

AVIATION OCCURRENCE REPORT

RUNWAY EXCURSION

**BEARSKIN LAKE AIR SERVICE LTD.
FAIRCHILD SA227-AC METRO III C-FFZN
NORTH BAY AIRPORT, ONTARIO
23 FEBRUARY 1994**

REPORT NUMBER A94O0055



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.

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Bearskin Lake Air Service Ltd.
Fairchild SA227-AC Metro III C-FFZN
North Bay Airport, Ontario
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Synopsis

Bearskin flight 372, a Fairchild SA227-AC aircraft, was on a regular scheduled passenger flight, carrying 16 passengers and a crew of two from Sudbury, Ontario, to North Bay. During the landing roll on runway 08 at North Bay, the aircraft went off the left side of the runway into deep snow. The aircraft No. 1 engine and propeller were damaged. The crew and passengers were not injured.

The Board determined that a frozen left brake prevented the left wheels from rotating during the landing roll, which led to loss of directional control and the aircraft going off the left side of the runway.

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
1.6.1 Aircraft	2
1.6.2 Aircraft Brake System	2
1.7 Meteorological Information	3
1.7.1 Sudbury Weather Observation	3
1.7.2 North Bay Weather Observation	3
1.8 Aerodrome Information	3
1.9 Flight Recorders	3
1.10 Wreckage and Impact Information	3
1.10.1 Runway	3
1.10.2 Engines and Propellers	3
1.10.3 Landing Gear Wheels and Tires Examination	3
2.0 Analysis	5
2.1 The Approach	5
2.2 Main Landing Gear Wheels	5
2.2.1 Left Landing Gear	5
2.2.2 Right Landing Gear	5
2.3 Loss of Directional Control	5
3.0 Conclusions	7
3.1 Findings	7
3.2 Causes	7
4.0 Safety Action	9
5.0 Appendices	
Appendix A - List of Supporting Reports	11
Appendix B - Glossary	13

1.0 Factual Information

1.1 History of the Flight

The Metro III aircraft, C-FFZN, operating as Bearskin flight 372, departed from Sudbury, Ontario, at 1847 eastern standard time (EST) on a regular scheduled domestic passenger flight to North Bay carrying two crew members and 16 passengers. The flight was conducted in accordance with instrument flight rules at an altitude of 9,000 feet above sea level (asl).

The co-pilot was seated in the right seat and was at the controls. Upon arrival in the North Bay area, the flight was radar vectored for an instrument landing system (ILS) straight-in approach to runway 08 at the appropriate altitudes and in a routine manner. The crew flew the approach at the appropriate airspeeds for the weight and flight conditions for the aircraft.

Touchdown was at the threshold of the runway at or near the runway centre line, at the correct airspeed and with the aircraft in the correct landing configuration. As the main landing gear wheels contacted the runway on touchdown, the aircraft nose pitched down abruptly and the aircraft began to veer to the left. The co-pilot applied heavy right brake and reverse thrust on the right engine, but was unable to prevent the aircraft from going off the left side of the runway into deep snow.

There were no injuries to the two crew members and the 16 passengers. Emergency evacuation was not required. The passengers exited the aircraft through the normal cabin exit airstair door and were transported to the airport terminal in airport van vehicles.

The incident occurred at the North Bay Airport, latitude 46°21'N, longitude 79°25'W, at an elevation of 1,215 feet asl, during the hours of darkness at 1915 EST.

1.2 Injuries to Persons

Crew	Passengers	Others	Total
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Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	2	16	-	18
Total	2	16	-	18

1.3 Damage to Aircraft

The aircraft No. 1 engine and propeller were damaged.

1.4 Other Damage

None.

1.5 Personnel Information

	Pilot-in-Command	Co-Pilot
Age	29	36
Pilot Licence	ATPL	ATPL
Medical Expiry Date	01 Feb. 1995	01 May 1994
Total Flying Time	6,100 hr	6,050 hr
Total on Type	1,043 hr	2,300 hr
Total Last 90 Days	250 hr	150 hr
Total on Type Last 90 Days	250 hr	150 hr
Hours on Duty Prior to Occurrence	13.5 hr	13.5 hr
Hours off Duty Prior to Work Period	>72 hr	>72 hr

The flight crew was certified and qualified for the flight in accordance with existing regulations.

1.6 Aircraft Information

Particulars	
Manufacturer	Fairchild Aircraft Corporation
Type	SA227-AC
Year of Manufacture	1991
Serial Number	AC-785B
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	3,265 hr
Engine Type (number of)	Garrett TPE 331-11U-612G (2)
Propeller/Rotor Type (number of)	McCaughey 4HFR34C652-F (2)
Maximum Allowable Take-off Weight	16,000 lb
Recommended Fuel Type(s)	Jet A, Jet A-1, Jet B, JP-1, JP-4, JP-5, and JP-8.
Fuel Type Used	Unkno wn

1.6.1 Aircraft

The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures. There were no recorded deferred aircraft maintenance items relevant to the circumstances of the occurrence.

The weight at the time of the landing was below the maximum landing weight for the aircraft. A landing weight of 15,500 pounds was used to compute the approach and landing speeds for the aircraft. The approach was flown at an airspeed of 134 knots with 20 degrees of flap extended. Touchdown speed was 113 knots with full flap extended. The crew reported that the aircraft landing lights were on.

1.6.2 Aircraft Brake System

The aircraft was equipped with dual-rotor, hydraulic-operated, multi-disk wheel brakes manufactured by Aircraft Braking Systems (ABS), formerly Goodyear Aerospace. The multi-disk brake assemblies are located between the dual wheels on the main landing gear. There are no means to prevent blowing snow from entering the brake disk area. The brake system was not power assisted nor did it incorporate anti-skid.

Operation of brakes is accomplished by applying toe pressure to the top of the rudder pedals. The brakes can be operated from either the left or the right seat of the aircraft through the dual rudder pedal system.

Normal rotation of the wheels during taxi, take-off, and landing causes the wheels and brake assemblies to heat up. Use of the brakes during these operations causes further heat buildup on the brake assemblies. Snow entering the warm brake assembly area will melt and form water. When the brake assemblies cool down with water adhering to them in temperatures below freezing, the water turns to ice, causing the brakes to bind and thus preventing the wheels from rotating.

From conversation with the crew of the occurrence aircraft and other crews operating this model of aircraft, it was evident that crews frequently encountered frozen main wheel brakes that prevented the aircraft main wheels from rotating. This usually occurred after a short stopover, when the crews attempted to taxi off the ramp after taxiing in during low temperatures with blowing snow or snow-covered taxiways.

The flight crew reported that they suspected the right brake was frozen when they taxied from the ramp at Sudbury; however, the brake released with the addition of extra power to commence the taxi. They did not report any other brake abnormalities until touchdown at North Bay.

1.7 Meteorological Information

1.7.1 Sudbury Weather Observation

The Sudbury weather reported at the time the aircraft departed was precipitation ceiling 1,100 feet obscured, visibility three-quarters of a mile in light snow, with the wind from 050 degrees at 23 knots. Temperature and dew point were minus 13 degrees Celsius and minus 18 degrees Celsius respectively.

1.7.2 North Bay Weather Observation

The North Bay 1915 EST special weather observation reported a precipitation ceiling sky obscured at 200 feet above ground level (agl), visibility one-quarter of a mile in moderate snow and blowing snow, and the wind from 080 degrees at 19 knots gusting 25 knots.

1.8 Aerodrome Information

The active runway was 08. It is oriented 076 degrees magnetic and is 10,000 feet long by 200 feet wide. The asphalt surface was reported ploughed to full width and was 30 per cent bare and dry, 70 per cent snow drifts to a depth of one inch. The runway condition report was broadcast to the flight crew while the flight was on approach.

1.9 Flight Recorders

The flight data recorder (Fairchild model F1000, serial number 00266) and the cockpit voice recorder (B&D, serial number AO1315) were removed from the aircraft after the occurrence and forwarded to the TSB Engineering Branch Laboratory for readout and analysis of the data.

1.10 Wreckage and Impact Information

1.10.1 Runway

A dual black scuff mark began approximately 2,300 feet in from the runway threshold and 26 feet left of the runway centre line; it extended 664 feet down the runway, at which point it went off the left side of the runway.

The scuff mark, although intermittent, formed a continuous line that arced from the beginning until it went off the left side of the runway.

There were no other marks on the runway that were considered relevant to flight 372 (C-FFZN).

1.10.2 Engines and Propellers

There was external damage to the No. 1 engine. The four blades on the No. 1 propeller were bent and curled. There was no damage to any of the leading edges of the four blades. The blades were in the feathered position. There was no damage to the No. 2 engine or propeller.

1.10.3 Landing Gear Wheels and Tires Examination

Both tires on the left dual main landing gear wheels had flat spots worn through to the tire cords. There was no other damage to the wheels or tires, and the tires showed little wear. Workers who recovered the aircraft from the side of the runway reported that the left main wheels would not rotate until after they applied heat to them from a portable aircraft heater.

The tires on the right main landing gear were undamaged and were in good condition. There was no evidence of binding or discrepancies found with the right main landing gear wheel or brake assembly.

2.0 *Analysis*

2.1 *The Approach*

The aircraft was operating in below freezing temperatures, with snow and blowing snow conditions on the ground at both the departure and the arrival airports. The aircraft was radar-vectoring in a routine manner. The crew flew a stabilized straight-in ILS approach at the appropriate altitudes and airspeeds. The aircraft was in the correct landing configuration and at the appropriate airspeed when it touched down on the threshold, at or near the runway centre line.

2.2 *Main Landing Gear Wheels*

2.2.1 *Left Landing Gear*

The rapid rate at which the nose of the aircraft dropped after the main landing gear wheels contacted the runway, the continuous black scuff mark along the runway surface from near the point of touchdown, and the flat spots worn on both tires of the dual wheel left landing gear, all indicate that the left main landing gear wheels did not rotate from the time the aircraft landed until it went off the runway into the snow.

The left main landing gear wheels would not rotate when maintenance crews attempted to tow the aircraft back onto the runway. However, applying heat to the brake assembly for several minutes allowed the wheels to rotate freely, indicating that the brakes were frozen and caused the wheel to bind. No other discrepancies were found with the left wheels or brake assembly.

As there are no means to prevent blowing snow from entering the brake disk area, it is likely that, during the departure from Sudbury, snow had blown onto the warm brake surfaces, melted, and then frozen either en route to North Bay or when the crew lowered the landing gear in the cold slipstream prior to landing.

2.2.2 *Right Landing Gear*

There was no evidence of binding or discrepancies found with the right main landing gear wheel or brake assembly. The crew reported heavy application of the right brake when the aircraft veered to the left on the landing roll. However, there was no evidence

either on the right tires or on the runway surface to indicate brake activation on the right side during the landing roll. It was not determined why the right brake appeared not to function during the landing roll.

2.3 *Loss of Directional Control*

The left main wheels were frozen and did not rotate during the landing roll, leading to loss of directional control of the aircraft on the ground.

3.0 *Conclusions*

3.1 *Findings*

1. The aircraft was operating in below freezing temperatures with snow and blowing snow conditions on the ground at the departure and arrival airports.
2. The aircraft left main landing gear brake froze, preventing the left wheels from rotating during the landing roll.
3. It was not determined why the right brake appeared not to function during the landing roll.
4. Directional control of the aircraft was lost during the ground roll, and the aircraft went off the left side of the runway.
5. The flight crew was certified and qualified for the flight in accordance with existing regulations.
6. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

3.2 *Causes*

A frozen left brake prevented the left wheels from rotating during the landing roll. Directional control of the aircraft was lost during the ground roll, and the aircraft went off the left side of the runway.

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 Gerald E. Bennett, Zita Brunet, the Hon. Wilfred R. DuPont and Hugh MacNeil, authorized the release of this report on 14 October 1994.

Appendix A - List of Supporting Reports

The following TSB Engineering Branch Laboratory reports were completed:

LP 29/94 - Flight Data Recorder; and
LP 30/94 - Cockpit Voice Recorder.

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

Appendix B - Glossary

ABS	Aircraft Braking Systems
agl	above ground level
asl	above sea level
ATPL	Airline Transport Pilot Licence
CVR	cockpit voice recorder
EST	eastern standard time
hr	hour(s)
ILS	instrument landing system
lb	pound(s)
TSB	Transportation Safety Board of Canada
°	degrees