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

Air Transportation Safety Investigation Report A18O0107

LOSS OF CONTROL AND COLLISION WITH WATER

Georgian Bay Airways
Found Aircraft Canada FBA-2C1 Bush Hawk-XP, C-FKNS
Lake Muskoka, Ontario
30 July 2018

About the investigation

The Transportation Safety Board of Canada (TSB) conducted a limited-scope, fact-gathering investigation into this occurrence to advance transportation safety through greater awareness of potential safety issues. It is not the function of the Board to assign fault or determine civil or criminal liability.

History of the flight

At 1858[1] on 30 July 2018, the Georgian Bay Airways float-equipped Found Aircraft Canada[2] FBA-2C1 Bush Hawk-XP aircraft (registration C-FKNS, serial number 34) departed from Toronto/Billy Bishop Toronto City Water Aerodrome (CPZ9), Ontario, bound for Parry Sound Harbour Water Aerodrome (CPS1), Ontario. On board were the pilot and 1 passenger, who was a friend of the pilot and was seated in the front-right seat. The trip was a ferry flight to return the aircraft to the company's floatplane base at Parry Sound following a charter flight bringing passengers to CPZ9. A member of the pilot's family was staying at a cottage on Lake Muskoka, and the pilot decided to fly over the cottage on the return trip.

At about 1930, the pilot descended and flew over the cottage, which was on the west point of a small bay (Figure 1), at about 80 knots indicated airspeed (KIAS). He then circled around to fly over the cottage again, flying just above tree-top level. Witnesses saw people standing outside at the cottage, watching the aircraft fly over. The aircraft closely cleared some trees before entering a right turn and

[1] All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

[2] On 23 November 2017, the type certificate was transferred from Found Aircraft Canada Inc. to the new type certificate holder, Pacific Aerospace Limited, which is based in New Zealand.

flying along the shoreline of the small bay to the east of the cottage. The bank angle in the right turn became steep[3] as the aircraft headed toward a wooded point on the east side of the bay. The aircraft turned before reaching the wooded point and continued turning to the south in a steep right bank and began to lose altitude as the nose pitched down. The aircraft reportedly did not respond to left aileron input. The aircraft continued to descend, and struck the surface of the water in a steep right-bank, nose-low attitude. It then cartwheeled before coming to rest in the water. Both occupants were wearing 4-point safety harnesses and sustained minor injuries.

Figure 1. Approximate final turning path of the aircraft after flying over the cottage (Source: Google Earth, with TSB annotations)

The cabin of the aircraft began to rapidly fill with water as the aircraft began to sink. The passenger released her seatbelt but could not locate the handle for the front-right door. The pilot released his seatbelt and tried to help the passenger open the front-right door. As water continued to fill the aircraft cabin, both occupants egressed by passing over the front seats and out one of the rear doors.

Neither the pilot nor the passenger had received egress training, nor were they required to by regulation. Personal flotation devices (PFDs) were on board the aircraft; however, neither occupant was wearing one, nor did they egress with them. Current regulations do not require that aircraft occupants wear PFDs.

The crash site was relatively close to shore, and witnesses arrived on scene immediately to rescue the 2 occupants from the water.

The weather at the time of the occurrence was suitable for visual flight rules flight.
Muskoka Airport (CYQA), Ontario, located about 6.5 nautical miles east of the accident site, recorded clear conditions with a light wind out of the west.

Company information

At the time of the occurrence, Georgian Bay Airways (GBA) operated 4 floatplanes (including the occurrence aircraft) under Subpart 702 (Aerial Work) and Subpart 703 (Air Taxi Operations) of the *Canadian Aviation Regulations* (CARs) that were based at CPS1. Most of the company's operations

[3] A steep turn is defined as a turn at more than 30° of bank.

consist of aerial tours and chartered day trips to nearby locations. The company also operates a training school to teach pilots how to fly float-equipped aircraft.

In 2011[4] and 2013,[5] GBA floatplanes were involved in accidents due to water impact during take-off and landing phases. Both cases required egress into the water. In both accidents none of the occupants were wearing PFDs, nor were they required to by regulation.

Earlier in 2018, the occurrence pilot was operating a GBA floatplane whose left wing struck a harbour marker during its take-off run.[6]

The company does not provide egress training for its pilots, nor is it required to by regulation.

Pilot information

The pilot held a valid commercial pilot licence – aeroplane, with a single- and multi-engine land and seaplane rating, a Group 1 instrument rating, and a valid Category 1 medical certificate. He had accumulated over 1800 hours total flight time, including 1600 hours on seaplanes. He began working for GBA in 2012 and was the chief pilot and operations manager at the time of the accident.

Aircraft information

The Found Aircraft Canada FBA-2C1 Bush Hawk-XP (Bush Hawk-XP) is a high-wing, 5-seat, single-engine aircraft. The occurrence aircraft was configured as a seaplane on float landing gear (Figure 2).[7]

Figure 2. Occurrence aircraft (Source: Georgian Bay Airways)

The Bush Hawk-XP is equipped with a vane-type stall warning unit in the leading edge of the right wing. The unit is designed to activate an aural warning and a light between 5 and 10 knots above the stall speed in all configurations. The aircraft's published wings-level stall speed is 58 KIAS.[8]

After the submerged aircraft was raised out of the water, it was examined on site. There was no indication of a pre-impact aircraft system malfunction or airframe failure. The aircraft was destroyed. All damage to the aircraft was consistent with overload forces from the impact with the water and with the engine operating at impact. The flaps were in the fully retracted position.

---

4 TSB Aviation Investigation Report A11O0166.

5 TSB Aviation Occurrence A13O0099.

6 TSB Aviation Occurrence A18O0065.

7 C-FKNS is an Aerocet model 3500L float-equipped derivative of the Found FBA-2C1, with the 300-hp engine and wing flaps modified per Found Aircraft Canada Inc. Modification 1043 to an electrically operated Fowler-type flap system, and is known as a Found FBA-2C1 Bush Hawk-XP. This configuration requires use of Pacific Aerospace Limited *Aircraft Flight Manual FAC2-M400* with *Supplement Manual M400-S01*.

8 The published stall speeds for an Aerocet model 3500L float-equipped aircraft with power off and flaps up, operating at 3800 pound gross weight and most forward centre of gravity. KIAS values are approximate.

Aerodynamic stall

A lack of response to left aileron input and the eventual yaw to starboard are consistent with an accelerated aerodynamic stall followed by the onset of a spin or spiral dive. An aerodynamic stall occurs when a wing's angle of attack[9] exceeds the critical angle at which the smooth airflow begins to separate from the wing. When a wing stalls, the airflow breaks away from the upper surface, and the amount of lift is reduced to below that needed to support the aircraft.

According to Transport Canada's *Flight Training Manual*,

> When an aircraft is stalled during a level or descending turn, the inside wing normally stalls first, and the aircraft will roll to the inside of the turn. In a level turn, the inside wing is travelling more slowly than the outside wing and obtains less lift, causing it to sink and increase its angle of attack. Under the proper conditions, this will produce a stall. During a descending turn, the path described by the aircraft is a downward spiral; therefore, the inside wing is meeting the relative airflow at a steeper angle of attack and is the one to stall first and drop lower.[10]

The speed at which a stall occurs is related to the load factor of the manoeuvre being performed. In straight and level flight, lift is equal to weight, and the load factor is 1*g*. In a banked level turn, however, greater lift is required and is achieved, in part, by increasing the angle of attack (by pulling back on the elevator control), which increases the load factor. The stall speed in a manoeuvre increases as the square root of the load factor. In a 60° bank angle, the load factor increases to 2*g*.

For the Bush Hawk-XP, the published stall speed in a 60° bank angle is 82 KIAS.[11]

A stall that occurs as a result of a high load factor, such as bank angle increased beyond 30°, is called an accelerated stall. Accelerated stalls occur at higher airspeed due to the increased load factor on the wing, are usually more severe than unaccelerated stalls, and are often unexpected. A stall from a steep bank angle can result in an aggressive departure from controlled flight that makes the aircraft rapidly lose altitude.

From a steep angle of bank beyond 45°, an aircraft will not remain in a stalled condition for more than a few seconds before it either enters a spin[12] or accelerates into a spiral dive.[13] Either condition will result in a nose-down attitude, a steep angle of bank, and a rapid loss in altitude.

Stall recovery

Pilots normally use the ailerons to raise a wing that drops (roll moment); however, using ailerons to raise a wing that has dropped as a result of a stall can aggravate the stall condition. For example, if the right wing dropped during the stall and excessive aileron control were applied to the left to raise the wing, the aileron deflected downward (right wing) would produce an even greater angle of attack

---

[9] The angle of attack is the angle at which relative wind meets the wing chord. The angle of attack can be simply described as the difference between where a wing is pointing and where it is going.

[10] Transport Canada, TP 1102, *Flight Training Manual*, 4th edition (August 2004), p. 79.

[11] The published stall speeds for an Aerocet model 3500L float-equipped aircraft with power off and flaps up, operating at 3800 pound gross weight and most forward centre of gravity. KIAS values are approximate.

[12] A spin occurs when a stall is allowed to progress into a deeper stall where 1 wing is providing less lift than the other. The aircraft enters a nose-down, steep angle of bank, and pivots around the vertical axis rapidly. The rapid turning makes it more difficult to recover from than a stall, and will result in more altitude loss.

[13] A spiral dive is a steep descending turn with the aircraft in an excessively nose-down attitude. A spiral dive may be recognized by an excessive angle of bank, rapidly increasing airspeed, and a rapidly increasing rate of descent.

(and drag), and could result in a more complete stall at the wing tip as the critical angle of attack is exceeded. The increase in drag created by the high angle of attack on that wing might cause the airplane to yaw in that direction. This adverse yaw could result in a spin if directional control were not maintained by the rudder or the aileron control input were not sufficiently reduced.

The typical recovery from a stall initially involves releasing the back elevator pressure, or moving the elevator control forward (elevator down) so that the angle of attack is reduced sufficiently to smooth the airflow over the wing. When the aircraft exhibits the first signs of recovery, a pilot will level the wings with aileron and gradually release the nose-down pressure. Any tendency to yaw is corrected by applying the rudder. As the recovery progresses and flight is regained, the nose-down pressure transitions to nose-up pressure (elevator up) to recapture the lost altitude.

When an aircraft stalls at low altitude, sufficient altitude may not be available to allow the appropriate stall recovery techniques to be applied before a collision with terrain occurs.

Low flying

The aircraft flew near cottages at tree-top altitude.

Intentional low flying is recognized to increase the risk of accidents, and the TSB has recently investigated a number of occurrences[14] in which this was a factor. The CARs and other publications contain specific reference to this risk.

The CARs state, "No person shall operate an aircraft in such a reckless or negligent manner as to endanger or be likely to endanger the life or property of any person."[15]

Regarding minimum altitudes and distances to be flown over non-built-up area, the CARs state the following:

> Except where conducting a take-off, approach or landing or where permitted under section 602.15, no person shall operate an aircraft [...] at a distance less than 500 feet from any person, vessel, vehicle or structure.[16]

The *Transport Canada Aeronautical Information Manual* contains the following warning in bold font regarding low flying:

> **Warning—Intentional low flying is hazardous. Transport Canada advises all pilots that low flying for weather avoidance or operational requirements is a high-risk activity.**[17]

Regarding the prevention of aerodynamic stalls at low altitude, the U.S. National Transportation Safety Board states the following (emphasis in original):

> **Resist the temptation to perform maneuvers in an effort to impress people,** including passengers, other pilots, persons on the ground, or others via an onboard camera. "Showing off" can be a deadly distraction because it diverts your attention away from the primary task of safe flying.[18]

---

[14] TSB aviation investigation reports A16A0084, A17Q0050, and A18W0098.

[15] Transport Canada, SOR/96-433, *Canadian Aviation Regulations*, section 602.01.

[16] Ibid., paragraph 602.14(2)(b).

[17] Transport Canada, TP 14371E (2018-1), *Transport Canada Aeronautical Information Manual* (29 March 2018), AIR - Airmanship, section 2.4.1, p. 394.

[18] U.S. National Transportation Safety Board, *Safety Alert 019: Prevent Aerodynamic Stalls at Low Altitude* (March 2013, Rev. December 2015), p.3.

Other jurisdictions have also recognized this risk. For example, a U.S. Federal Aviation Administration fact sheet on manoeuvring flight states,

> More than 25 percent of general aviation fatal accidents occur during the maneuvering phase of flight – turning, climbing, or descending close to the ground. The vast majority of these accidents involve buzzing attempts and stall/spin scenarios [...].[19]

TSB recommendations for personal flotation device use and egress training for seaplanes

During the investigation into an accident involving a DHC-2 aircraft departing Lyall Harbour, British Columbia, in 2009,[20] the TSB recognized that if a personal flotation device is not worn, and in the absence of other rescue capabilities, there is a higher risk that survivors of water impact will drown.

The TSB recommended that

> the Department of Transport require that occupants of commercial seaplanes wear a device that provides personal flotation following emergency egress.
>
> **TSB Recommendation A11-06**

In addition, the TSB has recognized, after many seaplane accidents, that pilots who receive underwater egress training have a greater chance of escaping the aircraft and surviving an accident. Those pilots can subsequently help passengers to safety. In 2013, following a DHC-2 floatplane accident in Lillabelle Lake, Ontario,[21] the TSB recommended that

> the Department of Transport require underwater egress training for all flight crews engaged in commercial seaplane operations.
>
> **TSB Recommendation A13-02**

Both of these recommendations have led to proposed regulatory changes that were published in the *Canada Gazette*, Part I, on 21 May 2016. With regard to Recommendation A11-06, the regulations would require all commercial seaplane occupants to wear a flotation device while boarding the seaplane, and while it is operated on or above water. The regulatory changes would also introduce mandatory underwater egress training for pilots of commercially operated seaplanes, with recurrent training every 3 years, which addresses Recommendation A13-02.

While TC had initially indicated that the proposed regulatory changes would be published in the *Canada Gazette*, Part II, in 2017, TC's latest response indicated that it anticipated the changes to be published in Part II in fall 2018. Although TC has undertaken continued safety promotion addressed at improving floatplane safety, as of the date of writing of this report, no proposed regulatory changes have been published. The Board is concerned about the additional delay of the publication of these amendments in the *Canada Gazette*, Part II. And although these amendments will, if published as currently proposed, substantially reduce or eliminate the safety deficiency identified in recommendations A11-06 and A13-02, until they are fully implemented, the risks to transportation safety remain.

---

[19] U.S. Federal Aviation Administration, General Aviation Joint Steering Committee, Safety Enhancement Topic: *Maneuvering Flight* (09 August 2018).

[20] TSB Aviation Investigation Report A09P0397.

[21] TSB Aviation Investigation Report A12O0071.

Therefore, the responses to recommendations A11-06 and A13-02 were assessed as showing Satisfactory Intent.

Safety messages

Intentionally manoeuvring an aircraft at low altitude is hazardous.

Pilots must pay particular attention to an aircraft's bank angle when manoeuvring. At high bank angles, the airspeed at which an aircraft will stall is higher than in wings-level flight, and pilots may not expect the early onset of an accelerated stall. A stall that occurs at low altitude may not be possible to recover from before impact with terrain.

The chances of survival are increased when all occupants on seaplanes wear PFDs, and when pilots operating seaplanes complete underwater egress training.

This concludes the TSB's limited-scope investigation into this occurrence. The Board authorized the release of this investigation report on 13 February 2019. It was officially released on 19 February 2019.

Transportation Safety Board of Canada
Place du Centre
200 Promenade du Portage, 4th floor
Gatineau QC K1A 1K8
819-994-3741
1-800-387-3557
www.tsb.gc.ca
communications@tsb.gc.ca

Air transportation safety investigation report A18O0107

Cat. No. TU3-10/18-0107E-PDF
ISBN 978-0-660-29535-0

This report is available on the website of the
Transportation Safety Board of Canada at www.tsb.gc.ca

Le présent rapport est également disponible en français.