



# Air Transportation Safety Investigation Report A18O0096

## IMPACT WITH TERRAIN

Bellanca 8KCAB, C-GDLP  
Toronto/Buttonville Municipal Airport, Ontario  
12 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

On 12 July 2018, the privately registered Bellanca 8KCAB aircraft (registration C-GDLP, serial number 622 80) was departing Toronto/Buttonville Municipal Airport (CYKZ), Ontario, with a student pilot on board for a solo cross-country training flight, first to Lindsay Airport (CNF4), Ontario, then to Stouffville Airport (CBB2), Ontario. The student pilot had been briefed and authorized for the flight by his instructor. He was seated in the front of 2 tandem seats.

The weather was suitable for the flight, with light winds, good visibility, and few clouds.

Air traffic control cleared the aircraft for takeoff from Runway 15 at 1957:24.<sup>1</sup> As the aircraft became airborne, it climbed on the runway heading.

At 1958:41, while on the initial climb, the pilot transmitted a Mayday call. Irregular engine noises could be heard, and the aircraft was seen turning west in a steep right bank and descending rapidly. The aircraft struck the ground in a right bank and steep nose-down attitude and was destroyed by impact forces and a post-impact fire. The pilot was fatally injured.

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<sup>1</sup> All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

## Aircraft information

The Bellanca 8KCAB aircraft, commonly known as the Decathlon, is an aerobatic, 2-seat tandem, strut-braced, high-wing aircraft. The fuselage consists of a tubular, welded steel frame covered with fabric material. The wings are manufactured with aluminum ribs and wooden spars and are covered in fabric.

The occurrence aircraft was manufactured in 1980 and had accumulated 1898 hours of airtime. It had been owned by the occurrence pilot since 2010 and was based at CBB2, which is approximately 9 nautical miles northeast of CYKZ. It was being maintained in accordance with *Canadian Aviation Regulations* (CARs) Standard 625, Appendix B and Appendix C, a maintenance schedule for small, privately operated aircraft. The last annual inspection had been completed on 06 June 2018.

The Bellanca Decathlon Pilot's Operating Manual<sup>2</sup> lists the stall speed in straight and level flight as 53 mph, while the stall speed at a 60° bank angle is listed as 75 mph.<sup>3</sup> The manual describes the stall characteristics as follows:

The Decathlon stall characteristics are conventional. The stall warning horn will precede the stall by 5 - 10 MPH depending on the amount of power used. There is very little aerodynamic buffeting preceding the stall.

Aileron control in a power on stall is marginal. Large aileron deflections will aggravate a near stalled condition and the use is not recommended to maintain lateral control. The rudder is very effective for maintaining lateral control in a stalled condition with the ailerons placed in the neutral position.<sup>4</sup>

According to the Pilot's Operating Manual, the emergency procedures for an engine failure after takeoff are as follows:

If sufficient runway remains:

- 1) Throttle — CLOSED.
- 2) Land using brakes as required.

If airborne and insufficient runway remains for landing, select the most favorable landing area ahead. Attempt an engine restart if altitude permits using ENGINE AIR RESTART procedures.

If no restart is possible, land in preselected area using FORCED LANDING procedures.

### WARNING

Maintain flying speed at all times and do not attempt to turn back towards the runway unless sufficient altitude has been achieved.<sup>5</sup>

<sup>2</sup> The manual was originally published by the Bellanca Aircraft Corporation in September 1979 with the title *Pilot's Operating Manual – Bellanca 1978–1980 Series Decathlon (Standard), Decathlon CS, Super Decathlon*. In May 1980, the manual was revised and published by the American Champion Aircraft Corporation with the title *OM-601 Operating Manual*.

<sup>3</sup> American Champion Aircraft Corporation, *OM-601 Operating Manual* (May 1980), p. 4-3.

<sup>4</sup> *Ibid.*, p. 2-7.

<sup>5</sup> *Ibid.*, p. 2-3.

The Pilot's Operating Manual lists the following emergency procedures for a partial power loss or rough running engine:

- 1) Follow the engine restart procedures.
- 2) Land as soon as practical using "Precautionary Landing Approach" procedures.<sup>6</sup>

### Wreckage information

The aircraft was destroyed by the impact forces and the subsequent fire; the wreckage was examined to the extent possible. The aircraft's interior, wooden airframe components, fabric covering, and fuel tanks, as well as several other components, were completely consumed by the fire; however, most of the steel tubing frame of the aircraft was still intact despite damage from impact forces.

The metal framing associated with the flight controls and trim tabs were all accounted for, and the cabling was contiguous and attached. However, the fire destroyed the pulleys and other associated hardware, so the freedom of movement and exact routing could not be evaluated.

The cockpit instruments were recovered from the wreckage and, although they had also sustained significant fire damage, they were examined at the TSB Engineering Laboratory in Ottawa, Ontario. Several of the instrument faces had impact markings from the associated indicators, which gave an indication of what information was likely being displayed at the time of impact (Table 1).

Table 1. Instrument readings at impact

Instrument	Indication at impact	Normal or maximum operating value
Airspeed indicator	86 mph	N/A
Tachometer	2680 rpm	2700 rpm (maximum)
Manifold pressure	21 inHg	N/A
Oil pressure	58–60 psi	60–100 psi (normal)
Fuel pressure	36 psi	12–45 psi (normal)
Oil temperature	145 °F	100–245 °F (normal)

### Propeller and engine examination

The damage to the propeller and the instrument markings indicated that the engine was developing power at the time of impact. The rpm was indicating 2680, while the manifold pressure was at 21 inHg, representing approximately 65% of the available horsepower. The fuel pressure and oil temperature were within the normal range, and the oil pressure was at, or very close to, the lower limit of the normal range.

The engine (Avco Lycoming AEIO-360-H1A) was significantly damaged by both the impact and the fire. It was disassembled and examined at the TSB's regional facility in Richmond Hill, Ontario. There were no signs of catastrophic engine failure. All of the internal components were complete and intact, and showed no signs of abnormal wear.

Several components from the fuel injection system were also examined to the extent possible. The examination found some debris and contamination. The contamination was examined at the TSB Engineering Laboratory and was determined to be consistent with an engine oil product; however, it

<sup>6</sup> Ibid., p. 2-4.

could not be determined whether this contamination was present prior to impact or whether it was a result of the impact. The amount of contamination identified did not appear to be sufficient to significantly affect fuel flow or power production.

No contamination was found in the fuel source located at CBB2.

### **Pilot information**

The pilot obtained a student pilot permit on 22 July 2011, which expired on 01 August 2016. On the day of the occurrence, just before the accident flight, an instructor with delegated authority from Transport Canada issued a new student pilot permit to the pilot.

According to subsection 401.19(1) of the CARs,

The holder of a student pilot permit may act as pilot-in-command of an aircraft of the category for which the permit is endorsed if

- (a) the flight is conducted for the purpose of the holder's flight training;
- (b) the flight is conducted in Canada;
- (c) the flight is conducted under day VFR [visual flight rules];
- (d) the flight is conducted under the direction and supervision of a person qualified to provide training toward the permit, licence or rating for which the pilot-in-command experience is required; and
- (e) no passenger is carried on board.<sup>7</sup>

### **Training**

The pilot's training record and aircraft's journey log indicated the pilot had received a total of 17.6 hours of dual flight instruction and had flown about 111 hours solo, of which only 3.3 hours were under the supervision of a flight instructor. Records also indicated that, prior to this flight, the pilot had received recent training from his flight instructor, including forced approaches.

An entry written in the pilot's training record by the instructor who had issued the student pilot permit to the pilot just before the occurrence flight indicated that most of the solo flights that had taken place after 22 September 2011 had not been supervised flights. In addition, the investigation found that the pilot had carried passengers on several occasions.

### **Emergencies during takeoff**

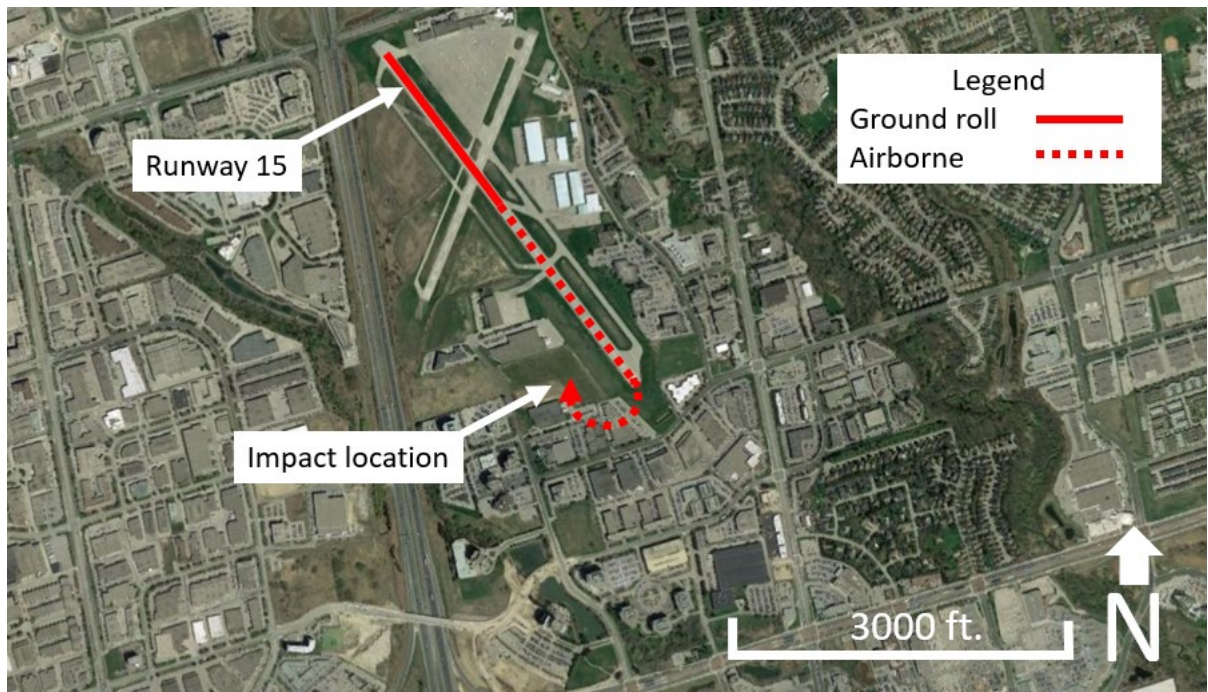
Managing an emergency during takeoff is challenging because of the significant workload. When an emergency occurs during takeoff, the pilot does not have time to look up the appropriate procedure before taking corrective action.

CYKZ is located in a built-up area, and is surrounded by residential and commercial buildings (Figure 1). When an aircraft is departing Runway 15, the pilot has very few, if any, suitable locations to carry out a forced landing successfully in the event of an emergency.

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<sup>7</sup> Transport Canada, SOR/97-433, *Canadian Aviation Regulations*, subsection 401.19(1).

Figure 1. Runway 15 departure area at CYKZ and occurrence aircraft's flight path (Source: Google Earth, with TSB annotations)



When taking off over an area that is not suitable for a forced landing, pilots benefit from having a plan for dealing with an emergency. The plan should take into account several factors, including terrain, altitude, the aircraft's glide ratio, and wind strength. It should also include the minimum altitude at which a 180° turn would be attempted in order to return to the take-off point after an engine failure.

If a mechanical problem occurs during takeoff that necessitates an immediate landing, pilots are faced with either attempting to carry out a forced landing in an unsuitable location—risking damage to the aircraft and injury to themselves—or attempting a 180° turn back toward the departure point. Historically, many fatal accidents have occurred when the pilot attempted to turn back in this type of situation, and the aircraft stalled or the pilot lost control of the aircraft in a high bank angle at low altitude with limited or no power while attempting to re-align the aircraft with the runway.

### Safety messages

In this accident, it could not be determined what type of emergency prompted the pilot to make the Mayday call and attempt to return to the airport. There were no substantial deficiencies noted with either the airframe or the engine components, although damage caused by impact forces and fire limited the TSB's ability to complete a comprehensive examination.

The investigation was unable to determine whether, during the turn-back manoeuvre, the airspeed decreased below a safe flying speed, resulting in an aerodynamic stall, or whether the pilot was distracted by the emergency, resulting in a loss of control.

Pilots are reminded to comply with the requirements of their permit or licence, as set out in the CARs.

Pilots who have not completed the required training to obtain a licence may not have developed the necessary skills or decision-making abilities to safely deal with an emergency during a critical phase of flight, such as takeoff.

*This concludes the TSB's limited-scope investigation into this occurrence. The Board authorized the release of this investigation report on 28 December 2018. It was officially released on 07 January 2019.*

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Cat. No. TU3-10/18-0096E-PDF  
ISBN 978-0-660-29104-8

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Transportation Safety Board of Canada at [www.tsb.gc.ca](http://www.tsb.gc.ca)

*Le présent rapport est également disponible en français.*