Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

Air Transportation Safety Investigation Report A21Q0007

LOSS OF CONTROL AND COLLISION WITH TERRAIN

Wag-A-Bond (amateur-built aircraft), C-GKGX
Barron Lake, Gore, Quebec
03 March 2021

History of the flight

At approximately 0817[1] on the morning of 03 March 2021, the Wag-A-Bond amateur-built aircraft (registration C-GKGX, serial number 01) took off from Barron Lake, near the municipality of Gore, Quebec, bound for the Lachute Aerodrome (CSE4), Quebec. The pilot was going to meet one of the aircraft's co-owners to conduct other flights during the day.

When the aircraft took off from the frozen surface of the lake, westbound, the flaps were set to 40°.[2] The aircraft climbed to nearly 50 feet above ground level (AGL), close to the north shore of the lake, and began turning left with the flaps still at 40°.[3] The aircraft entered a spin to the left and struck the surface of the lake in a near-vertical attitude, with the left wing contacting the surface first (Figure 1).[4]

[1] All times are Eastern Standard Time (Coordinated Universal Time minus 5 hours).

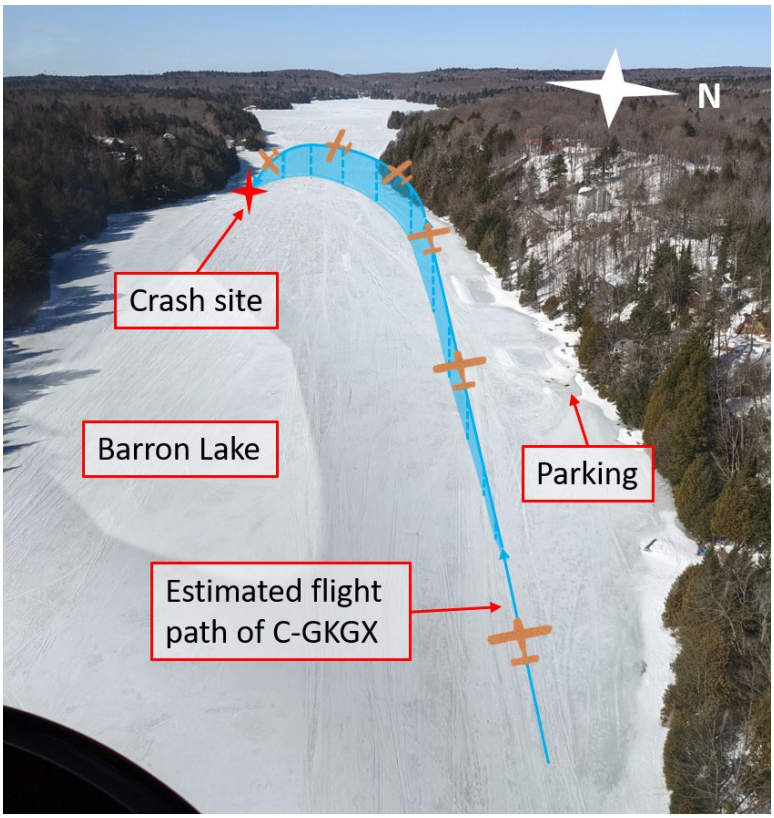
[2] The maximum flap setting is 40°. This setting was used to make the takeoff on snow easier. On some aircraft, such as the Piper PA-18, this setting is also used as a short field take-off technique.

[3] The pilot would have begun turning left to distance himself from the shore and conduct his climb in the centre of the lake to reduce the noise level for lakeside residents. This procedure was part of an agreement between the aircraft's co-owners.

[4] The aircraft's exact flight path could not be determined because the aircraft was not equipped with a flight data recorder, nor was it required to be by regulation.

Canada

Figure 1. Estimated flight path of the occurrence aircraft (Source: TSB)



A person who was near the accident site quickly contacted emergency services by dialling 9-1-1. The 121.5 MHz emergency locator transmitter activated on impact and transmitted a signal.

The pilot was fatally injured. The aircraft was destroyed by impact forces and there was no post-impact fire.

Weather information

According to the aerodrome routine meteorological report (METAR) issued at 0834 for the Montréal International (Mirabel) Airport (CYMX), Quebec, located 10 nautical miles (NM) southeast of the accident site, winds were variable from 230° true (T) to 320°T at 3 knots. Weather conditions were suitable for this visual flight rules flight and were not considered a factor in this accident.

Pilot information

The pilot was certified and qualified for the occurrence flight in accordance with existing regulations. He held a Canadian commercial pilot licence — aeroplane, and a Category 1 medical certificate, both of which were valid. He had the following ratings: single-engine, multi-engine, Group 1 instrument and seaplane. At the time of the occurrence, the pilot had accumulated 957 flight hours, including 30.5 hours on ski-equipped aircraft and 10.3 hours on the occurrence aircraft.

According to information gathered during the investigation, there was no indication that the pilot's performance was affected by medical, pathological or physiological factors.

Aircraft information

The Wag-A-Bond is an amateur-built aircraft. The occurrence aircraft was built in 2011. It received a special certificate of airworthiness[5] on 15 November 2012. The aircraft was equipped with wheels and skis (Figure 2).

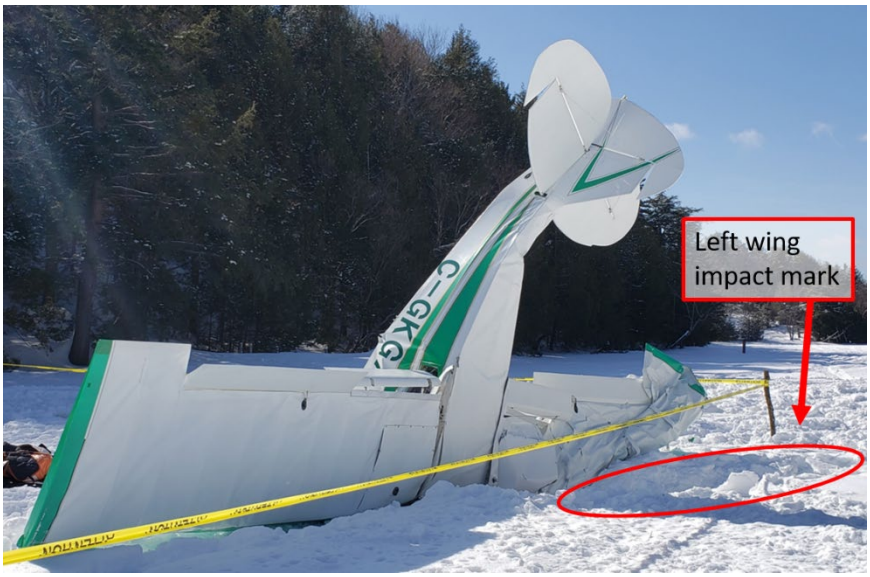
Figure 2. Photo of the occurrence aircraft (Source: Aircraft co-owner)

The aircraft's journey log indicated that it had accumulated 208.8 flight hours since its construction. It had a maximum take-off weight of 1800 pounds and an empty weight of 1176 pounds. The aircraft had an Avco Lycoming O-320-A2B engine (serial number L1057927). This is an air-cooled, 4-stroke, 4-cylinder engine, which generates 150 hp at a maximum speed of 2700 rpm.

The aircraft was not equipped with a stall warning system and had no known deficiencies before the occurrence flight.

Accident site and examination of the wreckage

Figure 3. Photo of the wreckage (Source: TSB)



The aircraft struck the frozen surface of the lake at a near-vertical angle and came to rest in that position at the point of impact. Marks in the snow indicated that the left wing had contacted the surface first, followed by the nose of the aircraft (Figure 3). The fuel tanks, located in the wings, were damaged, causing a small fuel spill.

[5] Certificate issued by Transport Canada pursuant to section 507.03 of the *Canadian Aviation Regulations*.

The wings had partially separated from the fuselage, but the cables controlling the ailerons were under tension and still attached to the cabin. The cable and pulley system that controls the elevators and rudder was checked to the extent possible: when the cables below the fuselage were pulled, the elevators and rudder moved freely. The control column and connecting cables were torn off by the impact forces. Damage to the wings and structure was the result of impact forces and the work of the first responders.

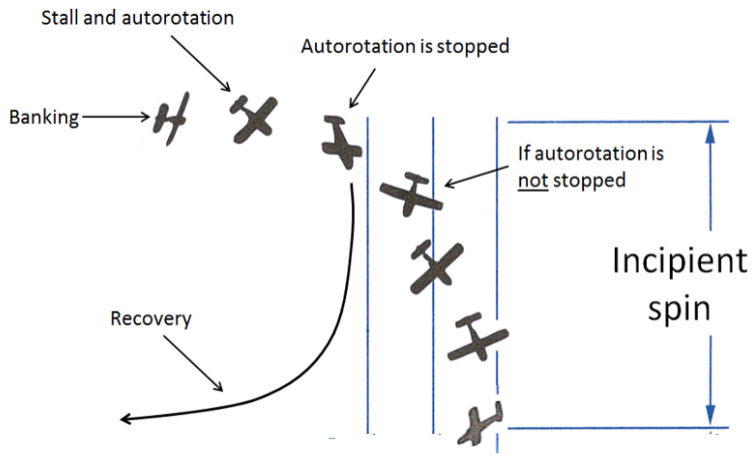
Aerodynamic stall and incipient spin

A stall is a loss of lift and an increase in drag that occurs when an aircraft is flying at an angle of attack greater than the angle that provides maximum lift. Regardless of airspeed, an aircraft always stalls when its wings reach this critical angle of attack.[6]

Stall speed varies depending on factors such as the aircraft's weight, power setting, flap position, and angle of bank. An incipient spin occurs when an aircraft stalls and one wing produces more lift than the other. Because the descending wing is at a greater angle of attack, it stalls even further and produces more drag, which triggers an autorotation. During this phase of the incipient spin, the flight path changes from horizontal to vertical.[7]

Generally, even if the pilot takes the necessary measures to stop the autorotation as soon as it begins, the aircraft is in a vertical position while accelerating rapidly, and a high altitude is necessary to regain a horizontal flight path. If the autorotation continues, the aircraft could stabilize in a spin and follow a spiral path downward (Figure 4).

Figure 4. Incipient spin (Source: TSB, based on Transport Canada, TP 1102, Flight Training Manual, 4th Edition [revised 2004], Figure 2-31)



In the occurrence flight, the higher drag caused by the flaps being set to 40° limited the aircraft's speed during the climb. The engine torque at full power caused the aircraft to roll to the left; the slipstream on the stabilizer and rudder caused the aircraft to yaw to the left. When the pilot began a

[6] Transport Canada, TP 1102, *Flight Training Manual*, 4th Edition (revised 2004), p. 76.

[7] Ibid., p. 82.

low-speed left turn by applying the controls and left pedal, it is likely that the aircraft stalled, sending it into an incipient spin. With the aircraft at approximately 50 feet AGL when control was lost, it was not high enough for the pilot to avoid collision with the frozen surface of the lake.

Safety message

In this occurrence, having the flaps at their maximum setting (40°) limited acceleration during the initial climb. When flying at a slow speed, especially during the initial climb after takeoff, pilots must watch for any warning signs that a stall is imminent and exercise caution in handling flight controls to avoid a stall and an incipient spin, and potentially impact with the ground.

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 28 July 2021. It was officially released on 17 August 2021.

ABOUT THIS INVESTIGATION REPORT

This report is the result of an investigation into a class 4 occurrence. For more information, see the Policy on Occurrence Classification at www.tsb.gc.ca

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