AVIATION INVESTIGATION REPORT
A01O0210

CONTROLLED FLIGHT INTO TERRAIN

CESSNA 182 D-EDOG

TIMMINS, ONTARIO

03 AUGUST 2001

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Summary

At 2145 eastern daylight time on 02 August 2001, a Cessna 182, serial number F18200128, departed on an instrument flight rules flight from Kuujjuaq to La Grande-Rivière, Quebec. The flight plan indicated that Timmins, Ontario, was the alternate airport. While en route, the pilot changed the destination airport to Timmins and made La Grande-Rivière the alternate airport. Thirty nautical miles north of Timmins, the pilot established radio contact with the Timmins Flight Service Station (FSS). The Timmins FSS specialist informed the pilot that the ceiling was 300 feet overcast with a visibility of 8 statute miles in haze. The pilot informed Timmins FSS that he would conduct a global positioning system approach to Runway 03. Timmins FSS requested that the pilot report over the VOR (VHF omnidirectional radio range). The pilot acknowledged the request, and 3 minutes 44 seconds later, at 0623Z (0223 local, 03 August), a signal from the aircraft's emergency locator transmitter was received at the Timmins FSS: 0623Z is assumed to be the time of the accident. The aircraft struck the ground 1.2 nautical miles northwest of the Timmins VOR. The pilot, who was the sole occupant of the aircraft, was fatally injured.

Ce rapport est également disponible en français.

Other Factual Information

The German-registered aircraft had been purchased by an American aircraft sales company and was being ferried by a German pilot from Egelsbach, Germany, to Waterloo, Iowa. The pilot departed Egelsbach at approximately 0605Z (0805 local) on 31 July 2001, made an en route stop at Newcastle, England, and spent the night in Stornaway, Scotland. The distance flown on 31 July was approximately 800 nautical miles. The next day, 01 August, he flew to Reykjavik, Iceland, to refuel, then flew to Kulusuk, on the east coast of Greenland, landing at 1629Z[1] (1429 local). The distance flown on this day was approximately 670 nautical miles. He departed the Kulusuk airport at 1113Z (0913 local) on 02 August and flew to Kangerlussuaq (Sondrestrom), Greenland, landing at 1344Z (1144 local). At 1454Z, after refuelling, he departed for Iqaluit, Nunavut, arriving at 1844Z (1444 local). The pilot refuelled at Iqaluit and took off at 2107Z (1707 local) and continued on to Kuujjuaq, Quebec. He received a weather briefing from the local flight service station (FSS), filed an instrument flight plan to La Grande-Rivière with Timmins as the alternate airport, and refuelled the aircraft. The pilot departed Kuujjuaq at approximately 0145Z, 03 August (2145 local, 02 August). En route, the pilot contacted Montréal Centre for a weather briefing. After receiving information that Timmins was forecast to be visual meteorological conditions all evening, the pilot changed the alternate airport to La Grande-Rivière and made Timmins his destination airport.

Thirty miles north of Timmins, at 10 000 feet above sea level, the pilot contacted Timmins FSS and requested landing clearance. The Timmins FSS specialist informed the pilot that he would need to be cleared for an approach by Toronto Centre, and the FSS specialist provided the pilot with the appropriate frequency.

The pilot contacted Toronto Centre and was cleared to maintain 5000 feet above sea level. A short time later, the pilot was cleared for an approach to the Timmins airport, and the flight was handed back to Timmins FSS. The pilot contacted Timmins FSS and was advised that the ceiling was 300 feet overcast, visibility was 8 statute miles in haze, and the instrument landing system (ILS) for Runway 03 was in use. The pilot informed Timmins FSS that he did not have a functioning ILS. Timmins FSS specialist restated the latest weather observation and inquired about the instrumentation the pilot had on board. The pilot informed Timmins FSS that he was equipped with a global positioning system (GPS) and that he would conduct a GPS approach to Runway 03. Timmins FSS acknowledged the pilot's intentions and requested that he report over the VOR (VHF omnidirectional radio range) for the GPS approach to Runway 03. The pilot's last transmission was an acknowledgment of the FSS request.

Timmins FSS received an emergency locator transmitter signal 3 minutes 44 seconds later. The FSS specialist, unable to contact the Cessna pilot, immediately contacted the Toronto Area Control Centre. Canadian Forces Rescue Coordination Centre in Trenton deployed fixed- and rotary-wing aircraft to the area.

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[1] UTC (Z) times are used to facilitate computing elapsed times en route.

A weather observation, taken at 0230, just after the emergency locator transmitter was heard, was as follows: sky condition partially obscured, ceiling 200 feet overcast, visibility 1 statute mile in fog, temperature 16°C, dewpoint 16°C, and wind 360° magnetic at 5 knots.

The terrain is relatively flat and densely forested in the area of the Timmins airport and within a radius of two nautical miles of the crash site. The aircraft initially hit treetops in a slight left-banked attitude in a shallow descent. The aircraft was on a heading of about 150° magnetic when it first struck the trees. The cockpit area was not compromised as both wings were torn away at the wing root by the impact with surrounding trees. The aircraft came to rest abruptly on its left side when the fuselage contacted the flat terrain. The tricycle landing gear was still attached to the fuselage. The engine and the propeller were in place, although two of the four engine mounts were bent by impact forces. The propeller blades were twisted and bent aft. The flaps were in the retracted position, consistent with the flap selection lever in the cockpit.

Control integrity checks were conducted in the field, and it was determined that the pilot had positive and correct elevator authority before impact with the ground. The rudder operation was free and correct. Aileron control integrity checks could not be performed because of wing damage during impact.

The cockpit and the cabin were distorted but not destroyed, and the instrument and control panels were intact. The aircraft had two altimeters. The primary altimeter, mounted in the instrument panel in front of the pilot's left-hand crew station, was set to 1019 millibars, which accurately represents the altimeter setting at the time of the occurrence. The standby altimeter was mounted in the top right corner of the instrument panel. Information received indicates that the pilot had two identical Garmin Mk lll handheld GPS units on board the aircraft when it left Germany, one with a European database and the other with a North American database. The GPS with the European database was found wrapped up and stowed in the aircraft. Because the pilot indicated that he would be flying a GPS approach, it is assumed that he was using another GPS for en route navigation and the approach. The other GPS was not found in or around the wreckage; the dense bush and brush could easily hide the GPS, a small, black unit.

There was a large area of fuel-soaked terrain at the occurrence site. The aircraft's fuel selector was found properly seated in the BOTH position. The amount of fuel absorbed by the ground could not be quantified, but it was determined that fuel starvation was not a factor in the occurrence.

Propeller twist and bending moments, combined with radial scarring on surrounding trees, were consistent with a functioning engine driving a propeller. The carburettor heat was selected ON, an appropriate configuration for a cruise descent power setting in conditions of visible moisture.

Canadian Aviation Regulations (CARs) did not require this aircraft to be equipped with a cockpit voice recorder or a flight data recorder, and neither was installed. The aircraft was certified to be flown with a single pilot and was operating within its certified weight and balance limitations at the time of the occurrence.

The aircraft was equipped with the Cessna Aircraft Company's standard Crown Instrument Package, which includes but is not limited to the following: two navigation/communication (NAV/COM) receivers; two VOR indicators, one of which is capable of displaying localizer and glideslope information from the aircraft's ILS receiver; an automatic direction-finder (ADF); and distance-measuring equipment (DME). Only one NAV/COM receiver was serviceable. The ADF, the DME, and the localizer/glideslope indicator were unserviceable. The pilot had only one VHF radio for communications and one VOR for radio navigation and approach. The aircraft was equipped with a two-axis autopilot, which was selected off at the time of the occurrence.

The start menu of the GPS that was found indicated that this GPS model was designed only "For VFR [visual flight rules] use as an aid to prudent navigation". *Aeronautical Information Publication* (AIP), COM 3.16.10, suggests, "Use only IFR-certified receivers for IFR [instrument flight rules] flights because non-IFR receivers do not provide the integrity needed for IFR operations." Furthermore, AIP COM 3.16.3.1 addresses the installation and certification requirements for using a GPS in Canada in the en route, terminal, and non-precision approach phases of flight and states:

> Avionics have to meet the appropriate class under the IFR equipment standard, TSO [Technical Standing Order] C129a. Equally important, their installation must be approved by Transport Canada. The key feature of these units is random acquisition integrity monitoring (RAIM) a safety feature that warns the pilot if there is a problem with satellite signals. Hand-held and other VFR receivers do not have this feature and, therefore, they cannot be used for IFR operations.

There were no published instrument approach procedures for Ontario found in the aircraft. A thorough search of the crash site accounted for all other flight documentation except for those required to conduct an instrument approach to an airport in Ontario. CAR 602.60, "Requirements for Power-driven Aircraft", states:

> (1) No person shall conduct a take-off in a power driven aircraft, other than an ultra-light aeroplane, unless the following operational equipment is carried on board:[. . .]
>
> > (b) where the aircraft is operated in VFR OTT [over the top], night VFR flight or IFR flight, all of the necessary current aeronautical charts and publications covering the route of the proposed flight and any probable diversionary route.

Runway 03 in Timmins has two IFR approaches: an ILS or non-directional beacon (NDB) (GPS) approach (see Appendix A) and a VOR (GPS) approach. The minimum descent altitude (MDA) for the NDB approach was 413 feet above ground level (agl). The MDA for the VOR approach was also 413 feet agl, but only if the aircraft has a serviceable NDB or DME; without an NDB or DME, the MDA was 733 feet agl.

The GPS portion of the titles indicates that there is a GPS overlay component to the non-precision approach procedure. Transport Canada's *Aeronautical Information Circular* 2/01, dated 19 April 2001, advises that "GPS overlay non-precision approaches are based on VOR, VOR/DME, NDB and NDB/DME approaches identified in the Canada Air Pilot (CAP). These approaches can be flown using GPS guidance by selecting the appropriate approach procedure from the airborne navigation database."

CAR 605.18 outlines equipment requirements for IFR flight in power-driven aircraft. It states, in part, that there must be on board

> (j) sufficient radio navigation equipment to permit the pilot, in the event of the failure at any stage of the flight of any item of that equipment, including any associated flight instrument display,
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> (i)to proceed to the destination aerodrome or proceed to another aerodrome that is suitable for landing, and
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> (ii)where the aircraft is operated in IMC [instrument meteorological conditions], to complete an instrument approach and, if necessary, conduct a missed approach procedure.

No instrument approach procedure publications for the Timmins airport were found in the aircraft or at the scene. Instrument approach procedure publications for all other applicable airports, except those in Ontario, and current en route information were found in the aircraft.

The pilot held a valid German private pilot licence and a valid German aviation medical certificate. The licence allowed him to fly as pilot-in-command of all single piston-engine land aeroplanes up to a maximum certified take-off weight of 2000 kg. No other ratings were attached to his German licence. He had a valid German radiotelephone operator's licence with the following restrictions:

1. non-commercial and non-professional activities
2. day flying only except in the vicinity of an aerodrome
3. restricted to the territory of the Federal Republic of Germany
4. additional ratings required to operate cross-country
5. only VFR flight permitted
6. only German language communications

The pilot also had an American private pilot licence with an attached instrument rating. However, according to CARs, Part IV, Personnel Licensing and Training, the pilot was not permitted to fly a German registered airplane in Canadian airspace under instrument flight rules based on his American instrument rating.

The pilot had been flying for 24 years and had accumulated 2013 hours' total flight time. All of this time had been in single-engine, non-high performance, land aircraft. He had completed 17 transatlantic crossings in single-engine aircraft and was conducting the flight for the German vendor. During the 90 days before the accident, he had flown 245 hours, 99 of which had been flown in the previous 30 days.

Records indicated that the aircraft had been flown 1727 hours. The engine had just been rebuilt and had accumulated approximately 88 hours.

Analysis

Based on the examination of the propellor blades and the lack of any radio transmissions related to any emergency situation, it is concluded that an engine failure or partial power loss was not a factor in this occurrence.

The pilot had a German private pilot licence with no other privileges attached to it. He also had an American private pilot licence with an instrument rating; however, regulations did not permit him to exercise the privileges of his American instrument rating while flying a German registered airplane in Canada. He was therefore restricted to day VFR flight within the confines of Canadian domestic airspace. The weather at Timmins at the time of the attempted landing was not suitable for VFR flight, and the flight was being conducted in darkness.

The decision to attempt the flight with one VHF radio, one VOR receiver, and a handheld GPS not certified for IFR navigation reflects a disregard of aviation regulations and the safety they provide. Furthermore, the pilot filed an IFR flight plan and attempted to conduct an IFR approach in airspace in which he was not qualified to do so. The aircraft instrumentation was also not appropriate for this flight. The GPS database probably contained some information relative to the route and airports.

The pilot knew that the cloud ceiling was 300 feet agl overcast, and the only serviceable approach aid in the aircraft for Runway 03 was the VOR, with a related minimum descent height of 733 feet agl. This would indicate that an approach to a successful landing was doubtful. The pilot was relying on a handheld GPS unit, not certified for use as a primary navigation or approach aid, to provide proper navigation and landing guidance. It is not known what the accuracy of the GPS was or what had been programmed into it. The crash occurred 1.2 nautical miles northwest of the Timmins VOR, which means that the pilot had probably not yet commenced the approach to Runway 03. It is not known why, if the pilot had the approach displayed on the GPS, he would be at such a low altitude in the area of the crash. A reasonable explanation may be that he was purposely descending in an attempt to visually acquire the airport and the surrounding area.

Fatigue is used as a catch-all term for a variety of different experiences, such as physical discomfort from overworking a group of muscles, difficulty concentrating, difficulty appreciating potentially important signals, and problems staying awake. In the context of an investigation, fatigue is important if it potentially reduces efficiency, erodes the safety margin, or otherwise impairs cognitive or physical performance. Although it is known that fatigue has powerful negative effects on pilot performance, the general public, including many pilots and other aviation workers, underestimate the potential of fatigue to impair virtually all aspects of performance.

Counting ground and air times, the pilot probably was on duty approximately 8 to 10 hours per day for the first two days. The third day was more taxing in that the distance flown was over 1900 nautical miles, and the time from take-off at Kulusak until the accident was 19 hours 10 minutes. With an estimated preparation time of one hour before the first flight, the duty day was over 20 hours. The flight was long, crossed six time zones, was over relatively featureless terrain, and was a single-pilot operation. Much of the flight was in instrument meteorological conditions (IMC), at night, and the aircraft lacked full instrumentation, which would require that the pilot constantly fly with reference to the flight instruments. Based on the above, it is likely that fatigue affected the pilot's performance, and may have contributed to the accident.

Findings as to Causes and Contributing Factors

1. The pilot attempted to fly an instrument approach procedure with the aid of a global positioning system receiver that was not certified or installed for that purpose.

2. Given known unserviceabilities, the aircraft was not properly IFR-equipped.

3. No published instrument approach procedures for Ontario were found either in the aircraft or at the crash site.

4. It is likely that fatigue affected the pilot's performance, and may have contributed to the accident.

Findings as to Risk

1. The pilot was not using the radio telephone in accordance with restrictions placed on his radio telephone operator's licence.

2. The pilot conducted a long-range IFR flight without sufficient radio navigation equipment.

3. The pilot operated the aircraft on an instrument flight rules (IFR) flight plan and attempted to conduct an instrument approach procedure in instrument meteorological conditions when he was not properly licensed to do so.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 16 October 2002.

Appendix A—ILS or NDB RWY 03 (GPS) Approach