NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: April 1, 1976

Forwarded to:

Honorable John L. McLucas
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-76-31 through 44

On June 24, 1975, Eastern Air Lines Flight 66, a Boeing 727, crashed during a precision instrument approach to the John F. Kennedy International Airport, Jamaica, New York. One hundred and thirteen persons died from the injuries that they received.

The National Transportation Safety Board's investigation of the accident disclosed that the aircraft developed a high descent rate as it passed through or below the base of a mature thunderstorm. The storm was astride the approach course and approximately 1 mile from the end of the runway. The pilots of other flights which preceded Flight 66 on the approach reported that they too had encountered problems in controlling their aircraft to maintain a safe approach profile. These aircraft avoided an accident possibly because the prevailing conditions were less severe or because the pilots recognized and responded to the situation faster than the pilots of Flight 66.

A study of flight recorder data taken from these flights showed that the performance of each of the aircraft was affected by the strong vertical drafts and changes in the direction of the horizontal winds in the vicinity of the thunderstorm. When a simulator, modeled to reproduce the aerodynamic characteristics of the B-727, was exposed to these approach conditions, it became evident that the ability of an airplane to negotiate a safe landing or even a missed approach was marginal. In the case of Flight 66, impact might possibly have been avoided had the flightcrew recognized the onset of the descent rate more quickly.

However, even though they had been alerted to a wind shear condition, the crew probably did not anticipate the rapid change in the airplane's flight profile. Also, since they had both the approach lights and subsequently the runway in sight, they were probably relying on visual cues for guidance, particularly since the glideslope was designated unusable below 200 feet. There were no visual aids such as VASI to help them detect the deviation below a safe glidepath.

The circumstances of this accident are similar to those of other accidents which have been investigated by the Safety Board. On May 18, 1972, an Eastern Air Lines Douglas DC-9-31 touched down hard on the runway at Fort Lauderdale, Florida; the airplane was destroyed and three persons were injured. On July 23, 1973, an Ozark Air Lines, Inc., Fairchild Hiller FH-227B crashed while on a precision approach to the Lambert-St. Louis International Airport, St. Louis, Missouri. Thirty-seven passengers died in that crash. On January 30, 1974, a Pan American World Airways, Inc., Boeing 707 crashed while on approach to Pago Pago, American Samoa, killing 96 persons. In all of these crashes, the airplanes were penetrating heavy rain and probably the adverse wind conditions associated with a mature thunderstorm.

The potential hazards of flight through or below a fully developed thunderstorm are well recognized. In fact, most, if not all, air carrier operations have established a policy to avoid the intense radar echoes by 20 miles or more when flying at cruising altitudes. This policy is consistent with Advisory Circulars 00-24 and 90-12A. In the terminal environment, however, there appears to be a tendency on the part of pilots, as well as traffic controllers, to let the desire for an uninterrupted flow of traffic interfere with an objective evaluation of the hazard potential of approaches through or under thunderstorms. Consequently, approaches are being conducted through these hazardous conditions during what is perhaps the most critical phase of flight -- when the aircraft is at low altitude, with little airspeed margin, and with the airplane in a high drag configuration.

The Safety Board recognizes the problems in the terminal area which stem from traffic density, air traffic control coordination requirements, complex departure and arrival routes, and adjacent airports. These factors, combined with the characteristics of rapidly developing thunderstorms and the limited weather detection capability of the ATC radar equipment, hinder the coordinated effort which must be made by pilots and controllers to avoid thunderstorms. Nevertheless, the Safety Board believes that these problems can and must be resolved in order to prevent more accidents of this kind.

Since 1973, the Safety Board has submitted to the Administrator, Federal Aviation Administration, eight specific recommendations which can be directly related to accidents involving approaches through conditions similar to those encountered by Flight 66. Copies of these recommendations and the Administrator's responses are attached. The recommendations concerned such areas as the expansion of authority for air traffic controllers to deny approaches or takeoffs through thunderstorms, the development of ATC radar with better severe weather detection capability, the implementation of better systems to relay severe weather warnings to pilots, the installation of VASI on all instrument runways, the issuance of training material and improvements in training programs to stress the effect of wind shear on an airplane's flightpath control, and the development of wind shear detection devices.

The FAA has expressed agreement with many of these recommendations and in some cases action has been taken to comply. In other cases, action has not been taken.

The Safety Board believes that the continuing occurrence of approach accidents involving passage of an airplane through or below thunderstorms indicates that more positive and more immediate actions are necessary. Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration, in coordination with the National Oceanic and Atmospheric Administration, where appropriate:

1. Conduct a research program to define and classify the level of flight hazard of thunderstorms using specific criteria for the severity of a thunderstorm and the magnitude of change of the wind speed components measured as a function of distance along an airplane's departure or approach flight track and establish operational limitations based upon these criteria. (Class II - Priority Followup)

2. Expedite the program to develop and install equipment which would facilitate the detection and classification, by severity, of thunderstorms within 5 nmi of the departure or threshold ends of active runways at airports having precision instrument approaches. (Class II - Priority Followup)

3. Install equipment capable of detecting variations in the speed of the longitudinal, lateral, and vertical components of the winds as they exist along the projected takeoff and approach flightpaths within 1 nmi of the ends of active runways which serve air carrier aircraft. (Class II - Priority Followup)

4. Require inclusion of the wind shear penetration capability of an airplane as an operational limitation in the airplane's operations manual, and require that pilots apply this limitation as a criterion for the initiation of a takeoff from, or an approach to, an airport where equipment is available to measure the severity of a thunderstorm or the magnitude of change in wind velocity. (Class II - Priority Followup)

5. As an interim action, install equipment capable of measuring and transmitting to tower operators the speed and direction of the surface wind in the immediate vicinity of all runway ends and install lighted windsocks near to the side of the runway, approximately 1,000 feet from the ends, at airports serving air carrier operations. (Class I - Urgent Followup)

6. Develop and institute procedures whereby approach controllers, tower controllers, and pilots are provided timely information regarding the existence of thunderstorm activity near to departure or approach flightpaths. (Class I - Urgent Followup)

7. Revise appropriate air traffic control procedures to specify that the location and severity of thunderstorms be considered in the criteria for selecting active runways. (Class I - Urgent Followup)

8. Modify or expand air traffic controller training programs to include information concerning the effect that winds produced by thunderstorms can have on an airplane's flightpath control. (Class III - Longer-Term Followup)

9. Modify initial and recurrent pilot training programs and tests to require that pilots demonstrate their knowledge of the low-level wind conditions associated with mature thunderstorms and of the potential effects these winds might have on an airplane's performance. (Class II - Priority Followup)

10. Expedite the program to develop, in cooperation with appropriate Government agencies and industry, typical models of environmental winds associated with mature thunderstorms which can be used for demonstration purposes in pilot training simulators. (Class III - Longer-Term Followup)

11. Place greater emphasis on the hazards of low-level flight through thunderstorms and on the effects of wind shear encounter in the Accident Prevention Program for the benefit of general aviation pilots. (Class II - Priority Followup)

12. Expedite the research to develop equipment and procedures which would permit a pilot to transition from instrument to visual references without degradation of vertical guidance during the final segment of an instrument approach. (Class III - Longer-Term Followup)

13. Expedite the research to develop an airborne detection device which will alert a pilot to the need for rapid corrective measures as an airplane encounters a wind shear condition. (Class III - Longer-Term Followup)

14. Expedite the development of a program leading to the production of accurate and timely forecasts of wind shear in the terminal area. (Class III - Longer-Term Followup)

TODD, Chairman, McADAMS, THAYER, BURGESS, and HALEY, Members, concurred in the above recommendations.

By: Webster B. Todd, Jr.
Chairman

Attachments