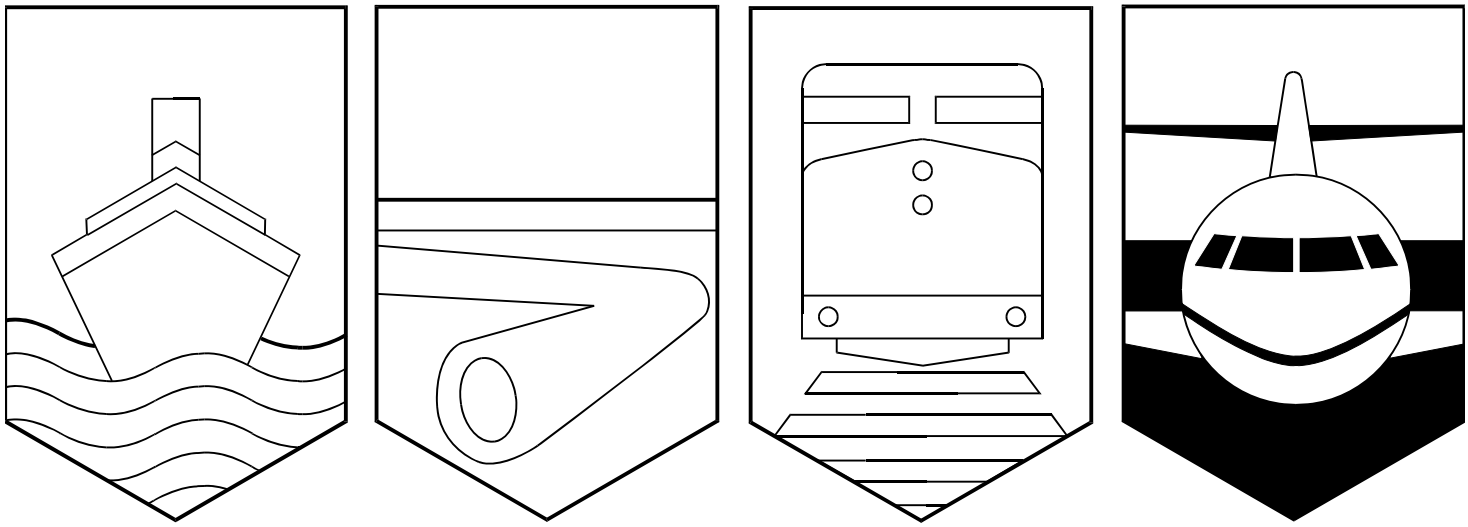
Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada



AVIATION OCCURRENCE REPORT

COLLISION WITH TERRAIN

BLUE ICE FLIGHTSEEING INC.
PIPER PA-32-260 C-GQKF
STEWART, BRITISH COLUMBIA 17 nm NW
25 MAY 1994

REPORT NUMBER A94P0098

Canada

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.

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Aviation Occurrence Report

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Synopsis

The pilot and five passengers departed from Stewart, British Columbia, in a Piper PA-32 Cherokee aircraft for a sightseeing flight over the glaciers near the town. When the aircraft did not return as scheduled, passengers waiting for the next flight made inquiries that resulted in Search and Rescue being alerted. Later that evening, the aircraft was found to have crashed on a snow-covered glacier. The pilot and five passengers were fatally injured; the aircraft was destroyed by impact forces.

The Board determined that the aircraft crashed into the glacier in a steep nose-down attitude, apparently out of the pilot's control. It was not determined what had caused the pilot to lose control of the aircraft.

Ce rapport est également disponible en français.

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5.0 Appendices

1.0 Factual Information

1.1 History of the Flight

The pilot had been retained to take members of a tour group on sightseeing flights over the glaciers located near Stewart, British Columbia. On the morning of the planned flights, the pilot delayed the first departure time of 0800 Pacific daylight saving time (PDT)[1] because of poor weather in the Stewart area. He stated that he would be able to complete the trip if the weather improved, and that he would probably fly along a route west of Stewart, over the Mackie glacier, since the weather there was normally more favourable than the weather over the glaciers east of Stewart.

The pilot and five passengers eventually took off from Stewart at about 1330. No flight plan was filed for the flight; however, the pilot's wife, who was also the president of the company, was aware of the flight itinerary.

Prior to departure, the pilot had instructed the remaining members of the tour group to be at the airport for the next flight at 1430. At 1540, when the aircraft had not returned as scheduled, the tour members made inquiries that resulted in the Department of National Defence search and rescue organization being informed that the aircraft was overdue, and an aerial search was initiated.

The aircraft wreckage was located at approximately 2100 the same evening; it had crashed at 6,500 feet above sea level[2] (asl)[3] on the side of the Mackie glacier, latitude 55°56'N and longitude 129°59'W, at approximately 1400, during the hours of daylight. The pilot and five passengers were fatally injured. There were no witnesses to the accident.

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

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

3 See Glossary for all abbreviations and acronyms.

1.2 Injuries to Persons

	Crew	Passengers	Others	Total
Fatal	1	5	-	6
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	1	5	-	6

1.3 Damage to Aircraft

The aircraft was destroyed by the impact.

1.4 Other Damage

There was no other damage.

1.5 Personnel Information

	Pilot-in-command
Age	38
Pilot Licence	Commercial
Medical Expiry Date	01 Oct 94
Total Flying Hours	970
Hours on Type	28
Hours Last 90 Days	50
Hours on Type Last 90 Days	28
Hours on Duty Prior to Occurrence	3
Hours off Duty Prior to Work Period	12

The pilot was certified and qualified for the flight in accordance with existing regulations. His instrument flying experience was limited to the basic instrument training received during courses for his private and commercial licences.

The pilot and his wife were the owners of the company formed to provide sightseeing flights from the Stewart Aerodrome, and he was the only pilot.

The aircraft had been ferried by an aircraft broker from Kingston, Ontario, to Vancouver, British Columbia, between 12 March and 16 March 1994. The accident pilot first flew the aircraft on 23 March 1994 in Vancouver. While in Vancouver, the pilot received a one-hour flight-check from an instructor who was familiar with the aircraft type. The instructor recalled that the pilot's performance during the flight-check was satisfactory.

On the day before the accident, the pilot had flown his company's Cessna 172 on a 75 nautical mile (nm) charter flight to Ketchikan, Alaska, and then returned to Stewart. He had declined a request to take a passenger to Stewart from Ketchikan because of unsuitable weather.

1.6 *Aircraft Information*

1.6.1 General

Manufacturer	Piper Aircraft Corporation
Type	PA-32-260
Year of Manufacture	1966
Serial Number	32-134
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	2,213 hr
Engine Type (number of)	Avco Lycoming O-540-E4B5 (1)
Propeller/Rotor Type (number of)	Hartzell HC-C2YK-1BF (1)
Maximum Allowable Take-off Weight	3,400 lb
Recommended Fuel Type(s)	100/130
Fuel Type Used	Unknown

The aircraft maintenance log-books contained no evidence of uncorrected deficiencies. The last scheduled maintenance inspection took place on 01 March 1994.

1.6.2 Aircraft Journey Log-book

Air Navigation Order Series VIII, No. 2 , the *Aircraft Journey Logbook Order*, requires that certain information, including date, time up and time down, air time, flight time, and point of departure and destination, be recorded for each flight in the aircraft journey log-book.

The journey log-book for the accident aircraft was recovered from the wreckage. Journey log-book entries by the owner began on 23 March 1994, and ended on 07 April 1994, 48 days before the accident. All of the entries during that period referred to flights from Vancouver to Stewart. There are no journey log-book entries after 07 April.

The president of the company reported that, subsequent to 07 April 1994, the accident aircraft had been used on at least three occasions for commercial revenue flights.

1.6.3 Aircraft Certification

The company had made an application for registration of the aircraft in the commercial category on 15 April 1994. The application was returned to the company by Transport Canada on 11 May 1994 because of missing documentation. Transport Canada also noted that the aircraft would have to be added to the operating certificate of the company before the commercial registration could be completed.

No record of a request to add the aircraft to the company operating certificate was found on the Transport Canada files. The aircraft re-certification, from private registration to commercial registration, had not been completed at the time of the accident.

A Transport Canada airworthiness inspector had inspected the aircraft at the company base in Stewart, and Transport Canada had issued an Annual Airworthiness Information Report form to

the company on the basis of the private registration.

1.7 *Meteorological Information*

Passengers on the aircraft had been taking photographs of the mountains and glaciers along the route of flight, and five rolls of film were recovered from cameras in the aircraft wreckage. When developed, the pictures provided route information and weather information near the accident site. The photographs showed that weather conditions near the site appeared to be clear, and that cloud obscured some of the ridges on the snowfield.

The weather aftercast obtained from Environment Canada Atmospheric Environment Service revealed that, on the accident date, a weak cold front traversed the north coast of British Columbia; by early afternoon, it was located over the Central Interior. A weak ridge of high pressure, positioned along the British Columbia coast and the Alaska Panhandle, was generating a light southerly low-level inflow through Portland Canal. The air mass was fairly dry and convectively unstable.

As a result, near the time of the accident, scattered to broken layers of cumulus cloud based at 5,000 feet asl covered the Stewart area. Associated towering cumulus topped at 18,000 feet asl was generating isolated showers. The visibility was generally greater than 15 miles near Stewart but the rain showers would have reduced the visibility to 6 miles. Above the freezing level of 4,000 feet asl, the isolated shower activity would have locally reduced the visibility to 1 mile in snow. Light to moderate clear icing would have occurred in the convective cloud below the freezing level. The temperature at the elevation of the accident site would have been approximately minus 5 degrees Celsius. The winds below 9,000 feet asl were predicted to be from the southwest at less than 15 knots, and, as a result, mechanical turbulence would have been generally light. In the vicinity of convective cloud, however, turbulence would have been moderate.

1.8 Weight and Balance

The aircraft departed from Stewart with an undetermined amount of fuel; thus, the actual weight at take-off could not be determined.

Based on previous loading practices and similar passenger weights, the aircraft's weight at take-off, with sufficient fuel for the accident flight and reserves, was estimated to be approximately 3,100 pounds. The allowable gross weight for the aircraft is 3,400 pounds.

The centre of gravity position, computed using the estimated weight of 3,100 pounds, was located 94 inches aft of the datum when the accident occurred. The allowable centre of gravity range for the aircraft at occurrence weight was between 87 and 96 inches aft of the datum.

1.9 Wreckage and Impact Information

The accident site is located at an elevation of 6,500 feet asl, on the west side of a north-to-south oriented snowfield on the Mackie glacier. The aircraft was on a westerly heading when it struck the rising, snow-covered surface, and it was at high speed and in a steep nose-down attitude at impact. It came to rest in a nose-down, left-wing-low attitude.

Only general observations were possible at the accident site because of unstable terrain conditions and the danger of an avalanche. It was determined, however, that the left wing had separated from the fuselage, the fuselage was demolished as far back as the rear of the cabin, and the tail cone had collapsed in telescopic fashion during impact.

The wreckage was removed from the site three months after the accident and taken to the TSB Regional Wreckage Examination Facility for further examination. This examination revealed damage not evident at the accident site.

The left wing, only attached to the fuselage by a control cable, was in two main pieces. It had broken chordwise between the aileron and flap, and the wing tip had separated.

The leading edge was crushed back in accordion style.

The right wing was also broken chordwise, in about the same location as the left wing. However, all the skin had been ripped off the spar inboard of the break. The wing tip had separated and the leading edge had been crushed back in the same manner as the left wing.

It was not possible to obtain a fuel sample from the aircraft. Both wing fuel tanks had ruptured and the fuel lines had broken open on impact and all fuel had drained from the system.

The engine was disassembled and examined. The interior of the engine was in good condition, and there was no evidence of pre-impact failure or system malfunction that would have prevented the engine from developing full power.

1.10 Aircraft Performance

The Piper PA-32 Aircraft *Owner's Handbook* performance chart indicates that the accident aircraft should have been capable of climbing at about 600 feet per minute at a 6,500-foot density altitude. The indicated airspeed necessary to obtain that maximum rate of climb is approximately 100 mph.

1.11 Communications

The pilot made normal transmissions on the Stewart aerodrome traffic frequency on departure, and they were heard by another pilot in the area. No other communications were received from the pilot of the accident aircraft.

1.12 Medical Information

The medical investigation revealed no evidence that incapacitation or physiological or psychological factors affected the pilot's performance.

1.13 Survival Aspects

1.13.1 General

Wreckage damage and injury patterns indicate that, because of the high impact forces, the accident was not survivable.

1.13.2 Survival Equipment

Neither the pilot nor the passengers on the aircraft were suitably dressed for survival in the harsh weather conditions that they would have experienced if a forced landing on the glacier had been necessary.

The emergency locator transmitter (ELT) activated on impact, and provided a signal that guided search aircraft to the location.

1.14 Use of Automotive Fuel

The pilot had purchased automotive fuel from a local supplier and transported it in a portable tank in the back of a pickup truck. A sample of fuel taken from the portable tank the day following the accident was confirmed to be automotive fuel. The company president indicated that the accident aircraft was normally refuelled from that portable tank when the aircraft was in Stewart.

Aircraft operation on automotive fuel is permitted for some aircraft types engaged in some limited types of operation. A supplemental type certificate (STC), which modifies the existing aircraft type certificate, is required. In this case, since the aircraft was manufactured in the United States, an STC approval by the Federal Aviation Administration (FAA) would be required. There are no FAA-approved STCs available for the use of automotive fuel for the PA-32-260 aircraft.

The other company aircraft, a Cessna 172, had been placarded to indicate that an STC for the use of automotive fuel had been issued. The certificate confirming the STC, however, could not be located in the company records, aircraft maintenance records, or Transport Canada files.

1.15 Additional Information

1.15.1 Whiteout

Whiteout is an optical phenomenon that can result in a loss of visual perception for pilots. The *Aeronautical Information Publication* (AIP), Section AIR 2.12.7, defines the phenomenon as follows:

> An atmospheric optical phenomenon of the polar regions in which the observer appears to be engulfed in a uniformly white glow. Neither shadows, horizon nor clouds are discernible; sense of depth and orientation is lost; only very dark, nearby objects can be seen. Whiteout occurs over an unbroken snow cover and beneath a uniformly overcast sky, when with the aid of the snow-blink effect, the light from the sky is about equal to that from the snow surface. Blowing snow may be an additional cause.
>
> Since the light is so diffused it is likely that the sky and terrain will blend imperceptibly into each other, obliterating the horizon. The real hazard in whiteout is the pilot not suspecting the phenomenon because the pilot is in clear air. In numerous whiteout accidents pilots have flown into snow-covered surfaces unaware that they have been descending and confident that they could "see" the ground

1.15.2 Glacier-Related Weather Phenomenon

Pilots with experience in the area reported that the weather conditions in the vicinity of the glacier can rapidly change, and can include fog and other conditions associated with reduced visibility and whiteout.

2.0 Analysis

2.1 Introduction

Because there was no evidence of pre-impact failure of the engine or of pre-impact flight control or aircraft structural failure, the analysis concentrated on weather conditions, aircraft operational deficiencies, and pilot experience.

2.2 Aircraft Operational Deficiencies

The aircraft was not registered commercially and was being operated with automotive fuel, which was not approved for this aircraft.

The aircraft journey log-book lacked entries for the 48 days preceding the accident.

2.3 Weather Conditions and Pilot Experience

Although the pilot was experienced in mountain and glacier flying, weather conditions may have been changing rapidly in the area of the accident. Although there is no evidence to indicate so, it is possible that weather conditions on the glacier may have included the cloud and lighting conditions known to cause whiteout. It could not be determined why the loss of control occurred.

3.0 Conclusions

3.1 Findings

1. The aircraft's weight and centre of gravity position were within limits.

2. The aircraft was not registered for commercial operations.

3. Journey log-book entries had not been made for flights during the 48 days preceding the accident.

4. The pilot was certified and qualified for the flight.

5. It is possible that weather conditions near the accident site may have included cloud and lighting conditions conducive to whiteout.

6. There was no evidence of pre-impact failure of the engine, flight control, or aircraft structural failure.

7. The aircraft struck the ground in a steep nose-down attitude, apparently out of the pilot's control.

8. It could not be determined why the loss of control occurred.

9. Neither the pilot nor the passengers on the aircraft were suitably dressed for survival in the harsh weather conditions that they would have experienced if a forced landing on the glacier had been necessary.

3.2 Causes

The aircraft crashed into the glacier in a steep nose-down attitude, apparently out of the pilot's control. It was not determined what had caused the pilot to lose control of the aircraft.

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 01 June 1995.

Appendix A - List of Supporting Reports

The following TSB Engineering Branch Laboratory reports were completed:

LP 90/94 - Fuel Sample Analysis;
LP 101/94 - Vacuum Pump Analysis; and
LP 102/94 - Instruments Analysis.

These reports are available upon request from the Transportation Safety Board of Canada.

Appendix B - Glossary

AIP	Aeronautical Information Publication
asl	above sea level
ELT	emergency locator transmitter
FAA	Federal Aviation Administration
hr	hour(s)
lb	pound(s)
mph	miles per hour
nm	nautical miles
PDT	Pacific daylight saving time
STC	supplemental type certificate
TSB	Transportation Safety Board of Canada
'	minute(s)
°	degree(s)

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