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

AIR TRANSPORTATION SAFETY INVESTIGATION REPORT A22O0032

COLLISION WITH OBSTACLE ON APPROACH

Brantford Flying Club
Cessna 172RG, C-GOFD
Brantford Aerodrome, Ontario
21 March 2022

History of the flight

At 1709[1] on 21 March 2022, the Brantford Flying Club Cessna 172RG aircraft (registration C-GOFD, serial number 172RG0615) departed Runway 29 at Brantford Aerodrome (CYFD), Ontario, for a local daytime visual flight rules (VFR) flight. The pilot was alone on board.

The weather was suitable for the VFR flight, with nearby weather stations reporting winds generally from the northwest between 7 and 21 knots. Given the wind direction, Runway 29 was the runway in use at CYFD.

According to the aircraft sign-out sheet, the pilot, who was renting the aircraft from the Brantford Flying Club, intended to conduct circuits and "long approaches."[2] Following departure, the pilot conducted a brief flight to the west, which was consistent with the intentions he had broadcast on the Brantford aerodrome traffic frequency. He returned to join the circuit for Runway 29 at approximately 1714 and there was another Brantford Flying Club aircraft ahead of him in the circuit. According to

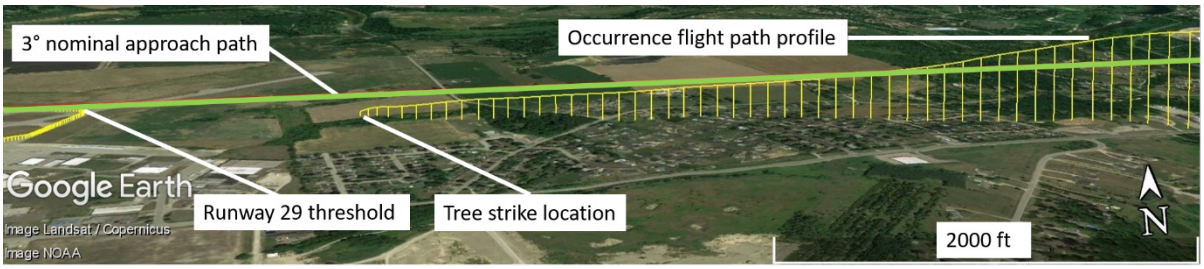
[1] All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

[2] The investigation was unable to determine the intent or significance of "long approaches."

their respective radio calls made while turning final, the pilot of each aircraft intended to conduct a touch-and-go.

The occurrence pilot turned onto the final approach track approximately 1.4 nautical miles (NM) from the touchdown zone for Runway 29. At this point, the aircraft was slightly above the 3° (nominal) approach path. However, at 1.2 NM from the touchdown zone, the aircraft had drifted below the nominal approach path, and after a short period of parallelling it, the aircraft continued to descend further below it (Figure 1).

Figure 1. Occurrence flight's approach path profile with the nominal 3° approach path (Source: Google Earth, with TSB annotations)



At 1716, while the aircraft had a ground speed of approximately 63 knots[3] and was well below the nominal approach path, the left wing struck a tree approximately 70 feet above ground level. Due to the tree strike, the aircraft yawed significantly to the left, pitched up, and spun around before crashing in a field approximately 200 feet past the tree-strike location, and 1920 feet short of the threshold of Runway 29.

The pilot, who had been wearing the available lap belt and attached shoulder harness, received critical injuries. He was transported to hospital, but died before arrival.

The emergency locator transmitter activated as a result of the impact. There was no post-impact fire.

Wreckage information

The aircraft's right wing tip impacted the ground first, followed immediately by the front-right corner of the aircraft's nose. The left wing did not hit the ground, but was significantly damaged when it struck the tree.

The throttle was found in the idle position, the mixture and propeller controls were both full forward, and the carburetor heat was selected on. The fuel selector was set to both tanks, and the auxiliary electric fuel pump switch was in the off position.[4] The flaps were selected and extended to 10°, and the landing gear was in the down and locked position.

The flight controls and aircraft systems were examined; there was no indication of a pre-impact mechanical malfunction.

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[3] This ground speed is indicative of a normal approach speed in the Cessna 172RG.

[4] It is important to note that due to impact dynamics, the position of the engine controls and other levers and switches found at the wreckage is not a reliable indicator of their actual position at the time and point of impact.

Pilot information

The occurrence pilot held the appropriate licence for the flight in accordance with existing regulations. He had obtained a private pilot licence — aeroplane in February 2009, and had obtained a group 3 instrument rating in 2013. His medical certificate was valid, and he met the recency requirements stipulated in section 401.05 of the *Canadian Aviation Regulations* (CARs) and CARs Standard 421.05.

The pilot had accumulated approximately 293.4 total flying hours at the time of the occurrence, approximately 149 of those hours were on the occurrence aircraft.

During the 12 months before the occurrence flight, the pilot had flown 4.6 hours, all on the occurrence aircraft. He had recorded 8 landings during this time, 5 of which were conducted during a flight with an instructor in August 2021.

Aircraft information

The Cessna 172RG is the retractable-gear variant of the popular Cessna 172. It is a 4-seat, high-wing aircraft with a Lycoming O-360 engine and a McCauley 2-blade constant-speed propeller.

The occurrence aircraft had accumulated 15 662.8 hours of total time before the occurrence flight. The last scheduled maintenance inspection was completed on 03 February 2022, 55.1 hours before the occurrence flight. On 11 March 2022, a 10-hour extension to the inspection schedule was approved, increasing the inspection interval to 60 hours. This was permissible based on the Brantford Flying Club's approved maintenance schedule.

The engine was being operated "on-condition,"[5] having accumulated 2900 hours since overhaul.

Airport information

CYFD has 3 runway surfaces, all of which are 100 feet wide. The main runway is Runway 05/23, which is 5036 feet long; there is a visual approach slope indicator (VASI) servicing Runway 05 that uses a set of lights installed near the runway threshold to help pilots maintain a 3° approach slope.

Runway 11/29 and Runway 17/35 are each 2626 feet long and typically used only when the winds are strong enough to necessitate their use. There are no VASI systems installed for these runways.

Recorded data

Flight data were recovered from a NemoScout 1C device, which had been attached to the occurrence aircraft's windscreen with a suction cup. The device recorded GPS (global positioning system) data, including position, ground speed, and altitude, once per second. It also recorded data on pitch and roll attitudes; however, this data was considered to be of low quality, possibly due to vibrations being propagated through the hardware used to mount the device to the windscreen. The device on the occurrence aircraft contained data for flights dating back to May 2019.

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[5] "On-condition" is a means to extend the useful life of an engine beyond the manufacturer's recommended time between overhauls, providing that certain parameters are regularly monitored to ensure continued safe operation.

The investigation also recovered data from an identical device in the other Brantford Flying Club aircraft that had been on approach immediately ahead of the occurrence aircraft, allowing for a comparison of flight data.

Additionally, 2 closed-circuit television (CCTV) videos were retrieved, which helped the investigation verify the flight data. However, the videos were not of sufficient quality to evaluate either the propeller speed or the positions of the flight control surfaces.

Engine examination

The engine was brought to the TSB regional facility in Richmond Hill, Ontario, for examination with the assistance of an investigator from Lycoming, the engine manufacturer. There were no signs of pre-impact mechanical failure, and the oil remaining in the crankcase and the oil filter media were not contaminated by metal, which would have indicated a potential internal engine issue.

The propeller did not exhibit damage indicative of significant power being developed at the time of the impact; the primary damage was to 1 propeller blade where it impacted the ground, with some light scoring along both blades. This type of damage is generally consistent with a low-power setting or a windmilling propeller at the time of impact.

Carburetor icing

Temperatures and dew points recorded at the Kitchener/Waterloo Airport (CYKF), Ontario, the Hamilton/John C. Munro International Airport (CYHM), Ontario, and the Delhi (CXDI), Ontario, weather stations (located 20 NM north, 18 NM east, and 18 NM south of CYFD, respectively) indicate that there was a risk of serious carburetor icing at descent power.[6] However, there were no reports of carburetor icing detected by pilots of any aircraft at or near CYFD during the evening of the occurrence.

Flap settings

The Cessna 172RG has 4 standard flap settings: 0°, 10°, 20°, and 30°. The Pilot's Operating Handbook (POH) does not specify which flap setting should be used for a normal landing; as a result, any flap setting may be used for a normal approach and landing in this aircraft. The Brantford Flying Club instructs students on the use of all flap settings; because the Cessna 172RG has a steeper full-flap approach than a standard Cessna 172, for normal approaches students are instructed to first set the flaps to 10°, and then adjust them as needed.

During approach in a C172RG, and in many similar aircraft, for a given approach speed and power setting, the pitch attitude and angle of descent of the aircraft will be affected by the flap setting. The U.S. Federal Aviation Administration's *Airplane Flying Handbook* states the following:

> Flap extension during landings provides several advantages by:
>
> • Producing greater lift and permitting lower landing speed,
>
> • Producing greater drag, permitting a steeper descent angle without airspeed increase, and

[6] The risk level is assessed using the Carburetor Icing chart found in Transport Canada, TP 14371, *Transport Canada Aeronautical Information Manual* (07 October 2021), AIR - Airmanship, section 2.3.

> • Reducing the length of the landing roll.
>
> Flap extension has a definite effect on the airplane's pitch behavior. The increased camber from flap deflection produces lift primarily on the rear portion of the wing. This produces a nose-down pitching moment [...].[7]

In most light aircraft, at a given airspeed and power setting, the increased nose-down attitude caused by extending flaps generally improves forward visibility. Conversely, at lower flap settings (i.e., 0° or 10°), the pitch attitude for a given airspeed and power setting will be more nose-high, reducing forward visibility.

There are 2 statements in the C172RG POH with respect to flap selection for landing, and only 1 which calls for a specific flap setting: "For a short field landing over an obstacle, make a relatively steep, low-power approach at 63 KIAS [knots indicated airspeed] with 30° flaps."[8] In the section titled "Crosswind Landing," the POH states, "[w]hen landing in a strong crosswind, use the minimum flap setting required for the field length."[9]

The investigation was unable to determine if the occurrence pilot typically used a flap setting of 10° for all approaches.

Approach profiles

Using data recovered from the NemoScout 1C device, cross-referenced with the occurrence pilot's personal log and the aircraft's journey log, the investigation evaluated the pilot's previous approaches and compared them to the occurrence approach. The data reviewed indicates that during previous approaches, the pilot consistently flew approaches with a nominal approach path of 3°, regardless of the runway in use.

Approach aids, such as precision approach path indicator (PAPI) or VASI systems, are set up to provide guidance to help pilots maintain a 3° approach path. Pilots of light aircraft who routinely fly approaches based on PAPI or VASI guidance may become accustomed to flying at a 3° approach angle, which requires the use of engine power to maintain the approach angle and reach the runway. In typical light single-engine aircraft, maintaining this nominal path with higher flap setting will require increased engine power.

Where possible and after considering aircraft characteristics and runway length, flying a visual approach steeper than 3° may offer benefits such as increased obstacle clearance and the requirement for less engine power.

TSB laboratory report

The TSB completed the following laboratory report in support of this investigation:

- LP032/2022 – Flight Data Analysis

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[7] Federal Aviation Administration (FAA), FAA-H-8083-3B, *Airplane Flying Handbook* (2016), Chapter 8: Approaches and Landings, Use of Flaps, p. 8-4.

[8] Cessna Aircraft Company, *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual,* 1981 Model 172RG (30 May 1980), Short Field Landing, p. 4-20.

[9] Ibid., Crosswind Landing, p. 4-21.

Safety messages

Flying an approach using a low flap setting can result in reduced forward visibility and decreased ability to identify obstacles should the aircraft drift below the intended approach path. Pilots are reminded to use flap settings and approach profiles appropriate to the situation and their type of operation.

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 28 September 2022. It was officially released on 11 October 2022.

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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