

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



DCA22LA178

FLIGHT DATA RECORDER

Specialist's Factual Report

May 3, 2023

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A. ACCIDENT

Location: Atlanta, Georgia
Date: August 6, 2022
Time: 21:15 eastern daylight time (EDT)
Airplane: Boeing 757-200, Delta Air Lines, N540US

B. FLIGHT DATA RECORDER SPECIALIST

Specialist Kyle Garner
Sr. Aerospace Engineer – Recorder Specialist
National Transportation Safety Board (NTSB)

C. FEDERAL CARRIAGE REQUIREMENTS

The airplane was operating under the provisions of Title 14 *Code of Federal Regulations* (CFR) Part 121 and was required to be equipped with a flight data recorder (FDR) that recorded, at a minimum, 34 parameters, as cited in 14 CFR Part 121.344(d).

D. DETAILS OF THE INVESTIGATION

An FDR group was not convened. The NTSB Vehicle Recorder Division received the following FDR:

Recorder Manufacturer/Model: Honeywell 4700
Part Number: 980-4700-035
Recorder Serial Number: 1323

1.0 FDR Description

The Honeywell 4700 FDR records airplane flight information in a digital format using solid-state flash memory as the recording medium. FDRs receive data formatted in the ARINC 573/717/747 configurations and are required to record a minimum of 25 hours of flight data. FDRs are configured to record a set number of 12-bit words of digital information every second. Each grouping of words is called a subframe and is identified with a subframe reference number (SRN). 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. Each data parameter (altitude, heading, and airspeed) has a specifically assigned word number within the subframe.

The Honeywell 4700 FDR recovered from the accident airplane was configured to record 64 12-bit words of digital information every second and was designed to meet the crash-survivability requirements of TSO-C124a.

1.1 Recorder Condition

The recorder was in good condition and the data were extracted normally from the recorder using instructions provided by the recorder manufacturer.

1.2 Recording Description

The FDR recording contained approximately 54 hours of data. The accident flight was the last flight on the recording, and its duration was approximately 2 hours and 4 minutes. The parameters evaluated for this report appeared to be in accordance with federal FDR carriage requirements.

1.2.1 Engineering Unit Conversions

The engineering unit conversions used for the data contained in this report are based on documentation from the aircraft manufacturer. 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 2 lists the FDR parameters verified and provided in this report. Additionally, Table 3 describes the unit and discrete state abbreviations used in this report. These tables are found in the Appendix to this report.

1.3 Time Correlation

Correlation of the FDR data from SRN to the event local time, EDT, was established by using the recorded Greenwich mean time (GMT) Hours, GMT Minutes, and GMT Seconds and then applying an additional 4 hours offset to change GMT to EDT.²

Accordingly, the time offset for the event flight data from SRN to local EDT is the following: FDR EDT = SRN - 117,029. Therefore, for the rest of this report, all times are referenced as EDT, not SRN.

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 = +, Left Aileron Trailing Edge Down = -, Right Aileron Trailing Edge Up = +, Pitch Up = +, Elevator Trailing Edge Up = +, Right Rudder = +.

² GMT is also known as coordinated universal time (UTC).

E. FIGURES AND TABULAR DATA

Figures 1 to 10 contain FDR data recorded during the accident flight on August 6, 2022. Table 1 is a summary of the figures provided in this report.

Table 1. Summary of figures.

Figure	Time Range ³	Summary of parameters in the figure
Figure 1	Full	Basic parameters.
Figure 2		Autopilot parameters.
Figure 3		Autothrottle parameters.
Figure 4		Engine and flap parameters.
Figure 5		Miscellaneous parameters.
Figure 6	Accident	Basic parameters.
Figure 7		Autopilot parameters.
Figure 8		Autothrottle parameters.
Figure 9		Engine and flap parameters.
Figure 10		Miscellaneous parameters.

These figures are configured such that right turns are indicated by the trace moving toward the bottom of the page, left turns toward the top of the page, and nose-up attitudes toward the top of the page.

At about 21:20:45 EDT, during the first landing attempt and subsequent go-around at Atlanta Hartsfield Jackson International Airport (ATL), Atlanta, Georgia, a maximum vertical acceleration of 1.231g was recorded. After going around and repositioning for another attempt, the aircraft landed at ATL at 21:29:46 EDT.

The corresponding tabular data used to create figures 1 to 10 are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

Submitted by:

Kyle Garner
Sr. Aerospace Engineer – Recorder Specialist

³ Where *Full* = 19:25 to 21:35 EDT, and *Accident* = 21:19 to 21:22 EDT.

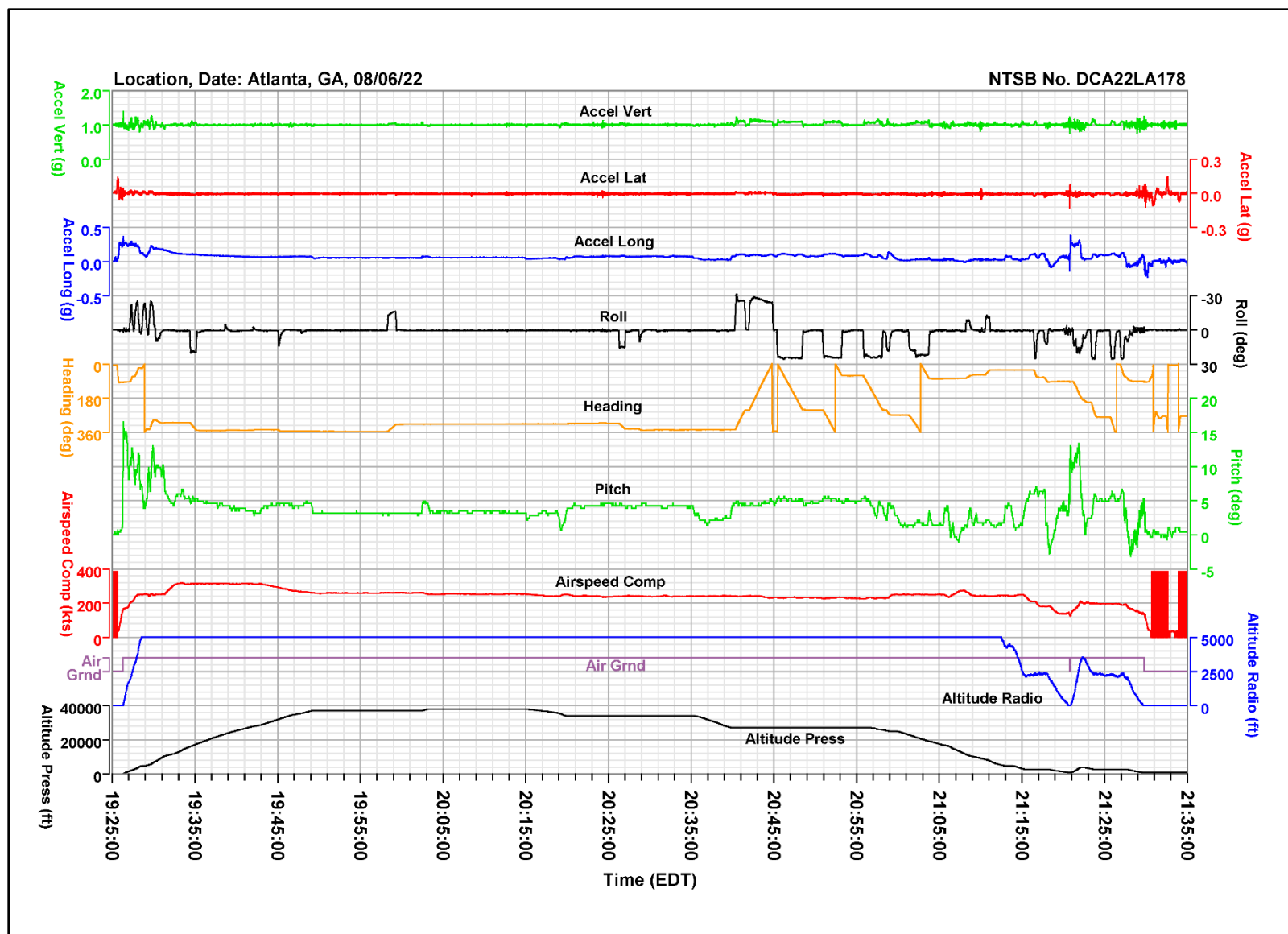


Figure 1. Plot of basic parameters for the full accident flight.

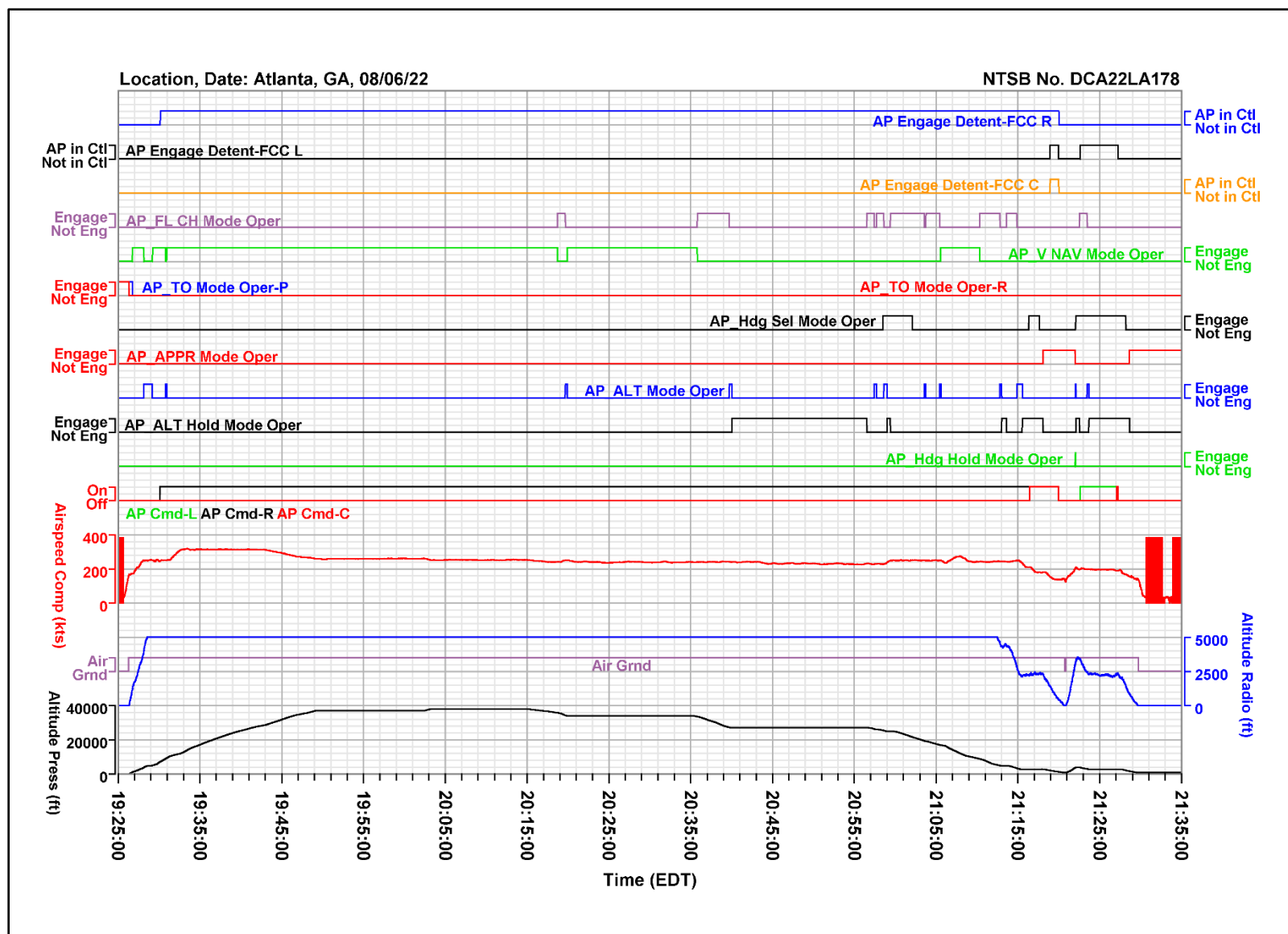


Figure 2. Plot of autopilot parameters for the full accident flight.

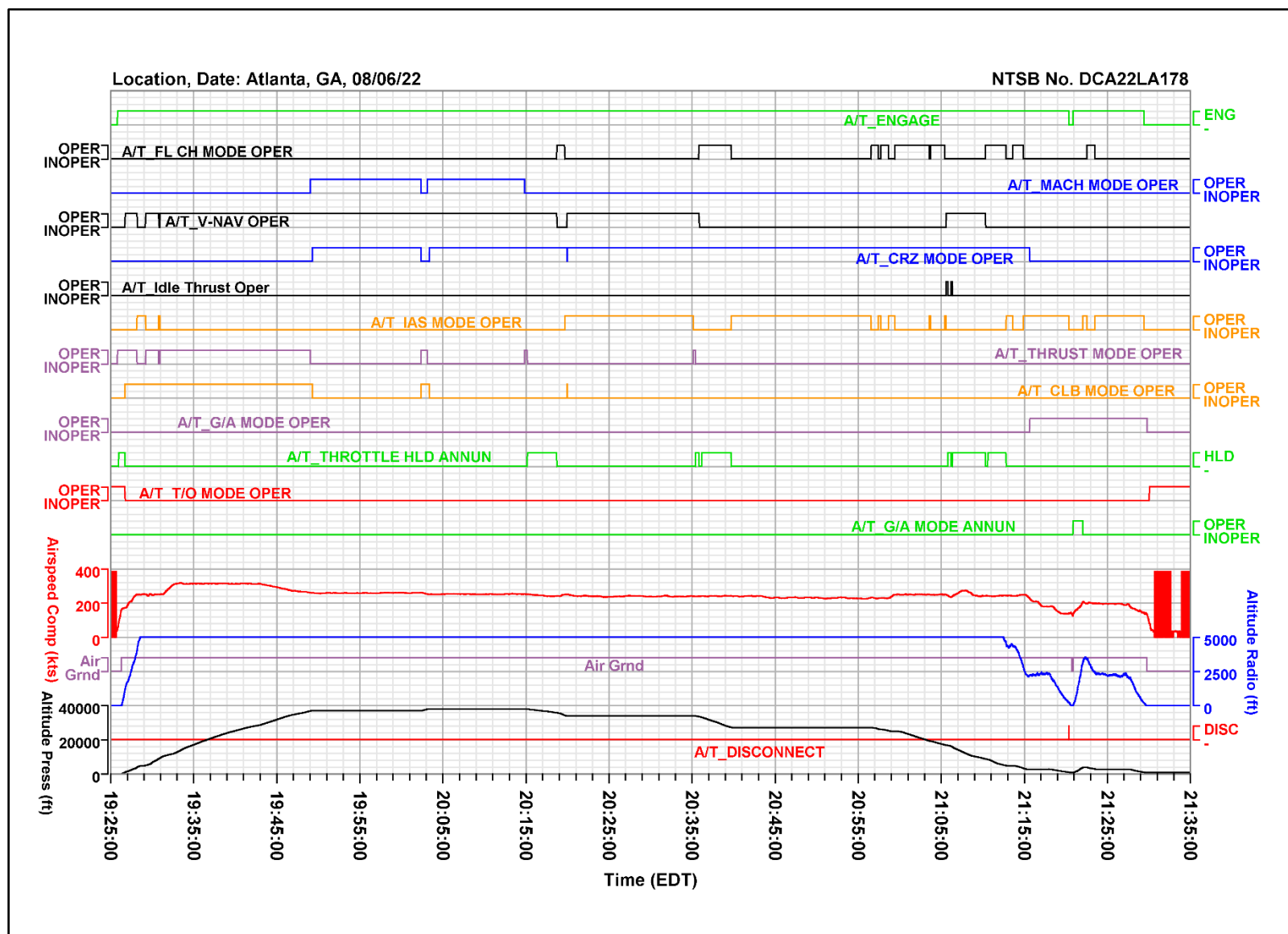


Figure 3. Plot of autothrottle parameters for the full accident flight.

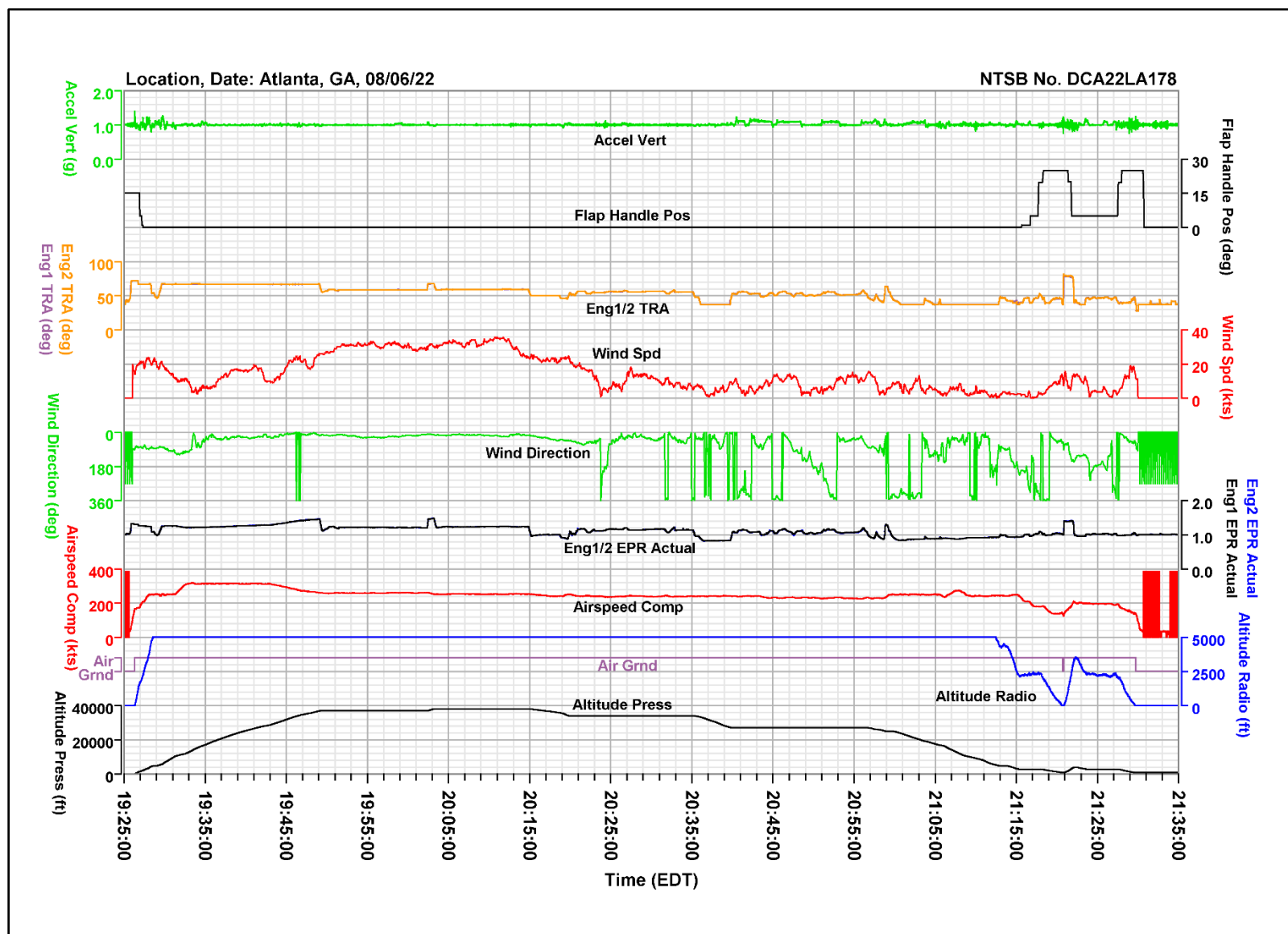


Figure 4. Plot of engine and flap parameters for the full accident flight.

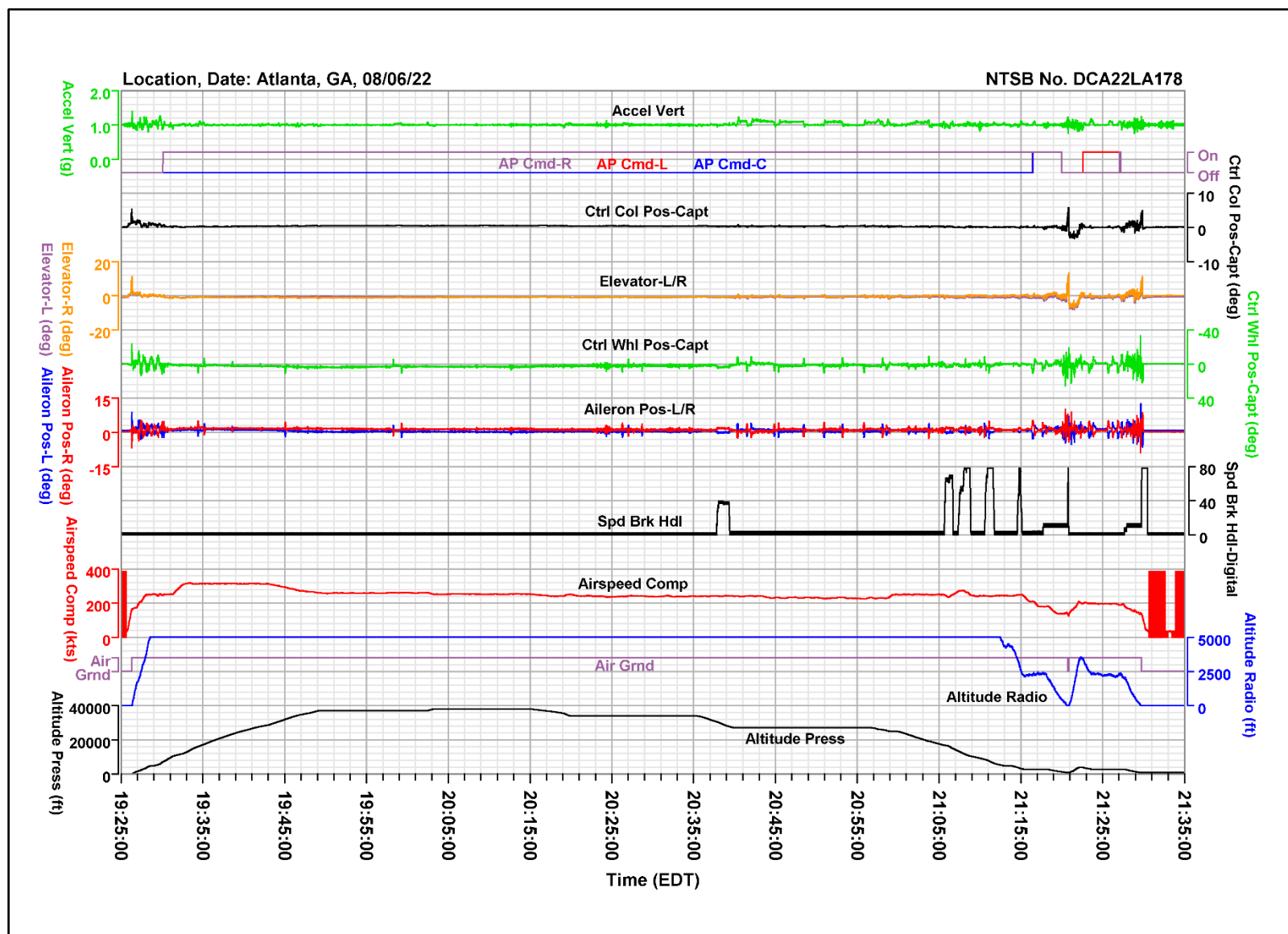


Figure 5. Plot of miscellaneous parameters for the full accident flight.

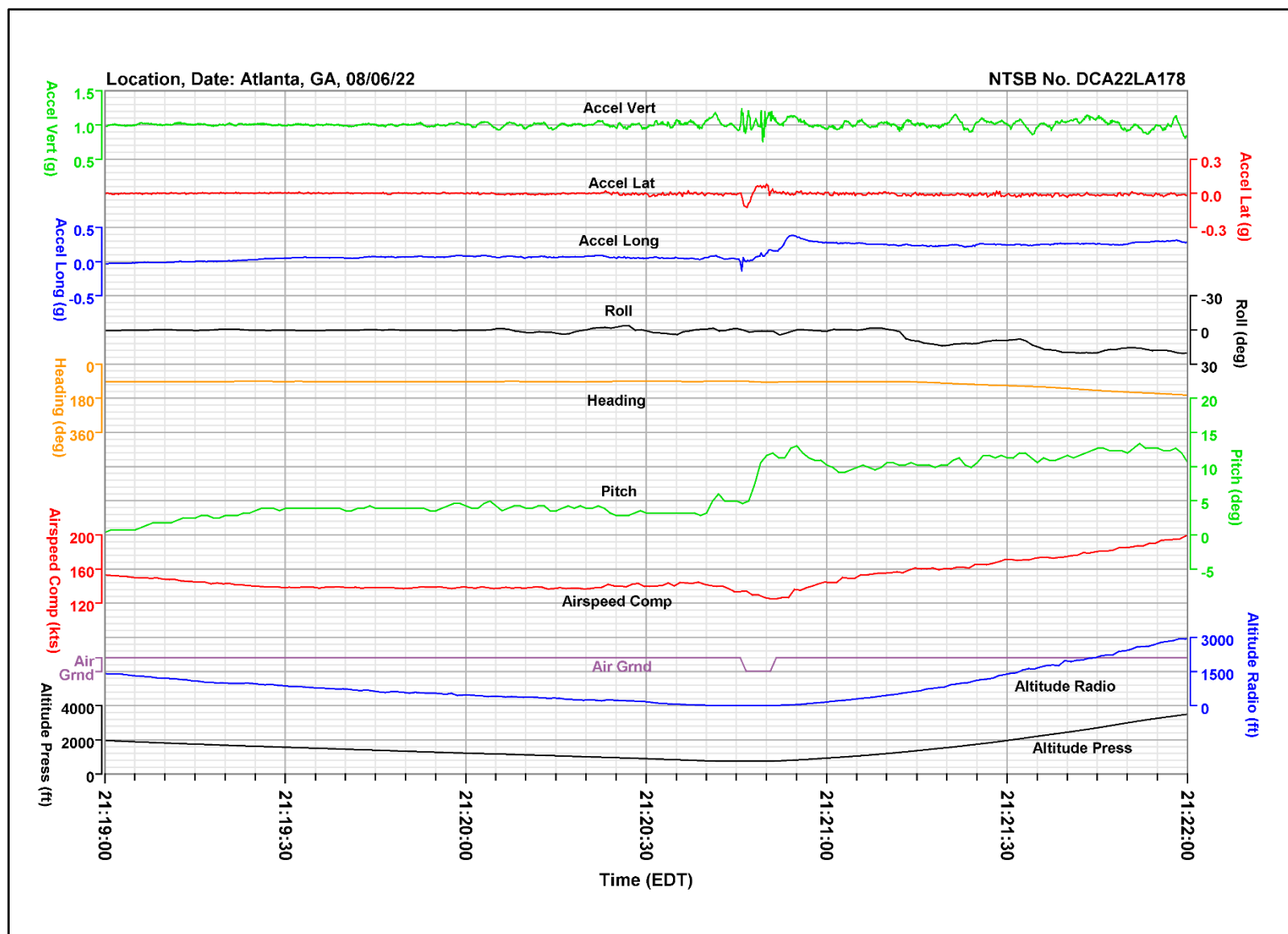


Figure 6. Plot of basic parameters during the accident.

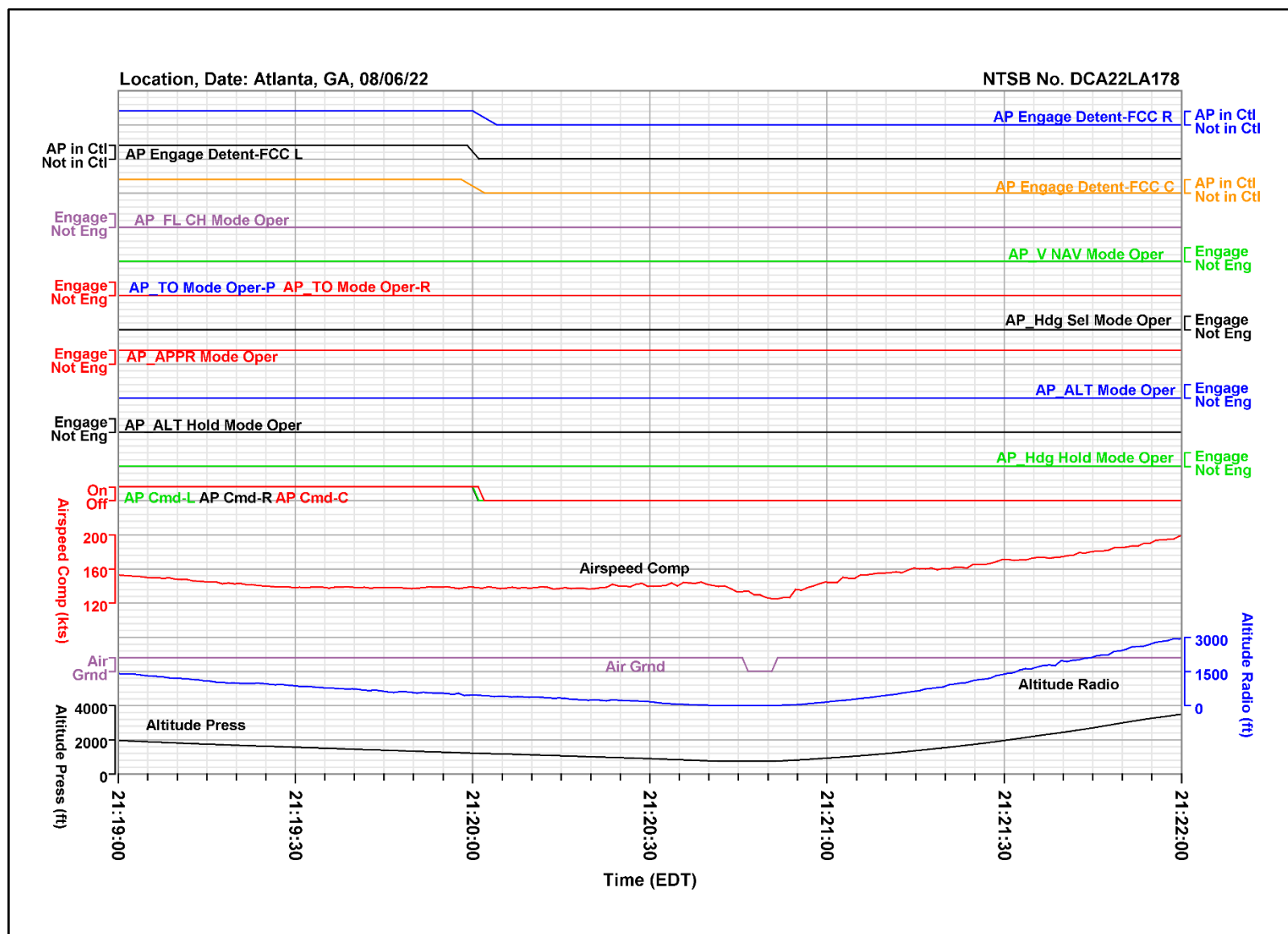


Figure 7. Plot of autopilot parameters during the accident.

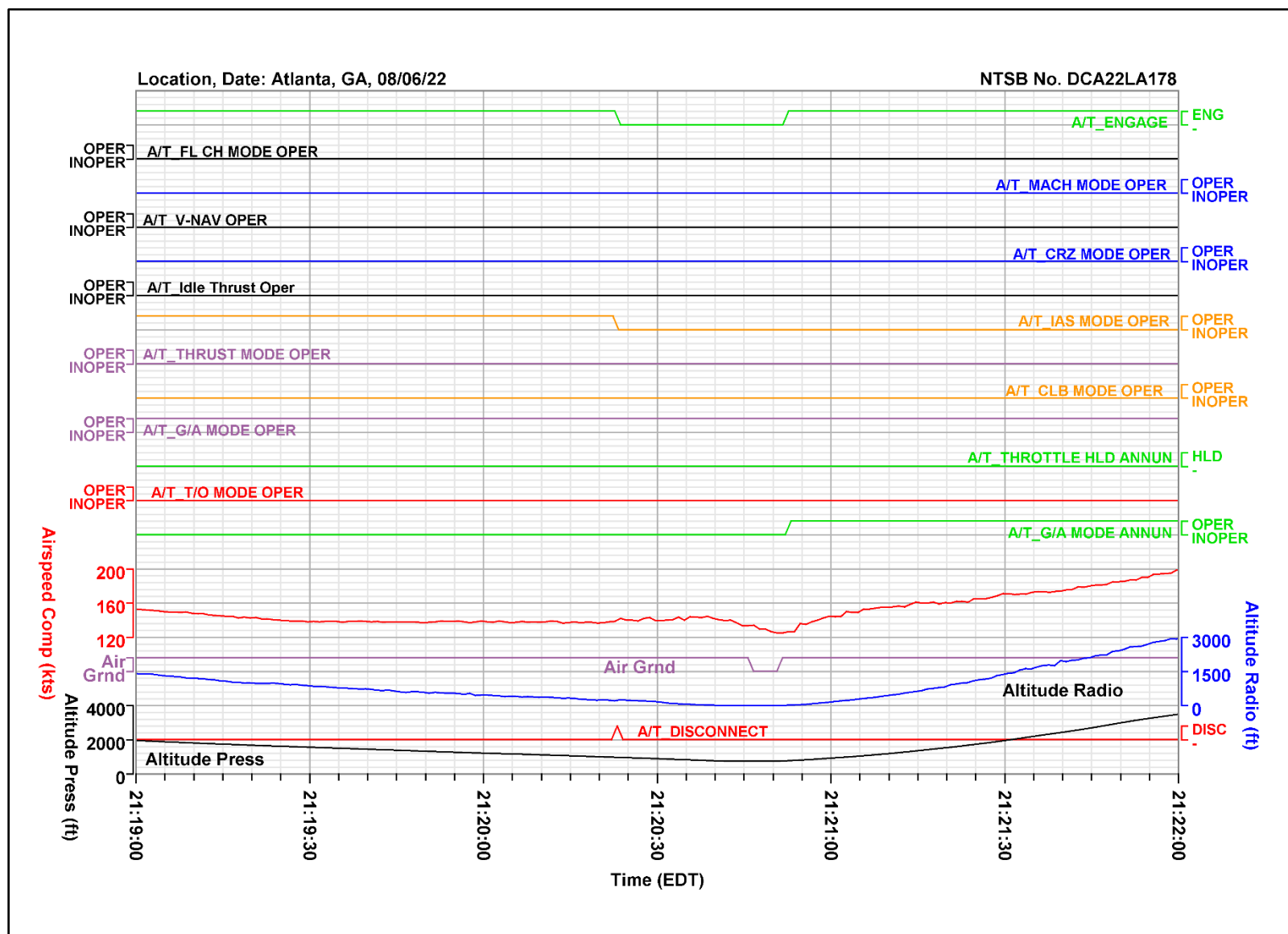


Figure 8. Plot of autothrottle parameters during the accident.

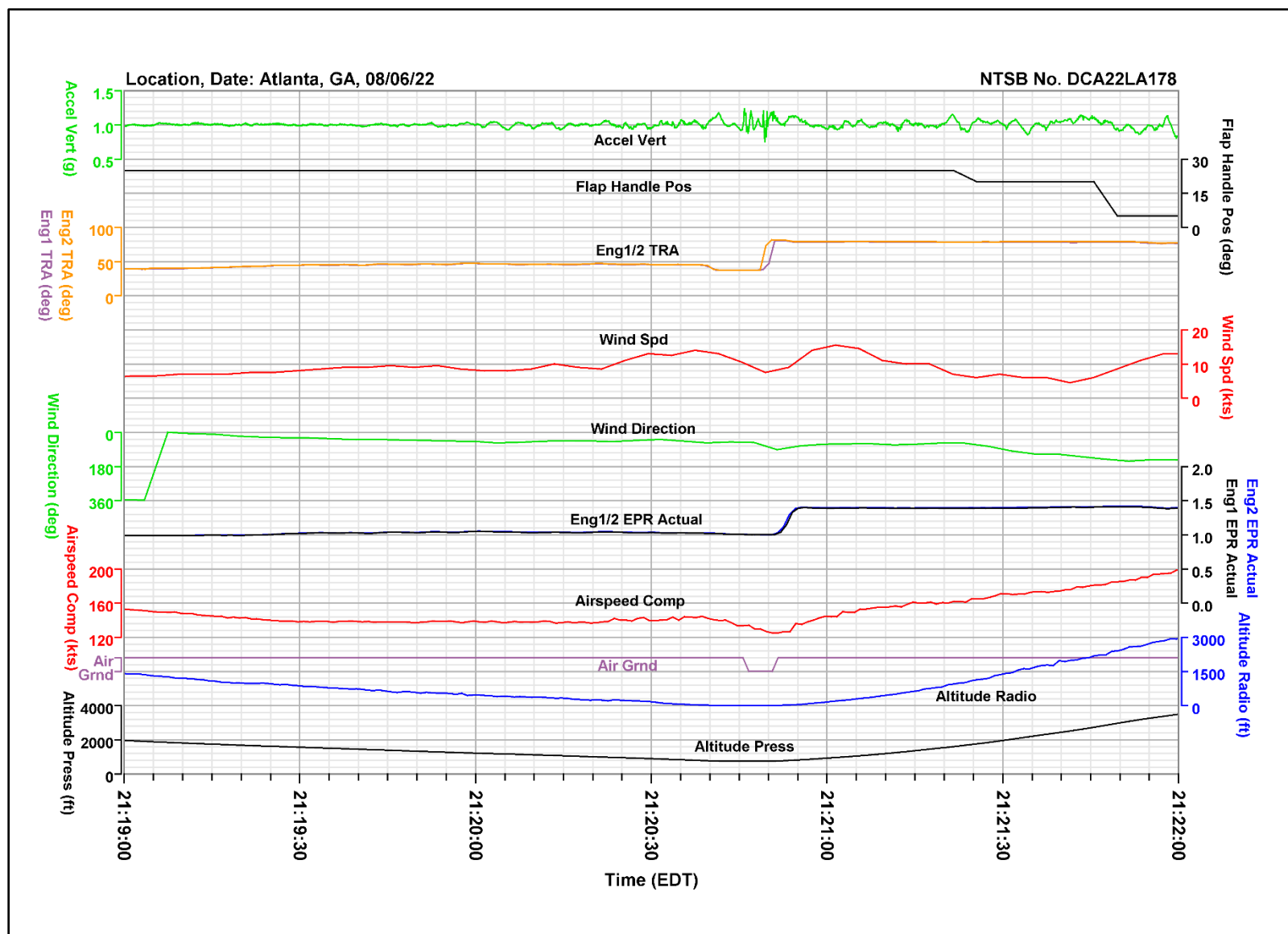


Figure 9. Plot of engine and flap parameters during the accident.

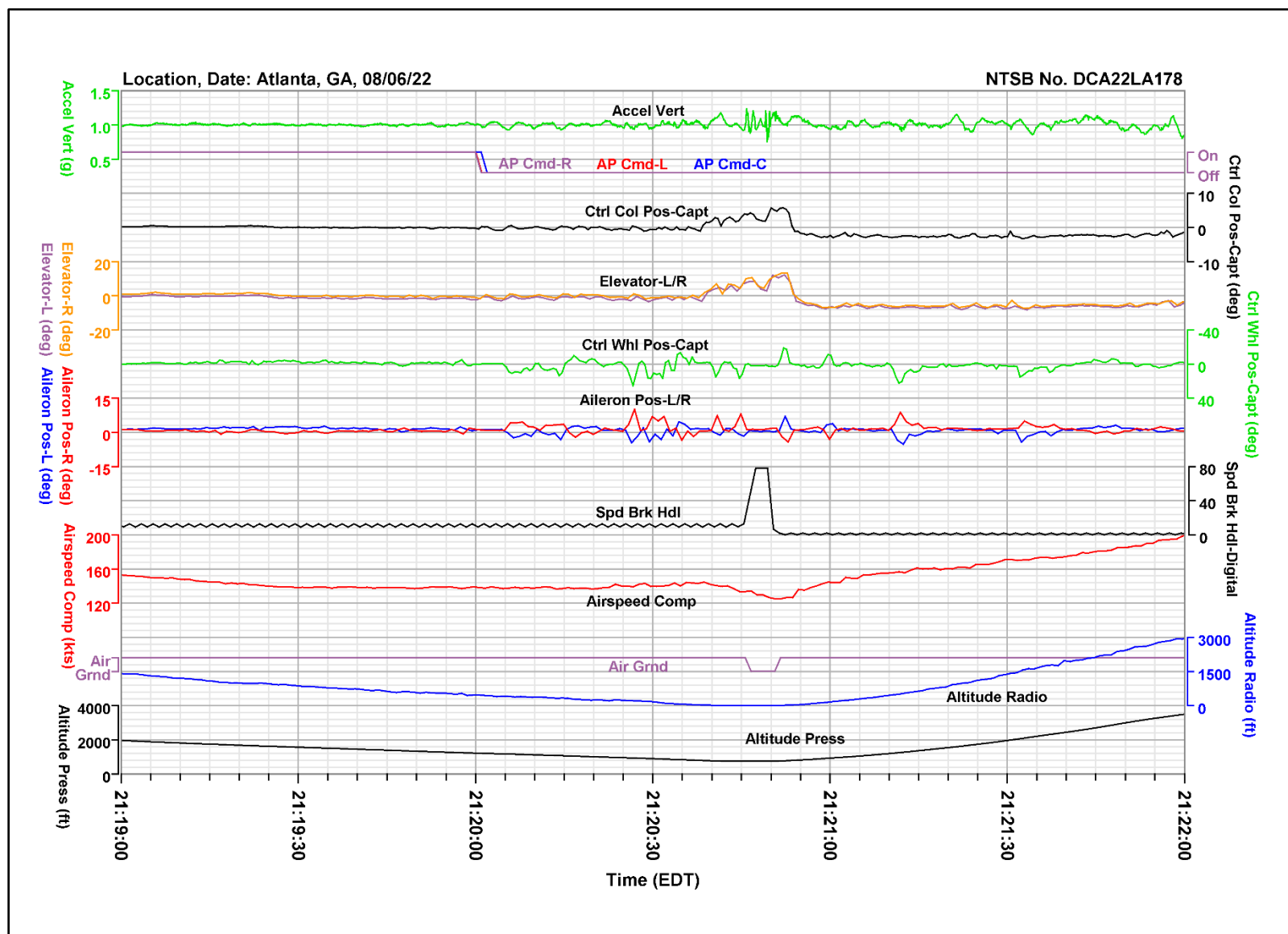


Figure 10. Plot of miscellaneous parameters during the accident.

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS

This appendix describes the parameters provided and verified in this report. Table 2 lists the plot/table labels, parameter names, and units. Additionally, Table 3 describes the unit and discrete state abbreviations used in this report.

Table 2. Verified and provided FDR parameters.

Plot/Table Labels	Parameter Names	Units
A/T_CLB MODE OPER	A/T Climb Mode Operating	
A/T_CRZ MODE OPER	A/T Cruise Mode Operating	
A/T_DISCONNECT	A/T Disconnect	
A/T_ENGAGE	A/T Engaged	
A/T_FL CH MODE OPER	A/T Flight Level Change Mode Operating	
A/T_G/A MODE ANNUN	A/T Go Around Mode Annunciated	
A/T_G/A MODE OPER	A/T Go Around Mode Operating	
A/T_IAS MODE OPER	A/T Indicated Airspeed Mode Operating	
A/T_Idle Thrust Oper	A/T Idle Thrust Mode Operating	
A/T_MACH MODE OPER	A/T Mach Mode Operating	
A/T_T/O MODE OPER	A/T Takeoff Mode Operating	
A/T_THROTTLE HLD ANNUN	A/T Throttle Hold Mode Annunciated	
A/T_THRUST MODE OPER	A/T Thrust Mode Operating	
A/T_V-NAV OPER	A/T Vertical Navigation Mode Operating	
Accel Lat	Lateral Acceleration	g
Accel Long	Longitudinal Acceleration	g
Accel Vert	Vertical Acceleration	g
Aileron Pos-L/R	Aileron Position - Left/Right	deg
Air Grnd	Air/Ground	
Airspeed Comp	Computed Airspeed	kts
Altitude Press	Pressure Altitude	ft
Altitude Radio	Radio Altitude	ft
AP Cmd-C/L/R	AP Commanded-C/L/R	
AP Engage Detent-FCC C/L/R	AP Engaged Detent-FCC C/L/R	
AP_ALT Hold Mode Oper	AP Altitude Hold Mode Operating	
AP_ALT Mode Oper	AP Altitude Mode Operating	
AP_APPR Mode Oper	AP Approach Mode Operating	
AP_FL CH Mode Oper	AP Flight Change Mode Operating	
AP_Hdg Hold Mode Oper	AP Heading Hold Mode Operating	
AP_Hdg Sel Mode Oper	AP Heading Select Mode Operating	
AP_TO Mode Oper-P/R	AP Takeoff Mode Operating-Captain/First Officer	
AP_V NAV Mode Oper	AP Vertical Navigation Mode Operating	
Ctrl Col Pos-Capt	Control Column Position - Captain	deg
Ctrl Whl Pos-Capt	Control Wheel Position - Captain	deg
Elevator-L	Elevator Position - Left	deg
Elevator-R	Elevator Position - Right	deg
Eng1 EPR Actual	Engine 1 Engine Pressure Ratio	
Eng1 TRA	Engine 1 Throttle Resolver Angle	deg
Eng2 EPR Actual	Engine 2 Engine Pressure Ratio	
Eng2 TRA	Engine 2 Throttle Resolver Angle	deg
Flap Handle Pos	Flap Handle Position	deg

Plot/Table Labels	Parameter Names	Units
Gear WOW-N	Landing Gear Weight-on-Wheels - Nose	
Ground Spd	Groundspeed	kts
Heading	Magnetic Heading	deg
Latitude ⁴	Latitude	deg
Longitude ⁴	Longitude	deg
Pitch	Pitch	deg
Roll	Roll	deg
Rudder ⁴	Rudder Position	deg
Rudder Ped Pos ⁴	Rudder Pedal Position	deg
Spd Brk Hdl-Digital	Speed Brake Handle Position	
T/R Deployed-L/R ⁴	Thrust Reverser Deployed - Left/Right	
T/R Intransit-L/R ⁴	Thrust Reverser In-Transit - Left/Right	
Time GMT Hrs ⁴	Time GMT Hours	hrs
Time GMT Min ⁴	Time GMT Minutes	min
Time GMT Sec ⁴	Time GMT Seconds	sec
Wind Direction	Wind Direction	deg
Wind Spd	Wind Speed	kts

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 the electronic data has not been corrected for the local altimeter setting at the time of the event.

Note: Parameters with a blank unit description in Table 2 are discretes. 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.

Table 3. Unit and discrete state abbreviations.

Unit and Discrete State Abbreviations	Descriptions
%RPM	percent revolutions per minute
A/T	autothrottle
AP	autopilot
deg	degrees
EPR	engine pressure ratio
ft	feet
g	unit of gravitational acceleration
hrs	hours
kts	knots
min	minutes
sec	seconds
T/R	thrust reverser
TRA	throttle resolver angle

⁴ Parameter is provided in the tabular data, but not plotted.