Margins of Safety

BY MARK V. ROSENKER

On the snowy evening of Dec. 8, 2005, Southwest Airlines Flight 1248, a Boeing 737-7H4, ran off the end of Runway 31C upon landing at Chicago's Midway Airport. The airplane struck two cars on a city street, killing a child.

While the flight was en route from Baltimore, the flight crew obtained updated weather information and runway braking action reports from air traffic control. Based on this information, the crew planned for fair braking action on Runway 31C. About 30 minutes before the accident, airport ground personnel had performed a runway friction measurement, which indicated that the runway friction was "good."

The flight crew used an on-board laptop performance computer (OPC) provided in the cockpit of Southwest Airlines' airplanes to calculate expected landing performance. 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 and to calculate the stopping margin (the amount of runway remaining after the airplane comes to a stop).

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 stop on Runway 31C with about 560 ft (171 m) of runway remaining. When the crew input "WET-POOR," the OPC calculated a 30-ft (9-m) stopping margin.

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, the flight data recorder 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 ft (305 m) of usable runway remained. During post-accident interviews, the captain stated that he attempted to immediately deploy the thrust reversers but was unable to do so. According to the first officer, at some point during the rollout, he noticed that the thrust reversers were

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not deployed, and he then deployed them. The late deployment of the thrust reversers almost completely negated the stopping-distance benefit that had been expected from their use.

The U.S. Federal Aviation Administration (FAA) does not allow the use of the reverse thrust credit when determining dispatch landing distances. The stopping benefit from thrust reverser use typically has provided a built-in safety margin to offset other variables. However, 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 ft 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 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.

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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 U.S. National Transportation Safety Board (NTSB) 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. NTSB believes that the safety margin must be restored to those airplanes for which the reverse thrust credit is currently allowed in landing performance calculations.

On Jan. 27, 2006, NTSB issued an urgent recommendation, A-06-16, to FAA to immediately prohibit airlines from using the reverse thrust credit in landing performance calculations.

The NTSB staff was informed that FAA agreed with the intent of the recommendation, and intended to develop a new requirement that would yield an even greater safety benefit than a blanket prohibition against taking credit for reverse thrust. Subsequently, on June 7, 2006, FAA published "Announcement of Policy for Landing Performance Assessments After Departure for All Turbojet Operators." This announcement stated that FAA considered a 15 percent margin between the expected actual airplane landing distance and the landing distance available at the time of arrival as the minimum acceptable safety margin for normal operations. As a result, FAA was planning to issue Operations Specification/Management Specification (OpSpec/MSpec) C082 implementing this requirement by Oct. 1, 2006.

While the proposed FAA action was not precisely what NTSB had recommended, it would have provided the additional safety margin that NTSB was seeking; it went beyond the NTSB recommendation by including all turbojet operators, not just carriers operating under Federal Aviation Regulations Part 121, *Domestic, Flag and Supplemental Operations*. However, on Aug. 31, FAA abandoned this plan and instead published a "Safety Alert for Operators (SAFO)," in which FAA announced that it would begin a rulemaking process to require the practices described in the policy statement. In the meantime, FAA recommended that operators voluntarily comply with the policy statement.

NTSB's concern is that rulemaking can take years and that the next snow and ice season is upon us (in the Northern Hemisphere). Some major airlines have indicated that they will comply with C082, but without a requirement, it could be years before all passengers have the additional safety margin that NTSB believes is required for landing on short, contaminated runways. NTSB urges FAA to follow its first course of action and hopes that, in the interim, all operators will comply with the SAFO. Let's not see a repeat of the Chicago Midway tragedy. ●