

AVIATION OCCURRENCE REPORT

COLLISION WITH TREE

**RAINBOW AIRWAYS INCORPORATED
CESSNA A185E SKYWAGON C-FVZM
NOGANOSH LAKE, ONTARIO
14 AUGUST 1994**

REPORT NUMBER A9400213

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

Collision with Tree

Rainbow Airways Incorporated

Cessna A185E Skywagon C-FVZM

Noganosh Lake, Ontario

14 August 1994

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Synopsis

The pilot arrived at the lake to pick up two passengers and their equipment. At the lodge, a third person asked to leave on the same flight.

After loading the three passengers and their equipment aboard the float-equipped aircraft, the pilot taxied to a position abeam the dock to the east, and began the cross-wind take-off run. As soon as the aircraft became airborne, the pilot began a left turn at low altitude between an island and the shoreline. The aircraft emerged from behind the island in a steep, skidding, left-hand turn just above the water and struck trees along the west shore of the lake. The aircraft sank about 20 feet from shore and came to rest upright in approximately 30 feet of water. One passenger was able to exit the aircraft and swim to shore. The pilot and the other two passengers did not survive.

The Board determined that the pilot began the take-off run from a position on the lake which did not allow sufficient distance for the take-off and climb-out.

Ce rapport est également disponible en français.

Table of Contents

	Page
1.0 Factual Information	1
1.1 History of the Flight	1
1.2 Injuries to Persons	1
1.3 Damage to Aircraft	1
1.4 Other Damage	1
1.5 Personnel Information	1
1.6 Aircraft Information	2
1.7 Meteorological Information	2
1.8 Flight Recorders	2
1.9 Previous Take-off on Noganosh Lake	3
1.10 Take-off Performance	3
1.11 Wreckage and Impact Information	3
1.11.1 Take-off Area Information	3
1.11.2 Aircraft Damage	4
1.12 Medical Information	4
1.13 Survival Aspects	4
2.0 Analysis	5
3.0 Conclusions	7
3.1 Findings	7
3.2 Causes	7
4.0 Safety Action	9
5.0 Appendices	

Appendix A - Take-off and Flight Path	11
Appendix B - List of Supporting Reports.....	13
.....	Appendix C - Glossary
	15

1.0 Factual Information

1.1 History of the Flight

The aircraft departed from the main float base on Snakeskin Lake, Ontario, to pick up two passengers at a lodge on Noganosh Lake, 16 miles to the northwest. This was the pilot's last scheduled flight for the day. When the pilot arrived at the lodge, a third member of the party asked to leave on the same flight. After the passengers and their baggage were loaded on board the aircraft, the pilot taxied approximately 700 feet to the east, parallel to the dock, then turned the aircraft toward the north and began the take-off run. (See Appendix A.) The aircraft travelled approximately 2,400 feet before becoming airborne. Almost immediately after becoming airborne, the pilot ~~made a steep left turn to pass between an island and the shoreline.~~ To negotiate the passage, the pilot was compelled to make a quick, steep turn to the right, followed immediately by another steep left turn. During the last steep left turn, the aircraft struck trees on the shore. The aircraft travelled approximately 100 feet further before hitting the water and sinking in approximately 30 feet of water, 20 feet from shore.

The accident occurred at 1657 eastern daylight saving time (EDT)¹ during the hours of daylight at latitude 45° 49'N, and longitude 080° 16'W.

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

1.2 Injuries to Persons

Crew	Passengers	Others	Total
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Fatal	1	2	-	3
Serious	-	-	-	-
Minor/None	-	1	-	1
Total	1	3	-	4

1.3 Damage to Aircraft

The aircraft was damaged substantially from impact with trees, rocks, and the water.

1.4 Other Damage

There was no other property damage.

1.5 Personnel Information

	Pilot
Age	23
Pilot Licence	Commercial
Medical Expiry Date	01 Apr 95
Total Flying Hours	392
Hours on Type	133
Hours Last 90 Days	131
Hours on Type Last 90 Days	131
Hours on Duty Prior to Occurrence	9
Hours off Duty Prior to Work Period	13

The pilot was certified and qualified for the flight in accordance with existing regulations. He started his flying training in May 1992, and gained his commercial pilot licence in December 1993. On 08 May 1994 he acquired a float endorsement, and on 20 May he began his training and employment with Rainbow Airways.

It was standard company procedure for all the pilots to receive a morning briefing from the dispatcher on the flying

activity scheduled for the day. Any weather, aircraft, and passenger information would be given to the pilots at this time. The pilot attended the morning briefing and, before departing from the main base to pick up the customers, he reviewed the flight information, including the load and the weather conditions, with a more experienced company pilot.

1.6 Aircraft Information

Manufacturer	Cessna Aircraft Corporation
Type and Model	A185E Skywagon
Year of Manufacture	1967
Serial Number	185 1272
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	3277.7 hr
Engine Type (number of)	Continental IO-520-D (1)
Propeller/Rotor Type (number of)	McCaughey D2A34C58-NO (1)
Maximum Allowable Take-off Weight	3,350 lb
Recommended Fuel Type(s)	Minimum Grade 100/130
Fuel Type Used	100/130

The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The weight and centre of gravity were within the prescribed limits.

1.7 Meteorological Information

Visual meteorological flight conditions generally prevailed at the time of the occurrence. The 1700 EDT sequence recorded by the automatic weather reporting station at Britt, Ontario, located 12 miles to the west of Noganosh Lake, reported a temperature of 16 degrees Celsius with wind from 290 degrees true at 11 knots with a peak gust of

28 knots. The Ontario Climate Centre branch of Environment Canada conducted a post-occurrence analysis of the weather conditions in the Noganosh Lake area at the time of the occurrence. The air mass was described as convectively unstable, combined with winds which were characterized as strong and gusty, making conditions favourable for moderate turbulence. The information gathered from Environment Canada records is consistent with the weather conditions reported by witnesses to the occurrence and the weather conditions observed on a videotape taken at the time of the occurrence.

1.8 Flight Recorders

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder, nor was either required by regulation. However, a witness to the occurrence videotaped the aircraft throughout most of the take-off until the aircraft disappeared behind an island. The videotape was sent to the TSB Engineering Branch Laboratory for analysis. Technical limitations of the recording medium prevented the analysis from yielding any useful information about the aircraft take-off configuration.

1.9 Previous Take-off on Noganosh Lake

On the Friday before the occurrence, the pilot flew two passengers to the lodge. After the passengers and cargo were dropped off, the pilot taxied the empty aircraft eastward, away from and parallel to the dock. He began the take-off run from approximately the same position he used on the occurrence flight. It was reported that the aircraft became airborne prior to entering the narrows and climbed out without any incident. The wind on the Friday was almost calm and there were no waves on the lake.

1.10 Take-off Performance

The aircraft was equipped with Wipline model 3700 floats, for which take-off performance charts are not available. The Cessna Floatplane owner's manual supplement for aircraft equipped with EDO Model 2960 floats shows that, at a gross take-off weight of 3,320 pounds, with the same ambient temperature as on the occurrence date, taking off from smooth water with no head wind and 20 degrees of flaps extended would require approximately 2,500 feet to take off and clear a 50-foot obstacle. The weight of the aircraft on the take-off from Noganosh Lake on the Friday before the occurrence flight was recorded as 2,537 pounds, and the weight of the aircraft on take-off from Noganosh Lake on the occurrence flight was 3,309 pounds.

The actual distance required for take-off would also be affected strongly by the take-off technique employed by the pilot and the direction and speed of the wind. The Transport Canada (TC) booklet *Light Aircraft Operating Tips* shows that a five-knot tail wind on take-off can increase the take-off distance for an aircraft by as much as 20 per cent. When taking off from water, the TC *Flight Training Manual* states the following:

As a general rule in selecting the take-off path, when you feel you have sufficient distance, double it. The climb-out path must be planned prior to starting the take-off, with hills, valleys, and downdrafts being taken into account.

Also, under strong wind conditions, strong descending air currents can be encountered along a shoreline with steep rising terrain.

1.11 *Wreckage and Impact Information*

1.11.1 *Take-off Area Information*

The south end of Noganosh Lake, on which the lodge is located, has an orientation of 350/170 degrees magnetic (M) and is approximately 7,800 feet in length. The south

end of this part of the lake is known locally as Turner's Bay.

It is narrower than the larger part of the lake and is approximately 3,400 feet in length. The lodge is located on the west side of the lake near the mouth of Turner's Bay.

Pilots at Rainbow Airways reported that nearly the entire length of Turner's Bay is usable and, for a take-off to the north, they always taxi south well into Turner's Bay to utilize the extra distance available. This procedure was confirmed by witnesses at the lodge, some of whom are long-time visitors to the lake, and cottagers on Turner's Bay.

Approximately 4,000 feet north of the south end of Turner's Bay is an island known locally as Dan's Island. Pilots taking off to the north use this island as their reject take-off point. On the day of the occurrence, the pilot did not taxi south into Turner's Bay, but began his take-off run from a point only slightly south of Dan's Island, leaving approximately 4,200 feet available to perform the take-off run and climb. The shore on all sides of Noganosh Lake quickly rises more than 50 feet above the lake and is covered by approximately 45-foot-high trees.

1.11.2 *Aircraft Damage*

The initial impact occurred on a heading of about 165°M while the aircraft was in a steep, skidding, left turn with the flaps retracted. The aircraft struck a tree, then the rocky shoreline, and then the water. Damage indicated that the engine was producing high power at the time of impact, and the impact with the tree destroyed the right float and tore the right wing off at the wing-root. Both doors remained closed throughout the impact, but both side door windows were fully open when the aircraft was located. A small hole in the right rear passenger window was the only broken window in the aircraft. The aircraft came to rest upright in approximately 30 feet of water about 20 feet from shore, 100 feet from the first impact scars.

1.12 *Medical Information*

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

1.13 Survival Aspects

Passengers received a comprehensive briefing prior to their departure from the main base on Snakeskin Lake. The briefing included seat-belt use and operation, door operation, and a demonstration of the proper way to don and use the life jackets. The briefing was not as comprehensive when the aircraft departed Noganosh Lake.

The aircraft was not equipped with shoulder harnesses. The pilot was very conscientious about passengers wearing their lap belts, and witnesses confirmed that all occupants fastened their lap belts prior to departure. Examination of the aircraft revealed no evidence of malfunction or failure of the lap belts, except that the floor attachment on the left side of the left rear passenger's seat-belt had become detached from the seat-belt. The surviving passenger had occupied that seat and exited the aircraft through the left door window and swam ashore.

Although witnesses reacted immediately to the occurrence, it took several minutes for them to reach the occurrence site from the lodge.

2.0 Analysis

The pilot had recent experience operating from Noganosh Lake, and, prior to departing from the main base, he had discussed the trip with a senior pilot. It is not known why the pilot did not taxi south into Turner's Bay to utilize all of the available water for the take-off; there was no known operational or other requirement to expedite the departure from Noganosh Lake.

On the Friday prior to the accident, the pilot departed from approximately the same position on the lake as on the accident flight. Although the take-off and climb-out during Friday's flight was uneventful, the conditions under which the take-off was performed were different. It is possible that on the occurrence flight, the pilot operated the aircraft in a similar manner to the departure of the previous Friday. He may have applied erroneously the experience gained on that day, and not fully comprehended the effect of the higher take-off weight and the different wind and water conditions on the take-off distance required. Pilot take-off technique may have contributed to the length of the take-off run.

It is not known why the pilot did not reject the take-off; however, several possibilities exist. The pilot may not have chosen a reject take-off point prior to beginning the take-off, or he may have chosen a reject take-off point farther along the lake from where the aircraft became airborne, or he may have formulated another plan to follow during the climb-out. In any event, he did not abort the take-off.

Once he entered the narrows toward the north end of the lake, it is possible that he encountered descending air on the leeward side of the island and/or a tail wind resulting from a funnelling effect through the narrows. Either or both of these factors would have had a detrimental effect on aircraft performance at a critical time of the flight. If the pilot planned a later reject take-off point or had an alternative plan to follow for the climb-out, an unexpected downdraft

and/or tail wind condition would have compelled him to deviate from or modify his plan.

In considering the lift-off point, the terrain ahead of the aircraft after lift-off, and the aircraft climb performance, the pilot likely had three possible options. First, he could set the aircraft back down on the water and attempt to slow or stop the aircraft before reaching the shoreline. Second, he could turn to the left and attempt to negotiate the passage to the northern section of the lake while airborne. Or third, he could turn the aircraft further to the left to negotiate the passage between the island and the shoreline while airborne.

The pilot chose the latter option, possibly to take advantage of the anticipated improvement in aircraft climb performance from the prevailing winds. Also, the passage to the north portion of the lake is initially a narrower passage and this may have dissuaded him from taking that route.

The continued turn to the left required a steep left turn, followed by a steep right turn and a second steep left turn to negotiate the passage. The fact that the pilot was able to successfully manoeuvre between the island and the shoreline suggests that there were no controllability problems with the aircraft. The steep bank angle required to execute the turns around the island would have precluded any appreciable altitude gain, thus preventing him from climbing above the terrain. When the aircraft emerged from the passage between the island and the shoreline, there was insufficient open space to climb above the rising terrain ahead. A skidding turn at impact was probably a result of excessive left rudder input, most likely made in an attempt to increase the rate of turn to avoid the collision with the trees.

3.0 Conclusions

3.1 Findings

1. The pilot was certified and qualified for the flight
2. The aircraft was certified, equipped, and procedures.
3. The weight and centre of gravity were within the
4. There was no evidence found of any airframe
5. The aircraft was not equipped with shoulder
6. The take-off distance on the occurrence flight
7. Pilot take-off technique may have contributed to
8. Approximately 3,600 feet of usable take-off distance remained behind the pilot when he began the take-off.
9. The aircraft did not climb above the trees after take-off.
10. It is possible that, after take-off, the aircraft encountered a downdraft, a tail wind, or both.

3.2 Causes

The pilot began the take-off run from a position on the lake which did not allow sufficient distance for the take-off and climb-out.

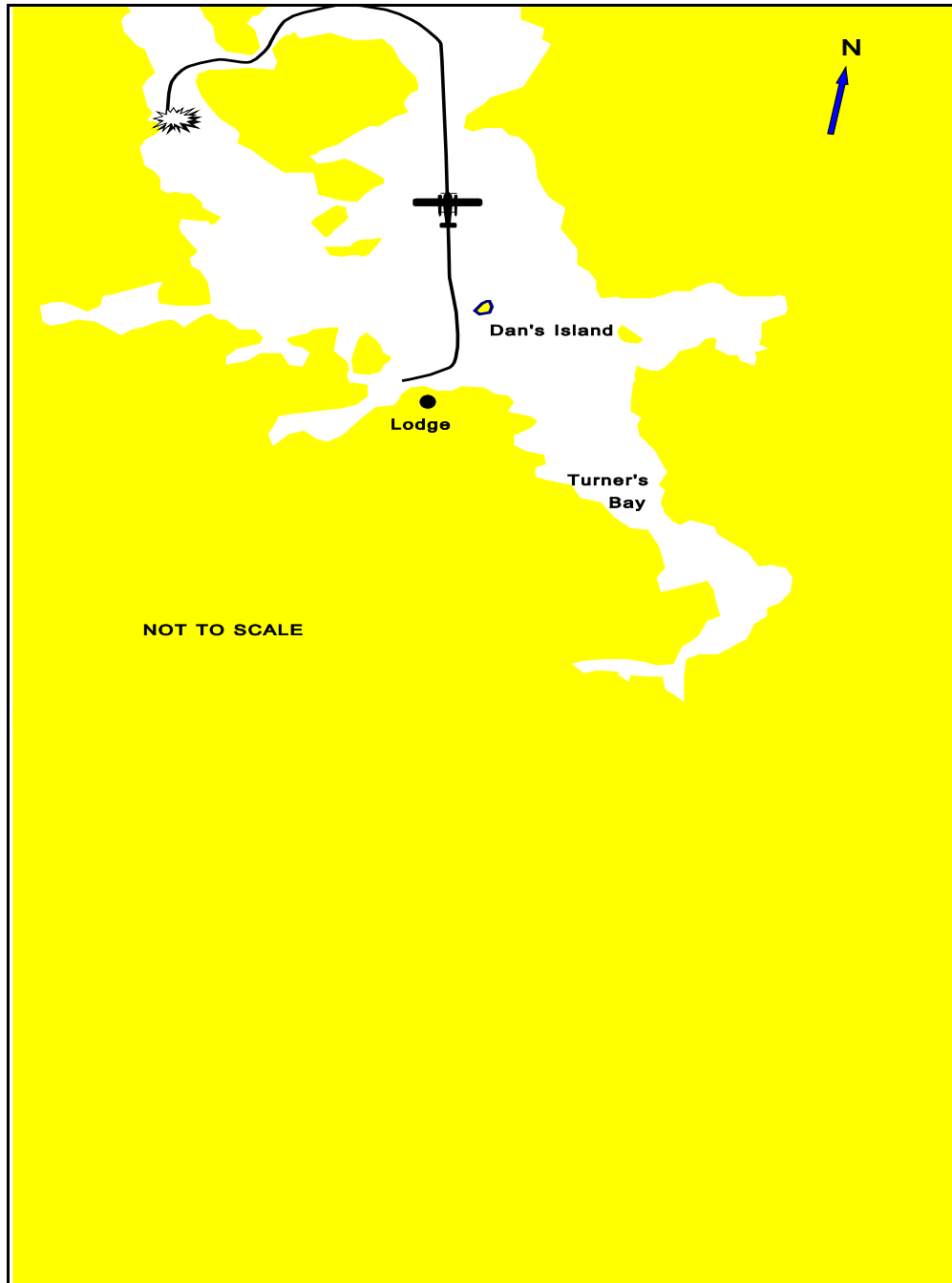
4.0 *Safety Action*

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 - Take-off and Flight Path



Appendix B - List of Supporting Reports

The following TSB Engineering Branch Laboratory Report was completed:

LP 159/94 - Videotape Analysis.

This report is available upon request from the Transportation Safety Board of Canada.

Appendix C - Glossary

EDT	eastern daylight saving time
hr	hour(s)
lb	pound(s)
TC	Transport Canada
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
°	degrees
°M	degrees magnetic
'	minutes

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