Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A06P0095

LOSS OF CONTROL

NORTHERN ROCKIES AIR CHARTER
CESSNA 185B C-FPKJ
PRINCE GEORGE AIRPORT, BRITISH COLUMBIA
31 MAY 2006

Canada

Aviation Investigation Report

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Summary

The pilot departed Prince George, British Columbia, from Runway 19 on a flight to Scoop Lake, British Columbia. The aircraft flew on the runway heading until it was about 2400 feet beyond the departure end of the runway, where it abruptly pitched up, climbed steeply, turned left, and rapidly descended into trees about 600 feet left of the runway's extended centreline. The aircraft was airborne for less than 47 seconds and reached a maximum height of about 270 feet above ground level. The aircraft was destroyed, and the pilot, who was the sole occupant, was seriously injured. There was no fire.

Ce rapport est également disponible en français.

Other Factual Information

General

The flight of the Cessna 185B (serial number 185-0601, registration C-FPKJ) originated at Kelowna, British Columbia, where the aircraft was loaded with supplies to be transported to a hunting/fishing camp at Scoop Lake in northern British Columbia. The leg of the flight from Kelowna to Prince George was uneventful, and the aircraft landed at Prince George at 1626 Pacific daylight time,[1] where it took on about 115 litres of avgas to fill both wing tanks. The aircraft then backtracked to the displaced threshold of Runway 19 and was cleared for take-off with a right turn out. Communications between the pilot and air traffic control personnel were normal before take-off, at 1654, for the final leg of the flight to Scoop Lake. There were no communications with the pilot after commencement of the take-off roll.

Airport

Prince George is a certified airport, equipped with an air traffic control tower. The airport elevation is 2267 feet above sea level (asl). Runway 19 was the active runway at Prince George at the time of the accident. The asphalt-surfaced runway is 3770 feet long and 75 feet wide, with a displaced threshold of 370 feet. The take-off distance available is 3770 feet.

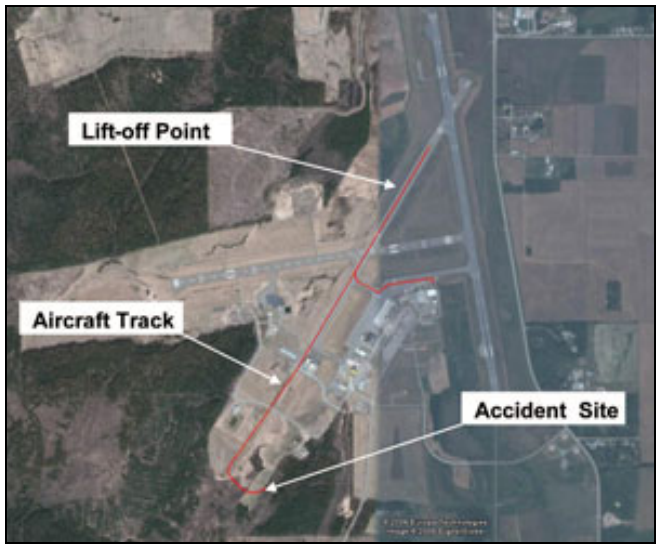

Photo 1. Departure path from Prince George Airport

Weather

The observed Prince George weather at 1700, about six minutes after the accident was in part: wind 190°T at 11 knots, gusting to 18 knots; temperature 24.2°C; altimeter setting 29.93; and visibility 45 statute miles. The wind immediately before take-off was 180°M at 10 to 15 knots. The wind 54 minutes before the accident was recorded as gusting to 22 knots. Density altitude at the time of the accident was about 3860 feet asl.

Pilot

The pilot was correctly licensed for the type of flight being conducted and had a valid medical. He had accumulated 9150 flight hours as of his last medical examination; approximately 5000 hours were flown in Cessna 185 model aircraft, 2500 hours of which were flown in the accident aircraft. The pilot had not flown during the week before the accident flight and was sufficiently rested.

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

Aircraft

The aircraft was manufactured in 1963 and equipped with a 260 HP Teledyne Continental Motors Inc. (TCM) model IO-470-F engine and a McCauley Propeller Systems D2A34C49-B propeller. The aircraft was modified in 1988 by supplementary type certificate (STC) SA525NW, which involved replacement of the original engine with a TCM IO-520-D22B engine, serial number 812987, and replacement of the original propeller with a McCauley D2A34C58-O, serial number 881880.

The replacement engine was overhauled 02 March 2006, and the propeller was overhauled 16 March 2006. Both were installed during an annual inspection of the aircraft conducted 12 April 2006, about 42 flight hours before the accident. No maintenance actions were recorded in the aircraft's technical log books following the inspection. Three journey log entries recorded a satisfactory test flight and two adjustments to fuel flow immediately following the inspection.

A flight manual supplement was not supplied with STC SA525NW to indicate changes to C-FPKJ's performance following the engine and propeller replacement. Therefore, the modified aircraft would have to be operated within the published performance limitations of an unmodified Cessna 185B.

Performance

Performance information taken from the Cessna 185B owner's manual indicates that, with the aircraft at its allowable gross weight of 3200 pounds, the take-off from Prince George would have required a minimum of 840 feet of ground run and the maximum rate of climb would have been about 800 feet per minute. For a normal take-off, the manual instructs the pilot to use full throttle, maximum rpm, and climb at 95 mph until all obstacles are cleared before increasing the airspeed to 110–120 mph, reducing the throttle and rpm, and retracting the flaps. Transport Canada's Flight Training Manual notes that retraction of flaps in flight may cause a change in an aircraft's balance. It was the pilot's practice to climb at 105 mph with a low rate of climb to keep the engine cool and increase the forward visibility.

There was a global positioning system (GPS) on board the aircraft. Data from the GPS were analyzed and indicated the following: the ground run was about 990 feet; the aircraft was airborne for 47 seconds; the aircraft reached a height of about 270 feet above ground level; and the average climb rate was 345 feet per minute (fpm). These data were compared to the aircraft's previous take-off from Kelowna and, taking into account the 11-knot headwind and 3860-foot density altitude at Prince George, the take-off profiles were similar.

The aircraft reached a maximum speed of about 104 mph a few seconds before its steep climb, abrupt turn and rapid descent. It is possible that the steep climb occurred coincident with the retraction of the flaps.

Weight and Balance

No cargo manifest or aircraft weight and balance information could be located for either leg of the accident flight. All rear seats had been removed, leaving only the pilot's and co-pilot's seats installed at the time of the crash. Cargo weighing about 665 pounds was recovered at the accident site. The cargo was distributed from the co-pilot's foot well, aft throughout the cabin to the baggage compartment bulkhead. No cargo restraint system had been used. A substantial number of containers had broken during impact and spilled their contents. This cargo could not be recovered, so its weight was not included in post-crash calculations.

Weight and balance calculations based on the weight of recovered cargo and on other known information determined that the aircraft weighed at least 3077 pounds at take-off from Prince George. Therefore, the aircraft was not more than about 120 pounds below its maximum allowable take-off weight when it departed Prince George. Had all the cargo been recovered and weighed, the aircraft would have been close to its maximum allowable take-off weight.

Calculations based on reported cargo distribution within the aircraft indicate that its centre of gravity (CG) was about 0.7 inches forward of the aft limit of the certificated envelope. A properly loaded aircraft will tend to stay in the attitude and airspeed at which it is trimmed.

Under turbulent conditions, and without the use of cargo restraints, it is possible for the cargo to shift in flight and adversely affect the balance of the aircraft. With an aft CG, the aircraft becomes less stable around the pitch axis and a point can be reached where the aircraft will be uncontrollable.

Examinations

The propeller, engine, cowls, right wing, and main landing gear separated from the aircraft at impact, and some cargo was ejected.

Examination of the airframe did not reveal any pre-impact failures of the aircraft structure or flight control systems. The flaps were found to be fully retracted at impact. The horizontal stabilizer, which can be trimmed by the pilot through a range of 10 degrees from full aircraft nose-up to full aircraft nose-down, was found 2.7 degrees from the full aircraft nose-down position. Examination of the engine did not reveal any pre-impact defect that would have contributed to a loss of engine power. Some anomalies of various engine accessories were attributed to the post-crash break-up of those components.

Examination of the propeller did not reveal any pre-impact defect that would have prevented normal operation. Both propeller blades exhibited slight S-bending, indicative of propeller impact while under power. Witness marks on one blade ferrule made by the actuating pin of the opposite blade indicate that the propeller was at about 15° of pitch at impact, about midrange between the high-pitch stop of 22° and the low-pitch stop of 9.2°. The pitch was normal for the climb-out phase of flight.

Oil pressure and oil temperature gauges were examined after the accident. Needle slap marks on the gauge faces indicate that the oil temperature was about 140°F and the oil pressure was about 60 pounds per square inch (psi) at impact, both within normal operating range.

Fuel samples taken from the fuelling source at Prince George and from the aircraft's right-wing tank were tested and found to be 100 LL avgas, with no contaminates.

Analysis

There are many indications that the engine was operating normally, making engine failure unlikely as a cause or contributing factor to the accident.

The take-off distance and climb speeds were consistent with the performance indicated in the owner's manual.

The aircraft's CG was near the aft limit and the flight path after take-off was consistent with an aircraft that is aft-heavy and unstable about the pitch axis. The horizontal stabilizer was found trimmed to a position consistent with an aft CG. The turbulent, gusty wind at Prince George and the retraction of the flaps would have exacerbated the unstable condition. As well, the unrestrained cargo may have shifted rearward in flight, moving the CG further aft.

It is concluded that a loss of pitch control, consistent with an aft CG, occurred in gusty and turbulent conditions at a height too low for the pilot to effect recovery. The unrestrained cargo likely struck the pilot during the crash and may have contributed to his injuries.

Findings as to Causes and Contributing Factors

1. Loss of pitch control, consistent with an aft centre of gravity (CG), occurred in gusty and turbulent conditions at a height too low for the pilot to effect recovery.

2. The cargo was unrestrained, which may have allowed some cargo to shift rearwards during the take-off and climb, resulting in an extremely aft CG.

Finding as to Risk

1. Unrestrained cargo presents a high risk to aircraft occupants during turbulence and during a crash.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 28 March 2007.