National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: January 27, 2006

In reply refer to: A-06-16

Honorable Marion Blakey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On December 8, 2005, about 1914 central standard time, Southwest Airlines flight 1248, a Boeing 737-7H4, N471WN, landed on runway 31C at Chicago Midway Airport (MDW), Chicago, Illinois. The runway was contaminated with snow. The airplane departed the end of the runway and rolled through a blast fence and a perimeter fence and then into traffic on an off-airport street. The airplane came to a stop after impacting two cars, which resulted in the death of a child passenger in one of the vehicles. Of the 2 flight crewmembers, 3 flight attendants, and 98 passengers aboard the airplane, 5 reported minor injuries, and the airplane was substantially damaged. The flight was operating under the provisions of 14 *Code of Federal Regulations* Part 121 as a commercial passenger flight from Baltimore/Washington International Thurgood Marshall Airport, Baltimore, Maryland. Instrument meteorological conditions prevailed for the flight. The National Transportation Safety Board believes that the urgent recommendation contained in this letter requires immediate attention to restore landing safety margins on contaminated runways.

Snow began to fall in the area surrounding MDW about 5 hours before the accident. While the flight was en route and holding to land at MDW, the flight crew obtained updated weather information and runway braking action reports from air traffic control. On the basis of this information, the flight crew planned for fair braking action on landing on runway 31C. The runway was last cleared and treated about 45 minutes before the accident. About 30 minutes before the accident, airport ground personnel performed a runway friction measurement, which indicated that the runway friction was "good." About 1/8 to 1/4 inch of scattered snow was on the runway when the airplane touched down.

Expected Landing Performance on Contaminated Runways

The flight crew used an on-board laptop performance computer (OPC) provided in the cockpit of Southwest Airlines' airplanes to calculate expected landing performance. For landing performance calculations, flight crews enter flight specific data into the OPC, including the expected landing runway, wind speed and direction, airplane gross weight at touchdown, and the

reported runway braking action. The 737-700 OPC is programmed to assume that the engine thrust reversers will be deployed on touchdown[1] and to calculate the stopping margin (the runway distance remaining from the front of the nose wheel to the end of the runway pavement after the airplane comes to a stop). The OPC then alerts flight crews if the remaining runway distance is not sufficient for the airplane to land and completely stop on the runway under the selected weather and runway conditions.

The flight crew entered weather data into the OPC and input WET-FAIR as the runway braking condition. The OPC calculated that the airplane would be able to land and completely stop on runway 31C under the selected weather and runway conditions with about 560 feet of runway remaining.[2] During postaccident interviews, the flight crewmembers told Safety Board investigators that they considered 560 feet to be an acceptable safety margin and, therefore, decided to execute the landing.

The assumption that engine thrust reversers would be deployed on touchdown is consistent with Southwest Airlines' Flight Operations Manual, which states that, when landing under less than good braking conditions, the thrust reversers are to be used as soon as possible during the landing roll and are to be applied with the brakes. However, flight data recorder data revealed that about 18 seconds passed from the time the airplane touched down to the time the thrust reversers were deployed; at that point, only about 1,000 feet of usable runway remained. During postaccident interviews, the captain stated that he attempted to immediately deploy the thrust reversers but that he was unable to do so. According to the first officer, at some point during the rollout, he noticed that the thrust reversers were not deployed, and he then reached over and deployed them. The late deployment of the thrust reversers almost completely negated the stopping distance benefit that had been expected because of the use of the thrust reversers. The airplane departed the end of runway 31C at a ground speed of about 50 knots.

Reverse Thrust Usage Credit

The Federal Aviation Administration (FAA) does not allow the use of the reverse thrust credit when determining dispatch landing distances. Further, the decrease in stopping distance resulting from thrust reverser use (which increases the safety margin) had typically been used to offset other variables that could significantly degrade stopping performance.

However, the FAA allows the reverse thrust credit to be used in calculating en route operational landing distances for some transport-category airplanes, such as the accident airplane, a 737-700. Accordingly, when using the reverse thrust credit for contaminated runways, the required runway length for 737-700 model airplanes is about 1,000 feet less than the required runway length without the reverse thrust credit. The OPCs of Southwest Airlines' 737-300 and -500 model airplanes do not use the reverse thrust credit; therefore, these model airplanes have a greater landing safety margin. In this accident, when the thrust reversers were not (or could not be) used in a timely manner, the airplane could not be stopped on the runway because of the absence of this extra safety margin.

[1] Boeing 737-300 and -500 model airplanes are not programmed with this assumption.

[2] The flight crew also input WET-POOR as the runway braking condition. The OPC calculated that a 30-foot runway margin would remain.

If the reverse thrust credit had not been factored into the stopping distance calculations made by the OPC, it would have indicated that a safe landing on runway 31C was not possible under a braking condition of either fair or poor. The Safety Board is concerned that the landing distance safety margin is significantly reduced on a contaminated runway when the reverse thrust credit is allowed in landing stopping distance calculations. As a result, a single event, the delayed deployment of the thrust reversers, can lead to an unsafe condition, as it did in this accident. The Safety Board concludes that the safety margin must be restored to those airplanes for which the reverse thrust credit is currently allowed in landing performance calculations.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Immediately prohibit all 14 *Code of Federal Regulations* Part 121 operators from using the reverse thrust credit in landing performance calculations. (A-06-16) Urgent

Acting Chairman ROSENKER and Members ENGLEMAN CONNERS, HERSMAN, and HIGGINS concurred with this recommendation.

[Original signed]

By: Mark V. Rosenker
Acting Chairman