

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN22LA430

FLIGHT DATA RECORDER

Specialist's Factual Report

August 1, 2023

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A. ACCIDENT

Location: Houma, Louisiana
Date: September 24, 2022
Time: 18:11 central daylight time (CDT)
Helicopter: Agusta AW139, Era Helicopters LLC, N811TA

B. FLIGHT DATA RECORDER SPECIALIST

Specialist Cassandra Johnson
Mechanical Engineer
National Transportation Safety Board (NTSB)

C. FEDERAL CARRIAGE REQUIREMENTS

The event helicopter, N811TA, was operating as Title 14 *Code of Federal Regulations* (CFR) Part 135 on-demand air taxi. The event helicopter was manufactured in 2011 and was operating such that it was required to be equipped with a flight data recorder (FDR) that recorded, at a minimum, 23 parameters, as cited in 14 CFR Part 135.152(a) and Appendix C to Part 135.

D. DETAILS OF THE INVESTIGATION

An FDR group was not convened. The NTSB Vehicle Recorder Division received an electronic file containing the FDR data from the N811TA helicopter.

1.0 FDR Data File Description

The FDR data in the electronic file was configured such that 512 12-bit words of digital information were recorded every second. Each grouping of 512 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 512-word intervals. Each data parameter (for example, pressure altitude, pitch angle, roll angle, and magnetic heading) has a specifically assigned word number within the subframes.

1.1 Recording Description

The FDR recording contained approximately 25.2 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 1 hour and 16 minutes. The parameters evaluated for the

purpose of this report appeared to be in accordance with federal FDR carriage requirements.

1.2 Engineering Unit Conversions

The engineering unit conversions used for the data contained in this report are based on documentation from the Bristow Group, Inc. 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, tables 2 and 3 describe the unit abbreviations and discrete state abbreviations used in this report, respectively.

1.2.1 Radio Altitude

Radio Altitude is only valid up to 4,095 feet (ft).

1.3 Time Correlation

Correlation of the FDR data from SRN to the event local time, CDT, 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 CDT.

Accordingly, the time offset for the event flight data from SRN to CDT is the following: CDT = SRN - 23,893. Therefore, all times are referenced as CDT, not SRN. However, the figures that contain the entire FDR recording have time referenced as SRN, not local time.

E. FIGURES AND TABULAR DATA

Figures 1 to 7 contain FDR data recorded during the event on September 24, 2022. Figures 8 to 14 contain FDR data recorded for the entire 25.2 hours of recording. The entire recording was included to allow for review of previous flights and trend analysis. All the parameters listed in table 1 are plotted except UTC Hours, UTC Minutes, and UTC Seconds.

These 14 figures provided 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.

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.

The FDR data indicated the following sequence of events:

- At 18:10:37 CDT, about 54.3 minutes after takeoff, while ascending through a pressure altitude of about 2,948 ft, the master warning transitioned from false to true. At this time, vertical acceleration (Accel Vert), lateral acceleration (Accel Lat), and longitudinal acceleration (Accel Long) recorded invalid data and remained invalid for the rest of the recording. The source of these three parameters is the triaxial accelerometer.
- At 18:10:40 CDT, the pressure altitude increased to about 3,024 ft and the avionic caution - collective channels 1 and 2 fail (AvionicCaution_1+2CollFail) transitioned from inactive to collective channel 1 fail (1 Coll Fail) and remained collective channel 1 fail for the rest of the data.
- At 18:10:42 CDT, the pressure altitude increased to about 3,179 ft and the master warning changed back to false.
- At 18:10:44 CDT, the pressure altitude increased to 3,274 ft and the essential bus 1 (ESS Bus1) decreased from 26 Volts Direct Current (VDC) to 25 VDC and continued to decrease.
- At 18:10:54 CDT, the pressure altitude increased to 3,766 ft and the essential bus 1 decreased to a minimum of 10 VDC and remained 10 VDC for the rest of the data.
- At 18:10:57 CDT, the pressure altitude increased to 3,879 ft and the engine fire detection (EngFire Det) transitioned from inactive to left and remained left for the rest of the data. Additionally, the electrical caution main battery off (ElecCaution MainBattOff) transitioned from inactive to main battery off (MAIN BATT OFF) and remained main battery off for the rest of the data.
- About 2 minutes and 9 seconds later at 18:13:06 CDT, the pressure altitude increased to a maximum of 6,720 ft and subsequently began decreasing.
- Over the next 19.5 minutes, the pressure altitude continued to decrease until reaching 0 ft when the data ended at 18:23:37 CDT.

The corresponding tabular data used to create figures 1 to 7, including UTC Hours, UTC Minutes, and UTC Seconds, are provided in electronic comma-separated value (CSV) format as attachment 1 to this report. The data provided are in local time, CDT, with the sampling rate of 512 Hertz (Hz).

Additionally, the corresponding tabular data used to create figures 8 to 14, including UTC Hours, UTC Minutes, and UTC Seconds, are provided in electronic CSV

format as attachment 2 to this report. The data provided in this attachment are in SRN with a sampling rate of 512 Hz.

Submitted by:

Cassandra Johnson
Mechanical Engineer

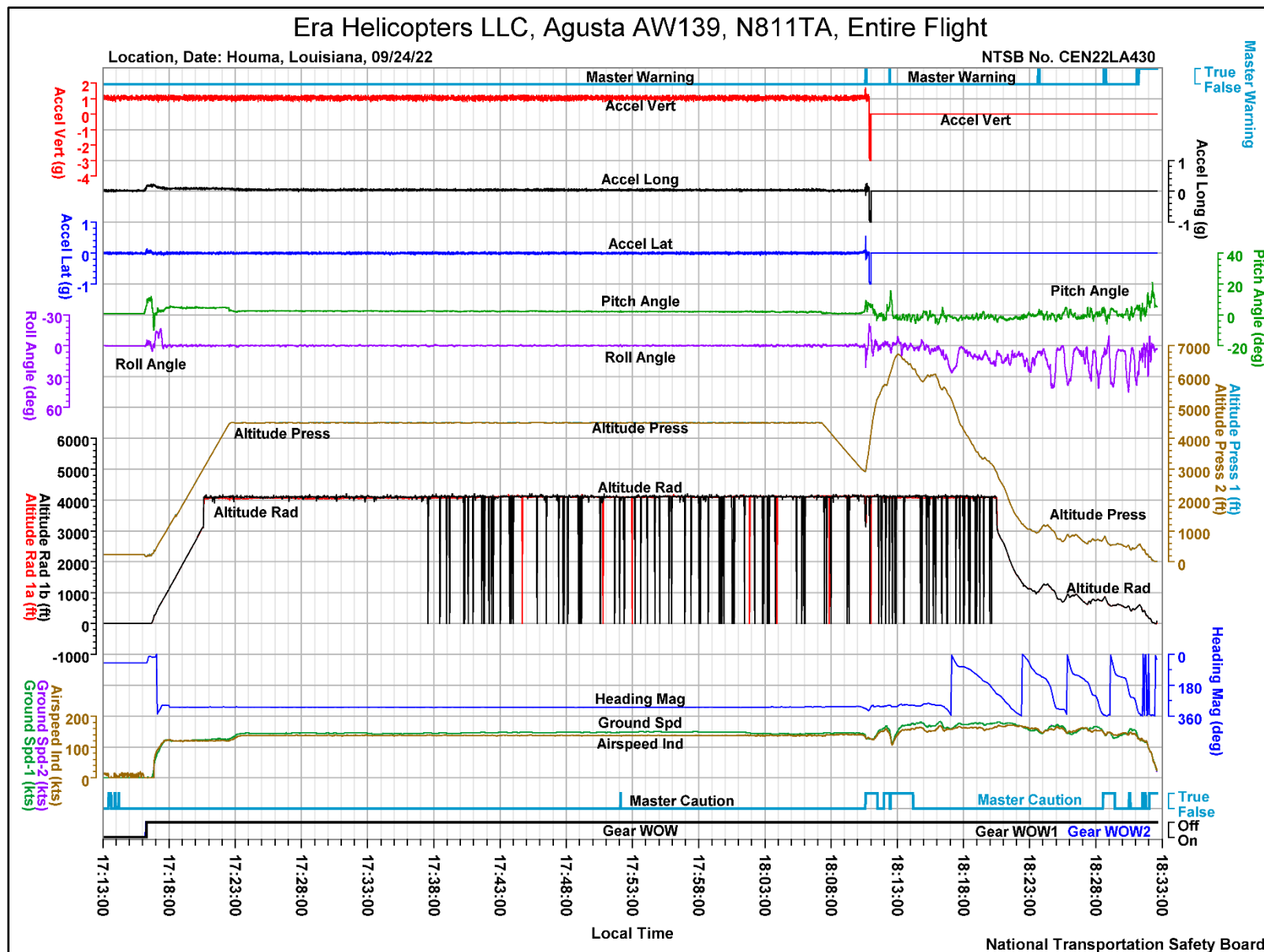


Figure 1. Plot of basic parameters for entire flight.

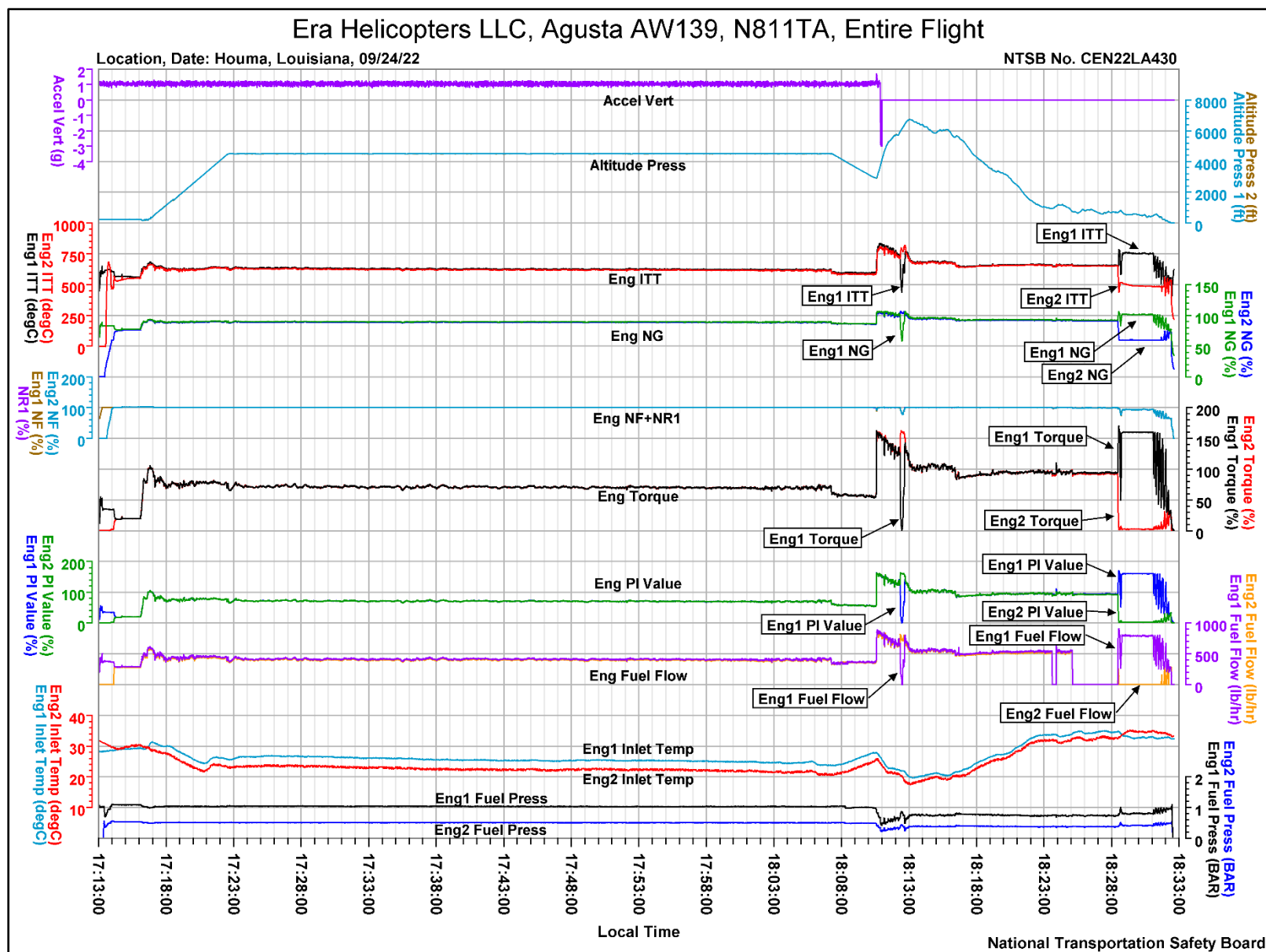


Figure 2. Plot of select engine parameters for entire flight.

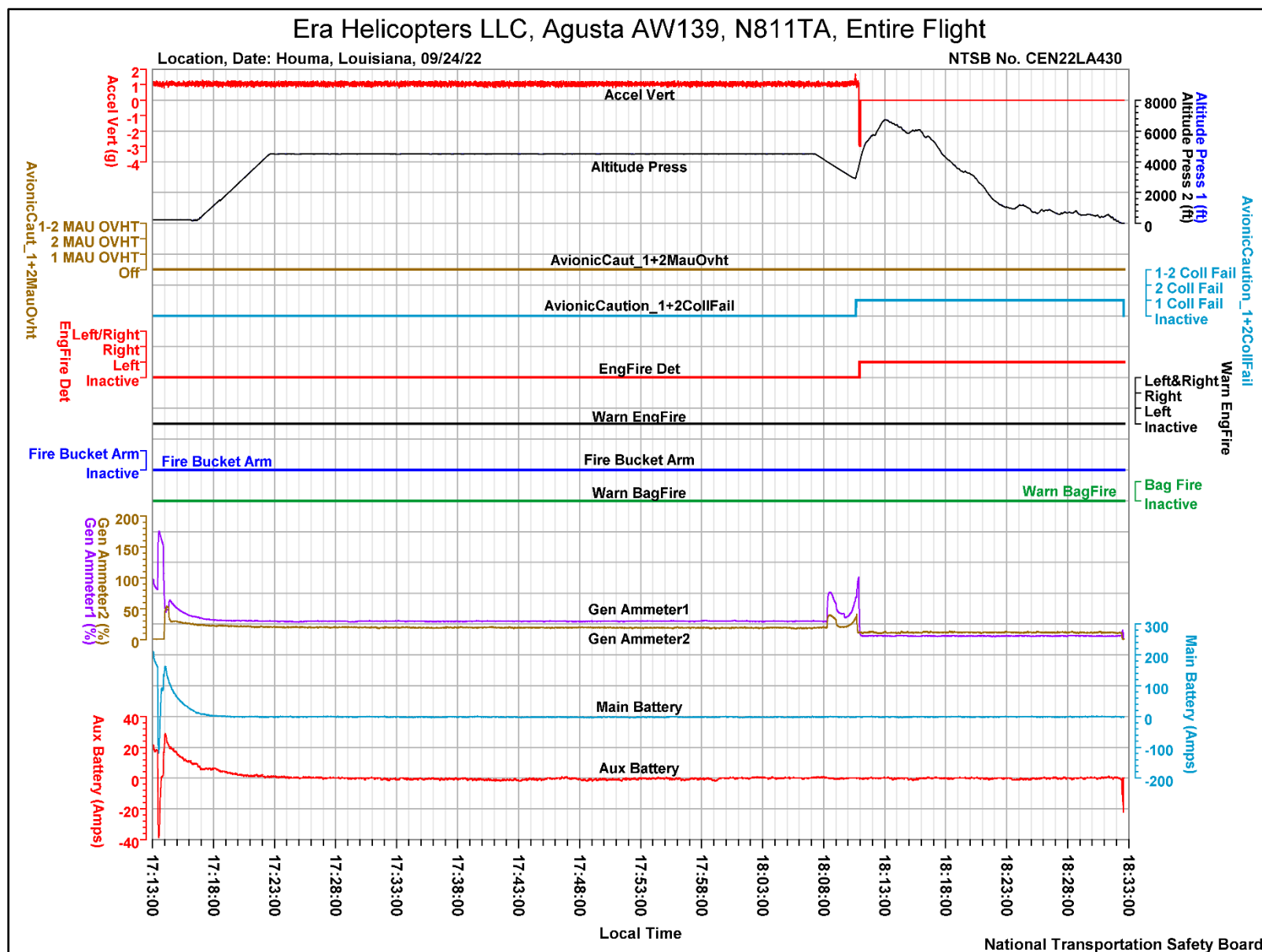


Figure 3. Plot of select electrical parameters (1 of 3) for entire flight.

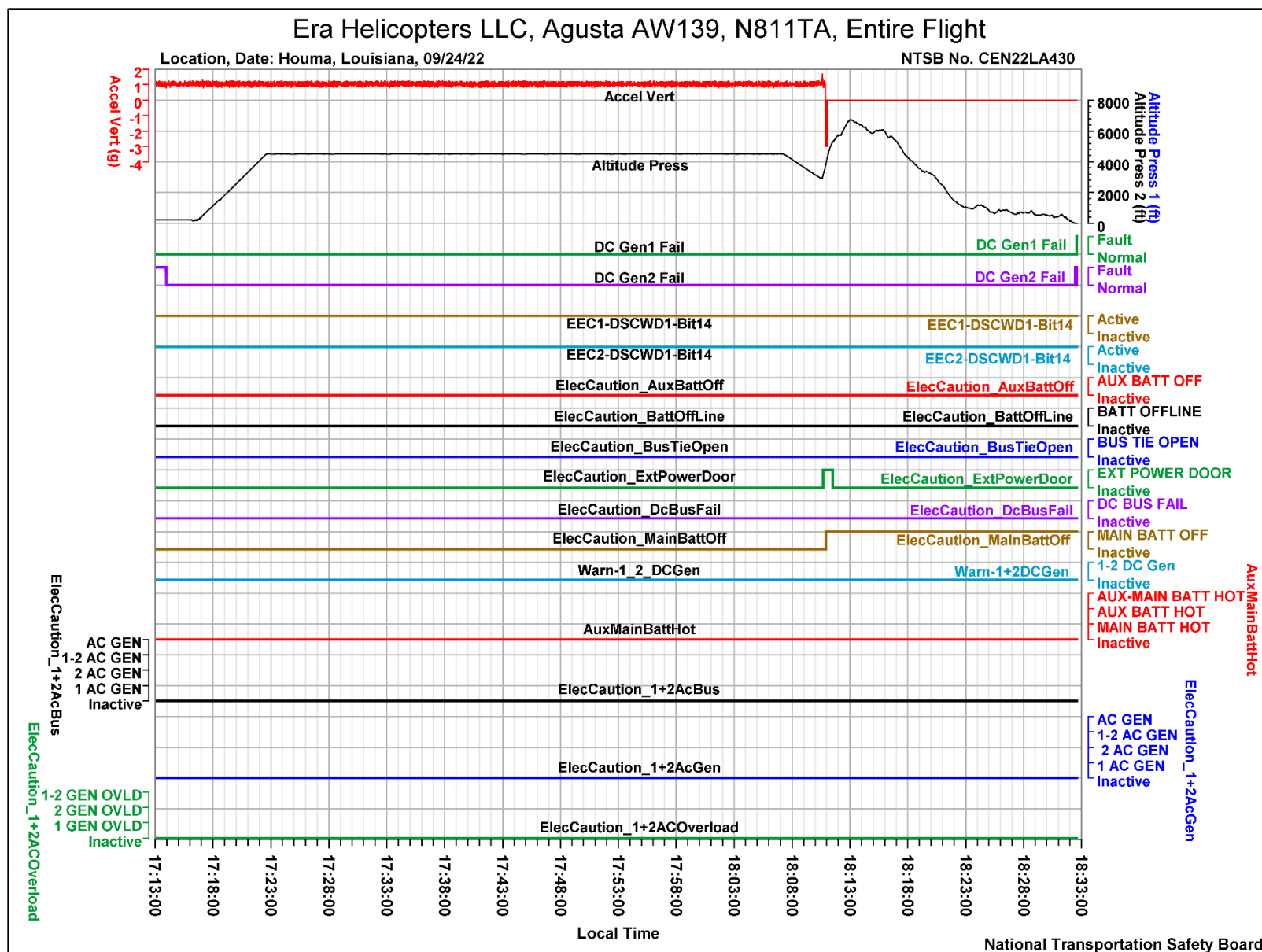


Figure 4. Plot of select electrical parameters (2 of 3) for entire flight.

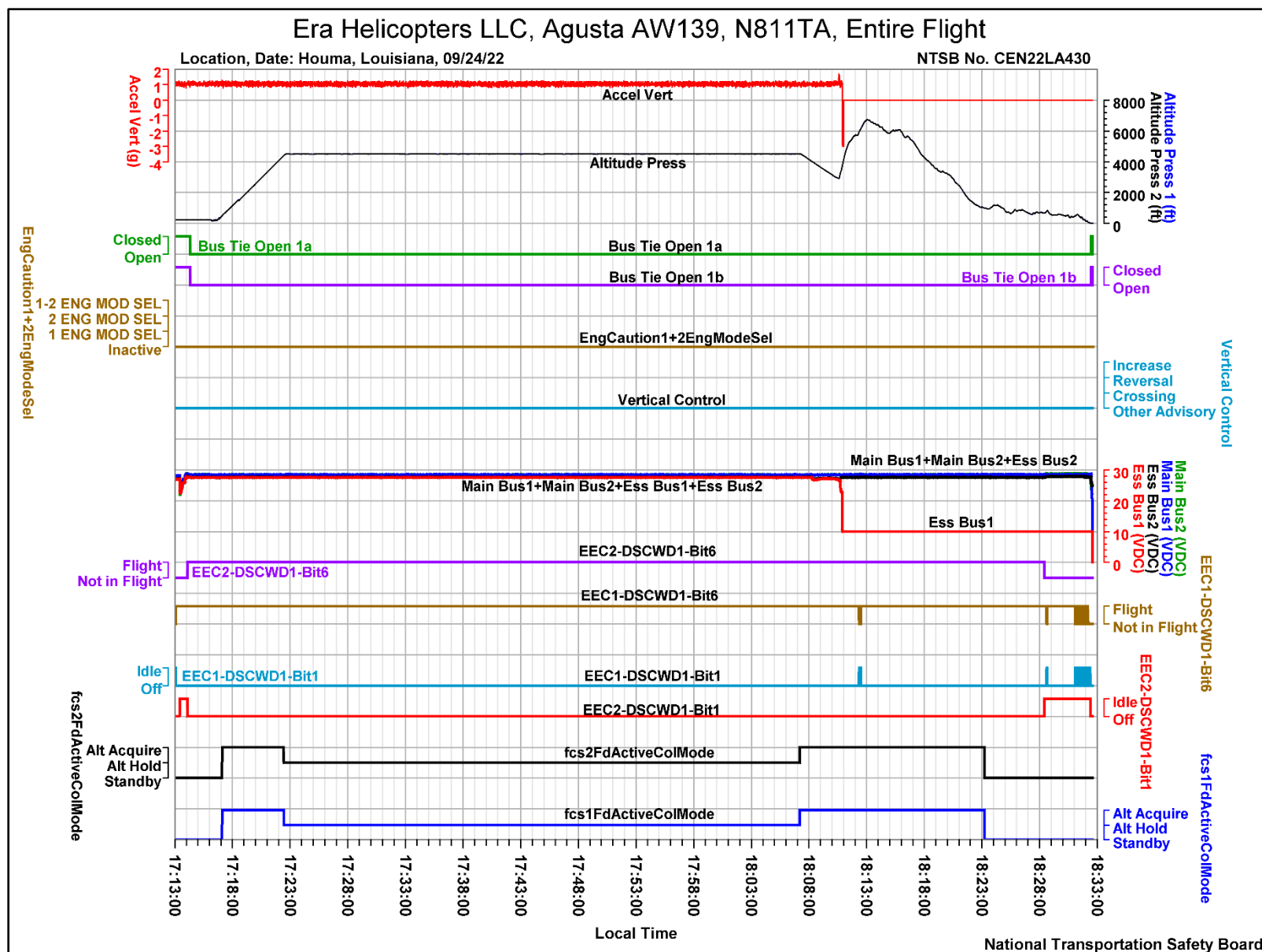


Figure 6. Plot of select parameters for entire flight.

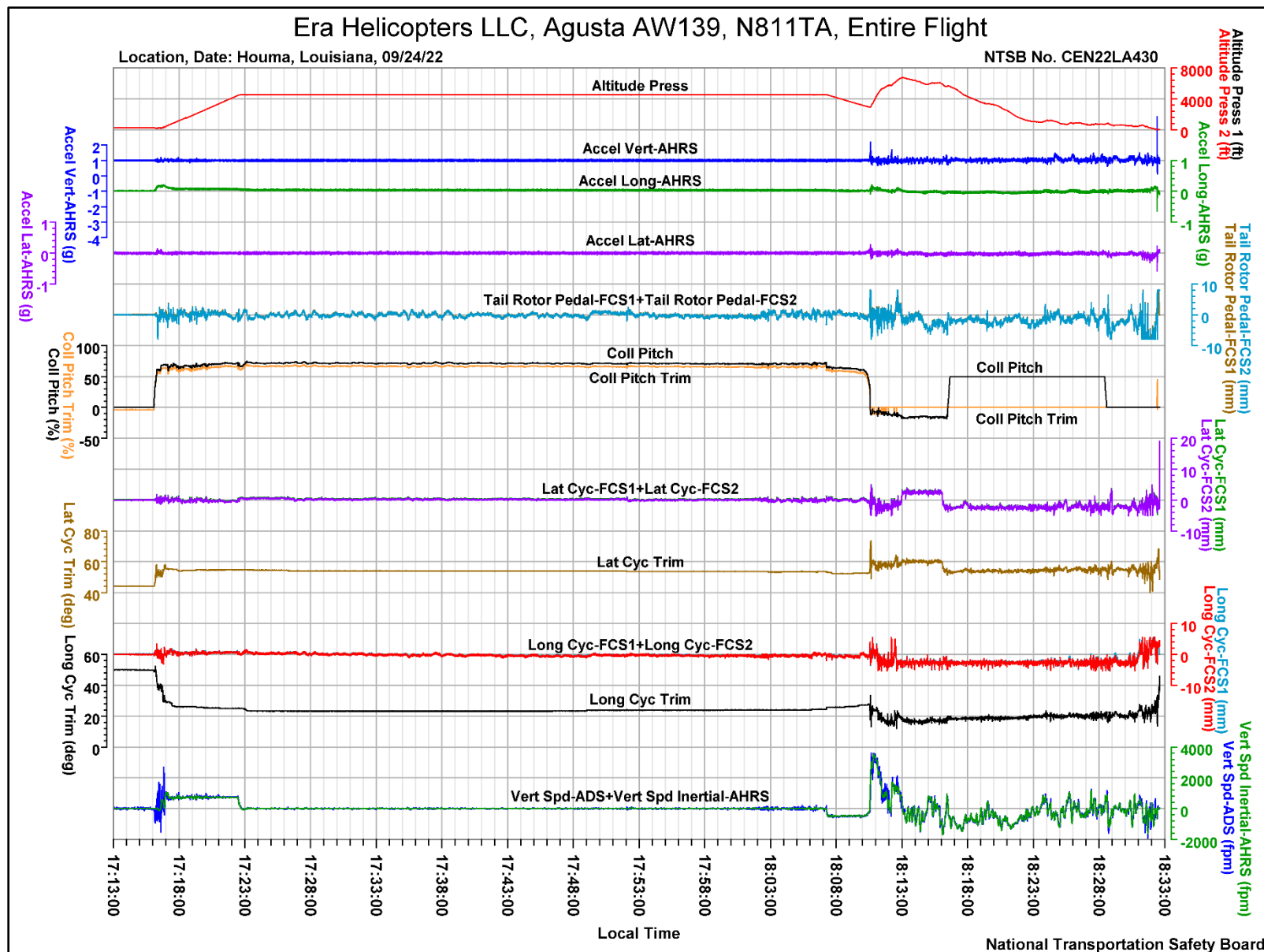


Figure 7. Plot of additional select parameters for entire flight.

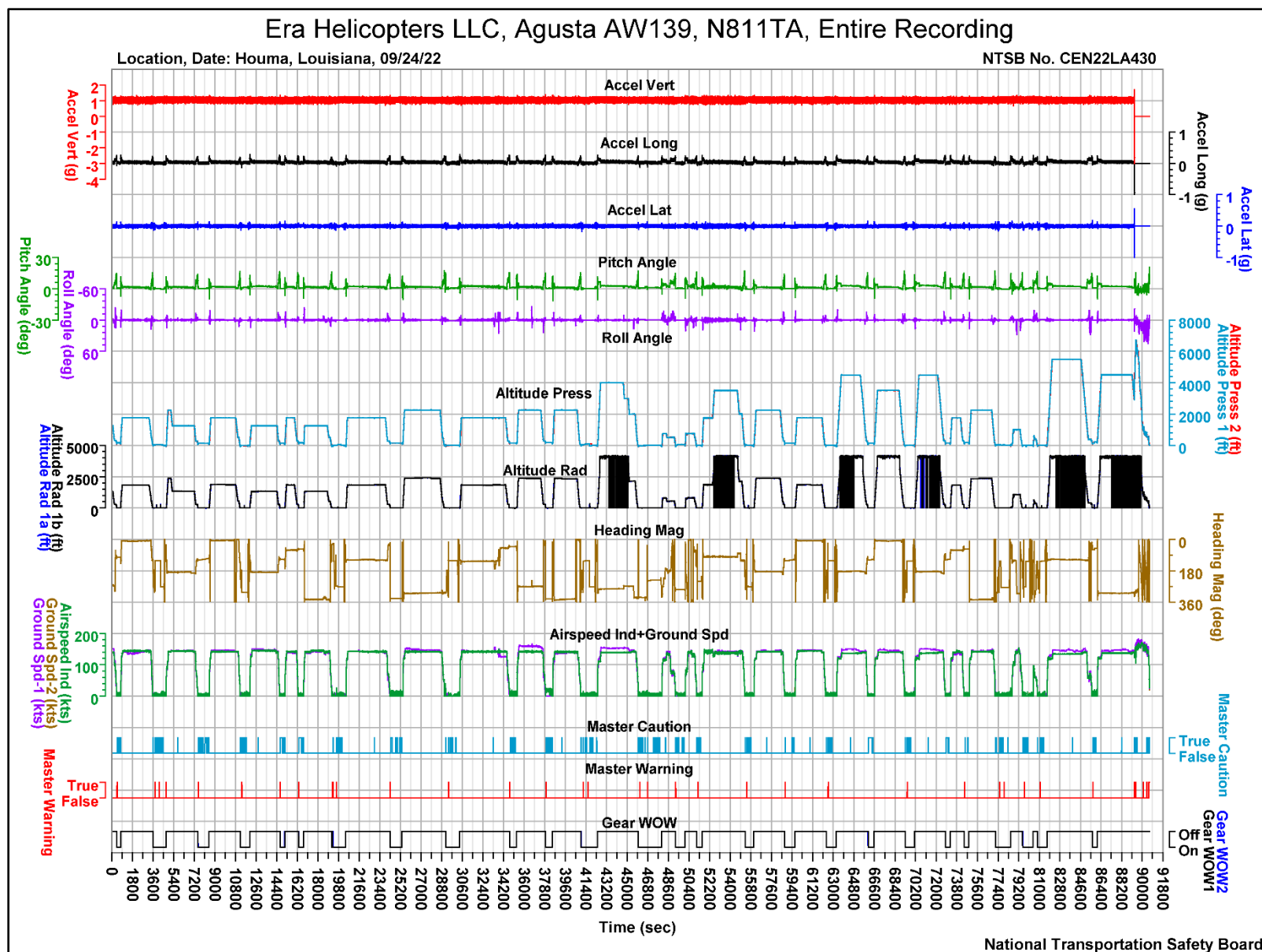


Figure 8. Plot of basic parameters for entire recording.

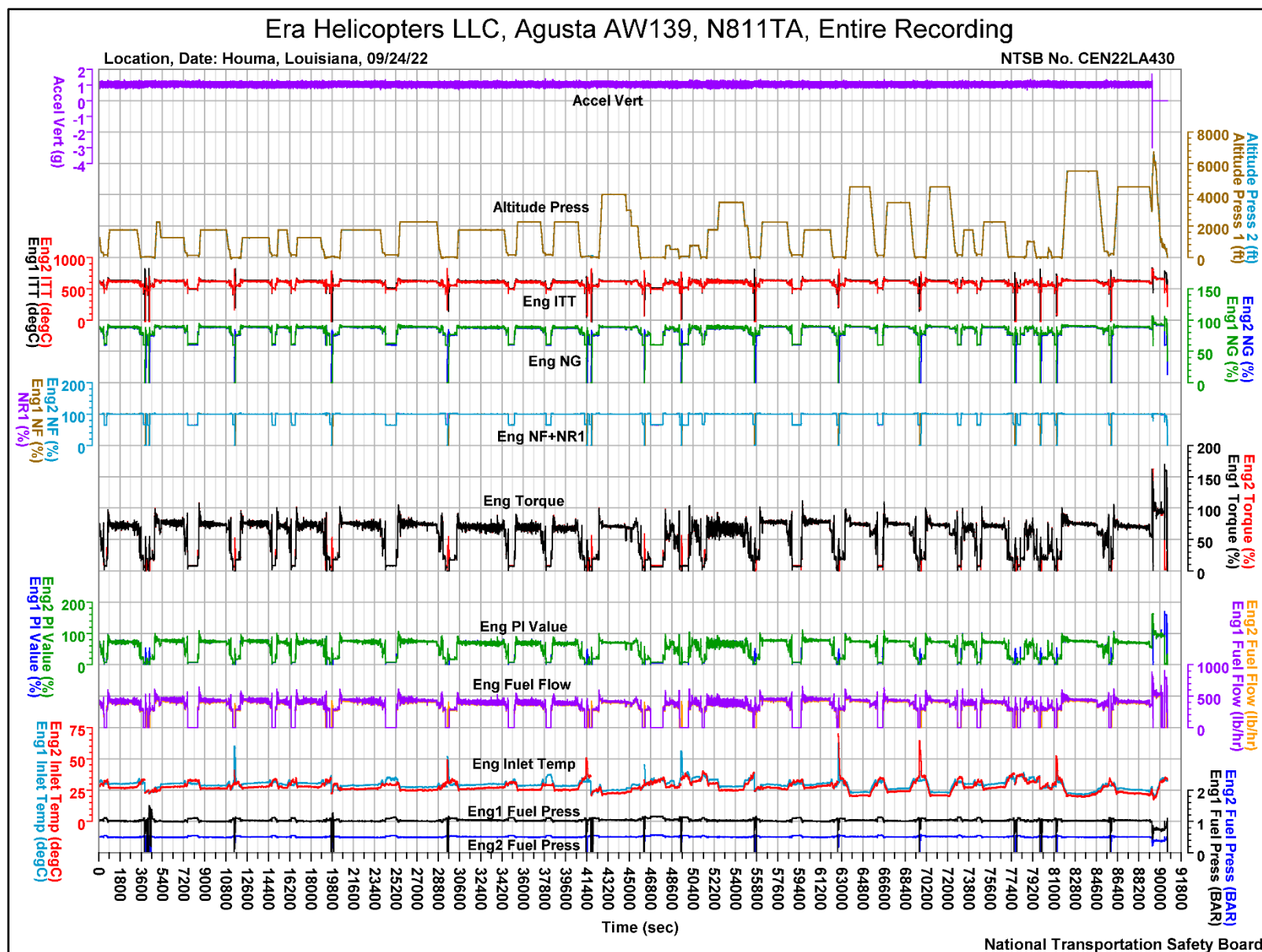


Figure 9. Plot of select engine parameters for entire recording.

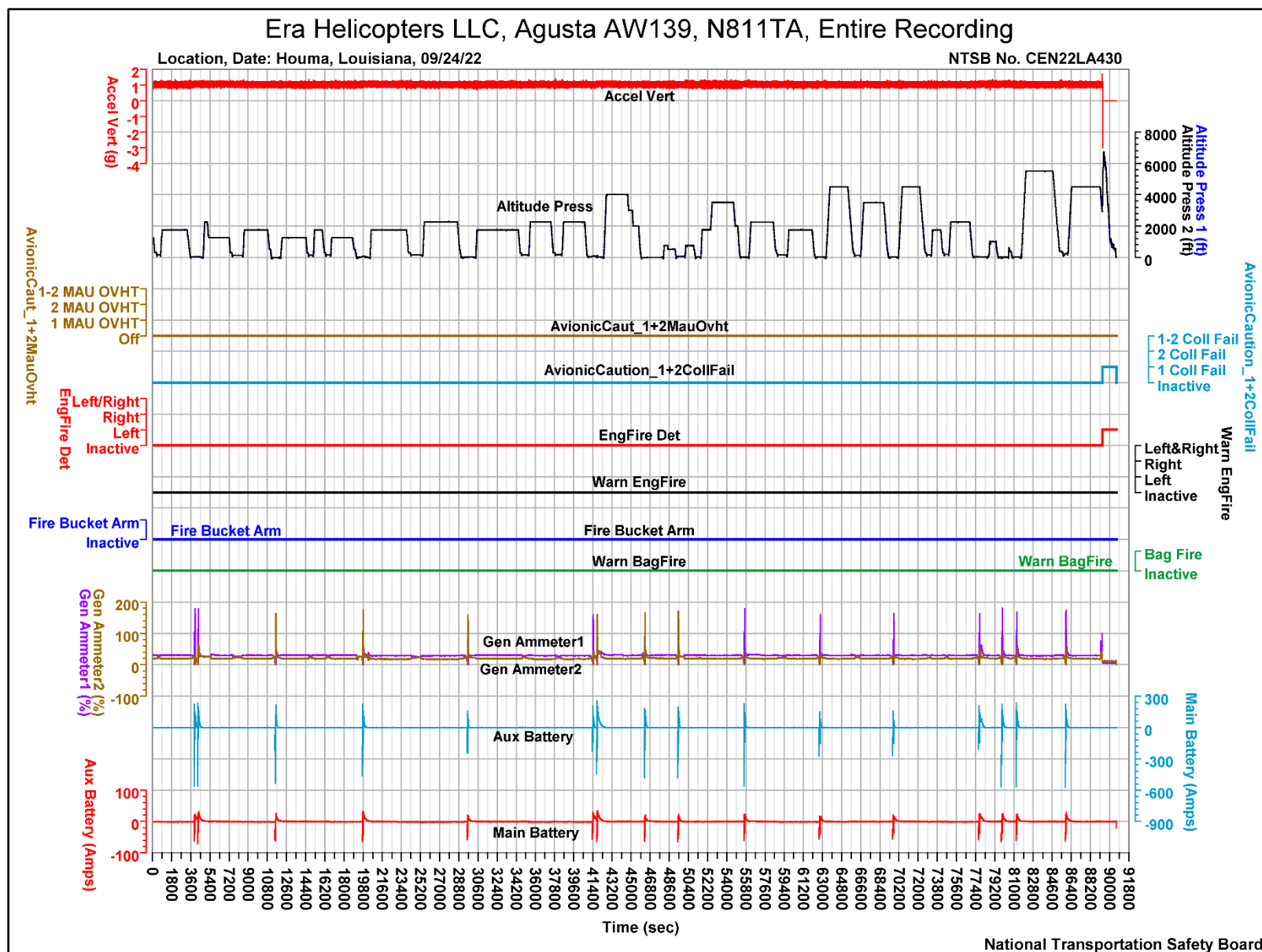


Figure 10. Plot of select electrical parameters (1 of 3) for entire recording.

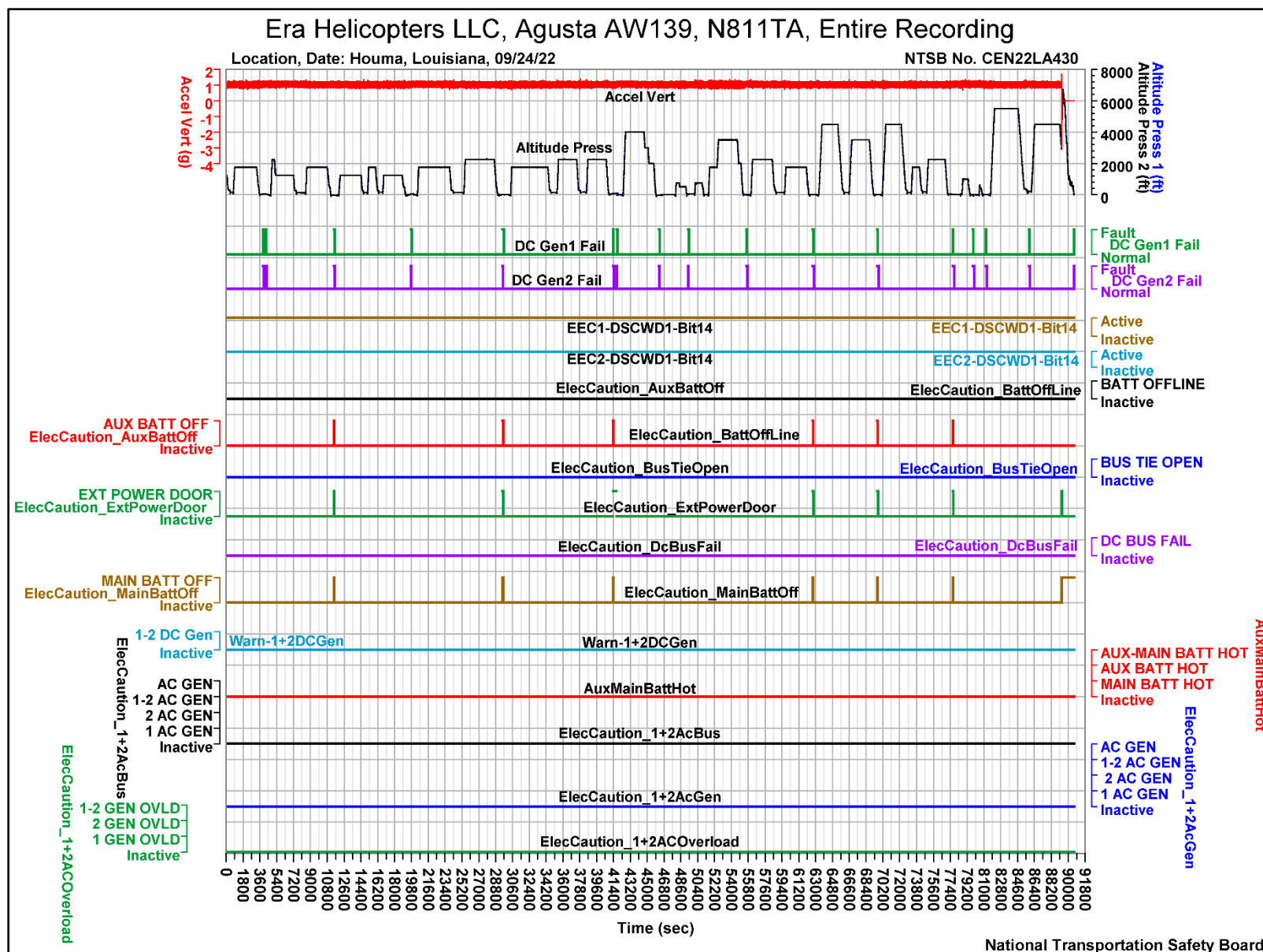


Figure 11. Plot of select electrical parameters (2 of 3) for entire recording.

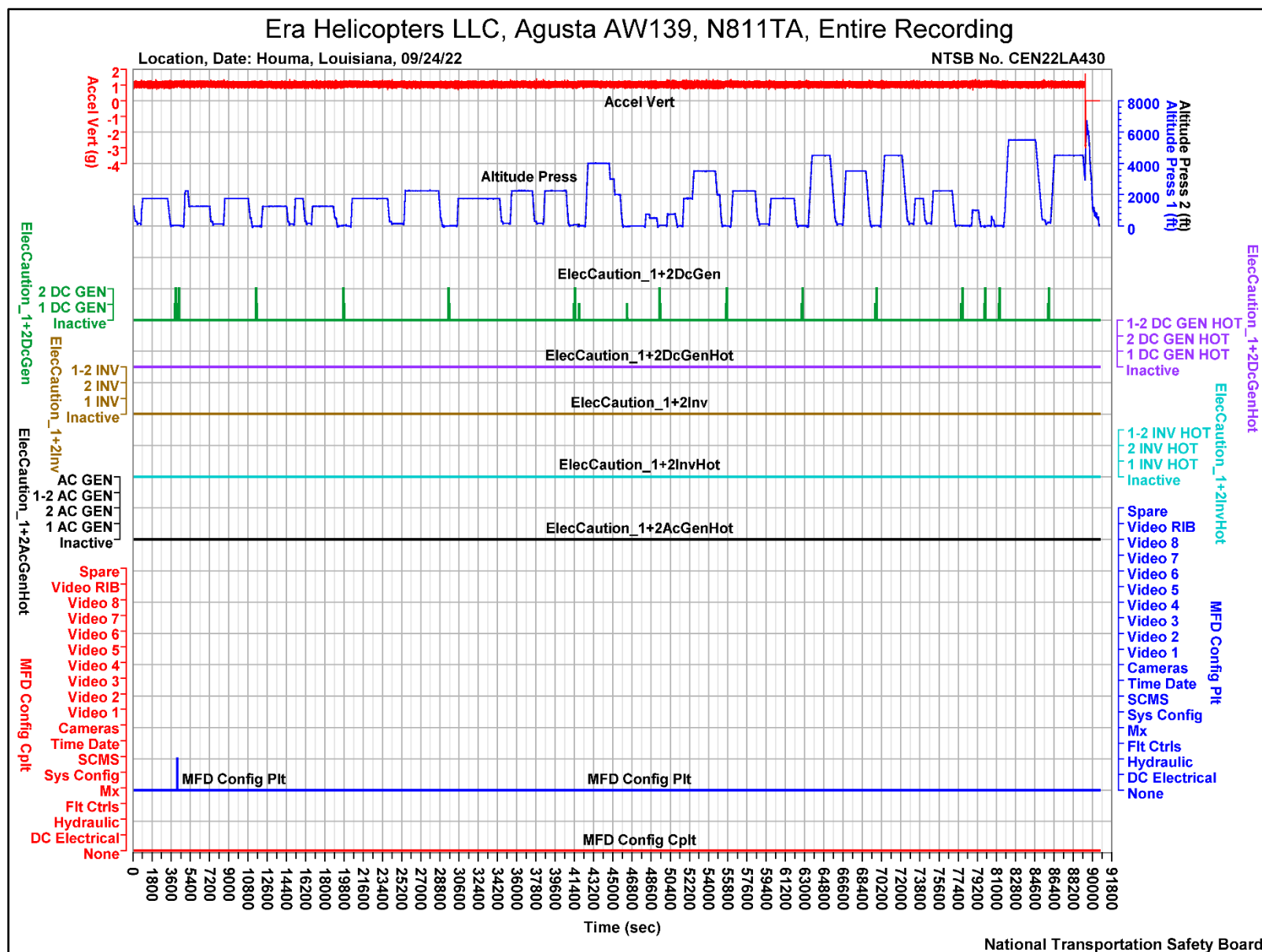


Figure 12. Plot of select electrical parameters (3 of 3) for entire recording.

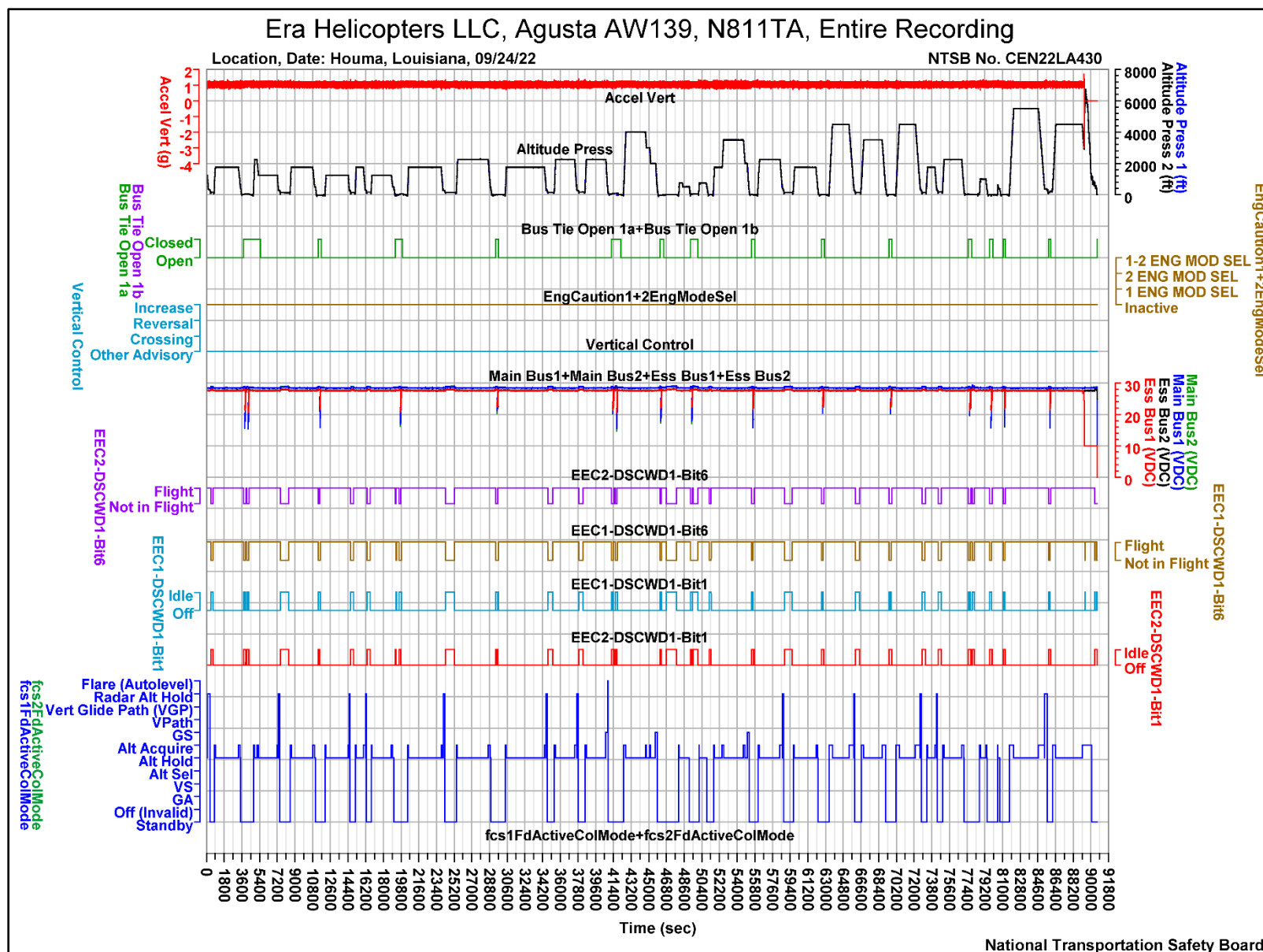


Figure 13. Plot of select parameters for entire recording.

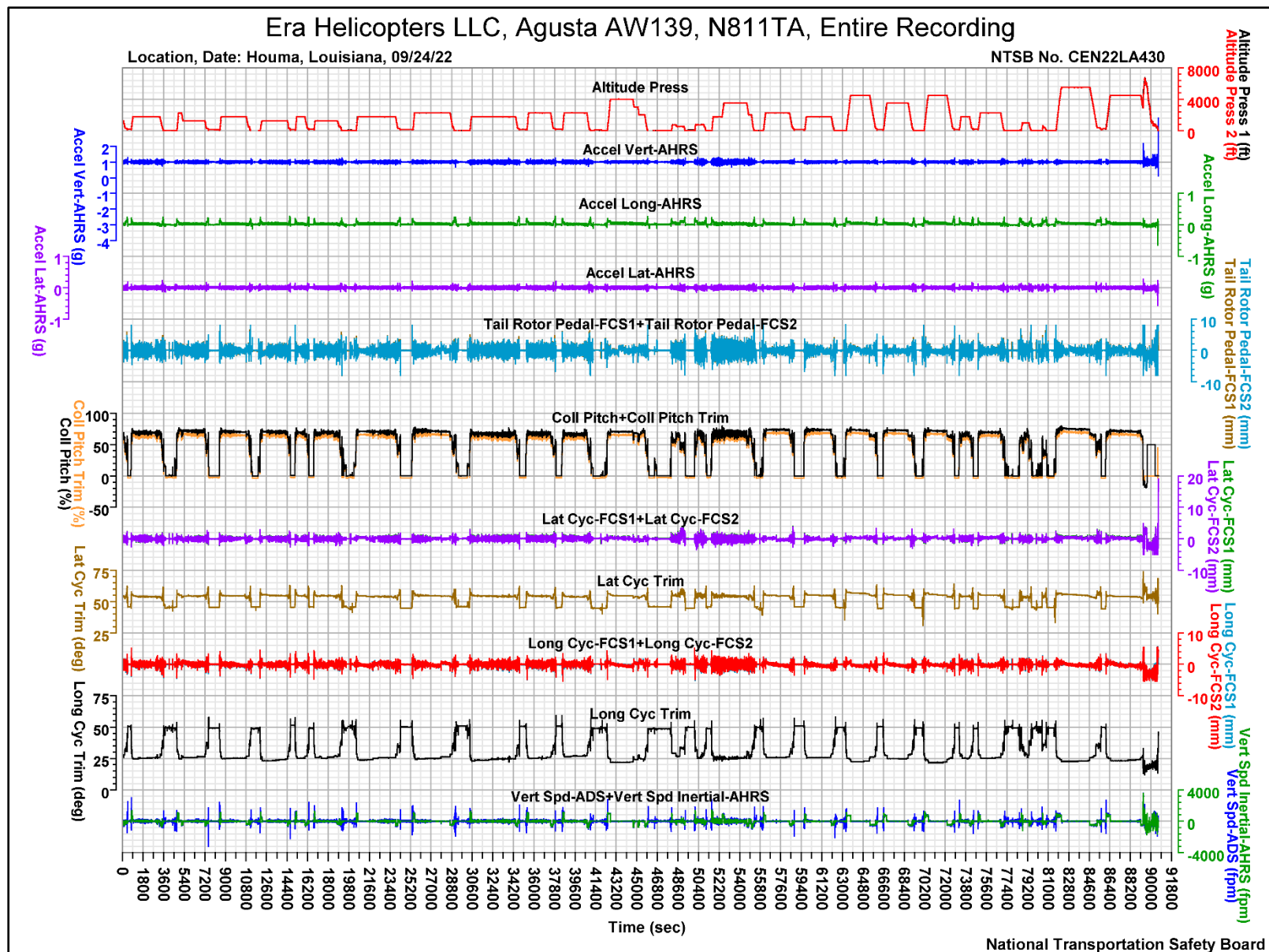


Figure 14. Plot of additional select parameters for entire recording.

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, tables 2 and 3 describe the unit and discrete state abbreviations used in this report, respectively. In table 1, parameters with a blank unit description are discretely. 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.

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 1. Verified and provided FDR parameters.

Plot/Table Labels	Parameter Names	Units
Accel Lat	Lateral Acceleration (Triaxial Accelerometer)	g
Accel Lat-AHRS	Lateral Acceleration - Attitude and Heading Reference System	g
Accel Long	Longitudinal Acceleration (Triaxial Accelerometer)	g
Accel Long-AHRS	Longitudinal Acceleration - Attitude and Heading Reference System	g
Accel Vert	Vertical Acceleration (Triaxial Accelerometer)	g
Accel Vert-AHRS	Vertical Acceleration - Attitude and Heading Reference System	g
Airspeed Ind	Indicated Airspeed	kts
Altitude Press 1	Pressure Altitude - 1	ft
Altitude Press 2	Pressure Altitude - 2	ft
Altitude Rad 1a	Radio Altitude - 1	ft
Altitude Rad 1b	Radio Altitude - 2	ft
Aux Battery	Auxiliary Battery	Amps
AuxMainBattHot	Main/Auxiliary Battery Hot Warning	
AvionicCaut_1+2MauOvht	Avionic Caution - #1 and #2 Modular Avionics Unit Overheat	
AvionicCaution_1+2CollFail	Avionic Caution - Collective Channels 1 and 2 Fail	
Bus Tie Open 1a	Bus Tie Open 1a	
Bus Tie Open 1b	Bus Tie Open 1b	
Coll Pitch	Collective Pitch	%
Coll Pitch Trim	Collective Pitch Trim	%
DC Gen1 Fail	Direct Current Generator 1 Fail	
DC Gen2 Fail	Direct Current Generator 2 Fail	
EEC1-DSCWD1-Bit1	Electronic Engine Control 1a - Idle Mode (1b)	
EEC1-DSCWD1-Bit14	Electronic Engine Control 1a - Electrical Power (1b)	
EEC1-DSCWD1-Bit6	Electronic Engine Control 1a - Flight Mode (1b)	
EEC2-DSCWD1-Bit1	Electronic Engine Control 2b - Idle Mode (2a)	
EEC2-DSCWD1-Bit14	Electronic Engine Control 2b - Electrical Power (2a)	
EEC2-DSCWD1-Bit6	Electronic Engine Control 2b - Flight Mode (2a)	
ElecCaution_1+2AcBus	Electrical Caution - #1 and #2 Alternating Current Bus	

Plot/Table Labels	Parameter Names	Units
ElecCaution_1+2AcGen	Electrical Caution - #1 and #2 Alternating Current Generators	
ElecCaution_1+2AcGenHot	Electrical Caution - #1 and #2 Alternating Current Generator Hot	
ElecCaution_1+2ACOverload	Electrical Caution - #1 and #2 Alternating Current Overload	
ElecCaution_1+2DcGen	Electrical Caution - #1 and #2 Direct Current Generators	
ElecCaution_1+2DcGenHot	Electrical Caution - #1 and #2 Direct Current Generator Hot	
ElecCaution_1+2Inv	Electrical Caution - #1 and #2 Inverter	
ElecCaution_1+2InvHot	Electrical Caution - #1 and #2 Inverter Hot	
ElecCaution_AuxBattOff	Electrical Caution - Auxiliary Battery Off	
ElecCaution_BattOffline	Electrical Caution - Battery Offline	
ElecCaution_BusTieOpen	Electrical Caution - Bus Tie Open	
ElecCaution_DcBusFail	Electrical Caution - Direct Current Bus Fail	
ElecCaution_ExtPowerDoor	Electrical Caution - Exterior Power Door	
ElecCaution_MainBattOff	Electrical Caution - Main Battery Off	
Eng1 Fuel Flow	Engine 1 Fuel Flow	lb/hr
Eng1 Fuel Press	Engine 1 Fuel Pressure	BAR
Eng1 Inlet Temp	Engine 1 Inlet Temperature	degC
Eng1 ITT	Engine 1 Inter-turbine Temperature	degC
Eng1 NF	Engine 1 Free Turbine Speed	%
Eng1 NG	Engine 1 Gas Generator Speed	%
Eng1 PI Value	Engine 1 Power Index Value	%
Eng1 Torque	Engine 1 Torque	%
Eng2 Fuel Flow	Engine 2 Fuel Flow	lb/hr
Eng2 Fuel Press	Engine 2 Fuel Pressure	BAR
Eng2 Inlet Temp	Engine 2 Inlet Temperature	degC
Eng2 ITT	Engine 2 Inter-turbine Temperature	degC
Eng2 NF	Engine 2 Free Turbine Speed	%
Eng2 NG	Engine 2 Gas Generator Speed	%
Eng2 PI Value	Engine 2 Power Index Value	%
Eng2 Torque	Engine 2 Torque	%
EngCaution1+2EngModeSel	Engine Caution 1 and 2 Engine Mode Selection	
EngFire Det	Engine Fire Detected	
Ess Bus1	Essential Bus 1	VDC
Ess Bus2	Essential Bus 2	VDC
fcs1FdActiveColMode	Flight Control System 1 Flight Director Active Collective Mode	
fcs2FdActiveColMode	Flight Control System 2 Flight Director Active Collective Mode	
Fire Bucket Arm	Fire Bucket Armed	
Gear WOW1	Weight on Wheels Sensor 1	
Gear WOW2	Weight on Wheels Sensor 2	
Gen Ammeter1	Generator Ammeter 1	%
Gen Ammeter2	Generator Ammeter 2	%
Ground Spd-1	Ground Speed - 1	kts
Ground Spd-2	Ground Speed - 2	kts
Heading Mag	Magnetic Heading	deg

Plot/Table Labels	Parameter Names	Units
Lat Cyc Trim	Lateral Cyclic Trim	deg
Lat Cyc-FCS1	Lateral Cyclic - Flight Control System 1	mm
Lat Cyc-FCS2	Lateral Cyclic - Flight Control System 2	mm
Long Cyc Trim	Longitudinal Cyclic Trim	deg
Long Cyc-FCS1	Longitudinal Cyclic - Flight Control System 1	mm
Long Cyc-FCS2	Longitudinal Cyclic - Flight Control System 2	mm
Main Battery	Main Battery	Amps
Main Bus1	Main Bus 1	VDC
Main Bus2	Main Bus 2	VDC
Master Caution	Master Caution	
Master Warning	Master Warning	
MFD Config Cplt	Multi Function Display Configuration Copilot	
MFD Config Plt	Multi Function Display Configuration Pilot	
NR1	Main Rotor Speed	%
Pitch Angle	Helicopter Pitch	deg
Roll Angle	Helicopter Roll	deg
Tail Rotor Pedal-FCS1	Tail Rotor Pedal Position - Flight Control System 1	mm
Tail Rotor Pedal-FCS2	Tail Rotor Pedal Position - Flight Control System 2	mm
UTC Hour	Coordinated Universal Time Hour	hrs
UTC Minute	Coordinated Universal Time Minute	min
UTC Second	Coordinated Universal Time Second	sec
Vert Spd Inertial-AHRS	Vertical Speed Inertial - Attitude and Heading Reference System	fpm
Vert Spd-ADS	Vertical Speed-Air Data System	fpm
Vertical Control	Vertical Control	
Warn BagFire	Baggage Compartment Fire Warning Light	
Warn EngFire	Engine Fire Warning	
Warn-1+2DCGen	Warning - #1 and #2 Direct Current Generator	

Table 2. Unit abbreviations.

Unit Abbreviations	Descriptions
Amps	Amperes
deg	degrees
degC	degrees Celsius
fpm	feet per minute
ft	feet
g	unit of gravitation acceleration
hrs	hours
kts	knots
lb/hr	pounds per hour
min	minutes
mm	millimeters
sec	seconds
VDC	Volts Direct Current

Table 3. Discrete state abbreviations.

Discrete State Abbreviations	Descriptions
1 AC GEN	Alternating Current Generator 1
1 Coll Fail	Collective Channel 1 Fail
1 DC GEN	Direct Current Generator 1
1 DC GEN HOT	Direct Current Generator 1 Hot
1 ENG MOD SEL	Engine Mode 1 Selected
1 GEN OVLD	Generator 1 Overload
1 INV	Inverter 1
1 INV HOT	Inverter 1 Hot
1 MAU OVHT	Modular Avionics Unit 1 Overheat
1-2 AC GEN	Alternating Current Generators 1 and 2
1-2 Coll Fail	Collective Channels 1 and 2 Fail
1-2 DC Gen	Direct Current Generators 1 and 2
1-2 DC GEN HOT	Direct Current Generators 1 and 2 Hot
1-2 ENG MOD SEL	Engine Modes 1 and 2 Selected
1-2 GEN OVLD	Generators 1 and 2 Overload
1-2 INV	Inverters 1 and 2
1-2 INV HOT	Inverters 1 and 2 Hot
1-2 MAU OVHT	Modular Avionics Units 1 and 2 Overheat
2 AC GEN	Alternating Current Generator 2
2 Coll Fail	Collective Channel 2 Fail
2 DC GEN	Direct Current Generator 2
2 DC GEN HOT	Direct Current Generator 2 Hot
2 ENG MOD SEL	Engine Mode 2 Selected
2 GEN OVLD	Generator 2 Overload
2 INV	Inverter 2
2 INV HOT	Inverter 2 Hot
2 MAU OVHT	Modular Avionics Unit 2 Overheat
AC GEN	Alternating Current Generator
Alt Acquire	Altitude Acquire
Alt Hold	Altitude Hold
Alt Sel	Altitude Select
AUX BATT HOT	Auxiliary Battery Hot
AUX BATT OFF	Auxiliary Battery Off
AUX-MAIN BATT HOT	Auxiliary and Main Battery Hot
BATT	Battery
DC	Direct Current
DC BUS FAIL	Direct Current Bus Fail
DC Electrical	Direct Current Electrical
EXT POWER DOOR	Exterior Power Door
Flt Ctrls	Flight Controls
GA	Go Around
GS	Glideslope
MAIN BATT HOT	Main Battery Hot

Discrete State Abbreviations	Descriptions
MAIN BATT OFF	Main Battery Off
Mx	Maintenance
Radar Alt Hold	Radar Altitude Hold
SCMS	Software Configuration Management Module
Sys Config	System Configuration
Vert Glide Path (VGP)	Vertical Glideslope Path
Video RIB	Video Remote Images Bus
Vpath	Vertical Path
VS	Vertical Speed