AVIATION INVESTIGATION REPORT
A02C0072

RUNWAY EXCURSION

PERIMETER AIRLINES (INLAND) LTD.
SWEARINGEN SA226-TC METRO II C-GIQF
WINNIPEG, MANITOBA
16 APRIL 2002

Aviation Investigation Report

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Summary

Perimeter 610, a Swearingen SA226-TC Metro II, C-GIQF, serial number TC279, was on a scheduled flight, under instrument flight rules, from St. Theresa Point to Winnipeg, Manitoba, with 2 pilots and 13 passengers on board. The crew was anticipating a visual approach to Runway 36 at Winnipeg International Airport but, because of conflicting traffic, accepted vectors for the instrument landing system (ILS) approach to Runway 13. At approximately 1908 central daylight time, the aircraft landed to the right of the runway centreline, then drifted further right and departed the runway surface, damaging a runway edge light, a taxiway edge light, and a runway identification sign. It then travelled 1150 feet through the infield and came to rest near the intersection of Runways 13/31 and 18/36. There were no reported injuries. The aircraft's left engine (Garrett TPE 33) sustained damage from ingested mud and vegetation. The right wing, left wing, and fuselage were damaged when the aircraft struck the edge lights and the runway identification sign. After the aircraft stopped, the crew shut down the engines and advised the Winnipeg Airport air traffic controller of their position. The airport crash alarm was activated and emergency response personnel responded.

Ce rapport est également disponible en français.

Other Factual Information

On arrival in the Winnipeg terminal area, the aircraft was cleared to descend to 6000 feet above sea level[1] (asl) and to proceed direct to the Winnipeg VOR. The Winnipeg automatic terminal information service (ATIS) indicated that Runway 36 was in use. Changing weather conditions during Perimeter 610's arrival period necessitated several runway changes for aircraft on approach to Winnipeg. The crew was in visual contact with the ground east of the airport, and planned to fly a visual approach to Runway 36. Thunderstorm activity to the south of the airport had precluded instrument approaches for Runway 36; however, visual approaches to Runway 36 were still possible. The arrival controller cleared Perimeter 610 to 4000 feet, reserving the airspace below this level for a possible overshoot by an aircraft landing on Runway 13. The altitude restriction would have required Perimeter 610 to initiate a steep descent to complete a visual approach to Runway 36.

Recognizing this, the arrival controller instructed Perimeter 610 to fly a heading of 310 °M on initial vectors for an approach to Runway 13. The crew had completed a descent check but they had not completed an instrument approach briefing or discussed what weather conditions would require the approach to be discontinued. During the ILS approach to Runway 13, the aircraft encountered increasing rain, low visibility, wind shear, and turbulence, and the crew had difficulty maintaining the required course and glide path on final approach. The flight plan alternate destination was Grand Forks, North Dakota. The crew did not take action to divert the flight to the alternate destination; during the latter part of the approach, an overshoot would have taken the aircraft into the active storm cell over the airport. The airport controller assumed control of the flight when it was on final approach, provided wind condition updates, and cleared the flight to land. The aircraft was not visible to the controllers in the Winnipeg control tower during or after the occurrence. The accident occurred during daylight hours, at 1908 central daylight time (CDT)[2]. Emergency response personnel arrived on scene within two minutes of the call from the aircraft crew to the airport controller. The response team consisted of the airport duty manager in a utility vehicle and fire-fighters in two fire trucks. The aircraft captain exited the aircraft and inspected the exterior; no fire was observed. Inspection revealed a minor fuel leak which had resulted from puncture damage to the left wing. A Winnipeg Airports Authority medical bus was deployed to the scene and the passengers and the first officer, who had remained on board the aircraft, were moved to the terminal area.

Winnipeg International Airport comprises two main runways, 18/36 and 13/31, and one secondary runway, 07/25. Runway 13 is 8700 feet long and 200 feet wide. The accident aircraft came to rest about 100 feet from the edge of the intersection of Runways 13/31 and 18/36.

The observed weather at Winnipeg International Airport at 1900 was as follows: winds 340°T at 11 knots gusting to 17 knots, visibility 10 statute miles in thundershowers and rain, overcast ceiling 1600 feet in cumulonimbus cloud, temperature 11°C, dewpoint 9°C, altimeter setting 29.32, remarks lightning in cloud. The observed weather at 1909 was as follows: winds 020°T at 14 knots, thunderstorms with visibility one statute mile in rain and hail measuring 15 millimetres in diameter. The aircraft came to rest about one-half statute mile from the control tower. The terminal forecast issued at 1742 was as follows: winds 050°T at 15 knots, scattered cloud at 1000 feet, overcast cloud at 2500 feet, temporarily visibility 5 statute miles in light showers and rain, probability 30 per cent chance of visibility one statute mile in heavy thundershowers and rain, broken cloud at 800 feet and overcast cumulonimbus cloud at 4000 feet. The airport controller observed a thundershower

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[1] Units are consistent with official manuals, documents, and instructions used by or issued to the crew.

[2] All times are CDT (Coordinated Universal Time minus five hours) unless otherwise noted.

approaching Winnipeg Airport while the accident aircraft was in the terminal area; however, light rain obscured the controller's view of the low cloud ceilings, heavy rain and hail which moved over the airport while the aircraft was on approach. Visibility from the control tower at the time of the accident was one-quarter to one-half statute mile in rain. The airport controller noted hail falling on the tower cab shortly before the aircraft landed and broadcast that information on the tower frequency. Because of the limited visibility, the controllers could not estimate the amount of hail accumulation on the runways.

The crew was qualified for the flight in accordance with current regulatory requirements. The captain had approximately 13 600 hours flight time, with 4200 hours on the Metro II aircraft type. The first officer completed his initial training on the Metro II aircraft type about three weeks before the accident. He had approximately 1800 hours flight time, with 110 hours on the Metro II aircraft type. The Perimeter Airline Standard Operating Procedures provide for pilot-monitored approaches in instrument meteorological conditions. However, the captain elected to fly this approach himself because of the first officer's limited experience on the Metro aircraft type. The first officer provided call-outs of airspeed, altitude, and track and performed the required checks as requested by the captain.

The crew planned an approach airspeed of 140 knots and a touchdown speed of 118 knots, with one-half flap extended. Radar information showed the aircraft's ground speed at touchdown was approximately 130 knots. With the average tailwind component during the approach and landing of approximately 9 knots, the indicated airspeed at touchdown would have been approximately 121 knots.

Hydroplaning is a phenomenon in which a film of water on a runway results in a partial or complete loss of tire-to-runway contact[3]. Hydroplaning is a function of water depth, speed, and, in the case of dynamic hydroplaning, tire pressure. Hydroplaning reduces the friction between the tire and the surface, and may result in a loss of braking or directional control. The main wheel tire pressure for the occurrence aircraft is 70 psi. According to the Transport Canada *AIP*, the minimum speed at which hydroplaning will commence for a non-rotating, bald tire with a pressure of 70 psi is approximately 65 knots (7.7 x sqrt of 70). Under hydroplaning conditions, a 10-knot crosswind can drift an aircraft off the side of a 200-foot runway in about 7 seconds. The average wind during the period from 1900 to 1909 had a crosswind component of approximately 12 knots and a tailwind component of approximately 9 knots. Light rubber deposits, consistent with viscous hydroplaning, were left on the runway surface by the aircraft tires.

The aircraft's records indicate that it was certified, equipped and maintained in accordance with existing regulations. No pre-existing aircraft technical deficiencies were identified. The aircraft's weight and centre of gravity were within approved limits throughout the flight.

The approach controller was using a radar data processing system (RDPS) situational display and the airport controller was using a Nav Canada auxiliary radar display system (NARDS). Both systems were designed to provide aircraft information; however, some weather information is also displayed. Doppler radar is an advanced radar which is designed to provide earlier prediction and detection of severe weather. By measuring the motion of precipitation within storms, it is able to provide radial velocity, microburst and shearline/gust data, along with other severe weather information. Doppler radar information was available for the Winnipeg area but it was not available on the display systems used by the approach or airport controllers. Winnipeg Airport was not equipped with wind shear detection equipment, nor was it required to be so equipped.

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[3] Transport Canada, *AIP Canada*, Section AIR, 1.6.5, TP2300.

The *Air Traffic Services Manual of Operations* (MANOPS) directs controllers to select the runway most closely aligned with the winds, with a maximum crosswind component of 15 knots on wet runways. The MANOPS also states that a maximum of 5 knots of tailwind is acceptable on a dry runway. These values are not limiting, provided that flight crews are given wind speed and direction information. The approach controller and the airport controller broadcast the changing wind conditions to aircraft crews during the relevant period. The MANOPS states that the final decision on the acceptability of a particular runway rests with the pilot. The approach and airport controllers did not have the authority to close the airport during adverse weather conditions. They would clear aircraft for operations in winds which exceeded the MANOPS guidelines if another runway was not available. The airport authority had the authority to close the airport or parts of the airport, subject to the notification requirements contained in the *Canadian Aviation Regulations* (CARs). The authority did not monitor the weather and runway situation to determine whether the guidelines contained in the MANOPS were being met, nor was it required to do so.

The operator's training program for Metro pilots did not include a formal course segment related to weather minima or operation of the aircraft's weather radar. New company pilots received instruction on the aircraft weather radar system during their line indoctrination training. The aircraft's weather radar system displayed rain in the area of the approach but the display was attenuated, in that rain immediately in front of the aircraft obscured the heavier rain further ahead.

Analysis

During their approach into Winnipeg, the crew encountered increasingly adverse weather conditions of rain, low visibility, wind shear, and turbulence. The crew anticipated a visual approach to land on Runway 36, because they were in visual contact with the ground and ATIS indicated that the active runway was Runway 36. They had not completed an instrument approach briefing when they received a short-notice clearance for an ILS approach to Runway 13. The approach change and the adverse weather conditions increased the crew's workload during the approach and made it more difficult for the crew to properly position the aircraft for landing. The crew continued the approach in deteriorating weather conditions and without the benefit of an instrument approach briefing. Because the captain flew the approach and did not initiate a pilot-monitored approach, he lost some supervisory overview of the situation. The aircraft landed on a wet runway with a crosswind, at a speed well above the minimum speed at which hydroplaning would be likely.

The weather radar display in the aircraft was attenuated and the air traffic controllers' radar displays contained limited weather information. As a result, the crew, and the air traffic controllers who were directing them, did not have an accurate picture of the severity of the weather in the terminal area. Doppler radar, which could have provided this information, was available for the Winnipeg area but not available to the controllers. The airport was not equipped with windshear detection equipment, and the controllers, therefore, did not have a direct indication of the windshear which accompanied the arrival of the storm cell over the airport.

The aircraft landed to the right of centre line, which increased the likelihood that it would depart the runway under the prevailing crosswind conditions. The amount of rain which had fallen likely provided a sufficient moisture film for aircraft hydroplaning, and the aircraft landed well above the speed at which hydroplaning can develop. It is likely that the crew lost directional control as the aircraft hydroplaned and moved off the side of the runway under the influence of the crosswind.

When weather conditions precluded instrument approaches for Runway 36, the airport controller arranged to use Runway 13. The tailwind at touchdown likely exceeded the MANOPS guidelines for operations on a wet

runway, and the crosswind at touchdown approached the limit in those guidelines. However, the approach controller and the airport controller broadcast the changing wind conditions to the crew during the approach in accordance with the MANOPS. The crosswind and tailwind conditions increased the likelihood that the aircraft would hydroplane after touchdown on Runway 13.

Findings as to Causes and Contributing Factors

1. The aircraft landed during heavy precipitation on a wet runway, and it likely hydroplaned, resulting in a loss of directional control and runway excursion.

2. The aircraft was cleared, on short notice, for an approach to a runway with a tailwind that exceeded the *Air Traffic Services Manual of Operations* (MANOPS) guidelines for operations on a wet runway, and was cleared to land with a crosswind that approached the limit in those guidelines.

3. The crew continued with an instrument approach in rapidly deteriorating weather conditions characterized by heavy rain, low visibility, wind shear, turbulence, and tailwind and crosswind components.

Findings as to Risk

1. Air traffic controllers at Winnipeg International Airport have limited access to weather information for the terminal area and runway environment. Doppler weather information was available for the Winnipeg area but it was not displayed by the systems available to the controllers.

2. Windshear detection equipment was not installed at Winnipeg International Airport: this was not a requirement.

Safety Action

After the occurrence, the operator, Perimeter Airlines (Inland) Ltd., added a crew resource management segment to its training programme for Metro pilots.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 09 December 2002.

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