Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A10A0056

CONTROLLED FLIGHT INTO TERRAIN

NORTH WIND AVIATION LTD.
PIPER NAVAJO PA31-350 C-FZSD
CARTWRIGHT, NEWFOUNDLAND AND LABRADOR, 60 NM W
26 MAY 2010

Canada

Aviation Investigation Report

Controlled Flight into Terrain

North Wind Aviation Ltd.
Piper Navajo PA31-350 C-FZSD
Cartwright, Newfoundland and Labrador, 60 nm W
26 May 2010

Report Number A10A0056

Synopsis

On 26 May 2010, at 0835, Atlantic Daylight Time, the North Wind Aviation Ltd. Piper Navajo PA31-350 (registration C-FZSD, serial number 31-7405233) departed on a round trip flight from Goose Bay to Cartwright and Black Tickle before returning to Goose Bay, Newfoundland and Labrador. The pilot was to deliver freight to Cartwright as well as a passenger and some freight to Black Tickle. At approximately 0905, the pilot made a radio broadcast advising that the aircraft was 60 nautical miles west of Cartwright. No further radio broadcasts were received. The aircraft did not arrive at destination and, at 1010, was reported as missing. The search for the aircraft was hampered by poor weather. On 28 May 2010, at about 2200, the aircraft wreckage was located on a plateau in the Mealy Mountains. Both occupants of the aircraft were fatally injured. The aircraft was destroyed by impact forces and a post-crash fire. There was no emergency locator transmitter on board and, as such, no signal was received.

Other Factual Information

History of the Flight

On 25 May 2010, North Wind Aviation Ltd. was contracted to haul freight to Cartwright.

On 26 May 2010, at about 0600 [1] and again at 0700, the pilot obtained the weather for Cartwright. He received the aviation routine weather report (METAR) and wind information from the Cartwright aerodrome forecast (TAF ADVISORY). After arriving at the Goose Bay airport, the pilot prepared the aircraft, filed a visual flight rules (VFR) flight plan and loaded the passenger and freight. The aircraft departed for Cartwright at 0835.

During the flight, the pilot made radio contact with another aircraft on 3 occasions. During these communications, the pilot did not report any concerns regarding the aircraft, the weather conditions or health-related matters. In the last communication, the pilot provided position information and reported to be at an altitude of 3500 feet above sea level (asl). The last radar return, which is based on the aircraft's altimeter setting, showed the aircraft at 3600 feet asl.

Weather

The weather in Goose Bay at 0835 was suitable for VFR flight. Visibility was 15 statute miles (sm) in light rain with a few clouds at 1500 and 4700 feet above ground level (agl). The weather in Cartwright was marginal for VFR flight with a visibility of 7 sm in light rain, broken clouds at 1000 feet agl and overcast at 2500 feet agl. At the time of departure, the altimeter setting was 29.93 inches of mercury (in. Hg) in Goose Bay and 29.71 in. Hg in Cartwright.

During the flight, the graphical area forecast for the southeast coast of Labrador included localized visibility of 5 to 6 sm in rain and mist and a ceiling of 1000 to 2000 feet agl topped at 15 000 feet agl. A north-south direction, low level jet stream was also forecast over the route with winds at 60 knots and moderate mechanical turbulence from the surface to 3000 feet agl.

Pilots familiar with the local flying conditions are aware of the possibility of severe turbulence with a low level jet stream over the Mealy Mountains.

Route

The most common route from Goose Bay to Cartwright is direct. However, weather conditions may require flying around the Mealy Mountains. Pilots who routinely fly the coast of Labrador choose any one of the following alternate routes (see Figure 1):

Alternate Route 1: Follow the Kenamu River Valley until south of the Mealy Mountains, then proceed eastward and follow the Eagle River.

---

[1] All times are Atlantic Daylight Time (Coordinated Universal Time minus 3 hours).

Alternate Route 2: Proceed northeast from Goose Bay along the south shore of Lake Melville to Frenchman Point, then follow the English River to the North River, which can be tracked to the coast.

Alternate Route 3: Fly to Lake Melville and through the Narrows to the coast proceeding down the shoreline to Cartwright.

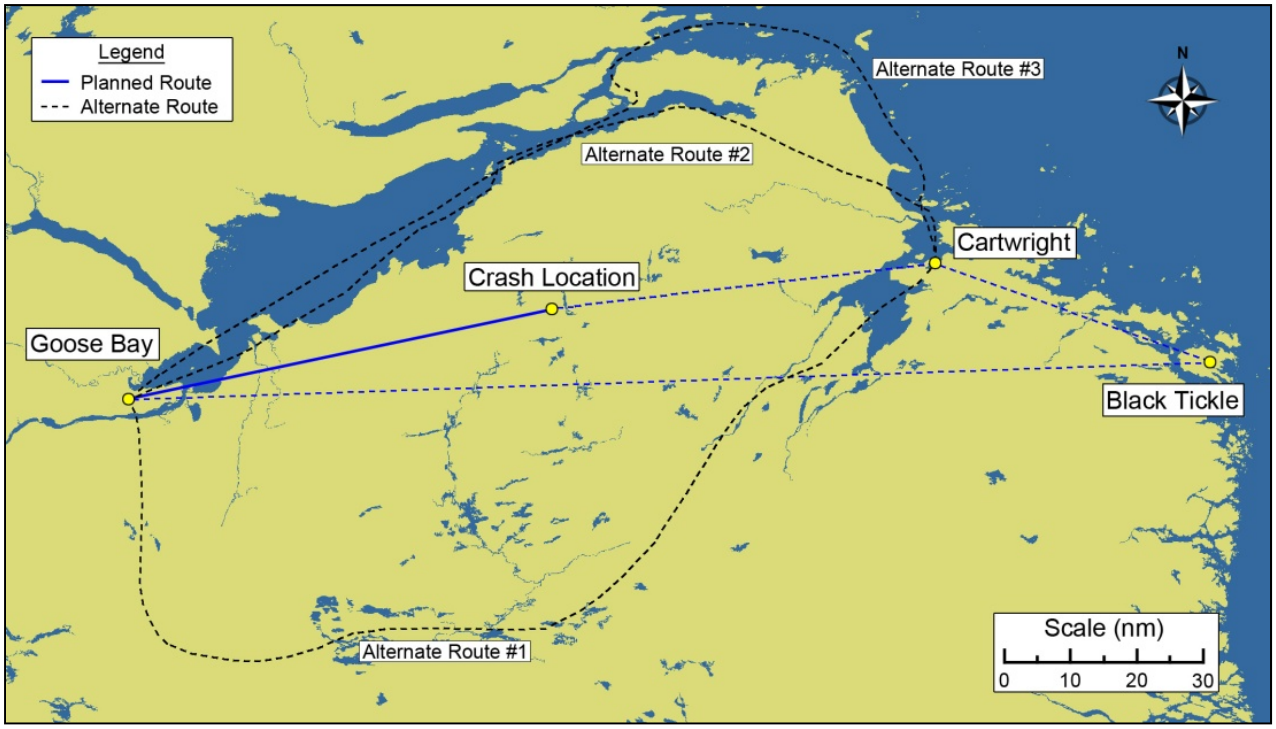

Figure 1. Route map

Operator

North Wind Aviation Ltd. is a charter operation based in Goose Bay and operated 1 Piper PA-31-350 Navajo. The company conducts day VFR operations under subparts 702 and 703 of the *Canadian Aviation Regulations* (CARs) using a self dispatch system. [2] Flight following is conducted by the pilot using the telephone to report arrival at destination or the time of departure with estimated time of arrival in Goose Bay on the return flight.

Pilot

Records indicate that the pilot was certified and qualified for the flight in accordance with existing regulations. The pilot held an Airline Transport Pilot License – Aeroplane, land and sea with a Group 1 instrument rating valid until 01 November 2011. He had approximately 9000 hours total flying time, much of which was accumulated on the east coast of Canada.

---

[2] In a self dispatch system, operational control is delegated to the pilot-in-command of a flight by the operations manager, who retains responsibility for the daily conduct of flight operations.

The pilot flew on 23 and 25 May 2010, but did not fly on 24 May 2010. The pilot was off duty when not flying. There was no indication of any physiological impairment, and fatigue was not considered a contributing factor in this accident.

Aircraft

The Piper Navajo is a low-wing, twin-engine aircraft with retractable tricycle landing gear (see Photo 1). The aircraft was equipped for instrument flight rules (IFR); however, North Wind Aviation Ltd. was not authorized for this type of operation. A portable global positioning system (GPS) was installed, but was not operating at the time of the accident.

Photo 1. Photo of accident aircraft

The emergency locator transmitter (ELT) had been removed for maintenance on 13 April 2010. When an ELT is removed for service, section 605.39 of the CARs requires that operators re-equip aircraft with a serviceable ELT within 30 days. At the time of the accident, the aircraft was still without a serviceable ELT even though the 30 days had elapsed on 11 May 2010. It could not be determined why an ELT had not been re-installed.

The aircraft had no known mechanical deficiencies before the accident flight. The weight and centre of gravity were within the prescribed limits and there was sufficient fuel on board to complete the flight. The aircraft was not equipped with onboard flight recorders, nor were they required by regulation. The aircraft was not equipped with a Terrain Awareness Warning System (TAWS), nor was it required by regulation.

Site

The wreckage was located 60 nautical miles (nm) west of Cartwright on the west side of a gently upward sloping mountain at approximately 3550 feet asl. The aircraft initially struck the ground approximately 100 feet below the crest of the mountain in a wings-level, horizontal attitude. There was a 40 foot long groove made in the snow by the left engine cowling. The aircraft continued up the slope for about 370 feet before coming to rest.

Both engines had separated from the aircraft, and the fuselage and wings were extensively damaged by impact forces and a post-crash fire.

There was no indication of pre-impact structural failure or failure of the flight control system. The damage noted on the propellers was consistent with rotation at the time of impact, indicating the engines were developing power. There was no indication of a pre-existing condition that would have prevented the engines from performing normally.

As the pilot's altimeter was not recovered, its setting could not be determined. The aircraft's transponder was examined, but no relevant information could be obtained.

Controlled Flight into Terrain

A controlled flight into terrain (CFIT) accident is an occurrence 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. According to statistics compiled by the TSB, CFIT accidents often happen when a pilot is trying to see the ground in order to fly by sight in conditions that do not allow visual flight. Half of all CFIT accidents resulting from a VFR flight entering instrument meteorological conditions occurred in mountainous or hilly terrain.

Between 2000 and 2009, there were 129 accidents of this type in Canada, which resulted in 128 fatalities. Collisions with land and water account for 5% of accidents, but nearly 25% of all fatalities. This type of accident often happens when visibility is low, at night or during poor weather. Such conditions reduce a pilot's situational awareness of surroundings and make it difficult to tell whether the aircraft is too close to the ground. The risk is even greater for small aircraft, which venture further into remote wilderness or into mountainous terrain, but are not required to have the same ground proximity warning equipment as large airliners.

The TSB has investigated numerous collisions with land and water, and has identified deficiencies, made findings and issued recommendations, such as installing terrain awareness warning systems in smaller aircraft. Advances in technology have resulted in cockpit equipment that can significantly improve a pilot's situational awareness. Some of this technology is now cost effective for small aircraft. Without this technology, passengers and crews continue to be at risk.

In 1995, the TSB issued the following recommendation regarding the installation of Ground Proximity Warning Systems (GPWS):

> The Department of Transport require the installation of GPWS on all turbine-powered, IFR-approved, commuter and airline aircraft capable of carrying 10 or more passengers.
>
> A95-10

Subsequent to the TSB's recommendation, Transport Canada (TC) proposed regulatory amendments that introduced requirements for the installation of Terrain Avoidance Warning Systems (TAWS) [3] in private, turbine-powered aeroplanes configured with 6 or more seats, excluding pilot seats, and in commercial aeroplanes with any power plant configured with 6 or more seats, excluding pilot seats. These proposed amendments would also introduce requirements for the installation of an Enhanced Altitude Accuracy function on airline and commuter aeroplanes with 10 or more seats, excluding pilot seats. Although TC has initiated changes to the regulations regarding TAWS, they had yet to be implemented as of June 2011. Further, they will not apply to operators who fly exclusively under day visual flight rules conditions.

---

[3] TAWS is the technology that supersedes GPWS.

In March 2010, the TSB issued its multi-modal Watchlist, which identifies the safety issues investigated by the TSB that pose the greatest risk to Canadians. One of the aviation safety issues identified relates to the number of fatalities that continue to occur when planes collide with land and water while under crew control.

Aircraft Altimeters

Aircraft altimeters are calibrated to indicate true altitude when International Standard Atmosphere (ISA) [4] conditions exist.

Actual conditions typically vary from ISA conditions. As a result, the indicated altitude will differ from the actual height of the aircraft above mean sea level. For differences in pressure, altimeters incorporate a controllable subscale, which a pilot can set to the actual barometric pressure. Section 602.35 of the CARs requires pilots to set altimeters:

- to the setting or elevation of the aerodrome before taking off;
- to the setting of the nearest station along the route of flight or, where the nearest stations along the route of flight are separated by more than 150 nautical miles, to the altimeter setting of a station near the route of flight; and
- to the altimeter setting of the aerodrome before commencing a descent for landing, if the setting is obtainable.

The following TSB Laboratory report was completed:

LP079/2010 – Instrument Analysis

This report is available from the Transportation Safety Board of Canada upon request.

Analysis

The aircraft had no deficiencies that precluded normal operation. Pilot incapacitation was ruled out; there was no indication of any health-related matters during the pilot's last radio communication, just prior to the aircraft impacting the terrain.

The investigation also determined that turbulence was not a factor contributing to the aircraft stricking the ground. If turbulence forced the aircraft down into the mountain, the debris field would consist of an initial impact point with debris spread about in multiple directions. In this occurrence, the left engine cowling was dragged through the snow for 40 feet, and the aircraft continued in a straight line for an additional 370 feet before coming to a stop. The majority of the debris was contained within a confined area.

At the time of departure, the pilot was aware that the altimeter setting was 29.93 in. Hg in Goose Bay and 29.71 in. Hg in Cartwright. The planned route would take the aircraft over rising terrain and toward an area of lower pressure. Therefore, if left untouched, the altimeter would

---

[4] These conditions assume, in part, that the air is a perfectly dry gas; the mean sea level pressure is 29.92 inches of mercury and its temperature is 15°C.

have read approximately 200 feet higher than the actual altitude of the aircraft. The last radar return showed the aircraft at 3600 feet asl. If the altimeter was reading 200 feet higher than the actual altitude, as a result of the pilot not having adjusted it to Cartwright's setting, then the aircraft would have been flying at an actual altitude of about 3400 feet.

Although the aircraft was extensively damaged, there was no evidence suggesting a problem with the flight controls or engines. Initial impact signatures and the debris field suggest that there was no attempt made to avoid the terrain. The pilot was flying VFR direct to Cartwright in weather conditions where he would have encountered lowering ceilings and reduced visibility en route towards the Mealy Mountains. If the pilot entered cloud or an area of low visibility, then he likely would have lost visual reference with the horizon due to the snow covered mountains, and would have had to rely on his altimeter to maintain clearance with terrain. The aircraft initially struck the ground at about 3450 feet, which is consistent with the altitude of the last radar contact if the pilot had not set the altimeter to Cartwright's setting. The aircraft flew into the rising terrain in a straight and level attitude with the engines running, consistent with CFIT.

The pilot had extensive experience flying in Labrador and the forecast weather conditions for the en route portion of the flight were marginal VFR. It could not be determined why the pilot chose to fly this route when alternatives were available.

Findings as to Causes and Contributing Factors

1. The pilot conducted a visual flight rules (VFR) flight into deteriorating weather in a mountainous region.

2. The pilot lost visual reference with the ground and the aircraft struck the rising terrain in level, controlled flight.

Findings as to Risk

1. When an aircraft is not equipped with a functioning emergency locator transmitter (ELT), the ability to locate the aircraft in a timely manner is hindered.

2. Not applying current altimeter settings along a flight route, particularly from an area of high to low pressure, may result in reduced obstacle clearance.

3. Without a requirement for terrain awareness warning systems, there will be a continued risk of accidents of this type.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 09 June 2011.

Visit the Transportation Safety Board's website (www.bst-tsb.gc.ca) for information about the Transportation Safety Board and its products and services. There you will also find links to other safety organizations and related sites.