Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION OCCURRENCE REPORT

LOSS OF CONTROL

BEECH B58P BARON C-FKSB
TORONTO ISLAND AIRPORT, ONTARIO 1.8 nm W
09 OCTOBER 1993

REPORT NUMBER A93O0343

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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Synopsis

Shortly after take-off from Toronto Island Airport, Ontario, the pilot reported that he had an engine failure and requested clearance to return to the airport. The aircraft crashed into Lake Ontario, 1.8 nautical miles west of the Toronto Island Airport. All four occupants of the aircraft were fatally injured and the aircraft was destroyed when it struck the water.

The Board determined that, after experiencing a power loss during the initial climb-out, the pilot lost control of the overweight aircraft while attempting to return to the airport. The cause of the power loss was not determined; however, both engines were found to be capable of producing full power when tested.

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 History of the Flight

At 0735 eastern daylight saving time (EDT)[1], the pilot, co-pilot, and two passengers departed from Toronto Island Airport, Ontario, in a Beech B58P Baron for a pleasure flight to Walker's Key, Bahamas, with an en route fuel stop at Wilmington, North Carolina.

The trip was originally planned for earlier in the week but was delayed when the aircraft became unserviceable after the installation of a new fuel management system. When the first flight following the installation was attempted, the left engine ran roughly and did not produce full power; the aircraft was returned to maintenance. On the night before the accident flight, the aircraft was successfully ground run and test flown after the maintenance and repairs were completed. Following the test flight, the aircraft was refuelled and parked in a hangar in preparation for the early morning departure.

At 0630, the aircraft was parked on the ramp. The pilot was observed loading his baggage at about 0645. Shortly afterwards, the co-pilot and two passengers arrived at the aircraft with their baggage and a small dog. At about 0720, the aircraft engines were started; after receiving his instrument flight rules (IFR)[2] clearance, the pilot taxied for take-off at 0730. Several witnesses observed the aircraft depart at 0735 and reported that the take-off appeared normal, with both engines operating smoothly and at what appeared to be full power.

Once airborne, the pilot contacted the Toronto Area Control Centre (ACC) departure controller and was given a departure instruction, which he did not acknowledge. When the departure controller repeated the departure instruction, the pilot responded that he had an engine failure and requested an immediate return to the airport. There were no further radio transmissions from the aircraft and it was observed in a steep nose-down descent when it struck the water at 0738 during daylight hours.

Metro Toronto Police divers found the aircraft about 1.8 nautical miles (nm)[3] west of the airport in 50 feet of water at latitude 43°37'37"N, longitude 079°26'41"W. There were no survivors.

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.

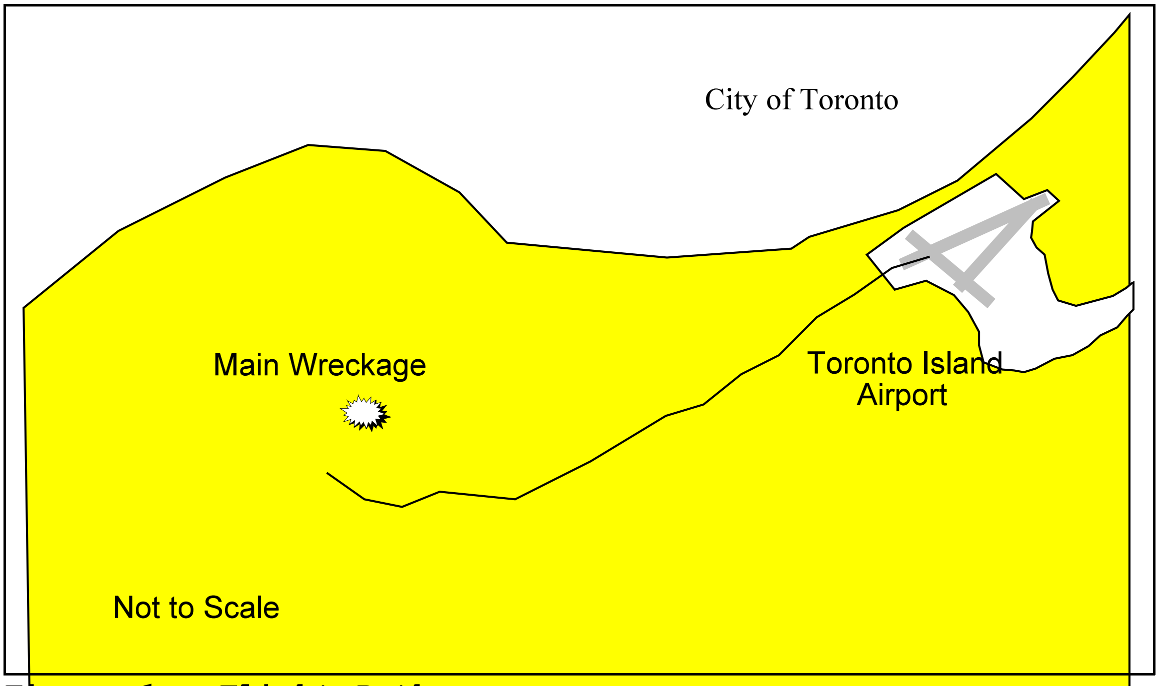


Figure 1 - Flight Path

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

The aircraft was destroyed when it struck the water and subsequently sank in Lake Ontario.

1.4 Other Damage

There was no other damage.

1.5 Personnel Information

	Pilot-in-command	Co-pilot
Age	46	49
Pilot Licence	ATPL	PPL
Medical Expiry Date	01 Mar 94	01 Feb 94
Total Flying Hours	3,500	700
Hours on Type	50	145
Hours Last 90 Days	50	18
Hours on Type Last 90 Days	50	18
Hours on Duty Prior to Occurrence	N/ A	N/ A
Hours off Duty Prior to Work Period	N/ A	N/ A

All the flying times for the pilot and co-pilot are approximate as no personal log-books for either individual were found.

1.5.1 Pilot History

The pilot obtained his private pilot licence on 02 February 1981 and his night rating on 07 August 1981 at Thunder Bay, Ontario. In 1984, he added a seaplane endorsement and multi-engine endorsement to his pilot qualifications. The pilot was unsuccessful at his first attempt to obtain an instrument rating during a flight test on 02 May 1986.

He subsequently passed his instrument rating flight test on 27 August 1986 and was issued a class one instrument rating. On 15 December 1987, the pilot's instrument rating was renewed to class one standards for six months only, because he experienced difficulty with non-directional beacon (NDB) approach procedures and because he responded slowly to a simulated power loss on a missed approach.

The pilot upgraded to an airline transport pilot licence (ATPL) on 26 April 1989. He completed a pilot proficiency test on a Piper Navajo PA-31 aircraft in September 1989. On 28 December 1989, he failed his instrument renewal flight test when he flew in the wrong direction to a final approach fix. A month later, he failed his re-ride when he did not fly a successful NDB approach during his flight test. On his third consecutive instrument renewal flight test, he successfully renewed his class one instrument rating on 06 February 1990. He maintained his instrument rating until 17 June 1992, when he failed his renewal flight test for flying a procedure turn 1,000 feet below the minimum altitude. On 04 August 1992, he successfully renewed his class one instrument rating. All of his instrument flight tests were flown in a Piper Twin Comanche PA-30 aircraft which he owned.

The pilot had first flown the accident aircraft on 09 July 1993, and had since accumulated 40 hours total flying time in it. Of these 40 hours, 11 hours had been flown with the co-pilot. The pilot was aware of the engine problems the aircraft had experienced over the previous days.

The pilot had a valid class one medical with the restriction that glasses must be available.

1.5.2 Co-pilot History

The co-pilot received his private pilot licence on 26 November 1978. By 06 December 1979, he had completed a multi-engine, night, and seaplane endorsement. He obtained a class two instrument rating on 06 May 1983. On 17 June 1992, he obtained a class one instrument rating after letting his previous instrument rating expire. The co-pilot was a joint owner of the aircraft with an Ontario numbered company. The co-pilot had a valid class three medical with no restrictions.

1.6 Aircraft Information

Manufacturer	Beech Aircraft Corporation
Type and Model	58P Baron
Year of Manufacture	1977
Serial Number	TJ - 106
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	1,982 hours
Engine Type (number of)	Teledyne Continental TSIO 520 - L (2)
Propeller/ Rotor Type (number of)	Hartzell PHC - J3YF - 2UF (2)
Maximum Allowable Take-off Weight	6,100 pounds
Recommended Fuel Type(s)	100 LL, 100/ 130, 115/ 145
Fuel Type Used	100 LL

1.6.1 Aircraft Maintenance History

The aircraft had been maintained and serviced in accordance with existing regulations and it was mechanically and cosmetically well kept.

There had been two recent modifications to the aircraft. On 11 June 1993, a vortex generator system was installed in accordance with supplemental type certificate (STC) SA4016NM. At that time, the aircraft had accumulated 1,866.7 hours total airframe time. The modification is designed to maintain laminar airflow over the wings and tail, and thereby enhance the handling and control of the aircraft at slower speeds as well as improve the stall characteristics.

The second modification was the installation of a Shadin Digiflo-L digital fuel management system on 04 October 1993. Part of this modification included the installation of a fuel flow transducer in the fuel lines of each engine. The second part of the installation included a light-emitting diode (LED) display instrument which indicated the fuel flow of each engine. The Shadin Digiflo-L digital fuel management system is designed so it can be coupled with some models of global positioning system (GPS) units and used to calculate the fuel required to proceed to any selected waypoint or destination. The GPS installed in this aircraft was not compatible with the Digiflo-L and therefore was not coupled to it. The selector switch on the LED display was found in the endurance position.

On the first flight following the installation of the Shadin Digiflo-L system, the pilot (not the accident pilot) rejected his take-off run because of a lack of engine power from the left engine. When the engine was examined by the aircraft maintenance engineer (AME), it was determined that there were two separate problems: first, that the engine was running roughly, and second, that the engine was not developing full power. In trouble shooting the first problem, the left magneto and ignition harness from the right engine were installed on the left engine. A new magneto and ignition harness were installed on the right engine. This corrected the rough running engine problem, but the left engine still did not produce full power.

The Bendix servo fuel units were exchanged between engines. The left engine still did not produce full power; the right engine did produce full power. A fuel flow check revealed that one of the fuel injectors on the left engine was partially plugged. When it was cleaned, the left engine produced full power and ran smoothly.

During the trouble shooting procedure, the right engine mixture control cable was found to be worn and was replaced. After all the work was completed, and after an extended ground run, the aircraft was test flown for approximately 30 minutes. There were no reported discrepancies during the ground run or flight.

1.6.2 Aircraft Weight and Balance

The maximum take-off and landing weight of the aircraft is 6,100 pounds, and the centre of gravity limits at that weight are between 78.4 inches and 84.5 inches aft of datum.

The calculated take-off weight for the flight was 6,445.3 pounds with a centre of gravity of about 80.1 inches aft of datum. At impact, the calculated weight was 6,337 pounds and the centre of gravity was virtually unchanged. The maximum weight of the aircraft was exceeded by 345.3 pounds at take-off.

1.6.3 Aircraft Performance

The aircraft flight manual (AFM) indicates that the take-off and maximum continuous power setting is 38.0 inches of mercury (in. Hg) of manifold pressure and 2,700 engine rpm. The normal cruise climb power setting is 34.0 in. Hg and 2,400 rpm. When leaning the mixture, the power is not to exceed the maximum cruise power settings of 33.0 in. Hg and 2,400 rpm, and a peak temperature of 1,650 degrees Fahrenheit, as indicated on the turbine inlet temperature (TIT) gauge, is not to be exceeded.

The AFM indicates that the climb performance for a normal departure with an indicated airspeed (IAS) of 115 knots, given the ambient conditions at the time of the occurrence and a take-off weight of

6,100 pounds, would result in a 1,600 feet per minute (fpm) climb with a climb gradient of 11.0 per cent. If one engine became inoperative and the pilot followed the correct one-engine inoperative procedures, the rate of climb would decrease to 230 fpm with a climb gradient of 1.50 per cent. Both climb performances are based on the power set at maximum continuous with the flaps and landing gear up, the cowl flap(s) open, and the inoperative propeller feathered. Any deviation from these conditions and procedures could reduce the aircraft performance.

The pilot of the accident flight had a Digiflo-L digital fuel management system installed in his recently acquired Beechcraft B55 Baron aircraft. The pilot's B55 Baron aircraft is equipped with two Teledyne Continental IO 520-C, 285 Hp engines. The smaller 285 Hp engines operate on a lower fuel flow than the larger 310 Hp engines that were on the accident aircraft.

1.6.4 Aircraft Equipment

The aircraft was fully equipped for IFR flight. Additional navigation equipment installed in the aircraft included the following: an Apollo GPS receiver with a North America data card, a King KN 74 Area Navigation (RNAV) unit, a distance measuring equipment (DME) receiver, a Collins WXR-200 weather radar, and a two-axis autopilot.

1.7 Meteorological Information

The 0700 actual weather observation for Toronto Island Airport was broadcast on the automatic terminal information service (ATIS). Information alpha, which the pilot acknowledged receiving when he requested the taxi clearance, was 1,200 feet above ground level (agl) scattered, measured 1,500 feet agl broken, 2,000 feet agl overcast, visibility greater than 15 miles with light rain showers, temperature eight degrees Celsius, dew point six degrees Celsius, and wind 350 degrees magnetic at 10 knots gusting to 21 knots. The altimeter was 29.96 in. Hg.

At 0800, about 22 minutes after the accident, the weather observation at Toronto Island Airport was similar to the previous hourly observation except that the overcast layer had changed to 2,500 feet agl, and the visibility had decreased to four miles in light rain showers and fog. The wind had decreased to 330 degrees magnetic at 9 knots gusting to 18 knots. The actual weather observations were consistent with the forecast weather for this area.

1.8 Communications

The flight was cleared to the Wilmington, North Carolina, Airport via an "Island four" standard instrument departure (SID), with radar vectors to intercept the Victor 252 airway until the Genesseo very high frequency omni-directional range (VOR) and then direct to Wilmington. The Island four SID for runway 26 required the aircraft to climb on the runway heading to 650 feet above sea level (asl) and then make a left turn to 200 degrees magnetic for radar vectors to the assigned route while climbing to maintain 2,000 feet asl.

The pilot received and read back his IFR clearance prior to taxiing for departure. At 0734, the pilot contacted the tower controller and advised him that the flight was ready to go on runway 26. The tower controller coordinated the IFR release of the flight with the Toronto ACC departure controller and then cleared the aircraft for take-off with instructions to contact the departure controller on the assigned radio frequency.

The aircraft took off at 0735 and contacted the departure controller about a minute and a half later. The aircraft was radar identified and cleared to maintain 5,000 feet asl and proceed direct to the Bulge intersection when able. The pilot did not acknowledge this transmission. After a second transmission by the departure controller at 0737, the pilot stated that he had an engine failure and requested an immediate return to the airport. The departure controller approved the request and directed the pilot to contact the airport tower controller. The departure controller also informed the tower controller that the aircraft was returning with an engine failure.

The pilot did not state which engine had failed or the nature of the engine failure, and did not re-establish communications with either the tower or departure controller. At 0738, the departure controller informed the tower controller that all radar contact with the aircraft was lost when the aircraft was about two miles west of the airport. The tower controller informed the departure controller that the aircraft had gone down into the water at 0738 after the driver of Red Two, an airport fire truck, advised the tower controller of the occurrence.

1.9 Aerodrome Information

The Toronto Island Airport, elevation 251 feet asl, is a public airport operated by the Toronto Harbour Commission and is located on Centre Island in the Toronto harbour. There are three paved runways, the longest being runway 08/ 26, which is 4,000 feet long by 150 feet wide. Humber Bay is located on the north shore of Lake Ontario and is adjacent to the western boundary of the airport and under the departure path of runway 26.

1.10 Flight Recorders

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

1.11 Radar Flight Path

The aircraft was identified at 0736 using the airport surveillance radar, ASR 5, located at Toronto International Airport, and was tracked until all radar contact was lost at 0737.

The first radar contact indicated that the aircraft was at 700 feet asl on the initial climb. The aircraft climbed about 1,000 fpm to 1,050 feet asl, with the groundspeed increasing from 96 knots at 700 feet asl to a maximum of 123 knots at 1,050 feet asl. The radar indicated that the aircraft was drifting south of the extended runway centre line, although no significant turn or change in aircraft heading was observed.

At 1,050 feet asl, the groundspeed began to decrease from 123 knots to 84 knots over a 15-second period. The 1,000 fpm climb was arrested as the aircraft temporarily levelled off at 1,200 feet asl. During the next 11 seconds, the groundspeed remained below 90 knots, and the 1,000 fpm climb was re-established as the aircraft climbed to its maximum altitude of 1,500 feet asl while maintaining a fairly constant departure track. During this portion of the climb, at approximately 1,300 feet asl, the pilot contacted the departure controller. The pilot received his initial departure instructions but did not read them back.

As the aircraft altitude reached 1,500 feet asl, the 1,000 fpm climb was arrested; the aircraft began to descend and momentarily reached a maximum descent rate of 4,000 fpm. In this nine-second flight segment, the aircraft track indicated a significant turn to the northwest while the aircraft groundspeed remained below 100 knots. The aircraft descended to 600 feet asl before the rate of descent was arrested, and a 1,000 fpm climb was briefly re-established as the aircraft climbed to an altitude of 900 feet asl and the ground speed decreased to 83 knots. Passing through 800 feet asl, the pilot informed the departure controller that he had an engine failure and wanted to return immediately to the airport. This was the last communication from the aircraft. The last radar target showed the aircraft at 900 feet asl in a right turn, with the ground speed below 100 knots.

1.12 Wreckage and Impact Information

1.12.1 Aircraft Structure

The aircraft struck the water in a steep nose-down, left-wing-low attitude. Although the impact was severe, the aircraft cabin section remained intact except for the pilot's side window, which was broken out, and the cockpit floor, which was pushed up. Other fuselage damage included the nose section, which disintegrated on impact, and the structure behind the nose baggage compartment, which was deformed upwards and to the left. It was not possible to open the right side door because of the deformation. There was no deformation at the back of the cabin, and the left rear door opened freely.

The tail section failed to the left at a point immediately in front of the empennage. The empennage itself was intact but was attached to the fuselage only by the control cables.

Both wings failed in a rearward direction at the fuselage attachment points and compromised the wing fuel tanks. The inboard wing sections, complete with the engine nacelles and engines, remained attached to the fuselage by only the engine control cables.

The outboard section of the left wing leading edge was rolled down and under. The outboard section of the right wing had failed outboard of the right engine. This section of wing was bent up and back at the wing tip.

There was some soot staining along the left side of the fuselage. The broken edges of plexiglass in the left cockpit window frame were heat blistered and the edges had melted slightly. There was also some soot staining and some blistered paint on the empennage.

1.12.2 Throttle Quadrant

The two front seats were compressed downward, but the actual seat positions were displaced upwards because the floor was pushed up.

The engine controls were consistent with the standard Beechcraft configuration for this type of aircraft. All the engine control levers were found in the full forward positions and all had been bent over to the right.

The propeller controls were bent over in front of the throttles, which were bent over slightly behind the mixture controls. An impact mark of unknown origin on the control quadrant between the left and right propeller controls was consistent with the right propeller control being at or near the feathered position. It was not possible to determine whether this mark was made prior to or at impact. The left throttle was behind the propeller control and had hit the propeller control knob. No conclusive evidence can be drawn from the position of the throttle quadrant engine controls.

1.13 Medical Information

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

1.14 Fire

Witnesses reported that there was no fire before the impact, but they did see a post-impact fire. There was some heat damage to the windows on the left side of the aircraft and some scorching of paint on the plastic fairing pieces on the tail. The soot patterns around the rivets were consistent with a post-crash fire pattern for an aircraft that was nose down and sinking in the water after the wings and fuel tanks were compromised. The most severely burnt component was the left-hand sun visor, which was found floating in the water.

1.15 Tests and Research

1.15.1 Engines

Both of the engines were recovered from Lake Ontario and examined. The initial examination of the engines revealed no evidence of any pre-impact airflow restrictions which could have adversely affected the combustion and the engine power produced. There was no indication that either of the air filters was plugged, and the alternate air doors, which ensure adequate airflow to the inlet side of the turbo chargers, were functional. Both of the turbo chargers turned freely and without any restriction. Most of the induction tubes on both engines had been damaged during the impact, but there was no indication of any pre-impact malfunction or condition in the induction system. The engine ignition systems, which consisted of four magnetos (two on each engine), ignition wiring harnesses, and spark plugs, were visually examined and were determined to be mechanically fit.

It was then decided to conduct a test of both engines at the Teledyne Continental Motors manufacturing facility in Mobile, Alabama.

The damage caused by the accident was repaired, which entailed replacing the oil sumps, rocker covers, induction tubes, exhaust stacks, and welding on the left engine propeller flange. Both engines were then installed in a test cell and run. The engine runs were conducted without any modifications or repairs to either of the engine's fuel systems, ignition systems, or mechanical drive trains, which were tested in an "as recovered" condition.

In the test cell, both engines were successfully run to full power. The left engine ran roughly during the test runs, and this was attributed to moisture in the magneto and impact damage to the ignition harness.

1.15.2 Propellers

The aircraft had two Hartzell constant-speed, full-feathering, three-bladed propellers. The pitch setting at the 30-inch station is from 15.3 degrees (low pitch) to 84.0 degrees (high pitch), which corresponds to the feathered position.

The propeller flange on the left engine had failed at impact and the left propeller had separated from the left engine. Despite several underwater searches, the left propeller was not found.

The right propeller was dismantled and examined. All three propeller blades were twisted towards a low pitch setting. Impact marks on the three propeller blade preload plates indicated that the blade angles at impact were 18, 18, and 19 degrees respectively. Although these blade angles are consistent with a take-off or climb power setting, they may also exist in a constant speed propeller system when engine power is reduced without a corresponding reduction in the selected propeller rpm.

1.15.3 Cockpit Instruments and Switches

Examination of the flight and engine instruments revealed the following indications at impact:

Tachometer - left engine - 2680 rpm
Tachometer - right engine - 2450 rpm
(red line is 2700 rpm)

Manifold pressure - left engine - 29 in. Hg
Manifold pressure - right engine - no indication
(red line is 38 in. Hg)

The attitude indicator indicated a 32- to 34-degree nose-down attitude with a 20- to 30-degree left bank.

The digiflo fuel gauge indicated that 25.9 imperial gallons of fuel had been used and 168 imperial gallons were remaining at the time of the accident. No indication of the fuel flows from the engine could be obtained. The flap selector was found in the down position and the flap indicator was at 15 degrees flap down. Examination of the wing flap extension actuator indicated that no flap was down. The landing gear handle was found in the up position and the landing gear motor was in the full-travel up position, as was the actual landing gear.

The fuel selectors located on the cockpit floor between the two front seats were both in the crossfeed position. Both fuel selector valves in the wings were in the off or full-travel position. Both of the fuel boost pump switches were selected on. The fuel system of the aircraft was compromised during the impact; however, small residual samples of fuel trapped in the fuel lines and fuel system components were collected and tested. The fuel tested was found to be clean and was the proper 100 low lead aviation gasoline for this aircraft.

The alternator switches, battery switch, and right landing light switch were found in the on position. The two rotary magneto switches were both found in the "both" position. The left electrical loadmeter indicated 0.4 on the loadmeter scale. The right loadmeter had no visible indication.

2.0 Analysis

2.1 Introduction

The investigation revealed that both the pilot and co-pilot were properly licensed and qualified, and the aircraft was serviceable for the flight.

2.2 The Power Loss

In consideration of the recent maintenance history of the aircraft, the engines were inspected and test runs were conducted to determine what could have caused a total or partial power loss on one or both of the engines. The engine test runs indicated that both engines were capable of producing full power even when tested in an almost "as recovered" condition. Based on the inspection of the engines and their performance during the test runs, the cause of the total or partial power loss on one or both of the engines could not be duplicated or determined.

The examination of the left propeller engine flange, the right propeller, and available cockpit engine instruments indicated that neither propeller was feathered at impact and that the left engine was producing at least partial power. The impact mark on the right engine tachometer indicated that the right propeller was at 2,450 rpm at impact.

It is most likely that the power loss experienced by the pilot was not caused by a mechanical malfunction of the engines.

2.3 Aircraft Performance

Although the nature and source of the power loss experienced by the pilot could not be determined, the examination of the radar data did reveal several key aspects about the aircraft's performance.

The radar data indicated that the initial climb was normal to 1,050 feet asl, at which time the ground speed decreased. This could have occurred when the pilot was reducing to climb power. Since the aircraft's rate of climb was a constant 1,000 fpm, the airspeed would have decreased as a result of the lower power setting.

The aircraft momentarily levelled off at 1,200 feet asl. When the pilot made his first call to the departure controller through about 1,300 feet asl, he did not indicate that he was having any engine problems. Therefore, it is unlikely that the momentary level-off at 1,200 feet asl was a result of the engine failure or the loss of power.

Since the pilot had difficulty with IFR flight, he may have found it advantageous to use the autopilot at this busy time of the flight. The momentary level-off could have been caused by the pilot engaging the autopilot if the autopilot was set for level flight. If the pilot then activated the autopilot trim wheel for a climb, this could explain the climb from 1,200 feet asl to 1,500 feet asl with a constant rate of climb of 1,000 fpm while the airspeed remained low. If the autopilot was engaged, the pilot would have been free to call the departure controller, complete his after take-off checks, and adjust the power settings.

If the pilot or co-pilot leaned the mixtures using the newly installed Shadin Digiflo-L fuel management system during this part of the climb, a power loss situation may have inadvertently occurred. If the mixtures were reduced to a fuel flow setting appropriate to the smaller 285 hp engines of the aircraft that the pilot owned and was familiar with, then, given the greater fuel flow required by the 310 hp engines on the accident aircraft, it is possible that the accident aircraft could have lost partial or total power on one or both engines. If this occurred, and the aircraft autopilot was engaged, the pilot may have been distracted in dealing with the engine malfunction and not have noticed the airspeed decrease. The radar data indicated that, at 1,500 feet asl, the aircraft descended rapidly with no increase in groundspeed; this could have resulted from the overweight aircraft stalling.

The aircraft descended to 600 feet asl before the rate of descent was arrested, then a 1,000 fpm climb was briefly re-established as the aircraft climbed to an altitude of 900 feet asl and the ground speed decreased to 83 knots. Passing through 800 feet asl, the pilot informed the departure controller that he had an engine failure and wanted to immediately return to the airport. This was the last communication from the aircraft. The last radar target showed the aircraft was at 900 feet asl in a right turn. The overweight aircraft most likely stalled again, and the pilot had insufficient altitude to recover as it descended steeply out of control into Lake Ontario.

2.4 Weather Factors

The lowest cloud near the airport at the time of the occurrence was a scattered layer at 1,450 feet asl. The next layer of cloud was at 1,750 feet asl. Since the aircraft climbed to 1,500 feet asl, it is possible that the aircraft entered cloud. The visibility at the time was as low as four miles in fog. These weather conditions could have aggravated the pilot's ability to regain control of the aircraft; the lack of a discernible horizon would result in disorientation, particularly since the pilot had weak instrument flying skills.

3.0 Conclusions

3.1 Findings

1. The aircraft was 345.3 pounds above the maximum gross take-off weight when the flight departed, and the aircraft was operating outside of the approved weight and balance envelope at the time of the accident.

2. Both the pilot and co-pilot were properly licensed and qualified to fly the aircraft.

3. The aircraft was maintained in accordance with approved procedures and regulations.

4. The aircraft experienced a power loss during the initial climb-out. The extent and nature of the power loss was not determined; however, the power loss may have been induced by one of the pilots.

5. The pilot lost control of the overweight aircraft at 1,500 feet asl, while operating in cloud, and descended to 600 feet asl prior to regaining control of the aircraft. This was followed by a second loss of control at 900 feet asl.

6. Since the pilot had weak instrument flying skills, the weather conditions at the time of the occurrence may have aggravated the pilot's ability to recover the aircraft.

7. The aircraft struck the water in a steep, nose-down, left-wing-low attitude.

3.2 Causes

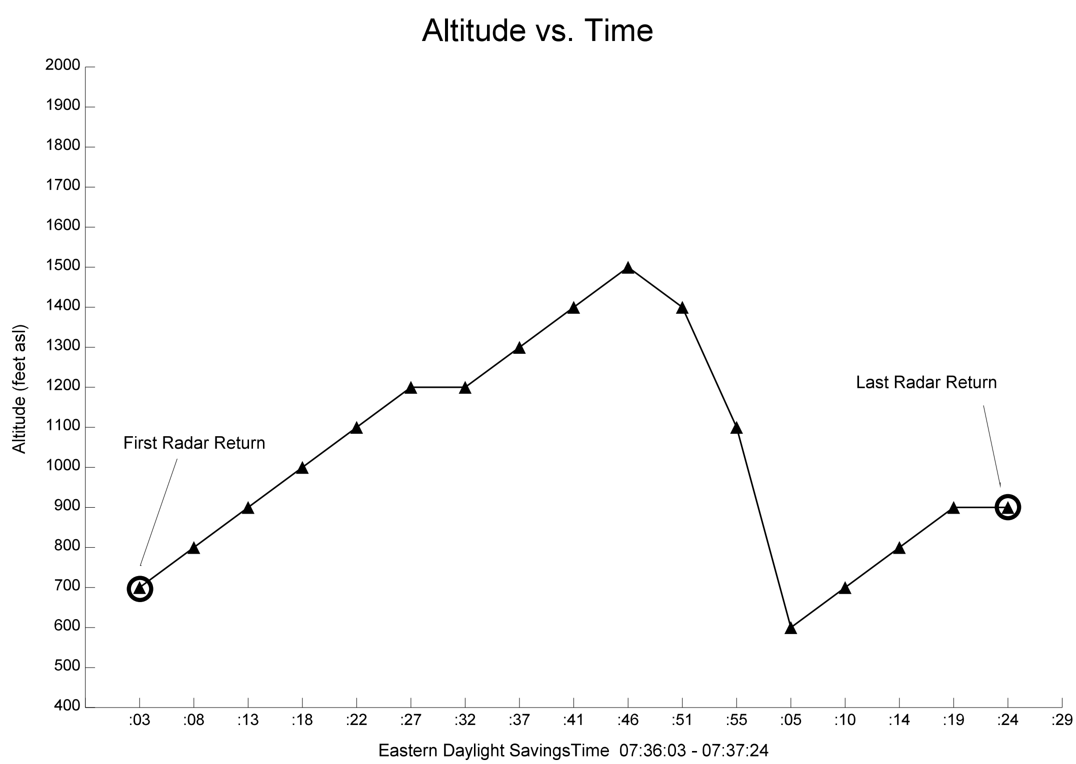
After experiencing a power loss during the initial climb-out, the pilot lost control of the overweight aircraft while attempting to return to the airport. The cause of the power loss was not determined; however, both engines were found to be capable of producing full power when tested.

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 June 1995.

Appendix A - Radar Flight Path Data



Appendix B - List of Supporting Reports

The following TSB Engineering Branch Laboratory Reports were completed:

LP 138/93 Fuel Sample Analysis;
LP 141/93 Instrument Analysis;
LP 152/93 Temperature Analysis - Exhaust Stack Material;
LP 5/94 Fuel Screen Contamination; and
LP 61/94 Fuel Flow Indicator.

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

Appendix C - Glossary

ACC	Area Control Centre
AFM	aircraft flight manual
agl	above ground level
AME	aircraft maintenance engineer
asl	above sea level
ATIS	automatic terminal information service
ATPL	Airline Transport Pilot Licence
DME	distance measuring equipment
EDT	eastern daylight saving time
fpm	feet per minute
GPS	global positioning system
hr	hour(s)
IAS	indicated airspeed
IFR	instrument flight rules
in. Hg	inches of mercury
lb	pound(s)
LED	light emitting diode
N/A	not available
NDB	non-directional beacon
nm	nautical miles
PPL	Private Pilot Licence
rpm	revolutions per minute
SID	standard instrument departure
STC	supplemental type certificate
TIT	turbine inlet temperature
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VOR	very high frequency omni-directional range
°	degrees
'	minutes
"	seconds

TSB OFFICES

HEAD OFFICE

HULL, QUEBEC*
Place du Centre
4th Floor
200 Promenade du Portage
Hull, Quebec
K1A 1K8
Phone (819) 994-3741
Facsimile (819) 997-2239

ENGINEERING
Engineering Laboratory
1901 Research Road
Gloucester, Ontario
K1A 1K8
Phone (613) 998-8230
24 Hours (613) 998-3425
Facsimile (613) 998-5572

*Services available in both official languages

REGIONAL OFFICES

ST. JOHN'S, NEWFOUNDLAND
Marine
Centre Baine Johnston
10 Place Fort William
1st Floor
St. John's, Newfoundland
A1C 1K4
Phone (709) 772-4008
Facsimile (709) 772-5806

GREATER HALIFAX, NOVA SCOTIA*
Marine
Metropolitain Place
11th Floor
99 Wyse Road
Dartmouth, Nova Scotia
B3A 4S5
Phone (902) 426-2348
24 Hours (902) 426-8043
Facsimile (902) 426-5143

MONCTON, NEW BRUNSWICK
Pipeline, Rail and Air
310 Baig Boulevard
Moncton, New Brunswick
E1E 1C8
Phone (506) 851-7141
24 Hours (506) 851-7381
Facsimile (506) 851-7467

GREATER MONTREAL, QUEBEC*
Pipeline, Rail and Air
185 Dorval Avenue
Suite 403
Dorval, Quebec
H9S 5J9
Phone (514) 633-3246
24 Hours (514) 633-3246
Facsimile (514) 633-2944

GREATER QUÉBEC, QUEBEC*
Marine, Pipeline and Rail
1091 Chemin St. Louis
Room 100
Sillery, Quebec
G1S 1E2
Phone (418) 648-3576
24 Hours (418) 648-3576
Facsimile (418) 648-3656

GREATER TORONTO, ONTARIO
Marine, Pipeline, Rail and Air
23 East Wilmot Street
Richmond Hill, Ontario
L4B 1A3
Phone (905) 771-7676
24 Hours (905) 771-7676
Facsimile (905) 771-7709

PETROLIA, ONTARIO
Pipeline and Rail
4495 Petrolia Street
P.O. Box 1599
Petrolia, Ontario
N0N 1R0
Phone (519) 882-3703
Facsimile (519) 882-3705

WINNIPEG, MANITOBA
Pipeline, Rail and Air
335 - 550 Century Street
Winnipeg, Manitoba
R3H 0Y1
Phone (204) 983-5991
24 Hours (204) 983-5548
Facsimile (204) 983-8026

EDMONTON, ALBERTA
Pipeline, Rail and Air
17803 - 106 A Avenue
Edmonton, Alberta
T5S 1V8
Phone (403) 495-3865
24 Hours (403) 495-3999
Facsimile (403) 495-2079

CALGARY, ALBERTA
Pipeline and Rail
Sam Livingstone Building
510 - 12th Avenue SW
Room 210, P.O. Box 222
Calgary, Alberta
T2R 0X5
Phone (403) 299-3911
24 Hours (403) 299-3912
Facsimile (403) 299-3913

GREATER VANCOUVER, BRITISH COLUMBIA
Marine, Pipeline, Rail and Air
4 - 3071 Number Five Road
Richmond, British Columbia
V6X 2T4
Phone (604) 666-5826
24 Hours (604) 666-5826
Facsimile (604) 666-7230