



Transportation
Safety Board
of Canada

Bureau de la sécurité
des transports
du Canada

Air Transportation Safety Investigation Report A19W0099

MID-AIR COLLISION

Cu Nim Gliding Club
Cessna 182N, C-FPZE
and
Cu Nim Gliding Club
Schleicher ASK 21 (glider), C-FLTY
Black Diamond/Cu Nim Aerodrome, Alberta, 0.5 NM SW
26 July 2019

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History of the flight

On 26 July 2019, the Cu Nim Gliding Club Cessna 182N aircraft (registration C-FPZE, serial number 18260067) (the tow plane) was conducting aerotow operations at Black Diamond/Cu Nim Aerodrome (CEH2), Alberta. The Cu Nim Gliding Club Schleicher ASK 21 glider (registration C-FLTY, serial number 21852) was being used for instructional flights with an instructor and student on board.

The tow plane pilot involved in the occurrence had completed 2 aerotow operations before the occurrence flight, the first of which had departed at 1510.¹

The occurrence glider flight was the 2nd flight of the day for the student and flight instructor involved in the occurrence. The 1st instructional flight had been completed at approximately 1030.

At 1549, the tow plane departed Runway 07 with the glider in tow and turned to the south while climbing to the intended release altitude of 5700 feet above sea level (ASL) (2000 feet above ground).

Around the time the aircraft crossed the extended centreline of Runway 07, the glider flight crew radioed the tow plane pilot and requested that he carry out some medium bank turns as part of the glider towing exercise. This was not briefed prior to departure. At this point, the tow plane was at approximately 5900 feet ASL. The tow plane completed a medium (approximately 30° bank) left turn

¹ All times are Mountain Daylight Time (Coordinated Universal Time minus 6 hours).

of about 145°, which brought both aircraft over approximately midfield of CEH2, followed by a medium (approximately 30° bank) right turn of about 90°, which brought the aircraft to a track of 305° true (T) near the western edge of CEH2, at approximately 6100 feet ASL. The glider released from the towline halfway through this turn.

Typically, a glider pilot will release from the towline when the 2 aircraft are in straight and level flight. When the tow plane reached the anticipated release point, the glider had already released; however, the tow plane pilot was not aware. Shortly after, the glider flight crew called the tow plane pilot on the radio to thank him for the tow. The tow plane pilot could not see the glider but executed a left clearing turn of approximately 80°, as is standard procedure² upon glider release. He did not initiate a descent at this point, but did begin preparing the aircraft for the approach and landing at CEH2.

Because the pilot of the tow plane could not see the glider, he entered a slight right turn in an effort to find the glider. This brought the tow plane to a track of 270°T. Still unable to see the glider, the tow plane pilot then proceeded to complete a 90° left turn, heading almost directly south. There was no attempt to communicate with the glider to determine its position.

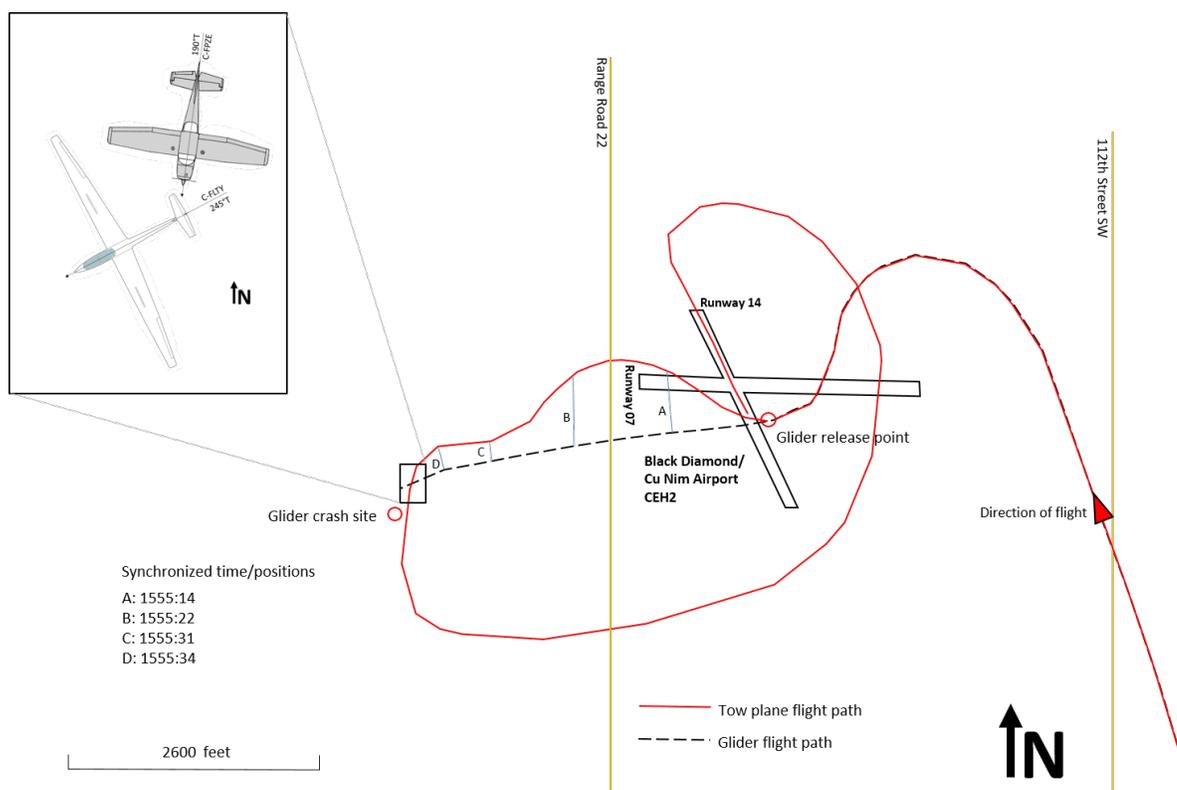
When the glider released from the tow plane, halfway through the second medium turn at an altitude of approximately 6100 feet ASL, the glider flight crew proceeded to fly more or less on a track of 270°T. By releasing in a right turn, the glider was not in a position where the tow pilot would normally expect to see it, i.e., behind and to the right of the tow plane (Figure 1).

At 1555, when the aircraft were 0.5 nautical miles (NM) southwest of the threshold of Runway 07 and at an altitude of approximately 6075 feet ASL, the tow plane's propeller struck the glider's empennage. The time between the glider release and the collision was 34 seconds.

When the tow plane struck the glider, the vertical and horizontal stabilizers separated from the glider. The glider entered a dive from which it was unable to recover and struck terrain in a near-vertical attitude. The student pilot and instructor were fatally injured. Both were wearing parachutes at the time of the occurrence.

² Cu Nim Gliding Club, *Cu Nim Gliding Club Operations Manual* (2019), section 12: Operating Rules for Tow Pilots, p. 28.

Figure 1. Overview of the tow plane and glider's flight paths, with inset diagram showing the positions of the aircraft at the time of the collision (Source: TSB)



The tow plane sustained substantial damage to the propeller and cowling, and minor damage to the right wing. The pilot was not injured and managed to perform a successful forced landing at idle power on Runway 14 at 1557.

Wreckage information

The glider impacted terrain in a near-vertical attitude, 0.61 NM west-southwest of the intersection of Runways 07/25 and 14/32 at CEH2, at an elevation of 3790 feet ASL. Both the left- and right-wing leading edges showed signs of impact damage along most of their length. The aircraft was destroyed in the collision with terrain.

The vertical stabilizer was found approximately 1200 feet northwest of the main accident site. The horizontal stabilizer was found approximately 1600 feet northwest of the main accident site and showed signs of paint transfer from the tow plane's propeller. The rudder and elevator were not found. Fiberglass material from the glider was found embedded in the tow plane's propeller.

Pilot information

The pilot of the tow plane held a valid private pilot licence, a valid pilot licence - glider, and a valid flight instructor rating - glider. He was a volunteer with the Cu Nim Gliding Club and held the position of chief tow pilot within the organization. He had accumulated approximately 740 flight-time hours in single-engine aircraft. He completed an annual tow pilot competency flight on 23 March 2019.

The instructor held a valid pilot licence - glider with a valid flight instructor rating - glider. He was also a volunteer with the Cu Nim Gliding Club. The last entry in the instructor's personal log was made on 01 July 2019. At that time, he had accumulated approximately 900 flight time hours made up of dual, pilot-in-command, and instructional flight time.

The student pilot held a student pilot permit - glider and had begun his flight training with the Cu Nim Gliding Club in 2017. His first instructional flight was logged on 13 July 2017. His first and only solo flight was conducted on 28 October 2018, for a flight time of 0.3 hours. At the time of the occurrence, the student pilot had recorded 76 dual flights, totalling 26.8 hours of dual flight time.

Aircraft information

Tow plane

The Cessna 182N is a single-engine piston, all-aluminium aircraft. The aircraft involved in this occurrence was manufactured in 1970 and was registered to the Cu Nim Gliding Club on 27 February 2015. It was used to tow the club's gliders for both recreational and instructional flights.

The aircraft was equipped with a PowerFLARM Core airborne collision avoidance system (ACAS).³ On the day of the occurrence, the PowerFLARM Core installed on the aircraft was not working. In addition, throughout the 2019 flying season, the following issues with the PowerFLARM had been recorded in the club's unofficial daily log for the aircraft:

- "Power Flarm intermittant [sic]" (22 March 2019)
- "POWER FLARM DISPLAY NOT WORKING" (31 March 2019)
- "Flarm intermittent => keeps resetting" (19 July 2019)

These defects were not recorded in the aircraft's journey log, although it was required by the regulations.⁴

Glider

The Schleicher ASK 21 glider is an all-composite 2-seat glider used primarily for conducting instructional flights. The glider involved in this occurrence was manufactured in 2009 and was registered to the Cu Nim Gliding Club on 02 June 2009. The student typically sits in the front seat and the instructor typically sits in the rear seat; this was the seating configuration during this occurrence. The glider was equipped with a PowerFLARM Portable device, which was installed on the instrument panel for the pilot seated in the rear seat. It was reported as working on the day of the occurrence.

Weather information

There is no aerodrome routine meteorological report (METAR) for CEH2. The closest airport that issues METARs is Calgary/Springbank Airport (CYBW), Alberta, which is located approximately 24 NM north-northwest of CEH2. The METAR issued at 1600 indicated the following:

- winds from 180°T at 12 knots, variable between 120°T and 190°T

³ See the *Defenses against a mid-air collision – Electronic traffic awareness systems* section of this report.

⁴ Transport Canada, SOR/96-433, *Canadian Aviation Regulations*, subsection 605.94(1).

- visibility 9 statute miles and clear
- temperature 26 °C and dew point 12 °C

Weather and sun position were not considered to be factors in this occurrence.

Defences against a mid-air collision

Visual lookout

As stated in the *Transport Canada Aeronautical Information Manual* (TC AIM):

When operating in accordance with VFR [visual flight rules], or in accordance with IFR [instrument flight rules] but in VMC [visual meteorological conditions], pilots have sole responsibility for seeing and avoiding other aircraft. Aural and visual alertness are required to enhance safety of flight in the vicinity of uncontrolled aerodromes.⁵

The see-and-avoid principle has been examined in a number of other TSB investigations.⁶ It is the basic method of collision avoidance for VFR flights that is based on active scanning, and the ability to detect conflicting aircraft and take appropriate measures to avoid them. An advisory circular published by the U.S. Federal Aviation Administration states: “Pilots should remain constantly alert to all traffic movement within their field of vision, as well as periodically scanning the entire visual field outside of their aircraft to ensure detection of conflicting traffic.”⁷ The most effective method of identifying potential conflicting traffic is to quickly scan small segments of the visual field (approximately 10° to 15° wide) to detect movement.⁸

Established tow and release procedures

SOAR and learn to fly gliders, published by the Soaring Association of Canada (SAC), provides guidance to glider pilots on flying techniques. The following guidance is provided with respect to releasing from the tow:

When you have reached the release altitude (usually 2000 feet above ground) and before releasing, scan around the horizon for other aircraft, particularly to the right, the direction in which you will be turning. If clear to your right look back at the towrope, pull the release, and visually check that the rope releases and falls clear of the glider. Now initiate a turn to the right. This turn indicates to the towpilot that you have released. At the same time it is usual to adjust your speed to that for the lesson that will follow. More often than not this will be a reduction in speed.⁹

⁵ Transport Canada, TP 14371E, *Transport Canada Aeronautical Information Manual* (TC AIM) (10 October 2019), RAC – Rules of the Air and Air Traffic Services, section 4.5.6.

⁶ TSB air transportation occurrences A99P0056, A99P0108, A99P0168, A00O0164, A06O0206, A09C0114, A12H0001, A12C0053, A13P0127, A15W0087, A17Q0030, and A18O0150.

⁷ U.S. Federal Aviation Administration, Advisory Circular (AC) 90-48D, *Pilots’ Role in Collision Avoidance*, Change 1 (28 June 2016), paragraph 4.2.1.

⁸ U.S. Federal Aviation Administration, “Midair Collision Avoidance: Your Role in Collision Avoidance,” at <https://www.jbmdl.jb.mil/Portals/47/documents/AFD-160121-033.pdf> (last accessed on 22 January 2020).

⁹ Soaring Association of Canada, *SOAR and learn to fly gliders: The Official Soaring Instruction Manual of the Soaring Association of Canada*, Edition 9, 2nd printing (August 2011), p. 72.

The publication further explains that:

The objective of the glider turning to the right after release is to quickly get clear of the towplane's slipstream and the dangling rope, but also to move to the side so that the towpilot can see you. The towpilot will not descend until he has assured himself that the glider is free. The turn need be of only a few degrees, though if in a thermal, you may wish to continue circling. However if you do this make sure that the towplane is clear and is descending as you circle around during your first complete turn.¹⁰

The *Cu Nim Gliding Club's Operations Manual* provides the following guidance to tow plane pilots on what to do following the glider's release:

- After the Tow Pilot has confirmed that the glider has released by visual check, a descending left hand turn shall be made while the glider executes a right hand turn.¹¹

The operations manual states the club's policies and procedures with respect to various aspects of aircraft operations. The club's safety manual provides supplemental safety-related information. Both the operations manual and the safety manual state that the club will use the tow and release procedures described in the SAC's soaring instruction manual.¹² However, the club does not have a standard procedure in place for tow plane pilots to follow if they lose sight of the glider, or if they are unsure of the glider's position relative to their own. Nor does the SAC provide any formal guidance material for the tow pilot to follow under these circumstances.

Electronic traffic awareness systems

Both aircraft were equipped with a FLARM ACAS, although this was not required by the regulations. The company describes this technology as follows:

FLARM works by calculating and broadcasting its own future flight path to nearby aircraft. At the same time, it receives the future flight path from surrounding aircraft. An intelligent motion prediction algorithm calculates a collision risk for each aircraft based on an integrated risk model. When a collision is imminent, the pilots are alerted with the relative position of the intruder, enabling them to avoid a collision.¹³

The PowerFLARM Core installed on the tow plane was not working during the day of the accident. As a result, the PowerFLARM Portable installed on the glider would not have provided any traffic information to the flight crew of the glider with respect to the tow plane's position.

¹⁰ Ibid., p. 73.

¹¹ Cu Nim Gliding Club, *Cu Nim Gliding Club Operations Manual* (2019), section 12: Operating Rules for Tow Pilots, p. 28.

¹² Soaring Association of Canada, *SOAR and learn to fly gliders: The Official Soaring Instruction Manual of the Soaring Association of Canada*, Edition 9, 2nd printing (August 2011).

¹³ FLARM, "Technology," at <https://flarm.com/technology/> (last accessed on 22 January 2020).

Operational oversight

Transport Canada

Gliding clubs in Canada are not required by the regulations to hold a flight training unit operator certificate, even though they may provide structured training and flight testing, and recommend to Transport Canada (TC) that a student pilot be granted a pilot licence - glider once the training requirements have been met. Because gliding clubs are not required to hold a flight training unit operator certificate, TC does not carry out any surveillance activities on these types of organizations. Therefore, TC had never conducted any form of process validation inspection or audit on the Cu Nim Gliding Club before the occurrence.

Soaring Association of Canada

The SAC is a non-profit amateur sports association promoting, enhancing, and protecting the sport of gliding in Canada. The association consists of several committees staffed by volunteers that address various topics related to the operation of gliders (e.g., flight training and safety, medical, technical, airspace). The association provides support to gliding clubs across the country, primarily in the form of written guidance material and standards that gliding clubs can use in the conduct of normal operations. The SAC has no regulatory authority to create or enforce aviation-related regulations in Canada.

The SAC recommends that gliding clubs perform a safety audit and submit the completed audit form to the association every 3 years. While the SAC does not perform these safety audits, it will provide support if specifically requested by a club. The SAC's Safety Committee reviews submitted audit forms in an effort to identify any items that may be of concern.

The last safety audit form submitted by the Cu Nim Gliding Club to the SAC had been completed on 15 November 2016. The SAC did not provide any feedback to the club regarding the results of the audit at that time.

Safety messages

In this occurrence, there was no procedure to follow if visual contact was lost after the tow was released. It is important that operators have procedures in place for the safe operation of their aircraft, and that personnel follow those procedures.

Neither pilot saw the other aircraft in time to avoid a mid-air collision, partly owing to the inherent limitations of the see-and-avoid principle. Relying solely on visual detection increases the risk of collision while in uncontrolled airspace. Pilots are encouraged to broadcast their intentions to maintain the situational awareness of other aircraft.

Airborne collision avoidance systems (ACAS) offer the potential to significantly reduce the risk of mid-air collisions. If an aircraft is equipped with an ACAS, it is important that the system be maintained in a serviceable condition.

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 05 February 2020. It was officially released on 10 February 2020.

Visit the Transportation Safety Board of Canada's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the key safety issues that need to be addressed to make Canada's transportation system even safer. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

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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