Transport Canada Transports Canada

Aviation Safety Letter

Safety: reflect on it or it may reflect on you! **Issue 3/2002**

High Density Altitude Suspect in Loss of Control

On July 1, 2000, the owner of an Aeronca 65-CA took off from his private aerodrome near Fort Steele, British Columbia, at about 20:00 MDT for a local flight. The pilot was accompanied by his teenage nephew. The aeroplane was observed to remain close to the ground after it lifted off from the grass strip. As it approached a stand of trees at the end of the strip, it turned, probably to avoid the trees. The bank angle appeared steep, and the aircraft pitched nose down, descended rapidly, and struck a house. The pilot and the passenger were seriously injured. The residents of the house were in the backyard and escaped injury. The aircraft was substantially damaged. This synopsis is based on Transportation Safety Board of Canada Final Report A00P0115.

Weather at the time of the accident was visual meteorological conditions. The temperature at the Cranbrook Airport, British Columbia, about 8 NM SW, was 24ºC. The wind at the accident site was reported to have been calm around the time of the accident; however, it had been blowing from the south earlier in the day.

The pilot operated his aircraft from a 1600-ft grass airstrip. The runway is oriented 14/32 and field elevation is 3100 ft above sea level (ASL). Based on the temperature and the atmospheric pressure, the density altitude for the occurrence takeoff would have been about 5100 ft. Performance charts are not available for this aeroplane, because there is no manual of operating instructions for aircraft of this type built before 1946; the occurrence aircraft was built in 1941.

Pilots who fly similar aeroplanes remarked that take-off and climb performance is limited. At gross take-off weight, with a density altitude similar to that during the accident flight, the Aeronca would require several thousand feet to clear a 50-ft obstacle during takeoff. The engine was rated at 65 horsepower (HP) at sea level, but at a density altitude of 5100 ft, the engine HP was calculated to decrease about 23% to about 50 HP.

The direct hit on the roof likely saved both occupants, as it cushioned the impact.

The occurrence takeoff was to the north. The aeroplane appeared not to be climbing very well. It reached about 50 ft, and as it approached a stand of trees at the north end of the field, it appeared as though the pilot was manoeuvering the areopolane around the high trees. During the manoeuver, the aeroplane's bank angle seemed to steepen, and the nose dropped. The aeroplane then descended steeply and struck the roof of a house. The nose, engine, and front cockpit of the aeroplane penetrated the house. The fuel tank ruptured, fuel spilled into the house, but did not ignite.

The gross take-off weight was calculated to be 1228 lb, which is 22 lb below the maximum gross take-off weight. The pilot was issued a recreational pilot permit in August 1997, and had received a checkout on the Aeronca. His flying experience totaled about 190 hr, most of which were on the accident aircraft.

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Analysis

The engine was likely operating normally; however, its HP would have decreased about 23% in the conditions present during the accident flight. The negative effects of the relatively high density altitude would be felt in all facets of the aeroplane's performance. The aeroplane was not loaded as heavily during a flight earlier in the day, and the pilot may not have been aware of the extent to which the high density altitude and wind conditions affected the accident flight. Also, even the slightest tail wind from the south would considerably increase the distance required to clear the trees at the end of the field. Because of the extra weight on the accident flight, these conditions contributed to the aircraft not attaining an angle of climb sufficient to clear the trees to the north of the airstrip.

The pilot, in attempting to climb over the trees, was likely operating the aeroplane at an angle of attack close to an aerodynamic stall. Because the aeroplane did not reach a height sufficient to fly over the trees, the pilot probably banked the aeroplane to avoid the trees. This manoeuvering would have affected the airflow over the wings, causing the aeroplane to stall at a height from which a recovery was not possible.

Interior damage shows again how [relatively] lucky the two occupants were.

Findings

- The aircraft was close to its maximum gross take-off weight and had degraded performance because of the relatively high density altitude. As a result, the angle of climb was too shallow to clear the trees at the end the airstrip.
- The pilot's attempt to manoeuver to avoid the trees resulted in a stall at an altitude that was too low for the pilot to recover.

Lesson learned—Let's all pay more attention to the performance capabilities of our aircraft, and how factors such as take-off weight, temperature, winds and density altitude can affect them. △

Short Take on Human Factors Basics

Approximately 80% of aviation accidents are primarily caused by a human error, while the remaining 20% almost always involve a human factors component. That is why we need to pay attention to the human elements that cause accidents. The following is the second of a series of short passages from TP 12863E, Human Factors for Aviation—Basic Handbook. *We hope this encourages you to look further into this fascinating, and relevant, topic. —Ed.*

Fatigue and Aviation Accidents

Fatigue is one of the conditions most frequently cited as a contributing factor in aviation accidents. In piloting, the greatest workload can occur at the end of a flight, when the pilot is also the most tired and consequently has reduced concentration and energy. This condition often causes oversights and errors in the approach and landing phases.

If something does go wrong, fatigue can then cause the pilot to deal with it inadequately. Thus yet another problem may arise, possibly initiating a chain of events, none of which alone may be serious enough to cause an accident, but which in combination could prove fatal.

Two Types of Fatigue Affecting Pilots

Acute Fatigue—Acute (short-term) fatigue is caused by intense mental or physical activity over a relatively short period of time. For example, acute fatigue could be caused by working under pressure of a deadline, digging an aircraft out of snow or clearing a runway of snow, or flying in difficult instrument conditions for hours on end. Any time you have to concentrate hard over several hours, you are likely to suffer from acute fatigue. This type of fatigue normally occurs between two regular sleep periods. Acute fatigue is easily cured by rest or a good night's sleep.

Chronic Fatigue—Chronic (cumulative) fatigue, on the other hand, results from many episodes of acute fatigue along with factors, such as stress, jet lag, or insufficient sleep over several days. Unlike acute fatigue, chronic fatigue is not easily cured. Typically, you have to get rid of what is causing the stress or sleeplessness before you can address the fatigue itself. If the chronic fatigue has been present for some time, it may take a long time to rid yourself of its effects.

Excerpt from TP 12863E Chapter 5, page 59. You can obtain your own copy of this publication by calling the TC Civil Aviation Communications Centre Services at 1-800-305-2059. △

Transport Canada / Transports Canada

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Captions from Our Captive Audience...

In our last *Aviation Safety Letter* (Issue 2/2002), we asked for submissions for new ASL captions, and submissions we got! We are quite pleased with the response, and the key benefit of course is to have our readers think about safety, which usually leads them to act safely. While we received many submissions, the overwhelming majority feels that our original caption was and still remains the best, and that no permanent change is needed! Therefore, we will present some of the submitted captions here, including one on the next two ASL covers, but will return to the original cover caption for Issue 1/2003. Here are some entries worth mentioning. Thank you to all who took the time to write us.

"Trust and assimilate the experience of others; it may prevent you from experiencing a hard lesson."
— *Greg Trigonakis, Montreal, Quebec*

"Making a mistake is not [inherently] a crime; not correcting for it is."
— *Ken Yates, Bolton, Ontario*

"Learn from everyone's mistakes; they're dying to teach us!"
— *Robert (Bob) Neve, Vancouver, British Columbia*

"Don't deny your mistakes...others can learn from them."
— *Jim Chappell, North Bay, Ontario*

"Learn to be proactive in your flying rather than reactive to your mistakes." — *Brendan Walsh, Flatrock, Newfoundland*

"Learn from mistakes—yours and others'—while you can!"
— *W. Garth Wigle, Cornwall, Ontario*

"Learn to live. Live to learn."
— *Larry Bangs, Vanderhoof, British Columbia*

"Good judgement comes from experience, and a lot of that comes from bad judgement." — *Katherine Gale, Rocky Mountain House, Alberta*

"In flight, the future rarely smiles to the daring."
— *Simon Pinsonneault, St-Bruno, Quebec*

"Safety: reflect on it or it may reflect on you."
— *Lyle Borkes, Edmonton, Alberta*

"If you are not thinking ahead of your aeroplane, you are being taken for a ride." — *Eleanor Eastick*

"Make it easier for yourself and others to stay out of harm's way."
— *Gerard M. Bruggink, Skipperville, Alabama* △

In This Issue

Owner-performed Maintenance

by Joe Scoles, former Editor, Aviation Safety Maintainer

Under the new Owner Maintenance Rules, Transport Canada has developed a list of aircraft approved for owner-maintenance, and owners of such aircraft are now able to perform their own aircraft inspection and maintenance after meeting the initial requirements for the issuance of a Special Certificate of Airworthiness. The intent of this article is to review the basic principles of maintenance that an aircraft owner is advised to become familiar with prior to performing maintenance under this new rule.

This information will only pertain to aircraft that are classified in this new category. To benefit from this new rule, we suggest you obtain all available information necessary to ensure the continued serviceability of the aircraft. This includes the Maintenance manual, service bulletins and airworthiness directives that apply to the aircraft, its systems, engine, propeller and appliances. Manufacturers manuals may be available from a number of commercial sources or a "type club," which is also a good source for reproduced original manuals.

The aircraft owner may choose to adopt the manufacturer's inspection and maintenance schedule or the one suggested by Transport Canada in Schedule B of Canadian Aviation Regulations (CARs) 625.86(2). This schedule is very comprehensive and has additional notes concerning aircraft accessories such as floats and skis. A review of CAR 605.86(1) will establish the obligation for the aircraft owner to adopt a maintenance schedule that will ensure that his aircraft will remain serviceable.

The maintenance information or a mentor will explain how to go about performing the necessary adjustments and how to replace the parts that are not serviceable. The Federal Aviation Administration (FAA) publishes Advisory Circular 20-106, an inspection guide for the general aviation aircraft owner. It can be downloaded electronically from the FAA Web site (http://www.faa.gov/) along with other useful Advisory Circulars.

How do you learn to do all this? There are many avenues open to you, such as courses possibly offered by community colleges, seminars given by regional Experimental / Amateur Built Aircraft Associations (http://www.eaa.org) and the Recreational Aircraft Association of Canada (http://home.inforamp.net/~raac/). The Canadian Owners and Pilot Association (COPA) has developed a course to help pilots through this new phase of responsibilities and have printed a guide called the COPA Guide to Owner Aircraft Maintenance Category, available in paperback format or electronically through the COPA Web site (http://www.copanational.org/). Regional Transport Canada inspectors are also a good source of

information to assist you in meeting the owner maintenance requirements.

One of the best courses of action may be to find an Aircraft Maintenance Engineer (AME) that will work with you at the beginning, at least through the first inspection. An AME will guide you in the performance of routine maintenance, such as the inspection and maintenance of spark plugs, changing the oil, oil filter, greasing the wheel/bearings, brake maintenance as well as engine and exhaust system checks to name a few of the important inspection items.

One should also be aware of human factors that come into play in aircraft maintenance and that may affect the quality of the work performed. A maintenance item checklist will help ensure that all critical components will be inspected and repaired on time.

Such human factor pitfalls might be to remove parts and incorrectly reinstalling them or failing to safety-wire the part as required. Removing a propeller for inspection and failing to properly torque the bolts that hold it following the reinstallation. Other pitfalls might be to work on control cables and not securing them adequately or failing to perform an in-depth exhaust system and cabin-heat system check.

In conclusion, the most important aspect of aircraft maintenance is to be trained adequately and to have available, when need be, another set of eyes to check that the work is performed accurately and with the outmost of safety practices in mind. As an owner you may plan to have someone assist you for the critical maintenance items that are dealt with such as flight control rigging or any major structural repairs. Assistance from experienced maintainers can go a long way toward ensuring that your aircraft will be "fit and safe" for flight.

For more information, go to: http://www.tc.gc.ca/civilaviation/maintenance/aarpg/menu.htm △

Pilots Can Refuse to Work

by Murray St. Louis, Occupational Health & Safety Officer, Commercial & Business Aviation, Transport Canada

The following article is published as a result of a joint effort between Transport Canada, the Air Transport Association of Canada, the Helicopter Association of Canada and l'Association des transporteurs aériens du Québec, to follow-up the implementation of the Safety of Air Taxi Operations (SATOPS) recommendation #37.

The Canada Labour Code (CLC), Part II, provides employees with three basic rights:

- the right to know;
- the right to participate; and
- the right to refuse dangerous work.

The following definition is also contained in the CLC, Part II:

"danger" means any existing or potential hazard or condition or any current or future activity that could reasonably be expected to cause injury or illness to a person exposed to it before the hazard or condition can be corrected, or the activity altered, whether or not the injury or illness occurs immediately after the exposure to the hazard, condition or activity, and includes any exposure to a hazardous substance that is likely to result in a chronic illness, in disease or in damage to the reproductive system.

For pilots, refusals to work in dangerous, or potentially dangerous, situations could occur under a variety of scenarios, including:

- security issues on board aircraft;
- concerns about improperly packaged, loaded or secured cargo;
- pressures to complete flight on schedule; or
- deteriorating weather conditions.

While not meant to be an exhaustive list, the above are all possible situations that could result in a pilot having reasonable cause to believe that taking-off or continuing a flight constitutes a danger, or a potential danger, to themselves or others. Should a pilot believe an operation is dangerous, for whatever reason, he or she would be acting within his or her legal right to refuse to work.

Once a pilot has indicated he or she is refusing to work, as per subsection 128.(1) of the CLC, Part II, both the pilot and the employer have specific roles and responsibilities that have been established to assist them in working together to help resolve the situation. Subsections 128.(1) through 129.(7) of the CLC, Part II, identifies these employee and employer roles and responsibilities, as well as the role and responsibility of the Transport Canada Civil Aviation Safety Inspector—Occupational Health and Safety (CASI-OH&S).

Section 147 of the CLC, Part II, states that no employer shall take, or threaten to take, any disciplinary action against an employee who has acted in accordance with Part II, or has sought the enforcement of any of the provisions of Part II. Employers should therefore assure their pilots that refusing to work in dangerous, or potentially dangerous situations will not, in and of itself, result in disciplinary action.

Pilots should, however, keep in mind that section 147.1 provides that after all the investigations and appeals have been exhausted by the employee who exercised their rights to refuse dangerous work, the employer may take disciplinary action if they can demonstrate the pilot willfully abused those rights.

Since pilots are often the sole company representative on a work site, beyond any legal requirements contained in the CLC, Part II, good Safety Management principals dictate that employers ensure their pilots are aware of their right to refuse dangerous assignments requested by clients.

One of the ways pilot's knowledge can be increased in this area is by encouraging them to take an active role in the company's Work Place Health and Safety Committee. By being involved in this committee, the pilots will become knowledgeable about all the employee/employer rights and responsibilities contained in the CLC, Part II.

In operations that are not required to have a Work Place Health and Safety Committee (i.e., a fewer than 20 employees), the company Health and Safety Representative should make a special effort to inform pilots that refusing to carry out dangerous assignments is a legal right, fully supported by the company.

Above all other considerations, the pilot's final decision to proceed with takeoff must always be based on "safety first."

For an automated link to the above Canada Labour Code, Part II, references, as well as to the contact list to reach a CASI-OH&S, you are invited to visit the Transport Canada, Aviation Occupational Health and Safety website at: http://www.tc.gc.ca/CivilAviation/commerce/ohs/ △

A Superior pilot is one who stays out of trouble by using Superior judgement to avoid situations which might require the use of Superior skill.

Recently Released TSB Final Reports

The following excerpts are extracted from Final Reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include only the TSB's synopsis and selected findings. We encourage our readers to read the complete Final Reports on the TSB's website at http://www.tsb.gc.ca/ —Ed.

TSB Final Report A00Q0006—Collision with the ground

On January 13, 2000, a de Havilland DHC-2 Mk. 1 Beaver skiplane, with the pilot and five passengers on board, took off from the frozen surface of Lake Adonis, Quebec, on a pleasure flight under visual flight rules (VFR). The route had not been determined, but the flight was to last about 20 min. When the aircraft did not return, the search and rescue (SAR) service was advised. The aircraft was found crashed on a mountainside in a wooded area a little less than 5 km from its point of departure. The pilot and two passengers suffered fatal injuries. The other three passengers suffered serious injuries and hypothermia. The aircraft was destroyed by the force of the impact, but did not catch fire.

Findings as to Causes and Contributing Factors

- The aircraft probably stalled with insufficient altitude for the pilot to execute a recovery.
- The prevailing conditions were conducive to optical illusions associated with low-altitude flight over rising terrain.
- The aircraft was not equipped with a stall warning system, nor was it required by regulation.
- The pilot's decision to fly at low altitude and probably use cutback power for the climb did not allow for safe obstacle clearance.
- The pre-flight safety briefing did not inform passengers where to find the survival equipment on board the aircraft. Consequently, they could not use the sleeping bags to protect themselves from exposure and thereby delay hypothermia.
- Rescue was late because the mostly white aircraft blended into the snowy ground, making it difficult to locate, and the emergency locator transmitter (ELT) antenna was broken, reducing the range of the signal. Consequently, the survivors' exposure time was increased.

TSB Final Report A00O0057—Midair Collision

On March 13, 2000, a Cessna 337 with only the pilot on board was conducting a highway traffic reporting mission and was in a left-hand orbit at 2000 ft above sea level (ASL) over a section of Highway 401 about 18 NM NE of Toronto/City Centre Airport. The aircraft was in a left turn when it passed from right to left underneath a Cessna 172. The Cessna 172, conducting a training session with one instructor and one student on board, was returning to Toronto/City Centre Airport from the practice area. Both pilots were flying under VFR. The Cessna 172 was descending on a steady southwesterly heading when the two aircraft collided. The nose gear of the Cessna 172 struck the left vertical stabilizer of the Cessna 337. Approximately half of the left vertical stabilizer and left rudder separated from the Cessna 337. The Cessna 172 nose gear assembly was damaged. Both pilots were able to maintain control of their aircraft. The Cessna 172 instructor pilot continued to Toronto/City Centre Airport and landed safely. The Cessna 337 pilot returned to Toronto/Buttonville Municipal Airport and landed without further incident. The accident occurred during daylight hours, in visual meteorological conditions (VMC).

Close-up view of the Cessna 337 damaged left vertical stabilizer.

Findings as to Causes and Contributing Factors

- Neither the Cessna 337 pilot nor the Cessna 172 instructor or student pilot saw the other aircraft in time to avoid the collision.
- The collision occurred in Class E airspace in a busy VFR corridor near a VFR route that is published in the *Canada Flight Supplement* (CFS). No frequency is specified for use by VFR aircraft flying on the route. Air traffic control (ATC) does not provide traffic information or conflict resolution to VFR aircraft in Class E airspace.
- The aircraft were on different radio frequencies, and there was no direct communication to alert either pilot to the presence of the other aircraft.
- The Cessna 337 pilot was conducting a highway traffic reporting mission, a task that detracted from his ability to maintain an effective lookout for other air traffic.
- The see-and-be-seen principle of VFR separation has inherent limitations and cannot always pro-

vide positive separation, particularly in areas of high-density air traffic. The VFR corridor where the collision took place is a known high-density air traffic area.

Safety Action Taken

Transport Canada initiated a System Safety Review of VFR operations in the Greater Toronto Area following the occurrence. This is a systematic evaluation process in which a Safety Review Team identifies hazards and system deficiencies and develops mitigation plans for these hazards and system deficiencies. The operator of the Cessna 337 has taken steps to improve the safety of the operation. The aircraft is operated with landing lights, navigation lights, anti-collision lights and beacon activated.

TSB Final Report A00H0007—Gear-up Landing

On December 4, 2000, a Beechcraft King Air A100, with two pilots on board, departed from the Ottawa/McDonald-Cartier International Airport, Ontario, on a visual flight rules (VFR) training flight. The aircraft proceeded to Ottawa/Gatineau Airport, Quebec, to conduct practice visual approaches and landings. A visual circuit and approach to runway 27 was flown with the left engine at low power, simulating an engine failure. The landing gear was not lowered before landing, and the aft fuselage and both propellers contacted the runway surface. The captain initiated a successful go-around, declared an emergency, and subsequently landed the aircraft at Ottawa/McDonald-Cartier International Airport. There were no injuries.

Findings as to Causes and Contributing Factors

- A simulated single-engine, flapless landing was conducted with its landing gear warning horn silenced.
- The King Air standard operating procedures do not require a redundant check of the landing gear status during single-engine approach and landing exercises.
- The crew forgot to complete the Before Landing check and did not lower the landing gear before landing. With the landing gear warning horn effectively disabled, there was no aural warning that the landing gear was not extended, although the gear warning light was most probably illuminated.

Safety Action Taken

After the occurrence, the operator clarified the functionality of the landing gear warning system on all models of the King Air that it operates and revised its King Air SOPs to include a redundant challenge/response verification of the landing gear position before landing.

TSB Final Report A00Q0114—Parallel Runways Incursion

A Regional Jet was on approach to runway 24 right (24R) at Montréal International Airport (Dorval), Quebec. Meanwhile, an Airbus Industries A319, was preparing to depart Dorval en route to Denver, Colorado. The A319 crew contacted the clearance delivery controller and was issued an instrument flight rules (IFR) clearance, with departure instructions that specified runway 24 left (24L). During the clearance readback, a pilot of the A319 read back runway 24R instead of 24L, but the controller did not challenge the change in runway. When the crew of the A319 contacted the ground controller (the same person as the clearance delivery controller), the controller instructed the A319 crew to taxi to runway 24R, with later instructions to contact the tower once in the holding bay of 24R. After arrival in the bay of 24R, the crew of the A319 reported to the airport controller that they were "with" him. About half minute later, the A319 crew was cleared by the airport controller to taxi to position on runway 24L. The crew acknowledged the clearance, without repeating the runway assignment, and taxied to position on runway 24R. The Regional Jet, 1.5 mi. on final approach to 24R, was cleared to land by the airport controller, who then noticed the A319 taking position on runway 24R. The airport controller cleared the A319 crew for an immediate takeoff, and they complied. However, the crew of the Regional Jet decided the aircraft could not be landed safely and went around. The go-around was initiated when the aircraft was about 500 ft above ground level (AGL).

Findings as to Causes and Contributing Factors

- The clearance delivery controller did not challenge the change in runway designation made during the readback of the IFR clearance. As the ground controller, he provided taxi instructions to runway 24R and the instruction to contact the tower when in the bay for 24R. Consequently, the crew of the A319 believed that runway 24R would be their departure runway.
- the A319 was cleared to taxi to position on runway 24L. However, based on the expectation that runway 24R would be the departure runway, the aircraft was taxied to position on runway 24R, placing the A319 on the runway intended for use by the Regional Jet.
- When cleared to position, the crew of the A319 did not read back the designation of the runway to which they had been cleared. This eliminated the possibility that they or the airport controller would detect the discrepancy by that means.
- The airport controller cleared an aircraft to land on runway 24R without ensuring that the runway would be clear of other traffic. △

Tom Liepins Wins Transport Canada Aviation Safety Award

Mr. Liepins receiving his prestigious award.

Mr. William Elliott, Assistant Deputy Minister, Safety & Security, presented the 2002 Transport Canada Aviation Safety Award to Mr. Tom Liepins, Director of Airworthiness for Air Canada, for his commitment to aviation safety in Canada. Mr. Liepins started in the airline industry as an aircraft maintenance engineer for Canadian Pacific Airlines before joining Transport Canada (TC) where his primary responsibility was inspecting the Canadian Airlines fleet for airworthiness. Following Air Canada's purchase of Canadian Airlines in 2000, he was named Director, Airworthiness, for the newly combined airline. Mr. Liepins' achievements include maintaining safe operations through the company's transition, as well as developing a strategic reporting structure and ensuring data integrity.

The Transport Canada Aviation Safety Award was established in 1988 to foster an awareness of aviation safety in Canada and to recognize persons, groups, companies, organizations, agencies or departments that have contributed, in an exceptional way, to this objective. The award was presented in Calgary, Alberta, on March 19, 2002, at the 14th annual Canadian Aviation Safety Seminar (CASS 2002), a major industry event hosted annually by TC for all sectors of the aviation community.

CASS 2002 was an international event composed of a two-day plenary session, featuring high-profile guest speakers, preceded by one day of wide-ranging, operationally-oriented workshops. The theme for this year's CASS was "Implementing Safety Management Systems and Making the Most of Lessons Learned." As outlined in the strategic framework Flight 2005, promoting safety management systems (SMS) represents an important evolving direction for Transport Canada. It is, in fact, the cornerstone to meeting our ambitious safety goals for 2005, and our approach recognizes the need for collaboration with our safety partners.

Building on the momentum of CASS 2000 (St. John's, Newfoundland), "Safety Management," which introduced the concept of SMS, and CASS 2001 (Ottawa), "Making Safety Management Systems Work in the 21st Century—Something for Everyone," CASS 2002 provided the opportunity to bring together the aviation community's different disciplines, specialties, and perspectives. It was a forum to share experiences on implementing SMS and making the most of lessons learned.

CASS 2002 was a great success, thanks to the efforts of the entire System Safety staff, several other TC employees, guest speakers, workshop facilitators, sponsors, and of course, the delegates. At the closing of the conference, Mr. Justin Bourgault, Regional Manager, System Safety, Quebec Region, accepted the baton for next year's CASS 2003, which will take place at the Bonaventure Hilton Hotel, in beautiful Montreal, Quebec, from April 14 to 16, 2003. The theme for CASS 2003 is: "Aviation Human Resources: The Future of Our Industry". We hope to see you in Montreal! △

New Products—PDM and CRM Educational Packages, and New Runway Incursion Video

System Safety is pleased to announce the release of three new aviation safety products.

The **Pilot Decision-making** (PDM) educational package (TP 13897E) is distributed **exclusively** via CD-ROM. The goal of this package is to help pilots make better decisions by introducing them to the concepts, principles and practices of good decision-making. The two (2) CD-ROMs contain lessons plans, slides and three Transport Canada videos to enhance the learning experience. It is divided into five (5) modules: Introduction; The Decision-making Process; Human Performance Factors; Human Error; and Risk Management.

The **Crew Resource Management** (CRM) multimedia educational package (TP 13689-2E) aims to provide a greater **awareness** of the concepts, philosophies and objectives of CRM training, to enable participants to use more CRM **tools** and to enhance participants' to use their most valuable resource—**themselves**.

The PDM and CRM packages can be purchased through the Civil Aviation Communications Centre at 1-800-305-2059 (or, in the National Capital Region, 993-7284) or online (http://www.tc.gc.ca/aviation/pubs/index_e.htm).

Transport Canada has also released a new safety video on the prevention of runway incursions entitled *Danger on the Runway*. This video was produced by the joint Transport Canada / NAV CANADA "Incursion Prevention Action Team." This video is available for loan from your regional System Safety office or for purchase through the TC Civil Aviation Communications Centre. △

ILS System Failure—A Free Lesson

This article has been adapted from a paper presented by New Zealand at the 38th Conference of Directors General of Civil Aviation Asia and Pacific Regions, Seoul, Republic of Korea, November 5-9, 2001.

On July 29, 2000, during a standard instrument landing system (ILS) approach to Faleolo at night, an Air New Zealand Boeing 767 with 165 passengers and 11 crew on board commenced a go-around after descending to an altitude of about 400 ft, some 6 mi. short of the runway. An exhaustive investigation revealed that the ILS glide path (GP) transmitter was transmitting invalid guidance information, while cockpit GP and localizer indications were normal. Much was learned from this event, with the main hazard not being widely recognized. Because every operator using an ILS is potentially at risk, the Civil Aviation Authority (CAA) of New Zealand is widely publicizing the event and lessons to be learned.

The aircraft was cleared to Faleolo via a FALE arrival 15 NM arc for the ILS runway 08. The approach was planned to be auto-coupled using a low drag approach profile. From FALE, the aircraft established on the 15 mi. arc then captured the localizer inbound course at 14 mi. About one second after APPROACH was armed, the auto-flight system captured the GP. Approximately 5 sec after GP capture, the rate of descent increased. Flight deck instruments confirmed the aircraft to be both on GP and on localizer and the ILS was identifying correctly.

Shortly after landing flap was selected, the pilot flying noted an anomaly in distance measuring equipment (DME) versus altitude. Around the same time, the pilot not flying, while trying to establish visual contact with the runway, became aware that visual clues did not correspond with what was expected. Approximately 6 mi. from the runway threshold, a missed approach was carried out from an altitude of about 400 ft. The aircraft instruments indicated "on glide path" throughout the go-around until abeam the runway. During the second approach the GP deviation indicator again indicated "on glide path" throughout the approach, which was manually flown with reference to DME/altitude profile. At no stage during the first approach, go-around, and second approach were any "flags" or engine indicating crew altering system (EICAS) messages displayed. Nor was there any autopilot warning or flight mode fault indicated.

Analysis—Although a "false glide path capture" was initially suspected, analysis of flight data recorders (FDR) revealed that at all positions within 40º of the localizer front course, the aircraft was receiving a zero GP deviation signal — the aircraft "thought" it was on GP, yet it had descended on a path of approximately 3.5º to a point 5.5 mi. short of the runway. It was discovered that the executive monitor of the GP had been left in a test (control bypass) mode, which inhibited the automatic shutdown of a faulty transmitter that was not radiating all of the signal required for aircraft steering. An inoperative tower remote indicator compounded the problem. The crew had read the NOTAMs, which showed the VOR, ILS/GP, ILS/DME were unmonitored, and the ILS/GP had no standby transmitter.

There is a common idea among pilots that the ILS consists of narrowly focused localizer and GP beams. Pilots have generally come to believe that ILS equipment is extremely accurate and reliable. Normally this is so; so much so that some pilots have been tempted to use an ILS when cockpit indications suggest the ILS is working, despite being indicated in the NOTAMs as on test or not monitored.

The perception that the ILS consists of narrowly focused beams is incorrect. In fact the aircraft steering information is created by a combination of signals such that if any one of them is not radiating in accordance with specifications then the aircraft will receive false guidance. Such false guidance can include "on-course" or "on glide-path" indications regardless of the actual position of the aircraft and with no flag or alarm indications in the cockpit. Flight director and autopilot functions will also appear normal. In approach mode, the flight director will automatically capture the incorrect GP without any prior fly-up or fly-down indication.

The crew was well prepared and competent, and executed their duties in accordance with company standard operating procedures (SOPS). Nothing in their collective experience and training had prepared them for the latent failures behind this event. It was most fortunate that, without discussion, the crew went straight from "inquiry" to "assertion" in less than 10 sec in executing the go-around.

The investigation revealed much information that needs to be promulgated. For example, there is a need to remove potential ambiguity from standard NOTAM phraseology notifying the status of navigation aids. There is a need to further educate flight crews, ground technicians and air traffic controllers about ILS systems and their monitoring. The necessity for maintenance personnel and their managers to ensure that critical items are independently checked and signed off prior to return to service needs to be reinforced. Design and ergonomic issues arise regarding the inability of aircraft systems to detect the existence of some erroneous navigation aid conditions.

In response to the preliminary incident notification, the Secretary General of the International Civil Aviation Organization (ICAO) issued Letter AN 7/5-01/52 on the general subject of incidents caused by operational use of ILS signals radiated during testing and maintenance procedures. This letter requested ICAO States to

invite the appropriate authorities, organizations and operators under their jurisdiction to review current practices and procedures as necessary. This would ensure that ILS will not be used for normal flight operations when test signals are being radiated or the executive monitoring function of the facility is inhibited for testing/maintenance purposes. The letter also listed a number of protective measures.

As soon as the implications of the event became apparent, the CAA of New Zealand issued a letter to all New Zealand pilots holding instrument ratings, and aircraft operators, reminding pilots of the risks involved in using navigation equipment when it is included as being tested, unserviceable or not monitored. The letter described the cause of the serious incident in some detail and listed procedures for pilots to prevent a recurrence.

The CAA of New Zealand also undertook a review of the requirements and practices for the operational use of radio navigation aids without status monitoring by the associated air traffic service (ATS) unit. This led the CAA writing to all organizations operating under New Zealand's CAR Part 171 (Aeronautical Telecommunications Service Organisations - Certification) to draw their attention to the relevant specific requirements within the rule that had apparently been widely overlooked in the past.

Conclusion—A controlled flight into terrain (CFIT) accident was narrowly averted on this occasion. This serious incident has provided a valuable insight into a hitherto little recognized weakness in ILS systems that will create an extreme hazard unless great care is taken to adhere to ICAO standards and guidance material during ILS operations and maintenance.

There is scope for improvement in NOTAM phraseology notifying the status of navigation aids, and further protective measures that can be taken during testing and maintenance. (Reference ICAO State Letter AN 7/5-01/52).

There is a need to further educate flight crews, ground technicians and air traffic controllers about ILS systems and their monitoring. The necessity for maintenance personnel and their managers to ensure that critical items are independently checked and signed off prior to return to service needs to be reinforced.

Design and ergonomic issues arise regarding the inability of aircraft systems to detect the existence of some erroneous navigation aid conditions. This serious incident warrants extensive publicity in order to further guard against CFIT accidents. △

COPA Corner—"Neighbourhood Watch"

by Kevin Psutka, President & CEO, COPA

In a recent issue of COPA Flight, Mr. Kevin Psutka, President of the Canadian Owners and Pilots Association (COPA), highlighted the need for all pilots, owners and practically everyone involved in the General Aviation community to institute a "Neighbourhood Watch," and to look out for each other. I felt it would be of value to share it with the ASL audience, and COPA was pleased to allow me to reprint that article, which follows. —Ed.

As the aviation community continues to struggle with the aftermath of September 11th, COPA is very active on many fronts in an effort to minimize the negative changes to our sector, while being sensitive to the perceptions of the public about general aviation's potential to be used as a weapon. The apparent copycat crash of a Cessna 172 into a building in Tampa in January was unfortunate in that it raised the public's concern about general aviation (GA) even further. However, it did help illustrate what we have been saying all along: a small aircraft cannot do the kind of damage that can be inflicted by large aircraft; therefore any security measures should be commensurate with this lower damage potential.

The key is to prevent persons with hostile intent from gaining access to small aircraft. I have followed closely the development of security measures in the United States, which started with a proposal from the major associations and culminated with an FAA announcement on January 9, 2002, of voluntary measures for small aircraft. They include control of ignition keys, better supervision of students, sign-out procedures, positive identification of all renters and students, and having parents or guardians co-sign for teen students before they take flying lessons. They also include improved securing of unattended aircraft, the use of prominent signs near areas of public access warning against tampering with or unauthorized use of aircraft, emergency telephone numbers posters (police, fire, FBI) so that people may report suspicious activity. Finally, they also include the training of employees and pilots who regularly use the aircraft to be on the look-out for suspicious activity such as transient aircraft with unusual or unauthorized modifications, persons loitering for extended periods in the vicinity of parked aircraft or in pilot lounges, pilots who appear to be under the control of another person, persons wishing to rent aircraft without presenting proper credentials or identification, persons who present apparently valid credentials, but who do not display a corresponding level of aviation knowledge, and any pilot who makes threats or statements inconsistent with normal uses of aircraft, or that do not fit the pattern of lawful, normal activity at an airport.

The philosophy is one of vigilance and the onus is on flight schools, fixed-based operations (FBOs) and individual pilots to take a much more active role in security. Let's call it a "Neighbourhood Watch" program for general aviation. Let's not wait for regulation to descend upon us. If each of us does not take an active role and get out there and do our part, it will not take very many incidents such as the Tampa crash to shut us down, or at least put severe restrictions in place.

In the coming months, COPA will continue to devote considerable effort to make sure that our perspective is included in security deliberations. I hope to be able to report that our freedoms remain intact. In the meantime, let's embrace the Neighbourhood Watch concept. For more information have a look at http://www.copanational.org △

Restricted Airspace—Know Where It Lies!

Dear Editor,

In a recent six-month span, the Moose Jaw military air traffic controllers have recorded five separate incidents of light civilian VFR aircraft violating CYR 303, a restricted military training area near Mossbank, Saskatchewan, used by 431 (Air Demonstration) Squadron, the "Snowbirds." In one startling case, one of these VFR aircraft came very close to a jet formation that was practicing aerobatic maneuvers. All aircraft were at the same altitude and none of the Snowbird pilots detected the conflicting aircraft.

While the Moose Jaw situation may be considered unique, it can nevertheless be used to remind all pilots of the need to prepare thoroughly prior to commencing any VFR flight. This should include the following:

1. in-depth analysis of the proposed route (including review of NOTAMs);
2. knowledge of the territory to be overflown (particularly Restricted [CYR] and Advisory [CYA] areas in Class F airspace); and,
3. possession of all applicable VFR charts.

While these three simple rules will seem obvious to most, the incidents we recorded lead us to believe some pilots do not follow them. No matter where you live, and where you fly, odds are there are CYAs and CYRs near you. By following the three simple rules stated above, you will avoid such hazardous areas and ensure you, your passengers, and fellow aviators have a safe and enjoyable flight.

Capt. F. Chouinard, Air Traffic Control
Moose Jaw, Saskatchewan

NAV CANADA Customer Service Hot Line

Dear Editor,

I was dismayed to read the letter on runway incursions in Issue 1/2002 of the *Aviation Safety Letter,* in which a pilot reported some difficulties with the air traffic control tower. The letter seemed to indicate the controller made a mistake and then deliberately penalized the pilot by withholding a take-off clearance.

This is the first I've heard of this and I can assure you that this practice is not acceptable to me. Controllers and Flight Services personnel are required to report any operating irregularities such as this to their supervisor. Each of these reports is investigated and actions taken when needed to correct system deficiencies or operational errors. Our investigators normally secure the recordings and all appropriate material during the investigation. NAV CANADA keeps the recordings for 30 days and, in this particular case unfortunately, I am unable to determine the circumstances surrounding this event.

NAV CANADA is committed to the provision of professional service at all of its facilities and takes this type of pilot issue very seriously. I would encourage your readers to contact the NAV CANADA Site Manager or the Customer Service Hot Line at 1-800-876-4693 to report any concerns about the safety or quality of the services provided.

Sincerely,

Kathleen Fox , Assistant Vice President
Air Traffic Services, NAV CANADA

Fly-ins: Poor Airmanship or Formation Flying?

Dear Editor,

I enjoyed Paul Tomascik's "Strikebound" in issue 2/2002 of the *Aviation Safety Letter*. But I think he may be "misinformed," or perhaps jumping to conclusions, when he states, "I've seen some undisciplined airmanship at fly-ins, including the busting of regulations and pilots doing other stupid things, such as landing two planes on an active runway at the same time (one touching down short and one landing long)."

I am a formation pilot, instructor and examiner, and Mr. Tomascik may not realize that he may have been witnessing a safe, standardized and entirely legal approach and landing by two aircraft flying in formation. I could run through the applicable regulations, but they're in the *Canadian Aviation Regulations* for all to enjoy. Sure, I've seen my share of "stupid pilot tricks," but what was described is not NECESSARILY one of them.

Name withheld on request

The only formation-specific requirement is found in CAR 602.24, and requires that pilots engaged in formation flight make adequate pre-arrangement among themselves, and when the formation flight is to take place within a control zone, that the appropriate air traffic control unit become part of the "pre-arrangement." Therefore, when pilots coordinate their formation activities, landing two planes on an active runway at the same time (one touching down short and one landing long) can be legal and safe. Keep in mind the requirement for pre-arrangements as specified in CAR 602.24, and it would be advisable to obtain training from an experienced instructor before trying formation flying. Finally, the A.I.P. provides further guidance on formation flight in section RAC 12.13.

Arlo Speer
General Aviation, Transport Canada

Altitude Permitting

On June 17, 2001, the pilot of a Cessna 172 took-off on a visual flight rules local flight from Runway 33 at the Toronto/Buttonville Municipal Airport, Ontario. When the aircraft reached about 400 to 500 ft above ground level (AGL) during the initial climb after takeoff, the engine stopped. The pilot began a forced approach and attempted unsuccessfully to restart the engine. The aircraft struck a treetop and the back of a house and came to rest on the back deck of the house. The aircraft and the house were substantially damaged. The occupants of the house were not injured; however, the pilot received serious, non-life-threatening injuries. This synopsis is based on the Transportation Safety Board of Canada (TSB) Final Report A01O0157.

The accident occurred in visual meteorological conditions The temperature was 22°C, the dew point was 11°C, the wind was 320° T at 8 kts, and visibility was 15 S.miles. The pilot was properly licensed and qualified for the flight. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

During the take-off and the initial climb, the pilot did not observe any abnormalities except that the carburetor heat control knob was slightly extended. He pushed the control knob in and kept his hand on it to ensure that it stayed fully in (OFF). He did not detect any degradation of power before the engine stoppage. During the forced approach, the pilot attempted two engine restarts without success. He then moved the fuel selector to OFF before impact. The aircraft turned left toward a residential area and struck a house approximately 1.4 NM west-northwest of the Toronto/Buttonville Municipal Airport, Ontario. After the aircraft came to rest on the back deck of the house, one of the occupants of the house assisted the pilot in exiting the aircraft. Numerous suitable forced landing sites were available off the departure end of Runway 33 had the aircraft continued straight ahead or altered course slightly to the right.

The aircraft was later examined and the fuel selector was in the OFF position. All other controls and switches (mixture, magnetos, and master switch) were in the engine operating position and had not been moved. Damage to the fuel selector mechanism indicated that the fuel selector was OFF at impact. The propeller bent rearward when it struck the deck; there was no indication of propeller rotation. The aircraft departed with ample fuel for the intended flight, and there were no indications of contaminated fuel. An inspection of the engine revealed no mechanical abnormalities that could explain the engine stoppage.

The engine was later started and ran at idle and various power settings for approximately 10 min. The in-flight loss of engine power could not be explained by any observed engine defect. Considering the phase of flight and the sudden stoppage of the aircraft engine with no prior indications of power degradation, carburetor icing was unlikely a factor in the power loss. The engine magnetos were tested and found to be functional, thereby eliminating the ignition source as a factor in the engine stoppage.

The emergency procedure to be followed in the event of an engine failure immediately after takeoff, as stated in the *Cessna Aircraft Information Manual,* is that, in most cases, the landing should be planned straight ahead with only small changes to avoid obstructions. It further states that the checklist procedures assume that adequate time exists to secure the fuel and ignition prior to touchdown.

The TSB could not determine why the engine stopped during the initial climb. After the engine stopped, directional control of the aircraft was not maintained, and the aircraft turned left and crashed into a residential area. This occurred when the pilot removed his hand from the control column during his attempts to restart the engine. Because of the low altitude at which the engine stopped, the pilot believed that he did not have sufficient time to conduct the appropriate emergency checklist. He concentrated his efforts on restarting the engine to the detriment of maintaining aircraft control, completing the appropriate checklist items, and conducting an effective forced approach and landing.

Lesson learned—While the cause of the engine stoppage was not determined, the main lesson we can draw out of this is the importance of following the correct procedure for an engine failure after take-off, in sequence, as time and altitude permit. If the engine fails immediately after take-off, you may only have time to close the throttle, attain a recommended landing path, and concentrate on a good landing. Do not become so engrossed in doing checks that you jeopardize the chances of making a good approach and landing. A qualified flight instructor will be glad to review this topic with you at any time. △

TAKE FIVE...

for safety

Five minutes reading could save your life !

Pilots' Rights

As PILOT-IN-COMMAND of an aircraft you HAVE NO RIGHT
... to endanger the lives of your passengers by:

- loading the aircraft beyond its weight and balance limits;
- omitting any flight planning or preflight steps;
- carrying insufficient fuel;
- not completing all systems checks and vital actions;
- flying beyond the limitations of your license, rating or currency;
- accepting an aircraft that is less than fully serviceable;
- exceeding your duty time limits; and
- flying when you are not completely serviceable.

...even if your passenger asks you to.

As PILOT-IN-COMMAND of an aircraft you HAVE EVERY RIGHT to expect your passengers to:

- comply with your directions as to loading of the aircraft;
- respect your request for silence during takeoff and the approach to land;
- accept without complaint the nature of VFR flight and the possibility of delays or overnight stops en route; and
- follow your instructions in the event of an emergency.

Courtesy of *Aviation Safety Digest*
Department of Aviation, Australia

Transport Canada Transports Canada

Canada

EACH TAXI SCENARIO IS DIFFERENT. BE SURE!

RUNWAY INCURSIONS ARE REAL!

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