

Log 1736

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: OCT 1 1984

Forwarded to:

Honorable John V. Byrne  
Administrator  
National Oceanic and Atmospheric  
Administration  
Department of Commerce  
Washington, D.C. 20230

SAFETY RECOMMENDATION(S)

A-84-108

On November 24, 1983, Air Canada Flight 965, an L-1011 en route from Port of Spain, Trinidad, to Toronto, Canada, encountered clear air turbulence approximately 70 miles south of the Wilmington, North Carolina VOR. Three passengers and 1 flight attendant were seriously injured. The aircraft landed at its destination without further incident.

On April 3, 1981, United Airlines Flight 12, a DC-10 en route from Los Angeles, California, to Newark, New Jersey, encountered severe clear air turbulence in the vicinity of Hannibal, Missouri. Twenty passengers and 9 crewmembers were injured. In this case, it was necessary for the flight to divert to O'Hare International Airport to obtain medical assistance for the injured.

In both of these accidents the Safety Board's investigation disclosed that the aircraft involved were in clear air or cirrus clouds above and downwind of thunderstorm activity. It appears from the statements of both flightcrews that in view of the information displayed on their airborne radar they believed they were sufficiently clear of the thunderstorms to have averted convective turbulence.

In the case of Air Canada Flight 965, there was a convective SIGMET in effect for thunderstorm activity. In the case of United Airlines Flight 12, there was both a convective SIGMET and a tornado watch in effect for the thunderstorm activity, but neither covered the area of the occurrence at the time of the accident. In neither case was there a forecast of high level turbulence other than that directly associated with convective activity.

In analyzing the atmospheric conditions that led to these accidents, it was the opinion of the Safety Board that the turbulence was developed by the interaction of the strong winds aloft and the intrusion of the convective activity creating wave conditions above and downwind of the thunderstorms. This opinion is generally verified in a report by investigators from the University of Arizona and the NASA Ames Research Center, who considered the atmospheric motions leading to two scheduled airline turbulence encounters, one of which was United Airlines Flight 12. <sup>1/</sup>

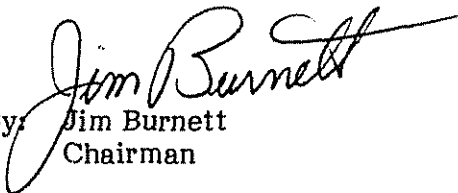
<sup>1/</sup> Parks, E.K., R.C. Wingrove, R.E. Bach, Jr., and R.S. Mehta, Identification of Vortex Induced Clear Air Turbulence Using Airline Flight Records. AIAA 22nd Aerospace Sciences Meeting, January 9-12, 1984, Reno, Nevada.

We believe that there is sufficient evidence to classify the combination of thunderstorm activity and strong winds aloft as a mechanism which can generate significant turbulence over a volume of the atmosphere from about the same level as the tops of the thunderstorms up to the tropopause and downwind for some unknown distance. This is a volume of potential turbulence that is considerably larger than pilots normally expect to be associated with thunderstorms. It is our opinion that action should be taken to warn pilots of this potential hazard when it exists.

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

Advise its weather forecasters to be alert for situations where there is a jet stream or strong upper level winds in association with lines of developing or developed thunderstorms which may produce an area of severe clear air turbulence, and to issue appropriate warnings of this potential turbulence to pilots through area forecasts, SIGMETs or other appropriate means of communication. (Class II, Priority Action) (A-84-108)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in this recommendation. GROSE, Member, did not participate.

  
By: Jim Burnett  
Chairman