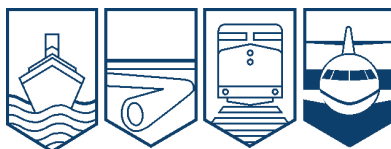


Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

**AVIATION INVESTIGATION REPORT
A07A0029**



RUNWAY EXCURSION

**VOLGA-DNEPR AIRLINES
ANTONOV AN 124-100 RA-82078
GANDER, NEWFOUNDLAND AND LABRADOR
31 MARCH 2007**

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

Runway Excursion

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Antonov AN 124-100 RA-82078

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Report Number A07A0029

Summary

On 31 March 2007, a Volga-Dnepr Airlines Antonov AN 124-100 (registration RA-82078, serial number 38718017006) was being operated as VDA 2100 on a flight from Greer, South Carolina, United States, to Gander, Newfoundland and Labrador. On arrival in Gander, the crew completed an approach to Runway 03/21. The aircraft touched down at 0216 Newfoundland daylight time but was unable to stop before reaching the end of the runway. It departed the left side of Runway 03/21 near the departure end and came to rest approximately 480 feet off the runway surface, facing the opposite direction. Several edge lights along the runway were broken. The nine crew members and ten passengers on board the aircraft exited without injury. Aircraft damage was limited to cuts in the aircraft tires.

Ce rapport est également disponible en français.

Other Factual Information

The operating crew on duty during the incident flight comprised one captain, the first officer, two flight engineers, one navigator, and the radio operator. Another captain, a flight engineer, and a navigator were also on board but were not operating as crew at the time. The flight crew members were appropriately licensed and certified for the flight. The operating captain, who was at the controls for the landing, had flown into Gander approximately 35 times previously.

The aircraft was within the prescribed weight and centre of gravity limits and there were no mechanical malfunctions with the aircraft.

There are two asphalt runways at the Gander Airport. Runway 03/21 is 10 200 feet long by 200 feet wide. There is a 0.34 per cent upslope when landing on Runway 03/21. Runway 13/31 is 8900 feet long by 200 feet wide. There is a 0.50 per cent downslope when landing on Runway 13/31. Runways 03/21 and 13/31 are each serviced by an instrument landing system (ILS) precision approach.

The Volga-Dnepr Airlines Flight 2100 (VDA 2100) had departed Greer, South Carolina, United States, at 2236 Newfoundland daylight time.¹ The en-route portion of the flight was uneventful. Before descent into Gander, it had been decided to approach and land on Runway 03/21, the longer of the two available runways. The Volga-Dnepr Airline crews, who were frequent visitors to Gander, usually used the longer runway if conditions permitted.



Photo 1. AN 124-100, registration RA-82078

Approaching Gander, the crew listened to the automatic terminal information service (ATIS) information “Oscar” for the Gander Airport issued at 0134. The ATIS broadcast included the following information: surface wind 325° true (T) at 2 knots; visibility 1¾ statute miles; ceiling 800 feet overcast; temperature -1°C, dew point -2°C; and that Runway 13/31 was the active runway. Also included in the ATIS was the 2306 runway surface condition (RSC) report which indicated that both runways were bare and wet on a 180-foot centreline. This RSC report, taken by Gander ground personnel, had been issued approximately two and one-half hours before the arrival of VDA 2100.

Radar vectors to the initial approach fix for a straight-in instrument landing system (ILS) approach to Runway 03/21 were requested by the crew.

¹ All times are Newfoundland daylight time (Coordinated Universal Time minus two and one-half hours) unless otherwise specified.

At 0204, 12 minutes before touchdown, the flight crew received the Gander 0202 special weather observation which contained the following: surface wind from 320°T at 2 knots; visibility 1¼ statute miles in light snow; ceiling broken at 600 feet, overcast at 1800 feet; temperature -2°C, dew point -2°C; and altimeter 29.49 inches of mercury. The English language ATIS would have been copied and then translated into Russian by the radio operator before being passed to the flight crew who at the time were preparing for the approach. The flight crew did not inquire whether or not a more recent RSC report was available and it could not be established if they were aware that snow was falling at Gander.

The crew carried out an autopilot-coupled straight-in ILS approach to Runway 03/21 and visually acquired the runway lights at about 600 feet above ground level. The autopilot was disengaged just before decision height. The aircraft was manually flown by the captain and the runway threshold was crossed at about 50 feet above ground level.

The touchdown airspeed was 140 knots (14 knots below the planned airspeed). The aircraft main landing gear touched down at approximately 3400 feet from the runway threshold which reduced the stopping distance available to 6800 feet. The normal touchdown point for aircraft landing off an ILS glide path is about 1000 feet beyond the runway threshold. Until the aircraft touches down, wheel braking, wing spoilers, and reverse thrust are not available to slow the aircraft.

About three seconds after touchdown, the aerodynamic wing spoilers were deployed and maximum reverse thrust was selected. Wheel braking was first applied by the captain, who was then assisted by the first officer. This brake application was initiated five seconds later than the planned brake application speed of 135 knots, leaving only 4800 feet of runway available for stopping the aircraft. Braking effectiveness was poor. The anti-skid system was functioning during the landing roll, indicating that there was low friction between the tires and runway surface.

Both the spoilers and thrust reversers remained deployed until the aircraft came to a stop. However, 17 seconds after touchdown, reverse thrust was reduced at 75 knots for a period of approximately 15 seconds before maximum reverse was re-applied and maintained until the aircraft came to a stop. The initial reverse thrust application was consistent with the technique used for previous landings, indicating normal actions by the crew. Thrust reversers for this aircraft have very little effect when used below 90 knots.

At 31 seconds after the touchdown, there was a marked decrease in the rate of deceleration without any apparent change in the aircraft's configuration. At this time, maximum reverse thrust was re-applied. No cause for the deceleration decrease could be determined.

During the latter part of the landing rollout, it became apparent that the aircraft would not stop on the runway. The aircraft was intentionally steered toward the left side of the runway to avoid colliding with ILS equipment located off the departure end of the runway. The aircraft departed the left edge of Runway 03/21, near the runway end at about 35 knots. The aircraft rotated to the left and came to rest approximately 480 feet from the runway end with the aircraft oriented nearly opposite to the direction of landing. The crew conducted an emergency shutdown during which they assessed that an immediate evacuation was not necessary.

The controller in the Gander control tower was notified of the overrun by airfield maintenance personnel at which point the controller activated the crash alarm. Airport rescue and fire fighting (ARFF) personnel responded to the aircraft with three vehicles from the airport fire station. The drivers of the vehicles encountered slippery driving conditions while en route to the aircraft. An RSC report issued at 16 minutes after the occurrence indicated that Runway 03/21 had a trace of wet snow on a 180-foot centreline. Snow removal personnel and equipment were only clearing and sweeping Runway 13/31 before the occurrence since it was the active runway.

Aircraft RA-82078, which was involved in the present occurrence, was also involved in a runway excursion incident at Trenton, Ontario, in 1996 (TSB report A96H0006). In 1998, another AN 124 aircraft operated by Volga-Dnepr Airlines was involved in a runway excursion during a landing on Runway 13/31 at Gander Airport. More recently, on 09 November 2007, RA-82078 landed long and was involved in another runway excursion at Gander Airport (TSB report A07A0135).

Runway friction at Gander is measured by a decelerometer mounted in a test vehicle. This instrument measures the decelerating forces acting on the vehicle when the brakes are applied. The instrument's readings are taken intermittently from the threshold to the end of the runway and from these readings an average is calculated. The readings taken are graduated in decimal increments from zero to 1.0 with 1.0 being the equivalent of a dry, hard surface runway and zero representing a runway that offers very little or no wheel-braking effectiveness, such as when completely covered in a smooth layer of ice. These numbers are referred to as the

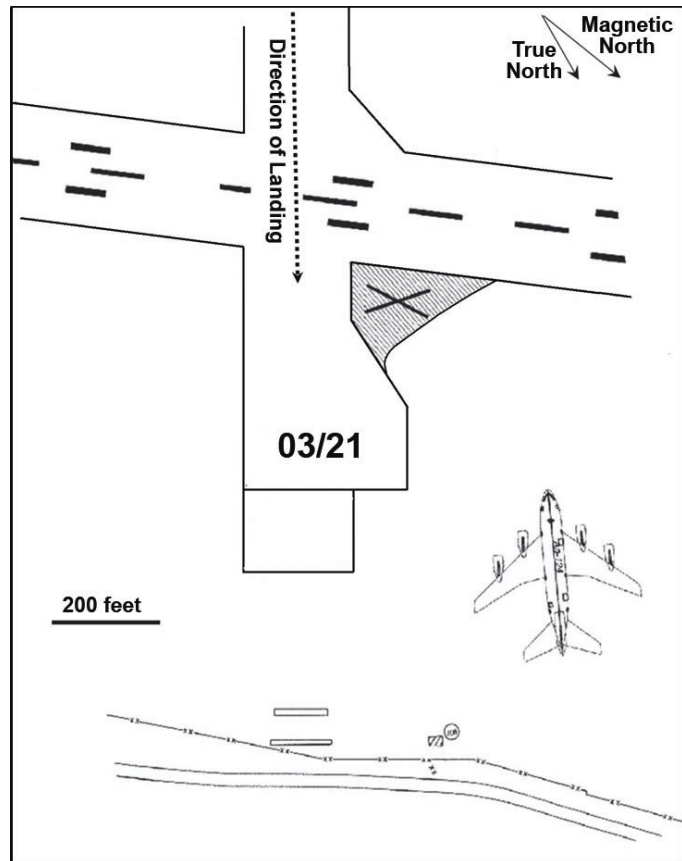


Figure 1. Final position of aircraft

Canadian runway friction index (CRFI). It is an International Civil Aviation Organization (ICAO) recommendation that runway surface condition reports be provided for each third of the runway.

Runway friction readings are not taken, and a CRFI is not provided, to air traffic services or pilots when the runway surface is simply wet with no other type of contamination present. CRFI measurements were not taken during the 2306 RSC because the surfaces of both runways were bare and wet and there was no accumulation of snow.

A CRFI measurement was taken on Runway 03/21 at 12 minutes after the incident. A total of 19 readings were taken ranging from decimal 32 near the halfway point on the runway to decimal 59 near the end. The average of all 19 readings was decimal 48. The minimum operating CRFI for the AN 124 type aircraft is decimal 47. Although the Russian flight crew members of VDA 2100 were more familiar with airports that provided runway friction index measurements for each one-third section of the runway length instead of an average for the entire runway length as is the Canadian airport practice, the captain on this particular flight had landed in Gander on 35 previous occasions.

Analysis

There were no mechanical failures that contributed to the occurrence. Therefore, the analysis will focus on the awareness of runway conditions, the runway touchdown point, the delay in wheel braking, and the reduction in aircraft deceleration.

The ATIS report received by the crew indicated that Runway 03/21 was bare and wet and that Runway 13/31 was the active runway. Twelve minutes before landing, the crew received a special weather observation indicating that light snow was falling. The fact that the latest weather observation was a special report and was reporting snowfall should have alerted the crew that weather conditions had changed and therefore the runway selected for landing may be contaminated. However, the crew did not request an updated RSC report.

Runway 13/31 had been designated as the active runway since the winds were light from the west. Active runways are chosen for various reasons such as surface wind direction, the predominate direction aircraft are approaching from, and taxi distance. Snow removal personnel and equipment were maintaining only Runway 13/31 before the occurrence.

The aircraft touched down approximately 2400 feet beyond the normal touchdown point (3400 feet minus 1000 feet). The fact that the aircraft touched down long and at an airspeed 14 knots below the planned airspeed indicates that the aircraft floated this additional distance before touchdown. Considering that the runway was contaminated with snow, the reduced stopping distance available greatly increased the chance of the aircraft being unable to stop on the remaining runway.

Wheel braking was applied by both pilots five seconds after the planned brake application speed of 135 knots. This brake application occurred 2000 feet after the touchdown point, leaving only 4800 feet of runway available for stopping the aircraft. The fact that both pilots were attempting to apply brake pressure simultaneously may indicate that both pilots were concerned about the stopping distance remaining.

Analysis of the recorded aircraft flight data indicated that the initial rate of deceleration may have been sufficient to stop the aircraft before the runway end. The crew did use reverse thrust after touchdown; however, it did not maintain maximum available reverse thrust until ensured of stopping on the available runway. Even though reverse thrust has little effect below 90 knots, that limited effect and the absence of residual forward thrust during the 15 seconds the idle power setting was restored may have been enough to prevent a runway overrun.

The following TSB Engineering Laboratory report was completed:

LP 032/2007 - FDR Analysis

This report is available from the Transportation Safety Board of Canada upon request.

Findings as to Causes and Contributing Factors

1. The aircraft touched down approximately 2400 feet past the normal touchdown point; this greatly reduced the available stopping distance.
2. The contaminated runway surface condition increased the distance required to stop the aircraft.
3. The delay in the application of wheel brakes combined with the failure to maintain maximum available reverse thrust until it was ensured that the aircraft would stop on the remaining runway contributed to the overrun.

Safety Action Taken

Volga-Dnepr Airlines has made arrangements with the Gander International Airport Authority to have, upon request, Canadian runway friction index (CRFI) reporting for each third of the runway.

Following this accident, Volga-Dnepr Airlines completed its own investigation and developed an in-house dedicated safety assurance program for the company's intensive flight operations via Gander Airport for the 2007-2008 season. It believes that the program will become permanent.

Volga-Dnepr Airlines is in the process of compiling a reliable table for translation of CRFI values into the friction coefficient. A table will be ready by the beginning of the next winter season operations (2008-2009).

A TSB Aviation Safety Information letter (A07A0029-D1-L1) has been sent to Transport Canada regarding Canadian differences with International Civil Aviation Organization (ICAO) recommended practices for reporting runway friction measurements.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 01 May 2008.