are relied upon to continue to operate in any kind of icing conditions.

Previously, a commuter type airplane suffered engine rollback events at altitudes between 28 000 and 31 000 feet. Extensive investigation, including flight testing, led to the understanding that ice particles were accreting on warm surfaces in the engine core. In 2003, the EHWG compared the commuter airplane events to the large transport events. Based on this comparison, the industry has recognized that these high altitude large transport airplane engine events are most likely due to ice particle or crystal icing.

[1] Appendix C: www.tc.gc.ca/civilaviation/RegServ/Affairs/cars/Part5/Standards/525/a525sc.htm

Analysis by the engine manufacturers determined that ice particles can accrete further aft (in the core) of the engine, resulting in effects not seen during certification testing with super-cooled liquid water, rain, or hail. In addition, these engine events seemed to involve no significant observations of any appreciable airframe icing, nor were there any ice detector responses, if installed. However, malfunctioning of the total air temperature (TAT) probe occurred during many of the engine events and is now a known indicator of ice particle or crystal accretion in engines. The events typically occurred in visible moisture conditions in cloud with light to moderate turbulence. Pilots report precipitation on the windscreen, often described as "rain" and no weather radar echoes at the location and altitude of the airplane engine event.

Significance

The ice crystal or mixed phase icing threat to engines is a major concern since engines are relied upon to continue to operate in any kind of icing conditions, even if the airplane is not certified for flight in those conditions.

Deep convective clouds

Deep convective clouds can lift high concentrations of water thousands of feet into the atmosphere. This warm, humid air is rapidly lifted to high altitudes where the very low ambient temperatures result in ice particle/crystal formation. In theory, the ice water content can be four times greater than the certification standard for super-cooled liquid water. Limited measurements exist of the microphysical properties of deep convective clouds. Existing measurements are confounded by uncertain accuracy of ice water content measurements. Ice particle or crystal size may be concentrated at much smaller sizes than previously thought.

Hypothesis of ice accretion mechanism

Frozen ice crystals bounce off cold surfaces. This explains why airframe icing is not noticed during airplane operation in high altitude ice crystal environments. The physics of ice particle or crystal accretion in the engine is still not completely understood by the industry, but the mechanism is commonly thought to be:

- ice crystals enter engine primary flowpath, upstream surfaces are dry and cooler (below freezing) so there is no accretion;
- at some point in the turbomachinery, air temperatures increase above freezing and warmer surfaces become wetted due to impacts with crystals and their melting into liquid water;
- a combination of further crystal impacts into wet surface layer and evaporation brings the surface temperature back down to the freezing point;
- ice begins to form with further crystal impacts;
- ice can continue to accrete, or it may shed, affecting the engine's normal operation.

This phenomenon means that ice accretion can occur well behind the fan in the engine core.

Industry challenges—Making the engine more capable

Zones of high ice particle or crystal concentration are not easily identifiable by pilots in-flight, nor are they predicted on weather forecasts. The most effective solution is to make the engine more capable of flight in these conditions. Flight research measurements of these conditions are needed to characterize the ice particle/crystal environment. Facilities for testing engines in these conditions do not exist and need to be developed. Manufacturers also need to conduct more research into the physics of the ice particle or crystal accretion and shedding mechanisms within the engine, as this is still not fully understood.

Government and industry committee (EHWG) activities

In support of the work done by the FAA ARAC IPHWG committee, the EHWG committee has created a draft Appendix D to FAR Part 33, *Airworthiness Standards: Aircraft Engines*, for the ice crystal envelope, and has written draft rules and guidance for engine compliance in the ice crystal environment. The committee has also written a Technology Plan (Research and Regulatory Road Map) to address the industry challenges. The work of these two committees has been submitted to the FAA through the ARAC process for consideration and possible future regulatory directions. △

Looking for *AIP Canada (ICAO)* Sup ements and Aeronautical Information Circulars (AIC)?

As a reminder to all pilots and operators, AIP Canada (ICAO) *supplements and AICs are found on-line on the NAV CANADA Web site* (www.navcanada.ca). *Pilots and operators are strongly encouraged to stay up to date with these documents by visiting the NAV CANADA Web site, and following the link to "Aeronautical Information Products."*

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 A05F0025—Hydraulic Flight Control Malfunction

On February 6, 2005, a Canadian-registered Eurocopter AS 350 B2 helicopter was engaged in various mining support activities in the jungle and terrain in the Kamarang area, Guyana. At 17:25 local time, with a 120-ft longline attached, the pilot entered a stable, out-of-ground-effect hover to begin coiling the longline onto the ground below the helicopter. As the pilot gradually descended, and at a height of about 10 ft above ground level (AGL), he experienced significant binding in the flight controls. The pilot was unable to rectify the control binding and had considerable difficulty maintaining attitude and altitude control of the helicopter. During 15 seconds of random, uncontrolled hover flight, the helicopter turned and climbed to about 20 ft AGL, whereupon the pilot retarded the throttle lever, causing the main rotor rpm to decay rapidly. As a result, the helicopter descended quickly, struck the ground, bounced, and landed upright, causing substantial damage to the skids, the tail boom, and the main rotor head. The pilot was not injured and the impact forces were insufficient to activate the emergency locator transmitter (ELT).

Finding as to causes and contributing factors

1. The helicopter had a flight control malfunction and the pilot was unable to effectively control the helicopter before it collided with the terrain. The cause of the malfunction could not be determined with certainty, but was most likely a loss of hydraulic pressure.

Findings as to risk

1. The hydraulic cut-off (HYD CUT OFF) switch is underrated for its application in the AS 350, and as a result, is exposed to higher-than-design electrical current draw, leading to intermittent function and premature failure. Failure of the switch can lead to improper operation of the hydraulic system or warning devices.

2. The two printed circuit boards (22-alpha and 30-alpha) in the centre pedestal were contaminated by debris accumulation. This could lead to an electrical short-circuit resulting in a malfunction of the hydraulic system and its warning systems.

3. The main rotor hydraulic servo actuators were out-of-tolerance for extension and retraction rates and internal leakage, a circumstance that may cause asymmetric servo operation.

4. The lateral hydraulic servo accumulators differed remarkably in the time required to exhaust them of hydraulic pressure, leading to asymmetric servo operation.

5. The hydraulic test (HYD TEST) switch is vulnerable to inadvertent operation that has been shown to cause loss of control of the helicopter. The helicopter manufacturer has issued a voluntary Service Bulletin to install a protective cover device over the HYD TEST switch to prevent inadvertent operation. Without the cover, the risk of unintentional use is always present.

6. The aural warning horn to alert the pilot of low main rotor speed also functions as the low hydraulic pressure warning, a situation that leads to ambiguity and potentially inappropriate response to the actual emergency.

7. The gross particulate contamination found in the hydraulic system fluid presents a clear risk of servo malfunction and could lead to loss of control; the source of the contamination was not found.

8. Although the AS 350 B2 can be controlled without hydraulic servo actuators, it requires the pilot to exert

considerable muscular effort, which is difficult to gauge accurately. The required effort may exceed the physical strength or endurance of some pilots.

9. The lack of a requirement for recurrent AS 350 training may result in unacceptable loss of familiarity with the emergency procedures, a loss of awareness of hydraulic system malfunctions, and the unusually high control forces that result. Collectively, these issues could result in a loss-of-control situation.

Safety action taken

Due to space limitations, we cannot publish the safety action taken section, which includes an aviation safety recommendation from the TSB. Readers are invited to read this section, and the entire final report of this major investigation, on the TSB Web site at: www.tsb.gc.ca/en/reports/air/2005/a05f0025/a05f0025.asp. *—Ed.*

TSB Final Report A05F0047—Loss of Rudder in Flight

On March 6, 2005, at 0645 Coordinated Universal Time (UTC), an Airbus A310-308 aircraft, departed Varadero, Cuba, for Québec City, Que., with 9 crew members and 262 passengers on board. At approximately 0702 UTC, the aircraft was 90 NM south of Miami, Fla., and in level flight at FL350, when the flight crew heard a loud bang and felt some vibration. The aircraft entered a Dutch roll and the captain disconnected the autopilot to manually fly the aircraft. The aircraft climbed nearly 1 000 ft while the captain tried to control the Dutch roll. The crew initiated a descent back to FL350 and requested further descent and a possible diversion to Fort Lauderdale, Fla. During the descent, the Dutch roll intensity lessened and then stopped when the aircraft descended through FL280. No emergency was declared. When the aircraft was abeam Miami, the crew decided to return to Varadero. During the landing flare, the rudder control inputs were not effective in correcting for a slight crab. The aircraft landed and taxied to the gate. After shutdown, it was discovered that the aircraft rudder was missing. Small pieces of the rudder were still attached to the vertical stabilizer. One flight attendant suffered a minor back injury during the event.

Findings as to causes and contributing factors

1. The aircraft took off from Varadero with a pre-existing disbond or in-plane core fracture damage to the rudder, caused by either a discrete event, but not a blunt impact, or a weak bond at the z-section of the left side panel. This damage deteriorated in flight, ultimately resulting in the loss of the rudder.

2. The manufacturer's recommended inspection program for the aircraft was not adequate to detect all rudder defects; the damage may have been present for many flights before the occurrence flight.

3. This model of rudder does not include any design features in the sandwich panels to mechanically arrest the growth of disbond damage or in-plane core failure before the damaged area reaches critical size (such a feature was not specifically demanded for certification).

Findings as to risk

1. A cockpit voice recorder (CVR) with a 30-min recording capacity was installed on the aircraft, and its length was insufficient to capture the rudder-loss event, resulting in critical information concerning the rudder failure not being available to investigators.

2. There was no published procedure for disabling the recorders once the aircraft was on the ground; valuable investigation information can be lost if the data are not preserved.

3. The sampling intervals for lateral and longitudinal acceleration captured by the digital flight data recorder (FDR) were insufficient to record the highly dynamic conditions present at the time of the occurrence. This resulted in incomplete information being recorded.

4. The rudder position filtering and the necessity for additional analysis adversely affected the accuracy and effectiveness of the investigation efforts.

5. There are insufficient published procedures available to flight crew members to assist in recovering from a Dutch roll.

6. Declaring an emergency and clearly communicating the nature of the problem allows air traffic control (ATC) to more easily co-ordinate between units and anticipate the needs of the crew in planning traffic management.

7. Procedures and practices that do not facilitate information sharing between crew members increase the likelihood that decisions will be based on incomplete or inaccurate information, potentially placing passengers and crew at risk.

Other findings

1. Throughout the event, the crew received no electronic centralized aircraft monitor (ECAM) message relating to the control problem that the aircraft had experienced, and there were no other warning lights or cockpit indications of an aircraft malfunction.

2. After the rudder-separation event, the aircraft was not in danger of losing the vertical tail plane during the flight, either through loss of static strength or loss of stiffness.

Safety action taken

Due to space limitations, we cannot publish the safety action taken section, which includes two aviation safety recommendations from the TSB. Readers are invited to read this section, and the entire final report of this major investigation, on the TSB Web site at: www.tsb.gc.ca/en/reports/air/2005/a05f0047/a05f0047.asp. *—Ed.*

TSB Final Report A05H0002—Runway Overrun and Fire

On August 2, 2005, an Airbus A340-313 aircraft departed Paris, France, at 1153 Coordinated Universal Time (UTC) on a scheduled flight to Toronto, Ont., with 297 passengers and 12 crew members on board. Before departure, the flight crew members obtained their arrival weather forecast, which included the possibility of thunderstorms. While approaching Toronto, the flight crew members were advised of weather-related delays. On final approach, they were advised that the crew of an aircraft landing ahead of them had reported poor braking action, and the A340's weather radar was displaying heavy precipitation encroaching on the runway from the northwest. At about 200 ft above the runway threshold, while on the instrument landing system (ILS) approach to Runway 24L with autopilot and auto thrust disconnected, the aircraft deviated above the glide slope and the groundspeed began to increase. The aircraft crossed the runway threshold about 40 ft above the glide slope.

During the flare, the aircraft travelled through an area of heavy rain, and visual contact with the runway environment was significantly reduced. There were numerous lightning strikes occurring, particularly at the far end of the runway. The aircraft touched down about 3 800 ft down the runway, reverse thrust was selected about 12.8 seconds after landing, and full reverse was selected 16.4 seconds after touchdown. The aircraft was not able to stop on the 9 000-ft runway and departed the far end at a groundspeed of about 80 kt. The aircraft stopped in a ravine at 2002 UTC (16:02 Eastern Daylight Time [EDT]) and caught fire. All passengers and crew members were able to evacuate the aircraft before the fire reached the escape routes. A total of 2 crew members and 10 passengers were seriously injured during the crash and the ensuing evacuation.

Findings as to causes and contributing factors

1. The crew conducted an approach and landing in the midst of a severe and rapidly changing thunderstorm. The operator did not have procedures related to the distance required from thunderstorms during approaches and landing, nor were these required by regulations.

2. After the autopilot and auto thrust systems were disengaged, the pilot flying (PF) increased the thrust in reaction to a decrease in the airspeed and a perception that the aircraft was sinking. The power increase contributed to an increase in aircraft energy and the aircraft deviated above the glide path.

3. At about 300 ft above ground level (AGL), the surface wind began to shift from a headwind component to a 10-kt tailwind component, increasing the aircraft's groundspeed and effectively changing the flight path. The aircraft crossed the runway threshold about 40 ft above the normal threshold crossing height.

4. Approaching the threshold, the aircraft entered an intense downpour, and the forward visibility became severely reduced.

5. When the aircraft was near the threshold, the crew members became committed to the landing and believed their go-around option no longer existed.

6. The touchdown was long because the aircraft floated due to its excess speed over the threshold and because the intense rain and lightning made visual contact with the runway very difficult.

7. The aircraft touched down about 3 800 ft from the threshold of Runway 24L, which left about 5 100 ft of runway available to stop. The aircraft overran the end of Runway 24L at about 80 kt and was destroyed by fire when it entered the ravine.

8. Selection of the thrust reversers was delayed, as was the subsequent application of full reverse thrust.

9. The pilot not flying (PNF) did not make the standard callouts concerning the spoilers and thrust reversers during the landing roll. This further contributed to the delay in the PF selecting the thrust reversers.

10. Because the runway was contaminated by water, the strength of the crosswind at touchdown exceeded the landing limits of the aircraft.

11. There were no landing distances indicated on the operational flight plan for a contaminated runway condition at the Toronto/Lester B. Pearson International Airport (CYYZ).

12. Despite aviation routine weather reports (METAR) calling for thunderstorms at CYYZ at the expected time of landing, the crew did not calculate the landing distance required for Runway 24L. Consequently, they were not aware of the margin of error available for the landing runway, or that it was eliminated once the tailwind was experienced.

13. Although the area up to 150 m beyond the end of Runway 24L was compliant with *Aerodrome Standards and Recommended Practices* (TP 312E), the topography of the terrain beyond this point, along the extended runway centreline, contributed to aircraft damage and to the injuries to crew and passengers.

14. The downpour diluted the firefighting foam agent and reduced its efficiency in dousing the fuel-fed fire, which eventually destroyed most of the aircraft.

Findings as to risk

1. In the absence of clear guidelines with respect to the conduct of approaches into convective weather, there is a greater likelihood that crews will continue to conduct approaches into such conditions, increasing the risk of an approach and landing accident.

2. A policy where only the captain can make the decision to conduct a missed approach can increase the likelihood that an unsafe condition will not be recognized early and, therefore, increase the time it might otherwise take to initiate a missed approach.

3. Although it could not be determined whether the use of the rain repellent system would have improved the forward visibility in the downpour, the crew did not have adequate information about the capabilities and operation of the rain repellent system and did not consider using it.

4. The information available to flight crews on initial approach in convective weather does not optimally assist them in developing a clear idea of the weather that may be encountered later in the approach.

5. During approaches in convective weather, crews may falsely rely on air traffic control (ATC) to provide them with suggestions and directions as to whether to land or not.

6. Some pilots are under the impression that ATC will close the airport if weather conditions make landings unsafe; ATC has no such mandate.

7. Wind information from ground-based measuring systems (anemometers) is critical to the safe landing of aircraft. Redundancy of the system should prevent a single-point failure from causing a total loss of relevant wind information.

8. The emergency power for both the public address (PA) and evacuation (EVAC) alert systems are located in the avionics bay. A less vulnerable system and/or location would reduce the risk of these systems failing during a survivable crash.

9. Brace commands were not given by the cabin crew during this unexpected emergency condition. Although it could not be determined if some of the passengers were injured as a result, research shows that the risk of injury is reduced if passengers brace properly.

10. Safety information cards given to passengers travelling in the flight decks of the operator's Airbus A340-313 aircraft do not include illustrations depicting emergency exit windows, descent ropes or the evacuation panel in the flight deck doors.

11. There are no clear visual cues to indicate that some dual-lane slides actually have two lanes. As a result, these slides were used mostly as single-lane slides. This likely slowed the evacuation, but this fact was not seen as a contributing factor to the injuries suffered by the passengers.

12. Although all passengers managed to evacuate, the evacuation was impeded because nearly 50 percent of the passengers retrieved carry-on baggage.

Other findings

1. There is no indication that the captain's medical condition or fatigue played a role in this occurrence.

2. The crew did not request long aerodrome forecast (TAF) information while en route. This did not affect the outcome of this occurrence because the CYYZ forecast did not change appreciably from information the flight crew members received before departure, and they received updated METARs for CYYZ and the Niagara Falls International Airport (KIAG).

3. The possibility of a diversion required the flight crew to check the weather for various potential alternates and to complete fuel calculations. Although these activities consumed considerable time and energy, there is no indication that they were unusual for this type of operation or that they overtaxed the flight crew.

4. The decision to continue with the approach was consistent with normal industry practice, in that the crew could continue with the intent to land while maintaining the option to discontinue the approach if they assessed that the conditions were becoming unsafe.

5. There is no indication that more sophisticated ATC weather radar information, had it been available and communicated to the crew, would have altered their decision to continue to land.

6. It could not be determined why door L2 opened before the aircraft came to a stop.

7. There is no indication that the aircraft was struck by lightning.

8. There is no information to indicate that the aircraft encountered wind shear during its approach and landing.

9. The flight crew seats are certified to a lower standard than the cabin seats, which may have been a factor in the injuries incurred by the captain.

Safety action taken

Due to space limitations, we cannot publish the safety action taken section, which includes seven aviation safety recommendations from the TSB. Readers are invited to read this section, and the entire final report of this major investigation, on the TSB Web site at: www.tsb.gc.ca/en/reports/air/2005/a05h0002/a05h0002.asp. *—Ed.*

TSB Final Report A06P0010—Engine Power Loss—Forced Landing

On January 21, 2006, a Cessna 208B aircraft was en route at 9 000 ft above sea level (ASL), from Tofino, B.C., to the Vancouver International Airport, B.C., when the engine failed. The pilot began a glide in the direction of the Port Alberni Regional Airport, B.C., before attempting an emergency landing on a logging road. The aircraft struck trees during a steep right-hand turn and crashed. The accident occurred at about 14:20 Pacific Standard Time (PST), approximately 11 NM south-southeast of the Port Alberni Regional Airport. Five passengers survived with serious injuries; the pilot and the other two passengers were fatally injured.

Findings as to causes and contributing factors

1. The engine lost power when a compressor turbine blade failed as a result of the overstress extension of a fatigue-generated crack. The fracture initiated at a metallurgical anomaly in the parent blade material and progressed, eventually resulting in blade failure due to overstress rupture.

2. The combination of aircraft position at the time of the engine failure, the lack of equipment enabling the pilot to locate and identify high terrain, and the resultant manoeuvring required to avoid entering instrument flight conditions likely prevented the pilot from attempting to glide to the nearest airfield.

Findings as to risk

1. Single-engine instrument flight rules (SEIFR) operations in designated mountainous regions have unique obstacle risks in the event of an engine failure. Canadian equipment requirements for such operations do not currently include independent terrain mapping, such as terrain awareness and warning systems (TAWS).

2. Airline operators are not currently required to conduct any additional route evaluation or structuring to ensure that the risk of an off-field landing is minimized during SEIFR operations.

3. Pilots involved in commercial SEIFR operations do not receive training in how to conduct a forced landing under instrument flight conditions; such training would likely improve a pilot's ability to respond to an engine failure when operating in instrument meteorological conditions (IMC).

4. Mean time between failure (MTBF) calculations do not take into account in flight shut downs (IFSD) not directly attributable to the engine itself; it may be more appropriate to monitor all IFSD events.

5. The design of the Cessna 208B Caravan fuel shutoff valves increases the risk that the valves will open on impact, allowing fuel spillage and increasing the potential for fire.

Other finding

1. The operator was not providing downloaded engine parameter data for engine condition trend monitoring (ECTM) evaluation at appropriate intervals.

Safety action taken

Terrain Awareness and Warning System (TAWS) Equipment Requirement

A requirement for the installation and use of TAWS has been supported by Transport Canada (TC). This installation and use of TAWS equipment will enhance a pilot's ability to identify and avoid terrain risks in the event of a loss of propulsion under IMC. Information about the TAWS equipment requirements that are being approved for Canada can be found in TC's Commercial and Business Aviation Advisory Circular (CBAAC) 0236 dated 29 July 2005, which is available on the TC Web site at www.tc.gc.ca/CivilAviation/commerce/circulars/menu.htm.

Enhanced Pilot Training Requirement

On June 6, 2007, the TSB sent a Safety Advisory to TC, suggesting that TC consider incorporating additional pilot training requirements into subsection 723.98(24) of the *Commercial Air Service Standards* (CASS) to ensure that SEIFR pilots receive practical training on engine failure procedures in IMC. The training would include the pilot's initial response to the failure, the descent in instrument conditions, the avoidance of terrain hazards during the descent, and the practice of forced landings under various degraded surface weather conditions.

TC responded to this Safety Advisory on July 25, 2007. The response outlined a number of difficulties involved in establishing a specific standard that could cover a myriad of circumstances that a pilot may meet in the event of an engine failure under SEIFR operations.

TC's position is that air operators should be proactive in reviewing their SEIFR operations, specific to their individual training program, to ensure that this possible training gap or related hazard is addressed within the company operations manual.

TC's Civil Aviation Standards Branch will prepare an issue paper with the recommendation that air operators review their company training programs to ensure that SEIFR pilots receive practical training on engine failure procedures in IMC specific to the air operator operations and geographic location.

Due to space limitations, we cannot publish the remainder of the safety action taken section, which includes two aviation safety recommendations from the TSB. Readers are invited to read this section, and the entire final report of this major investigation, on the TSB Web site at: www.tsb.gc.ca/en/reports/air/2006/a06p0010/a06p0010.asp. *—Ed.*

TSB Final Report A06P0157—Collision with Terrain

On August 7, 2006, a float-equipped Cessna A185F departed Nimpo Lake, B.C., at 12:45 Pacific Daylight Time (PDT), with only the pilot on board. The pilot was to pick up a passenger at Kluskoil Lake, B.C., and then return to Nimpo Lake. The aircraft was reported overdue at 15:00 PDT, and a search operation was initiated. An emergency locator transmitter (ELT) signal was received, and the aircraft wreckage was located on a hillside in the vicinity of Mount Downton, at an elevation of 6 824 ft above sea level (ASL). The aircraft was destroyed, but there was no fire. Both occupants received fatal injuries. The accident happened at about 14:00 PDT.

Aerial view of accident site, with TSB investigators at the approximate impact point

Findings as to causes and contributing factors

1. While flying in mountainous terrain, the pilot was manoeuvring close to terrain, and struck the ground at slow speed, with the aircraft in a nose-down attitude, possibly after a stall.

2. The pilot's lack of experience in mountain flying likely caused him to misjudge how close to the terrain he could safely fly. The strong wind from the southeast may have been a factor.

TSB Final Report A06Q0157—Engine Failure

On September 10, 2006, a Cessna 172M, with the pilot and two passengers on board, took off at 15:45 Eastern Daylight Time (EDT) from Saint-Hubert, Que., for a flight according to visual flight rules (VFR) over Montréal, Que. About 15 min after takeoff, when the aircraft was over the city, the engine (Lycoming O320- H2AD) lost power and stopped. The pilot tried to restart it, but without success. The pilot transmitted a distress message and quickly reported the situation to the control tower. The aircraft was approximately 1 250 ft above ground level (AGL) at the time. The pilot landed the aircraft on the northbound side of Parc Avenue, in Montréal. On landing, the left wing tip struck a traffic light post before the aircraft came to rest. The aircraft was substantially damaged, but there were no injuries.

Findings as to causes and contributing factors

1. The aircraft was not on level ground when the draining was done before the flight. Consequently, the water in the fuel tank was lower than the drain valve and could not be removed with the pipette.

2. The water accumulated in the right fuel tank migrated to the gascolator bowl, saturating it, and causing the engine to stop.

Findings as to risk

1. The inspections done by the approved maintenance organization (AMO) and the pilot did not find that the fuel filler cap chain for the right fuel tank was missing. As a result, the chain was exposed to the water in the bottom of the tank, and the fuel was contaminated by corrosion from the chain hooks.

2. On the Cessna 172, the location of the gascolator drain valve makes it hard to collect fuel for visual examination before flight.

3. The *Canadian Aviation Regulations* (CARs) do not require aircraft owners to comply with service bulletins. As a result, Service Bulletin SEB 92-26 was not completed on the occurrence aircraft. This upgrade would have made it possible to properly drain the water that had accumulated in the right fuel tank before the flight.

TSB Final Report A07W0005—Landing Short of Runway

On January 9, 2007, a British Aerospace Jetstream 3112 was conducting an instrument approach to Runway 29 at Fort St. John, B.C., on a scheduled instrument flight rules (IFR) flight from Grande Prairie, Alta. At 11:33 Mountain Standard Time (MST), the aircraft touched down 320 ft short of the runway, striking approach and runway threshold lights. The right main and nose landing gear collapsed, and the aircraft came to rest on the right side of the runway, 380 ft from the threshold. There were no injuries to the two pilots or 10 passengers. At the time of the occurrence, the runway visual range (RVR) was fluctuating between 1 800 ft and 2 800 ft in snow and blowing snow, with winds gusting to 40 kt.

This picture taken shortly after the occurrence illustrates the poor visibility

Findings as to causes and contributing factors

1. A late full flap selection at 300 ft above ground level (AGL) likely destabilized the aircraft's pitch attitude, descent rate, and speed in the critical final stage of the precision approach, resulting in an increased descent rate before reaching the runway threshold.

2. After the approach lights were sighted at low altitude, both pilots discontinued monitoring instruments, including the glide slope indicator. A significant deviation below the optimum glide slope in low visibility went unnoticed by the crew until the aircraft descended into the approach lights.

Finding as to risk

1. The crew rounded the decision height (DH) figure for the instrument landing system (ILS) approach downward, and did not apply a cold temperature correction factor. The combined error could have resulted in a descent of 74 ft below the DH on an ILS approach to minimums, with a risk of undershoot.

Other finding

1. The cockpit voice recorder (CVR) was returned to service following an intelligibility test that indicated that the first officer's hot boom microphone intercom channel did not record. Although the first officer's voice was recorded by other means, a potential existed for loss of information, which was key to the investigation. △

EMPLOYMENT OPPORTUNITIES AT TRANSPORT CANADA

In early fall 2008, Transport Canada will be launching two national external selection processes to establish a pool of qualified candidates to staff permanent positions throughout Canada in Aircraft Maintenance and Manufacturing as well as Aircraft Certification.

People living in Canada and Canadian citizens residing abroad will have an opportunity to apply. Language requirements will vary according to the position to be filled. Interested candidates are encouraged to submit an on-line application at www.jobs-emplois.gc.ca during the application period. Detailed information regarding the qualification requirements will also be available on the Web site above, or by calling the Infotel line at **1-800-645-5605** during the application period. Interested candidates will have two weeks to apply once the openings are posted on-line.

The public service of Canada is an attractive employer. Find out about the benefits of a career in the public service of Canada at www.jobs-emplois.gc.ca/menu/choice_e.htm.

***LOOK OUT FOR THESE OPPORTUNITIES AS EARLY AS SEPTEMBER 2008.**

ACCIDENT SYNOPSES

Note: All aviation accidents are investigated by the Transportation Safety Board of Canada (TSB). Each occurrence is assigned a level, from 1 to 5, which indicates the depth of investigation. Class 5 investigations consist 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 November 1, 2007, and January 31, 2008, are all "Class 5," and are unlikely to be followed by a TSB Final Report.

On November 3, 2007, the pilot of a **Turbo Lancair 4P** had departed Springbank, Alta., on a local flight. As the flight was returning to the airport, the engine began to lose power. The pilot attempted to switch tanks, but had problems with the fuel selector valve, and decided to attempt a forced landing in a farm field. Shortly after touchdown, the aircraft contacted a ravine and was substantially damaged. The pilot, the sole occupant, was not injured. *TSB File A07W0191.*

On November 4, 2007, an **ultralight Lincoln Ultra Sport** took off from a field for a local recreational flight. The pilot was the only occupant on board. The aircraft lost power in level flight, approximately 200 ft above ground level (AGL). The pilot banked right and headed to the field where he had taken off. Shortly after the turn, at approximately 45 ft AGL, the aircraft nosed over and crashed into a business parking lot. The pilot died after the accident. The site of the accident is approximately 800 ft from the field where he took off. Weather conditions were favourable for conducting a visual flight rules (VFR) flight. *TSB File A07Q0225.*

On November 6, 2007, an **Agusta A119 helicopter** was on a flight from Helena, Montana, to Riverton, Wyoming, with the pilot and three passengers on board. About 25 NM southeast of Cody, Wyoming, the pilot decided to land on a mountaintop at an elevation of 11 900 ft to allow the passengers to stretch their legs. When descending through about 100 ft AGL, the pilot heard the low rotor rpm warning horn and lowered the collective. The helicopter impacted the ground hard, resulting in collapsed skid gear and a tail rotor strike. An emergency was called in and the pilot and passengers were rescued by a Montana Air National Guard Blackhawk helicopter. The pilot suffered a hairline fracture of a vertebrae, and the three passengers were uninjured. The engine was returned to the manufacturer for testing, and it revealed some free turbine rpm (Nf) and gas generator rpm (Ng) instability pointing to a possible issue with the fuel control unit (FCU). *TSB File A07F0194.*

On November 7, 2007, a **Beechcraft 200** was on approach to Toronto/City Centre Airport, Ont., when the landing gear was selected down. The right main and nose landing gears extended, but the left main landing gear remained retracted. After three fly-bys next to the tower, the left main landing gear was confirmed to have remained in the retracted position. The flight crew decided to return to Toronto/Lester B. Pearson Airport and Toronto ATC was advised of the emergency situation. Emergency vehicles were standing by for the landing. The aircraft landed on Runway 15L and the flight crew minimized aircraft damage by maintaining aircraft weight on the nose and right main gear after touchdown. The aircraft came to a stop on the centerline of the runway, resting on the bottom of the right engine's nacelle. There was no fire and both crew exited the aircraft with no reported injuries. *TSB File A07O0300.*

On November 10, 2007, a **Diamond DV20** departed Runway 33 at the Fredericton, N.B., airport for a first solo circuit. The pilot reported downwind and final for Runway 33. After touchdown, the aircraft bounced heavily then veered left and off the runway surface. It continued across the grass and into an irrigation ditch that runs parallel to the runway. The aircraft crossed the ditch and contacted a wall of turf on the opposite side. The impact was sufficient to activate the emergency locator transmitter (ELT) and compromise the aircraft fuselage and empennage. The flight service specialist activated the crash alarm; upon arrival at the scene, emergency personnel advised an ambulance was necessary. The pilot was seriously injured and transported to hospital by ambulance. *TSB File A07A0133.*

On November 14, 2007, a **Cessna 172** took off from the Saint-Hubert, Que., airport for a local flight. While the aircraft was on approach for Runway 24L, the controller informed the pilot that winds were from 200º at 15 kt, gusting to 22 kt. The aircraft landed with its flaps at 40°. The aircraft bounced after the wheels touched down, then nosed over. The nose wheel broke off and the front landing gear bent backward. The front landing gear, propeller and engine sustained major damages. The pilot was not injured. *TSB File A07Q0235.*

On November 22, 2007, a **Eurocopter AS350B-2 helicopter** departed the airstrip at Silver Spruce camp (80 NM north of Goose Bay, N.L.) in day visual meteorological conditions (VMC) with the pilot on board, slinging four drums of fuel in a net on an 80-ft longline. At approximately 200 yd northwest of the strip, and at 150 ft AGL and 40 kt, the pilot recognized that he had reached the right lateral cyclic control stop without the expected disk response in roll attitude. The pilot attempted twice to physically achieve more right lateral cyclic input, but without success. The pilot turned back toward the strip in a slow right turn; however, at about 100 yd back on short final at about 150 ft and 40 kt, the nose suddenly dropped and the aircraft entered a rapid, right spiral and descended quickly. Despite full aft and left cyclic input, the pilot was unable to control the nose-down attitude or right turn. However, just before impact with the ground, the helicopter leveled somewhat and struck the ground on the right skid and fuselage, before coming to rest on its left side. Immediately after the nose dropped, the cockpit warning horn sounded and remained on until silenced by the pilot on the ground. After impact with the ground, the pilot shut down the still-running engine, turned off the battery master, and escaped the cockpit with minor injuries. There was no fire and the emergency locator transmitter (ELT) activated on impact. During the brief flight, the sling load was not erratic and flew normally beneath the helicopter with no oscillation. It was revealed that the longline had inadvertently wrapped around the rear of the left skid during the departure. *TSB File A07A0137*.

On November 22, 2007, an **American Aviation AA-1B** was en route from Marathon, Ont., to Thunder Bay, Ont. At an altitude of approximately 4 500 ft, the engine began to run rough. The pilot then successfully completed a precautionary landing on a dirt road near Hurkett, Ont. After completing an inspection of the aircraft, the pilot decided to take off. During the take-off roll, directional control of the aircraft was lost and the aircraft veered off the left side of the road and collided with the ditch. The pilot was not injured and the aircraft sustained substantial damage. It was reported that the dirt road was snow- and ice-packed. *TSB File A07C0216*.

On November 30, 2007, a **Piper PA-24-260 Comanche** was landing on Runway 28 at Carp, Ont. During the approach and landing, the landing gear was inadvertently left in the retracted position, resulting in the aircraft landing wheels up. The aircraft came to rest approximately three-quarters of the way down and to the north of Runway 28. The aircraft was lifted and the landing gear was successfully pulled down and locked. There were no injuries. *TSB File A07O0318*.

On December 21, 2007, after landing long at Valcourt, Que., the pilot of a **Beechcraft BE23** was unable to brake the aircraft, which became stuck in the snow at the end of the runway. The occupants were not injured. The left wing sustained major damage. The runway was 90 percent snow-covered. The same aircraft was involved in a runway excursion on October 26, 2007 (A07Q0217). This was the aircraft's first flight since undergoing repairs. *TSB File A07Q0252*.

On December 22, 2007, the pilot of a **ski-equipped Norman Aviation Nordic VI** was executing touch-and-go manoeuvres. On the third landing, the aircraft slid on the soft snow as it reduced speed. The skis sunk into the snow and the aircraft overturned. The occupants were not injured, but the aircraft sustained damages to the propeller, engine cowl and left wing ribs. *TSB File A07Q0253*.

On December 26, 2007, a **Cessna 177B** was landing at night on Runway 09 at Corman Air Park, Sask. The aircraft landed on the left side of the runway and the left main gear entered the snow alongside of the runway. The aircraft veered to the left and the nose gear collapsed in the snow. The pilot, the sole occupant, was not injured. *TSB File A07C0237*.

On January 4, 2008, a **Robinson 44 helicopter**, with two passengers on board, was flying low over Lac des Deux Montagnes, Que. At approximately 16:00 EDT, the helicopter struck the frozen surface of the lake. The helicopter sustained major damages and the three occupants suffered serious injuries. Local weather observations included a visibility of 15 mi., scattered clouds at 2 500 ft, and a covered ceiling at 4 800 ft. *TSB File A08Q0001*.

On January 5, 2008, an **ultralight Cumulus**, approximately 4 mi. south of Dolbeau, Que., took off with only the pilot on board, to conduct a recreational flight. On the take-off roll, the aircraft abruptly nosed up, then took off. Then, during the initial climb, the ultralight aircraft veered and nosed over before crashing into the frozen surface of the river. The aircraft sustained major damages and the pilot suffered fatal injuries. *TSB File A08Q0002*.

On January 18, 2008, a **Beech 95-B55 Baron** was on the landing roll on Runway 26 at Red Lake, Ont., when the landing gear was unintentionally retracted. The pilot was not injured and the aircraft sustained substantial damage. The operator will investigate the occurrence by way of its safety management system (SMS). *TSB File A08C0007*.

On January 21, 2008, a **DHC-2 MK.1 Beaver** was landing at a private airstrip near Montney, B.C., following a local flight. The main landing gear struck a snow bank short of the runway, and the aircraft slid to a stop on the runway with substantial damage to the landing gear, propeller, and engine cowling. There were no injuries to the pilot, who was the only person on board. Flat light conditions existed at the time of the occurrence. *TSB File A08W0017*.

On January 24, 2008, a **Van's RV9** departed Delta Heritage Air Park, B.C., for a flight up the Fraser Valley and was returning to Delta Heritage Air Park. While on final, the pilot was unable to retard the throttle enough to complete the landing, and he overshot to attempt a second approach. While turning from base to final, the pilot needed more power but it was not available due to a stuck and unresponsive throttle. The pilot aborted the turn onto final, leveled the wings and went through a wire fence. The aircraft eventually settled enough that the main gear impacted the far side of a deep ditch and was torn back. The aircraft came to rest on its belly just past the ditch, and was substantially damaged. There were no injuries. *TSB File A08P0024*.

On January 25, 2008, an **HS 748-2A** aircraft was being prepared for a flight from Vancouver, B.C., to Smithers, B.C. As the captain was performing his pre-flight walk-around inspection, he found that the left elevator was substantially damaged. The aircraft had been parked overnight at Gate 18. A maintenance engineer had performed an inspection of the aircraft the previous day, and had determined that the left elevator was undamaged at that time. The damage is consistent with the aircraft being struck by a vehicle. *TSB File A08P0028*.

On January 26, 2008, a **Cessna 152**, with an instructor and student on board, was on its way back from the training area south of the Jean Lesage International Airport in Québec City, Que. While the aircraft was over the Québec City bridge, on final for Runway 30, the flight crew detected a loss of power. They tried several times, in vain, to regain power. The aircraft continued to lose altitude. Seeing that they could not reach the airport, the flight crew attempted an emergency landing on the Duplessis highway. As the pilot attempted to avoid an automobile while landing, the right main wheel became stuck in a snowbank and the aircraft came to rest on the side of a ditch, overturned. The instructor and student got out of the aircraft. The instructor was taken to the hospital as a precautionary measure. The aircraft did not catch on fire. *TSB File A08Q0020*.

On January 30, 2008, a **Eurocopter AS350BA** was conducting training at the Springbank, Alta., airport. The first training exercise was a simulated hydraulic failure. The exercise was being conducted in the circuit for Runway 16. The first two simulations were successful. On the third attempt, the forward speed decayed to 0 kt at approximately 10 ft AGL. During the attempt to regain forward speed, the trainee (flying from the right seat) lost control of the helicopter and the helicopter came to rest on its left side just east of the threshold for Runway 16. The training pilot and trainee exited the helicopter with no injuries and there was no post-impact fire. The simulated loss of hydraulics exercise was performed according to the aircraft flight manual (AFM). The console hydraulic test switch was depressed and the helicopter slowed to 60 kt. The console switch was selected off and the hydraulic cutoff switch on the right side collective was then activated. When control was lost, it was not feasible for the instructor to reach over and turn the hydraulics back on. Prior to departure, the hydraulic accumulators did not pass the pre-flight check. The helicopter was shutdown and maintenance recharged and balanced the accumulators in accordance with maintenance instructions based on the outside air temperature (OAT) of -19°C. The helicopter was released by maintenance and the hydraulic check was successfully completed on the subsequent pre-flight check. *TSB File A08W0025*.

On January 31, 2008, a **Hughes 369D helicopter** was conducting a wildlife survey approximately 20 NM south of Empress, Alta. During touchdown, the tail rotor struck the ground, resulting in a loss of rotational control. The pilot reduced the collective immediately and the helicopter landed heavily but remained upright. There was substantial damage to the tail rotor, tail rotor drive train, tail boom, and skid gear. The pilot and observer were uninjured. *TSB File A08W0027*. △

Policy Instruments

by Pierre-Laurent Samson, Civil Aviation Safety Inspector, Regulatory Affairs, Policy and Regulatory Services, Civil Aviation, Transport Canada

The *Cabinet Directive on Streamlining Regulation* (CDSR) issued by the Treasury Board of Canada Secretariat (TBS) came into effect on April 1, 2007. It introduces specific requirements for the development, implementation, evaluation and review of regulations that federal departments (i.e. Transport Canada) must comply with.

One of the requirements the CDSR re-affirms is the obligation federal departments have to identify and justify the appropriateness of regulatory and non-regulatory instrument(s) they choose to achieve policy objectives.

This article will categorize instruments and explain where, in the Civil Aviation regulatory process, they should be identified and justified.

The *Guide to Making Federal Acts and Regulations* divides instruments in five groups (see chart):

- laws and regulations;
- information;
- capacity building;
- economic instruments (including taxes, fees and public expenditure); and
- organizational structures.

Laws and regulations guide behaviour by telling people how things are to be done. They may be formulated as precise requirements or as performance standards, setting objectives that people or organizations are responsible for meeting.

Information helps people modify their behaviour. It includes advertising, education, awareness campaigns, consumer information programs, etc.

Capacity building increases the ability of people and organizations to achieve their goals. It includes employment skills training programs, programs to support scientific research and public education about the results of research, information-gathering through consultation and monitoring, and working with industries to help them develop voluntary codes governing their practices, etc.

Economic instruments affect how people behave in the marketplace. They include taxes, fees, public expenditure, the creation of exclusive or limited rights (i.e. marketable permits, licences or marketing quotas that acquire value because they can be bought and sold), insurance requirements, which can compel industries to assess and reduce risks to ensure that their products are priced to cover the costs of insurance or preventive measures, etc.

Organizational structures support the use of other instruments by providing for their administration. Organizational instruments include departmental structures to deliver programs, framework agreements and partnerships with other governments or organizations, privatization or commercialization of government services, public investment in private enterprises, etc.

As instruments are mutually supportive and are often more effective when used in conjunction, they can be optimized through combination and timing. For example, an information campaign can develop awareness of a problem and prepare the way for a regulatory solution, or a combination of economic incentives with information and education may be enough to solve an issue without turning to regulations as a solution.

Though the TBS does not prescribe the manner in which departments and agencies demonstrate and justify their choice of instrument(s), the CDSR makes the instrument's identification and justification one of the first steps regulators must take when implementing policy objectives.

> "Departments and agencies are to… identify the appropriate instrument or mix of instruments, including regulatory and non-regulatory measures, and justify their application before submitting a regulatory proposal…"
>
> CDSR—*Selecting the appropriate mix of government instruments*

Civil Aviation has chosen risk assessments as its means of identifying viable instruments. The TBS will, therefore, expect Civil Aviation to demonstrate through a risk assessment that all applicable instruments were considered before choosing the regulatory option.

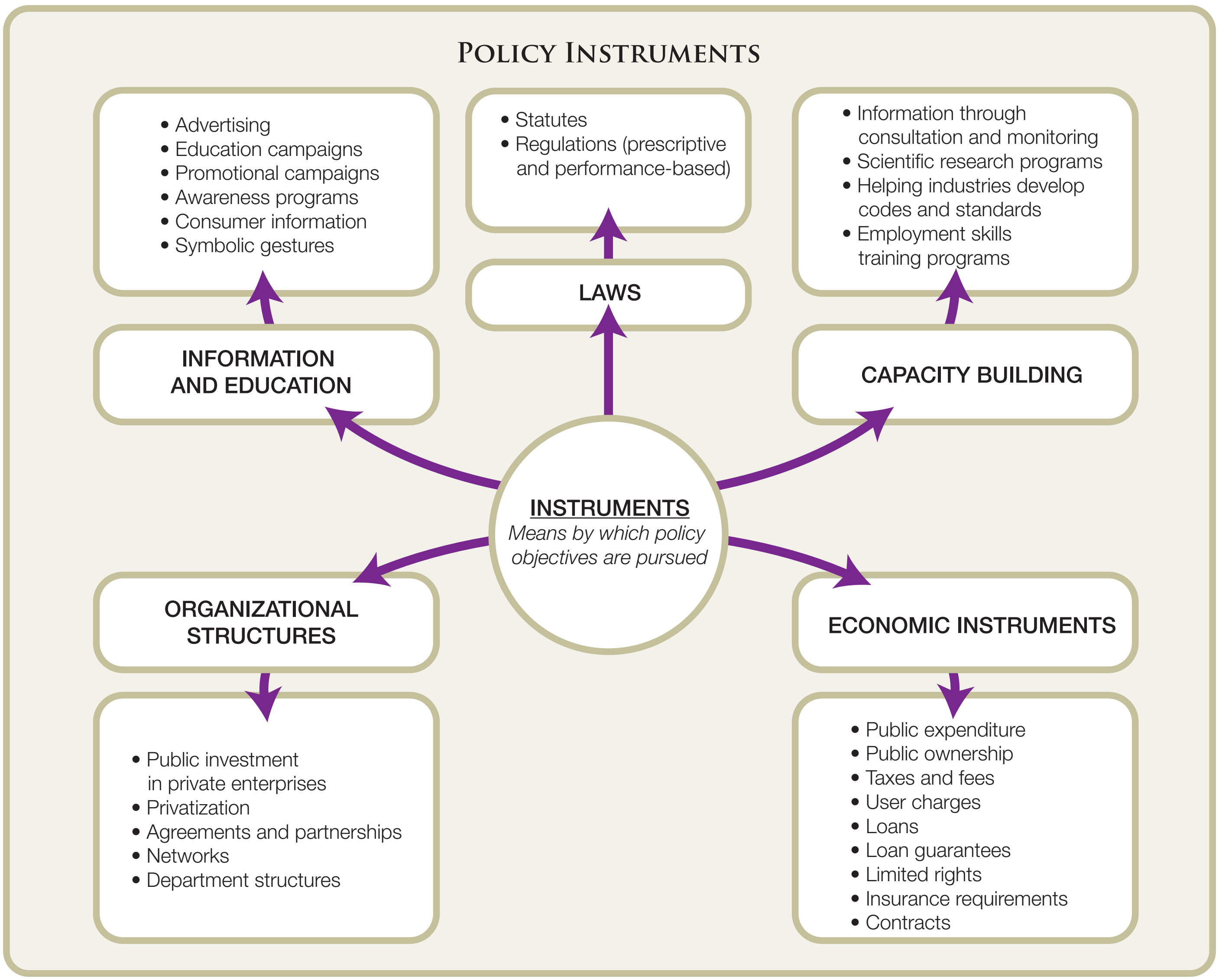
The CDSR further requires departments and agencies to consider the potential impact of regulation at an early stage in the process. The following four points will have to be assessed every time Civil Aviation is confronted with a policy issue:

- "potential impact of the regulation on health and safety, security, the environment, and the social and economic well-being of Canadians;
- cost or savings to government, business, or Canadians and the potential impact on the Canadian economy and its international competitiveness;
- potential impact on other federal departments or agencies, other governments in Canada, or on Canada's foreign affairs; and
- degree of interest, contention, and support among affected parties and Canadians."

CDSR 3.1—*Regulatory Process Requirements*

The risk assessment will, therefore, have to provide an estimate of the expected impact the considered instruments would have on different aspects of the Canadian fabric (i.e. health, safety, security, the environment) and on the Canadian economy (i.e. the cost or savings to government, business, and Canadians through the cost/benefit analysis of each appropriate instrument).

For more information on policy instruments, visit *Assessing, Selecting, and Implementing Instruments for Government Action* at www.regulation.gc.ca/documents/gl-ld/asses-eval/asses-eval00-eng.asp. For more information on the CDSR, visit www.regulation.gc.ca/directive/directive00-eng.asp. The *Guide to Making Federal Acts and Regulations* can be found on the Privy Council Office Web site, at www.pco-bcp.gc.ca. △



Removal of Sanctions

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

Removing a notation of sanction from a *person's* enforcement file is applicable to any *person* holding a Canadian aviation document. The word *person* includes an individual or corporation.

Pursuant to section 8.3 of the *Aeronautics Act*, any notation of suspension of a Canadian aviation document by the Minister or any notation of a monetary penalty imposed may be removed from the record on request from the *person* affected by the suspension or monetary penalty, provided that:

1. at least two years have transpired since the date the suspension expired or the penalty amount was paid;
2. no additional suspension or monetary penalty has been recorded against that *person* after that date; and
3. the removal of the record would not be contrary to the interest of aviation safety or security.

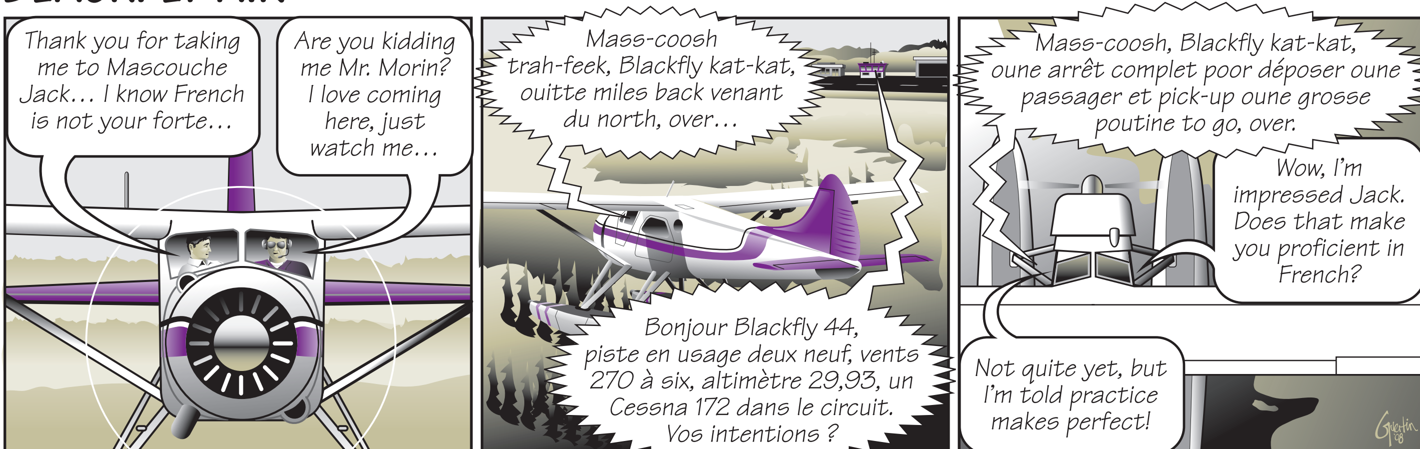
Where a *person* is the subject of an investigation at the time of the request for the removal of sanction, the request may be denied in the interest of aviation safety or security.

A *person* who has requested the removal of a notation of sanction that has been denied by the Minister may request a review before the Transportation Appeal Tribunal of Canada (TATC). A denied application for a removal of sanction cannot be resubmitted until an additional two-year period has expired from the date of the original application. If a *person* makes an application for the removal of a notation of sanction within a reasonable time before the two-year waiting period has expired, the application will be retained and acted on when the two-year limit has been reached.

A removal of a notation of sanction means the de-identification of the enforcement file by erasing the *person's* name and related personal information, as well as any reference to the notation of sanction from other records.

To initiate the action of removing a notation of sanction from a *person's* enforcement file, the *person* must make a request in writing to the Regional Manager, Aviation Enforcement. The Chief, Aviation Enforcement will notify the applicant, on behalf of the Minister, by registered mail as to whether or not the notation of sanction has been removed. △

BLACKFLY AIR



Transport Canada's
Safety Management Systems (SMS) Information Session

Hilton Toronto Airport Hotel
September 24–25, 2008

www.tc.gc.ca/civilaviation/SMS/Info/menu.htm

THE CIVIL AVIATION MEDICAL EXAMINER AND YOU

A Word About Selective Serotonin Reuptake Inhibitors (SSRIs)...

by the Education, Training and Safety Division, Civil Aviation Medicine, Transport Canada

The question below is listed in the Frequently Asked Questions (FAQ) section of our Web site. There is a lot of use of SSRIs in the general population, and in pilot communities. We hope that this article will be of interest to aircrew and perhaps lead to more interaction between aircrew and our offices.

> *Question: I've been under a lot of stress recently and my family physician has started me on "Zoloft" to help me get through this difficult time. I'm actually feeling better and I'm ready to fly but I understand that these medications (called SSRIs) are not compatible with flying. Why is this?*

Answer: There are a number of SSRIs and related medications presently on the market. These go under trade names such as *Prozac*, *Paxil*, *Zoloft*, *Luvox*, *Serzone* and *Effexor*, to name a few. (Similar classes of medications that are equally important will soon be listed in a table on the Civil Aviation Medicine Web site). There has been a steady increase in their use in the general population. These medications are mainly used in the treatment of major depression, but they can also be useful in other disorders such as minor depression, social phobias, anxiety, and premenstrual or other mood disorders.

Transport Canada must determine if the medical situation represents a threat to flight safety. We are concerned with both the underlying medical condition for which the medication has been prescribed and the side effects arising from that medication. When we learn that a pilot has been prescribed one of these classes of medication, we will request reports from the attending physician. This helps us to better understand the reason for prescribing, as well as the severity of the illness. While major depression exists, we consider the pilot unfit. A return to flying can be considered based on a satisfactory follow-up report from the attending psychiatrist following an appropriate interval of treatment. For other conditions, it may be possible for the pilot to resume flying (normally after discontinuing medication) once we have received a satisfactory report from the physician.

As far as the side effect profile is concerned, anyone taking these medications should be aware of the wide array of potential side effects. While most of the effects are of little significance, a small number of pilots may experience some serious alterations in thinking, mood, judgment and personality. Of even greater concern is the possibility that these effects may go unrecognized by the pilot.

At the present time, all aircrew using mood-altering medications will be refused medical certification until the circumstances of the case are reviewed. Transport Canada continues to review the literature and conduct studies to determine whether certain medical conditions and medications may be considered safe.

In the meantime, you would be best advised to discuss the situation with your physician. Discontinuing the medication should only be done under the supervision of your physician and only when the situation has stabilized. Contact one of our offices to discuss the return-to-flying parameters for your particular situation, or for any other aviation medical question you may have. The list of Civil Aviation Medicine offices can be found at www.tc.gc.ca/CivilAviation/Cam/offices.htm, and the FAQ section at www.tc.gc.ca/CivilAviation/Cam/questions.htm. △

The Luck Meter—Don't Leave Home Without It!

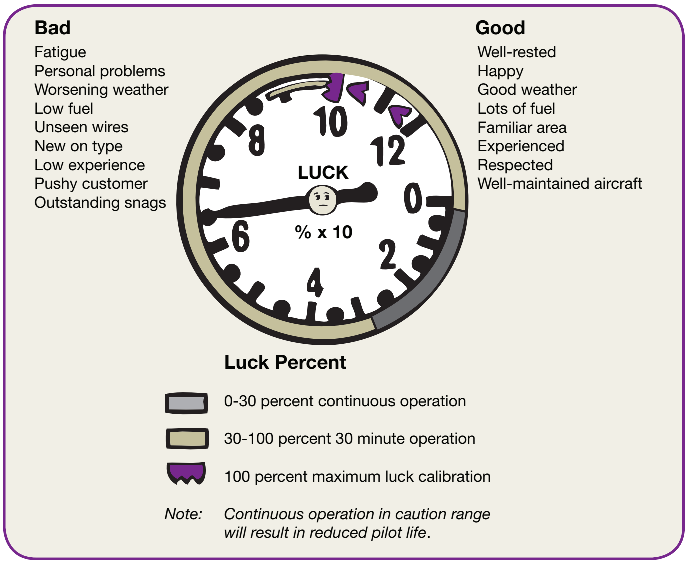
by Rob Freeman, Program Manager, Rotorcraft Standard, Operational and Certification Standards, Standards, Civil Aviation, Transport Canada

It is interesting to note that in 2008, the average life of many electronic items is now measured in mere months, before they become outdated. A three-year-old computer may as well have been unearthed in an archaeological dig when you try to get it serviced. "*Sorry, pal; we don't support that model any longer. It's way out of date.*" Technology and change surround us at an ever-quickening pace. All the same, we still cling to ancient dark concepts of chance, luck and inexplicable things that go bump in the night.

Granted, there is an undeniable element of randomness to events. Bad things do happen to good pilots, like lightning strikes on a relatively clear day, for example. However, accidents are more commonly a result of poor planning and multiple factors—many of which could have been mitigated earlier—than bad karma. Yet, how often do we hear the rationalization, "*it was just bad luck that caused the accident*"? It wasn't bad planning, questionable decision making, or pressing on into forecast bad weather, but rather, some malevolent force that determined the outcome of the flight. "*It wouldn't have mattered what the pilot had done—their time was up.*"

An old novel about unlikely aviation accidents and inevitability, entitled *Fate is the Hunter* by Ernest K. Gann, is one of the first and best of the "mysterious airplane crash" genre. It explores the consequences of luck running out and being in the wrong place at the wrong time. It is still available, and a good read if you want to delve a little deeper into the subject.

A few months back, I had the pleasure of joining an old friend, whom I had not seen for a long time, for coffee. As it happens, he is now a regional manager for the Transportation Safety Board of Canada (TSB). We were discussing some of the more recent accidents, and trying to figure out if there is any common thread among them that might alleviate the toll. After a thoughtful pause, he proceeded to sketch out a rough draft of a "luck meter" on a paper napkin. He reasoned that since so many folks believe in luck, and perception is reality, there should be such an instrument in every helicopter. Rather than a pilot having vague unpleasant feelings about how the flight is progressing, a luck meter would clearly indicate the current state of affairs. The common reaction of denial until it's too late when things aren't going well, would be vanquished forever!



A luck meter: think about it! Because of the obvious connection between high-risk activities and resulting bad luck (cause and effect?), such an instrument would be without equal for keeping us safe. As good luck—not surprisingly—most often follows solid safety practices, the luck meter would indicate movement into the realm of chance, which is really a loss of control of one's destiny. The readout would let pilots know when they are on relatively safe ground, or rolling the dice.

Accordingly, I have listed some of the common causes of good and bad luck on the appropriate sides of the luck meter. There are many more, but you get the idea. The grey arc indicates a minimum level of risk that leaves little to chance. The idea is to start a flight with solid safety practices in place, and to minimize dependence on luck wherever possible.

The likelihood (I almost said "chance") of unpleasantries increases as the needle moves away from the grey arc— and a predictable conclusion—into the beige, and finally into the purple. At 100 percent, you are flying completely on luck. This is the point where the guardian angels bail out. Brief forays beyond 100 percent may leave pilots with an interesting story for the bar crowd—if they survive. Most of us have one or two of those life- and consciousness-altering moments when the luck almost ran out. Some others didn't come back.

The hard work's done. Now we just need an avionics whiz to put this concept into action! With any luck, we should make a million. △

With thanks to Bill Yearwood, Regional Manager, Transportation Safety Board of Canada, Pacific Region

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TAKE FIVE...

for safety

Five minutes reading could save a life

Below 10 000 ft

When we consider that the change in atmospheric pressure is greater at the lower altitudes, where most of general aviation's flying is done, we must take some time studying its effects.

The ear

To put it simply—as you go up, gas expands, and as you come down, gas contracts. In the ear there is a small air space behind the eardrum that is connected with the throat through two narrow tubes. It's through these narrow tubes that the air behind the eardrum is equalized to the outside atmospheric pressure.

As you climb and the outside pressure decreases, the eardrum will bulge and may give a fullness sensation and pain. You may feel a "clicking" when the eardrum bounces back into place as the air is ventilated into the throat through the narrow tubes—now the pressure is equalized.

During descent, the reverse happens. However, the flutter valve at the end of the narrow tubes might not work so well. You can usually alleviate the problem by swallowing, yawning or closing your mouth, holding your nose and blowing gently (valsalva). The big problem will arise if you have a headcold, sore throat, ear infection, sinus trouble or any condition that will cause the tubes to swell. This will prevent the inner ear air pressure from equalizing with the outside, causing severe pain. A simple rule:

- if you cannot "click" your eardrums by valsalva on the ground—don't fly.
- if you can clear your ears with slight difficulty on the ground, you may decide to fly—but be prepared. Assume that you will have trouble on descent.

The sinuses

Those wretched holes in the head can create serious difficulty for some people. A blocked sinus can create visual problems, toothache, or other severe head pain. Unlike the ear, the air in the sinus is free to come and go during ascent and descent. An infection or allergy tends to close the sinus aperture; this can result in air escaping on ascent, but not being able to enter on descent. It is advisable that:

- if one or both sinuses are completely blocked and will not clear by a simple sniff—don't fly!
- if one or both nostrils can be partially cleared by sniffing—proceed with caution. Sniff hard on ascent and at altitude to get the passages as clear as possible. Plan for discomfort on descent.
- if the congestion is associated with any kind of fever or malaise—don't fly!

The vision

The retina of the eye is more sensitive than any other part of the body to an insufficiency of oxygen in the blood. Night vision is especially affected as there is a reduction of 25 percent by the time you reach 8 000 ft. Breathing oxygen will alleviate the problem. But here's more—since blood absorbs carbon monoxide more readily than oxygen, smoking three cigarettes in a row will reduce your night vision by 25 percent as well. Alcohol intake will also severely reduce night vision.

The brain

Since the brain needs oxygen for proper functioning, and alcohol reduces the amount of oxygen that the blood can carry, any ascent will further impair the brain. After some alcohol consumption if you fly at 8 000 ft, your brain may be flying at 20 000 ft—in this case you may pass out within 10 min. If you consider that your body may take up to 48 hr to recover from excessive alcohol consumption, planning a flight takes more than just looking at the weather.