Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A03A0012

LOSS OF DIRECTIONAL CONTROL

CANJET AIRLINES

BOEING 737-200 C-FGCJ

HALIFAX INTERNATIONAL AIRPORT, NOVA SCOTIA

02 FEBRUARY 2003

Canada

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 Investigation Report

Loss of Directional Control

Canjet Airlines
Boeing 737-200 C-FGCJ
Halifax International Airport, Nova Scotia
02 February 2003

Report Number A03A0012

Summary

Canjet Airlines flight 184 (CJA184), a Boeing 737, serial number 22352, registration C-FGCJ, was on a scheduled passenger flight from Ottawa to Halifax International Airport, Nova Scotia. At approximately 2107 Atlantic standard time, Moncton Area Control Center cleared the flight for the instrument landing system (ILS) approach for Runway 15. The automatic terminal information system (ATIS) report indicated that the ceiling at the airport was approximately 100 feet agl. During the descent, the crew were advised that the runway visual range (RVR) was 2200 feet with the lights on strength five.

On landing, the pilot lost directional control of the aircraft after touchdown. The aircraft drifted to the left of the runway centreline, with the left wheel near the edge of the runway, before the captain regained directional control. After the incident, passengers were deplaned normally at the assigned gate. There were no injuries, and the aircraft was undamaged. The incident took place at 2113 Atlantic standard time in the hours of darkness.

Ce rapport est également disponible en français.

Other Factual Information

The captain had flown a total of 12 800 hours with 1500 hours on the Boeing 737. The first officer had approximately 7500 hours total flying experience of which 800 hours were on the Boeing 737.

The first officer flew a stabilized, coupled ILS approach using the auto-pilot. On final approach, the captain acquired visual contact with the approach lights at 300 feet above ground level (agl), the runway threshold lights at 200 feet agl, and several runway edge lights at 100 feet agl. At about 200 feet agl, the captain advised the first officer that the aircraft was to the right of the extended runway centreline. Not seeing a response, the captain took control of the aircraft at approximately 100 feet agl. At that moment, there was a strong gust of wind from the right, and the aircraft drifted left of the extended centreline. The captain applied a correction; however, at around 50 feet the visibility suddenly deteriorated due to ground fog. At this point, the aircraft was in a low-energy state. An attempt to commence a go-around or balked landing while in the low-energy landing regime is a high-risk manoeuver[1]. The ground fog made it difficult to see the runway centreline markings; however, the captain retained visual references with the runway edge lights. The aircraft touched down at 2113 Atlantic standard time[2] (AST) on the right main gear with the aircraft fuselage estimated to be slightly left of the runway centreline and nearly aligned with the runway heading.

The speed brakes deployed automatically when the right main gear compressed. The left main gear then touched, followed by the nose gear. Immediately after touchdown the aircraft heading increased to nine degrees right of the runway heading. Reverse thrust was then selected and used. There was another strong gust and the aircraft continued to drift left. Right rudder, right differential braking, and nosewheel steering were used in attempting to correct the aircraft's track. As the aircraft continued to drift left, the captain brought the reverse thrust on both engines back to the idle detent and continued to apply right differential braking.

Maximum reverse thrust was applied on the number 2 (right) engine. Directional control was regained and the aircraft was brought back to the runway centre and stopped. After assessing that there was no obvious damage, the aircraft was taxied to the assigned terminal gate where the passengers were deplaned.

Prior to the initiation of the approach, the crew received the automatic terminal information system report, which indicated that the cloud ceiling at the airport was approximately 100 feet agl. During the descent, the crew were advised that the RVR was 2200 feet with the lights on strength five, the surface wind was 190°M at 12 gusting to 19 knots, and the outside air temperature was 2°C. A runway surface condition (RSC) report for Runway 15, valid at 1756 AST, indicated that 180 feet of the 200-foot-wide runway was 100% bare and wet

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1 Transport Canada Commercial and Business Aviation Advisory Circular (CBAAC) No. 0141 - Low Energy Hazards/Balked Landing/Go Around

2 All times are Atlantic standard time (Coordinated Universal Time minus four hours) unless otherwise noted.

and the remaining portion was 50% bare and wet and 50% compact snow. Only light drizzle was reported at the airport between the time the RSC was taken and the time that CJA184 landed.

As all aircraft systems were operating normally, the TSB did not conduct a technical inspection of the aircraft after the occurrence. After the incident company personnel inspected the aircraft. The tires were found to be within wear limits, and there was no indication of hydroplaning damage (flat spots or reverted rubber damage) on any of the tires.

Runway 15 at Halifax is 7700 feet long and 200 feet wide. It has a smooth (not grooved) asphalt surface. The runway is equipped with high intensity simplified short approach lighting with runway alignment indicator lights (SSALR). The runway is not equipped with centreline lighting. Canadian runways are tested to ensure that they meet minimum friction requirements. The runways at Halifax were last checked on 15 August 2002. This testing showed that the average frictions on both runways were well above the minimums required.

Runway 24 is equipped with Category II, high-intensity approach lighting, touchdown zone lighting, and centreline runway lighting. Runway 24 would normally have been preferred for the approach and landing because of superior approach and runway lighting. Runway 24 was closed, however, because of the pooling of water on the southeastern side of the runway. Heavy rain and warm temperatures earlier that day had resulted in a substantial snow melt and excess water on the airfield. Also, a collection pond on the south side of Runway 24 overflowed, adding to the already high ground water level. The drainage system for Runway 24 was not able to accommodate the excess water, which resulted in flooding of the southeastern side of the runway. Flooding of this portion of Runway 24 is not common. The runway was closed one other time in the same winter season because of standing water.

A RSC report for Runway 15, taken after the occurrence at 2228 AST, indicated that 180 feet of the runway centreline was 100% bare and wet with the remaining outer portion 50% bare and wet and 50% ice. After the occurrence, there were no visible tire marks on or near the runway to indicate the aircraft's track or whether a runway excursion had occurred. Therefore, it could not be determined if the left main wheels had gone off the runway surface.

When the flight data recorder (FDR) was removed from the aircraft, it was discovered that the installed FDR was a Fairchild F800, not the required Fairchild F1000. The Fairchild F800 FDRs were included in the parts inventory when the aircraft were leased from the United States. The FDR was then sent to the TSB Engineering Branch for analysis. It was found that only four parameters were being recorded instead of the required 18 parameters. The only information captured was magnetic heading, indicated airspeed, altitude, and radio keying. After the installation error was discovered the operator immediately checked the remainder of the fleet. One other Boeing 737 with a Fairchild F800 FDR was found, and there was one more Fairchild F800 FDR in the parts inventory.

The aircraft's cockpit voice recorder (CVR) was sent to the TSB Engineering Branch for analysis. The CVR had been overwritten after the occurrence and contained no relative information.

The Boeing 737 *Aircraft Operating Manual* contains a section titled "Landing on Wet or Slippery Runways." In this section, the use of reverse thrust and crosswinds is discussed:

> *"Reverse Thrust and Crosswind*
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> *The reverse thrust side force and a crosswind can cause the airplane to drift to the downwind side of the runway if the airplane is allowed to weathervane into the wind. As the airplane starts to weathervane into the wind, the reverse thrust side force component adds to the crosswind component and drifts the airplane to the downwind side of the runway. Main gear tire cornering forces available to counteract this drift will be reduced when the antiskid system is operating at maximum braking effectiveness for existing conditions. To correct back to the centreline, reduce reverse thrust to reverse idle and release the brakes. This will minimize the reverse thrust side force component without the requirement to go through a full reverser actuating cycle, and provide the total tire cornering forces for realignment with the runway centreline. Use rudder, steering, and differential braking, as required to prevent overcorrecting past the runway centreline. When re-established on the runway centreline, reapply steady brakes and reverse thrust as required to stop the airplane."*

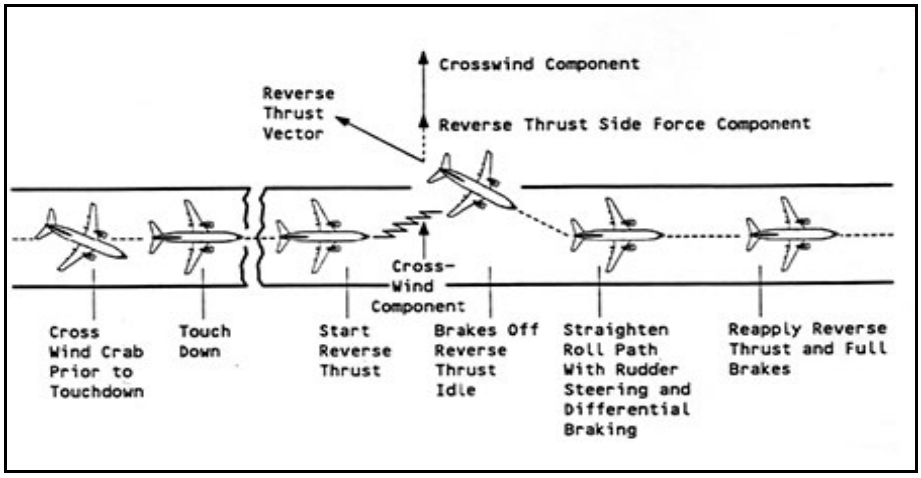

Figure 1. Reverse Thrust on Slippery Runways With Crosswind

Reverse thrust side force component is discussed during simulator training sessions. The issue is also part of the operator's yearly winter operations primer. Limitations of the current 737 simulator prevent the procedure from being demonstrated or practised.

Analysis

The crew acquired visual contact with the runway environment at 100 feet above the decision height. Up to this point, the approach was stable and the crew were making relatively minor corrections. The captain took control, not because of reduced visibility, but because the first officer did not respond immediately to his verbal direction. The captain had ample opportunity prior to this to assess the aircraft flight path. The crew's difficulty seeing the runway centerline markings in the final moments, after the aircraft was in the low-energy regime, combined with sudden heavy wind gusts, prevented the crew from detecting and correcting the aircraft's drift.

The captain had other visual references and felt that the aircraft landed slightly left of the runway centerline. As the aircraft was already in the low-energy regime, and a go-around would have been a high-risk manoeuver, the captain continued the approach to landing.

The absence of hydroplaning-related damage to the tires and the lack of standing water on the runway suggests that hydroplaning did not occur and was not the reason for the loss of directional control. Immediately after touchdown the aircraft weather vaned. It is likely that the combination of drift, reverse thrust, crosswind, and the wet runway resulted in the aircraft drifting to the downwind side of the runway, as stated in the Boeing operating manual.

The Boeing 737 aircraft operating manual procedure of releasing wheel brakes and placing the reverse thrust to idle to regain directional control was not precisely followed. The captain continued to apply maximum right wheel braking throughout the loss of directional control. The continued application of right wheel braking may have delayed the recovery of directional control.

The standing water on Runway 24 prevented flight crews from using the best-equipped and most-desirable runway for arrivals and departures. The superior approach and centerline runway lighting on Runway 24 would have afforded the crew better visual cues to detect and correct for drift earlier during the approach to landing. The pooling of water is likely to occur during adverse weather conditions, and renders the best-equipped runway unusable, precisely when it is needed most. The closing of Runway 24 for this type of flooding occurs infrequently and does not pose a reoccurring problem with flight operations.

The installation of an incorrect FDR prevented the TSB from completely assessing the aircraft's flight parameters during the incident. Although not critical in this instance, in a more serious incident the loss of data could be crucial.

The following TSB Engineering Laboratory Report was completed:

LP 014/2003—FDR Analysis.

Findings as to Causes and Contributing Factors

1. The crew's visual cues were degraded in the final moments of the approach because of a layer of ground fog, preventing them from detecting and correcting the aircraft's left drift prior to touchdown.

2. It is likely that a combination of drift, reverse thrust, strong gusting crosswind, and the wet runway resulted in the loss of aircraft directional control, and the continued application of right wheel braking throughout the loss of control may have delayed recovery of directional control.

Other Findings

1. The standing water on Runway 24 prevented crews from using the best-equipped and most desirable runway for landing.

2. The installed FDR was the incorrect model for the aircraft and most of the required parameters were not being recorded.

Safety Action Taken

On 04 February 2003, the operator replaced the installed Fairchild F800 FDRs with the approved models. The operator has initiated a receiving inspection system for FDRs, and regular inventory audits will be completed to ensure that the correct spare parts are in stock.

As of 25 September 2003, the Halifax International Airport Authority had completed maintenance and modification on the drainage system around Runway 24 and on the collection pond. This included remedial work on the Runway 24 drainage system and installation of a water level alarm system and a remote pump shut-off switch to help control the water level in the collection pond. In addition, when weather forecasters are predicting heavy rain, airport authority personnel will shut off the pumps at the start of the rainfall.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 03 March 2004.