Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A06Q0114

LOSS OF CONTROL AND COLLISION WITH TERRAIN

AVIATION MAURICIE
CESSNA U206F (FLOATPLANE) C-FMGP
PASTEUR LAKE, QUEBEC
08 JULY 2006

Canada

Aviation Investigation Report

Loss of Control and Collision with Terrain

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Summary

The Cessna U206F floatplane, registration C-FMGP, serial number U20602839, operated by Aviation Mauricie, was on a visual flight rules flight with one pilot, one student pilot and one passenger on board. At about 1125 eastern daylight time, the aircraft took off from Pasteur Lake, Quebec, and flew at low altitude over the water for a few seconds. About 30 feet above the surface of the lake, the aircraft made a 90° left turn and headed directly towards the departure wharf where the owners were. At about 100 feet above the wharf, the aircraft was seen in a nose-up attitude and appeared unstable. Shortly after, the right wing pointed towards the ground, and the aircraft pitched nose down and crashed into the trees about 300 feet farther south.

A witness rushed to the crash site. Smoke was coming from the wreckage. Several minutes later, flames appeared at the right wing root. The fire could not be brought under control with a fire extinguisher, and spread to the cabin and the rest of the aircraft. The three occupants sustained fatal injuries.

Ce rapport est également disponible en français.

Other Factual Information

At approximately 0940 eastern daylight time[1] on the morning of the accident, the floatplane took off from Tortue Lake, Quebec, Aviation Mauricie's main base. The planned flight consisted of a return flight with stops at Pasteur Lake, Quebec, and Taureau Reservoir, Quebec. At 1020, the floatplane docked at a wharf located on the eastern shore of Pasteur Lake. The occupants spent some time with the owner of the premises, who was a friend of the pilot.

The owner of the wharf had a floatplane that he used regularly to travel between Tortue Lake and Pasteur Lake. Before departure, he informed the occurrence pilot of the take-off flight path preferred by other pilots familiar with Pasteur Lake. It consisted in starting the take-off run from the far north end of the lake heading in a southwesterly direction, and after lift off, it was necessary to make a slight turn to the left to continue to climb in the saddle between the two mountains bordering the southern section of the lake (see Figure 1).

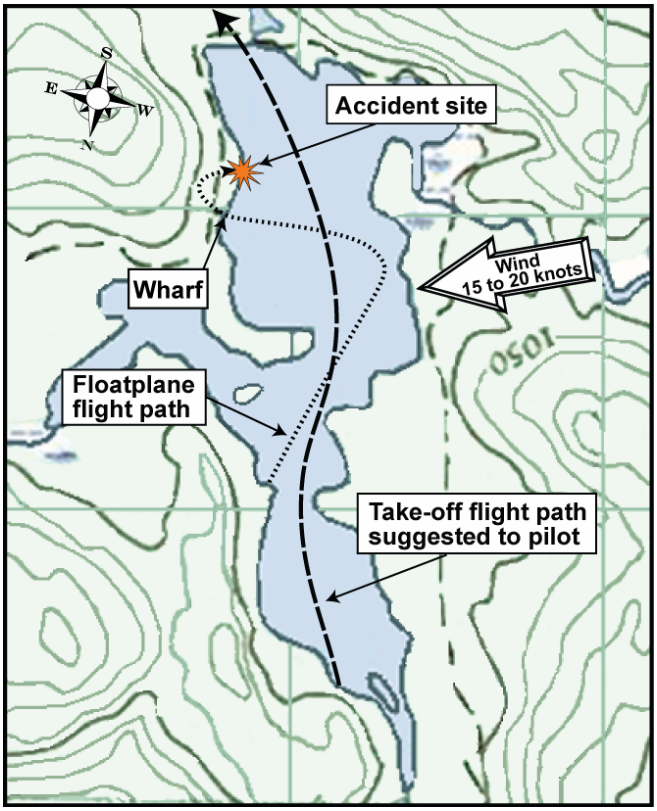

Figure 1. Topographic map of Pasteur Lake

At about 1100, the pilot got into the right front seat, the student pilot got into the left front seat and the passenger sat in the right back seat. At approximately 1112, the aircraft left the wharf and taxied on the water towards the northern section of the lake. The floatplane disappeared behind a peninsula (see Figure 1) and shortly after started its take-off run towards the southwest.

Rather than following the suggested flight path, the aircraft took off more or less into the wind in a southwesterly direction. Shortly after becoming airborne near the western shore of the lake, the aircraft turned left heading east with a tailwind, and headed directly towards the departure wharf (see Photo 1). About 1700 feet separated the two shores of the lake where the turn was made. After flying over the wharf, the aircraft stalled and crashed 300 feet to the south. The engine continued to operate for a short time.

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[1] All times are eastern daylight time (Coordinated Universal Time minus four hours).

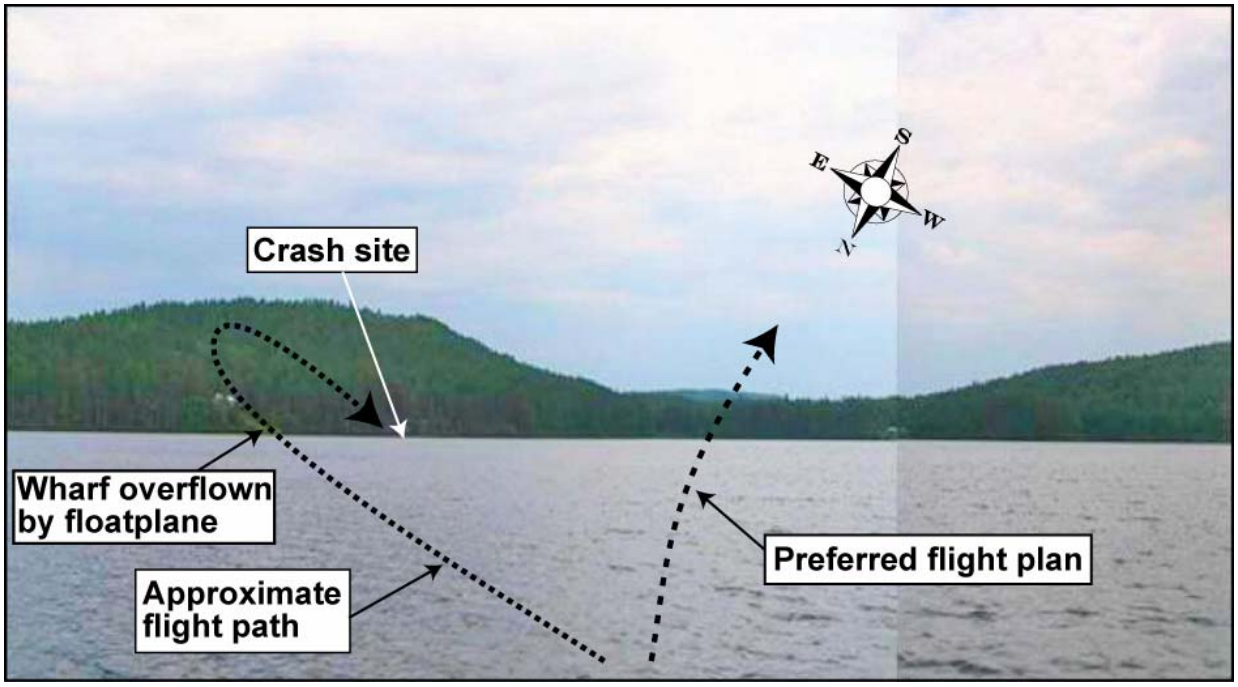

Photo 1. View of the location where the floatplane turned towards the wharf after becoming airborne

The pilot was certified and qualified for the flight in accordance with existing regulations. He held a commercial pilot licence (aeroplane) since 12 July 2004. He started working for Aviation Mauricie in July 2004. After being hired, he received, amongst other things, training on floatplanes and on the Cessna 206. The data available indicate that the pilot had accumulated approximately 1000 flying hours. It was the first time that he landed on Pasteur Lake. Although he did not have an instructor rating, the pilot could give training on floatplanes. The pilot, as pilot in command, was responsible for the conduct of the flight.

The student pilot held a private pilot licence (aeroplane) issued in October 1989 by the Direction Générale de l'Aviation Civile in France. He had accumulated 1226 flying hours and was endorsed on single-engine and multi-engine aircraft and seaplanes with a maximum take-off weight of 2700 kg or less. However, his class H seaplane endorsement issued in 1993 in Guyana was not valid at the time of the incident. His French medical certificate was valid until 30 September 2006. Transport Canada had issued a Foreign Licence Validation Certificate on 28 June 2005 valid until 01 July 2006. The certificate had not been renewed.

On 10 April 2006, the student pilot had purchased a block of 40 flying hours from Aviation Mauricie for floatplane training. He had accumulated 14.5 flying hours on C-FMGP since 25 June 2006. The company had no training file for the student pilot and was not required to keep one.

At the time of the accident, the weather conditions were favourable for visual flight. There were few clouds and the temperature was 26°C. The wind was from the southwest at 15 knots with gusts up to 25 knots. Waves of 20 to 25 cm stirred the surface of the lake.

The Cessna U206F is a high-wing, single-engine aircraft, with seating capacity of up to six people. The aircraft may be flown from the left or right seat. However, the pilot flying usually occupies the left seat. The aircraft journey logbook was not recovered. It was probably destroyed in the post-impact fire. The aircraft technical logbooks were examined to assess the floatplane's airworthiness. The aircraft had undergone a 200-hour recurrent inspection on 19 May 2006 and was found to be airworthy. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

The weight and balance of the aircraft were calculated using the estimated weight of the occupants and the estimated amount of fuel on board. There was no luggage on board. The aircraft weight at the time of the crash was about 3300 pounds, that is, 300 pounds less than the maximum allowable weight of 3600 pounds. According to calculations, the aircraft centre of gravity was within the specified limits. The pilot had completed the weight and balance form for the aircraft published in the company operations manual. The investigation revealed that the form used for the aircraft wrongfully indicated that the maximum allowable weight for the aircraft was 3800 pounds. However, the mistake on the form had no impact on the accident.

According to the aircraft flight manual, for a floatplane at this estimated weight and balance, using 20° of flap and 0° of bank angle, the stall speed is around 50 knots. The aircraft was equipped with a stall warning system that provided an audible warning. The stall warning system's horn is activated when the aircraft's speed is 5 to 10 knots above the stall speed.

According to Cessna, the optimal rate of climb on take-off using 20° of flap obtained during flight tests is 625 feet per minute. This rate is obtained in the following configuration: full throttle with an indicated airspeed of 76 knots. This rate of climb corresponds to an angle of climb of about 5° with no wind. The angle is steeper with a headwind and less steep with a tailwind. The aircraft climb performance is reduced when the suggested speed is not maintained. However, when it is necessary to clear an obstacle after take-off, the aircraft flight manual suggests using the best climb angle speed of 63 knots and 20° of flap.

In some situations, a pilot's ability to estimate speed, size, distance, the direction to a slope, or even to identify objects can be seriously diminished. Pilots can be subjected to optical illusions when approaching a rising slope at right angles. When getting close to the ridge, the pilot may tend to maintain a constant angle between the extended cowl and the mountain peak; as a result, the pitch attitude of the aircraft increases and speed decreases (see Figure 2). Consequently, aircraft performance decreases and vertical separation with the terrain decreases.

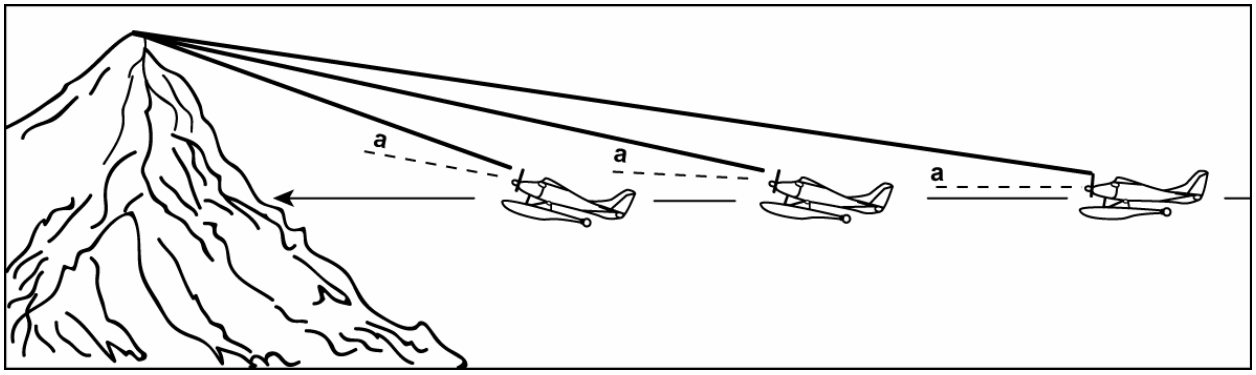

Figure 2. Possible optical illusion when approaching a rising slope

Also, the proximity of the ground tends to hold the pilot's attention and, as a result, can affect the flying of the aircraft. The illusion of increasing speed in relation to the ground in tailwind conditions is easily noticeable, to the point where the pilot may be tempted to reduce speed.

The aircraft crashed on the eastern shore of Pasteur Lake at about 15 feet above the water level. The wreckage was found at the bottom of a 300-foot hill that has a slope of almost 11°. As the aircraft descended, it severed trees for about 40 feet before striking the ground. Based on the marks on the trees and the aircraft damage, the floatplane had a right roll attitude of about 110° and was in a steep nose-down attitude before striking the ground. The aircraft came to rest on its back. The impact damage and the nose-down attitude of the wreckage are consistent with a loss of control following a stall.

An integral fuel tank was located in each wing near the wing root. The right wing had electrical wiring to operate the position light, flap motor and fuel quantity indicator.

A fire broke out about five minutes after the crash. The entire aircraft, except the left float, the wingtips and the empennage, was consumed by fire. The right side of the aircraft appeared to have sustained the most heat damage. The wings were burned in the area of the integral fuel tanks. The flaps were extended at 20°. On a Cessna U206F, this is the normal setting for take-off.

The instrument panel melted in the intense heat of the fire; as a result, it was not possible to determine the condition and operational capabilities of the aircraft systems and their components, or the positions of any controls, switches or indicators. However, examination of all components recovered revealed no pre-impact failures or malfunctions. The flight control system sustained substantial damage, but flight control continuity was established.

All failures were due to overload. The trees severed by the propeller blades and the blade damage indicate that the engine was producing power on impact. Part of the aircraft engine casing had melted. The propeller was sheared from the engine; all the engine crankshaft plate mounting bolts had failed in tension. The examination could not precisely determine the engine power. However, surrounding trees showed propeller strike marks indicating that the propeller was rotating. Examination of the wreckage revealed no evidence of any airframe failure, flight control problems, electrical problems, power loss, or fire during the flight.

Due to the condition of the instruments, it was not possible to determine the instrument readings at the time of impact. From examination of the wreckage, it was not possible to determine the position of the engine controls and fuel tank selector, or the condition of the seat belt attachments and the adjustment of the seat belts.

The emergency locator transmitter (ELT), Technisonic model TEL-82, serial number 12127, was not found in the burnt wreckage. Since the ELT is made almost entirely of plastic, it is likely that it was completely destroyed by heat. According to the aircraft's records, the ELT was installed in accordance with existing regulations.

The cockpit was severely damaged on impact, and the space for the front occupants was reduced to practically nothing. The cabin was then completely destroyed by the post-impact fire. Although the three occupants were wearing their seat belts, the accident was not survivable.

Autopsies and toxicological tests were done on the three occupants. In all three cases, the cause of death was determined to be multiple traumatic injuries. According to the autopsy and toxicological test results, there was no indication that incapacitation affected the pilot's performance. The autopsy performed on the student pilot who was in the front seat revealed the presence of coronary heart disease, but no recent indications of thrombosis or infarction were observed.

Analysis

Examination of the wreckage revealed no deficiencies, engine failure or aircraft system failure. There was no indication of any emergency situation or aircraft problems before the impact. The wreckage damage is consistent with a loss of control following a stall. The aircraft stalled at about 100 feet above the ground, an altitude insufficient to effect a recovery.

There was no evidence that incapacitation affected the pilot's or passenger's performance. Although the autopsy performed on the front seat passenger revealed the presence of coronary heart disease, no recent indications of thrombosis or infarction were observed.

The take-off flight path chosen was shorter than the usual flight path used by local pilots. Thus, the flight path for the initial climb before clearing the obstacles was shorter. As a result, at a given point, the aircraft was not as high over the obstacles as it should have been if the take-off run had been started at the far end of the lake. The investigation was not able to determine why the pilot did not follow the take-off flight path suggested by the owner of the wharf.

After becoming airborne, the aircraft should have made a 60° left turn towards the saddle at the south end of the lake in order to be able to continue the turn over the lowest terrain. However, the floatplane did not stop its turn when it was facing the saddle; it continued to turn until it was facing the departure wharf over which it flew shortly after. In light of these facts, it is reasonable to think that the pilot flying completed this manoeuvre to fly over the wharf from which he had just departed.

The left turn put the aircraft in tailwind conditions at low altitude, which resulted in the aircraft heading towards higher terrain than if it had been flown towards the saddle. It is possible that these conditions caused the pilot flying to increase the aircraft's attitude, thereby inadvertently decreasing the aircraft speed. The stall could thus be due to a combination of these factors, which reduced the difference between the aircraft's speed and the stall speed in conditions that were conducive to optical illusions created by drift and resulting from flying towards rising terrain.

After turning into the tailwind, the ground speed increased, reducing the aircraft climb angle and extending the flight path for the climb. As a result, climbing performance was reduced. The floatplane flew over the wharf at a height that did not allow it to climb over the terrain. It is possible that a lack of familiarity with the area caused the pilot flying to underestimate the distances and effect of the wind on the aircraft's performance.

It could not be determined who was at the controls during take-off or at the time of the accident. Nevertheless, the following possibilities were identified. On one hand, given that it was a training flight and that the student pilot was sitting in the seat usually occupied by the pilot flying, it is believed that the student was at the controls. On the other hand, it is also reasonable to believe that the manoeuvre was performed by the pilot-in-command since the aircraft did not fly towards the saddle, but towards the wharf where his friends were.

It is also possible that the student pilot, if he was at the controls, decided to fly over the wharf without obtaining the pilot's consent. In this eventuality, the pilot would not have reacted in time to correct the flight path. Given that the pilot was not an instructor, he was less likely to rapidly recognize unsafe practices and take the appropriate measures.

The collision with the trees caused a fuel leak in the right tank and damaged the electrical system that powered the various components in the right wing. The fact that the first flames appeared at the right wing root suggests that the fuel in the tank ignited. Several minutes were necessary to create a flammable gas mixture.

Findings as to Causes and Contributing Factors

1. The flight path towards the wharf put the aircraft into a tailwind facing a mountain slope that was too high for the floatplane's climbing performance.

2. The aircraft stalled in conditions conducive to optical illusions created by drift and resulting from flying towards rising terrain; there was insufficient altitude available to effect a recovery.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 31 July 2007.

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