

Log # 2608



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Date: July 11, 1996

In reply refer to: A-96-45 through -47

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On December 20, 1995, at 1136 eastern standard time, a Boeing 747-136, N605FF, operated by Tower Air, Inc., as flight 41, sustained substantial damage during a rejected takeoff from a snow-covered runway at John F. Kennedy International Airport, Jamaica, New York. There were 24 minor injuries and 1 serious injury among the 15 crewmembers and 453 passengers on board. Flight 41 was being conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 121 as a domestic, scheduled passenger/cargo flight to Miami, Florida.

Although the National Transportation Safety Board's investigation of this accident is ongoing, the Board has determined that the accident airplane's flight data recorder (FDR) held unusable data. The lack of usable FDR data has slowed the progress of the investigation.

Tower Air flight 41 was equipped with an Aeronautical Radio Incorporated (ARINC) 563 digital FDR system manufactured by Teledyne Controls. This system is installed in approximately 70 Boeing 747 and Lockheed L-1011 airplanes. System components include a central electronics unit (CEU) that provides all data processing functions for the FDR system and three data acquisition units (DAUs) that precondition inputs from various sensors.

Following the Safety Board's FDR readout that revealed the scrambled, unusable data, the CEU was removed from the accident airplane for bench testing. The unit passed all tests with no evidence of malfunction. However, when it was tested on a similar B-747, it caused the same data scrambling that was seen on the accident airplane FDR readout. Further testing of the CEU by the manufacturer determined that the malfunction was not in any of the circuit boards, and additional testing is planned to determine the exact source of the malfunction.

This malfunction is considered unusual because it does not cause the "Flight Recorder Fail" light in the cockpit to illuminate, and it cannot be diagnosed on the test bench. As a result, a malfunctioning CEU can remain in service without the operator being aware that the FDR data have been scrambled. However, the Safety Board has learned of an easily performed test that will identify a malfunctioning CEU.

The CEU has a built-in self test that can determine if the components in the ARINC 563 system are functioning properly. The self test is initiated through a switch on the CEU. When the test is completed, a failure in any component will cause a fault light to illuminate. If no fault lights illuminate, the system is considered operational. This test procedure, which requires opening the electronics bay hatch to gain access, can be completed by one technician in less than 2 minutes when electrical power is on the airplane.

A self test was attempted when the CEU from the accident airplane was installed on a similar B-747. Fault lights corresponding to many components blinked in a random fashion, and the test could not be completed. According to the technicians, this was indicative of a CEU malfunction. The Safety Board believes that the self test is an effective way to determine if a CEU malfunction is present.

The procedure for performing the self test is described in Chapter 31-31-00 of the B-747 Maintenance Manual. However, there is no requirement to perform this test unless a component in the system has been replaced. To prevent a similar loss of data from hindering other investigations, the Safety Board believes that the FAA should require operators of airplanes equipped with the ARINC 563 FDR system to perform a self test of the CEU each flight day.

The investigation also raised two additional concerns about Tower Air FDR system maintenance practices that the Safety Board believes the FAA should address.

A review of Tower Air maintenance records from the accident airplane revealed that on December 5, 1995, six required FDR parameters were found to have malfunctioned. An entry was made in the operational deferred item log that stated:

The DFDR parameters [were] reported suspect (missing or not recorded):
1) elev[ator] pos[ition], 2) radio comm[unication], 3) flap out board pos[ition], 4) vertical acceleration, 5) longitudinal accel[eration], 6) #2 [engine thrust] rev[er] pos[ition].

For 3 flight days, the airplane flew daily, round-trip passenger flights between John F. Kennedy Airport in New York (Tower Air's maintenance hub) and

Miami, Florida. According to the FAA's Master Minimum Equipment List¹ (MMEL), an airplane can remain in service for 3 days with an inoperative FDR system if the cockpit voice recorder (CVR) is operational. During those 3 days, Tower Air made no attempt to repair the FDR system. On December 7, 1995, Tower Air replaced DAU #1 and the airplane's logbook was signed off, indicating that the six parameters had been repaired.

The Safety Board is concerned that the airplane remained in service for 3 days without Tower Air attempting to repair the malfunction, even though the airplane was at a suitable repair facility on all 3 days. In 1990, following a series of accident investigations that were hindered by the lack of FDR or CVR data, the Safety Board concluded that specific guidelines about the circumstances under which an air carrier may operate with an inoperative recorder should be issued. In a May 30, 1990, letter to the FAA Administrator, the Board stated, "For example, the carrier could be required to terminate a flight at the next destination where repairs can be made...." The Safety Board issued Safety Recommendation A-90-74, asking that the FAA:

Revise the Master Minimum Equipment List policy regarding cockpit voice and digital flight data recorders to ensure that an inoperative recorder is repaired or replaced within a more stringent timeframe than is currently authorized.

In a November 1991 letter, the FAA informed the Safety Board that it had decided to reassign inoperative recorders to an MMEL category "A" repair interval. This category allows 3 days in which to replace or repair the inoperative unit, and cannot be extended by the operator. Based on this action, the Safety Board classified Safety Recommendation A-90-74 "Closed--Acceptable Action."

The Safety Board believes that the intent of the authorized repair interval was to allow operators to fly airplanes to a suitable repair facility, and to perform the necessary repairs at the first opportunity within 3 days. However, the circumstances of Tower Air's FDR repair illustrate that operators can delay repairs for 3 days, even if the airplane is at a suitable repair facility. To ensure that flight with an inoperative FDR is kept to a minimum, the Safety Board believes the FAA should modify MMELs so that flight with an inoperative FDR is permitted only when an airplane is not at a suitable repair facility, for a period not to exceed 3 days.

Finally, maintenance records indicate that Tower Air did not follow the procedures in the FAA-approved maintenance manual when performing this repair.

¹The Master Minimum Equipment List is in the FAA-approved Dispatch Deviations Procedures Guide. The list specifies the conditions under which an operator may dispatch an airplane with inoperative equipment.

Tower Air's corrective action to repair the six inoperative parameters was to replace DAU #1. However, according to the maintenance manual, only one of the six parameters is processed through DAU #1. The remaining five parameters are processed through the other DAUs. According to Teledyne Controls, replacement of DAU #1 had no effect on parameters processed by the other DAUs.

The procedure for troubleshooting inoperative FDR parameters is described in Section 31-31-00 of Tower Air's maintenance manual. The procedure specifies that each parameter is to be tested individually beginning with the sensor, then proceeding to airplane wiring, and finally to the DAU. There is no evidence that Tower Air followed this procedure when maintenance personnel determined that replacement of DAU #1 would correct the six parameters. The Safety Board believes that the FAA should increase its oversight of Tower Air FDR system maintenance practices to ensure that all future repairs are performed properly.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require that the operators of all airplanes equipped with a Teledyne Controls Aeronautical Radio Incorporated 563 digital flight data recorder system perform a self test of the central electronics unit each flight day to ensure that the system is operating properly. (Class II, Priority Action) (A-96-45)

Modify Master Minimum Equipment Lists to ensure that flight with an inoperative flight data recorder is permitted only until the airplane's first arrival at a suitable repair facility, but not to exceed 3 days. (Class II, Priority Action) (A-96-46)

Increase oversight of flight data recorder system maintenance practices by Tower Air to ensure that repairs are performed in accordance with the maintenance manual. (Class II, Priority Action) (A-96-47)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By:


Jim Hall
Chairman