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FLIGHT DATA RECORDER
GROUP CHAIRMAN'S FACTUAL REPORT
(4 PAGES)

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NATIONAL TRANSPORTATION SAFETY BOARD
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Flight Data Recorder

Group Chairman's Factual Report of Investigation
by John E. Schade

DCA96MA068

A. ACCIDENT

Location	:	Pensacola, FL
Date	:	07/06/96
Time	:	1542 Central Daylight Time (CDT)
Aircraft	:	MD-88, N927DA, Flight 1288

B. GROUP

Chairman	-	John E. Schade National Transportation Safety Board (NTSB)
Member	-	Stephen P. Lindenbaum Delta Air Lines, Inc. (DAL)
Member	-	Chris Baum Air Line Pilots Association (ALPA)
Member	-	Webster Heath McDonnell Douglas Corporation (MDC)

C. SUMMARY

On July 6, 1996, Delta Airlines flight 1288, a MD-88, N927DA experienced an uncontained failure of the left engine during the beginning of the takeoff roll. The flight crew stopped the airplane about 1,400 feet down the takeoff runway. On board the airplane were 142 passengers and 5 flight crew members. Initial examination indicated damage consistent with a fan disk separation.

The Digital Flight Data Recorder (DFDR), a Lockheed Model 209F (SIN 4131) was removed from the accident aircraft and sent to the National Transportation Safety Board's (NTSB's) Vehicle Performance Laboratory for readout and evaluation. A successful DFDR readout was performed. The data generated are presented in Attachments II and III which display graphical and tabular information for the takeoff roll during which the incident occurred. A total of 42 parameters were recorded by the DFDR including basic flight characteristics such as time, pressure altitude, indicated airspeed, magnetic heading and vertical acceleration. Engine data as well as control surface and aircraft orientation (pitch, roll) data were also recorded. Attachment I contains a complete list of the parameters recorded by the DFDR.

The DFDR data for the accident indicate that the McDonnell Douglas MD-88 began its takeoff roll on runway 17 of Pensacola Regional Airport. The engines spooled up to an Engine Pressure Ratio (EPR) of 1.9 over approximately 10 seconds. At the time of peak engine thrust, the power was lost to the DFDR and the recorded data for flight 1288 ceased.

D. DETAILS OF INVESTIGATION

1. Description of Data

The model flight recorder aboard the accident aircraft records aircraft data in a digital format on six separate tracks contained on ¼ inch mylar based magnetic tape. The tape, guided over a pair of record and playback heads, is driven from one coaxially mounted tape reel to the other by an electric motor. The recording method is bi-directional with tracks 1,3, and 5 recorded in one direction and tracks 2,4, and 6 in the other. Tension is maintained on the tape through the use of two constant force springs mounted between the reels.

The DFDR accepts 64 12 bit words of information contained in a serial binary data stream from the Flight Data Acquisition Unit (FDAU) every second. It then writes the data onto the tape in groups of 64 words. Each grouping of 64 words is called a subframe, four of which constitute a frame of data. Each subframe has a designated 12 bit synchronization (synch) word identifying it as subframe 1,2,3, or 4 within the frame. The synch words are the first word in each subframe. The data stream is "in synch" when successive synch words appear at 64 word intervals. Each data parameter (for example altitude, heading, or airspeed) has a specifically assigned word and bit location within the subframe.

The dast 25 hours of operational data are retained on the recording medium with each track having a duration of approximately 4.17 hours. The recording occurs in a cyclical fashion with the oldest data being erased and then the newest data being recorded in its place. This particular model DFDR records

data in one direction on a particular track and then switches tracks and direction when a transparent section of tape called a window passes by an optical end-of-tape sensor.

2. Examination and Readout

The DFDR was examined upon receipt and during tape removal was found to be undamaged. The DFDR data were transcribed from the magnetic tape medium to hard disk for further analysis using the NTSB's laboratory equipment. The accident flight was located during the transcription. The transcribed data were converted from the recorded binary values (i.e. 0's and 1's) to engineering units (i.e. feet, knots, degrees, etc.) using conversion formulas obtained from Delta Airlines, the aircraft's operator. The actual conversion is accomplished by an automated process which incorporates the NTSB laboratory's computers and associated software. A successful readout was completed with good data being transcribed on all tracks.

3. Details of Readout

The DFDR aboard the accident aircraft recorded approximately 42 parameters. A complete list of parameters recorded as received from Delta Airlines is presented in Attachment 1.

The accident data received from the DFDR were verified for accuracy by examining previous flights and landings also recorded on the medium. This was done in order to determine if the data received by the recorder were consistent with cruise and normal takeoff characteristics for the aircraft. In all cases the data were found to be consistent with the normal operation of the aircraft.

The DFDR data indicate that the aircraft was configured for takeoff on runway 17. At DFDR Subframe Reference Number (SRN) 1721[1], 11 seconds before the end of the data for flight 1288, the right and left engines began to spool up to takeoff power as evidenced by the increase in EPRs. At SRN 1722 the longitudinal acceleration of the aircraft began to increase signaling the beginning of the takeoff roll. The right and left engines reached a maximum EPR value of 1.90 and 1.93 respectively. A split second after these values were recorded by the DFDR, power was cut to the recorder's circuitry and further data storage was discontinued. The indicated airspeed (IAS) of the aircraft had just started to reach significant levels when the recording terminated. The IAS last recorded was 39.75 knots.

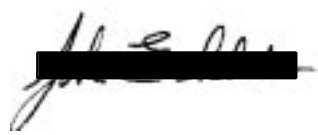
[1] The FDR Subframe Reference Number is a measure of relative time on the DFDR. One **Subframe** is equivalent **to** one second.

(3)

An in depth inquiry into the nature of the data transition (from the current data to data recorded 25 hours prior) was made using the NTSB's readout software. The transition was found to be "clean"—i.e. no more data relevant to the accident was recorded on the tape medium. Otherwise, the playback signal was found to be clear and well within the tolerances for the DFDR model.

4. Presentation of Data

Attachment II contains plotted data for the accident. Attachment 11-1 shows a plot of approximately the last 80 seconds of the accident flight and 20 seconds of flight data recorded **25** hours earlier for reference. Attachment 11-2 displays a close up view of the recorded portion of the takeoff roll. Attachment III contains tabular data corresponding to the plots in Attachment II.



John E. Schade
Engineering Technician
Vehicle Performance Division

List of Attachments:

Attachment I		DFDR Parameter Listing
Attachments 11-1 and 11-2	:	Plotted Data
Attachments III-1 to 111-1	:	Tabular Data