Transportation Safety Board of Canada
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TRANSPORTATION SAFETY

REFLEXIONS

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AIR

Engine Failure in SEIFR

The Eyes Did Not Have It

Wind, Terrain, and Turbulence

Canada

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Acting on TSB recommendations, Transport Canada initiated several changes affecting single-pilot IFR operations after this accident involving a Pilatus PC-12.

Engine Failure in SEIFR

The TSB forwarded six recommendations to Transport Canada (TC) as a result of the 18 May 1998 forced landing of a Pilatus PC-12 into a Newfoundland bog following an engine failure. The Pratt & Whitney PT6A-67B engine failed because of interrupted oil flow to the first-stage planet gear assembly. The cause of the oil flow interruption could not be determined. The pilot, a company observer, and one of the eight passengers on board sustained serious injuries in the forced landing. — Report No. A98A0067

The PC-12, operating as Kelner Airways Flight 151, was approaching its planned cruising altitude of 22 000 feet (FL220) en route from St. John's, Newfoundland, to Goose Bay, Labrador, when the pilot noted an unusually low indication on the engine oil pressure gauge. Just before levelling off at FL220, approximately 39 nm from St. John's Airport, the low oil pressure warning light activated. The pilot radioed company maintenance personnel about the low oil pressure indications, and he was advised to return to St. John's. The relaying of messages between the pilot and maintenance took about six minutes. The aircraft was, by then, 71 nm from St. John's and 40 nm from Gander Airport. The pilot then requested and received a clearance back to St. John's Airport from Gander Area Control Centre (ACC).

Four minutes after starting the turn back towards St. John's, an engine vibration developed. The aircraft was 44 nm from Gander and descending through FL200. The pilot declared an emergency with Gander ACC and was cleared direct to St. John's. The pilot was initially able to decrease the vibration by reducing the power setting; however, about four minutes later, the vibration became so severe that the pilot had to shut down the engine. The aircraft

The vibration became so severe that the pilot had to shut down the engine.

was about 49 nm from St. John's at an approximate altitude of 13 000 feet when the engine was shut down. The pilot then told Gander that there was a complete engine failure and asked for vectors to the nearest suitable airport. The nearest suitable airport, St. John's, was beyond the glide range of the aircraft at its present altitude. When the pilot advised Gander ACC of this, the controller provided him with vectors to Clarenville Airport, the only other airport in the area, which was 20 nm back, approximately 47 nm southeast of Gander.

The pilot slide-slipped the aircraft to see out the side window.

Approximately 15 minutes after the engine was shut down, the aircraft broke out of cloud cover over a wooded area at an estimated altitude of 400 or 500 feet above ground level. The front windscreen was obscured with engine oil on the outside and condensation on the inside; consequently, the pilot slide-slipped the aircraft to see out the side window. The airport was not visible, and the pilot elected to force-land in a bog.

Insufficient Oxygen

The TSB's analysis of this occurrence concentrated on equipment requirements for single-engine instrument flight (SEIFR) in commercial passenger-carrying operations and on pilot decision-making.

The PC-12 meets the requirement in the *Canadian Aviation Regulations* for pressurized aircraft to carry a 10-minute supply of oxygen for passengers and crew, or an amount sufficient to allow an emergency descent to 13 000 feet, whichever is greater. The SEIFR rule does not stipulate any additional oxygen equipment requirements.

The PC-12 pilot's operating handbook (POH) states that the oxygen system "will supply two crew and nine passengers for a minimum of 10 minutes in which time a descent from 30,000 feet to 10,000 feet is performed." A rapid descent is the best course of action for air contamination or depressurization while under power. However, if the aircraft loses pressurization due to an engine failure, a rapid descent would compromise the aircraft's glide profile and lessen the chances of reaching a suitable aerodrome.

Maintaining the aircraft's optimal glide profile is a fundamental aspect of coping with a total power loss. But, in a high-altitude engine failure scenario, the need to maintain optimal glide speed is at odds with the requirement to descend rapidly to below 13 000 feet. The POH states that at the aircraft's optimum engine-out configuration, it would take 16 minutes to descend to 13 000 feet from 30 000 feet (the maximum altitude for dual-pilot operations). In a descent from 30 000 feet, supplemental oxygen would have been depleted six minutes before reaching 13 000 feet; from 25 000 feet (the maximum altitude for single-pilot operations), it would take about 11.5 minutes for the descent. Therefore, the standard oxygen supply carried is insufficient to allow engine-out letdown using the optimal glide profile while maintaining oxygen reserves.

The need to maintain optimal glide speed is at odds with the requirement to descend rapidly to below 13 000 feet.

The oxygen equipment and supply regulation predates the 1993 implementation of the SEIFR policy. Other regulatory authorities have recognized the need for a specific oxygen equipment rule for SEIFR operations. Australia requires that pressurized SEIFR airplanes be equipped with "sufficient additional oxygen for all occupants to allow the descent from cruising level following engine failure to be made at the best range gliding speed and in the best gliding configuration, assuming the maximum cabin leak rate, until a cabin altitude of 13,000 feet is reached." European *Joint Aviation Requirements—Operations* (JAR–OPS) SEIFR draft regulations propose the same oxygen rule.

Although oxygen supply was not a factor in this occurrence, it has been demonstrated that pressurized SEIFR aircraft operating in Canada may have insufficient oxygen reserves to allow for an optimal engine-out descent from maximum operating level. Therefore, the Board recommended that:

The Department of Transport require that pressurized SEIFR aircraft have sufficient supplemental oxygen to allow for an optimal glide profile during an engine-out let-down from the aircraft's maximum operating level until a cabin altitude of 13,000 feet is attained.
A00-01

Electrical Power Insufficient

The PC-12, with two generators, meets the SEIFR requirement for two independent power generating sources. The POH states that the battery provides power for engine starting and can also provide power to essential electrical systems for 20 minutes in the event of a dual generator or engine failure if the electrical load is less than 60 amps, or 30 minutes if the load is reduced to below 50 amps.

At the PC-12's optimal glide speed and configuration, it would take about 32 minutes to descend to sea level from 30 00 feet, or 28 minutes from 25 000 feet. The typical electrical load from essential equipment on the PC-12 is about 50 amps and, according to Pilatus, a 70%-capacity battery with a rated battery power of 40 amp hours can supply this load for 31 minutes. Powering only the essential instruments and lights, battery power might be nearly or completely spent before touchdown. It may also be necessary to power other electrical systems, further reducing battery life. An attempted engine relight or the use of a landing light at night would place a large draw on the battery. Electric windshield heat may also be required in instrument meteorological conditions. With the pilot windshield heat continuously on light mode, the estimated battery life is 24 minutes; on heavy mode, the estimated life is only 22.5 minutes, which is below the optimal gliding time from the maximum operating altitude.

Australian regulations and the JAR-OPS draft regulations require an electrical system that provides for the following:

(i) one attempt at engine restart;

(ii) descent from maximum operating altitude to be made at the best range gliding speed and in the best gliding configuration, or for a minimum of one hour, whichever is greater;

(iii) continued safe landing; and

(iv) if appropriate, the extension of landing gear and flaps.

The PC-12 pilot thought the oil pressure indications were not valid and did not land as soon as possible.

TC has since advised operators of the PC-12 to install an engine chip detector that functions in all flight regimes.

Along these lines, the Board recommended that:

The Department of Transport require that SEIFR aircraft have a sufficient emergency electrical supply to power essential electrical systems following engine failure throughout the entirety of descent, at optimal glide speed and configuration, from the aircraft's maximum operating level to ground level.
A00-02

Engine Performance Monitoring

The SEIFR equipment standard requires a chip detector system to warn the pilot of excessive ferrous material in the engine lubrication system. The chip detector on the accident PC-12 was designed to be disabled in flight and did not meet the intent of the equipment standard. TC has since advised operators of the PC-12 to install an engine chip detector that functions in all flight regimes.

Further, the engine chip detecting system, as it is currently configured on the PC-12, does not monitor the entire engine lubrication system for ferrous particles, and other aircraft types using the PT-6 may be similarly configured. Therefore, the Board recommended that:

The Department of Transport require that the magnetic chip detecting system on PT-6–equipped single-engine aircraft be modified to provide a warning to the pilot of excessive ferrous material in the entire engine oil lubricating system.
A00-03

Before the implementation of the Canadian SEIFR regulation, TC staff produced a position paper that proposed means of managing the associated risk. One of the proposals was for an engine performance monitoring system capable of monitoring engine parameters and comparing actual engine performance against the ideal. This system would provide operators with early indications of engine damage and deterioration and of the necessity to conduct an early removal and overhaul of the engine. The final SEIFR rule, however, did not include a requirement for such a system.

Other regulating authorities have recognized the value of these systems and have included the requirement. Therefore, the Board recommended that:

The Department of Transport require that SEIFR operators have in place an automatic system or an approved program that will monitor and record those engine parameters critical to engine performance and condition.
A00-04

The 1993 Canadian SEIFR policy was ground-breaking and has led the way for other regulatory agencies to introduce SEIFR. However, it appears that the subsequent rule-making activity by these other aviation authorities is resulting in SEIFR equipment requirements that are more stringent than the Canadian rule. New aircraft equipment technologies and changes to how old equipment is fitted on SEIFR aircraft could serve to lessen the occurrence or consequence of a SEIFR engine failure. Therefore, the Board recommended that:

The Department of Transport review the equipment standard for SEIFR and include equipment technologies that would serve to further minimize the risks associated with SEIFR flight.
A00-05

The pilot misdiagnosed the oil pressure indication.

Pilot Decision Making

In this occurrence, the pilot misdiagnosed the oil pressure indication—he did not think the indications were valid—and therefore did not see the need to "land as soon as possible." The pilot encountered and failed to recognized an "error trap" (an unsafe action taken as a result of wrongful assumptions). The TSB has previously issued a recommendation (A95-11) on cockpit resource management and pilot decision-making (PDM) training for all operators and aircrew involved in commercial aviation. Ineffective PDM in small air carrier operations is still a matter of concern to the TSB. No specific decision-making course is required for SEIFR qualification, yet this training is required to receive operating qualifications in less complex environments, such as for flights in reduced visual flight rules limits.

The accident pilot did not have formal PDM training, company standard operating procedures, or PC-12 simulator training to help him formulate his decision. Without a systemic approach to improving PDM, accidents resulting from ineffective decisions in complex situations will continue to affect commercial operations. The Board believes that improved formal PDM training is a necessity for all commercial pilots. The Board also believes that standard operating procedures and an increased emphasis on appropriate decision making throughout pilot training and during all of a pilot's flying-related activities will serve to reduce the occurrence of PDM-related accidents. Therefore, the Board recommended that:

The Department of Transport improve the quality of pilot decision making in commercial air operations through appropriate training standards for crew members.
A00-06

TC's Responses

In response to the TSB's recommendations, TC developed notices of proposed amendments (NPAs) to the *Canadian Aviation Regulations* (CARs) and the *Commercial Air Services Standards* (CASSs) and submitted them to the December 2000 and June 2001 Canadian Aviation Regulation Advisory Council (CARAC)'s Commercial Air Services Operations (CASO) Technical Committee. Although the committee accepted each NPA, the pertinent articles in the CARs and the CASSs have not yet been amended.

In support of recommendation A00-01, NPA 2000-313 would add a new subsection (g) to CASS 123.22(2) as follows: "sufficient supplemental oxygen for an optimal glide profile during an engine out let-down from 25,000 feet until a cabin altitude of 13,000 feet."

NPA 2000-316 supported recommendation A00-02 and would add subsection (i) to CASS 723.22(2) as follows: "sufficient emergency electrical supply to power essential electrical systems, auto pilot flight instruments and navigation systems following engine failure throughout the entirety of a descent at optimal glide speed and configuration from the aeroplane's operating level to mean sea level."

Concerning recommendation A00-03, TC reviewed the consistency of certification and operational requirements of the chip detector system for single-engine aircraft. The CASO Technical Committee accepted NPA 2000-312, which would amend CASS 723.22(2)(d) to require "a chip detector system to warn the pilot of excessive ferrous material in the entire engine lubrication system in all regimes of flight." In effect, this would require the installation of a second chip detector on engines used in SEIFR operation.

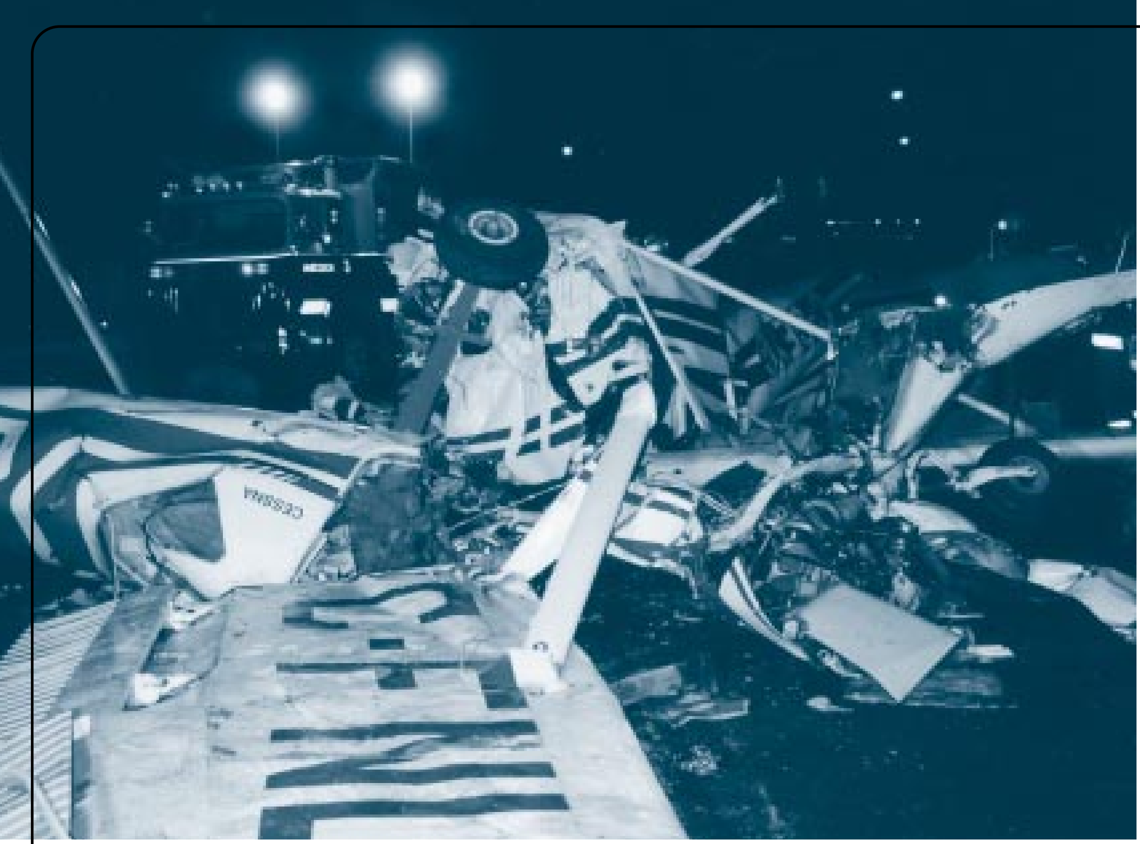
NPA 2000-314 supported recommendation A00-04 and would add subsection (h) to CASS 723.22(2) as follows: "a program that will monitor engine parameters critical to engine performance and condition". For unknown reasons, however, this NPA was subsequently withdrawn.

In response to recommendation A00-05, the CASO Technical Committe accepted TC's NPA 2000-315 at the December 2000 meeting. The amendment would add subsection (h) to CASS 723.22(2) as follows: "an electronic means of rapidly determining and navigating to the nearest airfield for an emergency landing".

Concerning recommendation A00-06, TC Commercial and Business Aviation introduced two NPAs (2001-134 and 2001-135) at the June 2001 CASO Technical Committee meeting. These NPAs to mandate single-pilot standard operating procedures were accepted, and TC contends that this will improve the PDM process for single-pilot operations. Standard operating procedures should improve the PDM process; however, CAR 703.107 has not yet been amended.

REFLEXION

If a pilot suspects a faulty gauge, it is better to carry out a diagnosis once the airplane is safely back on the ground.



Despite good visibility and proper procedures in the circuit, these two Cessnas collided, fatally injuring the four occupants.

The Eyes Did Not Have It

The pilots of a Cessna 150H and a Cessna 172M flying the circuit at Mascouche Airport, Quebec, on 07 December 1997 followed the correct procedures almost to the letter, but the aircraft collided while on final approach 450 feet above ground level. The four occupants of the aircraft were fatally injured.
— Report No. A97Q0250

The Cessna 150 joined the left-hand circuit downwind for Runway 29 at Mascouche after a local pleasure flight. At the same time, the Cessna 172, with an instructor and a student pilot on board, took off from Runway 29 for touch-and-goes on the runway following left-hand circuits.

Here is the sequence of events as reconstructed from radar data at Montréal control centre:

1420:51
The Cessna 150, arriving from the Saint-Hubert area, made a long detour northwards to approach Mascouche Airport on the upwind side of the circuit as the Cessna 172 took off from Runway 29.

1421:49
When the Cessna 150 joined the left-hand for Runway 29, it was preceded by another aircraft that would be first in the landing sequence. At that time, the Cessna 172 began its turn for the crosswind leg.

1423:11
The Cessna 150 stretched its downwind leg while the aircraft ahead turned on the final leg for a full-stop landing. The

The lack of evasive action indicates that neither aircraft had noticed the other.

Cessna 172 began the left-hand downwind leg for Runway 29.

1424:38
The Cessna 150 was now established on final about 5.8 nm from the runway while the Cessna 172 was established on the base leg.

1425:17
When the Cessna 172 turned on the final leg, it was 4 nm from the end of the runway. The Cessna 150 was ahead but at a lower altitude and at a slower speed.

1426:00
The radar identified only one target and then none.

Regulations Were Followed

The information gathered indicates that the pilots established radio communications on entering the circuit, on the downwind leg, and on the final leg, as prescribed in the regulations. Neither aircraft appears to have reported its position on the base leg and was not required to do so. Just before the collision, a third aircraft tried to communicate with the two aircraft on the final leg to advise them of the dangerous situation they were in, but it was already too late.

The crew of each aircraft could have seen the other aircraft at several places in the circuit. There was broken cloud at 2300 feet, and the visibility was 25 statute miles. The pilot of the 150 could have seen the 172 at turning on the base leg and after his turn to final. The pilot of the 172 could have seen the 150 while the 172 was on the downwind leg and during its descent on the base leg. Several factors, such as the appearance of the aircraft, the environment, a lack of attention, or operation of the radios, could explain the collision, but no single factor could be identified in the investigation. The lack of evasive action indicates that neither aircraft had noticed the other.

The two aircraft crashed by the bridge crossing Highway 640 at the exit for Mascouche Airport, 2000 feet from the threshold. Several laceration marks—caused by a propeller—were noted on the top of the Cessna 150's cabin.

Since this occurrence, Transport Canada has delivered several presentations on the subject of circuit procedures at uncontrolled aerodromes, emphasizing the importance of communication to ensure aircraft separation and emphasizing the use of landing lights to increase the probability of being seen.

REFLEXION

How is *your* outside scan while in an uncontrolled circuit? In a student/instructor environment, who is responsible for maintaining a lookout: the student, the instructor, or both?

When the Beaver crashed, it flipped over on its back, leaving only the bottom of the floats visible.

Seaplane Drownings Continue

Two TSB safety studies released in 1993 and 1994 included 16 recommendations aimed at reducing the overall number of seaplane accidents and increasing the survivability of such accidents. Despite the actions taken in response to both sets of recommendations, the number of seaplane accidents that terminated in the water has remained fairly constant, and the ratio of fatal seaplane accidents to total seaplane accidents has increased. — Report No. A98P0215

One such accident occurred on 04 August 1998 when the float(s) of a Harbour Air Ltd. de Havilland DHC-2 Beaver dug into the water on landing at Kincolith, British Columbia. The aircraft overturned and came to rest inverted with only the bottom of the floats visible. Several people who had been waiting for the aircraft rushed to it in small boats but were unable to rescue the pilot and the four passengers, who drowned.

The accident occurred on the pilot's fourth approach to the landing area after a 25-minute flight from Prince Rupert. Witnesses reported that the water surface was rough when the aircraft attempted to land. Therefore, it is most likely that the pilot made the first three approaches to assess the wind and water conditions and to determine the best water surface on which to land.

It could not be determined why the occupants did not escape from the aircraft.

Challenging Conditions

Experienced floatplane pilots find that the wind and water conditions in Kincolith are generally challenging to land in because of the water and the topography surrounding Nass Bay. Several times in the month before the accident, pilots had returned from Kincolith because the landing conditions were unfavourable. In the past, the occurrence pilot, who had 1250 hours in the Beaver, had also returned from unsuitable water landing areas.

Harbour Air asserts that it emphasizes to its less experienced pilots that if they are uncomfortable with the conditions, another company pilot can be called to complete the trip without prejudice to the pilots that decline to fly. The occurrence pilot lacked experience in outlying areas, and the company had routinely scheduled him to fly to less difficult water landing sites. In this instance, the pilot assessed the conditions as within his ability and declined an offer to have another pilot make the flight. However, he indicated that he would assess the conditions in Kincolith and return to Prince Rupert if he judged them unsuitable for landing. The company maintains that he would still have been paid had he decided to let another pilot conduct this flight.

In concert with the reported wind and water conditions, the brief accident sequence observed is consistent with two possible scenarios or a combination of the two:

a) On initial touchdown in a left-crosswind condition, the left float struck a swell or wave that forced the aircraft into an attitude that the pilot was not able to control before the float(s) or wing dug into the water and caused the aircraft to overturn.

b) At or shortly after touchdown, the aircraft was upset by a wind gust that the pilot was not able to control before the float(s) dug into the water and caused the aircraft to overturn.

The doors were functional and operated without difficulty, yet the pilot and the four passengers were unable to escape the aircraft and drowned.

A Survivable Accident

Rescuers found the five occupants unrestrained in the inverted cabin. Their injuries and the damage to the aircraft are consistent with those of survivable accidents. This aircraft was fitted with three-point lap belt and shoulder strap personnel restraints for the two front seats and with conventional two-point lap belts for all cabin seats. The personnel restraint for the right front-seat passenger was found still fastened; she may have slipped out of it as the aircraft overturned. The pilot personnel restraint and the other three passengers' seat belts were found undone and serviceable. No conclusion about the use of the restraint systems on this flight can be made. The passengers were all frequent flyers of floatplanes in the Prince Rupert area and would have been familiar with general seat belt safety and operation. In addition, it was Harbour Air's policy to conduct a passenger safety briefing, including seat belt fastening and adjustment, before all flights.

The normally easy action of locating and operating the door handles would have been a most challenging task.

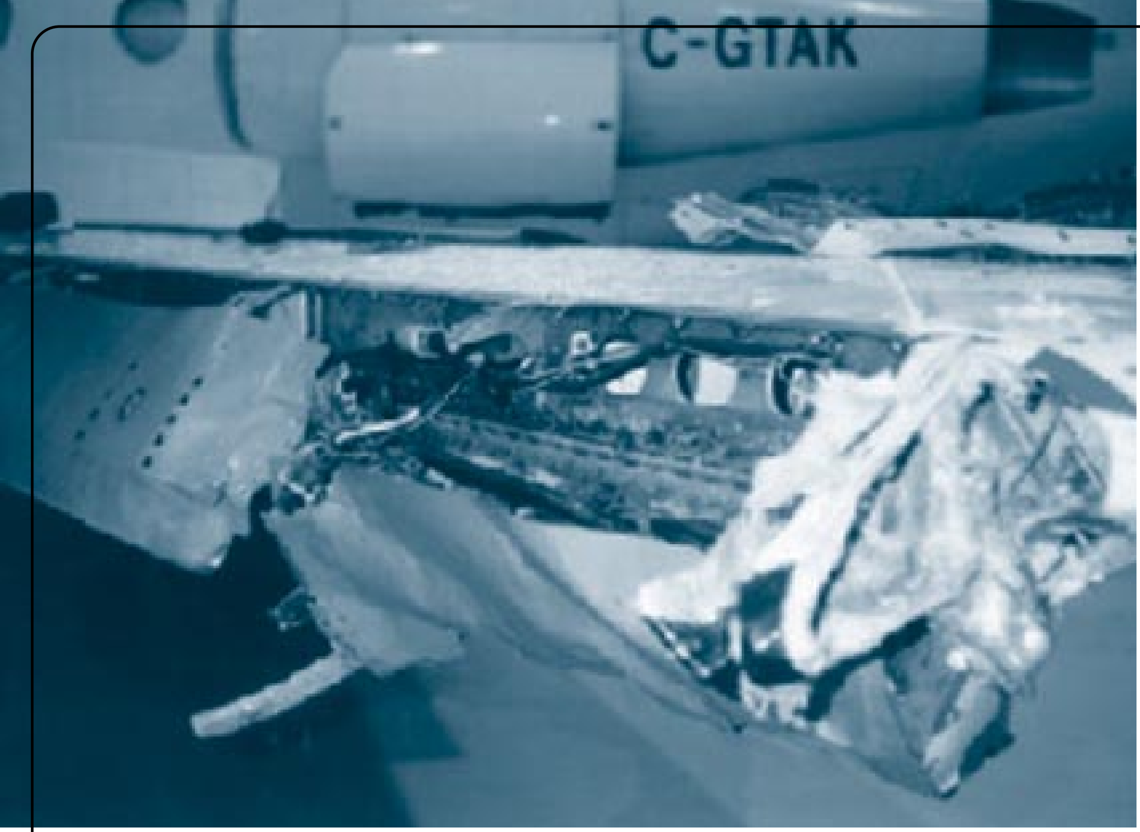
It could not be determined why the occupants did not escape from the aircraft. The doors were found functional and without defect. The interior and exterior handles on both cabin doors were found to turn freely, and the latching mechanisms functioned correctly. However, when the aircraft overturned and rapidly sank, it is probable that the occupants became disoriented in the dark and frigid water and panicked. The confined and inverted cabin would also have made the normally easy action of locating and operating the door handles a most challenging task. After undoing their seat belts, the passengers would have lost reference to their relative locations, thus increasing the challenge. Had the pilot been trained in or exposed to underwater evacuation techniques, he might have escaped and helped others to escape. No existing Canadian regulations require floatplane operators to provide underwater escape training for pilots and cabin attendants. In the past, on a voluntary basis, Harbour Air had provided such training to some of its floatplane pilots.

"Dunk-tank" training is likely the most effective means of preparing pilots for underwater egress.

Physical impediments associated with escaping from a submerged seaplane are often surmountable, despite shock and injury. Occupant restraint systems are required in aircraft. These systems reduce the likelihood of injury on impact, thus increasing the chances of egress. Commercial operators are required to provide preflight safety briefings, including information on the location and operation of exits, to passengers. Despite these defences against occupants not escaping from a submerged seaplane after a crash, accident histories indicate that the risk of drowning due to inadequate preparation for escape is still high.

Given some unnecessary risk associated with underwater escape from crashed seaplanes and the apparent lack of initiatives within the seaplane community to address the issue, the TSB sent Aviation Safety Advisory A000003-1 to Transport Canada (TC) on 02 March 2000. The advisory suggested that TC consider reviewing the previous safety recommendations contained in the TSB safety studies in order to develop effective measures that would enhance the likelihood of escape from cabins of submerged seaplanes.

The Board assessed TC's response to this advisory as satisfactory in part. TC has undertaken many initiatives on this issue, including articles in *Aviation Safety Letter*, pamphlets, training programs, a video, workshops, and enforcement actions. However, much of this material was available before the accident, which was the catalyst for the safety advisory. Also, TC has not addressed the issue of the provision of "dunk-tank" training for seaplane pilots. This training is likely the most effective means of preparing pilots for underwater egress.



Impact with trees caused considerable damage to the Falcon's left wing.

Wind, Terrain, and Turbulence

En route from Gander, Newfoundland, to St. John's on 30 December 1998, the crew of a Dassault Falcon 20 cargo flight operated by Knighthawk Air Express Limited was informed that the glideslope for the instrument landing system (ILS) to Runway 16 and the wind speed indicator (anemometer) at the airport were unserviceable. The crew was given an estimated wind of 150° magnetic at 10 knots, gusting to 25 knots. Although the ceiling was reported below landing minima for the localizer approach, the crew decided to attempt the approach after receiving a pilot report (PIREP) from an aircraft that had just landed on Runway 16. The PIREP did not contain any comment on turbulence. — Report No. A98A0191

During the initial part of the descent into St. John's, only light turbulence was encountered. At about 3000 feet above sea level (asl), the captain, who was the pilot flying, reduced the descent rate and speed. Around this time, there was a marked increase in turbulence, followed by a rapid increase in airspeed and drift. The crew were not overly concerned; they had encountered similar conditions during flights to St. John's in the previous week. The crew configured the aircraft for landing and had begun a correction toward the localizer when the turbulence became severe. Shortly thereafter, the aircraft uncontrollably and rapidly lost altitude.

The first officer believed that, during the rapid descent, he saw the ocean, followed quickly by terrain. He also believed he shouted "terrain" to the captain. The captain, who had taken windshear recovery in a Falcon 20 simulator, applied maximum

The more appropriate warning is that which advises of the potential for dangerous downdrafts.

power and increased the pitch attitude until the stall warning was heard. At about this time, the aircraft descended into trees atop a 920-foot (about 280-m) hill 5.5 nm from the threshold of Runway 16. After clipping several trees, the aircraft began to climb. The crew discontinued the approach and declared an emergency. During vectors for a second approach, the glideslope became serviceable, and an uneventful ILS approach and landing were carried out. The accompanying photograph shows the damage caused to the aircraft's left wing by the trees.

Inadequate Warnings

Most information regarding downdrafts is generally associated with thunderstorms or mountainous regions. Flight crews are provided with information, strategies, and/or training for managing their flights safely when such conditions may be encountered. However, available awareness training or information is limited for the circumstances this crew faced; no thunderstorms were present, and the terrain is not generally considered mountainous.

A cautionary note on the approach charts warns pilots that they may anticipate moderate-to-severe turbulence when approaching St. John's Airport. This is the only advisory of the presence of potentially adverse conditions at St. John's Airport. However, previous issues of the charts advised pilots that dangerous downdrafts could exist on the approaches. The more appropriate warning is that which advises of the potential for dangerous downdrafts.

Pilots who approach St. John's Airport under visual flight rules may not have reference to the instrument approach procedure charts. Because turbulence is not mentioned in *Canada Flight Supplement*, visual flight rules pilots may be unaware of turbulence hazards around the airport.

Avoidance is the fundamental strategy for operating safely in conditions where severe weather exists. This strategy can only be implemented if the crew has the correct information for the area in which the flight will be conducted. In this instance, the area forecast that the crew received before departure from Gander was not the correct forecast for the St. John's area and only forecasted light-to-nil turbulence.

FAF Altitude Could Be Increased

Aircraft on the localizer approach for Runway 16 at St. John's may descend from 2000 feet asl at the initial approach fix to 1600 feet asl and must maintain that altitude until over the final approach fix (FAF).

Transport Canada's (TC) *Criteria for the Development of Instrument Procedures* would allow for an increase in the intermediate approach altitude and FAF crossing altitude for Runway 16. The FAF altitude could be increased to as much as 1900 feet and still meet the maximum gradient for the approach. This altitude increase would help to position aircraft above downdrafts and would help to limit the time that aircraft would be exposed to the hazards of lee-side phenomena associated with precipitous terrain. It would also give the aircraft more terrain clearance in the event of an inadvertent encounter with a downdraft.

The TSB sent two aviation safety advisories to TC. One advisory identified that the obstacle clearance height at St. John's did not take into consideration the wind conditions and the precipitous terrain. The other advisory identified the inadequacy of pilot information regarding the potential hazardous weather/wind conditions. Both advisories suggested that these circumstances could be present at other airports in Canada.

TC and Nav Canada concurred with the advisories. Nav Canada indicated to TC that it will implement procedures to ensure that information regarding potential hazardous weather/wind conditions is available to pilots. Nav Canada will also examine the obstacle clearance criteria at St. John's and will include information on turbulence, windshear, and downdrafts in *Canada Flight Supplement.*

The flight crew in this occurrence reported that the lowest indicated altimeter reading observed was 1300 feet asl, and the lowest observed altitude on radar was 1200 feet asl. Because the aircraft struck the trees at 920 feet asl, this indicates a likely altimeter error of at least 280 feet. Altimeter errors as much as 2500 feet have been recorded in downdrafts.

Both pilots heard and saw the altitude alert but did not react.

Another CFIT Accident

A Beech King Air C90 on an air ambulance flight crashed in a controlled-flight-into-terrain (CFIT) accident during an overshoot on the night of 19 February 1999. Although there were no serious injuries, the emergency medical technician, who was not strapped into his seat, was propelled forward onto the centre console between the pilots. The four-year-old patient, who was lying in a fore-and-aft position on a stretcher, unsecured by the shoulder harnesses, was ejected from the stretcher and landed in the arms of the medical technician. — Report No. A99W0031

The flight, operated by Slave Air (1998) Ltd., was returning to Slave Lake, Alberta, from Red Earth, where it had picked up the patient, the medical technician, a paramedic, and the patient's sister.

During the flight, the pilots discussed options for alternate airports should the weather at Slave Lake deteriorate before their return. The crew received a report from the Edmonton flight service station based on the automatic weather observation system (AWOS) at Slave Lake. Although a low ceiling and low visibility were being reported (500 feet overcast, visibility 2.5 miles), the crew did not alter their plans for a visual flight rules (VFR) approach. Neither did they brief for the eventuality of a missed approach. The crew believed the AWOS report was faulty because they could see the lights of Slave Lake through the undercast. They also thought that missed approach briefings were required only for instrument flight rules (IFR) flight.

Descent Continued in IMC

The aircraft entered a layer of haze and mist at about 2900 feet above sea level (1000 feet above ground level) and lost sight of the lights. The crew continued the descent even though they had lost sight of all outside visual references and were now operating

They thought that missed approach briefings were required only for IFR flight.

in instrument meteorological conditions (IMC), contrary to regulatory requirements. During this time, the first officer was flying and attempting to gain visual contact by looking cross-cockpit; the captain was attempting to provide verbal guidance for the approach.

During the manoeuvring, the aircraft crossed the centreline of Runway 10 (the landing runway), and the first officer, assessing that he could not safely land, passed control of the aircraft to the captain.

The medevac patient was not strapped in by the shoulder straps and was ejected from the stretcher upon impact with the ground.

The captain turned the aircraft left over the lake and away from the lights of the town. Thus, he placed himself into an area that would have few ground lights or references, even in clear air. Additionally, the captain initiated a climb back into IMC and would, therefore, be flying with reference only to instruments. By entering cloud and not changing to instrument flight, the crew lost situational awareness.

Once the overshoot was initiated, the captain and the first officer did not brief or question the other's actions or verbally communicate their functions and tasks. Without a stated plan and intra-cockpit communications, flying the aircraft effectively became a one-pilot operation. This may be due, in part, to pilots regularly working in a mix of single- and two-crew operational environments and the pilots' limited training in crew coordination. (Crews are placed into a two-crew cockpit without the benefit of training specific to their duties as captain and co-pilot.) Without the benefit of such training, crews are less apt to work effectively as a team.

While the aircraft was in the left turn, the radio altimeter, set to 415 feet, activated. Both pilots heard the altitude alert and saw the altitude light activate; however, neither pilot reacted. The aircraft struck the snow-covered lake while in descent.

Patient Stretcher

The stretcher was fitted in accordance with the supplemental type certificate at the midcabin area on the right side. The medical team reported that they normally used the shoulder straps when transporting patients. On this flight, they believed that the patient was showing some signs of anxiety and that the patient would be more comfortable if the shoulder straps were not secured.

After the accident, the Emergency Health Services Branch of Alberta Health reminded its air ambulance medical crews that all stretcher straps, including the shoulder straps, must be fastened during transport. Medical crews were also reminded to follow appropriate cabin safety procedures to ensure their own safety.

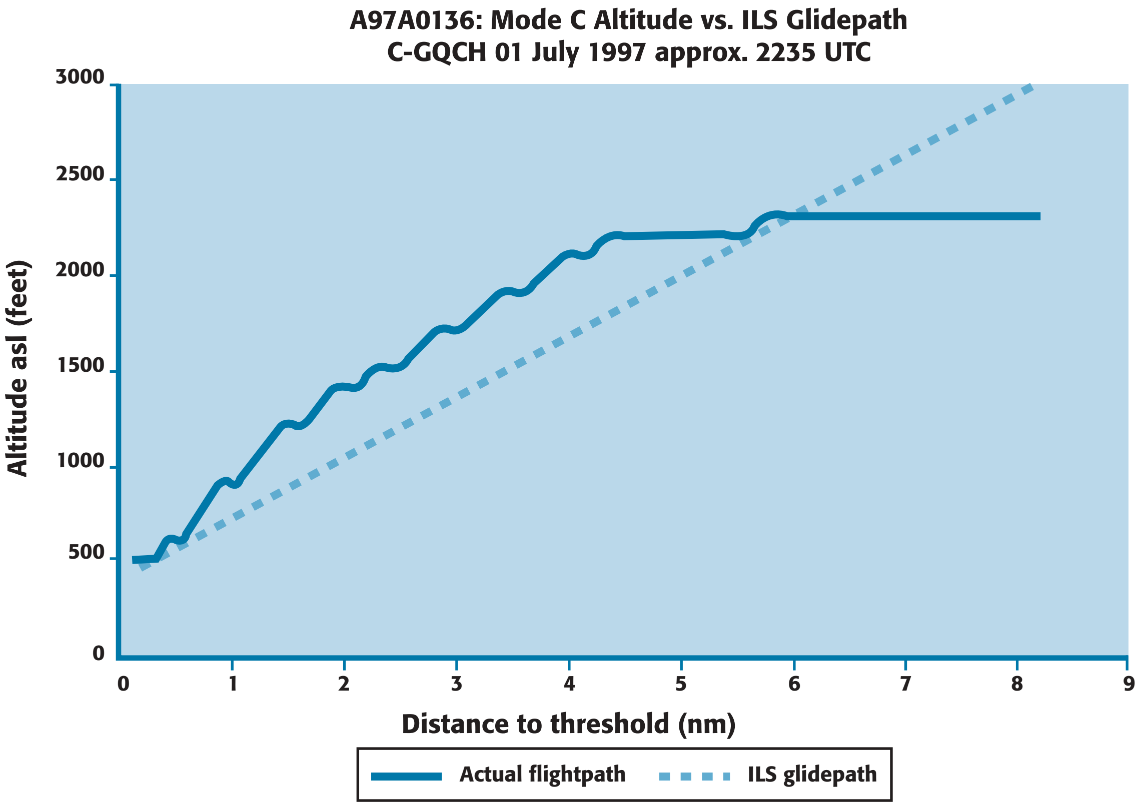
At Slave Air (1998) Ltd., where the King Air C90 has been replaced by a King Air 100, emphasis is being placed on standard operating procedures for VFR and IFR operations, with ad hoc flight checks by the chief pilot to monitor the flight crew. The company now requires VFR approach briefings and has instituted group ground recurrent training. Since the occurrence, all the company crews have attended cockpit resource management training.

The Workload Piled Up

The crew of the Cougar Helicopters Inc. Super Puma helicopter were conducting an instrument landing system (ILS) approach to Runway 29 at St. John's, Newfoundland, after a flight from an oil rig.
— Report No. A97A0136

As the helicopter was about to touch down, the crew realized that the helicopter was lower than normal and that the landing gear was still retracted. The crew began to bring the helicopter into a hover; however, as collective pitch was applied, the nose of the helicopter contacted the runway surface. Once the hover was established, the landing gear was lowered, and the helicopter landed without further incident. Damage was confined to two communications antennae and the supporting fuselage structure. There were no injuries to the 2 crew members and the 11 passengers in the 01 July 1997 occurrence.

The helicopter had departed from St. John's for a flight to an oil rig; however, the weather there was too poor to allow for landing and refuelling. The crew had sufficient fuel under the regulations to return to St. John's, but the available time and options for the return flight were more restrictive than if they had landed at the rig and refuelled. Several factors combined in this occurrence to create a situation where the crew inadvertently did not complete the pre-landing check and then did not recognize the landing gear warning when it activated before the intended landing.



The available time and options for the return flight were more restrictive.

Pre-landing Check Delayed

The flight proceeded uneventfully while returning to St. John's. Air traffic control clearance to the airport and then for descent were received while the aircraft was still a substantial distance from landing. As a result, the pre-landing check was delayed until the aircraft was closer to landing. The crew were advised of the weather conditions and found that the ceiling and visibility were expected to be near approach limits by the time they arrived, which further restricted their options.

The approach was flown by the co-pilot, who operated and closely monitored the automated flight control system. The pilot conducted the radio communications and monitored the overall progress of the approach.

The crew were aware that other higher-speed aircraft were following them on the approach. They decided to maintain cruising speed and delay slowing down to normal approach speed. In this now time-restricted context, the crew received their overshoot instructions, requiring them to go around and set up for another approach. They knew the weather was slightly better at their alternate of Long Pond. The captain decided that if the approach was unsuccessful, he wanted to proceed to Long Pond rather than expend precious fuel and time on an extended procedure to re-attempt an approach that had already been unsuccessful. The approach controller did not initially comprehend what the captain was requesting, and it took several radio transmissions during the next 45 seconds and 2 miles to get things sorted out. This conversation took place while the crew were transitioning to final approach, between 11 and 6 miles from touchdown. The pre-landing check would normally have been completed at approximately this point during the approach. The discussion regarding the missed approach intentions likely provided enough of a distraction that the crew failed to complete the pre-landing check that they had previously delayed.

Shortly thereafter, just before intercepting the ILS glidepath, the crew were instructed to change to the St. John's tower radio frequency. The aircraft then intercepted the glidepath, and because of the higher-than-ideal speed, the aircraft went high on the glidepath. This required the crew to make several power adjustments to slow down and regain the desired approach profile. Despite having an automatic flight control system, the workload for both crew members would be high in this situation. The successful completion of the approach likely became a primary focus for the crew.

Altimeter, Landing Gear Warnings

The crew regained the glidepath shortly before the decision height of 549 feet on the barometric altimeter. Just before reaching decision height, the captain acquired visual reference and assumed manual control of the aircraft to conduct the landing. The crew were conducting the Category I ILS approach to a 100-foot decision height in accordance with the Transport Canada operations specification. With no radar altimeter reference heights on the instrument approach procedure chart, the radar altimeter altitude alert was set to the published height above touchdown of 100 feet. When the aircraft reached decision height, it was still 164 feet above ground level. Therefore, the radar altitude warnings activated sometime after decision height was reached, while the captain was in manual control and slowing down and flaring for the touchdown.

The landing gear warning system will activate whenever the landing gear is retracted, the radar altimeter senses that the aircraft is less than 300 feet above ground level, and the airspeed is 60 knots or less. When the aircraft reached decision height, it was below 300 feet but travelling faster than 60 knots, so the landing gear warning did not activate. However, the warning system did activate sometime while the captain was slowing down and flaring for the touchdown.

To carry out the landing, the captain was flying by visual references, which required looking ahead through the windshield and not directly at the instrument panel. With the prevailing low visibility, this manoeuvre required a high level of concentration. The red warning lights for the radar altimeter and the landing gear are in the lower portion of the instrument panel and thus would both be at the lower edge of the captain's peripheral vision during the landing. It is possible that the captain was concentrating on the visual landing manoeuvre to the extent that, when these warnings illuminated in his peripheral vision, he either did not notice them or interpreted them as the radar altimeter warning, which would be a normal event during the landing sequence.

After the captain took control, the co-pilot monitored the flight instruments and called out altitudes and airspeeds for the captain until a stable hover or touchdown was achieved. The warning lights for the radar altimeter and the landing gear are also in the lower portion of the instrument panel on the co-pilot's side. The landing gear control panel, with the gear position indicators, was well out of the co-pilot's field of view, on the opposite side of the centre console, next to the pilot's left knee. The co-pilot did not recognize the landing gear warning when it activated, and he likely misinterpreted the visual warnings.

The aural warnings for the radar altimeter and the landing gear are close in frequency and are both non-pulsating, constant frequency tones. It was discovered that these tones, should they activate concurrently or in overlapping succession, could easily be misinterpreted as one tone. These tones are heard by the crew through their headsets. At the approximate time that the tones would have activated, several verbal calls were being made by the co-pilot, and likely some verbal acknowledgements were being made by the captain. It is very likely that both warning systems activated at or about the same time and that the crew interpreted them as the radar altimeter warning.

Company Procedures Changed

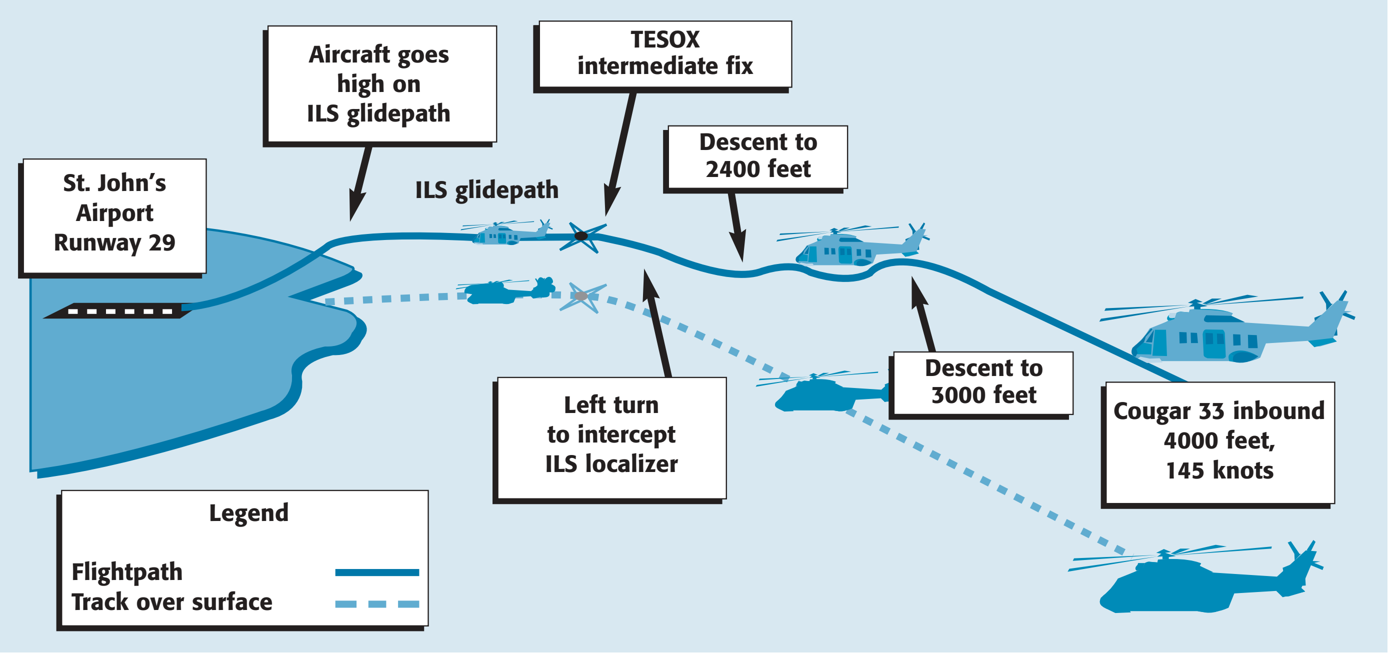
Company procedures now state that the pre-landing check is completed at 10 miles from the landing site. The company believes that this check is much earlier in the approach phase and that, as a result, this policy should ensure the completion of the pre-landing check at a time when other high-priority tasks are not competing for the pilots' attention.

The company introduced a final landing check that is silently carried out from memory on short final. The check covers landing gear, warning lights, coupler, radar, engine instruments, bleed valves, and destination. The non-flying pilot carries out this check and reports to the flying pilot that the "final check is complete."

At the time of the occurrence, the Long Pond approach was an interim procedure that had been used during previous offshore activities. The approach has since been approved, and the company has conducted liaison visits to the air traffic control centre to review unique requirements and alternate landing sites. The company was also investigating optional modifications to the radar altitude and landing gear warning systems to make them more distinct.

REFLEXION

Always take the time to complete the check, even when you don't have the time.



A combination of factors caused the helicopter to go high on the glidepath, requiring the crew to slow down and regain the desired approach profile.

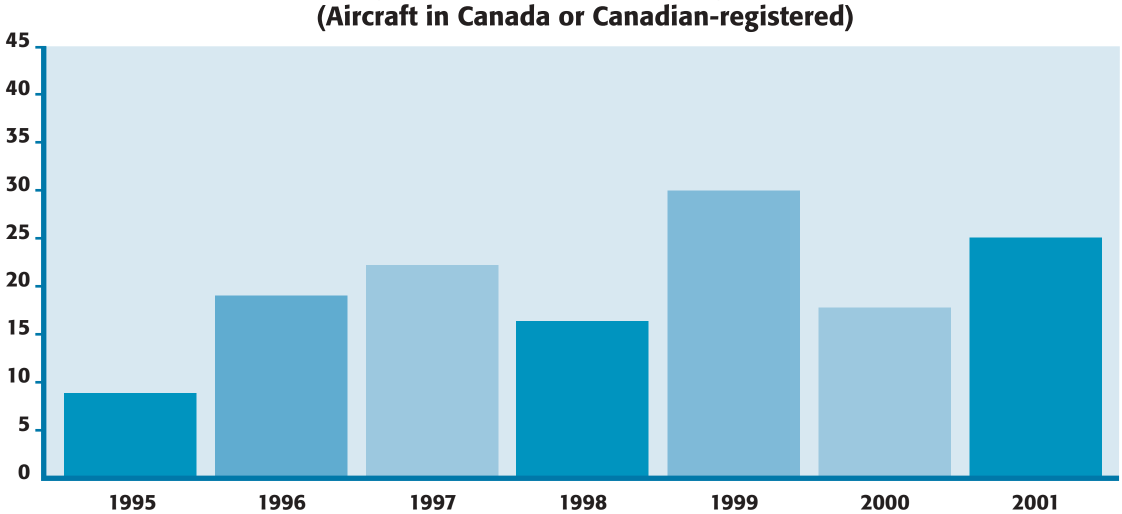
Runway Incursions on the Rise

TSB occurrence data show that the five-year average for runway incursions rose slightly from a decade low of 23 in 1995 to 30 in 1999. However, industry information indicates that in 1997–1999 there was a significant rise in operating irregularities that had the potential to increase the risk of a collision to aircraft during take-off and landing. — Report No. A98H0004

Nav Canada and Transport Canada (TC) have both recently studied the rise in runway incursions. In February 2001, Nav Canada released its *Runway Incursion Study at Nav Canada ATS Facilities Final Report* and outlined strategies for reducing the number of runway incursions. Several of these strategies have already been implemented. TC established a safety review group to examine the problem and, in September 2000, released its *Final Report—Sub-Committee on Runway Incursion* (TP13795). The Incursion Prevention Action Team (IPAT) has harmonized the recommendations from both reports. The team comprises representatives from both organizations and meets quarterly to work on implementing the recommendations.

One such runway incursion incident led to the risk of collision between a Nav Canada Canadair Challenger (Navcan 200) and a TC airport maintenance vehicle (Staff 61) at Terrace Airport, British Columbia, on 17 December 1998. The quick reaction of the vehicle operator in moving his vehicle to the edge of the runway in the few seconds available most likely prevented an accident.

Accidents or Reportable Incidents Involving a Runway Incursion (Aircraft in Canada or Canadian-registered)



1995	9
1996	19
1997	22
1998	16
1999	30
2000	18
2001	25
Total	**139**

Figures as of 11 January 2002.

The driver of Staff 61 was about 10 feet from the vehicle when he heard a jet engine to the south.

The Situation

The Challenger was inbound to Terrace after conducting flight inspection of navaids near the airport. At about 1116 local time, above the airport, the pilot of Navcan 200 advised the Flight Service Station (FSS) specialist on the mandatory frequency (MF) that he was joining the traffic circuit on a left-hand downwind for landing on Runway 33. The specialist responded with a wind advisory (wind calm). About one minute later, the pilot advised turning to final for a full-stop landing on Runway 33, and the specialist repeated the wind advisory.

Meanwhile, Staff 61 had been authorized to inspect previous snow-clearing work. The operator stopped a few times to pick up small pieces of snow that had fallen from a runway sweeper during the previous clean-up. Each time, while out of the vehicle, he left the vehicle door open and switched his radio to the rear exterior speaker.

Just before landing, the pilot requested that the specialist advise the aircraft refuelling company that the aircraft was landing. The specialist spent the next 35 seconds on the telephone with a refuelling company employee. At one point, the specialist commented that he could not see the aircraft after landing because it had disappeared into a layer of fog that partially obscured the northern half of Runway 33. At 1117:57, near the end of the telephone conversation with the refueller, the specialist received a radio call from Staff 61. The specialist did not immediately answer Staff 61 because he was still on the telephone. At 1118:03, the pilot of Navcan 200 reported to the FSS that a vehicle was at the end of the runway. At no time was information regarding the presence of a vehicle on the runway relayed to Navcan 200 by the FSS specialist.

Just before the incident, the driver of Staff 61 was about 10 feet (about 3 m) away from the vehicle when he heard a jet engine to the south. He quickly ran to the vehicle, put it in reverse, and backed over to the edge of the runway. Approximately five seconds had elapsed from the time he heard the jet engines until he saw the aircraft pass by. No communication had occurred between the specialist and Staff 61 for the previous 6 minutes 28 seconds until the call from Staff 61 to the FSS at 1117:57.

Prompted by the radio calls from Staff 61 at 1117:57 and the pilot of Navcan 200 at 1118:03, the specialist immediately instructed Staff 61 to exit the runway (the aircraft had already passed the vehicle) and to report clear. Staff 61 responded that the aircraft was already past his position and that he would follow it to the ramp.

Different Radio Frequencies

The objective of the vehicle control service provided by the FSS is to control the movement of ground traffic on the airport manoeuvring area. Ground traffic does not include aircraft; it includes all other traffic, such as vehicles, pedestrians, and construction equipment. A separate frequency is established for the control of ground traffic entering the manoeuvring surfaces of the airport. At airports where a vehicle control service is provided, vehicles do not normally monitor the MF. As a result, the FSS specialist is the focal point and the exclusive repository for all the available information on air and ground traffic. The FSS has the responsibility to ensure that operators are apprised of essential information as required.

Whenever information is compartmentalized to the extent that a single individual or system is the exclusive conduit for that information, a lapse in memory, a deviation from standard procedures, or a technical failure has the potential to result in an accident. In the absence of a sufficient depth of defence, a single lapse resulted in this occurrence. It did not become an accident only because of an unanticipated and unplanned defence: the operator of Staff 61 received information about a landing aircraft from the sound of the approaching jet engines.

The redundancy that would be achieved by providing more than one person/agency access to the information necessary for safe operation is lost when the information is restricted to only the FSS. The capability of the aircrew or the vehicle operator to listen to the other active frequency would have reduced the likelihood of the occurrence happening.

Terrace Snow-Clearing Procedures

At Terrace Airport, the term "work area 15/33" is reserved exclusively for snow-clearing operations. Snow-clearing vehicles are permitted unrestricted access by the FSS specialist to the entire area. While in the area, vehicles are not required to provide position reports to the FSS. This procedure was instituted because of the excessive amount of snow-removal operations at the Terrace Airport and the number of vehicles normally involved, often up to eight. The reduction in radio transmissions and workload between the FSS and vehicle operators was seen as a significant benefit.

The absence of radio communications to and from Staff 61 may have prevented the specialist from recalling the presence of the vehicle at a critical time. Routine communications requirements, such as position reports in the work areas, could have reminded the specialist that a vehicle was on the runway when Navcan 200 initially reported above the airport.

System Defences

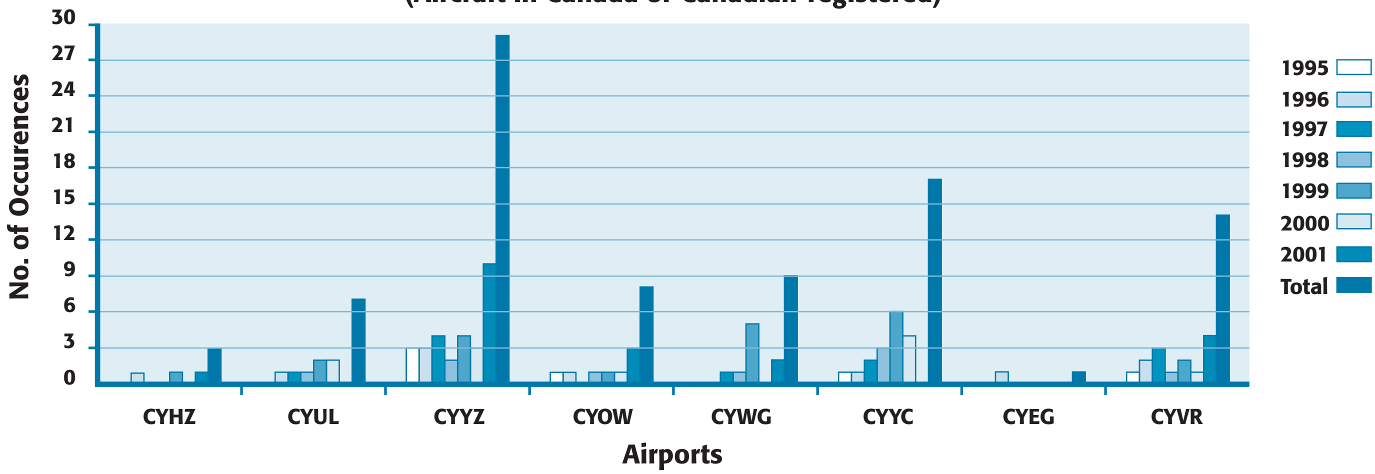
A more positive intervention is required to change a specialist's established routine for gathering information to ensure that the pertinent facts are recalled into working memory at the correct time. For example, Nav Canada has installed a SONALERT system at some of its FSS facilities to actively remind specialists that they have authorized a vehicle to operate on a runway. Terrace FSS and technical staff were also developing another system that would activate as soon as a vehicle strip was placed into the data strip board. However, technological systems alone will not be effective unless the FSS specialist consistently follows a disciplined approach to providing air traffic services, that is, scanning the immediate work area as well as the outside environment to gather all available and required information.

Other Follow-up Action

Through the Canadian Aviation Regulation Advisory Council (CARAC) Part III Technical Committee, Transport Canada was examining the extent to which vehicles should be allowed to use aircraft manoeuvring surfaces when transiting from one aerodrome location to another, with a view to reducing the potential for aircraft/vehicle conflicts. Additionally, the committee will determine whether vehicles at uncontrolled airports should be operating on the same frequency as that used by aircraft.

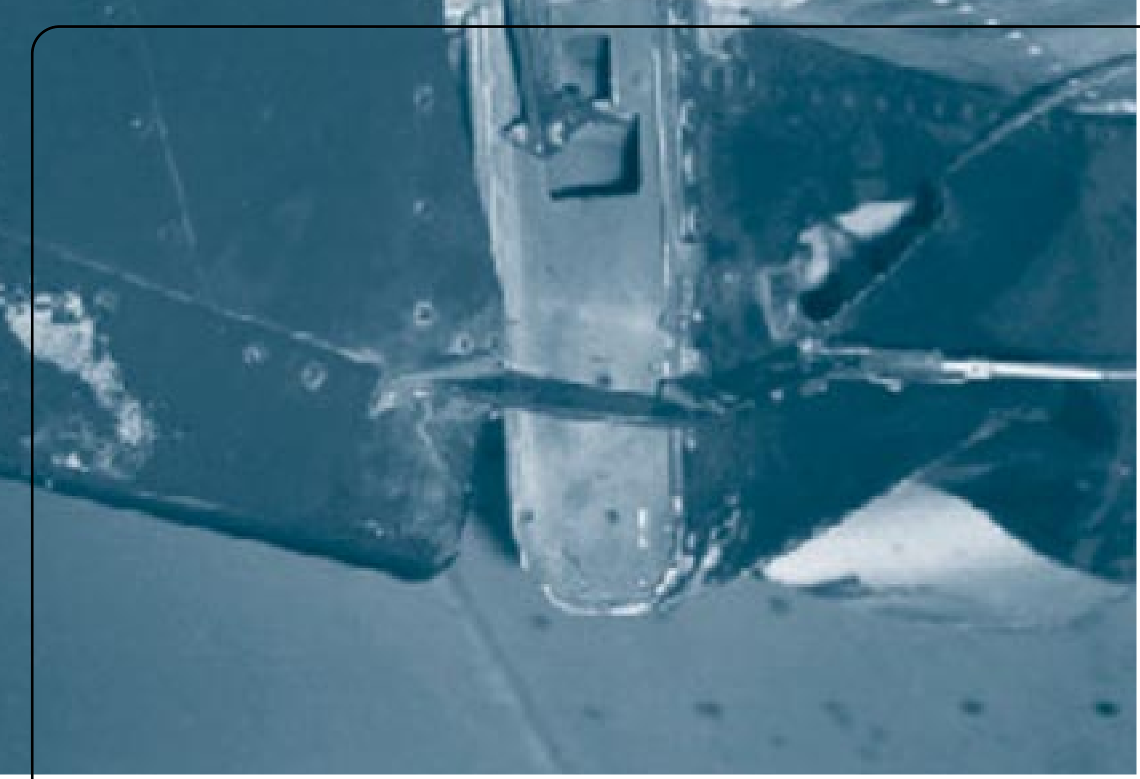
At Terrace Airport, all vehicles that operate on aircraft movement areas have been equipped with receive-only radios tuned to the MF to increase the situational awareness of vehicle operators.

Accidents or Reportable Incidents Involving a Runway Incursion - Major Canadian Airports (Aircraft in Canada or Canadian-registered)



		1995	1996	1997	1998	1999	2000	2001	Total
Halifax	**CYHZ**	0	1	0	0	1	0	1	3
Dorval	**CYUL**	0	1	1	1	2	2	0	7
Toronto	**CYYZ**	3	3	4	2	4	3	10	29
Ottawa	**CYOW**	1	1	0	1	1	1	3	8
Winnipeg	**CYWG**	0	0	1	1	5	0	2	9
Calgary	**CYYC**	1	1	2	3	6	4	0	17
Edmonton	**CYEG**	0	1	0	0	0	0	0	1
Vancouver	**CYVR**	1	2	3	1	2	1	4	14

Figures as of 11 January 2002.



Rudder jammed at 34° deflection.

Jammed Rudder

The student pilot in the Cessna 152 pulled the elevator control fully aft, stepped on the left rudder pedal, and the aircraft entered a left spin. Despite proper recovery actions by the student and the instructor, the aircraft continued downward in a stabilized spin until it struck the surface of a lake. The student pilot escaped the aircraft with serious injuries; the flight instructor was fatally injured in the 18 July 1998 accident at Lake Saint-François, Quebec. — Report No. A98Q0114

When the aircraft was recovered from the water, the rudder was found locked in the full left position. It was observed that the rudder stop plate on the right-hand half of the rudder horn was firmly jammed behind its stop bolt on the fuselage. The rudder was deflected 34° measured perpendicular to the hinge line, whereas the maximum allowable deflection for setting the stops is 23°. When the rudder was released from its jam, the deflection was 23°.

The day before the accident, an apprentice mechanic from Laurentide Aviation at Montréal / Les Cèdres Aerodrome, where the aircraft was based, carried out a 50-hour inspection of the aircraft. During the check, the right pedal rudder bar return spring and a spring attachment for this spring, which was welded to the rudder bar assembly, were found to be broken. The return spring supplied a tension force of about 10 pounds per inch of stretch and balanced the force exerted by the matching left rudder bar return spring. The two return springs maintain tension in the rudder cables that connect to the right and left halves of the rudder horn. Without the right pedal

The apprentice removed, but did not replace, the broken pieces of the rudder control system.

return spring, the right rudder cable slackens. The left rudder pedal return spring will then tend to pull the right rudder pedal toward the pilots, facilitating deflection of the rudder to the left.

The Aircraft Was Not Airworthy

The apprentice removed, but did not replace, the broken pieces of the rudder control system. He then requested the opinion of a company aircraft maintenance engineer, who judged that the absence of the spring and the bracket would not affect the flight characteristics of the aircraft and decided to release the aircraft for service until replacement parts could be installed.

Because the spring was missing, the aircraft was not airworthy. Further, the required entries were not made in the snag book—used by instructors and other pilots to record aircraft defects—or the journey logbook, which was not available to students and instructor pilots for viewing or recording times or defects. Transport Canada (TC) did not approve the use of a snag book at Laurentide Aviation, and TC inspectors were not aware of its use.

Had the logbooks reflected the defect and been available to the pilots, the flight instructor likely would have been aware that the rudder bar return spring was missing. The instructor then would have had the option of refusing to operate the aircraft in that condition.

During a TC maintenance audit of another flight school operator at Saint-Hubert Airport, discrepancies were noted that led to the grounding of several aircraft, including five Cessna 152 aircraft with reported rudder overtravelling. The audit revealed that there were scratches or score marks on the five airplanes, indicating that the rudder horns had overtravelled above and beyond the stop bolt at some time.

Further tests led investigators to conclude that the accident aircraft entered a left spin with the rudder locked at a 34° deflection. With the rudder jammed the way it was, no amount of right pedal force would have released the jam, because the direction of cable pull tends to increase the jamming by closing the horn.

With the rudder jammed the way it was, no amount of right pedal force would have released the jam.

Safety Action Taken and Required

On 14 March 2000, Cessna notified the TSB that it had designed a rudder horn stop bolt with a larger head diameter to prevent overtravel of the rudder after a hard rudder input. Cessna notified the Federal Aviation Administration (FAA) Certification Office about this manner and expected to issue a service bulletin offering the new configuration rudder stop bolt for all Cessna 150's and 152's built after 1996. A time frame for these actions was not specified.

On 09 May 2000, TC issued a service difficulty alert discussing the accident circumstances and outlining details regarding the inspection of the rudder control system.

While stated action by Cessna is appropriate, the Board is concerned that since the proposed service bulletin will be voluntary, not all Canadian-registered Cessna 150's and 152's will be modified. Therefore, the Board recommended that:

The Department of Transport issue an Airworthiness Directive to all Canadian owners and operators of Cessna 150 and 152 aircraft addressing a mandatory retrofit design change of the rudder horn stop bolt system to preclude overtravel and jamming of the rudder following a full rudder input.
A00-09

The implications of the broken or missing rudder cable return spring were not fully understood.

Any mandatory airworthiness actions to retrofit Cessna 150 and 152 aircraft with newly designed rudder horn stop bolt systems will likely take considerable time to complete. In the meantime, these aircraft will be flying with a known safety deficiency. The circumstances of this accident suggest that the implications of the broken or missing rudder cable return spring were not fully understood. Moreover, the possibility of an irreversibly jammed rudder during intentional spin entry by full rudder deflection was not understood until this accident investigation was completed. Therefore, the Board recommended that:

The Department of Transport, in conjunction with the Federal Aviation Administration, take steps to have all operators of Cessna 150 and 152 aircraft notified about the circumstances and findings of this accident investigation and the need to restrict spin operations until airworthiness action is taken to prevent rudder jamming.
A00-10

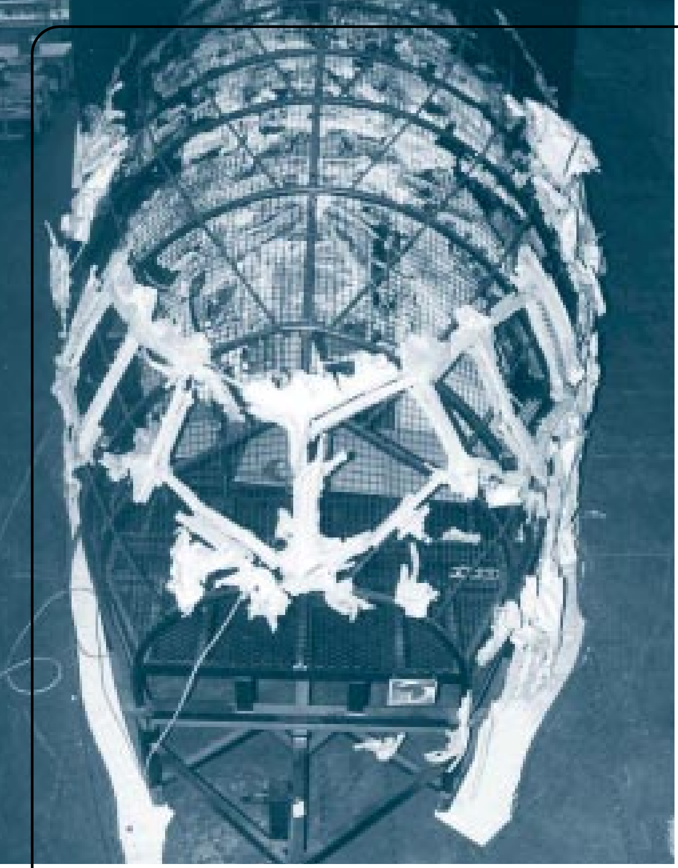
The required logbook entries regarding the maintenance performed on the rudder system were not made. It was evident that the operator, in general, did not maintain the aircraft journey logbooks in accordance with the *Canadian Aviation Regulations*. Therefore, the Board recommended that:

The Department of Transport take steps to ensure that operators and maintenance personnel are aware, in the interests of safety, of the importance of proper maintenance of aircraft journey logbooks and aware of their responsibilities in this regard.
A00-11

The FAA, as the regulatory body in the State of design and manufacture, has primary responsibilities for continuing airworthiness of the Cessna 150 and 152 aircraft. Therefore, the Board recommended that:

The National Transportation Safety Board review the circumstances and findings of this investigation and evaluate the need for mandatory airworthiness action by the Federal Aviation Administration.
A00-12

Transport Canada issued an airworthiness directive effective 04 August 2000 prohibiting intentional spins / incipient spins in Cessna 150 and 152 aircraft until a rudder system inspection has been carried out and any problems rectified. The rudder system inspection is to be completed at every 110 hours or 12 months, whichever occurs first. Aircraft not performing intentional spins / incipient spins are to be inspected not later than 110 hours or 12 months, whichever occurs first, from the effective date of the airworthiness directive and thereafter at every 110 hours or 12 months, whichever occurs first.



SR111 Firefighting Recommendations

In its ongoing investigation into the 02 September 1988 crash of Swissair Flight 111 (SR111), the TSB has identified safety deficiencies in several aspects of the current government requirements and industry standards involving in-flight firefighting. Each of these deficiencies has the potential to increase the time for an aircraft crew to gain control of what could be a rapidly deteriorating situation. Time is a prime consideration in the successful identification and control of an in-flight fire. — Occurrence No. A98H0003

SR111 crashed approximately 20 minutes after the crew detected an unusual odour. About 11 minutes elapsed between the time the crew confirmed the presence of smoke and the time that the fire is known to have begun to adversely affect aircraft systems. The TSB reviewed a number of databases to look for events that had similarities to the scenario of SR111. Fifteen such events were identified, the earliest of which occurred in 1967. For these events, the time from which fire was first detected until the aircraft crashed ranged from 5 to 35 minutes. Each of these accidents had the same characteristic: the in-flight fire spread rapidly and became uncontrollable.

More needs to be done to develop an effective firefighting system.

Integrated Firefighting Measures

During the SR111 investigation, the TSB has necessarily looked beyond the specific circumstances of this single occurrence to examine industry standards in the area of in-flight firefighting. The Board believes that industry efforts have fallen short in this area and that the industry should look at fire prevention, detection, and suppression as being the components of a co-ordinated and comprehensive approach. More needs to be done to develop an effective firefighting system and to ensure that all elements of such a system are fully integrated, compatible, and supported by all the other elements. The SR111 investigation has revealed that a number of safety deficiencies could reduce the chances of an in-flight fire being detected and extinguished in time, such as the following:

- lack of effective fire detection and suppression systems in vulnerable areas of the aircraft fuselage;
- dependence on human sensory systems for the detection of odours/ smoke; and
- inadequate appreciation for how little time is available to detect, analyze, and suppress an in-flight fire.

Therefore, the Board recommended that:

Appropriate regulatory authorities, in conjunction with the aviation community, review the adequacy of in-flight firefighting as a whole, to ensure that aircraft crews are provided with a system whose elements are complementary and optimized to provide the maximum probability of detecting and suppressing any in-flight fire.
A00-16

Smoke/Fire Detection and Suppression

At present, built-in smoke/fire detection and suppression systems in transport-category aircraft are required only in "designated fire zones," which are areas that are not readily accessible and that contain recognized ignition and fuel sources. These areas include powerplants, auxiliary power units, lavatories, and cargo areas.

The Board believes that there is the potential for a fire to ignite and propagate without detection in areas not designated as fire zones, including, but not limited to, the following:

- electronic equipment bays (typically below the floor beneath the cockpit and forward passenger cabin);
- the areas behind interior wall panels in the cockpit and cabin areas;
- the areas behind circuit-breaker and other electronic panels; and
- the area between the crown of the aircraft and the drop-down ceiling (sometimes referred to as the attic area).

The Board believes that the present detection and suppression capabilities in these non-designated fire zones of the aircraft fuselage are inadequate. Such smoke/fire detection is primarily dependent on human senses. In most transport-category aircraft, the occupied areas are isolated from the inaccessible areas by highly efficient ventilation/filtering systems, which can effectively remove combustion products from small fires and impede the timely detection of smoke by human senses. Therefore, small fires can continue to propagate and remain undetected by cabin occupants. Furthermore, any attempt at smoke/fire suppression in these areas would require direct human intervention using handheld fire extinguishers. As the SR111 accident and other occurrences demonstrate, early detection and suppression are critical in controlling in-flight fire.

Small fires can continue to propagate and remain undetected by cabin occupants.

The decision to initiate a diversion and prepare for a potential emergency landing must be made quickly.

Therefore, the Board recommended that:

Appropriate regulatory authorities, together with the aviation community, review the methodology for establishing designated fire zones within the pressurized portion of the aircraft, with a view to providing improved detection and suppression capability.
A00-17

Emergency Landing Preparation

The SR111 accident has raised awareness of the potential consequences of an odour/smoke situation, and the rate for flight diversions has increased as a result. Some airlines have modified their policies, procedures, checklists, and training programs to facilitate timely diversions and rapid preparations to land immediately if smoke from an unknown source appears and cannot be readily eliminated.

It can take a long time to complete the checklist, including troubleshooting actions.

Along with other initiatives, Swissair amended its MD-11 checklist for Smoke/Fumes of Unknown Origin to indicate "Land at the nearest emergency aerodrome" as the first action item. While such initiatives reduce the risk of an accident, the Board believes that more needs to be done industry-wide.

Within the aviation industry, there is an experience-based expectation that the source of odours/smoke will be discovered quickly and that troubleshooting procedures will fix the problem. Although in-flight fires like that aboard SR111 are rare, the TSB review shows that when an in-flight fire continues to develop, there is a limited amount of time to land the aircraft. When odour/smoke from an unknown source occurs, the decision to initiate a diversion and prepare for a potential emergency landing must be made quickly. Therefore, the Board recommended that:

Appropriate regulatory authorities take action to ensure that industry standards reflect a philosophy that when odour/smoke from an unknown source appears in an aircraft, the most appropriate course of action is to prepare to land the aircraft expeditiously.
A00-18

Troubleshooting Time

In circumstances where the source of odour/smoke is not readily apparent, flight crews are trained to follow troubleshooting procedures, contained in checklists, to eliminate the source of smoke/fumes. An indeterminate amount of time is required to assess the impact of each action. It can take a long time to complete the checklist, including troubleshooting actions. For example, the MD-11 Smoke/Fumes of Unknown Origin checklist can take up to 30 minutes to complete. There is no regulatory direction or industry standard specifying how much time it should take to complete these checklists. Therefore, the Board recommended that:

Appropriate regulatory authorities ensure that emergency checklist procedures for the condition of odour/smoke of unknown origin be designed so as to be completed in a time frame that will minimize the possibility of an in-flight fire being ignited or sustained.
A00-19

There is a lack of coordinated cabin and flight crew firefighting training and procedures.

Fire Suppression in Pressure Vessel

Current aviation requirements and standards stipulate that aircraft crews must be trained to fight in-flight fires. However, the TSB found that within the industry there is a lack of coordinated cabin and flight crew firefighting training and procedures to enable crews to quickly locate, assess, control, and suppress an in-flight fire within the fuselage of the aircraft. The Board is also concerned that aircraft crews are not trained or equipped to have ready access to spaces within the fuselage where fires have the potential to ignite and spread. The Board believes that the lack of comprehensive in-flight firefighting procedures and coordinated aircraft crew training to use these procedures constitutes a safety deficiency. Therefore, the Board recommended that:

Appropriate regulatory authorities review current in-flight firefighting standards, including procedures, training, equipment, and accessibility to spaces such as attic areas, to ensure that aircraft crews are prepared to respond immediately, effectively and in a coordinated manner to any in-flight fire.
A00-20

Responses

Transport Canada (TC), the US Federal Aviation Administration (FAA), and the UK Civil Aviation Authority (CAA) support these five firefighting recommendations. The agencies have noted that these broad-reaching recommendations will require international coordination and cooperation among regulatory authorities, aircraft manufacturers, and air operators. In October 2001, representatives from TC, the FAA, and the European Joint Aviation Authorities (JAA) met to "discuss the recommendations, to identify existing initiatives and groups that may already address some aspects covered by the recommendations, and to establish a team to develop an appropriate action strategy." The TSB will closely monitor the progress of these joint deliberations. The FAA has added the TSB's recommendations to its Safety Recommendation Program, and the CAA has taken several steps in support of the recommendations.

It is apparent that TC and the FAA agree with the thrust of the deficiencies and are committed, at least in the short term, to examine these issues and map out a course of action. Collectively, their responses are adequate and constitute a logical first step. Until such time as the details of the proposed action plan are known, it will remain unclear the extent to which the identified deficiencies will be reduced or eliminated. Since these declared initiatives will not yield any substantive change, the responses are considered to show satisfactory intent.

Stay Tuned

The TSB has also identified deficiencies and made recommendations concerning aircraft material flammability standards. Details will appear in our next issue or check out our Web site at **www.tsb.gc.ca**.

Aviation Occurrence Statistics

	2001	2000	1999	1996–2000 Average
Canadian-Registered Aircraft Accidents*	**295**	**319**	**341**	**349**
Aeroplanes Involved**	242	257	287	286
Airliners	5	9	6	8
Commuters	8	4	13	10
Air Taxis / Aerial Work	55	64	89	101
Private/Corporate/State/Other	174	180	171	166
Helicopters Involved	47	53	45	54
Other Aircraft Involved***	9	12	15	13
Hours Flown (thousands)******	**3 860**	**4 260**	**4 100**	**3 942**
Accident Rate (per 100 000 hours)	**7.6**	**7.5**	**8.3**	**9.2**
Fatal Accidents	**33**	**38**	**34**	**37**
Aeroplanes Involved	25	26	28	28
Airliners	0	1	1	1
Commuters	1	1	2	1
Air Taxis / Aerial Work	6	5	6	9
Private/Corporate/State/Other	18	19	19	18
Helicopters Involved	6	11	4	7
Other Aircraft Involved	3	1	4	2
Fatalities	**61**	**65**	**65**	**71**
Serious Injuries	**37**	**53**	**42**	**50**
Canadian-Registered Ultralight Aircraft Accidents	**35**	**38**	**35**	**39**
Fatal Accidents	6	5	12	7
Fatalities	7	9	19	10
Serious Injuries	8	10	7	8

	2001	2000	1999	1996–2000 Average
Foreign-Registered Aircraft Accidents in Canada	**29**	**21**	**24**	**21**
Fatal Accidents	8	8	6	6
Fatalities	10	19	9	58
Serious Injuries	5	3	1	3
All Aircraft: Reportable Incidents	**853**	**730**	**705**	**725**
Collision / Risk of Collision / Loss of Separation	222	169	176	190
Declared Emergency	254	227	209	212
Engine Failure	176	164	157	163
Smoke/Fire	108	84	86	84
Other	93	86	77	75

* Ultralight aircraft excluded.

** As some accidents may involve multiple aircraft, the number of aircraft involved may not sum to the number of accidents.

*** Includes gliders, balloons, and gyrocopters.

**** Source: Transport Canada. (Hours flown are estimated.)

Figures are preliminary as of 08 January 2002. All five-year averages have been rounded.

AIR Occurrence *Summaries*

The following summaries highlight pertinent safety information from TSB reports on these investigations.

JAMMED ELEVATORS

de Havilland DHC-8-102, Québec / Jean-Lesage International Airport, Quebec, 25 April 1988 — Report No. A98Q0057

The elevators of the Air Alliance Dash 8 jammed as the aircraft climbed through 12 000 feet above sea level (asl) during a flight to Montréal, Quebec. The captain tried to disconnect the left and right elevators by using the pitch disconnect handle, but that did not unjam the controls.

The crew declared an emergency and requested clearance back to Québec. The captain was able to control the attitude and the desired vertical speed using elevator trim and engine power. While descending through 6000 feet asl, the captain felt the aircraft's nose suddenly lift up. He immediately corrected the attitude by varying the engine power and using the elevator trim. He continued the descent for landing with 0° flaps so as not to disturb the attitude. The aircraft landed without further incident. After landing, the controls were free of any restriction.

The rivet heads and access plugs are conducive to the adherence of ice.

The carrier's technical staff discovered that the space between the leading edge of the elevators and the trailing edge of the stabilizer was contaminated by large dribbles of rough-textured paint. The technicians sanded the paint drips from the elevators to restore the space between the two surfaces to the manufacturer's recommended standards of between 0.150 and 0.250 inch.

The trailing edge surface of the stabilizer is studded with rivet heads and access plugs that reduce the space between the two surfaces. The rivet heads and the access plugs are conducive to the adherence of ice.

The observed weather conditions—wet snow and rain—during the aircraft's stop at Québec and on take-off met the icing-condition criteria specified by the aircraft manufacturer, the operator, and Transport Canada. The captain conducted two walk-around inspections of the aircraft before take-off, did not see any snow accumulation, and was confident that it was not necessary to de-ice the aircraft. Given the weather conditions, the decision to take off without de-icing the aircraft was questionable.

The use of the elevator trim to alleviate the normal pitch control forces during the climb made it impossible to recognize the imminent jamming of the elevators sooner. It was a potentially dangerous condition to control the aircraft using the elevator trim when the elevators were jammed. Should the elevators have suddenly become free with the trim in the full nose-down position, the aircraft would have quickly nose-dived unless there was an immediate intervention by the flight crew. On approach and especially at low altitude, the situation could potentially lead to impact with the ground.

Following this occurrence, Bombardier sent a letter to all operators and its regional representatives summarizing the occurrence and reminding them of the proper use of elevator trim. Bombardier also issued a Dash 8 safety of flight supplement reminding pilots that the elevator trim does not have the authority to overcome a frozen elevator.

NO INSTRUMENT RATING OR TYPE ENDORSEMENT

Mitsubishi MU-2B, 1 nm W of Parry Sound / Georgian Bay Airport, Ontario, 24 May 1999 — Report No. A99O0126

The MU-2 crashed while in a turn following a downwind take-off at night and in rain with little outside visual reference. The pilot and his son were fatally injured.

Transport Canada records indicate that the pilot attempted, but never successfully completed, the instrument rating examination on several occasions. His US pilot certificate (the MU-2 was US-registered) was issued on the basis of, and valid only when accompanied by, a valid Canadian licence. The pilot provided the US training provider with licensing documentation that indicated he held an instrument rating when, in fact, he did not hold this rating. Further, the pilot did not obtain a high-performance type rating on his licence for this type of aircraft.

The pilot attempted, but never successfully completed, the instrument rating examination on several occasions.

Remains of the MU-2 flown by a non-instrumented pilot on a dark, rainy night.

After this occurrence, Transport Canada (TC) reviewed a cross-section of instrument flight rules (IFR) flight plans from across Canada against the instrument qualifications of the pilot filing the flight plan. Three of the 360 flight plans examined were found to be questionable and required further investigation. Some flight plans were not completed properly and could not be validated. TC determined that the flying of IFR flights by non-instrument-rated pilots is not a widespread or systemic problem in Canada. Nevertheless, a zero-tolerance approach is needed. TC has recommended that inspectors periodically check IFR flight plans to ensure that the filing pilot has a current instrument rating and that offenders be prosecuted. TC also recommended that Nav Canada ensure that flight plans are legible.

TOO MUCH WEATHER, TOO LITTLE EXPERIENCE

Piper PA-34-200T, Québec / Jean-Lesage International Airport, Quebec, 28 March 1998 — Report No. A98Q0043

On initial contact with the Québec tower, the pilot was informed by the controller that the runway visual range (RVR) was 1400 feet, the observed visibility was $^1/_2$ mile in fog, and the vertical visibility was 100 feet.

While the aircraft was approaching, the crew of a Boeing 727, which was four minutes ahead, announced that they were doing a missed approach and that they wanted to turn back to Montréal without attempting another approach. Later, during the approach, the pilot of the Piper was informed that the RVR was 1200 feet. At 200 feet, the published minimum approach height, the pilot initiated a missed approach.

The pilot did not follow the missed approach procedure.

The pilot did not follow the missed approach procedure. The controller had to intervene to bring him back south of the airport and eventually on a heading for a second approach. The instrument landing system missed approach procedure at Québec is not complicated. The first part of the procedure simply requires staying on the runway's centreline and climbing to 3300 feet. This allows the pilot to contact Air Traffic Services and prepare for the second part of the procedure. Although this procedure is simple, it quickly becomes complicated if the workload increases, as during a missed approach. The situation can further deteriorate if the pilot has little experience and training and is the only crew member. This pilot had 63 hours of instrument time but only 1 hour in the previous 6 months.

The Piper Seneca crashed after a second missed approach.

The pilot also performed a missed approach on the second approach. The radar data indicate that the aircraft's speed increased while its altitude continued to drop. The pilot did not modify the aircraft's attitude to begin a pull-up, and the aircraft crashed 3342 feet (about 1019 m) from the threshold of Runway 06. One of the five occupants suffered minor injuries.

NOT CLEARED FOR TAKE-OFF

Airbus Industrie A319 / Cessna 172, Calgary International Airport, Alberta, 27 February 1999 — Report No. A99W0036

The Cessna pilot advised the controller that he would backtrack on Runway 25 for 400 feet. The controller replied that the Cessna would be number one for departure because the other aircraft (another Cessna) on Runway 25 was going to the end of the runway. According to the example given in the *Air Traffic Control Manual of Operations* (ATC MANOPS), the phraseology used should have been, "(Cessna), number two for departure, traffic A319 departing Runway 16." No mention was made to the Cessna that the A319 would be the first to depart. Twenty-one seconds later, the controller issued take-off clearance to the A319.

The Cessna pilot was not aware that the A319 was in position on Runway 16 and did not hear the take-off clearance issued to that aircraft, although they were on the same frequency. Believing he had authorization to take off, he applied power and began the take-off roll. He had second thoughts, however, and momentarily applied brakes. He looked to his right and saw the A319, but was unsure whether that aircraft was moving.

The controller told the Cessna pilot to abort; however, the pilot continued the take-off. The controller also told the A319 to abort, which it did.

He assumed that he had similarly missed the clearance amid the other verbiage.

The Cessna pilot was relatively inexperienced and not yet completely familiar with the speed and complexity of radio communications and the radio monitoring requirements at Calgary. He faced several distractions on this take-off. First, he had planned on using Runway 16 but was offered Runway 25, which he accepted. He did not expect to be authorized to follow the other Cessna and did not expect to be offered take-off in front of it.

His previous experience had prepared him to believe that, once on a runway, he was expected to carry out the take-off procedure without delay. On several occasions in the past, he had also missed the "cleared for take-off" instruction and had been prompted by his instructor to begin take-off. In this situation, he assumed that he had similarly missed the clearance amid the other verbiage. The runway had just been made available to him, the only other traffic of which he was aware (the other Cessna) was behind him, and he had been told that he was number one.

The radio skills and the heightened situational awareness necessary to operate on the surface or close to Calgary International Airport are not specifically targeted during training. Rather, pilots are expected to acquire these skills and awareness by exposure to the various situations encountered during training. This may not ensure sufficient familiarity with all the common safety-related circumstances and practices of which a student or newly licenced pilot should be aware. Those situations that are experienced may not be presented with enough emphasis to convince inexperienced pilots to devise methods to assure themselves that all appropriate clearances and instructions have been followed.

Investigations

The following is *preliminary* information on all occurrences under investigation by the TSB that were reported between 01 May 2000 and 31 December 2001. Final determination of events is subject to the TSB's full investigation of these occurrences.

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
MAY 2000 06	Sydney, N.S.	Piper PA-28	Take-off	Loss of control—stall	A00A0071
10	Cabot Island, Nfld.	Bell 212	En route	Collision with water	A00A0076
10	Abbotsford, B.C.	Bell 47G-2	Take-off	Tail-rotor gearbox malfunction	A00P0077
11	Edmonton Int'l Airport, Alta.	McDonnell Douglas DC-9-30	Take-off	Rejected take-off—runway overrun	A00W0097
20	Resolute, Nun., 35 nm SW	Bell 206L	Take-off	Loss of control—collision with level ice	A00C0099
27	Dorval / Montréal Int'l Airport, Que., 5 nm W	Cessna 650 Boeing 767-233	Approach Take-off	Loss of separation—safety not assured	A00H0003
30	Calling Lake, Alta.	Cessna 177B	Take-off	Loss of control—stall	A00W0109
30	Tofino, B.C., 17 nm E	Boeing 747-400 McDonnell Douglas MD-80	En route En route	Loss of separation	A00P0090
JUNE 01	Helmut, B.C.	Bell 206B	Approach	Collision with fence	A00W0105
01	Kamloops, B.C., 3 nm N	Stits Playmate SA-11A	En route	Collision with terrain	A00P0094
12	Kelowna, B.C., 120 nm NNE	Boeing 737-200	En route	Cabin depressurization	A00P0101
13	Peterborough Airport, Ont., 0.5 nm W	Dassault-Breguet Falcon 20E	Approach	Controlled flight into terrain	A00O0111

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
JUNE 13	McIvor Lake, B.C.	Cessna 180E	Manoeuvring	Loss of control	A00P0099
19	Hotnarko Lake, B.C.	de Havilland DHC-2	Take-off	Loss of control	A00P0103
22	Llewellyn Glacier, B.C.	Bell 206L-3	Manoeuvring	Collision with terrain	A00P0107
JULY 01	Fort Steele, B.C.	Bellanca 65-CA	Take-off	Loss of control	A00P0115
17	Harding, Man.	Piper PA-25-150	Manoeuvring	Loss of control, collision with terrain	A00C0162
19	Porters Lake, N.S.	Cessna 150M	Manoeuvring	Collision with terrain	A00A0110
23	Dorval / Montréal Int'l Airport, Que.	Boeing 747-200	Landing	Runway excursion	A00Q0094
AUGUST 14	Teslin Lake, B.C.	Cessna 208	Take-off	Loss of control, collision with water	A00W0177
17	Green Lake, B.C.	Cessna 185F	Take-off	Collision with water	A00P0157
26	Dorval / Montréal Int'l Airport, Que.	Canadair CL-600 Airbus A319-114	Approach Taxiing	Runway incursion	A00Q0114
29	Dorval / Montréal Int'l Airport, Que., 1 nm W	Airbus A319-114 Cessna 152	Take-off En route	Risk of collision	A00Q0116
SEPTEMBER 06	Lumsden, Sask., 45 nm W	Boeing 747-400 Airbus A319-114	En route En route	Loss of separation	A00C0211
13	Toronto / Lester B. Pearson Int'l Airport, Ont.	Airbus A320-232	Take-off	Fan cowl separation	A00O0199
13	Kingston, Ont.	Cessna 150G	Manoeuvring	Difficulty to control	A00O0210

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
SEPTEMBER 14	Vancouver Harbour Heliport, B.C.	Sikorsky S-61N/SP	Take-off	Input freewheel unit malfunction	A00P0182
15	Ottawa / Macdonald-Cartier Int'l Airport, Ont.	Boeing 727-200A	Landing	Runway overrun	A00H0004
22	Iqaluit Airport, Nun.	Boeing 727-200	Landing	Runway excursion	A00H0005
22	Clearwater, B.C., 18 nm NW	de Havilland DHC-2T	Manoeuvring	Collision with terrain	A00P0184
27	La Grande 4, Que.	Convair Liner 340/580	Landing	Runway excursion	A00Q0133
28	Smithers, B.C., 80 nm NW	Cessna 185F	Manoeuvring	Controlled flight into terrain	A00P0194
OCTOBER 02	Golden, B.C., 3 nm NNE	Cessna 310R	Manoeuvring	Loss of control	A00P0195
02	Fort Nelson, B.C., 90 nm E	Eurocopter AS 350BA	En route	Power loss—mechanical malfunction	A00W0215
03	Ottawa, Ont.	Diamond DA 20-A1	En route	Engine failure—forced landing	A00O0214
06	Rouyn-Noranda, Que., 5 nm S	Cessna 550	Take-off	Fire, explosion, fumes	A00Q0141
08	Vancouver, B.C.	de Havilland DHC-8-200	Approach	Hazardous situation, ATC irregularity	A00P0199
08	Port Radium, N.W.T.	Short Brothers SC-7	Approach	Collision with terrain	A00W0217
12	Rendell Creek Lodge, B.C.	Piper PA-24-250	Take-off	Collision with terrain	A00P0197
25	Vancouver Int'l Airport, B.C.	de Havilland DHC-8-200 de Havilland DHC-8-100	Take-off Standing	Runway incursion	A00P0206
31	Mt. Modeste, B.C., 5 nm NW	McDonnell Douglas 369D	En route	Main-rotor blade failure	A00P0208

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
NOVEMBER 01	Vancouver Harbour, B.C.	de Havilland DHC-6-100	Take-off	Loss of propulsion, collision with water	A00P0210
06	Winnipeg Int'l Airport, Man., 2 nm S	Piper PA-31-350	Approach	Collision with terrain	A00C0260
13	Fredericton, N.B.	Boeing 737-217	Landing	Engine failure	A00A0176
28	Fredericton, N.B.	Fokker F28 Mk 1000	Landing	Runway overrun	A00A0185
DECEMBER 02	Vancouver, B.C., 30 nm NW	Learjet 35A	En route	Loss of aileron control	A00P0225
04	Ottawa / Gatineau Airport, Que.	Beechcraft King Air A100	Landing	Gear-up landing	A00H0007
18	Windsor Airport, Ont.	Antonov 124-100	Landing	Runway overrun	A00O0279
31	Okanagan Mountain, B.C.	Piper Aerostar 602P	Approach	Collision—flight into terrain	A00P0244
31	Fox Creek, Alta., 45 nm W	Hughes 369D (500D)	Manoeuvring	Collision with trees	A00W0267
JANUARY 2001 13	Mascouche, Que	Piper PA-28-140	Take-off	Loss of control	A01Q0009
15	Porteau Cove, B.C.	Sikorsky S-61N	Climb	Loss of main-rotor drive	A01P0003
20	Victoria, B.C., 6 nm S	Cessna 172M	En route	Loss of control—pilot incapacitation	A01P0010
24	Toronto / Lester B. Pearson Int'l Airport, Ont.	Boeing 747-430	Taxiing	Collision	A01O0021
24	Near Edmonton, Alta., VORTAC	Cessna 560 Boeing 747-400	En route En route	ATS-related event	A01W0015

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
FEBRUARY 15	Colombo, Sri Lanka	Airbus A330-300	En route	Component/system-related incident	A01F0020
20	Val d'Or, Que.	Piper PA-31-350	Approach	Loss of control	A01Q0034
MARCH 05	Sydney, N.S., 23 nm SE	Boeing 767-300 Boeing 767-400	En route En route	Loss of separation	A01H0002
14	St. John's Int'l Airport, Nfld., 1.5 nm ESE	Piper PA-30	Take-off	Collision with terrain	A01A0022
15	Victoria Int'l Airport, B.C.	Schweizer 269B (300B)	Landing	Loss of control—tail-rotor drive decoupling	A01P0047
15	Vancouver Int'l Airport, B.C.	de Havilland DHC-8-200 Airbus A319-114	Approach Approach	Loss of separation	A01P0054
25	Eclipse Camp, B.C.	McDonnell Douglas 369D	Manoeuvring	Main-rotor blade failure	A01P0061
27	Massena, N.Y.	Canadair CL-600-2B19 (RJ) Airbus A310-300 Piaggio P.180	En route En route En route	Loss of separation	A01Q0053
30	Teslin, Y.T.	Cessna 215F	En route	Controlled flight into terrain	A01W0073
APRIL 03	Sydney, N.S., 65 nm W	de Havilland DHC-8-100	En route	Power loss—first engine	A01A0030
04	St. John's Int'l Airport, Nfld.	Boeing 737-200	Landing	Landing event	A01A0028
04	Toronto / Buttonville Municipal Airport, Ont., 10 nm NW	Robinson R22 BETA	Landing	Loss of control—collision with terrain	A01O0099

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
APRIL 28	Baker Lake, Nun., 26 nm N	McDonnell Douglas 369E	En route	Forced landing—dynamic roll-over	A01C0064
MAY 12	New Westminster, B.C.	Airbus A320 Cessna 172M	Take-off Manoeuvring	Air proximity—safety not assured	A01P0111
16	Abbotsford, B.C., 10 nm E	Robinson R22 BETA	Manoeuvring	Loss of control	A01P0100
22	Yellowknife, N.W.T.	Boeing 737-200	Landing	Landing event	A01W0117
25	Russell, Man.	Piper PA-28-140	Take-off	Engine power loss—collision with trees	A01C0097
25	Red Earth Creek, Alta., 33 nm NE	Cessna T310Q	Manoeuvring	Loss of control	A01W0118
31	Edmonton, Alta.	Boeing 747-200 Airbus A340-300	En route En route	Loss of separation	A01W0129
JUNE 05	Charlottetown, P.E.I.	Piper PA-31	Take-off	Collision with terrain	A01A0058
08	Duxar Intersection, N.W.T., 110 nm NW	Boeing 737-200 McDonnell Douglas DC-10-30	En route En route	ATS-related event	A01P0126
09	Vancouver Int'l Airport, B.C.	Boeing 767 Airbus A340-300	Approach Approach	Air proximity	A01P0127
10	Winnipeg ACC, Man.	Boeing 767-300 Boeing 747-300	En route En route	Loss of separation	A01C0115
14	Victoria Int'l Airport, B.C.	Bombardier CL-600-2B19	Approach	ILS false localizer capture	A01P0129
15	Empress, Alta., 5 nm W	Boeing 737-200 Boeing 737-200	En route En route	Loss of separation	A01W0144

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
JUNE 17	Toronto / Buttonville Municipal Airport, Ont., 1.4 nm WNW	Cessna 172N	Take-off	Engine stoppage	A01O0157
18	Lake Lavieille, Ont.	Cessna 210	En route	Collision with terrain	A01O0165
20	Uxbridge, Ont.	Cessna 170B Robinson R22	Take-off En route	Collision with moving aircraft	A01O0164
27	Roberval, Que., 80 nm N	Bell 212	En route	Power loss—other engine	A01Q0105
JULY 04	Empress, Alta., 20 nm W	Boeing 737-200 Fokker F28 Mk 1000	En route En route	ATS-related event	A01W0160
07	Nestor Falls, Ont., 2 nm NW	de Havilland DHC-2 Mk. I	En route	Altitude-related event	A01C0152
13	Red Lake, Ont., 35 nm SE	Boeing 757-200 Airbus A320-200	En route En route	ATS-related event	A01C0155
14	Gloucester, Ont.	Aerostar RX-7	Taxiing	Collision with object	A01O0200
18	Cultus Lake, B.C.	Cessna U206G	Landing	Overturned on water landing	A01P0165
18	Dorval / Montréal Int'l Airport, Que., 6 nm NE	Cessna 172N de Havilland DHC-8-102	En route En route	Risk of collision	A01Q0122
20	Corcaigh Int'l Airport, Cork, Ireland	Boeing 727-200	Take-off	Component/system—related incident	A01F0094
22	Abbotsford, B.C.	Pilatus PC-6T	Take-off	Power loss—first engine	A01H0003
23	Port Hardy, B.C., 48 nm E	Cessna 421 de Havilland DHC-7	En route En route	Air proximity	A01P0171

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
JULY 26	Haines Junction, Y.T., 25 nm SW	Cessna 185F	En route	Collision with terrain	A01W0186
30	Grande Cache, Alta., 13 nm W	Aerospatiale AS 350BA	Approach	Operations-related event	A01W0190
AUGUST 03	Timmins, Ont., 1.2 nm N	Cessna 182Q	Approach	Collision with terrain	A01O0210
04	Fort Lauderdale, Fla.	Boeing 737-200	En route	Power loss—first engine	A01F0101
09	Baffin Island, Nun.	McDonnell Douglas 369D (500D)	Manoeuvring	Collision with terrain	A01Q0139
13	Juniper Station, N.B., 42 km NE	Bell 206B	Take-off	Loss of control	A01A0100
13	Mackenzie Lake, B.C., 2.5 nm N	de Havilland DHC-2 Mk. I	Manoeuvring	Weather-related event	A01P0194
20	Valemount, B.C., 37 nm SE	Helio H-295	En route	Airframe failure	A01P0203
24	Invermere, B.C.	Pitts S2A-E	Take-off	Power loss	A01P0207
SEPTEMBER 02	Red Lake, Ont.	Pilatus PC-12	Take-off	Component/system malfunction	A01C0217
13	Swan Lake Airstrip, Y.T.	Beech UC45-J	Take-off	Collision with terrain	A01W0239
27	Winnipeg Int'l Airport, Man., 2 nm N	Beech 95	Approach	Loss of control	A01C0230
OCTOBER 05	Fort Simpson, N.W.T., 5.5 nm WNW	McDonnell Douglas 369HS	Approach	Operations-related event	A01W0255
08	Mont-Joli, Que., 23 nm S	Piper PA-23	En route	Collision with terrain	A01Q0165
08	Mollet Lake, Que.	de Havilland DHC-2 Mk. I	Landing	Collision with terrain	A01Q0166

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
OCTOBER 11	Shamattawa, Man., 1 nm N	Fairchild SA226-TC	Approach	Collision with terrain	A01C0236
15	Fort Liard, N.W.T.	Piper PA-31-350	Unknown	Collision with terrain	A01W0261
23	Toronto / Lester B. Pearson Int'l Airport, Ont.	Boeing 767-200	Landing	Runway incursion	A01O0299
24	Peace River, Alta.	de Havilland DHC-8-100	Approach	Diversion in-flight	A01H0004
NOVEMBER 02	Inuvik, N.W.T., 4 nm NE	Cessna 208B	Approach	Loss of control—fixed wing	A01W0269
08	Cranbrook, B.C., 20 nm NW	Aerospatiale AS 315G	Manoeuvring	Operations-related event	A01P0282
DECEMBER 03	Boundary Bay Airport, B.C.	Cessna 152	Take-off	Component/system-related event	A01P0296
11	Victoria VOR, B.C., 5 nm N	Piper PA-31-350 Cessna 208B	En route En route	ATS-related event	A01P0305
18	Yellowknife Airport, N.W.T., 3 nm E	Eurocopter EC 120B	Approach	Power loss—first engine	A01W0297
31	Fort Good Hope, N.W.T., 25 nm S	Cessna 172N	En route	Collision with terrain	A01W0304

Final Reports

The following investigation reports were approved between 01 May 2000 and 31 December 2001.
*See article or summary in this issue.

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
97-07-30	Bear Valley, B.C.	Bell 206B	En route	Collision with terrain	A97P0207
97-09-06	Beijing, China	Boeing 767-375 ER	Take-off	Uncontained engine failure	A97F0059
97-10-30	Comox Lake, B.C.	Boeing Vertol BV-234	Manoeuvring	Flight control system malfunction	A97P0303
98-02-26	Saint-Hubert Airport, Que.	Cessna 172 Diamond DA 20-A1	Take-off	Midair collision	A98Q0029
98-04-25	Québec / Jean-Lesage Int'l Airport, Que.	de Havilland DHC-8-102	En route	Jamming of elevators in flight	A98Q0057*
98-06-20	Victoria, B.C.	Piper PA-24 Piper PA-30 Fairchild SA-226-TC	Approach	Loss of separation and operating irregularity	A98P0164
98-07-15	Saturna Island, B.C.	de Havilland DHC-2 Mk. I	Overshoot	Loss of control, collision with water	A98P0194
98-07-18	Lake Saint-François, Que.	Cessna 152	Manoeuvring	Spin, loss of directional control	A98Q0114
98-08-04	Kincolith, B.C.	de Havilland DHC-2	Landing	Collision with water	A98P0215*
98-08-13	Windsor, Ont., 3 nm E	Bell 47G-2	Manoeuvring	In-flight main-rotor blade separation	A98O0214

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
98-11-12	Toronto / City Centre Airport, Ont.	Piper PA-23-250	Manoeuvring	Loss of control, stall	A98O0313
98-11-23	Mount Tuam, B.C.	Cessna 208B	En route	Controlled flight into terrain	A98P0303
98-12-03	Iqaluit, Nun.	Hawker Siddeley HS-748-2A	Take-off	Rejected take-off, runway overrun	A98Q0192
98-12-17	Terrace Airport, B.C	Canadair CL-600-2A12	Landing	Risk of collision with airport maintenance vehicle	A98H0004*
98-12-30	St. John's, Nfld.	Dassault-Breguet Falcon 20 D	Approach	Collision with trees	A98A0191*
99-01-04	Saint-Augustin, Que.	Beech 1900C	Approach	Controlled flight into terrain	A99Q0005
99-01-13	Mayne Island, B.C	Douglas DC-3C	En route	Controlled flight into terrain	A99P0006
99-01-18	Langruth, Man., 35 nm W	Boeing 767-233 Boeing 767-300	En route	Loss of separation	A99H0001
99-02-19	Slave Lake, Alta., 3 nm NW	Beech King Air C90	Approach	Controlled flight into terrain (lake)	A99W0031*
99-03-10	Calgary Int'l Airport, Alta.	Boeing 727-200	Landing	Wing strike	A99W0043

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
99-03-19	Davis Inlet, Nfld., 2 nm NNE	de Havilland DHC-6-300	Approach	Controlled flight into terrain	A99A0036
99-04-06	Valentia, Ont.	Cessna 152	Manoeuvring	Loss of control, spiral	A99O0079
99-04-13	Gaspé, Que.	Cessna 335	Approach	Loss of control	A99Q0062
99-04-28	Fairview, Alta., 10 nm E	Aerospatiale AS 355 F1	Approach	In-flight fire	A99W0061
99-05-01	Points North Landing, Sask., 22 nm NW	de Havilland DHC-3	Take-off	Collision with terrain	A99C0087
99-05-01	Calgary, Alta., 6 nm NE	Airbus A320 Boeing 737-200	Approach	Loss of separation	A99W0064
99-05-16	108 Mile Airport, B.C.	Cessna 172D Cessna 172	Approach	Midair collision	A99P0056
99-05-24	Parry Sound / Georgian Bay Airport, Ont., 1 nm W	Mitsubishi MU-2B-40	Unknown	Collision with terrain	A99O0126*
99-06-07	Winnipeg Int'l Airport, Man., 5 nm W	Piper PA-31 Mooney M20C	En route	Loss of separation	A99H0003
99-06-09	Pelican Narrows, Sask., 16 nm NW	Sikorsky S55B/T	Manoeuvring	Power loss, forced landing	A99C0127
99-06-25	Long Haul Lake, Man.	de Havilland DHC-3	Landing	Loss of engine power, collision with terrain	A99C0137

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
99-07-04	Kaslo, B.C., 35 nm NW	Bell 214B	Manoeuvring	Power loss, fuel starvation	A99P0075
99-07-11	St. Andrews, Man., 2 nm SE	Mooney M20F	Manoeuvring	Loss of control, collision with terrain	A99C0157
99-07-11	Saint-Mathias-de-Richelieu, Que.	Cosmos Phase II ES	Manoeuvring	Loss of control, collision with terrain	A99Q0134
99-08-15	Squamish, B.C., 3 nm W	Eurocopter AS 350BA	Manoeuvring	Collision with terrain	A99P0105
99-08-20	Penticton, B.C.	Cessna 177RG Mooney M20C	Manoeuvring	Midair collision	A99P0108
99-08-29	Princess Harbour, Man.	Piper PA-31-350	En route	Engine power loss, forced landing	A99C0208
99-09-24	St. John's, Nfld.	Airbus A320-211	Landing	Landing short	A99A0131
99-10-02	Pickle Lake, Ont., 6 nm N	de Havilland DHC-2	Approach	Fuel contamination, loss of engine power	A99C0245
99-10-10	Bancroft, Ont., 1 nm W	Cessna 172M	Approach	Collision with terrain	A99O0242
99-10-13	Temagami, Ont., 6 nm S	Cessna A185F	En route	Collision with object (wirestrike)	A99O0244
99-10-15	Halifax Int'l Airport, N.S.	de Havilland DHC-8-100 ATR 42-300	Approach	Operating irregularity	A99H0005

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
99-11-20	Cloverdale, B.C.	ERCO Aircoupe 415C Cessna 152	Manoeuvring	In-flight collision	A99P0168
99-11-22	Dryden, Ont.	Fairchild Metro SA-227-AC	Landing	Runway overrun, collision with approach lights	A99C0281
99-12-24	Calgary Int'l Airport, Alta.	Airbus A320-211	En route	Engine fire	A99W0234
99-12-28	Abbotsford Airport, B.C.	Cessna 208	Take-off	Loss of control	A99P0181
00-01-13	Lake Adonis, Que.	de Havilland DHC-2 Mk. I	Unknown	Collision with terrain	A00Q0006
00-01-20	Goldbridge, B.C.	Eurocopter SA 315B	En route	Power loss	A00P0010
00-02-07	Williston Lake, B.C.	Piper PA-31-350	En route	Controlled flight onto ice	A00P0019
00-02-21	Prince George, B.C., 20 nm S	Schweizer 269C	Manoeuvring	Engine power loss, mechanical malfunction	A00P0026
00-03-13	Toronto / City Centre Airport, Ont., 18 nm NE	Cessna 172 Cessna 337	En route	Midair collision	A00O0057
00-03-17	Ennadai Lake, Nun.	Douglas DC-3	Take-off	Loss of control on go-around	A00C0059
00-03-17	Smoothstone Lake, Sask., 10 nm SE	Cessna 180J	Approach	Loss of control, collision with terrain	A00C0060
00-03-23	Innisfail Airport, Alta.	Rotorway Exec 90	Unknown	Loss of control	A00W0072

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
00-03-31	Victoria Int'l Airport, B.C., 8 nm N	de Havilland DHC-6 Cessna 172	En route	Air proximity event	A00P0047
00-04-11	Sydney, N.S., 95 nm N	Airbus A340 Airbus A340	En route	Loss of separation	A00H0002
00-04-11	Maniwaki, Que.	Cessna 172L	En route	Incorrect assembly of aileron control system	A00Q0043
00-04-15	Fox Lake, Y.T.	Cessna 172RG	En route	VFR flight into terrain, reduced visibility	A00W0080
00-04-27	Beloeil, Que.	Bell 206B-III	Manoeuvring	In-flight break-up	A00Q0046
00-05-06	Sydney, N.S	Piper PA-28	Take-off	Loss of control, stall	A00A0071
00-05-10	Abbotsford, B.C.	Bell 47G-2	Take-off	Tail-rotor gearbox malfunction	A00P0077
00-05-10	Cabot Island, Nfld.	Bell 212	En route	Collision with water	A00A0076
00-05-11	Edmonton Int'l Airport, Alta.	Douglas DC-9	Take-off	Rejected take-off, runway overrun	A00W0097
00-05-20	Resolute, Nun., 35 nm SW	Bell 206L	Take-off	Loss of control, collision with level ice	A00C0099
00-05-27	Dorval / Montréal Int'l Airport, Que., 5 nm W	Boeing 767-233 Cessna 650	Approach Take-off	Loss of separation, safety not assured	A00H0003
00-05-30	Calling Lake, Alta.	Cessna 177B	Take-off	Loss of control, stall	A00W0109

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
00-05-30	Tofino, B.C., 17 nm E	McDonnell Douglas MD-80 Boeing 747-400	En route	Loss of separation	A00P0090
00-06-01	Kamloops, B.C., 3 nm N	Stits Playmate SA-11A	En route	Collision with terrain	A00P0094
00-06-01	Helmut, B.C.	Bell 206B	Approach	Collision with fence	A00W0105
00-06-12	Kelowna, B.C., 120 nm NE	Boeing 737-200	En route	Cabin depressurization	A00P0101
00-06-13	Peterborough Airport, Ont., 0.5 nm W	Dassault-Breguet Falcon 20E	Approach	Controlled flight into terrain	A00O0111
00-06-13	McIvor Lake, B.C.	Cessna 180E	Manoeuvring	Loss of control	A00P0099
00-06-19	Hotnarko Lake, B.C.	de Havilland DHC-2	Take-off	Loss of control	A00P0103
00-06-22	Llewellyn Glacier, B.C.	Bell 206L-3	Manoeuvring	Collision with terrain	A00P0107
00-07-01	Fort Steele, B.C.	Bellanca 65-CA	Take-off	Loss of control	A00P0115
00-07-17	Harding, Man.	Piper PA-25-150	Manoeuvring	Loss of control, collision with terrain	A00C0162
00-07-23	Dorval / Montréal Int'l Airport, Que.	Boeing 747-200	Landing	Runway excursion	A00Q0094
00-08-14	Teslin Lake, B.C.	Cessna 208	Take-off	Loss of control, collision with water	A00W0177
00-08-17	Green Lake, B.C.	Cessna 185F	Take-off	Collision with water	A00P0157
00-08-26	Dorval / Montréal Int'l Airport, Que.	Airbus A319-114 Canadair CL-600	Taxiing Approach	Runway incursion	A00Q0114

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
00-08-29	Dorval / Montréal Int'l Airport, Que., 1 nm W	Airbus A319-114 Cessna 152	Take-off En route	Risk of collision	A00Q0116
00-09-06	Lumsden, Sask., 45 nm W	Boeing 747-400 Airbus A319-114	En route	Loss of separation	A00C0211
00-09-13	Toronto / Lester B. Pearson Int'l Airport, Ont.	Airbus A320-232	Take-off	Fan cowl separation	A00O0199
00-09-13	Kingston, Ont.	Cessna 150G	Manoeuvring	Difficulty to control	A00O0210
00-09-14	Vancouver Harbour Heliport, B.C.	Sikorsky S-61N/SP	Take-off	Input free-wheel unit malfunction	A00P0182
00-09-15	Ottawa / Macdonald-Cartier Int'l Airport, Ont.	Boeing 727-200A	Landing	Runway overrun	A00H0004
00-09-28	Smithers, B.C., 80 nm NW	Cessna 185F	Manoeuvring	Controlled flight into terrain	A00P0194
00-10-02	Golden, B.C., 3 nm NNE	Cessna 310R	Manoeuvring	Loss of control	A00P0195
00-10-02	Ottawa, Ont.	Diamond DA 20-A1	En route	Engine failure, forced landing	A00O0214
00-10-02	Fort Nelson, B.C., 90 nm E	Eurocopter AS 350BA	En route	Power loss, mechanical malfunction	A00W0215
00-10-08	Port Radium, N.W.T.	Short Brothers SC-7	Approach	Collision with terrain	A00W0217
00-10-12	Rendell Creek Airstrip, B.C.	Piper PA-24-250	Take-off	Collision with terrain	A00P0197

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	REPORT NO.
00-10-25	Vancouver Int'l Airport, B.C.	de Havilland DHC-8-100	Standing	Runway incursion	A00P0206
		de Havilland DHC-8-200	Take-off		
00-10-31	Mt. Modeste, B.C., 5 nm NW	McDonnell Douglas MD 369D	En route	Main-rotor blade failure	A00P0208
00-11-06	Winnipeg Int'l Airport, Man., 2 nm S	Piper PA-31-350	Approach	Collision with terrain	A00C0260
00-11-13	Fredericton, N.B.	Boeing 737-217	Landing	Engine failure	A00A0176
00-12-02	Vancouver, B.C., 30 nm NW	Learjet 35A	En route	Loss of aileron control	A00P0225
00-12-04	Ottawa / Gatineau Airport, Que.	Beechcraft King Air A100	Landing	Gear-up landing	A00H0007
00-12-31	Okanagan Mountain, B.C.	Piper Aerostar 602P	Approach	Controlled flight into terrain	A00P0244
01-01-13	Mascouche, Que.	Piper PA-28-140	Take-off	Loss of control	A01Q0009
01-01-20	Victoria, B.C., 6 nm S	Cessna 172M	En route	Loss of control	A01P0010
01-03-15	Victoria Int'l Airport, B.C.	Schweizer 269B	Landing	Loss of control, tail-rotor drive decoupling	A01P0047
01-03-30	Teslin, Y.T.	Cessna 210F	En route	Controlled flight into terrain	A01W0073

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