

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

AVIATION INVESTIGATION REPORT
A05P0189



COLLISION WITH TERRAIN

NORTHERN THUNDERBIRD AIR
RAYTHEON BEEHCRAFT KING AIR 200 C-FCGL
SHOVELNOSE CREEK, BRITISH COLUMBIA
28 JULY 2005

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.

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Summary

A Raytheon Beechcraft King Air 200 (registration C-FCGL, serial number BB190) operating as NTA202 (Northern Thunderbird Air), departed Vancouver, British Columbia, at 0824 Pacific daylight time on 28 July 2005 for a visual flight rules flight to Smithers, British Columbia, with a crew of two on board. The aircraft did not arrive at its destination, and a search was commenced later that same day. The aircraft was found on 30 July 2005. The crash site was in a narrow canyon at an elevation of about 3900 feet above sea level, in an area of steeply rising terrain. Both occupants were fatally injured. A post-crash fire destroyed most of the aircraft. The emergency locator transmitter was destroyed in the fire and no signal was detected. The crash occurred at about 0840 Pacific daylight time.

Ce rapport est également disponible en français.

Other Factual Information

The reported weather at Vancouver International Airport, British Columbia, approximately 54 nautical miles (nm) south of the accident site, at 0900 Pacific daylight time,¹ about 20 minutes after the accident, was as follows: wind 310°T at 7 knots; visibility 30 statute miles; scattered clouds at 22 000 feet above ground level (agl); temperature 20°C; dew point 17°C; altimeter setting 29.95 inches of mercury; remarks: 2 oktas cirrus, sea-level pressure 1014.2 hectopascals. A pilot report from a helicopter pilot who flew in the area of the accident that same morning indicated that there was a light wind from the northwest and that there were three oktas of altocumulus cloud between 6800 and 8000 feet above sea level (asl) over the ice cap to the north and northeast of the accident site.

The crew, which consisted of a captain and first officer, were alerted for the flight the previous day. The purpose of the flight was to ferry the aircraft empty to Smithers, British Columbia, and thereafter to operate it as a revenue flight. The crew reported to Vancouver International Airport at 0700 and took off at 0824 under visual flight rules (VFR) with 3600 pounds of fuel on board. No flight plan was filed but a company flight note was activated. Radar data indicated the aircraft flew north up Howe Sound, British Columbia, at 2000 feet asl. The last recorded radar hit, at 0831:23, showed the aircraft in the vicinity of Anvil Island, descending through 1700 feet asl. The aircraft was later observed flying low up the Squamish River valley, about 12 nm south of the accident site, on a northerly heading.

The captain had been employed by Northern Thunderbird Air for three years. He held a valid airline transport pilot licence issued by Transport Canada (TC), endorsed for the Beechcraft King Air 200, and a Group 1 instrument rating. His last medical was conducted on 01 March 2005 and the medical certificate was valid for 12 months. He had undergone a pilot proficiency check (PPC) on the Beechcraft King Air 200, conducted by TC on 27 April 2005, which was valid for two years. He had accumulated 2700 hours of total flying time, including 100 hours on the Beechcraft King Air 200 as captain. The captain was free of duty the day before the accident. He went to bed at a reasonable hour the night before the flight, and there was nothing in his 24-hour history to suggest that he might have been fatigued. While the captain did have a second job, he did not work at that job the day before the accident.

The first officer had been employed by Northern Thunderbird Air for about four months. He held a valid commercial pilot licence issued by TC, endorsed for the Beechcraft King Air 200, and a Group 1 instrument rating. His last medical was conducted on 21 January 2005 and the medical certificate was valid for 12 months. On 02 June 2005, he completed a PPC on the Beechcraft King Air 200, conducted by TC, which was valid for two years. He had accumulated 1200 hours of total flying time, including 80 hours as first officer on the King Air 200. He was free of duty the day before the accident. He went to bed at a reasonable hour the night before the flight, and there was nothing in his 24-hour history to suggest that he might have been fatigued.

Autopsies and full toxicology examinations of the two pilots did not reveal any conditions that could have led to or contributed to the accident.

¹ All times are Pacific daylight time (Coordinated Universal Time minus seven hours).

Both pilots had received company training on the status and use of the Northern Thunderbird Air company operations manual (COM) and on the hazards of controlled flight into terrain (CFIT). The COM, section 4.3.1, Obstacle Clearance Requirements, states the following:

Except for take-off and landing, the aircraft shall **not** be operated in VFR flight: . . . b) during the day, at less than 500 feet AGL or at a horizontal distance of less than 500 feet from any obstacle.

Records indicate that the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The aircraft was manufactured in 1976 and had flown a total of 21 336.1 hours as of 26 July 2005. A review of the airframe, engine, and propeller logbooks showed nothing remarkable. The left engine, serial number PCE80325, had accumulated 3435.2 hours since overhaul. The right engine, serial number PCE80384, had accumulated 3169.8 hours since overhaul.

The wreckage was found in the Shovelnose Creek valley at an elevation of 3900 feet asl. The aircraft had clipped the tops of two trees before contacting the 33° slope at about a 33° pitch angle. Measurements of the angle and direction between the two clipped tree tops indicate that the aircraft was climbing at an angle of about 12 or 13° when it struck the two trees, and was flying on a track of 038° M. The average slope was 11°, but it was much steeper at the accident site.

Calculations made by the aircraft manufacturer, using the estimated aircraft weight and conditions at the time of the accident, indicate that the aircraft would have been capable of climbing at an angle of 13° at full power, and that this was close to its maximum sustainable climb capability.

The post-crash fire consumed most of the aircraft except for the tail section. Two small pieces of fibreglass, some white paint chips, and an antenna were found along the flight path. Right aileron parts and the right wing lower skin, including fuel tank access panels, were found in the woods to the right of the right engine, but most of the wreckage debris was confined to an area no larger than the aircraft. The propeller had separated from the left engine and its reduction gearbox was fractured. Both propeller cylinders were intact. Of the four exhaust stacks, only the left engine's left stack showed any damage.

Both Pratt & Whitney PT6A-41 engines were recovered from the accident site and shipped to Pratt & Whitney Canada for analysis. The examination found severe fire damage but minimal impact damage to both engines. There were numerous indications of internal circumferential rubbing on both engines, characteristic of impact while operating at high power. Little indication of longitudinal compression damage was found.

Both propellers were recovered and removed to the Transportation Safety Board of Canada (TSB) regional wreckage examination facility where a teardown took place, assisted by a representative of the propeller manufacturer. Witness marks were found on the left propeller at the feather stop. Multiple blade angle witness marks, both higher and lower than normal operating blade angles, were found on the right propeller. Extensive blade damage, consisting of multiple fore and aft bends, deep gouges in the leading edges, and torn tips, was evident on both propellers, characteristic of impact with engine power on.

Flying safely in mountainous terrain requires an understanding and awareness of the hazards associated with mountain flight. Some of these hazards are visual illusions, more extreme weather phenomena than are otherwise normally encountered, including turbulence, degraded aircraft performance due to density altitude effects, and a requirement to employ special operating techniques. Nothing could be found to indicate that either pilot had received dedicated mountain flying training or a dedicated pilot decision-making course. Their TC-approved flight training program to obtain their pilot licences may have included some of this training.

Analysis

Visual meteorological conditions existed at the time of the accident and weather was not considered to have been a factor.

The left propeller witness marks at the feather stop can be explained by the fact that the reduction gearbox was fractured on impact. The subsequent loss of oil to the propeller would have allowed the blades to move to the feathered position. The multiple blade angle witness marks on the right propeller suggest multiple impacts while the propeller was changing pitch. The extensive blade damage evident on both propellers is more compelling than the multiple witness marks. This information, coupled with the internal circumferential rubbing found on both engines, indicates that the engines were operating on impact. However, a more precise indication of the power being developed could not be determined.

The aircraft appeared to have contacted the 33° slope in about a 33° pitch angle. This is supported by the engine examination, which showed little indication of longitudinal compression damage.

Most flights operated by Northern Thunderbird Air are conducted under instrument flight rules (IFR). It could not be determined why the crew decided to conduct this flight under VFR.

Since both pilots had received training on the status and use of the COM, they should have been aware of the VFR obstacle clearance requirements. As they had also received CFIT avoidance training, they should have been aware of the factors leading to CFIT.

It could not be determined why the pilots turned northeast and flew up Shovelnose Creek at a low altitude. It is possible that this was a navigational error. This canyon narrows quickly, the terrain rises very steeply, and the slope exceeds the climb capability of the aircraft. The pilots' attention was probably focused outside of the aircraft and, by the time they realized they were reaching the aircraft performance limits, there was not enough room to reverse course and their only option was to out climb the terrain. Information from the aircraft manufacturer indicates that the aircraft, with specification performance, would be able to climb at an angle of 13°; however, this was insufficient to clear the steeply rising terrain.

Any training that the crew may have received on CFIT, mountain flying techniques, and pilot decision making was either ineffective or not applied. Despite this training, the crew members did not fully comprehend the hazards of flying low in mountainous terrain and were unprepared for the flight as attempted.

Findings as to Causes and Contributing Factors

1. The aircraft was flown up a narrow canyon into rapidly rising terrain for reasons that could not be determined. The aircraft's proximity to terrain and the narrowness of the canyon precluded a turn, and the aircraft's climb rate was insufficient to clear the rising terrain.
2. The pilot decision-making training received by the crew members was ineffective because they were unprepared for the unique hazards and special operating techniques associated with flying low in mountainous terrain.

Finding as to Risk

1. The company operations manual (COM) gave no guidance to the crew for the operation of a visual flight rules (VFR) flight, except for the provision that it should not be conducted closer to obstacles than 500 feet vertically and horizontally.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 06 March 2006.

Appendix A – View Down the Valley from Above the Accident Site

