

Log 1910B



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: September 3, 1986

In reply refer to: A-86-79 through -81

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On August 2, 1985, at 1805:52 central daylight time, Delta Air Lines (Delta) flight 191, a Lockheed L-1011-385-1, N726DA, crashed while approaching to land on runway 17L at the Dallas/Fort Worth International (DFW) Airport, Texas. While passing through the rain shaft beneath a thunderstorm, flight 191 entered a microburst which the pilot was unable to traverse successfully. The airplane struck the ground about 6,300 feet north of the approach end of runway 17L, hit a car on a highway north of the runway killing the driver, struck two water tanks on the airport, and broke apart. Except for a section of the airplane containing the aft fuselage and empennage, the remainder of the airplane disintegrated during the impact sequence, and a severe fire erupted during the impact sequence. Of the 163 persons aboard, 134 passengers and crewmembers were killed; 26 passengers and 3 cabin attendants survived. ^{1/}

Many meteorological programs, such as the Joint Airport Weather Studies (JAWS) Program, the Classify Locate Avoid Wind Shear (CLAWS) Program, and the recently completed Federal Aviation Administration (FAA)-Lincoln Laboratory Operational Weather Studies (FLOWS) program at Memphis, Tennessee, have been dedicated to developing an understanding of the microburst and convective storm phenomena. However, information derived from these and other similar programs may not be getting to operational meteorologists in a timely manner. The Safety Board is concerned about the lack of formal training programs designed to inform operational meteorologists about the results of microburst and convective storm research. Testimony at the public hearing into the flight 191 accident revealed that past and present microburst research has had very little impact on National Weather Service (NWS) operations and that there is no formal training in research results. The National Oceanic and Atmospheric Administration (NOAA) has been involved in developing microburst forecasting techniques based on JAWS data for approximately 4 years. Although these techniques show promise, for the most part this information and formal training in these techniques has not been provided to operational meteorologists.

^{1/} For more detailed information, read Aircraft Accident Report--"Delta Air Lines, Inc., Lockheed L-1011-385-1, N726DA, Dallas/Fort Worth International Airport, Texas, August 2, 1985" (NTSB/AAR-86/05).

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Information and formal training programs derived from microburst and convective research can be used by operational meteorologists to prepare and issue aviation forecasts and advisories. Therefore, the Safety Board believes that every effort must be made to require that pertinent information and formal training programs for microburst and convective storm research are provided to operational meteorologists in a timely manner.

The NWS meteorologist working the aviation forecast desk at the Fort Worth Weather Service Forecast Office is responsible for issuing aviation weather warnings to DFW Airport for (1) sustained (1 minute) winds of 35 knots or greater; (2) wind gusts of 40 knots or greater; or (3) when a severe thunderstorm/tornado warning is in effect for Tarrant and/or Dallas County. On the evening of August 2, an Aviation Weather Warning was not issued for the thunderstorm that affected Delta 191 even though the thunderstorm produced wind gusts at the airport of 46 knots subsequent to the accident. A warning was not issued for DFW because the meteorologist did not believe that the thunderstorm flight 191 penetrated would produce wind gusts of 40 knots or more at the airport.

The meteorologist compiles information from many sources in developing an Aviation Weather Warning. However, one of the primary sources of weather information is data obtained from the remote weather radar displays at the Fort Worth Forecast Office. These weather radar displays depict up to six levels of radar echo intensity.

Information displayed on the radar is received from the NWS network radars located at Stephenville and Longview, Texas. The Longview radar was out of service on August 2. A map depicting counties, geographic boundaries, and cities is part of the weather radar displays. However, it was determined during the public hearing that DFW Airport was not located on these maps. Although the Safety Board believes that the absence of a depiction of DFW Airport on the weather radar displays did not contribute to the fact that an advisory was not issued, DFW Airport should be part of the map display on each weather radar unit. Incorporating the location of DFW Airport on the map display would enhance the meteorologist's ability to determine the position of weather echoes in relation to the airport and enhance his ability to issue timely and accurate warnings. The Safety Board also believes that the location of airports should be noted on the weather radar display or displays of other weather service offices that have Aviation Weather Warning responsibility to airports.

The Safety Board also notes that although the meteorologist at the Fort Worth Forecast Office was aware before the accident of the very strong convective weather echo (VIP level 4) that was penetrated by flight 191 on final approach, the meteorologist elected not to issue an Aviation Weather Warning. As noted previously, his decision was based on his belief that this weather echo would not produce wind gusts of 40 knots or greater. The Safety Board found that the meteorologist's decision not to issue a warning was reasonable and correct based on the current procedures in his Station Duty Manual. However, because of the potential effects on terminal aircraft operations of convective weather echoes and the ability of the meteorologist to identify and locate these echoes on remote radar weather displays, the Safety Board believes that NOAA should develop Aviation Weather Warning criteria based on radar weather echo intensities and the proximity of weather echoes to airports. For example, the Safety Board suggests that one criterion should reflect that any convective weather echo within 5 nautical miles of an airport represents a potential hazard to aircraft operations. In conjunction with developing these criteria, NOAA should develop a means to communicate the information immediately to affected FAA facilities at airports.

Therefore, the National Transportation Safety Board recommends that the National Oceanic and Atmospheric Administration:

Require that pertinent information and formal training programs derived from microburst and convective storm research be provided in a timely manner to operational meteorologists. (Class II, Priority Action) (A-86-79)

Require that all offices that have a weather radar display or displays and an aviation weather warning responsibility to airports have those airports clearly located on a useable map on each weather radar display. (Class II, Priority Action) (A-86-80)

Develop definitive aviation weather warning criteria based on radar weather echo intensities and the proximities of radar weather echos to airport approach and departure corridors, and implement a means to communicate this information immediately to Federal Aviation Administration Terminal Radar Approach Control and tower facilities. (Class II, Priority Action) (A-86-81)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations A-86-79 through -81 in your reply.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER and NALL, Members, concurred in these recommendations.

By: 
Chairman