

National Transportation Safety Board

Office of Research and Engineering

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ERA22LA150

FLIGHT DATA RECORDER

Specialist's Factual Report

December 16, 2022

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A. ACCIDENT

Location: Pittsburgh, Pennsylvania
Date: March 9, 2022
Time: 08:27 eastern standard time (EST)
Airplane: HondaJet HA-420, Jet It LLC, N903JT

B. FLIGHT DATA RECORDER SPECIALIST

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C. FEDERAL CARRIAGE REQUIREMENTS

The aircraft, N903JT, was operating under the provisions of Title 14 *Code of Federal Regulations* (CFR) Part 135 as an air taxi flight. Per Title 14 CFR 135.152, the aircraft was not required to be equipped with a flight data recorder (FDR) because it did not have more than 10 passenger seats.

Although it was not required by statute to be equipped with an FDR, the aircraft had a combination cockpit voice and flight data recorder (CVFDR) installed and operational at the time of the accident.

D. DETAILS OF THE INVESTIGATION

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

Recorder Manufacturer/Model: Universal Avionics CVFDR
Part Number: 1605-01-00
Recorder Serial Number: 2233

A CVFDR is a combined cockpit voice recorder (CVR) and FDR. For the remainder of this report, the CVFDR's flight data recording functionality will be referred to as an FDR. For details about the CVR functionality of the CVFDR, refer to the *Cockpit Voice Recorder – Specialist's Factual Report*, which is available in the public docket for this accident.

In addition to the FDR data, the aircraft manufacturer provided a comma-separated value (CSV) file with data downloaded from the aircraft's central maintenance computer (CMC) on the day of the accident.

1.0 FDR Description

The Universal Avionics FDR records airplane flight information in a digital format using solid-state flash memory as the recording medium. The FDR can receive data in the ARINC 717 configuration and can record a minimum of 25 hours of flight data. It is configured to record 512 12-bit words of digital information every second. The FDR is designed to meet the crash-survivability requirements of TSO-C123b.

1.1 FDR Condition

Upon arrival at the laboratory, it was evident that the FDR had not sustained any heat or structural damage, and the flight data was extracted from the recorder normally, without difficulty.

A photograph of the FDR, as received by the lab, is shown in Figure 1.



Figure 1. FDR, as received.

1.2 FDR Recording Description

The FDR recording contained approximately 140 hours of data. Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals

one elapsed second. The accident flight was the last flight of the recording, and its duration was approximately 1 hour and 10 minutes.

The parameters evaluated for this report appeared to be per 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 1 lists the FDR parameters verified and provided in this report. Additionally, table 2 describes the unit and parameter abbreviations used in this report.

1.3 FDR Time Correlation

Correlation of the FDR data from SRN to the accident local time, EST, was established by using the recorded coordinated universal time (UTC) Hours, UTC Minutes, and UTC Seconds and then applying an additional -5 hours offset to change UTC to EST.

Accordingly, the time offset for the accident flight data from SRN to local EST is the following:

$$FDR\ EST = FDR\ SRN - 475893$$

For the remainder of this report, all times are referenced as EST.

2.0 Central Maintenance Computer (CMC) Recording Description

The CMC is a unit installed onboard the aircraft used for maintenance troubleshooting and engine trend analysis. Per the aircraft manufacturer, the CMC data also contains a recorded landing gear weight-on-wheels (WOW) and engine 1/2 throttle lever angle (TLA) parameters. These parameters are unique to the CMC data and are not recorded on the FDR.

The aircraft manufacturer downloaded the CMC data and provided it in an electronic comma-separated value (CSV) format to the NTSB for review. Each line of

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 = +.

data in the file had a date and timestamp in UTC. Timing information in the file indicated that the data were sampled at a rate of 1Hz.

The CMC data contained many of the same parameters that were recorded on the FDR. After review, it was determined that the data from the CMC, except for the landing gear WOW and engine 1/2 TLA parameters, was redundant to the data contained on the FDR and are not discussed further in this report.

Using the UTC timestamp in the CMC data, the landing gear WOW and engine 1/2 TLA angle parameters were imported for plotting with the FDR data. An additional -5 hour offset was applied to the timestamp to change the imported parameters to local time, EST.

E. FIGURES AND TABULAR DATA

Figures 2 through 7 contain FDR data recorded during the accident flight on March 9, 2022. All parameters listed in table 1 are plotted except Time UTC-Hrs, Time UTC-Min, Time UTC-Sec, Latitude GPS 1, and Longitude GPS 1.

Figures 2, 4, and 6 are plots of basic, engine, and autopilot parameters, respectively, for a time range of 08:19:00 to 08:29:00, which represents the final 10 minutes of the accident flight.

Figures 3, 5, and 7 are plots of basic, engine, and autopilot parameters, respectively, for a time range of 08:27:00 to 08:28:40, which represents the final 1 minute and 40 seconds of the accident flight.

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.

The data show at 08:19:00 the aircraft was level at a pressure altitude of about 6,000 feet en route to Allegheny County Airport (AGC) in West Mifflin, Pennsylvania. At 08:20:00, the AFCS Vert Mode switched to "VS" or vertical speed mode and the aircraft started to descend further.

The aircraft continued its descent, and the landing gear handle indicated "Down" at 08:25:02. At 08:27:34, at a computed airspeed of 119 knots the landing gear weight-on-wheels indicated "Gnd". The aircraft's groundspeed continued to decrease until large spikes in lateral, longitudinal, and vertical acceleration were recorded, consistent with the aircraft departing the runway's paved surface.

The recorded data ended at 08:28:32.

The corresponding tabular data used to generate figures 2 to 7 are provided in electronic CSV format as attachment 1 to this report.

Submitted by:

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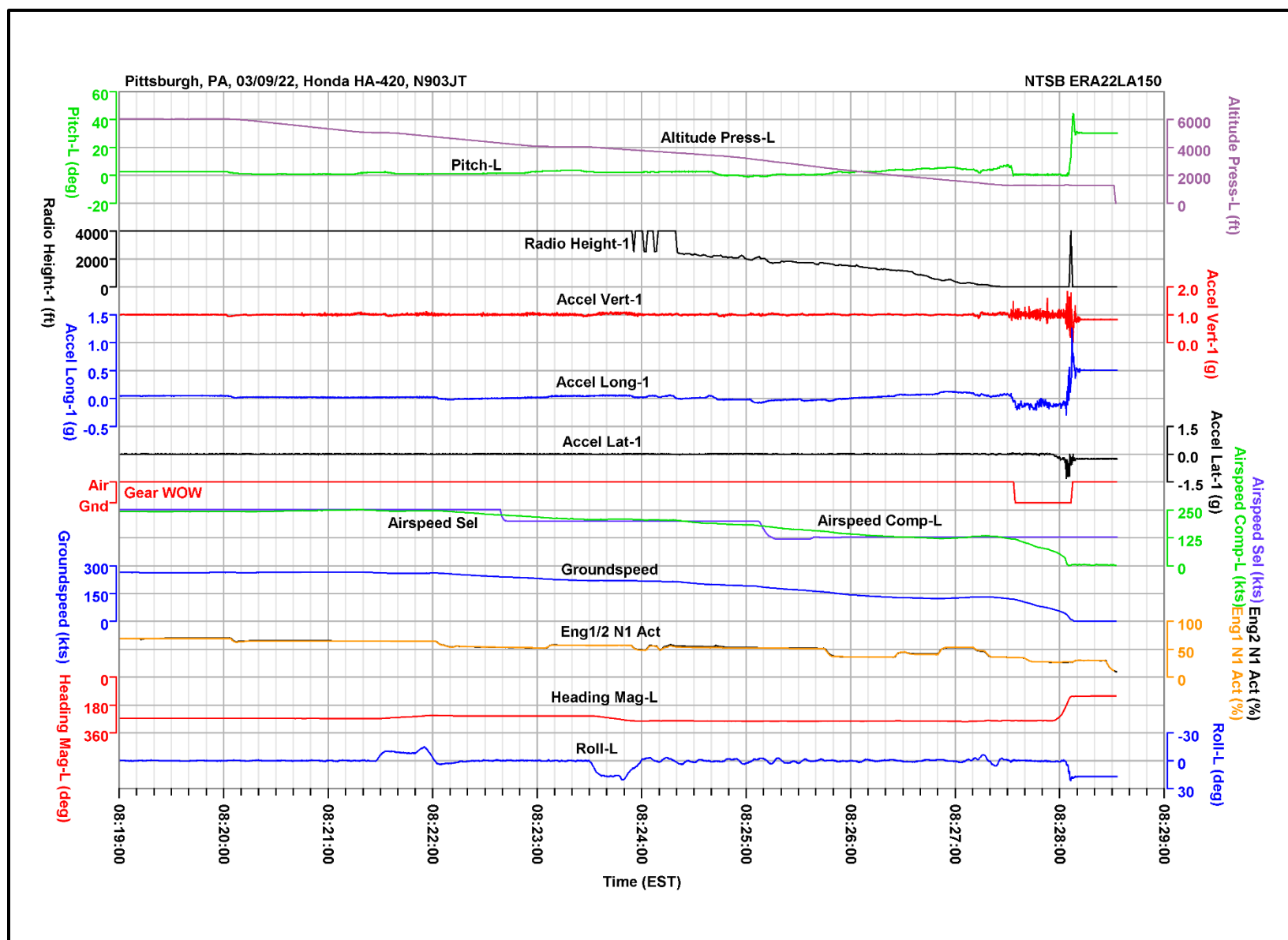


Figure 2. Plot of basic parameters for the final 10 minutes of the accident flight.

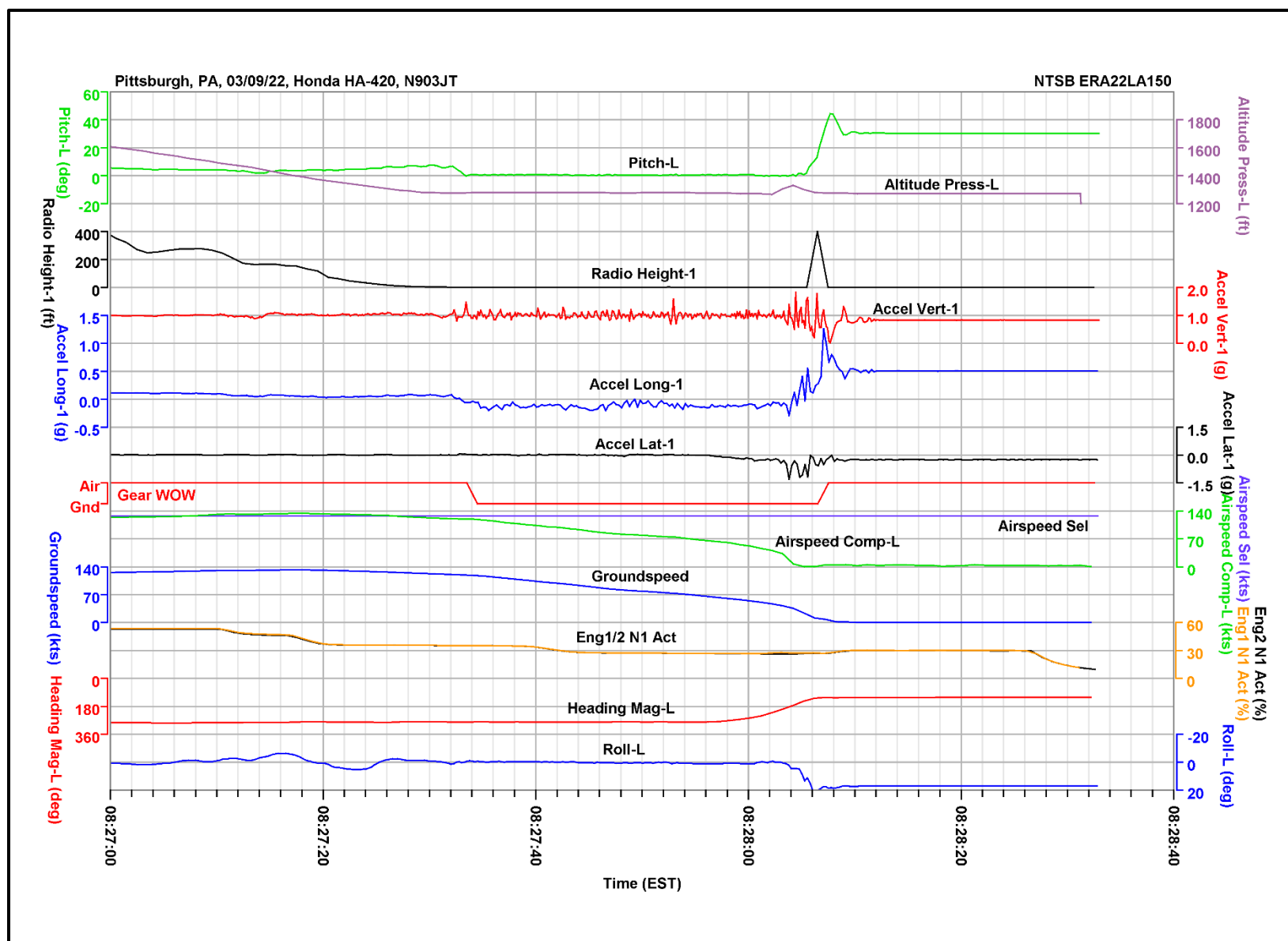
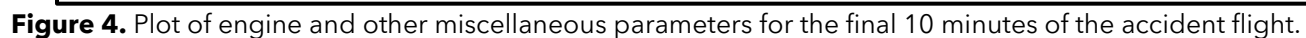


Figure 3. Plot of basic parameters for the end of the accident flight.



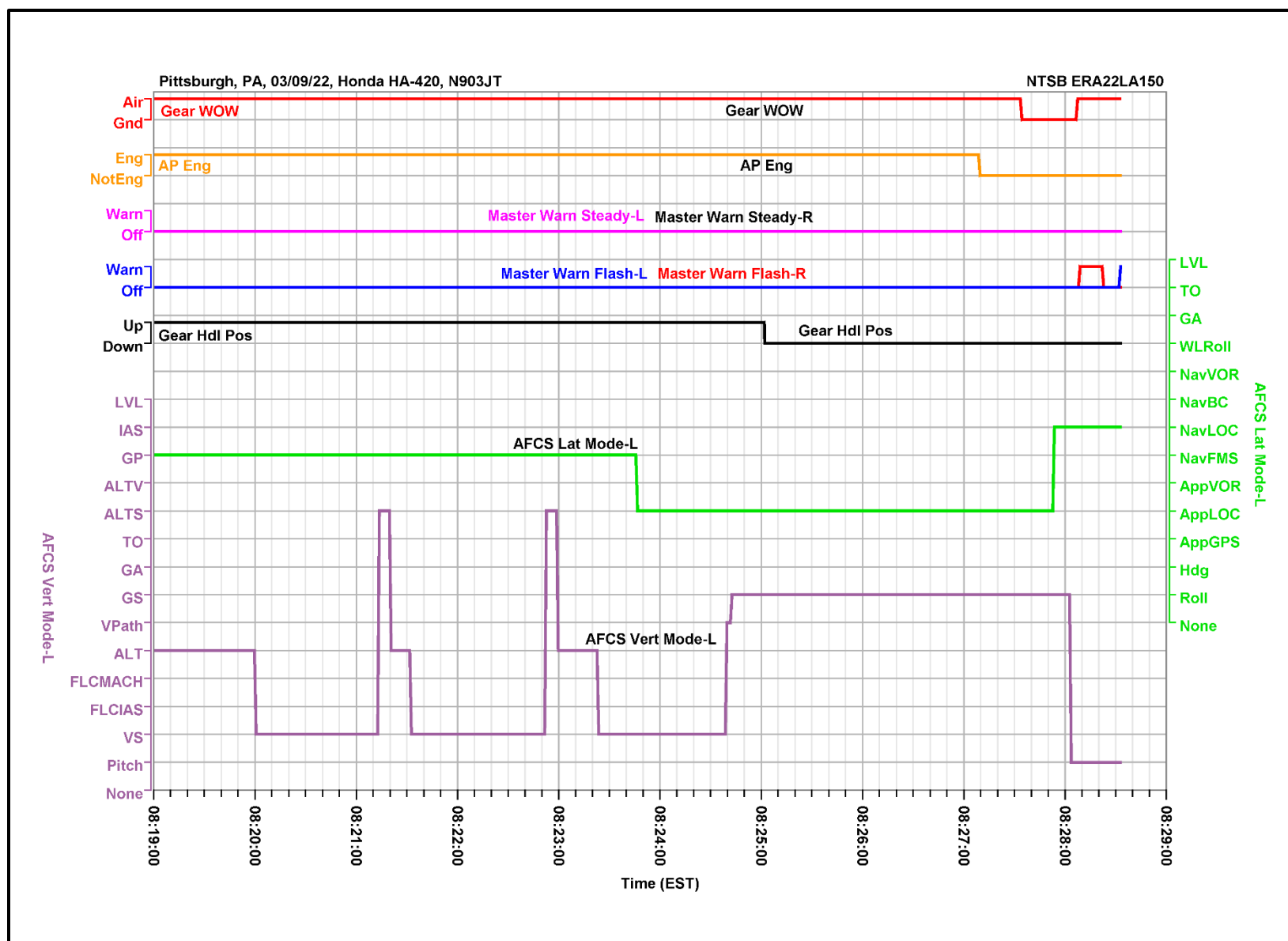


Figure 6. Plot of autopilot and warning parameters for the final 10 minutes of the accident flight.

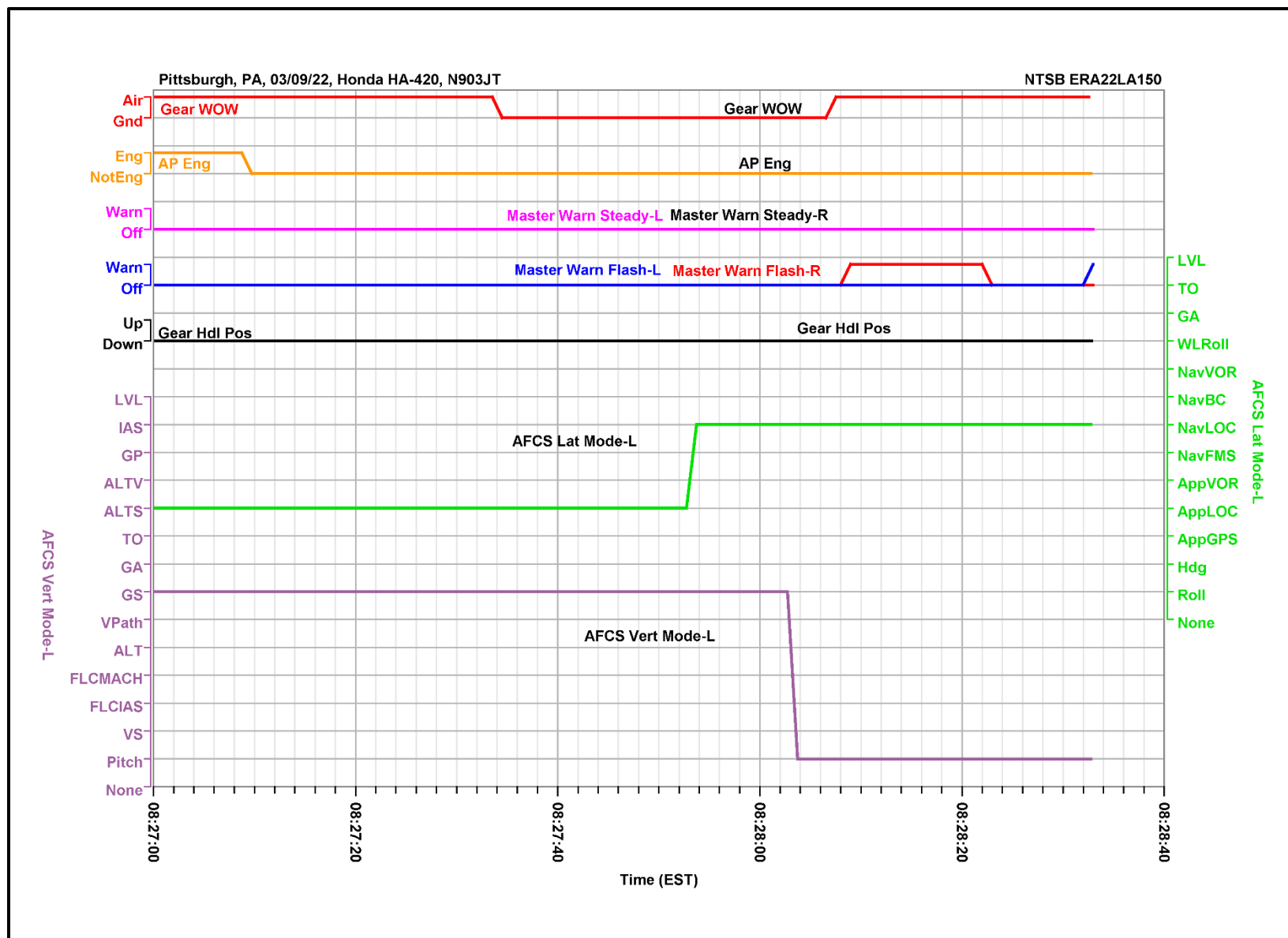


Figure 7. Plot of autopilot and warning parameters for the end of the accident flight.

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS

This appendix describes the parameters provided and verified in this report. Table 1 lists the plot/table labels, parameter names, and units. Additionally, table 2 describes the unit and parameter abbreviations used in this report.

Table 1. Verified and provided FDR & CMC parameters.

Plot/Table Labels	Parameter Names	Units
Accel Lat-1	Lateral Acceleration-1	g
Accel Long-1	Longitudinal Acceleration-1	g
Accel Vert-1	Vertical/Normal Acceleration-1	g
AFCS Lat Mode-L	AFCS Lateral Mode-L	
AFCS Vert Mode-L	AFCS Vertical Mode-R	
Airspeed Comp-L	Computed Airspeed-L	kts
Airspeed Sel	Selected Airspeed	kts
Altitude Press-L	Pressure Altitude	ft
AP Eng	Autopilot Engaged	
Eng1/2 Anti-Ice	Engine 1/2 Anti-Ice On/Off	
Eng1/2 ITT	Engine 1/2 Interstage Turbine Temperature	degC
Eng1/2 N1 Act	Engine 1/2 Low-Pressure Fan Rotation Speed Actual	%
Eng1/2 N2 Act	Engine 1/2 High-Pressure Fan Rotation Speed Actual	%
Eng1/2 Oil Press	Engine 1/2 Oil Pressure	psig
Eng1/2 Oil Temp	Engine 1/2 Oil Temperature	degC
Eng 1/2 TLA ²	Engine 1/2 Throttle Lever Angle	deg
Flap Hdl Ldg-1	Flap Handle in the Land Position	
Flap Hdl TO App-1	Flap Handle in the TO/App Position	
Flap Hdl Up-1	Flap Handle in the Up Position	
Gear Hdl Pos	Landing Gear Handle Position	
Gear WOW ²	Landing Gear Weight-on-Wheels	
Groundspeed	Groundspeed	kts
Heading Mag-L	Magnetic Heading	deg
Hyd Press	Hydraulic Pressure	psi
Latitude GPS 1	Latitude GPS 1	deg
Longitude GPS 1	Longitude GPS 1	deg
Master Warn Flash-L	Master Warning Flash-L	
Master Warn Flash-R	Master Warning Flash-R	
Master Warn Steady-L	Master Warning Steady-L	
Master Warn Steady-R	Master Warning Steady-R	
Pitch-L	Pitch-L	deg
Radio Height-1	Radio Height-1	ft
Roll-L	Roll-L	deg
Spd Brk Hdl Pos	Speed Brake Handle Position	
Spd Brk Pos	Speed Brake Position	
Time UTC-Hr	Time UTC-Hours	
Time UTC-Min	Time UTC-Minutes	
Time UTC-Sec	Time UTC-Seconds	
Wind Direction	Wind Direction	deg

²This parameter was sourced from CMC data provided by the aircraft manufacturer.

Plot/Table Labels	Parameter Names	Units
Wind Speed	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 in 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 1 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 2. Unit and parameter abbreviations.

Unit and Parameter Abbreviations	Descriptions
AFCS	Automatic flight control system
App	approach
deg	degrees
degC	degrees Celsius
ft	feet
g	gravitational acceleration
GPS	Global Positioning System
kts	knots
psig	pounds per square gauge
TO	takeoff
UTC	coordinated universal time