

Adopted 2-1-92

Log 2335



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: February 4, 1992

In reply refer to: A-92-8 and -9

Honorable Barry L. Harris
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

On November 14, 1990, a McDonnell Douglas DC-9-32, registered in Italy as I-ATJA and operated as Alitalia flight 404, (AZA-404) crashed into the side of a mountain about 5 miles north of Zurich-Kloten Airport (LSZH). The flight had departed Milano-Linate Airport (LIML) at 1936.¹ The accident occurred at 2013, during an instrument landing system (ILS) approach to runway 14 at LSZH. The captain, first officer, 4 flight attendants, and 40 passengers perished. The accident is under investigation by the Swiss Federal Aircraft Accident Investigation Bureau, and the National Transportation Safety Board, the Federal Aviation Administration (FAA), and Douglas Aircraft Company are participants in accordance with the provisions of the International Convention on Civil Aviation.

Details of the accident sequence of events and conclusions will be forthcoming when the Swiss Government publishes the report in March, 1992. The investigation has disclosed a possible failure mode of the very high frequency omnidirectional range (VOR)/ILS system, which was installed on the airplane, that could have contributed to this controlled flight into terrain. This failure mode could have led the flightcrew into believing they were on course and on the glidepath when they were not.

According to Douglas Aircraft Company engineers, it is possible that a short circuit or an open circuit in certain models of VOR/ILS receivers could cause navigation instruments to indicate "zero deviation." Thus, raw data deviation information on the attitude direction indicator, displayed by the flight director bars, and the horizontal situation indicator could center and remain centered with no failure or warning flag in view. In addition, this short circuit or open circuit could prevent the autopilot and the ground

¹All times are Zurich local time (UTC+1 hour).

proximity warning system (GPWS) from receiving the proper course and glidepath deviation signals. The autopilot would continue to guide the airplane according to previously established crew inputs, and the GPWS would not sound an alarm due to glideslope deviation or descent below a safe altitude. This could also occur if the VOR localizer (LOC) or glideslope signals to the autopilot were interrupted by an open circuit.

As a crosscheck of the system, the captain and first officer would normally use two separate VOR/LOC receivers for navigation information that would be displayed on their respective instruments. However, without warning flags indicating system failure, the pilots might accept as accurate centered indications and then use the "NAV" switching function to select the malfunctioning VOR/LOC receiver on both panels.

According to Douglas, some VOR/ILS receivers have an expanded self-monitoring capability to detect this type of failure. Receivers that do not have this feature are:

- Collins model 51RV-1
- Collins model 51RV-4
- Wilcox model 806
- King model KNR6030
- Bendix model RNA 26C (some versions)

Douglas issued two All Operators Letters (AOLs) (AOL No. C1-E60-HHK-L134, dated July 27, 1984, and AOL No. 9-1565, dated August 24, 1984,) that described the potentially hazardous failure modes. The company issued another All Operators Letter (Douglas AOL No. C1-JLO-TMR-91-L001) on March 1, 1991, following this accident that reiterated the information in the 1984 letters. According to Douglas records, Alitalia received the 1984 letters and other information relating to the anomaly in 1984. Alitalia pilots, however, were unaware of the potential problem until after the accident.

Douglas Aircraft Company revised DC-9 and MD-80 flightcrew operating manuals to reflect the possibility of short or open circuits within the VOR/ILS system. Douglas officials also believe that the failure scenario should be incorporated into all DC-9/MD-80 flightcrew training curricula. The Safety Board believes that this action is appropriate. Douglas officials are recommending that if a discrepancy exists between deviations displayed on the indicators of the same type of instrument, the pilots should carefully compare the VOR/LOC or glideslope deviation information with other navigational aids, such as distance measuring equipment, VOR bearing, radio and barometric altitude, marker beacon, automatic direction finder bearing, and vertical speed. Also, if "NAV" switching is used, it should be accomplished before localizer and glideslope capture on an instrument approach to allow positive verification of all deviation information that will be used for that approach. Douglas further recommends that if one VOR/ILS receiver is inoperative, the other receiver should be temporarily tuned to a nearby VOR station and the selected course varied to ensure that the course deviation indicator moves in accordance with the selected course.

These VOR/ILS receivers may also be installed in an undetermined number of air carrier and other aircraft made by U.S. and other manufacturers. The Safety Board has no reasonable means to determine what other types of airplanes utilize these receivers or what companies operate these airplanes. However, because these VOR/ILS receivers may also be installed in some corporate or other general aviation aircraft, the Safety Board believes that information regarding this potential problem should be published in Advisory Circular (AC) 43-16, General Aviation Airworthiness Alerts, in addition to being disseminated to all air carriers.

In view of the findings, the Safety Board recommends that the Federal Aviation Administration:

Issue an Air Carrier Operations Bulletin to Principal Operations Inspectors requiring that operators of airplanes equipped with the following navigation receivers include in their Pilot Operating Manuals procedures for detecting malfunctions that result in the display of disparate information: Collins model 51RV-1; Collins model 51RV-4; Wilcox model 806; King model KNR6030; and some versions of Bendix model RNA 26C. Also, notify formally foreign airworthiness authorities about the potential failure modes in such equipment. (Class II, Priority Action) (A-92-8)

Publish the substance of this recommendation in Advisory Circular (AC) 43-16, General Aviation Airworthiness Alerts. (Class II, Priority Action) (A-92-9)

Chairman KOLSTAD, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT, concurred in these recommendations.



By: James L. Kolstad
Chairman

Attachments

Douglas AOL CI-JLO-TMR-91-L001, March 1, 1991
Douglas AOL 9-1565, August 24, 1984
Douglas AOL CI-E60-HHK-L134, July 27, 1984