

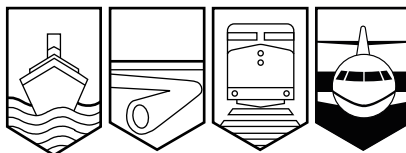
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

AVIATION INVESTIGATION REPORT

A01W0269



CONTROLLED FLIGHT INTO TERRAIN

STAGE AIR LTD.

CESSNA 208B C-GGUH

INUVIK, NORTHWEST TERRITORIES 4 nm N

02 NOVEMBER 2001

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report

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Summary

A Cessna Caravan, C-GGUH, serial number 208B0827, was on a visual flight rules flight, at night, from Tuktoyaktuk, Northwest Territories, to Inuvik (Mike Zubco) Airport, when instrument meteorological conditions (IMC) were encountered. Before entering the Inuvik control zone, the pilot contacted the air traffic controller and was issued an instrument approach clearance for Runway 23 at 1932 mountain standard time. During the approach the aircraft contacted a hill top four nautical miles (nm) north of the airport and came to rest in an upright position. The aircraft was substantially damaged; the pilot and the one passenger sustained minor injuries.

Ce rapport est également disponible en français.

Other Factual Information

The pilot had flown from Inuvik to Tuktoyaktuk earlier in the day, with the accident occurring on the return flight to Inuvik. The pilot made his initial radio call to the Inuvik Flight Service Station (FSS) at 43 nm north of the airport on the 330 degree magnetic radial from the Inuvik very high frequency omnidirectional range (VOR); the aircraft was level at 2000 feet above sea level (asl). The FSS operator informed the pilot of current weather conditions at Inuvik, which were below the minimums required for visual flight rules (VFR) flight. When the pilot indicated his intention to request a clearance for either special VFR or an instrument approach, he was instructed to call the Edmonton Area Control Centre (ACC).

On initial contact with the ACC, the pilot was cleared to the Inuvik 330° radial at 20 DME (distance measuring equipment) to maintain 3000 feet asl in controlled airspace. When the aircraft was at 26 DME, the ACC controller cleared C-GGUH to Inuvik Airport for an approach. The pilot was then instructed to call Inuvik FSS. When in contact with the FSS, the pilot indicated his intention to conduct an instrument approach to Runway 23. Subsequent traffic developments in the airport area made it necessary for the ACC controller to specify an approach for C-GGUH, and the pilot was again asked to call the ACC. The ACC controller cleared C-GGUH to Inuvik Airport for a straight-in localizer back-course DME Runway 23 approach via the 330° radial to intercept the 13 DME arc transition. When the pilot re-established contact with the FSS, the aircraft was at 2200 feet asl, 21 DME from the VOR. The minimum sector altitude (MSA) for this approach 25 nm or less from the Inuvik VOR is 2200 feet asl. (See Appendix A).

Radar returns from C-GGUH recorded by the Department of National Defense, North Bay, indicate that C-GGUH was never established on any part of the approach for Runway 23. The aircraft overflowed the 13 DME position by about three nautical miles, while approximately on the 330° radial, then made a turn to the southeast. After two to three miles on this track, the aircraft turned southward. Four nautical miles further on, the aircraft struck the ground. The radar recording did not include altitude information.

C-GGUH contacted the ground at 1932 MST¹, at an elevation of about 750 feet asl on a relatively flat, lightly treed hill top, 525 feet above airport elevation, on a bearing of 359° M from the airport. Ground scars and a wreckage trail of about 100 feet indicate that the aircraft was on a track of 142 degrees, and heading directly toward the threshold of Runway 23. This track is about 90 degrees to the final approach track to the runway. On ground contact, the aircraft was in a wings-level, slightly nose-down attitude. The landing gear, right aft fuselage section, left wing, and the belly structure, including the belly-mounted cargo pod, sustained substantial damage. Approach flaps were selected, and the pilot had slowed the aircraft to about 80 knots during the last few minutes of flight. Propellor damage suggested that the engine was operating at relatively low power on ground impact.

¹ All times are MST (Coordinated Universal Time minus seven hours) unless otherwise noted.

Before departure from Inuvik, the pilot received a telephone weather briefing for Inuvik and Tuktoyaktuk. Weather in Inuvik at 1615 (2315 UTC) was as follows: partially obscured; measured 5500 feet broken, 10 000 feet overcast; visibility three statute miles (sm) in light snow; winds 290°T at five knots. The terminal forecast for Inuvik from 1300 to 2300 (022006 UTC) was as follows: winds 330°T at five knots, visibility greater than six statute miles, 600 feet scattered, 1500 feet overcast; temporarily one statute mile in light snow and light freezing drizzle, 400 feet overcast. The pilot did not obtain an update during his stop at Tuktoyaktuk. Weather at Inuvik as observed by the Inuvik FSS after the accident, at 1942 (0242 UTC) was as follows: precipitation ceiling 200 feet obscured, visibility 5/8 sm in light snow, temperature minus 14°C, dew point minus 16°C, altimeter approximately 29.59. There were snow showers in the vicinity. A pilot report passed from an aircraft which departed Inuvik shortly before the time of the accident, indicated that at eight nautical miles north of the Inuvik airport, flight visibility was greater than eight nautical miles and that there was no distinct ceiling. The accident took place during the hours of darkness.

The pilot held a valid commercial pilot license with an instrument rating and a Category 1 medical certificate. He had accumulated approximately 11 000 hours total flying time, with about 400 hours on type, and completed a Cessna Caravan conversion course at Flight Safety International Ltd. in February 2001. He had flown approximately 150 hours in instrument flight rules (IFR) operations. During a Transport Canada (TC) administered pilot proficiency check (PPC) in February 2001, it was noted that the pilot did not effectively use the radar altimeter during instrument approaches. The pilot failed a March 2001 PPC/IFR flight in a PA31 Navajo because the aircraft was allowed to descend below a minimum altitude during an instrument approach; he passed a subsequent PPC/IFR flight in May 2001.

The company held a valid TC Operations Certificate with operations specifications authorizing passenger carrying flight under IFR or night VFR without a second-in-command pilot. The company's main base was in Penticton, British Columbia, with a sub-base at Inuvik. At the time of the accident, the pilot of C-GGUH was Base Manager and Senior Pilot at the Inuvik base.

C-GGUH had been recently acquired by the company for work out of the Inuvik base. Records indicate that the aircraft was certified, maintained, and equipped in accordance with existing regulations and approved procedures. All systems were operating normally when it contacted the ground. Aircraft weight at the time of the occurrence was calculated to be 6637 pounds, within the maximum gross weight limit of 8756 pounds. The calculated centre of gravity was within limits. The aircraft carried a cargo of empty water bottles distributed between the cabin and the belly cargo pod. The aircraft's fuel load was sufficient for the intended flight.

After the accident, the pilot reset the aircraft radios and navigation equipment to give the rescue party information on the position of the accident site. The aircraft was fitted with a radar altimeter and the pilot had armed the alerting system to activate at 500 feet above ground level (agl); the pilot did not monitor the instrument on the accident flight. The aircraft was equipped with an autopilot, in accordance with *Canadian Aviation Regulation (CAR) 703.66* for single pilot operations in IFR/ night VFR, but it was not used on this flight. The aircraft was not equipped with a ground proximity warning system (GPWS) or a terrain avoidance warning system (TAWS). Installation of GPWS is mandatory in Canada on all turbojet aircraft with a maximum certified take-off weight greater than 33 069 pounds that carry 10 or more passengers on CAR 704 operations. This requirement does not extend to CAR 703 operations—Stage Air

operates under CAR 703—even though these operations may be conducted by a single pilot at night or in IMC in high risk areas, often without the benefit of radio monitoring and other support normally provided to larger aircraft. This had been identified as a factor in other recent occurrences: TSB investigation reports A98P0303, A00H0001, and A01W0261.

The Flight Safety Foundation defines a controlled flight into terrain (CFIT) accident as “one in which an airworthy aircraft, under the control of the crew is flown unintentionally into terrain, obstacles, or water with no prior awareness on the part of the crew of the impending collision.” This occurrence fits this definition².

TC defines situational awareness as “all the knowledge that is accessible and can be integrated into a coherent picture, when required, to assess and cope with a situation”³. It is necessary that a pilot have a mental map of where the aircraft was, is, and where it is going.

The emergency locator transmitter (ELT) functioned automatically, and the pilot turned it off after making radio contact with the FSS. A ground search and rescue party, which was dispatched on snow machines immediately after the accident, was unsuccessful in locating the accident site because of darkness, rugged terrain, and the lack of a hand-held VHF homer. The two occupants were rescued five hours after the accident when a local helicopter was dispatched. The pilot of G-GGUH was in cellular telephone and VHF radio contact with the FSS, and helped to coordinate the rescue.

Analysis

The pilot had received a weather briefing before departure from Inuvik, and despite the likelihood of an IFR arrival at Inuvik, the pilot planned and flew under VFR. Although the pilot was aware of the probable weather conditions at Inuvik for his arrival, he was not prepared to fly an approach in instrument conditions. The pilot had extensive experience in VFR operations; however, he was relatively inexperienced in flight under IFR and in IMC, and was not comfortable flying in these conditions. Other events that demonstrated this were as follows:

- the pilot requested special VFR rather than flight filing IFR when confronted with weather that was below VFR limits in Inuvik;
- he hand flew the aircraft rather than using the autopilot;
- he did not use the radar altimeter as an effective tool for altitude awareness; and
- he did not establish the aircraft on any portion of the published LOC/BC approach to Runway 23.

² Flight Safety Foundation Flight Safety Digest, April-May 1996, *An Analysis of Controlled-flight-into-terrain (CFIT) Accidents of Commercial Operators, 1988 Through 1994*, p. 4

³ *Human Factors for Aviation, Basic Handbook*, TP12863(E), Transport Canada, Safety and Security, p. 142.

A successful transition from VFR to IFR flight and preparation for an approach would require a high degree of organization on the part of a pilot and a significant amount of time to accomplish. By the time the pilot of C-GGUH read back the approach clearance, the aircraft was eight nautical miles north of the 13 DME arc, and considering his low comfort level with IFR procedures, he had a relatively short time to prepare for the approach.

Available radar track information shows that the aircraft did not become established on the published instrument approach. It is likely that the pilot was unable to capture the 13 DME arc and attempted to navigate to the airport using global positioning system (GPS) information. With a degradation of situational awareness of position and altitude, the pilot allowed the aircraft to descend below a safe altitude for terrain clearance (MSA). When the aircraft struck the ground, it was flying on a track about 90° to the published final approach track for Runway 23, heading directly toward the airport. Considering that the aircraft was under full control of the pilot, developing power, and in a normal flight attitude at ground contact, the occurrence fits the definition of a CFIT accident.

The pilot did not monitor the radar altimeter on the accident flight, and his performance on PPC/IFR check rides suggests that he was not in the habit of using this equipment. In requiring installation of a functioning autopilot for single-pilot IFR flight in commercial operations, TC recognizes that pilot performance is augmented by the use of the equipment in this high workload environment, especially at night. Although an autopilot must be installed, there is no regulatory requirement for the pilot to use it under these conditions. A functioning GPWS or TAWS installation may have alerted the pilot to imminent ground contact.

The cargo pod, filled with empty plastic water bottles, cushioned the impact forces and probably mitigated the degree of damage to the aircraft and injury to the occupants.

Use of a portable VHF homer by the ground search party could have reduced the time to rescue the pilot and passenger.

Findings as to Causes and Contributing Factors

1. The pilot did not adequately plan for the IFR approach, did not execute the approach in a manner so as to align the aircraft with the runway, and flew into terrain.
2. The pilot's low comfort level with IFR procedures coupled with the relatively short time to organize for the assigned approach most likely resulted in the pilot losing situational awareness.
3. The pilot did not use the autopilot or the radar altimeter to reduce workload and provide terrain alerting during the approach.

Findings as to Risk

1. The aircraft was not fitted with, nor required to be fitted with, a GPWS/TAWS. Installation and use of GPWS/TAWS would have warned the pilot of decreasing terrain clearance.

Other Findings

1. The time required to locate and access the accident site by a ground rescue party may have been hampered by the lack of a hand-held VHF homer.

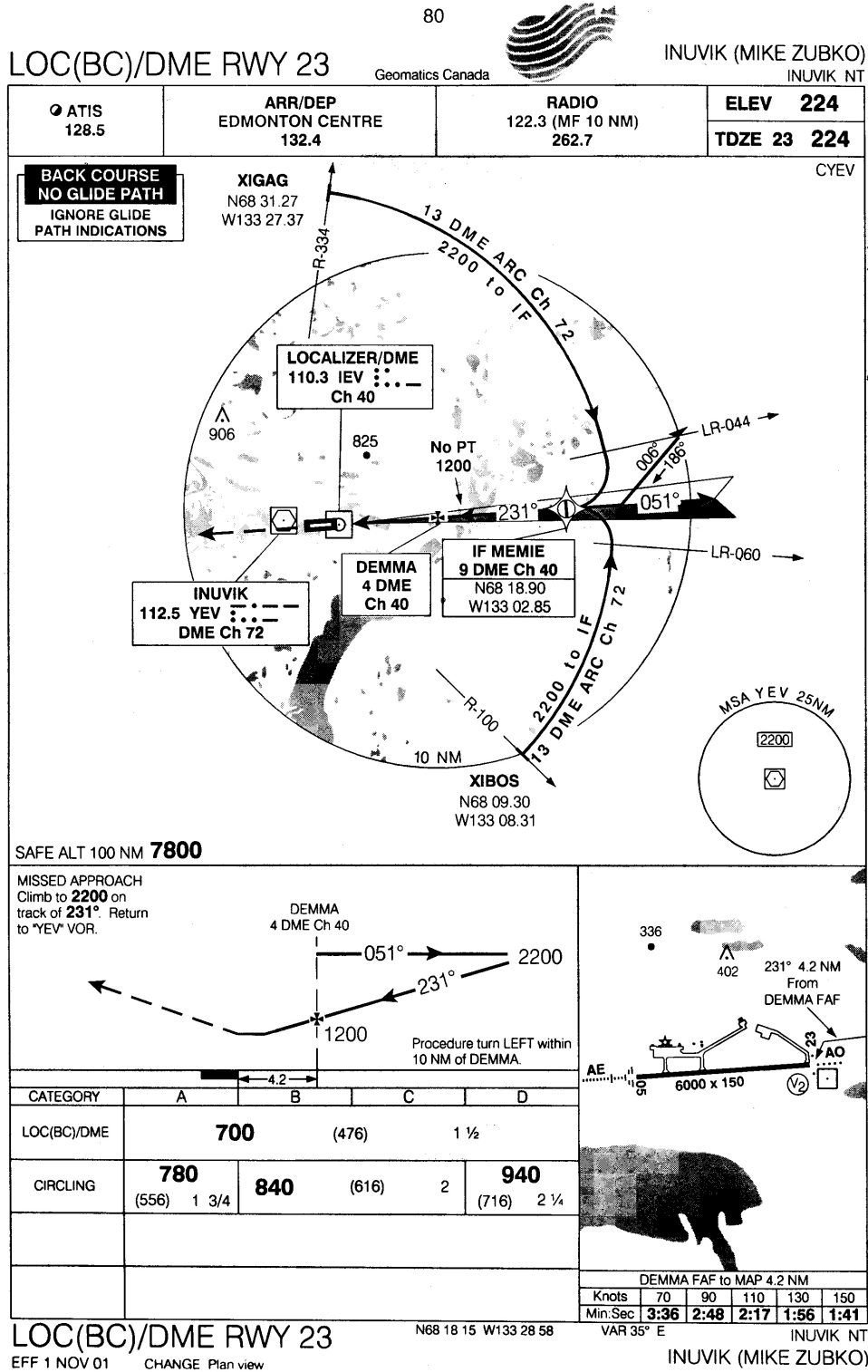
Safety Action

Following this accident, the company instituted a policy of operating their aircraft with a second qualified pilot while in IFR or night VFR operations.

TC has introduced a *Notice of Proposed Amendment 2001-131* to CAR 605.37, requiring installation of TAWS in commercial aircraft. The amendment, if approved, requires that CAR 705 aircraft, all CAR 704 aircraft with 10 or more seats, and all CAR 703 aircraft with six or more seats manufactured after 29 March 2002, be equipped with TAWS; those aircraft manufactured before that date must be equipped by 29 March 2005.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 04 December 2002.

Appendix A — Approach Chart, Inuvik (Mike Zubco) Airport



(Not for navigational use)