Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

TRANSPORTATION SAFETY

REFLEXIONS

Issue 27 – March 2004

AIR

Out of Gas, Out of Options

The Mountains Win Again

Rapid Decompression and SOPs

Canada

Contents

1
Out of Gas, Out of Options

4
The Mountains Win Again

6
Rapid Decompression and SOPs

www.tsb.gc.ca
For information on the TSB and its work, including published reports, statistics, and other communications products, please see the TSB Internet site.

Reflexions is a safety digest providing feedback to the transportation community on safety lessons learned, based on the circumstances of occurrences and the results of TSB investigations.

Pass it on!
To increase the value of the safety material presented in *Reflexions*, readers are encouraged to copy or reprint, in part or in whole, for further distribution but should acknowledge the source.

Acknowledgements

The articles in this issue of *Reflexions* have been compiled from official text of TSB reports by Hugh Whittington, under contract.

Cover photograph:
Tony Gasbarro

Également disponible en français

ISSN # 1449-2442

Results of a forced landing at a major city intersection

Out of Gas, Out of Options

The Piper PA-31-350 Chieftain pilot estimated that he would have 50 minutes of fuel remaining upon arrival at Winnipeg, Manitoba. However, the aircraft ran out of gas during the second attempt at an instrument landing system (ILS) approach and crashed at a major traffic intersection in downtown Winnipeg, striking traffic signals and several vehicles. All seven of the aircraft passengers and several of the vehicle occupants were seriously injured in the 11 June 2002 accident; one passenger subsequently died from his injuries. — TSB Report No. A02C0124

The Keystone Air Services Ltd. Chieftain was fuelled to its maximum capacity of 192 US gallons (1152 pounds), of which 182 gallons (1092 pounds) is useable, at the company's base in Swan River, Manitoba, the night before the accident. The aircraft was then positioned to Winnipeg to fly a group of fishermen and baggage to Gunisao Lake, Manitoba, and to return with another group. The positioning flight, which was flown by another company pilot, took 1 hour and 38 minutes and the aircraft was not refuelled after arrival in Winnipeg.

After reporting for duty on the morning of the accident, the 3000-hour, airline transport-rated pilot checked the weather and noted that instrument meteorological conditions (IMC) existed at Winnipeg and for part of his route. He filed instrument flight rules (IFR) flight plans from Winnipeg to Gunisao Lake and return. The alternate aerodrome that he filed for both flights was Island Lake, Manitoba, located about 258 nautical miles north of Winnipeg. He completed pre-flight and run-up checks of the aircraft and noted that

The level of supervision that the company should have provided was not achieved on this series of flights.

the total fuel was approximately 3/4 of the total capacity of the aircraft. The pilot accepted seven passengers with baggage for the flight to Gunisao Lake. He did not complete weight and balance or fuel calculations on the operational flight plan and load control form provided in Chapter 8 of the *Keystone Air Services Ltd. Operations Manual*. Based on his belief that a full load of fuel would provide approximately five hours of flight time, he made a mental estimate that there was sufficient fuel to complete a round trip to Gunisao Lake. He estimated that the 3/4 full tanks would allow him to return to Winnipeg with a fuel reserve of 50 minutes, and he did not refuel.

Although there were company supervisory personnel present when the pilot began his flight, none took any action when the pilot began his flight into IMC without an autopilot as required by the *Canadian Aviation Regulations* for single-pilot IMC operations. The level of supervision that the company should have provided was not achieved on this series of flights. Company practices did not conform to the company operations manual regarding flight release; the operations manual was apparently incorrect with respect to the requirements for flight release.

The pilot estimated the flight time from Winnipeg to Gunisao Lake as 1 hour and 20 minutes. The actual aircraft flight time was approximately 1 hour and 31 minutes. At Gunisao Lake, the seven passengers disembarked with their baggage and the pilot accepted six passengers and 450 pounds of baggage for the return flight. He made no further weight and balance or fuel calculations on the operational flight plan and load control form. The pilot estimated the flight time from Gunisao Lake to Winnipeg on his operational flight plan as 1 hour and 20 minutes. The actual aircraft flight time from Gunisao Lake until the overshoot at Winnipeg was 1 hour and 30 minutes. The total flight time from Swan River to Winnipeg plus the flight plan estimates for the flight to Gunisao Lake and return was 4 hours and 18 minutes. These flights would have used 993 pounds of fuel, based on the company's guidance of 240 pounds per hour (pph) and 210 pph for the first and second hours respectively. (The first hour estimate included taxi, take-off and climb fuel.) This would have left a reserve of 99 pounds or 28 minutes of fuel, which was not sufficient for the flight to the filed alternate of Island Lake and the required hold time of 45 minutes.

View along wreckage trail to show vehicular strike

View to illustrate the proximity of a restaurant

Notes made by the pilot found in the aircraft indicate that the company's consumption figures had been communicated to him. The pilot had also noted that the flight time to dry tanks was 4 hours and 45 minutes.

Before the aircraft was on approach to Winnipeg, the right engine low pressure fuel light illuminated and the right engine sputtered. Fuel cross feed was selected, the light went out and the engine returned to normal operation. The pilot did not declare an emergency or ask for assistance.

The pilot flew an ILS approach to Runway 13 at Winnipeg, recognizing that the fuel situation was critical and that engine power loss was imminent. He intentionally flew the aircraft well above the glidepath for the ILS, and at speeds significantly higher than normal, in order to have more time to respond to an engine power loss.

The aircraft was not in a position to return to any runway.

This decision resulted in an ineffective approach from which a landing could not be made, although the reported weather at the time of the approach (300 feet overcast and 1 statute mile visibility) was better than the landing minima required. The pilot's decision, to continue the approach well beyond the ILS missed approach point, did not ensure obstacle clearance while in proximity to the ground in cloud, and effectively reduced, rather than increased, flight safety.

The pilot attempted to inform the air traffic controller during the missed approach that he had an urgent fuel problem; however, the critical information was not received by the controller. The pilot switched the fuel selector from cross feed and re-selected the main tanks in order to conserve the remaining fuel in the left tank for the left engine. The right engine then lost power and he feathered it. Approximately three minutes before the crash, the pilot advised the approach controller that he would like to expedite and return to the airport as soon as possible. Approximately 30 seconds later, the left engine lost power and the pilot transmitted a "Mayday" call. The aircraft was not in a position to return to any runway and crashed as the pilot conducted a forced landing at the major city intersection.

REFLEXION

The company involved in this accident did not provide an adequate level of supervision and did not have a safety system in place to prevent a fuel exhaustion situation from developing. Does your company?

The aircraft struck a tree before the pilot was able to regain control.

The Mountains Win Again

The Rocky Mountains claimed four more victims on 06 June 2002 when a Cessna 182P Skylane crashed at an altitude of 4048 feet above sea level (asl) near Needle Peak, British Columbia, while on a visual flight rules (VFR) flight from Abbotsford, British Columbia, to Springbank Airport at Calgary, Alberta. — TSB Report No. A02P0109

Before departing Abbotsford, the pilot received a weather briefing in person from the Abbotsford flight service station (FSS) specialist, who advised that the weather appeared to be suitable for flight in accordance with VFR.

The geographical area forecast, a summary of the important area forecasts for the area between Abbotsford and Calgary, called for the following conditions: broken clouds based at 6000 feet asl topped at 16 000 feet asl; scattered towering cumulus clouds topped at 20 000 feet asl; prevailing visibility more than six statute miles in light rain showers; isolated cumulonimbus clouds topped at 25 000 feet developing after 1300; and prevailing visibility more than six statute miles in light thunderstorms with hail along the mountains. The freezing level was forecast to be around 6200 feet asl.

It was suggested that the pilot contact Abbotsford FSS, in the vicinity of Hope, British Columbia, on the peripheral frequency of 122.2 megahertz for a weather update, since the weather in the vicinity of Hope is known to be subject to rapid changes. The pilot, who had about 3370 flying hours and an instrument rating, filed a VFR flight plan to Springbank via Revelstoke, British Columbia, and indicated that he would proceed directly to Revelstoke.

The aircraft departed Abbotsford at 1405 local time and was observed on radar to fly directly to Hope at an altitude of 5000 feet asl and at a ground speed of 150 knots. At Hope, at approximately 1430, the radar returns ceased because of the mountainous terrain.

The pilot did not make the suggested call for a weather update.

Weather Worse Than Forecast

The pilot did not make the suggested call for a weather update. Information from three British Columbia Ministry of Transportation weather observation stations, all located within a few miles of the accident site, and a surveillance video, taken at the Coquihalla highway toll both, about five miles northwest of the accident site, indicate that weather conditions at the time and place of the accident were likely much worse than forecast. The ceiling was probably lower than the forecast 6000 feet asl and the freezing level very close to the surface, around 4000 feet asl. In the area of the accident site, the pilot would have encountered rising terrain. He would also probably have encountered a lowering ceiling, likely forcing him to descend below his cruising altitude of 5000 feet asl in order to maintain VFR flight. Near the base of the cloud, he may have encountered turbulence, snow, and airframe icing. However, he would have had very little room to descend as the terrain in that area is relatively high, with no less than five mountain peaks, ranging in elevation from 6009 to 7088 feet asl, located within a 10 nautical mile radius of the accident site.

The wreckage was located by a search aircraft the same day, less than one nautical mile from the Coquihalla highway.

While the pilot had considerable experience in instrument flight, he was not in contact with air traffic control (ATC) and had no instrument flight rules (IFR) clearance. To contact ATC, he would have had to climb several thousand feet because of the high terrain. A climb through cloud from his location would have been risky because of the low performance of the aircraft due to its high weight (it was almost at its maximum take-off weight) and high elevation, as well as the close proximity of the mountain peaks. Had the pilot abandoned visual flight, made a transition to instrument flight, and attempted to climb to a safe altitude, he would likely have encountered icing and possibly thunderstorms.

When he encountered rising terrain and lowering cloud, the pilot probably lowered the aircraft's nose to avoid entering cloud and started a turn to reverse his course. Because no horizon was visible when looking outside the aircraft, the only way to maintain control during this turn would be by reference to flight instruments. For unknown reasons, the pilot lost control of the aircraft, entered a spiral dive and, given the relative proximity of the terrain, the aircraft struck a tree before the pilot was able to regain control.

REFLEXION

Flying in mountainous areas presents many built-in hazards, including quickly changing weather and aircraft performance limitations. This is not a forgiving environment. How do you manage the risks?

Fragments from the failed window

Rapid Decompression and SOPs

Non-adherence to standard operating procedures following a rapid decompression put the crew and passengers in a Beech 1900D airliner at unnecessary risk. – TSB Report No. A02A0046

The Labrador Airways aircraft was climbing through 18 500 feet above sea level (asl) on a flight from Stephenville, Newfoundland and Labrador to St. John's, Newfoundland and Labrador on 25 April 2002 when there was a loud bang. Both crew members experienced severe ear discomfort and the first officer experienced "dizziness." The first officer, who was the pilot not flying (PNF), contacted Gander area control centre (ACC), requested descent, and advised the controller that the aircraft had depressurized. The crew received a descent clearance and the first officer then donned his oxygen mask and switched the microphone selector switch from the normal to the mask position. At about the same time, a passenger approached the cockpit and informed the crew that a cabin window had broken. The passenger then returned to her

The captain did not don his own oxygen mask nor did he deploy the passenger oxygen masks.

Completion of the correct checklist ensures that important safety procedures have been followed.

seat. The captain did not don his own oxygen mask nor did he deploy the passenger oxygen masks.

After donning his oxygen mask, the first officer attempted to communicate with air traffic control; however, he could not hear his voice (side tone) on his headset, and assumed he was not transmitting. Gander ACC, however, was receiving the transmission. Consequently, the captain intervened and requested a clearance to return to Stephenville. At an altitude of approximately 13 000 feet and one and one-half minutes after the window failed, the first officer removed his oxygen mask and resumed communications using his normal microphone. The first officer then made a cabin announcement to the passengers using the passenger address system. The time required for descent to 10 000 feet was approximately five minutes.

After levelling off from the rapid descent and assessing the situation, the crew declared an emergency. The first officer initiated the Cabin Decompression emergency checklist; however, the captain redirected him to the Cabin Door or Cargo Door Unlocked emergency checklist. This latter checklist was the only emergency checklist actioned.

The crew members were able to determine that the third cabin window on the right side of the aircraft had failed, but were unable to establish if there was more extensive damage. The crew carried out an uneventful landing in Stephenville.

Company SOPs

The company standard operating procedures (SOPs) and the aircraft emergency checklist require that in the event of a rapid cabin decompression, the crew is to initiate an emergency descent and don their oxygen masks. After the descent and when the aircraft is stabilized in level flight below 13 000 feet, the Emergency Descent and Cabin Depression checklists are to be called for and completed. Completion of the correct checklist ensures that important safety procedures have been followed.

At the first indication of the depressurization, the captain, who was the pilot flying, should have initiated an emergency descent while the first officer donned his oxygen mask. Once the first officer had his mask on, control of the aircraft should have been transferred and the captain should have donned his oxygen mask. Also, passenger oxygen should have been selected once the crew had their masks donned. Non-adherence to the SOPs put the crew and passengers at unnecessary risk after the rapid decompression.

Following this incident, a Transport Canada inspector qualified on aircraft type was assigned to conduct the following at Labrador Airways:

1. a review of the SOPs currently in use to determine if improvements can be recommended;
2. conduct in-flight inspections with particular emphasis on the intelligibility of public announcements and radio transmissions via the mask microphone;
3. review of and/or monitor High-Altitude Indoctrination training; and
4. monitor Technical Ground and Flight/Simulator training and Pilot Proficiency Checks, with emphasis on SOP usage, rapid decompression and proper oxygen mask usage.

Transport Canada said it was considering the requirement for action on a national basis.

The Damaged Window

Examination of the aircraft showed that most of the right cabin emergency exit window and a piece of the interior window trim were missing, with only small window fragments still attached to the window seal. The failed window fragments and the two right side forward cabin windows were removed and sent to the manufacturer for further examination. Two of the fragments contained the area of the plastic side window that protruded beyond the rubber seal and was exposed to the environment in a similar manner as the two forward side windows. All the cracked edges appeared to be the result of secondary cracking failures propagating from the original crack failure. Both pieces had surface chip gouges on the exterior surface between the rubber seal and the cracked edge. The chip gouges measured 0.022 inches deep by 0.050 inches wide and 0.028 inches deep by 0.075 inches wide.

The *Beech 1900 Maintenance Manual* states that, for pressurized flight, the maximum allowable depth for scratches, gouges, or chips in a window is 0.015 inches. Examination of the two forward side windows revealed many light scratches and small chipped gouges that ranged in depth from 0.009 to 0.026 inches, with one of the gouges reaching a maximum width of 0.125 inches.

It appears that at some time during the aircraft's operating history, a take-off was conducted from a runway surface that had excessive debris on it, and this debris was blown against the windows by the right-hand propeller, causing surface gouges. With only small fragments from the failed window available for examination, the exact cause of the window failure could not be determined. However, these fragments and the adjacent windows had surface chip gouges in excess of the recommended tolerance and some of the gouges had cracks protruding internally. Therefore, it is probable that a cracking failure occurred due to the extensively damaged condition of the exterior surface of the window.

Prior to this incident, the operator measured window surface damage with a needle tip dial indicator. During laboratory testing, Raytheon used a 966A1 Optical Micrometer and a SPI scale comparator. Labrador Airways has since purchased an optical micrometer for window inspections. In tandem with this, a Quality Assurance Bulletin was issued changing the inspection schedule from 1200 hours to 200 hours; the bulletin also states that any window with questionable limits is to be replaced before flight.

As a safety action, the operator has replaced the three forward side windows on both sides of the aircraft with multi-ply windows.

Dual failures of the input freewheel unit led to the loss of this helicopter.

Dual Engine Failure

A history of accidents shows that when one engine, or one input freewheel unit, fails on a Sikorsky S-61 helicopter, a significant risk exists that the second input freewheel unit will also fail, causing a dual engine power loss. That is what happened to a Sikorsky S-61 during heli-logging operations at Wendle Creek, British Columbia on 08 August 2002. — TSB Report No. A02P0169

The American-registered helicopter, being flown by Canadian pilots, was using a 200-foot longline and was picking up a load of logs from an area at 4200 feet above sea level (asl), uphill from standing timber at the edge of a cut-block when the engine sound stopped. White smoke was seen coming from the engine exhaust area for about three seconds, and the main rotor began slowing as the helicopter flew down the hillside, over the standing timber, toward the log-landing area. The rotor continued slowing and several seconds later, the helicopter struck trees, then the ground, at 3700 feet asl. The helicopter was destroyed and both pilots were fatally injured.

The rotor continued slowing and several seconds later, the helicopter struck trees, then the ground, at 3700 feet asl.

An inspection of the engines did not reveal any anomalies that would have caused them to stop operating prior to impact. However, the white smoke seen coming from the engine exhaust area after the engine sounds stopped suggests that, although the engines were still turning and fuel was being introduced, the fuel was not being burnt. The most likely explanation for these events is an engine overspeed and shutdown.

Sikorsky S-61 using a longline to pick up logs

Engine Overspeed

An engine overspeed is possible for a variety of reasons, including a drive train interruption such as an input freewheel unit (IFWU) spit-out, defined as the rapid, forceful and complete disengagement of the rollers in the IFWU during operation. The IFWU itself is a mechanical device that functions as a one-way clutch, allowing a helicopter's engine to drive the rotor but preventing the rotor from driving the engine.

The left and right IFWUs had been overhauled by the operator, Croman Corporation, on 12 September 2001, using new camshafts, roller retainers, rollers, supports (oilites), gear housings and gear housing bearings. At the time of the accident, the IFWUs had accumulated 532 hours, which is within the recommended time between overhaul (TBO) of 500 ± 50 hours for IFWUs used for repetitive external lift (REL) operations (this TBO had been recommended by Sikorsky as a direct result of the finding of increased IFWU wear in REL operations noted in TSB Report No. A93P0051). Following the accident, the IFWUs were disassembled, inspected, and several component parts were tested. The right and left IFWUs exhibited similar wear and damage.

Metallographic examination of the area around flat spots on the rollers showed an untempered martensite surface layer. Skidding and spit-out of the rollers is the most likely cause of these metallurgical anomalies. The rollers were

The rollers were not through-hardened to the required specification during their manufacturing process.

not through-hardened to the required specification during their manufacturing process. It is not known what effect this defect may have had on the IFWU's ability to maintain engagement. Wave-shaped areas of raised metal on the camshaft flats on the low (disengaged) side of the roller impressions indicate that the rollers were forced in the disengaged direction with extreme and unusual force. Other damage to the IFWU components—smearing of the roller metal, denting and pitting of the gear housing roller path, and breakup of the oilites—is also indicative of damage caused by slipping and spitting out.

Damage to the oilites can cause a loss of support to the roller retainer. This in turn can cause a loss of alignment of the rollers, which increases the likelihood of roller spit-out. During normal operation, the oilites are stationary and do not carry a load. However, a quantity of fine bronze particles was found in the oil, indicating that the oilites were subject to repeated small loads and motions, such as would occur as the result of vibration. Contamination of the roller path with oilite material increased the likelihood of roller spit-out.

Engine Shutdowns Almost Simultaneous

It is likely that when the first IFWU spit out, the affected engine oversped and shut down. As the other engine/ IFWU took up the full load of the rotor, that IFWU spit out and its associated engine oversped and shut down. The IFWUs disengaged one after the other with so little time between disengagements that the disengagements could be considered simultaneous. It is unlikely that the helicopter entered fully developed auto-rotation descent because of the loss of rotor rpm, the height available, and the manoeuvring required.

Pilots of dual engine helicopters reasonably expect that, in the event of a power loss from the first engine, the second engine would be available.

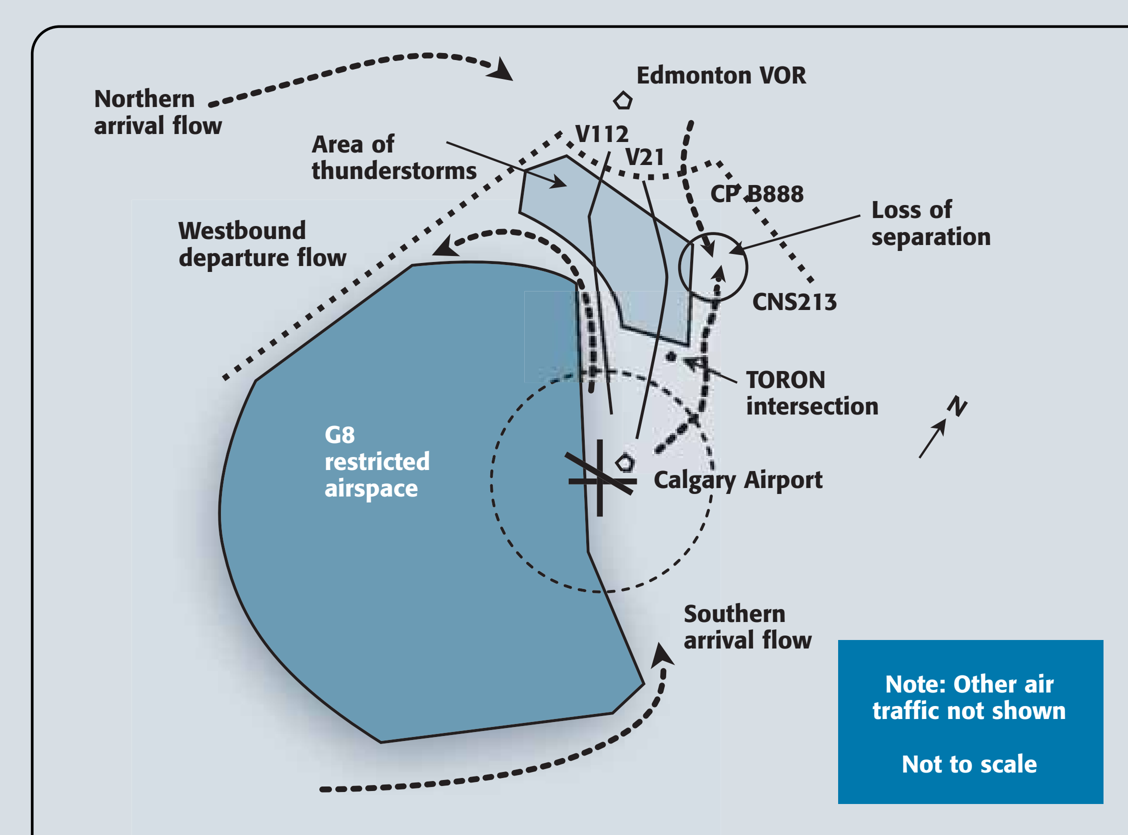
Pilots of dual engine helicopters reasonably expect that, in the event of a power loss from the first engine, the second engine would be available. In part, this expectation forms the basis for the pilots' acceptance of the level of operational risk. Unlike helicopters that operate the majority of the time in cruise flight, a helicopter working in a high risk flight regime (such as heli-logging) is unlikely to be able to carry out a successful autorotation in the event of a total drive train power loss.

Sikorsky issued Alert Service Bulletin (ASB) No. 61B35-67A, dated 11 October 2002. In part, the ASB reduced the TBO for IFWUs used for repetitive external lift operations from 500 hours to 350 hours. The ASB also required that certain IFWU components be measured and inspected during disassembly for overhaul, and that these measurements, as well as details of the condition of the components, be forwarded to Sikorsky.

Transport Canada is reviewing the ASB to determine the rationale for reducing the TBO of the IFWUs and the applicability of the ASB to Canadian operators of the S-61 aircraft. As well, Transport Canada is reviewing REL operations in general in an effort to determine the validity of established certification and maintenance programs.

It is unlikely that the helicopter entered fully developed autorotation descent.

Occurrence diagram



A Recipe for Trouble

A large block of restricted airspace, thunderstorms and an air traffic control situation with a high concentration of complex air traffic combined to form the recipe for a loss of separation in the skies 60 nautical miles south of Edmonton, Alberta, on 27 June 2002. — TSB Report No. A02W0115

A British Aerospace Jetstream 3112, operating as Corpac Canada Ltd.(Corporate Express) flight CPB888, was en route under instrument flight rules (IFR) from Fort McMurray, Alberta, to Calgary International Airport, Alberta, while a Fairchild SA227DC operating as Alta Flights (Charters Inc.) flight CNS213, was en route, also under IFR, from Calgary International Airport to Edmonton City Centre Airport, Alberta. Because of extensive thunderstorm activity between Edmonton and Calgary and the restricted airspace (CYR255) associated with the G-8 Conference at Kananaskis, Alberta, both aircraft were diverted east of their flight planned routes. At 1610 local time, the aircraft met on a nearly reciprocal heading at an altitude of 16 000 feet above sea level (asl). They had vertical separation of 200 feet and lateral separation of 1.3 nautical miles (nm) in an area where 1000 feet or 5 nm is required. The aircraft passed in cloud and neither crew saw the other aircraft.

The aircraft passed in cloud and neither crew saw the other aircraft.

CPB888 was flight planned at an altitude of 16 000 feet and was given a heading of 175° magnetic to intercept the 354° radial of the Calgary very high frequency omni-directional range (VOR) beacon. This heading resulted in a track of about 164° because of westerly winds. Control was handed off to the Edmonton departure sector, and then to the Red Deer en route sector. The aircraft remained at 16 000 feet.

Inappropriate Altitude

When CPB888 passed from the La Biche, Alberta, en route sector to the Edmonton north terminal sector, its altitude of 16 000 feet was appropriate for the direction of flight. After the aircraft turned onto a track of 164°, 16 000 feet was then inappropriate. NAV CANADA had no policy to routinely clear southbound aircraft through the Edmonton terminal into the Red Deer sector at altitudes inappropriate for the direction of flight. There was no provision in the preferred route system to abrogate the responsibility of controllers to follow (*Air Traffic Control) Manual of Operations* (MANOPS) or *Canadian Aviation Regulations* requirements. Since much of the traffic in the sector spent a significant amount of time climbing or descending in association with the terminal areas, it had become normal among controllers to vector aircraft toward the TORON intersection at inappropriate altitudes, often without following MANOPS guidelines regarding implementation, hand offs and flight progress strip marking.

The crew of CPB888 anticipated remaining at 16 000 feet consistent with previous experience, and the turn to a direction that required a different altitude did not pose any concern. There are indications that pilots in local companies, including those involved in the occurrence, were accustomed to receiving altitudes inappropriate for the direction of flight through the Edmonton terminal and Red Deer en route sectors, and would seldom query controllers on the validity of these altitudes. This was likely due, in part, to the *Canada Flight Supplement* planning section statement that pilots may be cleared at inappropriate altitudes for direction of flight on preferred routes between Edmonton and Calgary.

CNS213 was flight planned from Calgary to Edmonton via V112 to the Edmonton VOR at 16 000 feet asl and proceeded at an initial altitude of 14 000 feet asl. Five minutes before the occurrence, the Red Deer sector radar controller cleared CNS213 to maintain 16 000 feet asl. When the two aircraft were about 4.2 nm apart, the Edmonton terminal arrival controller noticed the conflict and drew it to the attention of the Red Deer data controller by land line. The data controller then verbally relayed this information to the Red Deer radar controller who instructed CNS213 to descend immediately to 15 000 feet.

At 1430 that day, the Calgary Airport was closed to protect the departure of G-8 VIP aircraft. At 1530, after most

The TORON intersection was not available as a holding fix because of weather.

VIP aircraft had departed, the Calgary terminal control coordinator lifted the closure.

The Traffic Builds Up

When the airport was reopened, there was a surge of traffic in and out of Calgary and flow control was initiated to meter arrivals and departures at Calgary. This flow control took the form of ground delays with five-minute intervals between departures of similar traffic from Edmonton to Calgary, as well as an air stop on traffic destined for Calgary. Four southbound aircraft, including CPB888, were either being held or were being set up for 20-minute holds outside the Calgary terminal shortly before the occurrence. Since the TORON intersection was not available as a holding fix because of weather, the Red Deer sector controller had to develop revised holding fixes. In addition, a “16/17” split was in effect at the request of the Calgary terminal, whereby inbound traffic was generally kept at 17 000 feet asl and above and outbound traffic was kept at 16 000 feet asl and below. However, the combined effects of weather, restricted airspace, and concentration of traffic volumes in the Red Deer en route sector resulted in a traffic backlog there.

During the 34 minutes preceding the loss of separation, the Red Deer en route radar controller was involved in 311 communications by radio or land line.

With extensive thunderstorm activity blocking the direct routes between Edmonton and Calgary, and with CYR255 traffic restrictions precluding diversions to the west, the Red Deer en route sector controllers had to send much of their traffic into the eastern portion of the sector. The G-8 controller —the liaison between the military and the area control centre (ACC) in the planning and management of the G-8 restricted airspace—was unavailable and the Red Deer sector supervisor, working a controller position, was unable to respond to the controllers' concern for the building level of traffic. The controllers were therefore unable to obtain effective flow control measures to alleviate the traffic concentration in their sector.

Avoiding Armed Interception

Because of the possibility of armed interception of unauthorized aircraft inadvertently entering CYR255, the radar controller focused much of his attention to westbound airline flights from Calgary that were transiting the narrow space between the thunderstorm activity and the restricted airspace. This added to the workload associated with the negotiation of weather avoidance deviations and the vectoring of several aircraft that were in the eastern portion of the Red Deer sector. The complexity of traffic in the sector was increased by the 16/17 split; which, in effect, reduced the altitudes available to the controllers and added to controller workload.

During the 34 minutes preceding the loss of separation, the Red Deer en route radar controller was involved in 311 communications by radio or land line in addition to unrecorded conversations between the two controllers.

During the time leading to the occurrence, the Calgary en route specialty was not considered to be short-handed. ACC management had increased staffing in anticipation of higher, more complex workload; however, three of the 11 specialty controllers were on a break. Exercising his option of bringing at least one controller off break would have freed up the supervisor to assume supervisory duties rather than occupy a controller position. He then may have been able to assist the Red Deer controllers in managing traffic in their sector.

The radar and data controllers, as well as the supervisor, indicated that they felt somewhat fatigued because of increased cumulative workload associated with G-8 activities and weather diversions. Although there were no clear indications that fatigue was a factor in the occurrence, the effects of cognitive fatigue—reduced short-term memory, inappropriate timing of tasks and reduced attention levels—have been shown to result in reduced performance in air traffic controllers. A lack of proper marking of the flight progress strips and ineffective scanning of the radar display were both shown to have been factors in this occurrence.

In response to indications that controllers in the Edmonton ACC were not consistently following procedures in accordance with strip markings for aircraft operating at inappropriate altitudes, the NAV CANADA Edmonton ACC issued an operations bulletin drawing controllers' attention to the necessity of following ATC MANOPS directives.

An air traffic conflict alert system has been put into service in the en route sectors of the Edmonton ACC. The system alerts controllers to potential traffic conflicts for aircraft at altitudes at and above 14 000 feet asl.

View of the aircraft from the south

Gear-Up Landing and GPWS

We saw in the article entitled "Rapid Decompression and SOPs" how lack of adherence to standard operating procedures put the crew and passengers at unnecessary risk. In this occurrence, failure to complete the before-landing checklist resulted in a Cessna Citation 550 air ambulance landing with the landing gear in the retracted position. A Ground Proximity Warning System (GPWS) also would have provided a defence against that happening. — TSB Report No. A02P0290

The Canada Jet Charters Limited Citation with two pilots and two Advance Life Support Paramedics aboard departed Vancouver, British Columbia, for a flight to Sandspit, British Columbia, at 1918 local time on 12 November 2002. As permitted by regulation, the first officer was the pilot flying in the left seat while the captain occupied the right seat. The flight was routine until 2021, when the crew obtained the Sandspit weather observation from the automated weather observation system (AWOS). This observation, taken at 2020, reported the wind to be from 220 degrees magnetic at 30 knots, gusting to 37 knots. The crew briefed for a VOR/DME approach to Runway 30 and in view of the strong, gusting crosswind, decided to land with flaps in the approach (15°) position instead of the landing (full) position. The crew completed the descent checklist and began their descent from flight level (FL) 350 for the approach to

Each time the horn sounded, it was silenced by the crew.

Sandspit at 2035. They completed the transition-level checklist through FL 180, and the 10 000-foot checklist. At 2045, at an altitude of approximately 10 000 feet, the speed brakes were selected out and remained out for the rest of the flight.

During the approach, the crew received numerous radio transmissions from the AWOS and the Terrace, British Columbia, flight service station (FSS) regarding the Sandspit weather. At the appropriate point in the approach, the flaps were selected to the approach position.

Canada Jet Charters' standard operating procedures (SOPs) call for the before-land checklist to be completed prior to the aircraft passing the final approach fix (FAF) on a non-standard approach. This was not done despite the landing gear warning horn sounding four times before the FAF, and a further three times between the FAF and touchdown. Each time the horn sounded, it was silenced by the crew.

Landing Gear Warning System

The design of the Cessna Citation 550 landing gear warning system is such that if the gear is not down, and the flaps are selected to the land position, the warning horn sounds and cannot be silenced. With the flaps at the approach position and the gear not down, the warning horn sounds when a thrust lever is retarded below about 70 per cent N1, but the horn can be silenced. If it is silenced, there will be no further aural warning should the gear not be extended, unless either thrust lever is advanced above the reset position and then retarded.

The first officer did not call for the landing gear to be extended, nor did he call for the before-landing checklist to be completed. The captain did not remind the first officer to extend the landing gear and accomplish the pre-landing checks. The before-landing checklist in use called for the speed brakes to be applied as required while the before-landing checklist contained in the Federal Aviation Administration-approved *Aircraft Flight Manual* called for the speed brakes to be *retracted prior to 50 feet*.

The captain believed that the nosewheel, and then the main gear, collapsed as the aircraft slid on its belly.

At two miles from the runway, the captain remarked that he could not see the precision approach path indicator (PAPI), and became preoccupied with getting the PAPI turned on. As a result of his request to the Terrace FSS as to the status of the PAPI, the intensity of the runway lights was increased, requiring a further call from the captain to have them dimmed. These distractions, and the numerous radio transmissions to the aircraft regarding the Sandspit weather, likely resulted in the crew forgetting that the

Straps are attached to the fuselage of the Citation.

gear had not been extended and that the before-landing checklist had not been completed. Just before touchdown, the aircraft's nose pitched down; the captain believed that the nosewheel, and then the main gear, collapsed as the aircraft slid on its belly. The crew carried out an evacuation and proceeded to the airport terminal building. When they returned to the aircraft to retrieve their belongings, the crew discovered that the gear was in the up position as was the landing gear selector.

The Citation is raised so that the landing gear can be extended.

GPWS and TAWS

The aircraft was not equipped with a ground proximity warning system (GPWS), nor was it required to be so equipped under the *Canadian Aviation Regulations* (CARs). The GPWS is designed to generate aural and visual warnings if the aircraft enters a flight path toward the ground that would lead to a collision with terrain, or for a landing with an incorrect landing configuration. Had the aircraft been equipped with a GPWS, during the approach to Sandspit, the GPWS mode 4 would have activated at an altitude, measured by the radio altimeter, of 500 feet above the ground, generating warning lights and the aural warning "TOO LOW, GEAR."

On 10 January 2003, the Transportation Safety Board of Canada issued an Aviation Safety Information Letter to Transport Canada, with a copy to the British Columbia Ambulance Service, regarding the design of the Cessna Citation 550 landing gear warning system. The letter also showed that a GPWS would provide defences against the risk of landing with the landing gear retracted.

As a result of the letter, the British Columbia Ambulance Service decided to require the fitting of a GPWS system to all fixed-wing aircraft operated on their behalf by contracted carriers.

Transport Canada (TC) responded on 14 February 2003, describing a proposed amendment to the CARs regarding the implementation of Class "A" and Class "B" Terrain Avoidance Warning Systems (TAWS). The TC letter indicated that if the amendments were promulgated, and depending on class, installation and operator, TAWS might provide defences against landing with the gear retracted. These proposed amendments have subsequently been accepted in principle. If the proposals become regulations, they will require aircraft such as the Cessna Citation 550 to be equipped with TAWS. An AC550 operating under CAR 704 would require, as a minimum, a Class "B" TAWS if configured with six to nine passenger seats. A Class "A" TAWS with a display would be required for an aircraft equipped with 10 or more passenger seats. There would be no requirement for an aircraft configured like the occurrence aircraft to be equipped with TAWS.

There would be no requirement for an aircraft configured like the occurrence aircraft to be equipped with TAWS.

It is not known why the pilot of this Piper Seneca descended below the minimum descent altitude.

For Want of a CVDR . . .

The main reason why aircraft accidents are so thoroughly investigated is to prevent future accidents with the same causal factor or factors. But when accident investigators are unable to determine a “why,” their efforts are frustrated.

This was the case with an accident involving an Airco Aircraft Charters Piper PA-34 Seneca III near High Prairie, Alberta, on 04 September 2002. For undetermined reasons, the aircraft descended below the minimum safe altitude as prescribed on the non-directional beacon Runway 25 approach chart for High Prairie and struck the terrain. The pilot and passenger were fatally injured and the aircraft was destroyed. — TSB Report No. A02W0173

The charter flight departed Edmonton City Centre Airport, Alberta, a few minutes after the planned departure time of 0800, local time, and the aircraft levelled off at the flight planned altitude of 8000 feet above sea level (asl) approximately 15 minutes after take-off. Radar information showed that the aircraft tracked approximately 295 degrees magnetic (M) at an average ground speed of 165 knots. These figures are consistent with the aircraft’s cruise performance, the track to the High Prairie non-directional beacon (NDB) via the transition from the Edmonton NDB, and the upper winds.

At 0843, the Seneca III was cleared out of the controlled airspace via the NDB Runway 25 approach at High Prairie. A descent was initiated by the pilot at 0849, and the last radar return was at 0854, with the aircraft descending through 6800 feet asl, 33 nautical miles (nm) from the High Prairie Airport.

Icing not a Factor

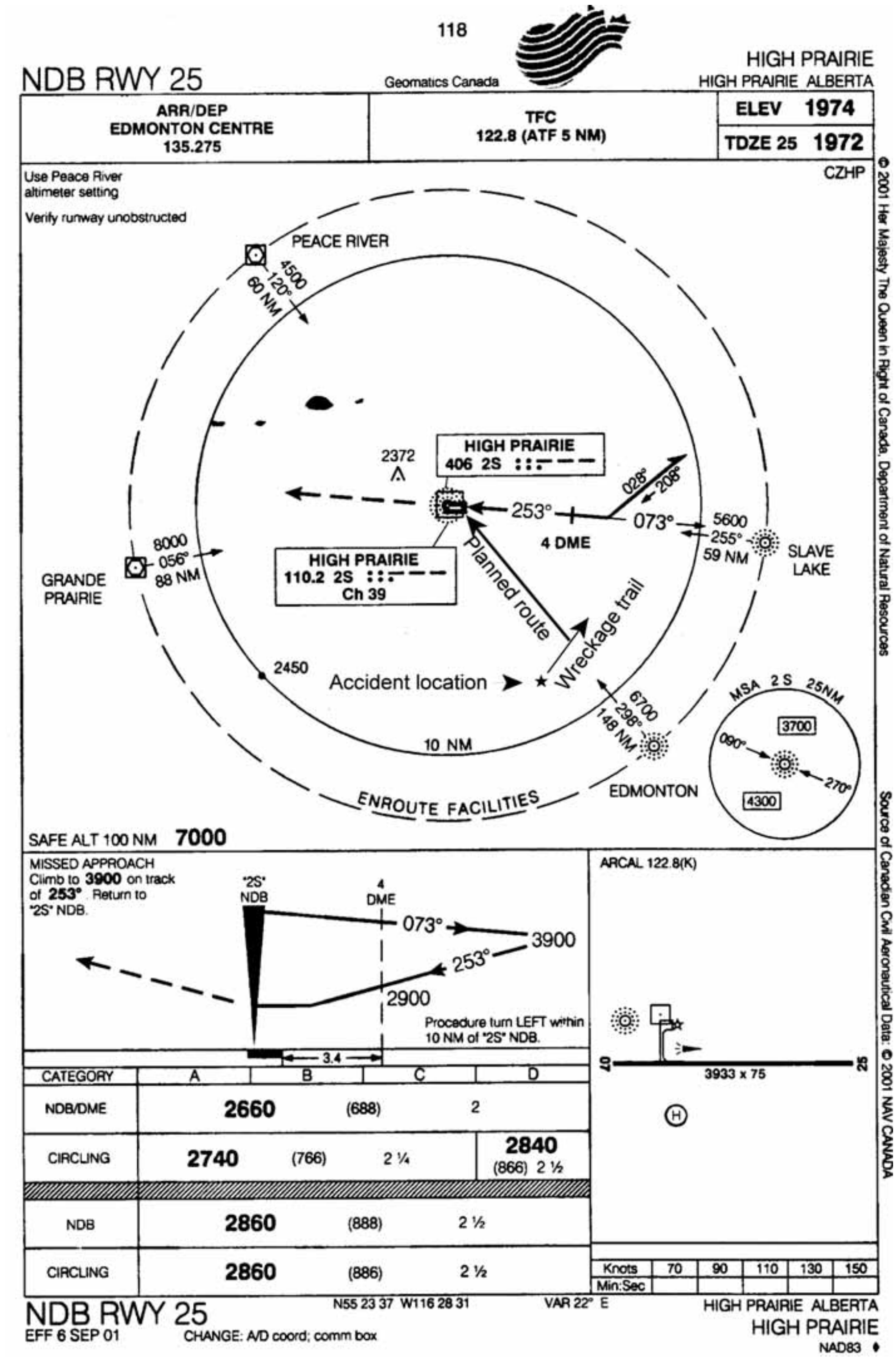
Weather forecasts in the High Prairie area indicated that the latter stages of the flight were conducted in instrument meteorological conditions. Forecast icing conditions and an absence of icing reports in local pilot reports suggest that aircraft icing was not an influencing factor in this accident.

The Seneca III descended into a densely treed area 7 nm southeast of the High Prairie Airport.

The NDB approach for Runway 25 allows for the pilot to descend to a minimum descent altitude of 2660 feet asl (688 feet above ground level [agl]) with the use of a distance measuring equipment receiver, and provides for lateral approach guidance to Runway 25. When the pilot was cleared for the approach, the minimum safe altitude (MSA) through the transition zone was 6700 feet asl, with 4300 asl (2300 feet agl) as the MSA, when within 25 nm of the NDB.

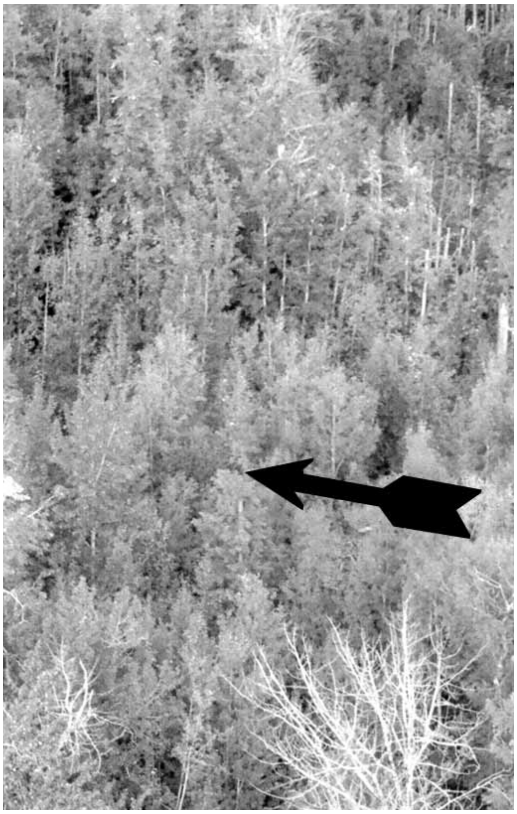
The Seneca III descended into a densely treed area 7 nm southeast of the High Prairie Airport on a heading of 358°M. Just prior to striking the ground, tree impact marks showed a descent angle of about 22° with a bank angle to the right of approximately 50°. The aircraft was configured with the landing gear up and the flaps in the retracted position.

The configuration of the aircraft and the 360-foot-long wreckage trail are indicators that the aircraft struck the trees in a fairly steep dive with a considerable amount of speed. Because of the severity of the impact, limited information was available as to the aircraft's performance and functionality.



Note: Not for navigation purposes

High Prairie NDB Runway 25 approach plate



The plane crashed into a densely wooded area.

Inspection of the engines and propellers indicated that they were developing power at impact. All of the aircraft's control surfaces and airframe components were accounted for at the site; it is therefore unlikely that an in-flight component failure occurred.

There was nothing abnormal in the pilot's conversations with another company pilot when receiving weather information prior to the occurrence. It is not known if the pilot suffered a loss of situational awareness, as it appears the aircraft was on track to the NDB, and the pilot was familiar with the airport and the approach.

A CVDR Would Have Helped Investigators

The degree of destruction of the aircraft systems and components prevented the investigation from gathering important data points. Compounding this was that neither occupant survived, radar coverage in that area ceased at about 7000 feet, there were no eyewitnesses, and the aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR). Neither are required by regulation for this aircraft.

Aircraft typically used in *Canadian Aviation Regulations* (CAR) 703 Air Taxi Operations, as this Seneca III was, are not fitted at manufacture with the electrical infrastructure required to support an FDR, and the installation of FDRs in this category of aircraft would require extensive system upgrades. A light-weight, comparatively simple and inexpensive alternative to an FDR is a cockpit video digital recorder (CVDR). While CVDR technology exists to record the instrument panel and the view forward from the aircraft, there is no regulatory requirement or schedule to install this equipment in commercially operated, non-FDR equipped aircraft. Had the accident aircraft been equipped with a CVDR or similar device, the investigation might have been able to determine the initiating events, and associated safety deficiencies, that resulted in this accident.

There have been numerous other recent CAR 703 fatal occurrences where the availability of CVDRs would have provided investigators a better opportunity to identify safety deficiencies related to the occurrence.

The U.S. National Transportation Safety Board recently forwarded Safety Recommendation No. A99-60 to the U.S. Federal Aviation Administration, urging the installation of crash-protective CVDRs on all turbine-powered aircraft that are not currently required to be equipped with an FDR, once an applicable technical standard order has been issued. The recommendation has not yet been implemented. This issue had previously been raised in TSB report No. A01W0261.

Aviation Occurrence Statistics

	2003	2002	2001	1998-2002 Average
Canadian-Registered Aircraft Accidents[1]	**297**	**274**	**295**	**323**
Aeroplanes Involved[2]	244	210	243	263
Airliners	7	6	5	8
Commuters	9	6	8	8
Air Taxis	35	41	37	60
Aerial Work	18	12	18	17
State	3	4	3	2
Corporate	2	2	4	6
Private/Other[3]	170	139	168	161
Helicopters Involved	44	56	46	52
Other Aircraft Involved[4]	12	10	9	13
Hours Flown (thousands)[5]	**3790**	**3694**	**3356**	**3799**
Accident Rate (per 100 000 hours)[6]	**7.6**	**7.2**	**8.6**	**8.3**
Fatal Accidents	**31**	**30**	**33**	**33**
Aeroplanes Involved	26	22	25	25
Airliners	0	0	0	0
Commuters	0	0	1	1
Air Taxis	5	4	5	5
Aerial Work	4	1	1	1
State	0	2	0	1
Corporate	0	0	1	1
Private/Other[3]	17	15	17	16
Helicopters Involved	3	6	6	7
Other Aircraft Involved	3	3	3	3
Fatalities	**58**	**50**	**61**	**65**
Serious Injuries	**44**	**42**	**35**	**44**
Canadian-Registered Ultralight Aircraft Accidents	**45**	**36**	**35**	**37**
Fatal Accidents	7	9	6	7
Fatalities	10	12	8	11
Serious Injuries	14	4	8	7
Foreign-Registered Aircraft Accidents in Canada	**29**	**13**	**29**	**20**
Fatal Accidents	6	1	8	5
Fatalities	8	2	10	55
Serious Injuries	3	0	5	2
All Aircraft: Reportable Incidents	**831**	**865**	**853**	**783**
Risk of Collision / Loss of Separation	154	194	204	182
Declared Emergency	291	280	255	239
Engine Failure	131	160	175	164
Smoke/Fire	103	100	107	97
Collision	16	22	19	12
Other	136	109	93	89

1 Ultralight aircraft excluded
2 As some accidents may involve multiple aircraft, the number of aircraft involved may differ from the total number of accidents.
3 Other: contains, but is not limited to, organizations that rent aircraft (i.e. flying schools, flying clubs, etc.)
4 Includes gliders, balloons and gyrocopters
5 Source: Transport Canada (2002 hours flown are estimated)
6 Accident rate does not include "Other Aircraft Involved."
Figures are preliminary as of January 14, 2004. All five-year averages have been rounded.

Aviation Occurrence *Summaries*

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

DOWNDRAFT, MAYBE 3000 FPM HELICOPTER RATE OF CLIMB, 1500 FPM

The winds were strong and gusty as the Bighorn Helicopters Inc. Eurocopter AS350D approached a weather station in mountainous terrain 12 nautical miles north of Blairmore, Alberta, on 26 March 2002. — TSB Report No. A02W0057

Wind conditions most likely exceeded the helicopter's performance limitations.

At about 50 to 100 feet above the mountainside landing site, an updraft, and then a downdraft, were encountered. The pilot aborted the landing and turned downhill but was unable to stop the sink rate as the helicopter settled into trees and rolled over onto its right side. The pilot and the front seat passenger received serious injuries and the passenger received minor injuries.

Winds at the site, as forecast and as reported by surrounding stations, were probably from the south or southwest at speeds of 20 to 40 knots, resulting in subsidence, turbulence, and wind shears on the east (lee) side of the mountain. An updraft on final approach caused the pilot to lower the collective slightly; this was probably followed by a downdraft, or wind shear, which caused the helicopter to suddenly descend. From an altitude of approximately 50 to 100 feet above the trees, at a near-hover speed, there was little margin for the helicopter to recover. The maximum rate of climb of the helicopter, at the altitude and load, was about 1500 feet per minute (fpm), in downdrafts that could have exceeded 3000 fpm.

SEAT FAILURE

> *The winch operator initiated a "full-out" launch to compensate for the wind conditions. The Schempp-Hirth KG Cirrus glider lifted off normally, then pitched up in a steep climb to an estimated 200 feet above ground level and rolled inverted to the right. When the winch operator noticed the glider pitch up abruptly and prematurely, he applied more power to the winch because he believed the glider was about to stall. The tow cable released after the glider rolled inverted, and the glider descended and struck the ground in an inverted altitude. The pilot was fatally injured and the glider was destroyed. — TSB Report No. A02A0065*

An examination of another Cirrus glider revealed ergonomic features that could provide challenges to shorter pilots. A Transportation Safety Board of Canada investigator of about the same stature as the accident pilot (five feet six inches) could not fully manipulate the rudder pedals unless the seat adjustment was full forward. Even then, he was required to stretch to achieve full rudder deflection. Also, the tow hook emergency release handle is positioned on the cabin floor to the left and forward of the control yoke. The handle is difficult to reach because the upper body is restrained by the five-point safety harness. As the angle of seat recline is made greater, the distance between the handle and the pilot's reach increases, and the handle becomes more difficult to reach.

During the accident launch, acceleration forces would have effectively pressed the pilot rearward, transferring high load forces to the seat and its attachment hardware. Two of the three forward seat attachment bolts were found detached. The shiny appearance of the threads on the right anchor nut was likely due to the bolt tearing out, which would suggest that the bolt in the right anchor nut was only engaged by a maximum of four threads. Ordinarily, this amount of thread engagement would be sufficient to provide the maximum strength of the bolt and anchor nut assembly. However, in this occurrence, the threads had been previously damaged by cross-threading, and the assembly may not have been able to develop the full clamping force. It could not be determined why the bolts were not completely fastened.

Wreckage of the Cirrus glider

Although there was not enough information available from the engineering analysis to determine whether the bolts pulled out in the air or at ground impact, other information supports the conclusion that the bolts pulled out in the air. The glider pitched up excessively a short time after lift-off. This was certainly abnormal and no fault was found with the glider's control system or structure. It was concluded that the combined effect of the cross-threading damage, the probability that the centre and right bolts were not fully engaged, and the acceleration forces of the launch resulted in the bolts pulling free from the anchor nuts, resulting in seat failure. When the seat failed, the pilot would have moved downward and aft, away from the controls. This sudden rearward movement would have resulted in a corresponding rearward control stick movement, and an abrupt pitch upward, with subsequent loss of control. In addition, the pilot would have been unable to reach the manual tow cable release.

Investigations

The following is *preliminary* information on all occurrences under investigation by the TSB that were reported between 01 January 2003 and 31 December 2003. 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.
JANUARY 2003					
11	St. John's Int'l Airport, N.L.	Beechcraft 1900D	Taxiing	Collision with windrow	A03A0002
21	Mekatina, Ont.	Eurocopter AS-350 B2	En route	Collision with terrain	A03O0012
29	Pikangikum,Ont., 2 nm NW	Beechcraft 99	Take-off	Collision with terrain	A03C0029
FEBRUARY					
02	Halifax Int'l Airport, N.S.	Boeing 737-200	Landing	Loss of directional control	A03A0012
04	Badger, N.L., 19 nm WNW	Cessna 188B	En route	Power loss – first engine	A03A0013
11	Windsor Airport, Ont.	Airbus A320-200-212	Taxiing	Runway excursion	A03O0034
14	Goose Bay Airport, N.L., 5 nm E	Cessna 210N	Approach	Component/ system failure	A03A0022
MARCH					
05	St. John's Int'l Airport, N.L., 90 nm E	McDonnell Douglas MD-11 Boeing 757-224	En route En route	Component/system failure	A03H0001
11	Kelowna, B.C.	Boeing 737-200	Take-off	Power loss – first engine	A03P0054
13	Dauphin, Man., 25 nm SW	Beechcraft C90A	En route	Component/system malfunction	A03C0068
25	Langley, B.C., 7 nm NE	Piper PA-28-140	Manoeuvring	Altitude-related event	A03P0068
APRIL					
07	Lake Temagami, Ont.	Found Brothers FBA-2V1	Take-off	Loss of control – stall	A03O0088
09	Peace River Airport, Alta., 13 nm SE	Robinson R44	Approach	Loss of control – rotorcraft	A03W0074
23	Prince Alpert, Sask., 6 nm SW	Beechcraft 99A	Approach	Loss of control – fixed wing	A03C0094
MAY					
22	Lac du Bonnet, Man.	de Havilland DHC-3 Otter	Take-off	Power loss – first engine	A03C0118

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
22	Active Pass, B.C.	de Havilland DHC-3 Otter Sikorsky S76A	En route En route	Altitude-related event ATS-related event	A03P0113
31	Chilliwak Airport, B.C., 7.5 nm E	Cessna 182	Manoeuvring	Controlled flight into terrain	A03P0133
JUNE 05	Lake Wicksteed, Ont.	de Havilland DHC-6-300	Take-off	Nosedown/overturned	A03O0135
06	Ward Creek, B.C.	Bell 206B	Manoeuvring	Power loss – first engine	A03P0136
17	Gisborne, New Zealand	Convair 580	En route	Navigation error	A03F0114
24	Wasaga Beach, Ont., 5 nm WSW	Mooney M20E	En route	Power loss – first engine	A03O0156
26	Buchans, N.L., 25 nm SE	PZL-M-18 Dromader	Manoeuvring	Power loss – first engine	A03A0076
JULY 04	Lac Boucher, Que.	Bell 206B	Take-off	Power loss – first engine	A03Q0092
07	Toronto City Centre Airport, Ont.	Beech 58	Approach	Controlled flight into terrain	A03O0171
13	Manning, Alta., 75 nm NE	Bell 204B	Manoeuvring	Power loss – first engine	A03W0148
16	Cranbrook, B.C., 9 nm SE	Lockheed 188A	Manoeuvring	Collision with terrain	A03P0194
18	Harrison Hot Springs, B.C., 24 nm NNW	Cessna 172M	Approach	Collision with terrain	A03P0199
26	Jean Lesage Int'l Airport, Que., 6 nm E	Cessna 172M	En route	Power loss – first engine	A03Q0109
AUGUST 05	London, Ont., 40 nm NE	Boeing 767-200 Fokker F-28 MK 100	En route En route	ATS-related event ATS-related event	A03O0213
10	Princeton, B.C.	Cessna 210A	Approach	Collision with object	A03P0239
11	Port Hardy, B.C., 26 nm W	Boeing 757-200 Boeing 747-400	En route En route	ATS-related event	A03P0244
17	Bonaparte Lake, B.C.	Bell 204B	Take-off	Component/system incident	A03P0247
23	Vernon, B.C.	Airbus A319-100	Approach	Navigation error	A03P0259

DATE	LOCATION	TYPE OF AIRCRAFT	PHASE OF FLIGHT	EVENT	OCCURRENCE NO.
29	Penticton, B.C., 10 nm N	de Havilland DHC-2 Beaver	Take-off	Altitude-related event	A03P0265
SEPTEMBER 03	Vancouver Harbour, B.C.	de Havilland DHC-6-200	Taxiing	Loss of control	A03P0268
11	Summer Beaver, Ont., 3 nm W	Cessna 208B	Approach	Collision with terrain	A03H0002
16	Mayo, Y.T., 80 nm N	Bell 206B	Landing	Power loss – first engine	A03W0194
23	Calgary Int'l Airport, Alta., 49 nm S	Cessna 414A	En route	Altitude-related event	A03W0202
26	Toronto/Lester B. Pearson Int'l Airport, Ont.	Gulfstream Aerospace LP Astra SPX	Landing	Operations-related event	A03O0273
27	Gaspé, Que., 2 nm NE	Piper PA-31	Approach	Collision with terrain	A03Q0151
OCTOBER 04	Linda Lake, B.C.	Piper PA-18-150	Approach	Loss of control – stall	A03W0210
09	Toronto/ Buttonville Municipal Airport, Ont., 2 nm SSE	Cessna 172N	Take-off	Power loss – first engine	A03O0285
NOVEMBER 04	Ottawa/ Macdonald-Cartier Int'l Airport, Ont.	de Havilland DHC-8-100	Take-off	Weather-related event	A03O0302
06	Vancouver Int'l Airport, B.C.	Airbus A330-300	Take-off	Component/system incident	A03P0332
DECEMBER 16	Jellicoe, Ont.	de Havilland DHC-3 Otter	Take-off	Collision with terrain	A03O0341

Final Reports

The following investigation reports were released between 01 January 2003 and 31 December 2003.

DATE	LOCATION	TYPE OF AIRCRAFT	REPORT NO.
98-09-02	Peggy's Cove, N.S., 5 nm SW	McDonnell Douglas MD-11	A98H0003
01-02-15	Colombo, Sri Lanka	Airbus A330-300	A01F0020
01-04-03	Sydney, N.S., 12 nm W	de Havilland DHC-8-100	A01A0030
01-04-04	St. John's Int'l Airport, N.L.	Boeing 737-200	A01A0028
01-06-05	Charlottetown Airport, N.L.	Piper PA-31-310 Navajo	A01A0058
01-06-27	Roberval, Que., 80 nm N	Bell 212	A01Q0105
01-07-22	Abbotsford Parachute Centre, B.C., 1.5 nm SW	Pilatus PC-6T	A01H0003
01-08-04	Fort Lauderdale, Florida	Boeing 737-200	A01F0101
01-08-09	Baffin Island, Nun., 69°10′ N 074°21′ W	Hughes 369D (500D)	A01Q0139
01-09-27	Winnipeg Int'l Airport, Man., 2.4 nm N	Beech 95 Travel Air	A01C0230
01-10-05	Fort Simpson, N.W.T., 5.5 nm WNW	McDonnell Douglas 369HS	A01W0255
01-10-08	Mont-Joli Airport, Que., 23 nm S	Piper PA-23	A01Q0165
01-10-11	Shamattawa, Man., 1 nm N	Fairchild SA226TC	A01C0236
01-10-15	Fort Liard, N.W.T.	Piper PA-31-350 Navajo Chieftain	A01W0261
01-11-08	Sawtooth Mountain, B.C.	Eurocopter SA315B Lama	A01P0282
01-12-31	Fort Good Hope, N.W.T., 30 nm S	Cessna 172N	A01W0304
02-01-08	Campbell River, B.C.	Shorts SD-3-60 Beechcraft 1900D	A02P0007
02-01-17	Vancouver Intn'l Airport, B.C.	Airbus A330-300	A02P0010
02-02-01	Abbotsford Airport, B.C.	Boeing 737-200	A02P0021
02-02-14	Brookfield, N.S., 10 nm ENE	Cessna 172L	A02A0015
02-03-04	Goose Bay Airport, N.L.	Fairchild Metro SA227-AC	A02A0030
02-03-05	La Ronge, Sask., 40 nm N	Hawker Siddeley HS 748 2A Beechcraft 1900D	A02C0043
02-03-26	Blairmore, Alta., 12 nm N	Eurocopter AS350D	A02W0057
02-03-27	Saint John, N.B.	Fokker F-28 MK 1000	A02A0038
02-04-08	Manning, Alta., 20 nm W	Robinson R22 Beta Helicopter	A02W0064
02-04-18	SU34 Hare Field, Ont.	Schweizer 269C (300C)	A02O0105
02-04-25	Stephenville, N.L., 38 nm ESE	Beechcraft 1900D	A02A0046
02-04-25	Saskatoon, Sask., 63 nm E	Boeing 747-200 Boeing 747-400	A02C0079

DATE	LOCATION	TYPE OF AIRCRAFT	REPORT NO.
02-05-21	Stanley Airport, N.S.	Schempp-Hirth KG Cirrus (Glider)	A02A0065
02-05-27	Swan River, Man.	Cessna TU206F (Amphibious)	A02C0105
02-06-02	Tobin Lake, Sask.	Bell 205A-1	A02C0114
02-06-06	Needle Peak, B.C.	Cessna 182P	A02P0109
02-06-11	Winnipeg, Man.	Piper PA-31-350	A02C0124
02-06-14	Frankfurt/Main Airport, Germany	Airbus 330-343	A02F0069
02-06-20	Gander, N.L., 180 nm ENE	Boeing 747 Boeing 767 Boeing 767	A02A0079
02-06-27	Edmonton, Alta., 60 nm S	British Aerospace Jetstream 3112 Fairchild SA227DC	A02W0115
02-06-28	Sasaginnigak Lake, Man., 10 nm S	de Havilland DHC-2 Mk1 Beaver	A02C0143
02-06-29	Engemann Lake, Sask.	Cessna A185F (Seaplane)	A02C0145
02-07-01	Boundary Bay Airport, B.C.	Cessna 127-N	A02P0136
02-08-08	Wendle Creek, B.C.	Sikorsky S61L	A02P0169
02-08-18	Goose Bay, N.L.	Bell Textron 212	A02A0098
02-09-04	High Prairie, Alta., 7 nm SE	Piper PA-34-220T (Seneca III)	A02W0173
02-09-18	Toronto/Lester B. Pearson Int'l Airport, Ont.	Canadian Flyers International PA-44-180 de Havilland DHC-8	A02H0002
02-09-28	Natashquan, Que., 57 nm N	de Havilland DHC-3 Otter	A02Q0130
02-10-15	Porcher Inlet, B.C.	MD Helicopters 369D	A02P0256
02-11-12	Sandspit Airport, B.C.	Cessna Citation 550	A02P0290
02-11-20	Vancouver Int'l Airport, B.C.	Boeing 747-400 Shorts SD 360	A02P0299
03-01-11	St John's Int'l Airport, N.L.	Beechcraft 1900D	A03A0002
03-01-29	Pikangikum, Ont., 2 nm NW	Beechcraft 99	A03C0029
03-02-04	Badger, N.L.,19 nm WNW	Cessna 188B	A03A0013

TRANSPORTATION SAFETY
REFLEXIONS
AIR

Issue 27 – March 2004

Subscription

Reflexions is distributed free of charge. For a subscription, send your name, title, organization, address, and postal code. State the number and language (English or French) of the copies you wish to receive and an estimate of the number of readers per copy.

Please address all subscriptions, requests, or comments to

TSB Communications Division
Place du Centre
200 Promenade du Portage
4th Floor
Gatineau, Quebec K1A 1K8

Tel.: (819) 994-3741
Fax: (819) 997-2239
E-mail:
communications@tsb.gc.ca

TSB Recruitment Campaign

Interested in advancing your career and transportation safety? From time to time, the TSB is looking to fill investigator and technical positions. Need more information? Want to apply? Go to **www.jobs.gc.ca**.

THE CONFIDENTIAL
TRANSPORTATION SAFETY REPORTING PROGRAM

SECURITAS

SHARE

safety

experience

You are a pilot, air traffic controller, flight service specialist, flight attendant, aircraft maintenance engineer, and you are aware of situations potentially affecting aviation safety. You can report them in confidence to SECURITAS.

Here's how you can reach SECURITAS

SECURITAS
P.O. Box 1996, Station B
Gatineau, Quebec J8X 3Z2

e- Securitas@tsb.gc.ca

1 800 567-6865

FAX (819) 994-8065

Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

1770 Pink Road
Gatineau, Quebec K1A 1L3

CANADA POST
POSTES CANADA
Postage paid
Port payé
Publications Mail
Poste-publications
40050014

Transportation Safety Board
Aviation Occurrence Reporting Service

TSB aviation regional offices can be reached during working hours (local time) at the following phone numbers:

HEAD OFFICE,
GATINEAU, Quebec*
Phone: (819) 994-3741
Fax: (819) 997-2239

GREATER HALIFAX, Nova Scotia*
Phone: (902) 426-2348
Fax: (902) 426-5143

MONTRÉAL, Quebec*
Phone: (514) 633-3246
Fax: (514) 633-2944

GREATER TORONTO, Ontario
Phone: (905) 771-7676
Fax: (905) 771-7709

WINNIPEG, Manitoba
Phone: (204) 983-5991
Fax: (204) 983-8026

EDMONTON, Alberta
Phone: (780) 495-3865
Fax: (780) 495-2079

GREATER VANCOUVER, British Columbia
Phone: (604) 666-4949
Fax: (604) 666-7230

After-hours emergency reporting: (819) 997-7887

*Service available in English and French

Services en français ailleurs au Canada :
1 800 387-3557