



AVIATION OCCURRENCE REPORT

COLLISION WITH TERRAIN

**CESSNA 172M SKYHAWK C-GFVF
BRANTFORD AIRPORT, ONTARIO
22 OCTOBER 1994**

REPORT NUMBER A94O0279

MANDATE OF THE TSB

The Canadian Transportation Accident Investigation and Safety Board Act provides the legal framework governing the TSB's activities. Basically, the TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by:

- conducting independent investigations and, if necessary, public inquiries into transportation occurrences in order to make findings as to their causes and contributing factors;
- reporting publicly on its investigations and public inquiries and on the related findings;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- conducting special studies and special investigations on transportation safety matters.

It is not the function of the Board to assign fault or determine civil or criminal liability. However, the Board must not refrain from fully reporting on the causes and contributing factors merely because fault or liability might be inferred from the Board's findings.

INDEPENDENCE

To enable the public to have confidence in the transportation accident investigation process, it is essential that the investigating agency be, and be seen to be, independent and free from any conflicts of interest when it investigates accidents, identifies safety deficiencies, and makes safety recommendations. Independence is a key feature of the TSB. The Board reports to Parliament through the President of the Queen's Privy Council for Canada and is separate from other government agencies and departments. Its independence enables it to be fully objective in arriving at its conclusions and recommendations.



The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Occurrence Report

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Synopsis

The pilot and two passengers departed on a short night visual flight rules (VFR) flight from Hamilton to Brantford, Ontario. The three were returning from the southern United States and had landed at Hamilton to clear customs. No flight plan, flight note, or flight itinerary was on file for the flight.

An emergency locator transmitter (ELT) signal was detected shortly before midnight, and its location was determined to be at the Brantford Airport. A ground search party with portable direction finding equipment was dispatched to Brantford, and the aircraft wreckage was located at approximately 0525 EDT. Dense fog in the Brantford area hampered the search for the source of the ELT signal.

The pilot and front-seat passenger were found fatally injured and the second passenger died later in hospital.

The Board determined that the aircraft struck the ground while the pilot was turning onto final approach; the pilot had lost visual reference with the ground, likely because of fog conditions.

Ce rapport est également disponible en français.

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1.0 *Factual Information*

1.1 *History of the Flight*

The pilot and two passengers were on a private pleasure/travel flight returning from the southern United States. They departed from the southern States around noon on the day of the accident and were on the final leg of the trip after landing at Hamilton Airport, Ontario, for customs clearance.

The aircraft departed Hamilton at 2215 eastern daylight saving time (EDT)¹ for the 18.5 nautical mile (nm)² VFR flight to the Brantford Airport where the pilot based the aircraft and where he and the passengers had parked their cars for the duration of their trip. No flight plan, flight note, or itinerary had been filed for the flight, nor was any required by regulation.

Radar tracking tapes contained a record of the flight. The Hamilton Airport elevation is 780 feet above sea level (asl), and the Brantford Airport elevation is 815 feet asl³. After take-off, the pilot climbed to 2,800 feet asl and proceeded direct to the Brantford Airport. (See Appendix A.) The last radio communication with the flight was at

1 All times are EDT (Coordinated Universal Time [UTC] minus four hours) unless otherwise stated.

2 See Glossary for all abbreviations and acronyms.

3 Units are consistent with official manuals, documents, reports, and instructions used by or issued to the crew.

2222 EDT, when the pilot reported that he was at 2,800 feet. At 2232 EDT, when the aircraft was one mile south of the Brantford Airport at 1,900 feet asl, flying in a westerly direction, the pilot turned to a southerly heading and climbed to 3,000 feet asl. After completing a 360-degree turn, 5.5 nm south of the airport, he flew on various headings, generally toward the southwest, ending up 13 nm southwest before commencing a right turn back towards the airport. As the pilot approached the airport from the west, he descended to 1,200 feet asl and manoeuvred the aircraft overhead the

airport at altitudes ranging from 1,200 feet asl to 1,700 feet asl. The final radar track of the aircraft showed it flying southwest, parallel to runway 05/23, less than half a mile to the south of the runway, and then entering a right descending turn. The last stored radar position for the aircraft was at 2303 EDT, when it was descending out of 1,000 feet asl. The aircraft struck the ground 680 feet west of the threshold of runway 05, 72 feet north of the runway extended centre line. The pilot and front-seat passenger were fatally injured on impact, and the rear-seat passenger died in hospital.

An ELT radio signal was reported by an airline crew flying at high altitude in the London area at 2341 EDT. The signal was also received by the search and rescue satellite system (SARSAT), and the ELT source was determined to be at the Brantford Airport.

A ground search party was dispatched to the Brantford Airport. With the use of direction finding equipment, the ELT signal source was located in the aircraft wreckage at approximately 0525 EDT on 23 October 1994. Dense ground fog hampered the ground search for the ELT source.

The accident occurred at 2304 EDT during the hours of darkness at latitude 43°07'N, longitude 080°20'W, at elevation 815 feet asl.

1.2 *Injuries to Persons*

	Crew	Passengers	Others	Total
Fatal	1	2	-	3
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	1	2	-	3

1.3 *Damage to Aircraft*

Substantial.

1.4 *Other Damage*

None.

1.5 Personnel Information

	Pilot-in-command
Age	52
Pilot Licence	PPL
Medical Expiry Date	01 April 1995
Total Flying Hours	154
Hours on Type	62
Hours Last 90 Days	21
Hours on Type Last 90 Days	21
Hours on Duty Prior to Occurrence	N/A
Hours off Duty Prior to Work Period	N/A

The pilot-in-command was at the controls and occupied the left front seat. He was certified for the night VFR flight in accordance with existing regulations and had recorded 1.1 hours night flying time in the six months prior to the accident. The number of night landings in that period of time was not recorded in any log-book.

The pilot commenced flying in March 1991 and was issued his private pilot licence in June 1993. His licence was endorsed for night flying in December 1993, and he had flown a total of 15 hours at night at the time of the accident. He was not qualified or trained to fly aircraft in accordance with instrument flight rules (IFR).

1.6 Aircraft Information

Manufacturer	Cessna
Type and Model	172M
Year of Manufacture	1976
Serial Number	17267258
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	10,178 hr
Engine Type (number of)	Lycoming O-320-E2D (1)
Propeller/Rotor Type (number of)	McCaughey IC160/DTM
Maximum Allowable Take-off Weight	2,300 lb
Recommended Fuel Type(s)	80/87
Fuel Type Used	100 LL

The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

At the time of the accident, the aircraft had flown 3.2 hours since last being fuelled to capacity. It is capable of flying for 4.5 hours when fuelled to capacity.

The weight and centre of gravity were within prescribed limits.

1.7 Meteorological Information

At 2000 EDT, 22 October 1994, a weak ridge of high pressure was lying north-south through the east end of Lake Ontario. The ridge gave clear sky conditions, visibility greater than six statute miles (miles) and light southeasterly winds throughout the late afternoon and early evening in the Hamilton and Brantford areas. The light winds and high moisture content in the low level air mass resulted in the formation of thin fog patches in the Hamilton/Brantford area in the late evening, with dense fog forming over southwestern Ontario after midnight and on into the early hours of 23 October 1994.

Pilots flying in the vicinity of the Brantford Airport before, at the time of, and after the accident reported thin fog formation in the Brantford area. Fog conditions around midnight prevented a pilot from landing at the Brantford Airport, and he diverted to a nearby airport where he landed without difficulty.

No weather observations are taken at the Brantford Airport and there is no aerodrome forecast available. The closest weather reporting station at the time of the accident was London, 36 nm to the west. The 2300 EDT London weather observation was as follows: sky clear, visibility 10 miles, wind from 088 degrees magnetic (°M) at four knots, temperature 9°C and dew point 8°C. The last weather observation for the day at Hamilton was taken at 2100 EDT. At that time there was scattered cloud at 25,000 feet above ground level (agl), visibility was seven miles, the wind

was from 059°M at four knots, and the temperature and dew point were both 9°C.

The control tower operator at Hamilton advised the pilot that he could see ground fog forming over the airport when the pilot was departing there at 2215 EDT.

The London aerodrome forecast issued 22 October 1994 and valid from 1900 EDT until 1900 EDT 23 October 1994 was as follows: high scattered cloud, visibility better than six miles, occasional sky partially obscured, visibility one mile in fog after 0400 EDT 23 October 1994. After 1000 EDT (23 October) cloud 2,000 feet agl scattered, 8,000 feet agl broken, visibility better than six miles, occasional sky partially obscured, cloud 2,000 feet agl broken, 8,000 feet overcast, visibility two miles in light rain showers and fog. Wind, after 1400 EDT, was forecast from 270°M at 10 knots gusting to 20 knots. The Hamilton aerodrome forecast issued 22 October 1994 and valid until 2100 EDT (22 October) was as follows: cloud 4,000 feet agl scattered, visibility better than six miles with occasional cloud 4,000 feet agl broken, and visibility better than six miles.

1.8 Aids to Navigation

1.8.1 En Route

The aircraft was equipped with Loran C navigation equipment. The Loran receiver in the aircraft was found in the ON position with the Brantford Airport waypoint selected. The Brantford Airport is served by a non-directional radio beacon (NDB) located 4.5 nm southwest of the airport. There is an NDB non-precision approach to runway 05 from the beacon.

The receiver in the aircraft for the NDB beacon was found in the OFF position.

1.9 Communications

The aircraft was equipped with two very high frequency (VHF) radios for navigation and communications (NAVCOM). Communication between the pilot and the Hamilton control tower operator was without difficulty, and the last two-way communication between the Hamilton tower operator and the pilot was at 2222 EDT. The control tower operator made several unanswered transmissions to the pilot after 2222 EDT.

Traffic information in the Brantford Airport area is carried out on the airport unicom frequency of 123.0 megahertz (MHz). The unicom frequency is not monitored while the airport is unattended at night.

The aircraft number one NAVCOM radio was found in the ON position. It could not be determined what frequency the radio was tuned to. The number two NAVCOM radio was found in the OFF position.

1.10 Aerodrome Information

The Brantford Airport is a public licensed airport with three asphalt surface runways in a triangular layout. Two of the runways are 2,600 feet long; runway 05/23 extends to the east and is 5,000 feet long. All runways are 200 feet wide.

The airport is unattended at night.

1.10.1 Aerodrome Lighting

Runway 05/23 is equipped with a type K Aircraft Radio Control of Aerodrome Lighting (ARCAL) lighting system. Flashing strobe runway identification lights and a two-bar visual approach slope indicator system (VASIS) are installed at the threshold of runway 05. A VASIS only is installed at the threshold of runway 23. The pilot can activate and control the intensity of the runway lights by tuning the VHF radio to 123.0 MHz and keying the

microphone. Once activated, the lights remain on for approximately 15 minutes. The runway lights, the VASIS, and the taxiway lights associated with runway 05/23 are the only lights activated by the ARCAL system. The runway lights were reported to be serviceable the night of the accident.

1.11 Flight Recorders

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder, nor was either required by regulation.

1.12 Wreckage and Impact Information

The aircraft struck the ground in a shallow, nose-down, right-wing-low attitude. The first ground scar mark, made by the right wing tip, was 72 feet north of the runway 05 extended centre line and 680 feet from the threshold of the runway. The aircraft was on a heading of 035°M when it struck the ground. The wreckage trail was on a track of 335°M from the initial impact, with the fuselage located 200 feet from the initial impact point. The engine broke free on impact and was located 116 feet beyond the fuselage.

One propeller blade was bent rearward and the other blade was twisted and slightly bent rearward. The leading edges of both blades were nicked and damaged on impact.

1.13 Medical Information

The pilot's last aviation medical examination was on 08 March 1994. He was assessed as fit, category 3, and was required to wear glasses while flying.

There was no evidence that incapacitation or physiological factors affected the pilot's performance.

1.14 Fire

There was no evidence of fire either before or after the occurrence.

1.15 Survival Aspects

There was no flight plan, flight notification, or flight itinerary on file for the flight, and, as a result, the aircraft was not reported missing or overdue at destination. The ELT functioned and ultimately led searchers to the crash site. The dark night and restriction to visibility because of dense ground fog hampered search efforts. The wreckage, although located near the airport, was not visible to searchers until they were right at the crash site, which they located with portable directional finding equipment homing in on the ELT signal.

2.0 *Analysis*

2.1 *Introduction*

There was no evidence found to indicate any failure or malfunction of the aircraft or its components that could have contributed to the cause of the accident. Stored radar data shows that the pilot flew directly to the Brantford Airport and descended to circuit altitude (1,000 feet agl) before turning south and climbing to 3,000 feet asl (about 2,200 feet agl). It is likely that the pilot was unable to clearly see the runway because of shallow ground fog and that he proceeded south of the airport before deciding to return and attempt to land on runway 05.

2.2 *Landing Attempt*

It was concluded that the fog layer was not very thick, which permitted the pilot to see the airport and runway environment from above the fog layer, provided he remained between 700 and 1,000 feet agl. This conclusion is substantiated by the stored radar data that shows the aircraft manoeuvring over and close to the airport after the pilot returned to the airport from the southwest. The last stored radar data shows the aircraft descending from 200 feet agl in a right turn, perhaps toward the final approach course to runway 05. The wreckage was found just slightly north of the extended centre line of runway 05 where the aircraft had struck the ground in a descending right turn. It is likely that, as the pilot descended, he lost visual reference with the runway lights when the aircraft entered fog. He either lost control of the aircraft at this point or he continued descent expecting to regain visual reference with the runway, and the aircraft struck the ground.

2.3 *Survival*

Without any filed flight plan, flight note, or itinerary, alerting of search and rescue agencies and location of the wreckage was accomplished solely with reference to the ELT signal.

3.0 *Conclusions*

3.1 *Findings*

1. The pilot was attempting a night VFR approach and landing.
2. Visual reference with the runway was restricted by shallow ground fog.
3. The aircraft struck the ground while in a descending right turn onto final approach.
4. The pilot was certified for the night VFR flight.
5. The search for the aircraft wreckage was hampered by dense ground fog.
6. No flight plan, flight notification, or flight itinerary was on file for the flight, nor was any required by regulation.

3.2 *Causes*

The aircraft struck the ground while the pilot was turning onto final approach; the pilot had lost visual reference with the ground, likely because of fog conditions.

4.0 *Safety Action*

The Board has no aviation safety recommendations to issue at this time.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson John W. Stants, and members Zita Brunet and Hugh MacNeil, authorized the release of this report on 13 July 1995.

Appendix A - Aircraft Flight Path

Appendix B - Glossary

agl	above ground level
ARCAL	aircraft radio control of aerodrome lighting
asl	above sea level
EDT	eastern daylight saving time
ELT	emergency locator transmitter
hr	hour(s)
IFR	instrument flight rules
lb	pound(s)
MHz	megahertz
miles	statute miles
N/A	not available
NAVCOM	navigation and communications
NDB	non-directional beacon
nm	nautical miles
PPL	Private Pilot Licence
SARSAT	search and rescue satellite system
TSB	Transportation Safety Board of Canada
UNICOM	a private advisory station located at an uncontrolled aerodrome
UTC	Coordinated Universal Time
VASIS	visual approach slope indicator system
VFR	visual flight rules
VHF	very high frequency
°	degrees
'	minutes
°M	degrees of the magnetic compass

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