

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

**AVIATION INVESTIGATION REPORT
A08H0002**



RUNWAY INCURSION

NAV CANADA

LESTER B. PEARSON INTERNATIONAL AIRPORT

TORONTO, ONTARIO

29 JULY 2008

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.

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Summary

WestJet Flight 699, a Boeing 737-700, was on a scheduled flight from Toronto Lester B. Pearson International Airport, Ontario, to Vancouver, British Columbia. At approximately 1141:50 eastern standard time, the north ground controller, believing that Runway 15 right/33 left (15R/33L) was under the control of the north ground position, cleared three emergency services vehicles to enter Runway 15R/33L en route to the fire training area. At 1142:27, WestJet 699 was cleared for take-off from Runway 33L. The WestJet B737 was approximately one-third of the way down the runway when the vehicles entered Runway 15R. The flight became airborne approximately 2500 feet from the vehicles.

Other Factual Information

Runway 33L was being used for departures and Runway 06L for arrivals. The Toronto Lester B. Pearson International Airport (LBPIA) preferential runway policy favours the use of Runways 05 and 06L (or their reciprocals). Runway 05 was not in use because the instrument landing system (ILS) was temporarily unserviceable, while visual operations to Runway 05 were not favoured because of the heavy workload this would impose on the terminal control unit. Tower controllers controlled Runways 33L and 06L while ground controllers controlled the remaining runways and taxiways.

The 1100¹ the airport traffic information system (ATIS) reported the weather as follows: wind calm, visibility 15 statute miles (sm), few clouds at 3500 feet above ground level (agl), few clouds at 13 000 feet agl, ceiling 25 000 feet agl, temperature 23°C, dew point 15°C, altimeter setting 29.96 inches of mercury.

The tower was staffed by a supervisor, a south tower controller, a south ground controller, a north tower controller, a north ground controller, and a clearance delivery controller. Staffing was consistent with NAV CANADA policy; the controllers were properly qualified for their functions. Shift schedules the preceding day and breaks on the morning of the occurrence were also consistent with NAV CANADA policy.

At approximately 1030 hours, the ILS for Runway 05 became serviceable. In accordance with LBPIA preferential runway policy, it was decided to switch from using Runway 33L for departures only and Runway 06L for arrivals only to Runway 05 and Runway 06L for departures and arrivals. In preparation for the first arrival on Runway 05, the north tower controller requested and received ownership and control of Runway 05 from the north ground controller. This sort of transfer is done verbally at the LBPIA control tower; there are no visual indicators or other aide-memoires to show who owns or controls a particular runway at any given time.

Workload was neither heavy nor complex. The north tower controller was in contact with the last four aircraft awaiting departure on Runway 33L; the first in the queue was WestJet 699, followed by Jazz 7962, Westwind 560, and Jazz 677. All other subsequent departures were being routed to Runway 05 for take-off. Upon reaching Runway 33L, WestJet 699 requested a short delay and was consequently moved onto Taxiway Mike (See Appendix A - Toronto LBPIA Diagram) to allow other aircraft to get by. The only remaining traffic under the control of the north ground controller was a telecom vehicle on Runway 33R.

When on the airport manoeuvring area, vehicles are usually controlled by a ground controller. There are times, however, when it is more convenient to have vehicles using an active runway to be controlled by the appropriate tower controller. This allows the tower controller to issue immediate instructions to the vehicle without having to coordinate with the ground controller.

¹ All times are eastern daylight time (Coordinated Universal Time minus four hours).

Tech 37² had been dispatched to do ILS checks on Runway 33L. To maximize opportunities for these checks on the runway, the north tower controller was in direct contact with the vehicle and issued clearances on and off the runway as aircraft departures permitted.

At 1139:48, after Jazz 677 had departed, the north tower controller attempted to contact WestJet 699 to determine how much further delay might be expected so that Tech 37 could be cleared back on the runway to complete the ILS checks. After calling WestJet 699 four times without reply, the north tower controller cleared Tech 37 onto the runway at 1140:56. Sixteen seconds later, at 1141:12, WestJet 699 advised they were ready for take-off. The north tower controller advised WestJet 699 to line-up and wait, and then, at 1141:58, asked Tech 37 how much longer he needed to remain on the runway. When Tech 37 advised that two minutes would be needed, the north tower controller directed Tech 37 to exit the runway for the departure of WestJet 699, with the explanation that as soon as it was airborne, the runway would be free for the use of the technical vehicle.

During the north tower controller's exchanges with Tech 37, Red 8³ and two other aircraft rescue and firefighting (ARFF) vehicles contacted the north ground controller requesting clearance from their position on Taxiway Juliette in front of the north fire hall to the fire training area.

The north ground controller had transferred ownership and control of Runway 05 to the north tower controller; the first aircraft landing on Runway 05 was about ten miles away on final approach. While the ownership and control of Runway 05 had been transferred to the north tower controller, ownership and control of Runway 33L remained with the north tower controller and had not been transferred to the north ground controller.

The north ground controller's workstation in the tower is positioned such that the southern half of Runway 33L is directly behind. By turning left, the north ground controller is able to see that portion of the runway from about Taxiway Foxtrot Two north. As Tech 37 was moving toward the north service road, the north ground controller saw the vehicle but was unaware of where the vehicle was going. The north ground controller issued a clearance to Red 8 to proceed on Taxiway Juliette and onto Runway 15R⁴, to hold short of Runway 05. As the ARFF vehicles were proceeding on Taxiway Juliette, the north ground controller had exchanges with another vehicle.

Shortly thereafter (at 1142:27), after having scanned the runway for obstructions, the north tower controller issued take-off clearance to WestJet 699. Five seconds later, WestJet 699 reported beginning its take-off roll. At 1143:00, the airport surface detection equipment (ASDE) showed WestJet 699 to have accelerated to 59 knots as the first of the ARFF vehicles entered the north end of Runway 33L.

² Tech 37 is the call sign of the NAV CANADA technical vehicle used for electronic equipment checks.

³ Red 8 is the call sign of an aircraft rescue and firefighting (ARFF) vehicle.

⁴ Runway 15R is the nomenclature for the north end of Runway 33L and is commonly used because it is more familiar to the vehicle operators.

The ASDE in the tower is fitted with a runway incursion monitoring and conflict alert subsystem (RIMCASS). When an aircraft commences take-off on a runway that is occupied or becomes occupied during the take-off roll and the aircraft is within 30 seconds of a conflict, the system issues an amber alert (stage 1) on the ASDE display. The amber alert is a visual signal only, in which the labels of the conflicting targets turn amber. When the aircraft accelerates to 60 knots, if there is another target on the runway, the RIMCASS generates an immediate red alert (stage 2) in which the labels of the conflicting targets turn red and an aural alarm is sounded.

When the first of the ARFF vehicles entered the runway at the north end, WestJet 699 had not yet accelerated to 60 knots, so the RIMCASS provided an amber alert. Two seconds later, WestJet 699 attained 60 knots and the RIMCASS produced a red alert signal together with the aural alarm. At 1143:14, the tower controller instructed WestJet 699 to abort the take-off but, because the aircraft was at rotation speed, the crew continued the take-off and lifted off the runway at approximately 2500 feet from the vehicles.

The Greater Toronto Airports Authority (GTAA) is responsible for the establishment of the standards by which vehicles working on the airside at LBPIA must be operated, equipped, and marked. The GTAA determines an applicant's need to drive on the airside of the airport by assessing the job-related duties and the frequency of required airside access, and then issues an airport vehicle operator's permit (AVOP) to operators who successfully undergo the AVOP training program.

The drivers of the ARFF vehicles were appropriately trained and licensed. The fire training area to which the ARFF vehicles were proceeding is accessible from the north fire hall by means of a service road (the north service road) that avoids the aircraft manoeuvring areas. The vehicles were not responding to an emergency situation and did not have a pressing operational need to proceed to the fire training area by the shorter route across the runways.

Analysis

When a tower controller is about to begin operations on another runway, a request for its ownership and control is made. When a tower controller is finished using a runway, its ownership and control is usually transferred to the ground controller. In this occurrence, the north tower controller needed the ownership and control of Runway 05 to accommodate impending arrivals, but still needed ownership and control of Runway 33L to accommodate the delayed departure of WestJet 699. Ownership and control of Runway 05 had been transferred to the north tower controller, but ownership and control of Runway 33L had not been relinquished to the north ground position.

The north ground controller expected ownership and control of Runway 33L to be relinquished to the north ground position when ownership and control of Runway 05 was transferred to the north tower controller. The sighting of Tech 37 on Runway 33L by the north ground controller likely confirmed in the mind of the north ground controller that Runway 33L was no longer in use for aircraft departures and was indeed under north ground control. Moreover, the location of the north ground controller position in the tower made surveillance of the south end of Runway 33L problematic and likely prevented the north ground controller from seeing the WestJet aircraft near the threshold.

Runway ownership and control transfer is accomplished verbally. There is no visual indication or process to inform controllers of runway ownership, nor is there any physical act performed to confirm controller ownership of runways when changing runway operations.

Convinced that the north ground position had ownership and control of Runway 33L, the north ground controller cleared the ARFF vehicles onto the runway, leading to the conflict with WestJet 699.

The north service road provides access from the north fire hall to the fire training area as well as to many other areas around the airport without the need for vehicles to traverse airport manoeuvring areas utilised by aircraft. There was no operational need, in this instance, for the ARFF vehicles to be present on the airport manoeuvring area en route to the fire training area.

Finding as to Causes and Contributing Factors

1. Believing Runway 33L to be under the control of the north ground position, the north ground controller cleared the aircraft rescue and firefighting (ARFF) vehicles onto that runway, leading to a conflict with the departing WestJet 699.

Findings as to Risk

1. The absence of an effective method for indicating runway ownership and control increases the likelihood of incursions.
2. Where aircraft rescue and firefighting (ARFF) vehicles do not need to use the runways, their unnecessary presence on a runway increases the risk of incursions, especially during a runway change.

Safety Action Taken

NAV CANADA reviewed its procedures involving runway ownership. As a result, a new runway surface indicator (RSI) was designed and implemented in early September 2008. This system operates within EXCDS (extended computer display system), allowing visibility at all positions within Toronto tower, as well as a recording of all actions associated with the application. Both the EXCDS and phraseology manuals have been updated to reflect the current standard of operation.

The Greater Toronto Airports Authority (GTAA) initiated a communication process to assist in mitigating risk, which requires emergency services to notify NAV CANADA prior to conducting training exercises that involve crossing the airfield. The GTAA will monitor this process to ensure on-going effectiveness. These on-field training exercises are deemed to be essential for vehicle operators to ensure that they maintain a level of proficiency to minimize the risk of an incursion.

The GTAA reiterated that airport traffic directives and the associated airport vehicle operator's permit (AVOP) training program indicate and inform AVOP applicants that the service roads should be used whenever possible and that an operational need is required to be present in the manoeuvring area.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 15 May 2009.

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Appendix A - Toronto LBPIA Diagram

