

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

**AVIATION INVESTIGATION REPORT
A08W0162**



CONTROLLED FLIGHT INTO WATER

**TRANS NORTH TURBO AIR LIMITED
BELL 206B (HELICOPTER) C-FGGC
CARMACKS, YUKON
09 AUGUST 2008**

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.

Aviation Investigation Report

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Summary

The pilot and sole occupant of the Bell 206B helicopter (registration C-FGGC, serial number 1080) was departing the Trans North helicopter base on the west bank of the Yukon River at Carmacks, Yukon at about 0700 Pacific daylight time. After lifting off the pad into a low hover facing away from the river, the pilot pedal-turned through 180 degrees to the left and departed over the river on an easterly heading. Shortly thereafter, there was a loud impact and splash, and pieces of wreckage drifted down the river. A pilot and two aircraft maintenance engineers, who were preparing a Bell 205 helicopter for flight from an adjacent pad, immediately started the aircraft, tracked the aft fuselage section that was floating down the river, and assisted in its recovery. The submerged forward fuselage section, engine, and transmission were not recovered until located by side-scan sonar on 17 August 2008. The pilot drowned.

Ce rapport est également disponible en français.

Other Factual Information

The pilot of C-FGGC was tasked to support the positioning of power poles in the vicinity of Carmacks, Yukon. He was to depart for the job site at around 0700¹. Another helicopter pilot, flying a Bell 205 (registration C-GEAG), was to assist in this operation and was to depart around 0800.

Prior to the pilot's arrival at the helipad, a company aircraft maintenance engineer had conducted a routine daily inspection on C-FGGC and fuelled the aircraft with 50 United States gallons (USG) of fuel. The pilot arrived and conducted a pre-flight inspection of the aircraft; no defects were reported. He started the aircraft, lifted off, and entered a low hover (about five feet) above the helipad, conducted a 180-degree pedal-turn to the left, and departed to the east, into the sun, directly out over the 800-foot-wide river.

The helipad was about six feet above the level of the river; therefore, the initial departure altitude would have been about ten to fifteen feet above the water level. The flight path was directly across the river on a constant descent in a level attitude until the impact with the water surface about 600 feet horizontally from the helipad. Total air time was about 14 seconds. Engine and rotor sounds were normal until impact.

The lower fuselage and rear section of the helicopter, containing the floor, rear seats, fuel tank, baggage compartment, and landing gear, remained on the surface of the river and floated downstream until beaching on a sand bar. All other helicopter components were submerged. Eight days later, a boat with a side-scanning sonar found the forward section of the cockpit containing the pilot and the power train in the area of the initial impact with the surface of the river. The pilot was in his seat, secured by his four-point harness, and was wearing a headset but no helmet.

The main rotor system had separated from the mast on impact and, although located by the sonar, was not recovered due to operational constraints. Examination of the fracture surfaces on the mast revealed 45° shear lips, indicating overload failure and power being transmitted at impact. The transmission and hydraulic servos remained attached to the deck and were examined to the extent possible. No pre-existing deficiencies were found. The tail boom and tail rotor assembly were not located.

The airspeed indicator was indicating about 40 knots, the torque gauge was indicating 100 per cent, and the altimeter was indicating about 5250 feet above sea level (asl). All other instruments had reverted to zero or were impact-damaged. The engine had sustained a main rotor blade strike on top of the combustion chamber, separating the gas generator section from the gearbox. The fuel cell was intact and about 50 USG of fuel were recovered. Residual fuel on board prior to fuelling was not determined.

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

The pilot was certified and qualified for the flight in accordance with existing regulations. He had approximately 23 000 hours of total flying time. The pilot had not flown in the preceding 24 hours, but had accumulated a total of 116.6 hours in the preceding 30 days and 285.0 hours in the 90 days before the occurrence. These hours are within the regulatory limits.

The pilot's licence was validated with a Category 1 medical certificate issued on 07 May 2008 and valid to 01 November 2008, with the condition that glasses must be available. The pilot would normally be wearing his glasses during the start up and departure phases of flight. He was not wearing sunglasses.

Autopsy results revealed non-life-threatening fractures and injuries to ribs, pelvis, and right leg, and no significant head injuries. The cause of death was by drowning. Also found was severe, multifocal coronary artery atherosclerosis with no obvious sign of acute infarction. Based on medical opinion, pilot incapacitation does not appear to have been a factor in this occurrence.

Weather conditions at Carmacks as observed by an automated weather observation system (AWOS) at the time of the occurrence were as follows: winds 350° true (T) at 2 knots, temperature 3°C.

Most of the flight and the impact were recorded with a low-resolution video camera taken from the river bank about one-half mile upstream from the occurrence site. The section of river, from the helicopter pad to the campground where the video was taken, is straight and oriented due north and south (about 350 degrees T). Water current speed was about 11 knots, with no wave action. While clear sky conditions were present, there was a trace of light mist over the river. The sun was just above the ridge and trees, directly to the east across the river, and was reflecting brightly off the surface of the river. The helicopter's intended flight path would have been directly into the sun. The sun's angle was calculated to be about 15 degrees above the pilot's horizontal reference, and the reflection of the sun in the water to be about 15 degrees below the pilot's horizontal reference.

The US Department of Transportation Federal Aviation Administration (FAA) report number DOT/FAA/AM-03/6 defines glare as "a temporary visual sensation produced by luminance (brightness) within the visual field that is significantly greater than that to which the eyes are adapted". The report queried the US National Transportation Safety Board Aviation Accident/Incident Database from 01/01/1988 to 12/31/1998 for terms related to glare including sun, glare, vision, blinded, and reflections. For the study period, there were 130 accidents in which glare from natural sunlight was found to be a contributing factor, with 55 per cent associated with the takeoff/departure and approach/landing phases of flight.

Somatogravic illusion is an erroneous sensation of pitch (rotation in the vertical plane) caused by linear acceleration or deceleration. It is a common phenomenon during rapid acceleration or deceleration as would be experienced during an aircraft's takeoff, initial climb, or descent. Analysis of the video revealed that the helicopter had accelerated from zero to 40 mph in less than 14 seconds, which is sufficient to produce the sensation of about 8.5 degrees of pitch-up in the absence of visual clues as to actual attitude if linear acceleration is assumed.

Analysis

A normal helicopter departure requires the pilot to lower the nose of the aircraft slightly and to increase collective pitch to initiate forward flight and begin to climb. During the departure/climb phase of the flight, any problems, such as a loss of power, would be countered by raising the nose to initiate a flare to slow the helicopter for landing. In this occurrence, the pilot accelerated to about 40 knots through translation in a level or slightly nose-down attitude, flying in a straight line for about 14 seconds until impact. Engine and rotor sounds were normal, and wreckage examination did not reveal mechanical or control anomalies that would have prevented the helicopter from accelerating and climbing.

The pilot had lifted off facing away from the sun and then had turned to face directly into the sun as he began forward flight. A more common departure procedure in a single-engine helicopter would be to turn 90 degrees to the left or right, to accelerate and climb along the riverbank before turning out over the water. This would decrease the risk of having to ditch in the fast-flowing river in case of an engine or power train failure.

The sun was at a low angle above his horizon and the bright sunlight was compounded by its strong reflection off the water. The resulting glare on and through the windscreen would have obscured the pilot's forward vision before his eyes could react to the sudden brightness, especially because he was not wearing sunglasses. The bright light would also have obscured the instrument panel in shadow, depriving the pilot of backup instrument information.

During this period, the helicopter would have been accelerating. Somatogravic illusion would likely have caused the pilot to sense that the aircraft was climbing at about an 8.5-degree angle when, in fact, the aircraft was descending slightly until impact.

Findings as to Causes and Contributing Factors

1. The pilot's forward vision was obscured by the bright sunlight and glare from the surface of the river.
2. The pilot most likely lost visual reference with terrain and descended into the surface of the river.
3. It is likely that the pilot did not realize that the helicopter was descending instead of climbing due to somatogravic illusion.

Finding as to Risk

1. Departing over water, instead of accelerating and climbing along the shoreline, increases the risk of losing visual references and the risk of ditching into water in the event of a power train failure.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 02 July 2009.

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