NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

September 27, 2011

Flight Data Recorder - 10

Specialist's Factual Report
By Christopher Babcock

1. EVENT SUMMARY

Location: Boston, Massachusetts
Date: July 14, 2011, 1933 Eastern Daylight Time (EDT)
Aircraft: Boeing 767-300ER
Registration: N185DN
Operator: Delta Airlines
NTSB Number: DCA11FA084B

At approximately 1933 EDT on July 14, 2011, a Delta Airlines Boeing 767-300ER, registration N185DN, operating as Delta flight 266, was taxiing on taxiway B for departure on runway 4 from Boston Logan International Airport, Boston, Massachusetts. As the aircraft passed the intersection with taxiway M, the left winglet of the aircraft struck the horizontal tail of an Atlantic Southeast Airlines CRJ-900. No injuries were reported on either aircraft. The flight data recorder from the 767 was recovered and forwarded to the National Transportation Safety Board's Vehicle Recorder Laboratory for evaluation.

2. FLIGHT DATA RECORDER GROUP

An FDR group was not convened.

3. FDR Carriage Requirements

The event aircraft, N185DN, was manufactured in 1995, and was operating such that it was required to be equipped with an FDR that recorded, at a minimum, the 34 parameters cited in 14 CFR 121.344(d)(1).

4. DETAILS OF FLIGHT DATA RECORDER INVESTIGATION

The NTSB's Vehicle Recorder Division received the following FDR:

Recorder Manufacturer/Model: **Lockheed Aeronautical Systems Model 209**
Recorder Serial Number: **4213**

4.1. Lockheed Aeronautical Systems Model 209 Description

The Lockheed Aeronautical Systems Model 209 (LAS 209) FDR records ARINC 573 configuration data in a binary format onto six tracks of 1/4-inch Mylar tape using an analog signal, for a total of 25 hours of recorded flight data. Data is recorded onto a single track in a predetermined bi-directional sequence, where the old data is erased before recording

new data; end-of-tape and beginning-of-tape marks allow the recorder to sense when to switch the recording direction and track.

The LAS 209 FDR records 64 words of digital information every second, with each word 12 bits in length. Each grouping of 64 words is called a subframe. Each subframe has a unique 12-bit synchronization (sync) word identifying it as either subframe 1, 2, 3, or 4. The sync word is the first word in each subframe. Each grouping of consecutive 1, 2, 3 and 4 subframes comprise a frame (i.e., four seconds of data). The data stream is "in sync" when successive sync words appear at the proper 64-word intervals. Each data parameter (e.g. altitude, heading, and airspeed) has a specifically assigned word number within the subframe.

The LAS 209 FDR is designed to meet the crash-survivability requirements of TSO–C51a.

4.1.1. Recorder Condition

The recorder was in good condition and the data were extracted normally from the recorder.

4.1.2. Recording Description

The FDR recording contained approximately 25 hours of data. Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals one elapsed second. The parameters evaluated for the purpose of this report appeared to be in accordance with the federal FDR carriage requirements.

4.1.3. Engineering Units Conversions

The engineering units conversions used for the data contained in this report are based on documentation from the manufacturer of the data acquisition unit installed in the aircraft. Where applicable, the conversions have been changed to ensure that the parameters conform to the NTSB's standard sign convention that climbing right turns are positive (CRT=+).[1]

Appendix A lists the FDR parameters verified and provided in this report.

4.1.4. Airspeed

For most of the plotted data on the ground, the computed airspeed parameter shows non-computed data (NCD). NCD is a particular case of data invalidity where the source system is unable to compute reliable data for reasons other than system failure. In the case of the computed airspeed parameter, NCD is recorded when the airspeed is below 30 knots.

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[1] CRT=+ means that for any parameter recorded that indicates a climb or a right turn, the sign for that value is positive. Also, for any parameter recorded that indicates an action or deflection, if it induces a climb or right turn, the value is positive. Examples: Right Roll = +, Pitch Up = +, Elevator Trailing Edge Up = +, Right Rudder = +.

4.2. Time Correlation

Correlation of the FDR data from SRN to the local EDT, was established by setting SRN 6530 seconds to 1932:47.6 EDT.[2]

4.3. FDR Plots and Corresponding Tabular Data

The following plot contains FDR data recorded during the July 14, 2011, event. This figure is configured such that right turns are indicated by the trace moving toward the bottom of the page, left turns towards the top of the page, and nose up attitudes towards the top of the page.

The corresponding tabular data used to create this plot are provided in electronic (*.csv)[3] format as a separate docket item.

Christopher Babcock
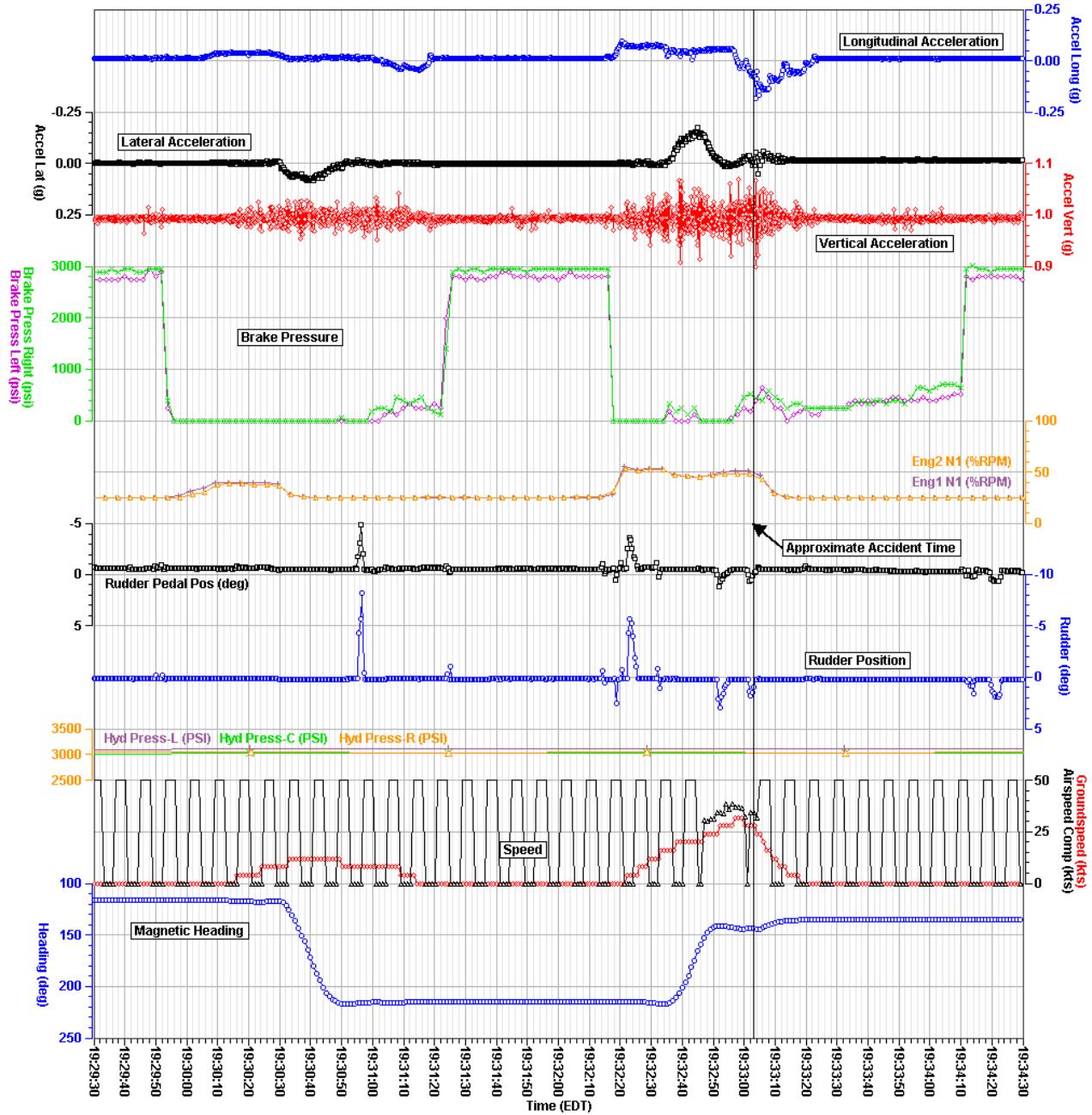Aerospace Engineer
Vehicle Recorder Division

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[2] See the CVR Group Chairman's Factual Report for more information.
[3] Comma separated value format.

Figure 1. Basic FDR data from taxiway collision.

APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameters and table A-2 describes the unit abbreviations used in this report.

Table A-1. Verified and provided FDR parameters.

Parameter Name	Parameter Description
1. Accel Lat (g)	Lateral Acceleration
2. Accel Long (g)	Longitudinal Acceleration
3. Accel Vert (g)	Vertical Acceleration
4. Airspeed Comp (kts)	Computed Airspeed
5. Groundspeed (kts)	Ground Speed
6. Heading (deg)	Magnetic Heading
7. Rudder (deg)	Rudder Position
8. Rudder Ped Pos (deg)	Rudder Pedal Position
9. Eng1 N1 (%rpm)	Left Engine N1
10. Eng2 N1 (%rpm)	Right Engine N1
11. Brake Press Left (psi)	Main Brake Pressure Left
12. Brake Press Right (psi)	Main Brake Pressure Right
13. Hyd Press-L (psi)	Left Hydraulic Pressure
14. Hyd Press-C (psi)	Center Hydraulic Pressure
15. Hyd Press-R (psi)	Right Hydraulic Pressure
16. Key VHF-L (discrete)[a]	Left Audio Control Panel (ACP) VHF Key
17. Key VHF-C (discrete)[a]	Center ACP VHF Key
18. Key VHF-R (discrete)[a]	Right ACP VHF Key

[a] These parameters are provided in the tabular data only

Table A-2. Unit abbreviations.

Units Abbreviation	Description
deg	degrees
kts	knots
g	acceleration
psi	pounds per square inch
%rpm	percent revolutions per minute