

Aviation Occurrence Report

Collision with Terrain

Cessna 180K C-GIGK
Aux Mélézes River, Quebec
10 August 1997

Report Number A97Q0168

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The TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by:

- conducting independent investigations including when necessary, public inquiries, into selected transportation occurrences in order to make findings as to their causes and contributing factors;
- reporting publicly on its investigations and on the findings in relation thereto;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies.

It is not the function of the Board to assign fault or determine civil or criminal liability.

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To encourage public confidence in transportation accident investigation, the investigating agency must be, and be seen to be, objective, independent and free from any conflicts of interest. The key feature of the TSB is its independence. It reports to Parliament through the President of the Queen's Privy Council for Canada and is separate from other government agencies and departments. Its independence enables it to be fully objective in arriving at its conclusions and recommendations. Its continuing independence rests on its competence, openness, and integrity, together with the fairness of its processes.

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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 pilot of the seaplane, serial number 18053048, accompanied by one passenger, took off from the du Gué River, in the extreme north of Quebec, to look for a good location to fish and set up a temporary camp. During the approach for a water landing on the aux Mélézes River, the pilot executed a go-around. A short time later, the aircraft crashed on the south slope of the valley running alongside the river. The pilot and the passenger, who was seated in the right seat, were fatally injured. The aircraft was destroyed by the fire that started a few seconds after impact.

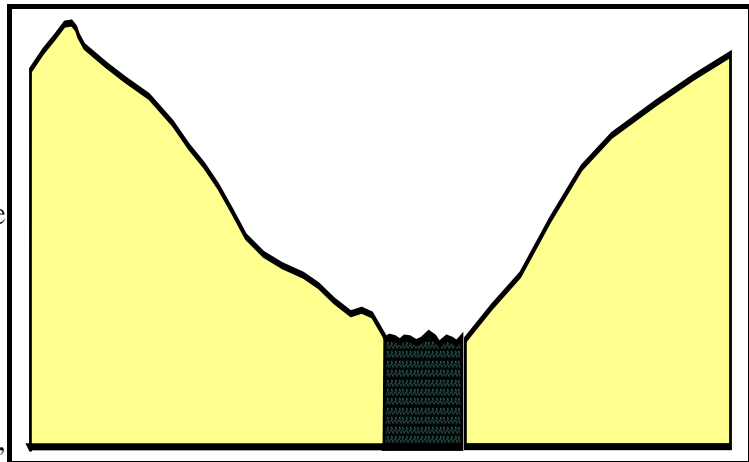
Ce rapport est également disponible en français.

Other Factual Information

On 07 August 1997, C-GIGK and CF-RHI, two Cessna 180K aircraft, departed Montreal for a flight to the Ungava Bay region, in the extreme north of Quebec, for a fishing trip that was to last about 10 days. Each aircraft had one pilot and one passenger on board. On 10 August, the day of the accident, both aircraft took off from Lake Maricourt, Quebec, and proceeded north. Conditions were suitable for visual flight; visibility was over 15 miles, the temperature was 27 degrees Celsius, there was no precipitation, and the cloud layer was over 5,500 feet above sea level (asl).

The two aircraft first landed on the du Gué River. Around 1230 eastern daylight time (EDT), the seaplanes took off again for the aux Mélézes River, which they followed in a westerly direction, to find a suitable place to fish and set up a temporary camp. The floor of the valley is at an altitude of 300 feet asl, and the terrain on both sides of the river rises to at least 1,200 feet asl. The wind was from the west at approximately 20 knots; it was blowing partly parallel to the river, with a light south component.

During the flight, the pilots communicated with each other on a common VHF frequency. C-GIGK was a few miles ahead of CF-RHI at an approximate altitude of 1,000 feet asl. After finding a spot he considered suitable, just upstream from some rapids, the pilot of C-GIGK relayed the information to the other pilot so the latter could make an inspection overflight of the site. The pilot of CF-RHI overflew the suggested location, then made a water landing with no difficulty. A short time later, the pilot of C-GIGK initiated a final



approach to land at the same spot, but before touchdown, the pilot initiated a missed water landing procedure. He then informed the pilot of CF-RHI that he was going to inspect more carefully the landing area. He had decided to fly another circuit because he was unsure of the strength of the current in the river. After advising the pilot of CF-RHI of his intentions, the pilot of C-GIGK did a go-around over the river to about 450 feet above ground level, followed by a 90-degree left turn to join the cross-wind leg. The aircraft levelled off and proceeded toward the south slope of the valley. About 30 seconds later, as C-GIGK had not yet turned parallel to the river and the upward-sloping terrain, for the downwind leg, and the seaplane was getting close to the rising terrain, the pilot of CF-RHI advised the pilot of C-GIGK to watch out for the mountain. A few seconds later, the aircraft pitched up without changing heading, then made two turns; the first turn was at a low bank angle to the right, upwind, and the second turn was steep and to the left, downwind. The aircraft started to lose altitude and pitched up gradually until it struck the trees, then struck the ground in a nose-down attitude. Four or five seconds after the impact, a fire started on the right side of the cabin. Thirty to sixty seconds elapsed

¹ All times are EDT (Coordinated Universal Time (UTC) minus four hours), unless otherwise noted.

between the pull-up and the accident.

The pilot of CF-RHI immediately took off to overfly the crash site to assess the situation and call for rescue. A helicopter arrived at the site 45 minutes later. The aircraft was still burning and the two occupants were seated in their seats in the cabin.

The accident occurred around 1330, during daylight, at 100 nautical miles southwest of Kuujuaq, Quebec, in a partially wooded area approximately half a mile south of the aux Mèlèzes River. The area is somewhat rough, with trees, mainly larch, of average size. The south side of the valley slopes upward at an angle of almost 20 degrees. The aircraft came to rest about 450 feet above the valley floor. The aircraft cut several trees over a distance of 50 feet before striking the ground.



Based on the cut trees and the damage to the wings, the seaplane had a left roll attitude of 15 to 20 degrees, was nose-down, and on a heading of 113 degrees magnetic when it struck the ground. The damage attributable to the impact and the nose-down attitude of the wreck are consistent with a loss of control following a stall.

The aircraft appeared to be relatively intact right after the crash. The wings were still attached to the airframe; however, the aircraft was destroyed by the fire that started shortly after the ground impact. The fire spread to the vegetation over a distance of 40 feet in front of the aircraft. All of the fuselage, except the empennage and part of the left wing, was consumed by fire. The right side of the aircraft appears to have sustained the most damage from heat. The lock of the pilot door was engaged, but the passenger door lock was not recovered. The fuel selector switch was on "BOTH". The wings were burned in the area of the integral fuel tanks. A tree broke through the spar and underside of the right wing near the integral fuel tank and wing attachment bracket. The flaps were extended at 20 degrees. On a Cessna 180K, this is the flap setting normally used for a go-around.

The instrument panel melted in the intense heat of the fire; as a result, no determination could be made with regard to the condition and operational capabilities of onboard systems or 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 circuit sustained substantial damage, but continuity was confirmed. All failures were attributed to overload. Examination of the engine and propeller at the accident site revealed that the engine was running at the time of impact and the propeller blades were at low pitch. The engine power could not be determined from the examination. However, the cuts in the surrounding trees indicate that the propeller was being driven by the engine at the time. Examination of the wreckage yielded no indication of any airframe failure, flight control problems, electrical problems, loss of power or in-flight fire. No messages were received from the pilot. The emergency locator transmitter (ELT) activated on impact and transmitted a signal

that the pilot of CF-RHI was able to hear for a few seconds on the frequency 121.5 megahertz.

On the morning of the accident, the pilot appeared to be well rested. He was certified and qualified for the flight in accordance with existing regulations. He had held a private pilot (aeroplane) licence since 12 May 1984, and was authorized to fly in accordance with visual flight rules (VFR) by day and by night. He had his check on single-engine seaplanes on 27 May 1985. His licence validation certificate was valid. The pilot had about 1,850 flying hours; he flew about 150 hours a year. He had a reputation for being a safe pilot who knew the aircraft flight manual well and complied rigorously with the manufacturer's procedures and instructions.

The pilot was involved in two previous aircraft accidents. The first accident occurred at Saint-Jean Airport, Quebec, on 04 June 1984 when the Piper PA 28-140 he was flying left the runway after landing. The second accident happened on 02 July 1994 at Lake Louise, Quebec, where, shortly after take-off, downdrafts over mountainous terrain blew his Cessna 172 toward the ground; the pilot had then decided to land in the trees straight ahead. The two occupants were not injured, but the aircraft sustained substantial damage.

The passenger held a private pilot (aeroplane) licence since 06 September 1996. On the morning of the accident, she seemed well rested. She had, nonetheless, been indisposed by motion sickness on the first flight of the day. She was sick after the landing on the du Gué River. There was no indication that she was flying the aircraft at the time of the crash; the pilot usually flew during the critical phases of flight. However, the pilot had occasionally let the passenger take the controls during level flight.

The aircraft belonged to the pilot. No journey log-book was found. It was probably destroyed by the post-crash fire. The technical log-book was used to assess the airworthiness of the seaplane. The aircraft had been declared airworthy on 04 June 1997 following the annual inspection. The records indicate that the aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures. The data available indicate that the aircraft had approximately 1,190 flying hours. A supplementary type certificate authorized the maximum allowable take-off weight to be increased from 2,950 to 3,190 pounds. The weight and centre of gravity were within the prescribed limits. The weight of the aircraft at the time of the accident was estimated at 2,965 pounds. There were no flammable liquids on board the aircraft or in the float compartments which could have caused the fire. The pilot did not mention any aircraft deficiencies or problems after departure. The witnesses stated that they noticed nothing unusual regarding the aircraft prior to impact.

Since the pilot had to abort his approach and go around while the aircraft was configured for a water landing, the recommended procedures for a missed water landing and the performance of the Cessna 180K were examined. The manufacturer recommends extending the flaps 20 degrees immediately after applying full power. Then the flaps are retracted gradually when the aircraft reaches a safe altitude and speed. The optimum theoretical rate-of-climb is 900 feet per minute; it is obtained in the following configuration: flaps up, full power, 2,400 rpm, cowl flaps open, indicated airspeed of 79 knots, weight of 2,950 pounds, altitude of 1,000 feet asl, and temperature of 30 degrees Celsius. This rate-of-climb corresponds to a climb gradient of approximately 6.5 degrees with no wind; the gradient is steeper with a headwind, and less steep with a tailwind. Climb performance is substantially reduced with the flaps extended or when the recommended speed is not maintained.

Just before it crashed, the aircraft pitched up gradually until it reached stall speed. The normal stall speed for a

float-equipped Cessna 180K with a weight of 2,950 pounds, in level flight with the wings levelled, engine off, and 20 degrees of flap is about 50 knots. Stall speed increases with bank angle. In a turn with 30 degrees of bank, the stall speed is 53 knots; with 45 degrees, it is 58 knots; and at 60 degrees, the aircraft will stall at 69 knots. An audible alarm sounds to warn the pilot when the speed of the aircraft is 5 to 10 knots above the stall speed.

The electrical system is designed to be isolated, by turning off the master switch, from the battery located at the rear of the cabin. By switching off the electrical power and fuel supply before a forced landing, it is possible to greatly reduce the risk of fire.

The impact was survivable. The trees and the type of terrain helped to reduce the deceleration forces applied to the cabin structure. The cabin appears to have been only slightly buckled by the impact. Neither the occupants nor the cargo on board the aircraft were subjected to sufficient force to eject them from the cabin. The pilot's seat-belt was fastened and the passenger's was unfastened. The seat-belts were not fitted with shoulder harnesses. The seat locking mechanisms showed no indication of failure.

Based on the autopsy and toxicology testing, there was no indication that incapacitation affected the pilot's performance. The pilot was flying the aircraft from the left seat, and he survived the crash; he died as a result of the post-crash fire. The autopsy, however, did not determine whether he was conscious after ground impact. Furthermore, it was not possible to evaluate the injuries caused by the impact or deceleration forces. The passenger was seated in the right front seat; the heat generated by the fire was so intense that the cause of death could not be determined. It was also impossible to determine whether she was alive or conscious prior to the fire.

In some situations, a pilot's ability to estimate size, distance, speed, 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. Consequently, aircraft performance decreases and vertical separation with the terrain decreases.

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 is easily noticeable, to the point where the pilot may be tempted to reduce speed.

Analysis

Examination of the aircraft revealed no deficiencies, no engine failure nor aircraft system failure. There is no indication of any emergency situation or aircraft problems prior to impact, and no distress calls were received.

The pilot decided to go around after informing the pilot of the other aircraft that he had doubts regarding the suitability of the water landing area. The purpose of the manoeuvre was to fly a circuit and make another examination of the area so he could establish more clearly the characteristics and condition of the landing area. Consequently, the pilot's decision was justified from a safety standpoint, based on the information obtained during the approach.

The pilot's decision to fly a left-hand circuit was sound since he was sitting in the left seat and visibility was better on that side. Since the reconnaissance phase was to allow an examination of the surface of the water, it required that the flight be made at low level and low speed. The reconnaissance track was to be rectangular, or oval.

When the pilot turned onto the crosswind leg, he was over the river and, due to drift over the ground, the ground speed increased. Since the aircraft was nearly in level flight, it must have closed rapidly with the rising terrain. The pilot did not keep close to the north side of the valley before turning onto the crosswind leg, which did not allow him as much room as was possible, should he have needed it. As a result, not all the space available for the circuit was used to minimize the roll attitude of the seaplane in the turns and maximize the aircraft performance. The type of circuit chosen by the pilot reflected his intention to overfly the landing area at low altitude.

Flying in mountainous terrain requires constant vigilance. Pilots must constantly compare their impressions with instrument readings. It could not be determined why the pilot continued flying at right angles to the ridge and did not try to avoid the mountain until the pilot of CF-RHI warned him. However, two possible explanations were identified to explain the pilot's delay in turning onto the downwind leg: the pilot may have been distracted and/or he may have been subjected to optical illusions.

On one hand, the pilot may have been preoccupied with either planning the water landing or an untimely event in the cabin. It is possible that, after the go-around, most of his attention was devoted to continuously examining the landing area to his left and slightly behind him rather than to flying the circuit. Similarly, a distraction on board the aircraft, such as the passenger being indisposed by motion sickness, could have had the same result.

On the other hand, while flying toward the rising slope, the pilot may have been subjected to optical illusions, which can be treacherous at low altitude and at near-stall speeds.

After the message from the pilot of CF-RHI warning him of the imminent danger of collision with the mountain, the pilot of C-GIGK seemed to have responded, but he had little time to react and his room to manoeuvre may have been so limited that a half-turn could have led to a stall in a turn. An assessment of the situation may have led the pilot to decide to end the flight quickly and make a forced landing in the best possible conditions on the slope of the valley, as he had done at Lake Louise in 1994. The pilot apparently did

not have enough time to switch off the electrical power and the fuel and prepare for a quick evacuation from the cabin. The information gathered and the statements recorded did not reveal the causes of the accident.

Considering the light damage sustained by the cabin, the accident was survivable. However, the rapid onset and intensity of the post-crash fire gave the occupants no chance to evacuate the cabin in time. It could not be determined how the passenger's seat-belt was unfastened. It appears that no attempt was made to evacuate, since the pilot and passenger were found sitting in their seats and the pilot's door was still locked after the accident.

Damage to the right wing was serious enough to cause a fuel leak, which, on coming into contact with an ignition source, started the fire. Engine heat and electricity were the two possible sources of ignition. Although witness statements and the damage caused by the fire suggest that the fire started on the right side of the cabin, and the most likely source of ignition was electrical, the investigation could not determine the exact source of ignition. However, engine heat would have been the only possible source of ignition if the master electrical switch was selected off prior to impact.

Conclusions

Findings

1. The pilot was certified, trained and qualified for the flight in accordance with existing regulations.
2. Based on the autopsy and toxicology testing, there was no indication that incapacitation affected the pilot's performance.
3. The weight and centre of gravity of the aircraft were within the prescribed limits.
4. Records show that the aircraft was maintained in accordance with existing regulations.
5. There was no indication of any airframe or flight controls failures, or of any engine malfunction.
6. Weather conditions at the time of the accident were suitable for VFR flight, although the wind was moderate.
7. After executing a go-around in the aux Mélézes River valley, the pilot turned left onto the crosswind leg to make a reconnaissance circuit about 450 feet above the river and 450 feet below the ridge of the valley.
8. It seems that the pilot attempted to avoid the rising terrain after the other pilot warned him.
9. The pilot died as a result of the post-crash fire, which started about five seconds after the accident.
10. An unexplained distraction and/or the effects of an optical illusion may have contributed to distracting the pilot's attention from flying the circuit.

Causes and Contributing Factors

The cause of the accident was not determined.

Safety Action

Although the cause of this accident was not determined, the conditions associated with it were conducive to optical illusions, resulting from flying over rising terrain at low altitude. To increase pilot awareness of this hazard, Transport Canada will be publishing an article on the subject in a future issue of its *Aviation Safety Letter*.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Maurice Harquail, Charles H. Simpson and W.A. Tadros, authorized the release of this report on 22 July 1998.