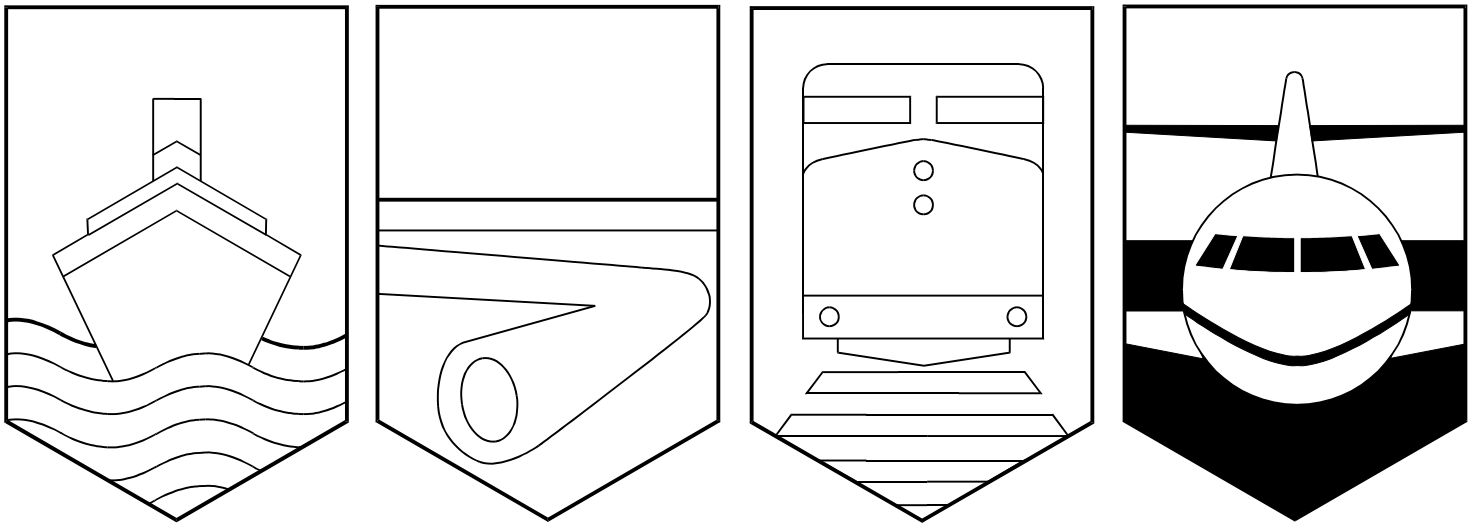
Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada



AVIATION OCCURRENCE REPORT

COLLISION WITH TERRAIN

FONDS DU SERVICE AÉRIEN GOUVERNEMENTAL
SHORTS SD3-30 VARIANT 300 C-FPQE
UMIUJAQ, QUEBEC
01 DECEMBER 1993

REPORT NUMBER A93Q0245

Canada

MANDATE OF THE TSB

The Canadian Transportation Accident Investigation and Safety Board Act provides the legal framework governing the TSB's activities. Basically, the TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by:

- conducting independent investigations and, if necessary, public inquiries into transportation occurrences in order to make findings as to their causes and contributing factors;
- reporting publicly on its investigations and public inquiries and on the related findings;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- conducting special studies and special investigations on transportation safety matters.

It is not the function of the Board to assign fault or determine civil or criminal liability. However, the Board must not refrain from fully reporting on the causes and contributing factors merely because fault or liability might be inferred from the Board's findings.

INDEPENDENCE

To enable the public to have confidence in the transportation accident investigation process, it is essential that the investigating agency be, and be seen to be, independent and free from any conflicts of interest when it investigates accidents, identifies safety deficiencies, and makes safety recommendations. Independence is a key feature of the TSB. The Board reports to Parliament through the President of the Queen's Privy Council for Canada and is separate from other government agencies and departments. Its independence enables it to be fully objective in arriving at its conclusions and recommendations.

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Synopsis

The crew was on a flight from Kuujjuarapik to Umiujaq, Quebec. During the turn onto the final approach to Umiujaq Airport runway 21, the aircraft stalled. The pilot-in-command regained control of the aircraft but he was unable to pull up sufficiently to clear the obstacles, and the aircraft crashed. The two pilots and two of the 11 passengers sustained minor injuries.

The Board determined that the stalling speed of the aircraft increased due to ice on the leading edge of the wings and because the pilot made a steep turn; the aircraft stalled at an altitude from which the pilot was unable to recover. A contributing factor was the crew's decision to continue the visual approach into Umiujaq despite the weather conditions reported.

Ce rapport est également disponible en français.

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OCCURRENCE NUMBER:	A93Q0245
TYPE OF OCCURRENCE:	Collision with Terrain (Accident)
DATE OF OCCURRENCE:	01 December 1993
LOCAL TIME:	1510 EST
LOCATION:	Umiujaq, Quebec
TYPE OF AIRCRAFT:	Shorts SD3-30 Variant 300
REGISTRATION:	C-FPQE
TYPE OF OPERATOR:	Provincial
TYPE OF OPERATION:	Private
DAMAGE CATEGORY:	Substantial
PILOT LICENCE:	Airline Transport (Aeroplane)

	PILOT-IN-COMMAND		CO-PILOT	
PILOT HOURS:	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	10,122	500	10,000	10
LAST 90 DAYS	103	49	100	10

INJURIES:	FATAL	SERIOUS	MINOR	NONE
CREW	-	-	2	-
PASSENGERS:	-	-	2	9

1.0 Factual Information

1.1 History of the Flight

The two pilots were transporting Hydro-Québec employees in the aircraft to allow them to check electrical facilities in several villages along the Hudson Bay coast. The aircraft departed Kuujjuarapik, Quebec, at about 1444 eastern standard time (EST)[1] on a flight to Umiujaq, Quebec, a distance of 86 nautical miles (nm)[2] to the north. The pilot-in-command was flying the aircraft.

After the take-off from Kuujjuarapik, the crew contacted the Kuujjuarapik Flight Service Station (FSS) to file a flight notification and request weather information. The crew received three weather reports for Umiujaq from that FSS. The flight was conducted at an altitude of 5,000 feet on an outbound track of 045 degrees from the Kuujjuarapik non-directional beacon (NDB). Thirty miles from Umiujaq, the crew commenced the descent. Seven miles from the village, the aircraft was at an altitude of 700 feet and the crew could see the ground.

The crew used a global positioning system (GPS) waypoint to supplement visual navigation (before reaching a downwind position), and continued their step-down procedure to about 200 feet above ground level (agl) on a heading of 25 degrees magnetic (°M). At that altitude, the visibility was reported by the crew to be over one and one-half miles and the crew could recognize references on the ground and position the aircraft for landing. When turning onto the final approach to runway 21, the pilot-in-command initiated a turn with at least 35 degrees of bank angle, and the aircraft stalled. The pilot-in-command initiated a stall recovery and called for full power. The aircraft did not gain sufficient altitude to overfly the rising terrain, and it crashed.

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[1] All times are EST (Coordinated Universal Time [UTC] minus five hours) unless otherwise stated.

[2] See Glossary at Appendix A for all abbreviations and acronyms.

The two crew members and two of the passengers sustained minor injuries. They were given first aid treatment at the accident site by other passengers.

1.2 Crew

The crew were certified and qualified for the flight in accordance with existing regulations.

The pilot-in-command, who was seated in the left seat of the aircraft at the time of the occurrence, had been qualified on the aircraft since November 1991. He had 500 flying hours on type. His flight checks indicated that he was considered a competent pilot with a positive attitude who knew his aircraft well. The pilot-in-command had previously flown to Umiujaq on several occasions.

The co-pilot had been qualified on the aircraft since November 1993. This was his first passenger-carrying flight.

1.3 Aircraft

The aircraft was acquired by the Gouvernement du Québec in June 1991 and had logged 1,323 hours at the time of the accident. It was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

The weight and centre of gravity of the aircraft were within the prescribed limits. The crew stated that all aircraft systems were functioning normally at the time of the accident. The aircraft was equipped with a cockpit voice recorder (CVR).

The aircraft was equipped and approved for flight in icing conditions in accordance with existing regulations. The wing de-icer boots were not used by the crew. The co-pilot indicated that a 1/ 8- to 1/ 4-inch-thick piece of ice had formed on the unheated part of the windshield. The aircraft flight manual specifies that the wing de-icer boots should not be used unless the ice buildup is 1/ 2-inch thick. Early activation of the boots may result in ice bridging on the wing, rendering the boots ineffective.

1.4 Flight in Uncontrolled Airspace

Air Navigation Order (ANO) V, No. 4 indicates that no person shall conduct wholly outside controlled airspace an IFR flight or a flight under IFR weather conditions unless he has filed an IFR flight plan prior to taking off, or, if communication facilities are inadequate to permit communication with ATC or an aeradio station, has given to a responsible person notice of his proposed flight by means of a flight itinerary.

The Gouvernement du Québec was operating under ANO I, No. 2. This order applies to every Canadian aircraft used by operators for the carriage of passengers where the aeroplane is a private or state aircraft. The aircraft can be a turbine-engine-powered pressurized aeroplane or an aeroplane with a maximum certificated take-off weight greater than 12,500 pounds.

Under ANO I, No. 2, the operator shall establish an Operations Manual and submit at least one copy of the manual to Transport Canada. Transport Canada will approve only a few sections of the manual, which mainly deal with training, take-off and landing minima, and crew coordination. Operations dealing with aerodrome standards, aeroplane performance,

communications, navigation, uncontrolled airspace, flights over water, and flights over mountainous areas do not have to be approved by Transport Canada.

In addition, whereas commercially operated companies are regularly audited by Department of Transport Air Carrier Inspectors to ensure compliance with the Company Operations Manual, among other things, there is no requirement for the Department of Transport to conduct audits of companies operating under ANO I, No. 2.

Because operations dealing with uncontrolled airspace do not have to be approved in the Operations Manual, a pilot flying in the uncontrolled airspace has to refer to section V of the Air Regulations. Article 553, section V of the Air Regulations states that: "Except when taking off and landing, aircraft in IFR flight shall be flown at altitudes of at least 1,000 feet above the highest obstacle located within a horizontal radius of 5 miles from the estimated position of the aircraft in flight."

The Air Regulations governing the transition from IFR to VFR during a descent for the purpose of landing appear ambiguous; therefore, during the process of the investigation, Transport Canada was queried about this subject. Conflicting answers from within Transport Canada have been received. Transport Canada's Regulatory Compliance Branch (Quebec region) conducted an investigation to determine if any regulatory infractions were committed by the crew. They concluded that none were committed. In contrast, Transport Canada Head Office indicated that they believed that the crew violated Air Regulation 553 by descending to 700 feet agl in IFR weather conditions. The two varying opinions from within Transport Canada indicate that there are different interpretations of the Air Regulations regarding operating in uncontrolled airspace and transitioning from IFR to VFR flight for the purpose of landing.

When flying VFR, the pilot will have to respect the rules governing visual flight in uncontrolled airspace which are stated in ANO V, No. 3. Visual flight rules indicate that when an aeroplane is flying below 700 feet above ground or water, the aeroplane shall be clear of any cloud and maintain a visibility not less than one mile.

1.5 Meteorological Information

The crew obtained a complete weather briefing in person from the dispatcher in Quebec City before departing for their flight. The briefing included the area forecast for the proposed flight, the hourly weather, and the terminal forecast for the destination airports. The area forecast for Kuujjuarapik, Umiujaq, and areas north indicates that, by 1200 Coordinated Universal Time (UTC), a wave over Hudson Bay with a warm front was located along a line by Inukjuak, La Grande Rivière, and a point about 60 miles west of Matagami. The system was forecast to be on a line located 60 miles north of Inukjuak, Kuujjuaq, and Wabush by 2400 UTC. For the region of Umiujaq, around the expected time of arrival, the weather was forecast to be a broken ceiling at 3,000 feet, and variable overcast ceiling at 18,000 feet. Intermittent visibilities of three to six miles in light snow showers with local ceilings of 600 to 1,200 feet in snow showers were also forecast. The surface winds were forecast to be from 250 degrees true (°T) at 35 with gusts to 45 knots giving surface visibility of half a mile to three miles in snow and blowing snow.

The terminal forecast for Kuujjuarapik (86 miles south of Umiujaq) valid from 1700 UTC to 0500 UTC indicated a ceiling of 1,500 feet overcast, visibility greater than six miles, winds from 220°T at 15 knots with gusts to 25 knots; occasional ceiling at 2,500 feet broken, 4,000 feet overcast, visibility of 4 miles in light snow showers. The terminal forecast for Inukjuak (126 miles northwest of Umiujaq) valid from 1700 to 0300 UTC indicated that, from 1700 UTC,

the expected conditions were a ceiling of 2,000 feet overcast, visibility 4 miles in light snow, winds 240°T at 20 gusting to 30 knots, with an occasional partially obscured ceiling of 800 feet overcast, visibility of one mile in light freezing drizzle and light snow. From 0000 UTC, the ceiling was forecast to be 1,200 feet overcast, visibility four miles in light snow showers, winds 230°T at 15 gusting to 25 knots, occasionally 1,200 feet scattered, ceiling 4,000 feet broken, visibility greater than six miles. The terminal forecast for Povungnituk (210 miles north of Umiujaq) valid from 1700 UTC to 2300 UTC indicates a ceiling of 2,000 feet overcast, visibility of four miles in light snow, winds 190°T at 15 knots, occasional partially obscured, ceiling 800 feet overcast, visibility one mile in light freezing drizzle and light snow. After 2100 UTC, the weather was forecast to be ceiling 1,200 feet overcast, visibility of four miles in light snow showers, winds 230°T at 15 knots gusting to 25 knots, occasional scattered clouds at 1,200 feet, a broken ceiling of 4,000 feet, and visibility greater than six miles.

At 1446 EST, a few minutes after the take-off from Kuujjuarapik, the crew received the 1400 EST report from Umiujaq. It indicated the weather to be partly obscured, a balloon-measured overcast ceiling at 100 feet, and a visibility of one mile in light freezing drizzle. The temperature and dew point were minus two degrees Celsius and the winds were from 230°M at 20 knots. The crew also requested and received weather information for Povungnituk, Akulivik, and Salluit. None of these locations had a ceiling lower then 1,300 feet and a visibility less than 2 miles.

At 1448 EST, the FSS contacted the crew to give them the 1441 EST Umiujaq special weather report. The weather report stated an indefinite ceiling at 100 feet obscured, with visibility three-quarters of a mile in light freezing drizzle, light snow, and fog.

At 1453 EST, the FSS gave the crew the latest special report for Umiujaq issued at 1450 EST, which indicated partly obscured conditions with a balloon-measured overcast ceiling at 100 feet and a visibility of one mile in light freezing drizzle, very light snow, and fog. Winds were from 230°M at 17 knots. The remarks mentioned light blowing snow.

Before the approach into Umiujaq, the pilot-in-command told one of the passengers what his intentions were. The pilot-in-command decided to proceed to Umiujaq for an approach, and to Povungnituk if landing at Umiujaq was not possible. He never felt any pressure from the passengers.

At 1500 EST, he inquired again about the weather at the Umiujaq Airport when he called the airport operator. The information provided was similar to the last report except that the winds were from 260°M at 23 knots and there was mechanical turbulence on the approach to the runway.

1.6 Impact Sequence

When the aircraft crashed, the flaps were extended eight degrees, the wheels were up, and the engines were operating at full power. The aircraft left a scar on the ground about 289 feet long on a track of 128°M. Near the end of its slide, the fuselage turned left and came to rest on a heading of 040° in a steep right-wing-low attitude.

At the beginning of the impact trajectory, small trees had been cut by the aircraft; these were followed by traces of turbine oil. The first major component, the left portion of the empennage, was found 151 feet from the beginning of the slide. The right wing separated during the impact and came to rest 200 feet from the initial point of impact, and the right engine reduction

gearbox came to rest 225 feet from the initial point of impact. The impact forces were not sufficient to activate the emergency locator transmitter (ELT).

1.7 Evacuation and Survival Aspects

The aircraft came to a stop in a right-wing-low attitude. The main door, located on the right side of the cabin, was opened and almost all occupants evacuated through that door. Some passengers broke the windows out with their feet and evacuated through them. None of the seat anchors or seat-belts failed, nor did the cargo net fail. The pilot did not wear his shoulder harness; however, the co-pilot wore his.

Shortly after the evacuation, the occupants gathered to decide in which direction they should walk to reach the village. They walked for 45 minutes before they saw the first lights. They split into two groups at that point; one group headed for the airport, the other continued toward the village.

1.8 Quebec Government Air Services Operations Manual

Section 2 of the operations manual describes employees' duties, responsibilities, and authority. One responsibility of the pilot-in-command is to request flight information from appropriate sources, and to plan the flight on the basis of the information received. The co-pilot is required to assist in obtaining information on flight conditions and to prepare the flight plan under the direction of the pilot-in-command.

The manual also sets out the duties of the dispatcher, which include compiling and analyzing the factors that could affect the flight, preparing flight plans, monitoring weather conditions that could affect the flight, and transmitting to the crew all messages and information considered essential. The pilot-in-command stated that the information he received from the dispatcher before departure included no Notices to Airmen (NOTAMs) for Umiujaq.

1.9 Aircraft Performance

When an aircraft makes a turn at a constant bank angle in no-wind conditions, it describes an arc with a constant radius about a fixed point on the ground. In strong wind conditions, if a pilot flying downwind wishes to turn upwind while maintaining a constant turn radius about a fixed point, he must increase the bank angle at the start of the turn.

The stalling speed of an aircraft increases in proportion to the load factor. An aircraft with a normal stalling speed of 77 knots can stall at 85 knots in a 35-degree banked turn at constant altitude.

The meteorological conditions were conducive to the formation of ice on the aircraft when in cloud. During the wreckage examination, ice was found on the leading edge of the wings. This ice was 1/ 4-inch thick and almost completely covered the pneumatic de-icer. There was an additional accumulation of ice 1/ 8-inch thick over an area 3/ 4 of an inch wide at the level of the wing chord. The ice had formed a symmetrical layer over the pneumatic de-icer. Ice on an airfoil increases the stalling speed.

1.10 Pilot Manoeuvres Prior to Impact

The pilot-in-command stated that, during the stall recovery, the aircraft did not want to gain altitude, as if it were behind the power/ speed curve. He would have liked to lower the nose of the aircraft in order to accelerate before initiating the climb, but the aircraft was too low.

1.11 Umiujaq Airport

Runway 03/ 21 is parallel to the shore of Hudson Bay, or more precisely, parallel to Nastapoka Strait. The runway is 3,500 feet long by 100 feet wide, and has no published instrument approaches. The reference point elevation is 244 feet. The terrain at that location rises gradually from the shore to an elevation of 650 feet.

At the time of the accident, the community aerodrome radio station (CARS) was manned. When the crew was 30 miles south of the Umiujaq Airport, the station operator reported to the crew the latest meteorological information. He also described the runway condition in detail. However, he did not mention that a NOTAM was in effect for the airport.

Runway 03/ 21 of the Umiujaq Airport was initially closed by NOTAM because of snow on 25 November 1993 at 0012 UTC. From that time until the accident, six such NOTAMs were issued. In effect, runway 03/ 21 at Umiujaq was closed continuously due to snow until at least 02 December 1993 at 2000 UTC (1500 EST).

During the course of the investigation, it was observed that another carrier used runway 03/ 21 at Umiujaq when there was a NOTAM in effect which closed the runway.

1.12 FSS and CARS

The Kuujjuarapik FSS informed the crew three times of the changing meteorological conditions at Umiujaq Airport. In addition, the FSS talked to the crew about a flight notification filed after take-off and about the weather at several airports on the Hudson Bay coast. However, the FSS did not mention to the crew that Umiujaq Airport runway 03/ 21 was closed by NOTAM.

The *Flight Service Station Manual of Operations* (TP 2043E) states that personnel are required to provide the following information to en route aircraft, whether or not the pilot requests it, during regular air-ground contacts or by directed call: altimeter, Significant Meteorological Reports (SIGMETs), Airman's Meteorological Advisories (AIRMETs), and Missing Aircraft Notices (MANOTs). In addition, if it is likely to affect the safety of the flight, or upon request, personnel are required to provide Pilot Reports (PIREPs), hourly and special weather reports, terminal forecasts, NOTAMs, and other information.

The employee of the Umiujaq CARS gave the pilot detailed information about the airport in accordance with the *CARS-1 Manual of Operations* (TP 3323E), except for the NOTAM stating that the runway was closed.

1.13 Operator Occurrence History

This occurrence was the second serious accident in a little over a month involving Service Aérien aircraft and crew. (In October 1993, during a low level operation, a Service Aérien Bell 206 helicopter struck wires near Montmorency Falls; there were four fatalities. Report

A93Q0225 refers.) TSB data also indicate that there were five other significant occurrences involving Service Aérien aircraft in 1993.

2.0 Analysis

2.1 Meteorological Conditions

Meteorological conditions were conducive to the accumulation of ice on the aircraft when in cloud, and the investigation revealed that ice had indeed accumulated on the aircraft. Even though the co-pilot saw an accumulation of ice on an unheated part of the windshield, the wings were not visually checked by the crew and the de-icer boots were not used.

2.2 The Approach, Stall, and Recovery Attempt

The flight crew of the aircraft were qualified on type and all aircraft systems were functioning normally.

At Umiujaq, the winds were from 260°M at 23 knots while the aircraft was on the approach. The aircraft had a strong tail wind component on the right base leg for runway 21. In these conditions, a turn onto the final approach must be steeper if it is initiated with reference to a fixed point. In addition, the aircraft was flying toward terrain that rose steadily to 650 feet, and the pilot-in-command could not afford to go beyond the final approach track. Executing a constant-altitude turn with 35 degrees of bank would increase the stalling speed of the aircraft from 77 knots to 85 knots.

To execute a steep turn at constant altitude, the pilot must pull back on the elevator to maintain altitude, which the pilot did. However, the symmetrical coating of ice on the pneumatic de-icer and the increased angle of bank led to a breakup of the airflow over the surface of the wings and the aircraft stalled. The aircraft was reacting as if it were behind the power/ speed curve after the pilot recovered from the stall. Despite the indicated airspeed of 93 knots and maximum power being applied, the aircraft did not climb. Given the rising terrain and the tail-wind component, there was insufficient altitude for the pilot to lower the nose of the aircraft to accelerate.

2.3 NOTAMs

The crew was not aware and was not informed that the Umiujaq runway 03/ 21 was closed. The crew members were not advised of the situation by the air service dispatcher, the FSS, or the CARS.

2.4 Pilot Decision Making

The weather for Umiujaq for the period preceding and during the approach was indicating that the ceiling was about 100 feet overcast and that the visibility was reduced to about one mile in light freezing drizzle and light snow. Although the weather observation at Umiujaq was indicating a low ceiling and reduced visibility, the pilots reported the ceiling at Umiujaq during the approach to be 700 feet. They decided to continue with the approach to Umiujaq knowing that they had a suitable alternate airport. All destination points north of Umiujaq had a ceiling greater than 1,300 feet and a minimum visibility of two miles.

The weather conditions north of Umiujaq were considered to be suitable for the flight, and the approach into Umiujaq was conducted in accordance with VFR regulations. However, flying a VFR approach in weather conditions of low ceilings and poor visibility produced by light

freezing drizzle and light snow showers can be dangerous. Although GPS was used as a supplement to visual navigation during this flight, it is concluded that the use of GPS was not a factor in this occurrence.

2.5 VFR/IFR Flight in Uncontrolled Airspace

The rules governing IFR flights in uncontrolled airspace are subject to interpretation with respect to transitioning from IFR to VFR conditions. Article 553 of the Air Regulations contains an exception to the rule that an aircraft must maintain 1,000 feet above the highest obstacle located within a horizontal radius of five miles from the estimated position of the aircraft in flight. The exemption specified is: "Except when taking off and landing." Furthermore, article 553 does not specifically address whether visual contact has to be established prior to a descent below 1,000 feet. A descent below 1,000 feet in uncontrolled airspace while in IFR conditions for the purpose of landing is interpreted differently by different Transport Canada personnel. The different opinions also indicate the need to clarify Air Regulation 553.

During the approach into Umiujaq, the pilots began to see the ground at 700 feet and obtained sufficient forward visibility to transition from IFR to VFR. The pilots continued the approach to Umiujaq under VFR conditions. The aircraft was clear of cloud and the crew had at least one mile flight visibility.

3.0 Conclusions

3.1 Findings

1. All aircraft systems were functioning normally.

2. A layer of ice covered the pneumatic de-icer in a symmetrical pattern.

3. On final, the pilot made a steep turn of at least 35 degrees, and the aircraft stalled at an altitude from which the pilot was unable to recover.

4. Runway 03/ 21 at Umiujaq was closed under a NOTAM but the crew members were not aware of the situation.

5. There was an insufficient exchange of information between the air service dispatcher, the FSS, the CARS, and the crew members.

6. The crew decided to continue the visual approach into Umiujaq despite the weather conditions reported.

7. Regulations with regard to descending below 1,000 feet in uncontrolled airspace while in IFR conditions, for the purpose of landing, are interpreted differently by different Transport Canada personnel.

3.2 Causes

The stalling speed of the aircraft increased due to ice on the leading edge of the wings and because the pilot made a steep turn; the aircraft stalled at an altitude from which the pilot was unable to recover. A contributing factor was the crew's decision to continue the visual approach into Umiujaq despite the weather conditions reported.

4.0 Safety Action

4.1 Action Required

4.1.1 Obstacle Clearance Altitudes

During this investigation, it became evident that Article 553 of the Air Regulations was being interpreted in a way such that its application with respect to operations in uncontrolled airspace was questionable. The regulation, when used as a reference for the flight conditions required for the transition from IFR flight to VFR flight in uncontrolled airspace, appears to have been ambiguous to such an extent that the Transport Canada (TC) Quebec regional office had an interpretation substantially different from that of TC's head office in Ottawa.

The flight procedure that brings into question the intent of the regulation is an en route IFR descent in instrument meteorological conditions (IMC) to conduct a VFR landing. Air Regulation 553 requires that aircraft in IFR flight be flown at an altitude 1,000 feet above the highest obstacle within 5 miles of the estimated position of the aircraft, except when taking off or landing[3]. The descent procedure used by the aircrew in this occurrence, and interpreted by the TC regional office as being acceptable, could eliminate this safety margin. Using a line of thinking consistent with this interpretation, a crew could descend an aircraft in IMC, without being on an approved instrument approach, to an altitude where visual meteorological conditions (VMC) were anticipated, as long as the descent was considered to be for the purpose of landing. The Board and TC's head office both believe that this was not the intent of the regulation.

The new Canadian Aviation Regulations (CARs) (recently announced in the Canada Gazette) contain a detailed section on minimum altitudes to ensure obstacle clearance in IFR flight; however, the CARs are no clearer than the Air Regulations as to what differentiates the en route and/ or approach phase of a flight from the landing phase. Nevertheless, until the CARs are in effect, aircrew are still required to fly in accordance with the existing Article 553; therefore, some aircrew may still believe that a descent is permissible to any altitude while attempting to transition to a VFR landing. Moreover, given the increasingly widespread use of GPS for navigating in remote areas and considering GPS' reputation for accuracy, aircrew may be more likely than ever to question the need for the 1,000-foot safety buffer.

The Board is concerned that regulatory officials and the operator of a fleet of state aircraft apparently did not question the appropriateness of a procedure that put aircraft, crew, and passengers at an increased level of risk. Therefore, the Board recommends that:

> The Department of Transport advise the aviation community, including Transport Canada regional staff, of the correct interpretation of Air Regulation Article 553; and
>
> A96-01

[3] The Air Regulations define "landing" as the act of coming into contact with a supporting surface; this includes the immediately preceding and following acts.

The Department of Transport clarify the wording of the CARs with respect to descents for landing in uncontrolled airspace to ensure that the intended level of safety is not jeopardized through misinterpretation.

A96-02

4.1.2 State-Owned Aircraft

In Canada, several departments and agencies of the federal and provincial governments operate fleets of aircraft. These fleets vary in size from just a few aircraft to over 100 aircraft, often with a mixture of aircraft types in any one fleet. The aircraft are frequently used to transport passengers, albeit not in a commercial capacity. The state aircraft generally operate under Air Navigation Order (ANO) I, No. 2, which regulates the transport of passengers in private aircraft. Private aircraft in this context include state and corporate aircraft. Thus, a private aircraft with a passenger-carrying capacity of only a few passengers and state/ corporate aircraft with significant passenger-carrying capacity (often significantly greater than that of the accident aircraft type) are treated in a similar manner from a regulatory perspective. The Fonds du Service Aérien Gouvernemental is classified as a state-owned operation and was operating under ANO I, No. 2.

Commercial operations are generally conducted in accordance with ANO VII, No. 2 (large aircraft), and ANO VII, No. 3 (small aircraft). The aircraft type involved in this accident would be operated under ANO VII, No. 2, in a commercial operation. There are significant differences between ANO I, No. 2, operations and ANO VII (particularly ANO VII, No. 2) operations in the areas of the requirement for an operating certificate, operational requirements, crew training and qualifications, and regulatory overview.

In the late 1980s, the predecessor to the TSB, the Canadian Aviation Safety Board (CASB), became concerned about the number of occurrences involving another operator of a large fleet of state aircraft, the RCMP. It was noted at that time that a number of the practices and procedures meant to enhance safety in the commercial aviation sector were absent in the day-to-day operation of that fleet. The CASB suggested that the operator request an independent safety survey to assist in identifying shortcomings in the operation. A safety survey was subsequently done by TC and corrective measures were taken. Some of these measures were in excess of ANO I, No. 2, requirements and more in line with ANO VII requirements. The number of significant occurrences involving RCMP aircraft has reduced considerably since 1990.

Following this accident, and with the concurrence of Service Aérien, Transport Canada initiated a post-accident safety survey of the organization. As a result of this survey, changes were made to the organization's managerial staff. The TSB was unable to determine what other changes, if any, resulted from this survey.

In providing its regulatory overview of commercial operators, Transport Canada uses risk management indicators to identify those carriers possibly requiring extra surveillance and audit. However, operators of state aircraft do not come under the same regulatory scrutiny; thus, indicators of increasing risk are less likely to be detected. The operation of TC's own fleet of aircraft is voluntarily subjected to the requirements of an operating certificate similar to that of commercial carriers.

The recently announced CARs will require state and private operators of large or turbine-powered, pressurized passenger aircraft to adhere to more demanding safety standards. However, these standards are still not equivalent to those applicable to commercial air carriers.

It is recognized that the operations in which state aircraft are often engaged are unique, and that, for the most part, they do not involve the travelling public. Yet, when passengers are regularly carried on state aircraft, it is reasonable for these passengers to expect that the aircraft and aircrew involved in state operations are subject to the same regulatory requirements as commercial carriers. The Board believes, therefore, that state operations would benefit from the increased standards and regulatory overview applicable to commercial operations. Therefore, the Board recommends that:

> The Department of Transport require that the operators of state aircraft be subject to regulatory overview, as practicable, equivalent to that of similar commercial operations.

A96-03

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson John W. Stants, and members Zita Brunet and Maurice Harquail, authorized the release of this report on 28 February 1996.

Appendix A - Glossary

agl	above ground level
AIRMET	Airman's Meteorological Advisory
ANO	Air Navigation Order
ATC	Air Traffic Control
CAR	Canadian Aviation Regulation
CARS	community aerodrome radio station
CASB	Canadian Aviation Safety Board
CVR	cockpit voice recorder
ELT	emergency locator transmitter
EST	eastern standard time
FSS	Flight Service Station
GPS	global positioning system
IFR	instrument flight rules
IMC	instrument meteorological conditions
MANOT	Missing Aircraft Notice
NDB	non-directional beacon
nm	nautical mile(s)
NOTAM	Notice to Airmen
PIREP	Pilot Report
SIGMET	Significant Meteorological Report
TC	Transport Canada
TSB	Transportation Safety Board
UTC	Coordinated Universal Time
VFR	visual flight rules
VMC	visual meteorological conditions
ºM	degrees magnetic
ºT	degrees true

TSB OFFICES

HEAD OFFICE

HULL, QUEBEC*
Place du Centre
4th Floor
200 Promenade du Portage
Hull, Quebec
K1A 1K8
Phone (819) 994-3741
Facsimile (819) 997-2239

ENGINEERING
Engineering Laboratory
1901 Research Road
Gloucester, Ontario
K1A 1K8
Phone (613) 998-8230
24 Hours (613) 998-3425
Facsimile (613) 998-5572

REGIONAL OFFICES

GREATER HALIFAX, NOVA SCOTIA*
Marine
Metropolitain Place
11th Floor
99 Wyse Road
Dartmouth, Nova Scotia
B3A 4S5
Phone (902) 426-2348
24 Hours (902) 426-8043
Facsimile (902) 426-5143

MONCTON, NEW BRUNSWICK
Pipeline, Rail and Air
310 Baig Boulevard
Moncton, New Brunswick
E1E 1C8
Phone (506) 851-7141
24 Hours (506) 851-7381
Facsimile (506) 851-7467

GREATER MONTREAL, QUEBEC*
Pipeline, Rail and Air
185 Dorval Avenue
Suite 403
Dorval, Quebec
H9S 5J9
Phone (514) 633-3246
24 Hours (514) 633-3246
Facsimile (514) 633-2944

GREATER QUÉBEC, QUEBEC*
Marine, Pipeline and Rail
1091 Chemin St. Louis
Room 100
Sillery, Quebec
G1S 1E2
Phone (418) 648-3576
24 Hours (418) 648-3576
Facsimile (418) 648-3656

GREATER TORONTO, ONTARIO
Marine, Pipeline, Rail and Air
23 East Wilmot Street
Richmond Hill, Ontario
L4B 1A3
Phone (905) 771-7676
24 Hours (905) 771-7676
Facsimile (905) 771-7709

PETROLIA, ONTARIO
Pipeline and Rail
4495 Petrolia Street
P.O. Box 1599
Petrolia, Ontario
N0N 1R0
Phone (519) 882-3703
Facsimile (519) 882-3705

WINNIPEG, MANITOBA
Pipeline, Rail and Air
335 - 550 Century Street
Winnipeg, Manitoba
R3H 0Y1
Phone (204) 983-5991
24 Hours (204) 983-5548
Facsimile (204) 983-8026

EDMONTON, ALBERTA
Pipeline, Rail and Air
17803 - 106 A Avenue
Edmonton, Alberta
T5S 1V8
Phone (403) 495-3865
24 Hours (403) 495-3999
Facsimile (403) 495-2079

CALGARY, ALBERTA
Pipeline and Rail
Sam Livingstone Building
510 - 12th Avenue SW
Room 210, P.O. Box 222
Calgary, Alberta
T2R 0X5
Phone (403) 299-3911
24 Hours (403) 299-3912
Facsimile (403) 299-3913

GREATER VANCOUVER, BRITISH COLUMBIA
Marine, Pipeline, Rail and Air
4 - 3071 Number Five Road
Richmond, British Columbia
V6X 2T4
Phone (604) 666-5826
24 Hours (604) 666-5826
Facsimile (604) 666-7230

*Services available in both official languages