

AVIATION INVESTIGATION REPORT

A03A0022

LOSS OF CONTROL AND COLLISION WITH TERRAIN

COMPUTAPLANE LTD.

CESSNA 210N, N104WF

GOOSE BAY, NEWFOUNDLAND AND LABRADOR, 5 NM E

14 FEBRUARY 2003

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.

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Summary

The single-engine Cessna 210N aircraft, N104WF, serial number P21000033, was en route from Narsarsuaq, Greenland, to Goose Bay, Newfoundland and Labrador, a leg of a ferry flight from Prestwick, Scotland, to the United States. The pilot was conducting a straight-in precision radar approach to Runway 26 at Goose Bay in instrument meteorological conditions. Six nautical miles from the airport, the pilot radioed that the attitude indicator had failed. Shortly after the transmission, control of the aircraft was lost, and the aircraft struck the ice-covered surface of Hamilton Inlet, Newfoundland and Labrador. Both the pilot and her daughter were fatally injured, and the aircraft was destroyed. The accident occurred in darkness at 1809, Atlantic standard time.

Ce rapport est également disponible en français.

Other Factual Information

The pilot had over 5000 reported flying hours, held a commercial pilot licence, and was rated for instrument flight rules (IFR) flights. She was experienced in ferry pilot operations with 110 trans-Atlantic flights.

The aircraft logbook was recovered with the wreckage, and it showed that on 16 November 2000, the aircraft underwent maintenance at the Jersey Airport, Jersey, Channel Islands. Among the maintenance tasks completed were: replacement of the engine (Continental Teledyne TSIO-520P-5) with a zero-time engine; replacement of the vacuum pump; replacement of the emergency locator transmitter (ELT) battery (new expiry date June 2002); and, certification of the aircraft as being airworthy. The aircraft was moved to Exeter, England, on 02 March 2001, where it was stored. Prior to being purchased by the new owner in January 2003, the aircraft underwent another annual inspection on 18 December 2002, and was again certified as being airworthy.

Maintenance records for work conducted on the aircraft from the time of purchase to the time of departure from Prestwick, Scotland, were not among the items found in the wreckage and could not be located. The maintenance history and outstanding defects for the aircraft in this time period were reconstructed from other sources. On 22 January 2003, the owner of the ferry company contracted to deliver the aircraft, picked up the aircraft in Exeter and flew it to Prestwick. During the flight, a list of maintenance deficiencies was compiled. The list included, *inter alia*: stuck cabin heat controls; poor pressurization; mis-adjustment of the propeller governor; engine running hot at cruise; excessive nosewheel shimmy; poor nosewheel steering; lack of an automatic direction-finding (ADF) receiver; a wandering horizontal situation indicator. After arriving in Prestwick, the major mechanical airworthiness items were rectified to the point where the aircraft could be flown under visual flight rules (VFR) by a local flying club to break-in the engine prior to the ferry flight. Meanwhile, efforts were made to further improve the general mechanical condition of the aircraft. During these flights the turn coordinator was found to be unreliable¹ and the windows of the aircraft would occasionally mist up due to poor heating. The aircraft was not equipped with a standby attitude indicator.

On 06 February 2003 the accident pilot flew the aircraft back to Exeter for more maintenance work, returning the aircraft to Prestwick on the evening of 07 February 2003. (This was the last time the accident pilot flew the aircraft prior to her departure on 12 February 2003.) The local flying club then flew two flights with the aircraft on 08 February 2003, and four flights on 09 February 2003. On 11 February 2003 the vacuum system filters as well as the engine oil and oil filter were reportedly changed. Two final flights were then flown by the flying club, with the last flight on the aircraft occurring on the evening of 11 February 2003. None of the flying club pilots noted any anomalies with the attitude indicator during any of the pre-departure flights; however the turn coordinator was observed to be unserviceable on the final flights before departure.

¹ The malfunctioning turn coordinator was noted by two sources in Prestwick. Regulations require a serviceable turn coordinator for night VFR or IFR flight when a standby attitude indicator is not installed (CARs 605.16 (1), (c) & 605.18).

The aircraft departed Prestwick for Reykjavík, Iceland, on an IFR flight plan on 12 February 2003. When the aircraft arrived in Reykjavík, the pilot commented that the aircraft's turn coordinator was unserviceable and the aircraft's heater was not working well. She did not, however, have these items serviced. The flight was delayed a day in Reykjavík due to a winter storm and departed for Narsarsuaq, Greenland, at 0730 Atlantic standard time² on 14 February 2003. On arrival in Narsarsuaq at 1140, the pilot and her daughter were chilled due to the lack of heat, and the pilot commented that there was a complete lack of heat and pressurization. The two then went to a nearby hotel restaurant for lunch.

The pilot received a weather briefing package prior to departing for Goose Bay. The weather forecast for Goose Bay for the time of arrival was as follows: wind from 360° true at 10 knots, visibility 5 statute miles (sm) in light snow, a scattered layer of clouds at 2000 feet, and a broken ceiling at 3000 feet. The forecast also contained a TEMPO³ condition for the period advising of visibilities reduced to 2 sm, and a broken ceiling at 2000 feet. The weather forecast for the arrival time at the planned alternate airport, Churchill Falls, was ½ sm in light snow and blowing snow, with a vertical visibility of 500 feet. There was also a TEMPO condition, spanning the entire forecast period, which indicated a visibility of 2 sm in light snow and an overcast ceiling of 1000 feet. The actual weather at Churchill Falls was below alternate limits throughout the day. There are three published IFR approaches at Churchill Falls, but the aircraft was not equipped to fly any of them. The pilot filed an IFR flight plan for Goose Bay, with Churchill Falls as the alternate aerodrome.

At 1428, almost three hours after its arrival, N104WF departed Narsarsuaq under IFR for Goose Bay on a direct routing over the ocean at 14 000 feet. Temperatures at altitude were below -30°C. To compensate for the lack of heat in the aircraft, both occupants wore multiple layers of clothing under their cold-water survival immersion suits.

At 1800, while 23 nautical miles (nm) from the Goose Bay airport, the aircraft had descended to 2000 feet and was cleared for a straight-in precision approach radar (PAR) to Runway 26. Air traffic control radar data showed that the aircraft proceeded inbound at 2000 to 2100 feet, with occasional small corrections to maintain the on-course track (See Appendix A - Final Flight Path). At 1808, just inside 6 nm from Goose Bay, the pilot radioed that the attitude indicator had failed. The PAR controller immediately reverted to "No Compass" approach procedures, advising the pilot to disregard the compass.

Shortly after the pilot's transmission, the aircraft veered left, descended rapidly to 1400 feet, then levelled on a northerly heading. The PAR controller then discontinued the approach and attempted to aid the pilot by advising of necessary corrections to the flight path. The aircraft stayed on a northerly heading for approximately 20 seconds climbing gradually to 1600 feet; it then entered a spiral dive to the left. The PAR controller initiated a search immediately upon losing radar and radio contact with the aircraft. The aircraft wreckage was found by ground searchers at about 0100 hours on 15 February 2003. The search had been hampered by darkness, reduced visibility in blowing snow, and the lack of an ELT signal. The aircraft struck the ice-covered surface of Hamilton Inlet, 5 nm east of the airport, at 1809 (one hour after local sunset), in a left-wing-down, nose-low

² All times are Atlantic standard time (Coordinated Universal Time [UTC] minus 4 hours).

³ The A.I.P. Canada (MET 3.9.3) and the NAV CANADA Aviation Weather Guide describe TEMPO as a temporary fluctuation. TEMPO is indicated when a transitory change in some or all weather elements is expected during a specified time period. The publications state that TEMPO is only used when the modified condition is forecast to last less than one hour, and if expected to recur, will not in total cover more than half of the forecast period during which the modified condition is expected to occur.

altitude, at a high speed. The speed and attitude of the aircraft were consistent with the aircraft being in a spiral dive at impact. The impact was not survivable. The aircraft was substantially damaged when it struck the ice, with a wreckage trail that was 160 feet long, heading 118° magnetic. The wing structure was torn from the fuselage, with most damage to the left wing. The engine compartment, instrument panel and cabin area was destroyed. A strong smell of fuel was noted at the accident site after the occurrence.

Numerous aircraft components were recovered along the wreckage trail; however, some items were not found. The ice at the initial impact point was fractured, and it is believed that portions of the wreckage penetrated the ice and settled to the bottom of the inlet. Among the missing items was the turn coordinator. The aircraft was inspected on-site and in a hangar environment. No pre-impact discrepancies were found with the flight controls which would have led to a loss of control. The gear was fully extended, and the flaps were fully retracted. The elevator trim tab was in the neutral position according to the trim tab actuator.

The attitude indicator was found, damaged but intact. Other components of the vacuum system were also recovered and were forwarded to the TSB Engineering Branch for examination. The examination showed that the attitude indicator gyroscope was not spinning with appreciable energy at the time of impact, and that the vacuum driven directional gyroscope exhibited indications of normal operation. This suggests that suction was being created by the vacuum system, but the attitude indicator, or system plumbing directly associated with only the attitude indicator, had malfunctioned.

The ELT was torn from its mount and was found midway along the wreckage path. The case was cracked, and the antenna had been torn free. The ELT activation switch, which has three positions, "Armed" for automatic activation, "On", and "Off" was found in the "Off" position. The ELT battery was time expired, with a replacement date of June 2002. The ELT battery was bench checked after the accident, and produced a voltage of 6.03 volts where 9.00 volts is the full charge voltage. The reduced voltage produced by the time expired battery would have resulted in a weakened signal, lessening the chance of detection. The ELT unit was activated during the check and was functional. Had the ELT activation switch been in the "Armed" position, it is possible that a weak signal would have been produced.

The Goose Bay weather at 1800 (nine minutes prior to the accident) was as follows: wind 250° true at 20 gusting to 26 knots, visibility $\frac{3}{4}$ sm in light snow and blowing snow, and overcast ceiling at 1700 feet. Another pilot flew the same PAR approach to Goose Bay about 30 minutes after the accident. He reported that he entered cloud at 6000 feet on descent, and was in instrument meteorological conditions (IMC) at five miles. He remained in IMC until he acquired the runway lighting between 1500 and 1000 feet on final. There was no icing in cloud. The weather at Churchill Falls at 1942, near the expected arrival time had a diversion been necessary, was as follows: wind 310° true at 25 gusting to 32 knots, visibility $\frac{1}{8}$ sm in light snow, vertical visibility zero, remarks sky obscured.

Fuel consumption calculations were made using the flight times and fuel upload information from the previous legs. These calculations showed that there was an estimated 1.6 hours of usable fuel remaining at the time of impact. The approximate flight time to the alternate airport was 1.5 hours. The *Canadian Aviation Regulations* (CARs) require that where an alternate aerodrome is specified in the flight plan, the aircraft must carry sufficient fuel to fly to, and execute, an approach and a missed approach at the destination aerodrome, to fly to and land at the alternate aerodrome, then to fly for a period of 45 minutes. The aircraft did not carry sufficient fuel to meet the CARs fuel requirements.

The Flight Manual for the Cessna 210N contains instructions for emergency operations in clouds. The instructions assume that only the electrically-powered turn coordinator or the turn and bank indicator is

operative, and that the pilot is not completely proficient in instrument flying. Part of the corrective action for recovery from a spiral dive is to stop the turn by referring to the turn coordinator. The turn coordinator had been reported to be unserviceable prior to the aircraft departing Prestwick.

Analysis

Despite the certification of the aircraft as being airworthy in December 2002, the aircraft was in generally poor mechanical condition when it was picked up by the operator on 22 January. Mechanical deficiencies with the aircraft were subsequently resolved to the point that the aircraft was considered capable of proceeding with the flight. However, some significant deficiencies, such as the expired ELT battery, poor cabin heating, the lack of an ADF receiver, and the unserviceable turn coordinator were not corrected prior to departure.

The aircraft was equipped to the point that it could be navigated along an IFR route; however, it was not equipped for IFR flight or for night VFR flight. It did not have a serviceable turn coordinator, and it lacked an ADF necessary for approach at the filed alternate airport. When the attitude indicator failed during the PAR approach the aircraft was in IMC. The pilot did not have a means of assessing or correcting the aircraft's flight attitude, and was, therefore, not able to recover from the spiral dive which ensued.

The lack of heat may have had two adverse effects. The lengthy stopover in Narsarsuaq may have been due in part to the need to recover from previous cold exposure. The lengthy stopover in Narsarsuaq resulted in an arrival in Goose Bay one hour after sunset. In the frigid temperatures encountered en route, lack of cabin heating may also have resulted in frosting of the aircraft windows. Both darkness and frosted windows would have decreased the likelihood of acquiring visual references during the spiral dive; however it is not known if any of the aircraft's windows were frosted.

The weather forecast that the pilot received at Narsarsuaq indicated VFR conditions for the destination airport, Goose Bay, with a TEMPO condition of 2000 foot ceilings and 2 sm visibility. These weather conditions were well above the PAR approach limits, and may have prompted the pilot to attempt the flight. Churchill Falls was not a legal IFR alternate for three reasons: the aircraft was not equipped with the necessary navigation equipment (ADF) to conduct an IFR approach; the aircraft did not have sufficient fuel to meet the CAR IFR alternate fuel requirements; and, the airport did not meet the weather requirements for an alternate IFR airport. Despite this, the pilot selected the airport as the alternate. It is not known why the pilot selected an alternate airport that did not meet forecast alternate weather requirements.

Several deficiencies served to increase the risk exposure during the ferry flight: the turn coordinator was known to be unserviceable before departure; there was insufficient fuel and navigation equipment for the IFR alternate; the ELT battery had expired and the switch was in

the "Off" position; and the flight was flown in frigid temperatures without cabin heat. The combined effect of the deficiencies served to eliminate the safety defences normally available, and left little margin for error or mischance.

The following Engineering Branch report was completed:

LP16/03 - Instrument Examination

Findings as to Causes and Contributing Factors

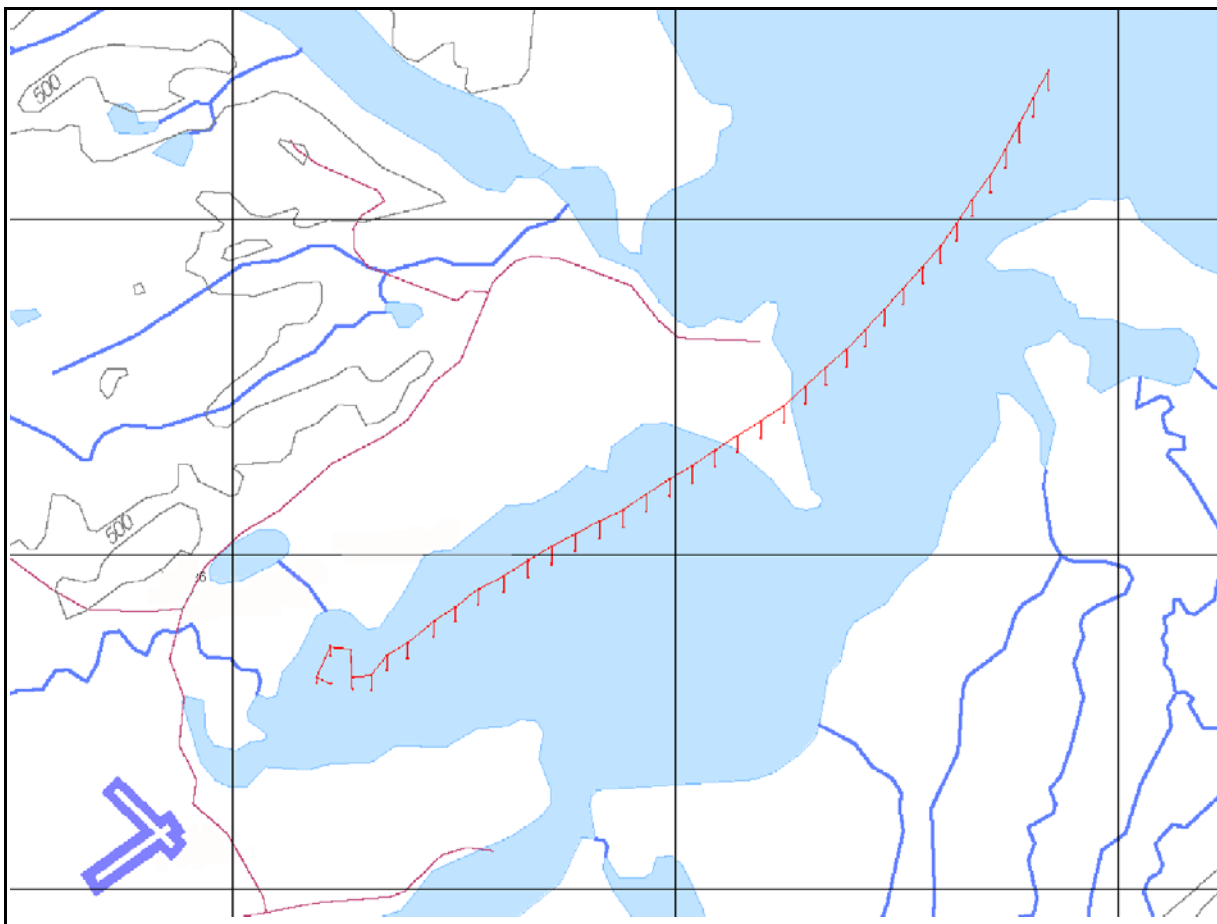
1. For an unknown reason, the attitude indicator gyro stopped functioning during the approach to Goose Bay.
2. The aircraft was not equipped with a serviceable turn coordinator which would have allowed the pilot to assess and correct the aircraft's flight attitude even after the attitude indicator had failed.
3. Control of the aircraft was lost, and the pilot was not able to recover from the spiral dive which ensued.

Findings as to Risk

1. The filed alternate airport, Churchill Falls, was below approach limits at the expected arrival time.
2. The aircraft did not carry the fuel required for an alternate airport.
3. The aircraft did not have the necessary equipment to carry out an IFR approach at the alternate.
4. The ELT battery was time expired and the ELT was not armed.
5. The flight was conducted in frigid temperatures with a failed aircraft heater.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 25 November 2003.

Visit the Transportation Safety Board of Canada web site (www.tsb.gc.ca) for information about the TSB and its products and services. There you will also find links to other safety organizations and related sites.



Appendix A - Final Flight Path