

4. Recommendations

As a result of the investigation of this accident, the National Transportation Safety Board makes the following recommendations:

—To the Federal Aviation Administration

For all 14 *Code of Federal Regulations* Part 121 and 135 operators of airplanes equipped with automatic spoiler systems, require dual crewmember confirmation before landing that the spoilers have been armed, and verify that these operators include this procedure in their flight manuals, checklists, and training programs. (A-01-49)

For all 14 *Code of Federal Regulations* Part 121 and 135 operators, require a callout if the spoilers do not automatically or manually deploy during landing and a callout when the spoilers have deployed, and verify that these operators include these procedures in their flight manuals, checklists, and training programs. The procedures should clearly identify which pilot is responsible for making these callouts and which pilot is responsible for deploying the spoilers if they do not automatically or manually deploy. (A-01-50)

Issue a flight standards information bulletin that requires the use of 1.3 engine pressure ratio as the maximum reverse thrust power for MD-80 series airplanes under wet or slippery runway conditions, except in an emergency in which directional control can be sacrificed for decreased stopping distance. (A-01-51)

Require principal operations inspectors of all operators of MD-80 series airplanes to review and determine that these operators' flight manuals and training programs contain information on the decrease in rudder effectiveness when reverse thrust power in excess of 1.3 engine pressure ratio is applied. (A-01-52)

Require all operators of MD-80 series airplanes to require a callout if reverse thrust power exceeds the operators' specific engine pressure ratio settings. (A-01-53)

For all 14 *Code of Federal Regulations* Part 121 and 135 operators, require the use of automatic brakes, if available and operative, for landings during wet, slippery, or high crosswind conditions, and verify that these operators include this procedure in their flight manuals, checklists, and training programs. (A-01-54)

Establish a joint Government-industry working group to address,

understand, and develop effective operational strategies and guidance to reduce thunderstorm penetrations, and verify that these strategies and guidance materials are incorporated into air carrier flight manuals and training programs as the strategies become available. The working group should focus its efforts on all facets of the airspace system, including ground- and cockpit-based solutions. The near-term goal of the working group should be to establish clear and objective criteria to facilitate recognition of cues associated with severe convective activity and guidance to improve flight crew decision-making. (A-01-55)

Incorporate, at all air traffic control facilities, a near-real-time color weather radar display that shows detailed precipitation intensities. This display could be incorporated by configuring existing and planned Terminal Doppler Weather Radar or Weather Systems Processor systems with this capability or by procuring, within 1 year, a commercial computer weather program currently available through the Internet or existing stand-alone computer hardware that displays the closest single-site Weather Surveillance Radar 1988 Doppler data or regional mosaic images. (A-01-56)

Provide U.S. air carriers operating under 14 *Code of Federal Regulations* Part 121 access to Terminal Doppler Weather Radar, at airports where the system is available, and access to the Weather Systems Processor, when it becomes available, so that their flight dispatch offices can use this information in planning, releasing, and following flights during periods in which hazardous weather might impact safety of flight. (A-01-57)

In cooperation with the National Weather Service, ensure that Center Weather Service Units are adequately staffed at all times when any significant weather is forecast. (A-01-58)

Modify automated weather systems to accept runway visual range (RVR) data directly from RVR sensors. (A-01-59)

Maintain at least a 48-hour archive of 1-minute runway visual range data. (A-01-60)

Provide additional information on the Low Level Windshear Alert System (LLWAS) in the Aeronautical Information Manual, including that an LLWAS alert is a valid indicator of windshear or a microburst. (A-01-61)

Issue a mandatory briefing item to tower controllers that describes the circumstances of this accident, including the interactions between the controller and Aircraft Rescue and Fire Fighting (ARFF) crews. This briefing item should emphasize that location information provided to ARFF crews should be as complete and specific as possible to minimize

opportunities for confusion. (A-01-62)

Amend Federal Aviation Administration Order 7110.65, "Air Traffic Control," to require controllers to monitor the progress of Aircraft Rescue and Fire Fighting crews responding to emergencies to ensure that the response is consistent with known location information. (A-01-63)

Amend Federal Aviation Administration (FAA) Order 7210.3R, "Facility Operation and Administration," to direct tower managers to establish mutual annual briefings between air traffic control (ATC) and Aircraft Rescue and Fire Fighting (ARFF) personnel to ensure that these personnel have a common understanding of the local airport emergency plan and sections of the FAA's Advisory Circular 150/5210-7C, "Aircraft Rescue and Firefighting Communications," that are applicable to local ATC/ARFF emergency response procedures. (A-01-64)

Amend 14 *Code of Federal Regulations* 139.319(j) to require a minimum Aircraft Rescue and Fire Fighting staffing level that would allow exterior firefighting and rapid entry into an airplane to perform interior firefighting and rescue of passengers and crewmembers. (A-01-65)

Evaluate crash detection and location technologies, select the most promising candidate(s) for ensuring that emergency responders could expeditiously arrive at an accident scene, and implement a requirement to install and use the equipment. (A-01-66)

Develop specific criteria, using the Federal Railroad Administration's requirements as guidance, to be evaluated during a postaccident interagency emergency response critique, and amend 14 *Code of Federal Regulations* Part 139 to require airport operators to conduct this critique within 60 days after any air carrier accident and provide the results of the critique to the Federal Aviation Administration. (A-01-67)

Conduct research activities to determine if recent technological advances would enable submerged low-impact structures and other nonfrangible structures at airports to be converted to frangible ones. (A-01-68)

Define detailed parameters for a stabilized approach, develop detailed criteria indicating when a missed approach should be performed, and ensure that all 14 *Code of Federal Regulations* Part 121 and 135 carriers include this information in their flight manuals and training programs. (A-01-69)

Provide additional personnel to accomplish direct oversight of American Airlines' flight training and flight operations, and include the principal operations inspector for American in decisions regarding where these

personnel are to be placed. (A-01-70)

—To the National Weather Service

In cooperation with the Federal Aviation Administration, ensure that Center Weather Service Units are adequately staffed at all times when any significant weather is forecast. (A-01-71)

Eliminate the Automated Surface Observing System lockout feature as soon as possible. (A-01-72)

In addition, the Safety Board reiterates the following recommendations to the Federal Aviation Administration:

Establish within 2 years²³⁴ scientifically based hours-of-service regulations that set limits on hours of service, provide predictable work and rest schedules, and consider circadian rhythms and human sleep and rest requirements (A-99-45)

Require air carriers to adopt the operating procedures contained in the manufacturer's airplane flight manual and subsequent approved revisions or provide written justification that an equivalent safety level results from an alternate procedure. (A-98-102)

²³⁴ As previously stated, because the 2-year timeframe specified in this recommendation has already expired, the Safety Board urges the FAA to expedite its efforts to accomplish this recommendation.