

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

February 19, 2015

Flight Data Recorder

Specialist's Factual Report
By Cassandra Johnson

1. EVENT SUMMARY

Location: Aspen, Colorado
Date: January 5, 2014
Aircraft: Bombardier CL-600-2B16
Registration: N115WF
Operator: Vineland Corporation Company
NTSB Number: CEN14FA099

On January 5, 2014, at 1222 mountain standard time (MST), a Bombardier CL-600-2B16, N115WF, impacted the runway while attempting to land on Runway 15 at Aspen-Pitkin County Airport/Sardy Field (KASE), Aspen, Colorado. There were two crewmembers and a passenger onboard. One crewmember was fatally injured; the other crewmember and passenger received serious injuries. The airplane was destroyed. The airplane was registered to the Bank of Utah Trustee and operated by Vineland Corporation Company, Panama, South America under the provisions of Title 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules flight plan. The flight originated from Tucson International Airport (KTUS), Tucson, Arizona, at 1004.

2. FLIGHT DATA RECORDER GROUP

A flight data recorder (FDR) group was not convened.

3. FDR Carriage Requirements

The event aircraft, N115WF, was manufactured in 1994, and was operating such that it was required to be equipped with an FDR that recorded, at a minimum, 18 parameters, as cited in 14 CFR Part 91.609(c).

4. DETAILS OF FDR INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following FDR:

Recorder Manufacturer/Model: **Loral/Fairchild F1000**
Recorder Serial Number: **00523**

4.1. Loral/Fairchild F1000 Description

This model FDR records airplane flight information in a digital format using solid-state flash memory as the recording medium. The F1000 can receive data in the ARINC 573/717/747/542a configurations and can record a minimum of 25 hours of flight data. It is configured to record 64 12-bit words of digital information every second. Each grouping of 64 words (each second) is called a subframe. Each subframe has a unique 12-bit synchronization (sync) word identifying it as subframe 1, 2, 3, or 4. The sync word is the first word in each subframe. The data stream is "in sync" when successive sync words appear at proper 64-word intervals. Each data parameter (e.g. altitude, heading, airspeed) has a specifically assigned word number within the subframe. The F1000 is designed to meet the crash-survivability requirements of TSO-C124.

4.1.1. Recorder Condition

The recorder was in good condition and the data were extracted normally using the recorder manufacturer's software and NTSB's equipment.

4.1.2. Recording Description

The FDR recording contained approximately 124 hours of data. Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals one elapsed second. The event flight was the last flight of the recording and its duration was approximately 2 hours and 18 minutes. The parameters evaluated for the purpose of this report appeared to be in accordance with the federal FDR carriage requirements, except the flight spoiler parameter. The flight spoiler parameter was installed and appeared not to be working. During the investigation, the FAA was informed of the inoperative flight spoiler parameter.

4.1.3. Engineering Units Conversions

The engineering units conversions used for the data contained in this report are based on the Supplemental Type Certificate (STC) number SA8353SW documentation obtained from Gulfstream Aerospace Corporation, the current STC owner. 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

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

4.2. Time Correlation

Correlation of the FDR data from SRN to the event local time, MST, was established with an offset provided by the Cockpit Voice Recorder (CVR) Group Chairman².

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 = +.

² For more details, refer to NTSB's CVR Group Chairman's Factual Report.

Accordingly, the time offset for the event flight data from SRN to local MST is the following: MST = SRN – 402,226.25. Therefore, for the rest of this report, all times are referenced as MST, not SRN.

4.3. FDR Plots and Corresponding Tabular Data

Figures 1 to 6 contain FDR data recorded during the January 5, 2014 event. All the parameters listed in table A-1 are plotted. Figures 1 and 2 cover the entire flight (the x-axis is from 10:00:00 MST to 12:25:00 MST). Figures 3 and 4 cover the missed approach, as reported by the Investigator-In-Charge, and the final approach including the end of the FDR recording (the x-axis is from 12:00:00 MST to 12:23:00 MST). Figures 5 and 6 have an expanded scale covering the last 46 seconds of recorded data (the x-axis is from 12:21:35 MST to 12:22:22 MST). Figures 1, 3 and 5 plot the basic parameters; and figures 2, 4, and 6 plot the rest of the parameters. These figures are 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 FDR data starting at 12:08:00 MST shows a pattern consistent with the missed approach. After the missed approach, at 12:19:45 MST, approximately 2 minutes and 37 minutes before the end of the FDR recording, the aircraft began its final descent from a pressure altitude of approximately 12,900 feet (ft). At this time, the left and right flaps were at 28 degrees (deg), the autopilot was “On”, and engine 1 N1 (Eng1 N1) and engine 2 N1 (Eng2 N1) were both decreasing through about 73% revolutions per minute (RPM).

Twenty-four seconds later, at 12:20:09 MST, while descending through a pressure altitude of about 12,500 ft, the autopilot transitioned to “Off” and remained “Off” for the rest of the FDR recording.³ At this time, Eng1 N1 and Eng2 N1 were steady at about 33% RPM.

Thirty-four seconds later at 12:20:43 MST, while descending through a pressure altitude of about 11,000 ft, the left and right flaps increased to 44 deg. Twenty-seven seconds later at 12:21:10 MST, while descending through a pressure altitude of about 9,150 ft, Eng1 N1 and Eng2 N1 began increasing.

For the next 56 seconds, Eng1 N1 and Eng2 N1 varied between a maximum of about 75% RPM and a minimum of about 42% RPM. Also during this time, the pitch angle varied, peaking at a maximum of 4.3 deg and a minimum of -5.2 deg. At 12:22:06 MST, the vertical acceleration peaked at 2.91 g's and pitch angle increased to about 5.6 deg.

For the next 16 seconds until the end of the FDR recording at 12:22:22 MST, the pitch angle increased to about 15.3 deg, decreased to about -13.1 deg, increased to about 24.7 deg and then settled to about 0 deg. Additionally, vertical acceleration decreased to -0.17 g's, peaked at 5.76 g's and then settled at -1.46 g's.

The corresponding tabular data used to create figures 1 to 6 are provided in electronic comma separated value (*.csv) format as attachment 1 to this report.

³ Numerous parameters, including autopilot, change in a manner that indicate the data may be unreliable after the 5.76 g spike in vertical acceleration at 12:22:10 MST.

Figure 1. Basic parameters during entire flight.

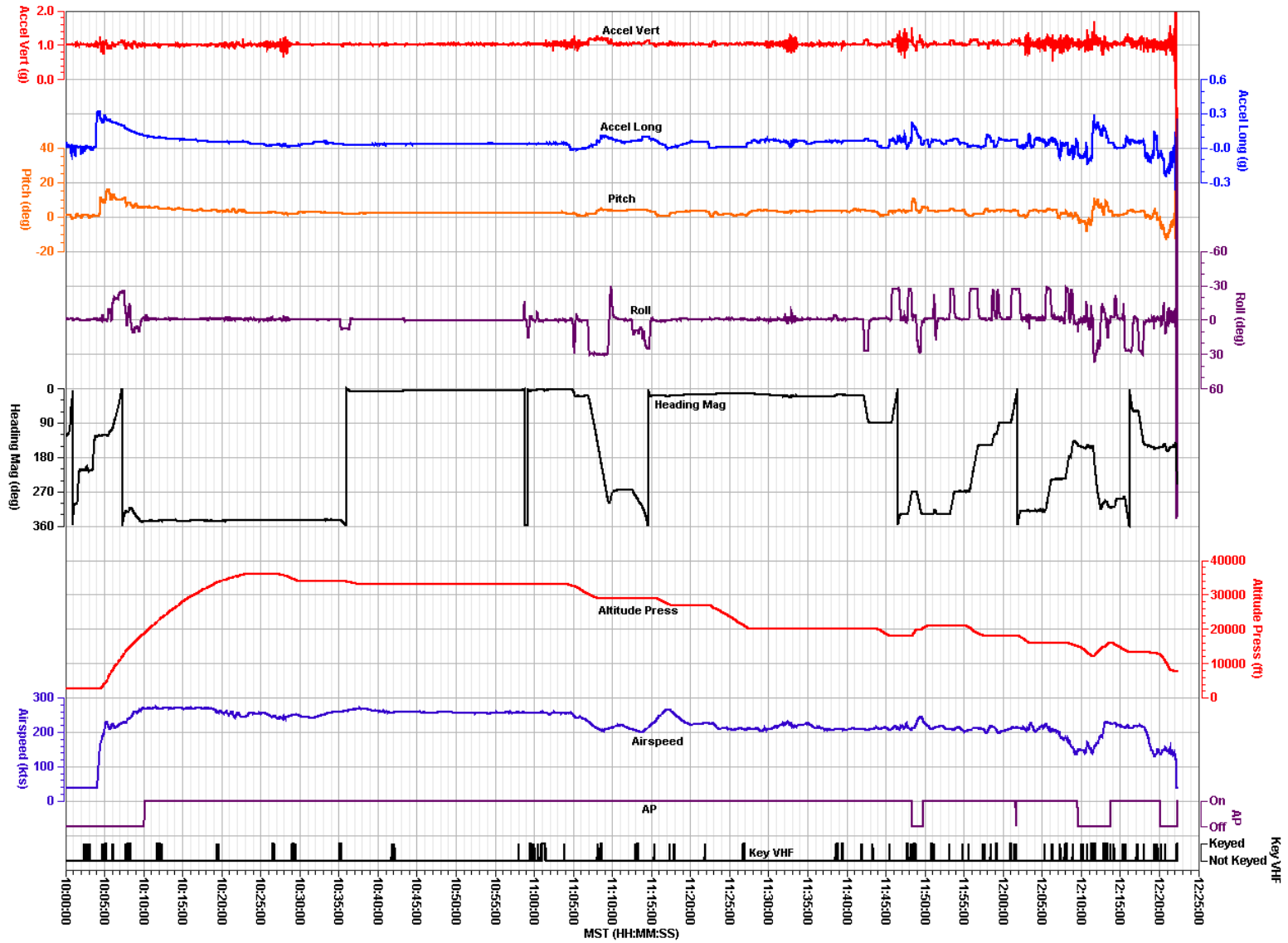


Figure 2. Additional parameters during entire flight.

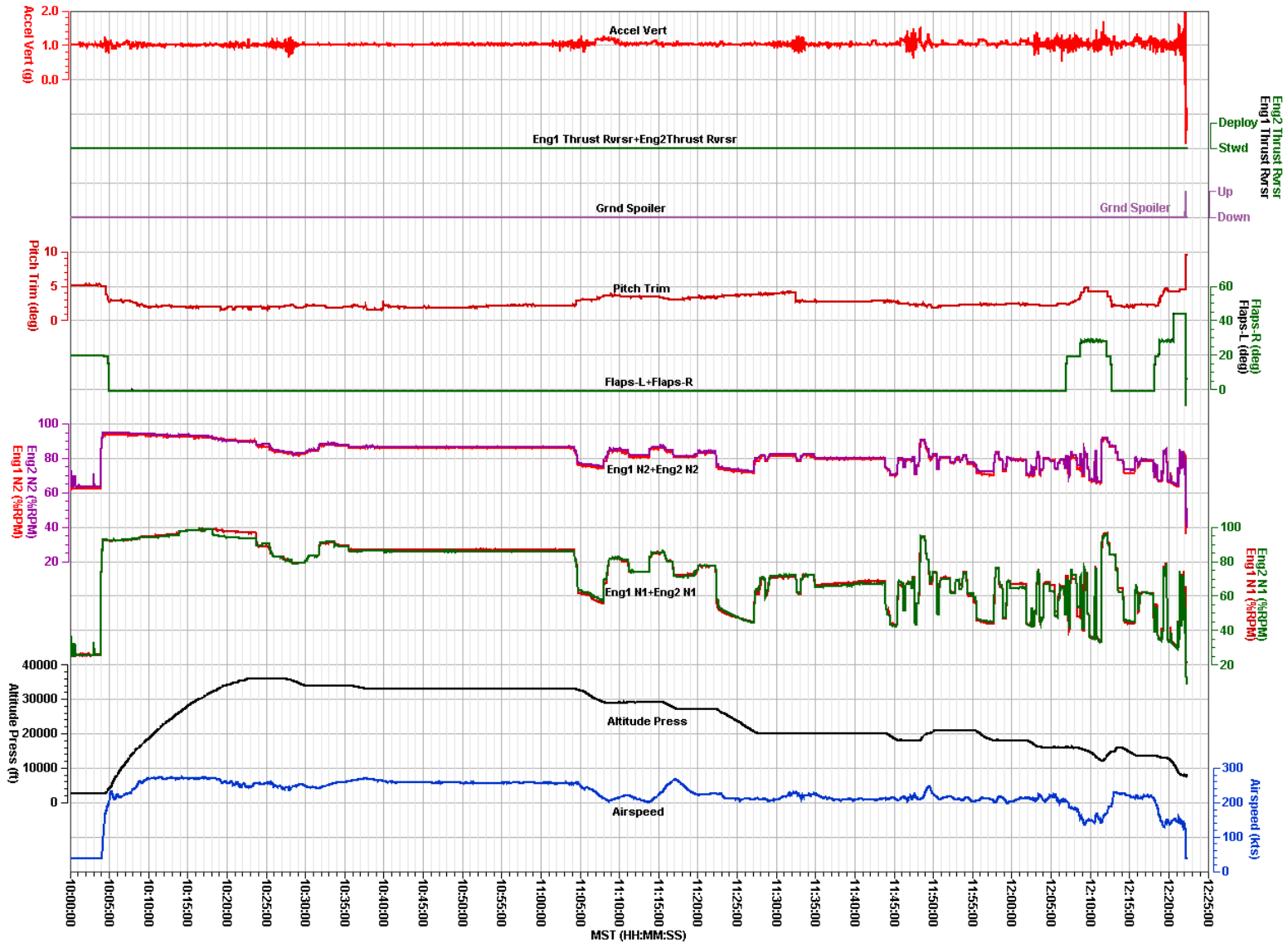


Figure 3. Basic parameters during missed approach and final approach.

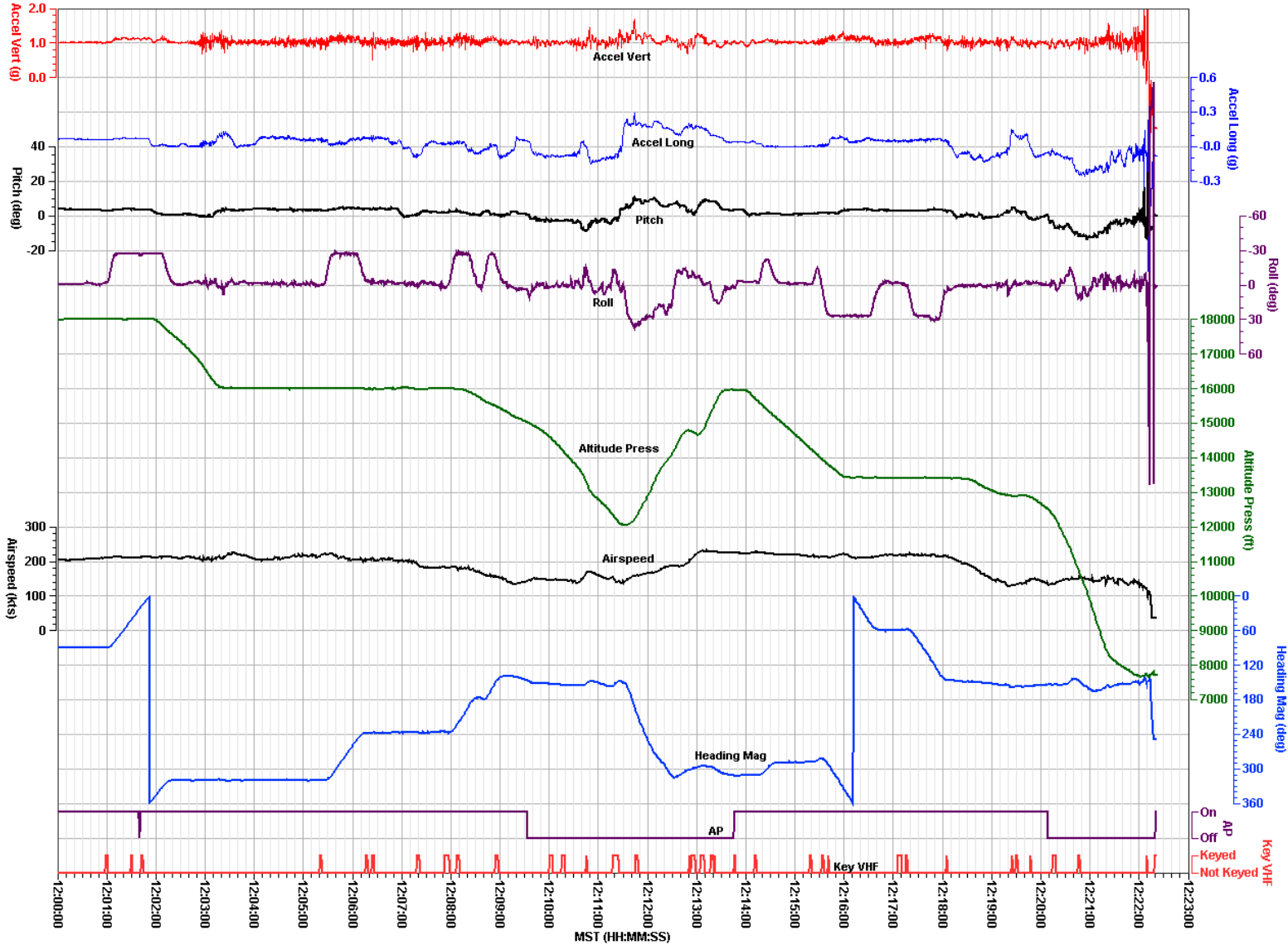


Figure 4. Additional parameters during missed approach and final approach.

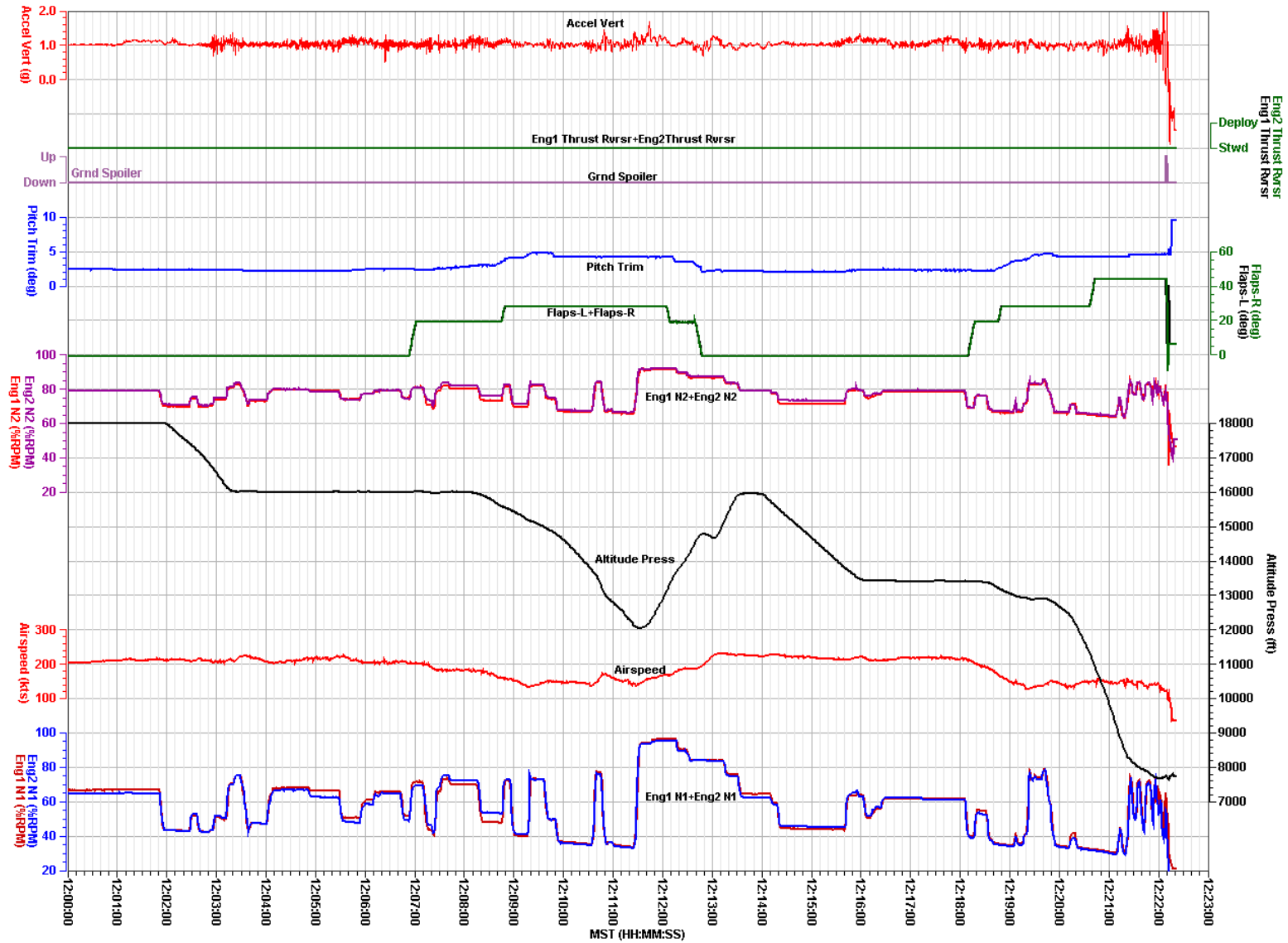


Figure 5. Basic parameters during last 46 seconds of recorded data.

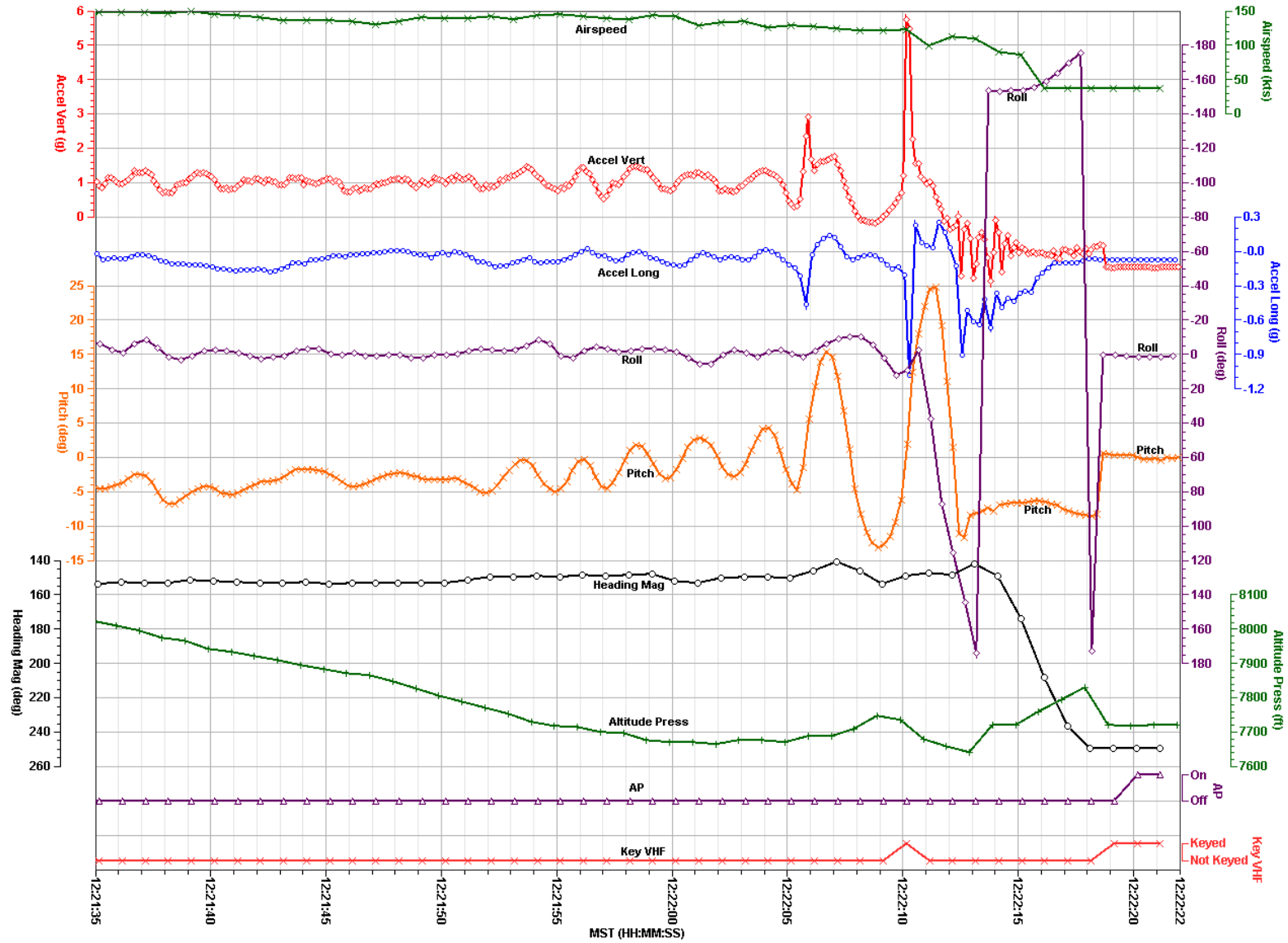
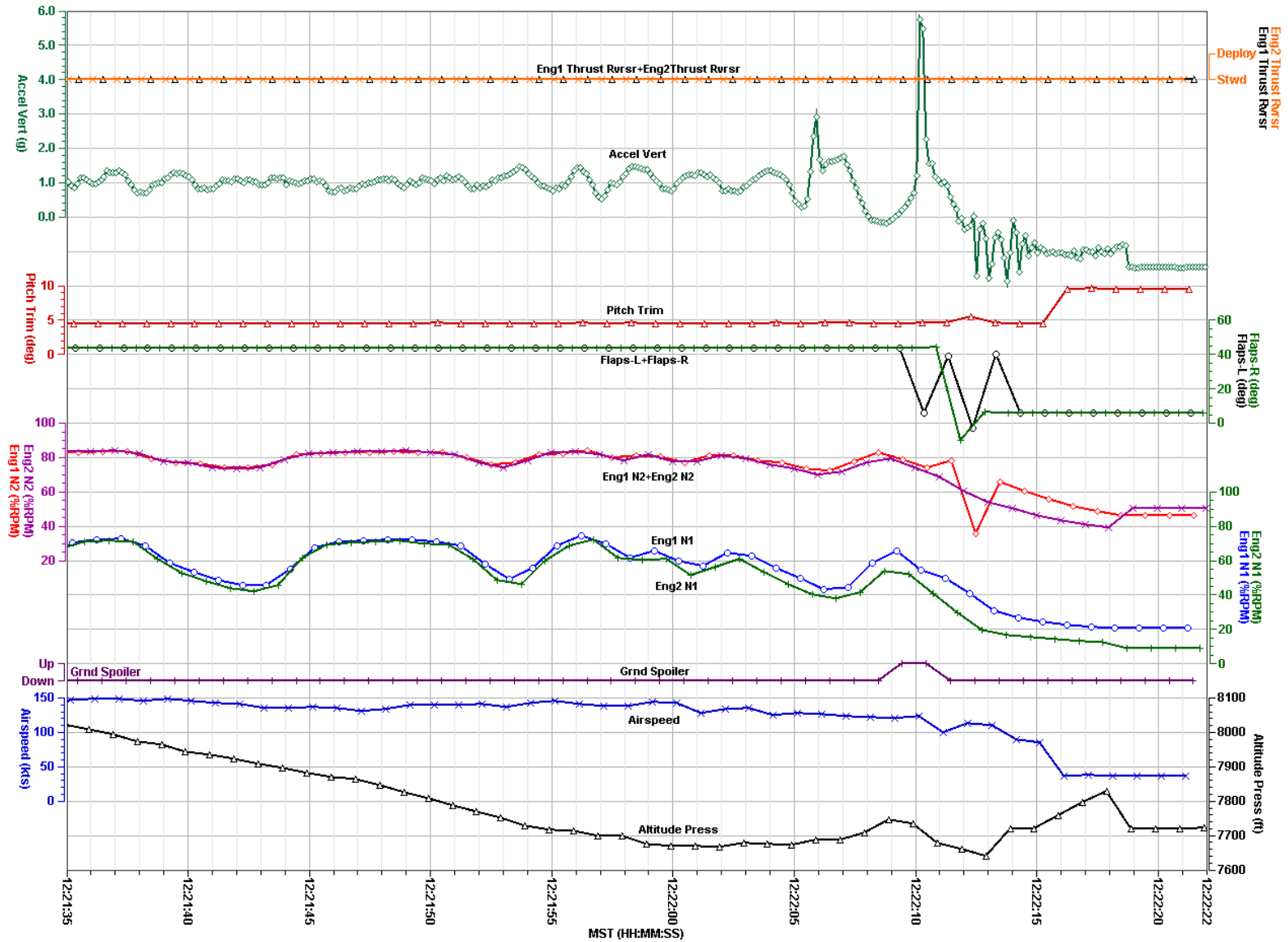


Figure 6. Additional parameters during last 46 seconds of recorded data.



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 Long (g)	Longitudinal Acceleration
2. Accel Vert (g)	Vertical Acceleration
3. Airspeed (kts)	Airspeed
4. Altitude Press (ft)	Pressure Altitude
5. AP (discrete)	Autopilot
6. Eng1 N1 (% RPM)	Engine 1 N1
7. Eng1 N2 (% RPM)	Engine 1 N2
8. Eng1 Thrust Rvrsr (discrete)	Engine 1 Thrust Reverser
9. Eng2 N1 (% RPM)	Engine 2 N1
10. Eng2 N2 (% RPM)	Engine 2 N2
11. Eng2 Thrust Rvrsr (discrete)	Engine 2 Thrust Reverser
12. Flap-L (deg)	Left Flap Position
13. Flap-R (deg)	Right Flap Position
14. Grnd Spoiler (discrete)	Ground Spoiler
15. Heading Mag (deg)	Magnetic Heading
16. Key VHF (discrete)	Microphone Keying
17. Pitch (deg)	Pitch Angle
18. Pitch Trim (deg)	Pitch Trim Position
19. Roll (deg)	Roll Angle

NOTE: This FDR records pressure altitude, which is based on a standard altimeter setting of 29.92 inches of mercury (in Hg). The pressure altitude information presented in the FDR plots and in the electronic data has not been corrected for the local altimeter setting at the time of the event.

Table A-2. Unit abbreviations.

Units Abbreviation	Description
% RPM	percent revolutions per minute
deg	degrees
discrete	discrete
ft	feet
g	g
kts	knots

NOTE: For parameters with a unit description of discrete, a discrete is typically a 1-bit parameter that is either a 0 state or a 1 state where each state is uniquely defined for each parameter.