

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA22LA027

FLIGHT DATA RECORDER

Specialist's Factual Report

December 12, 2022

A. ACCIDENT

Location: Orlando, Florida
Date: October 22, 2021
Time: 1750 eastern daylight time (EDT)
Airplane: Embraer EMB-500, N925DR

B. FLIGHT DATA RECORDER SPECIALIST

Specialist Michael Portman
Aerospace Engineer – Recorder Specialist
National Transportation Safety Board (NTSB)

C. FEDERAL CARRIAGE REQUIREMENTS

The event aircraft, N925DR, was operating as Title 14 *Code of Federal Regulations* (CFR) Part 91. The event aircraft was not required to be equipped with a flight data recorder (FDR).

D. DETAILS OF THE INVESTIGATION

An FDR group was not convened. The NTSB Vehicle Recorder Division received the following Cockpit Voice and Data Recorder (CVDR) and central maintenance computer (CMC) card:

Recorder Manufacturer/Model: L-3 FA2100-3083
Part Number: 2100-3083-50
Recorder Serial Number: 000647032

Recorder Manufacturer/Model: CMC SD Memory Card
Part Number: Unknown
Recorder Serial Number: Unknown

1.0 L-3 FA2100-3083 CVDR Description

The L-3 Cockpit Voice and Data Recorder (CVDR) is a dual function recorder providing both FDR and Cockpit Voice Recorder (CVR) functions. The FDR function records airplane flight information in a digital format using solid-state flash memory as the recording medium. The FA2100 can receive data in the ARINC 573/717/747 configurations and can record a minimum of 25 hours of flight data. It is configured to record 256 12-bit words of digital information every second. Each grouping of 256 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 256-word intervals. Each data parameter (for example, altitude, heading, airspeed) has a specifically assigned word number within the subframe. The CVDR is designed to meet the crash-survivability requirements of TSO-C123a and TSO-C124a. For the rest of this report, the CVDR will be referred to as an FDR.

1.1 Recorder Condition

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

1.2 Recording Description

The FDR recording contained approximately 246 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 7 minutes.

Review of the data during the event flight showed two time gaps. The time gaps were 6 and 9 seconds in duration. The aircraft manufacturer, Embraer, was contacted regarding the time gaps. Embraer previously diagnosed a similar time gap issue on EMB-505 (Phenom 300) aircraft due to loss of data subframes due to high throughput. This means there is a memory overflow in the data concentrator unit (DCU) #1 resulting in loss of synchronization of the ARINC 717 data to the CVDR unit, causing the time gaps. Embraer is continuing to work to determine the root cause of the problem found on this EMB-500. The gaps resulted in a minor time drift at the points of the gaps, and, as a result, the beginning of the flight recording is approximately 2 seconds behind actual time.

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 discrete state abbreviations used in this report.

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 = +.

1.3 Time Correlation

Correlation of the FDR data from SRN to the event local time, eastern daylight time (EDT), was established by using the recorded coordinated universal time (UTC) Hours, UTC Minutes, and UTC Seconds and then applying an additional 4 hours offset to change UTC to EDT.

Accordingly, the time offset for the event flight data from SRN to local EDT is the following: $EDT = SRN - 820,649$. Therefore, for the rest of this report, all times are referenced as EDT, not SRN.

2.0 CMC Description

The CMC (Central Maintenance Computer) is a function performed by the avionics system designed to aid in troubleshooting and maintenance of the aircraft systems on ground. The CMC collects maintenance data, while the individual aircraft subsystems supply real-time captured data. This data is stored on SD cards.

2.1 Recorder Condition

The SD cards were in good condition. Upon consultation with the Investigator-In-Charge (IIC), review of the data contained in the cards was unnecessary for the investigation. Therefore, no data were extracted from the devices.

E. FIGURES AND TABULAR DATA

Figures 1 to 6 contain FDR data recorded during the event on October 22, 2021. All the parameters listed in table 1 are plotted except UTC Hours, UTC Minutes, UTC Seconds, Latitude, and Longitude.

Figures 1, 2, and 3 show basic parameters for the entire flight, the final approach, and the landing sequence, respectively. Figures 4, 5, and 6 show landing gear related parameters for the entire flight, the final approach, and the landing sequence, respectively.

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.

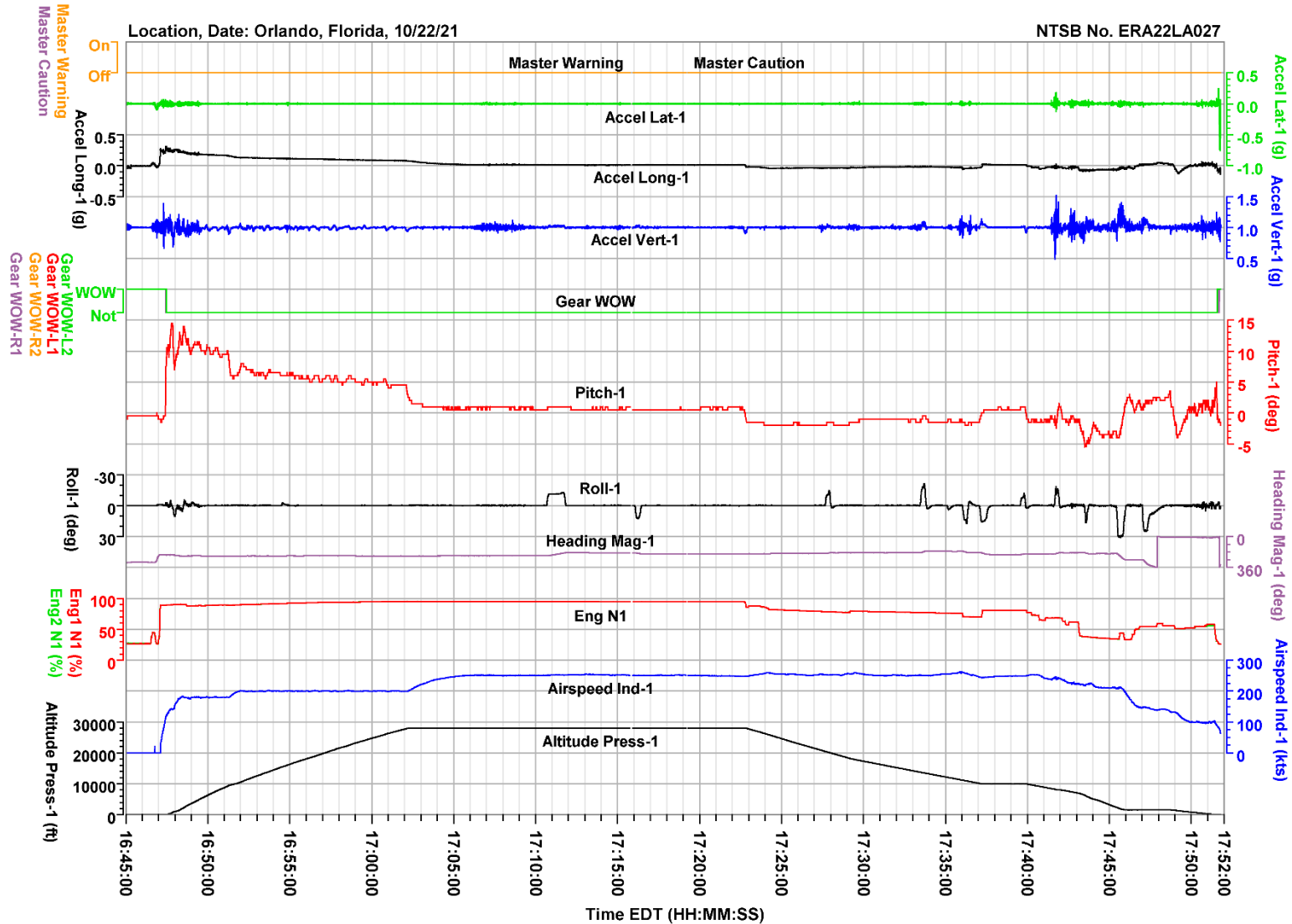
In summary, the flight took off at 1647:28 EDT and climbed to a maximum altitude of approximately 28,000 ft. The aircraft descended into Orlando, and weight on wheels sensors registered touch down at different times ranging between 1751:35 and 1751:37, at an airspeed of approximately 87 kts. Lateral acceleration deviations were recorded shortly after touchdown. As the aircraft slowed, brakes were applied on the right side, however the aircraft began yawing to the left. No warnings or

cautions were recorded, and the FDR recording ceased at 1751:48, with the aircraft still in motion at approximately 63 kts.

The corresponding tabular data used to create figures 1 to 6, including UTC Hours, UTC Minutes, UTC Seconds, Latitude, and Longitude, are provided in electronic comma separated value (CSV) format as attachment 1 to this report.

Submitted by:

Michael Portman
Aerospace Engineer - Recorder Specialist

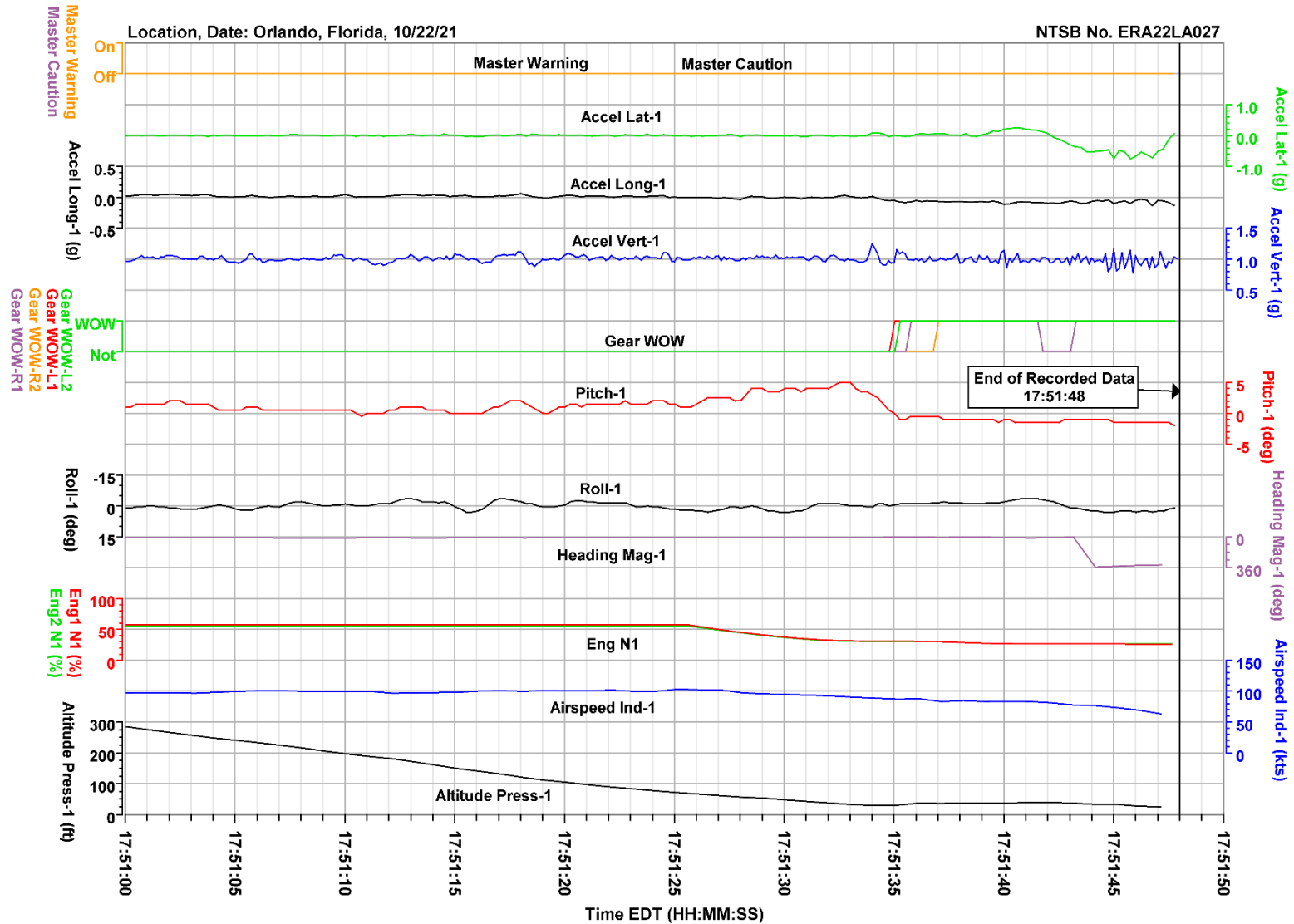


Scout About, LLC, Embraer EMB-500, N925DR

Overview, Whole Flight

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

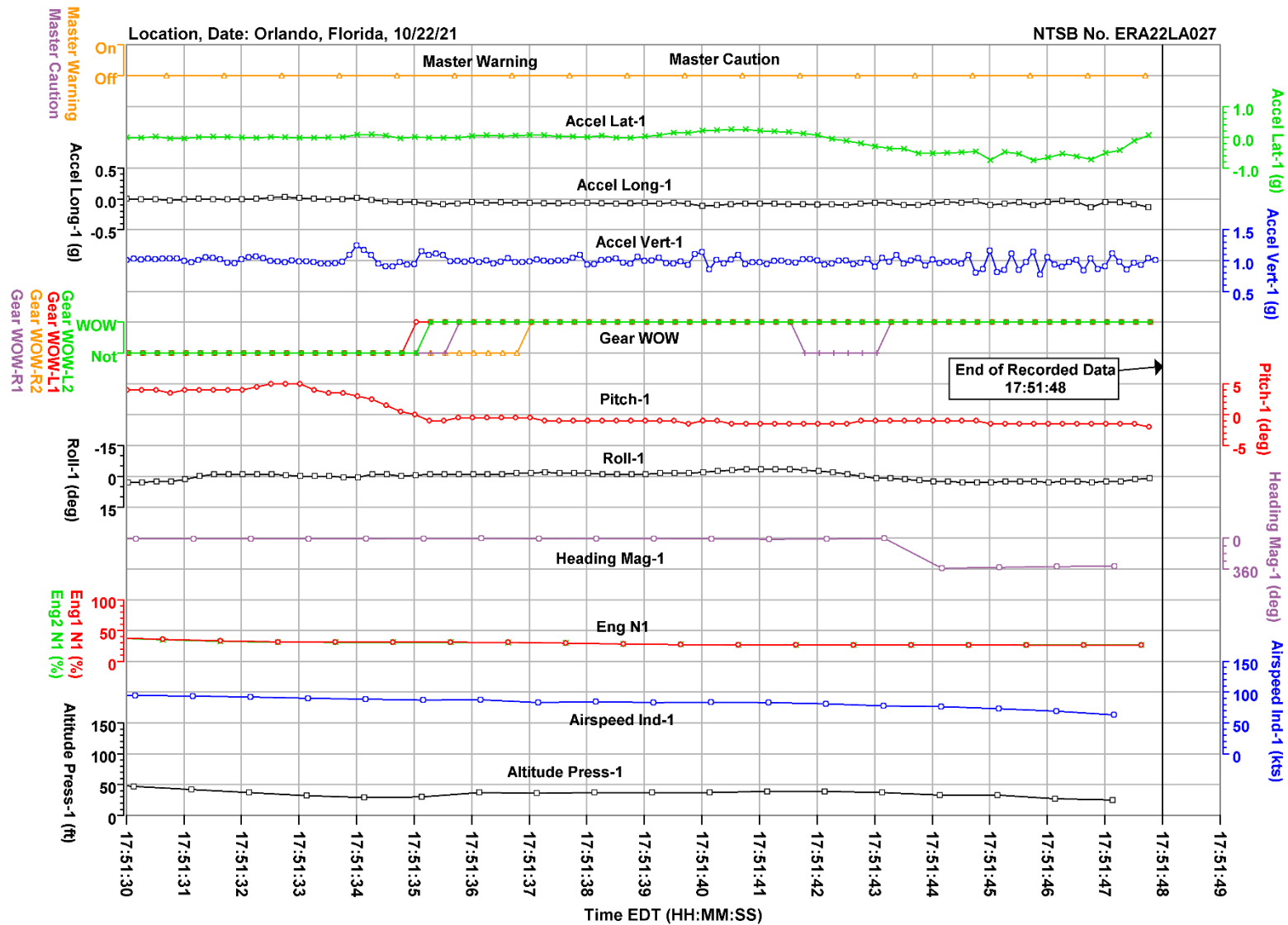


Scout About, LLC, Embraer EMB-500, N925DR

Overview, Final Approach

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Figure 2. Plot of basic parameters for the final approach.

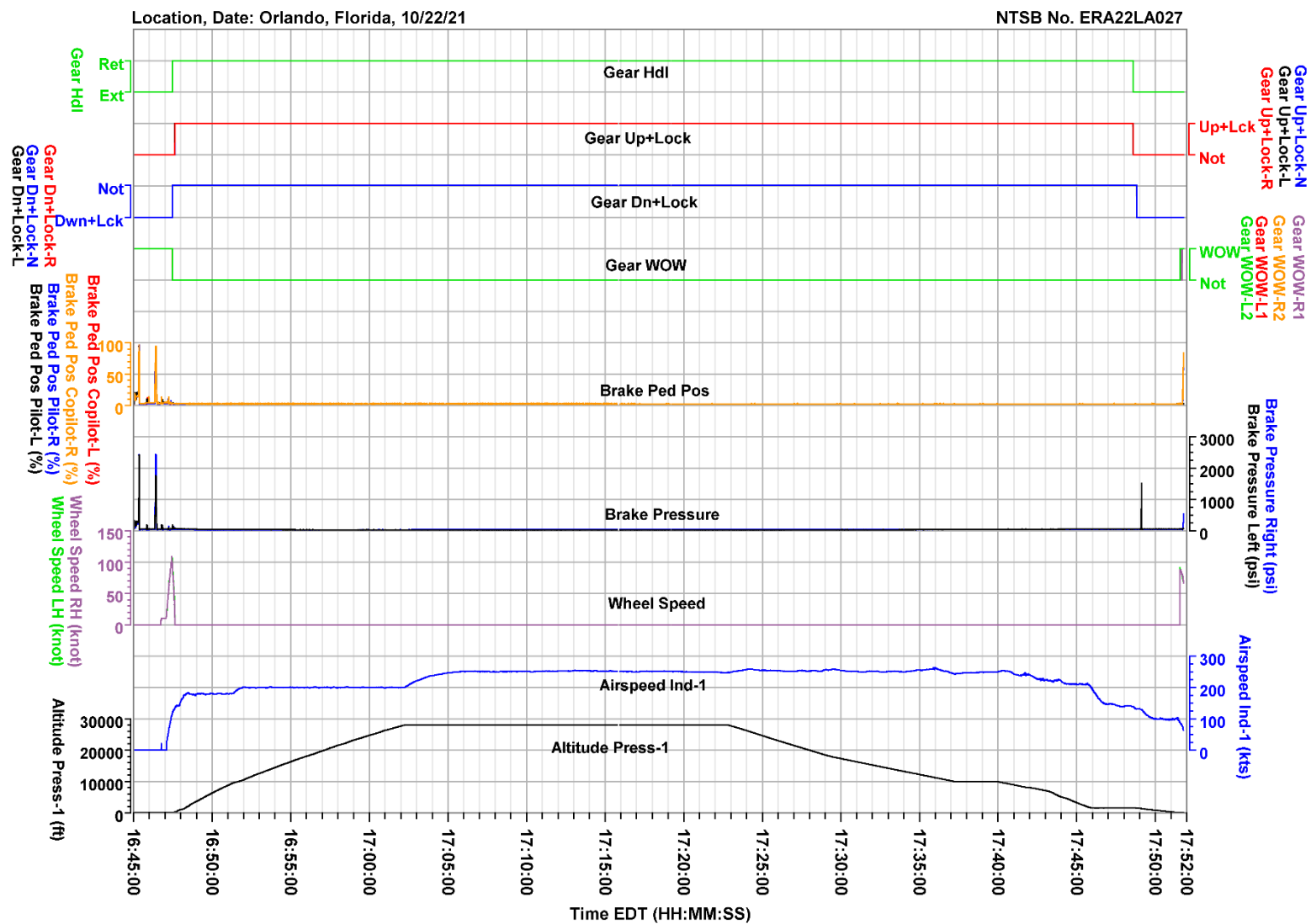


Scout About, LLC, Embraer EMB-500, N925DR

Overview, Touchdown and Rollout

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Figure 3. Plot of basic parameters for the landing and rollout.

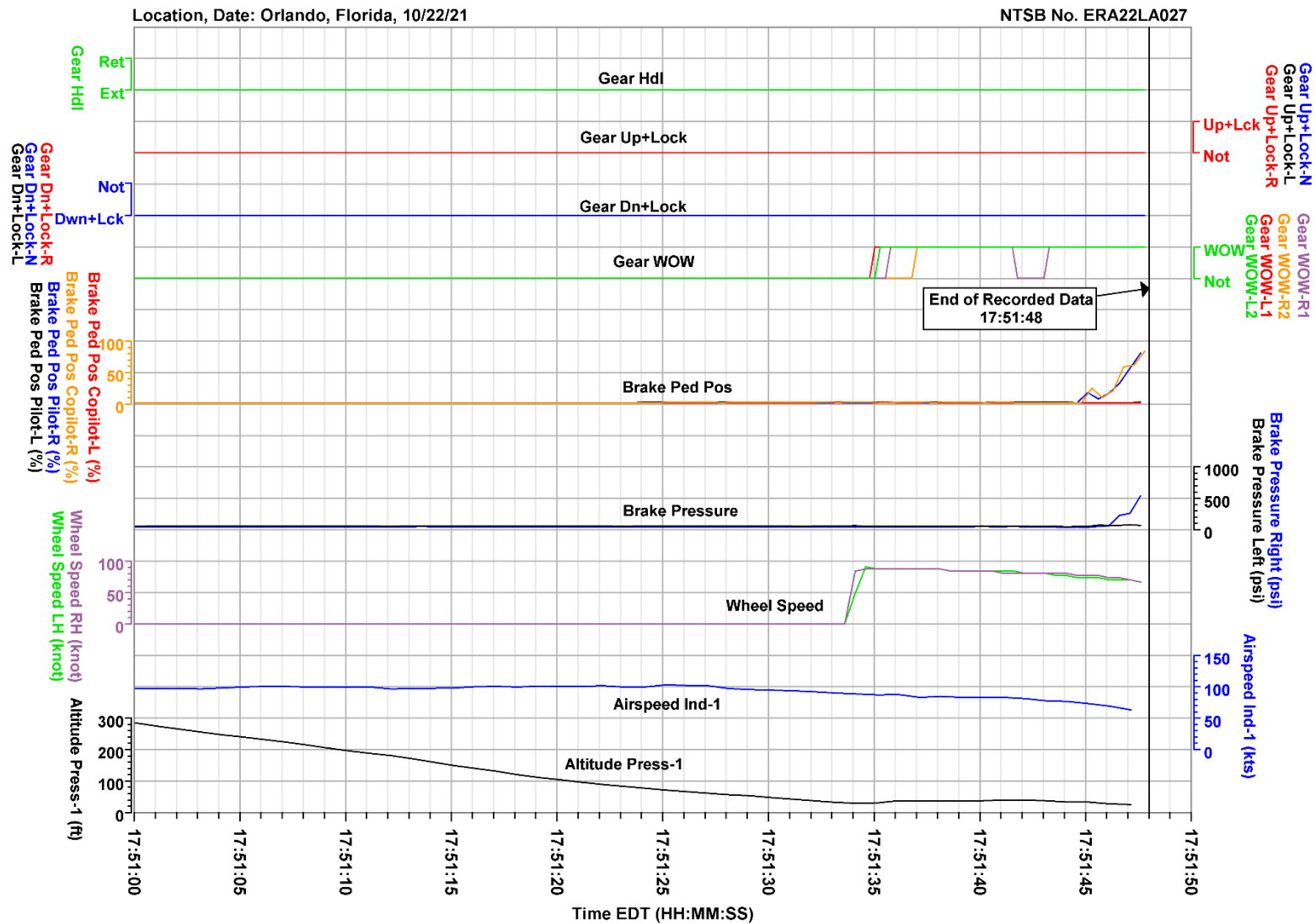


Scout About, LLC, Embraer EMB-500, N925DR

Landing Gear, Whole Flight

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Figure 4. Plot of landing gear related parameters for the entire accident flight.

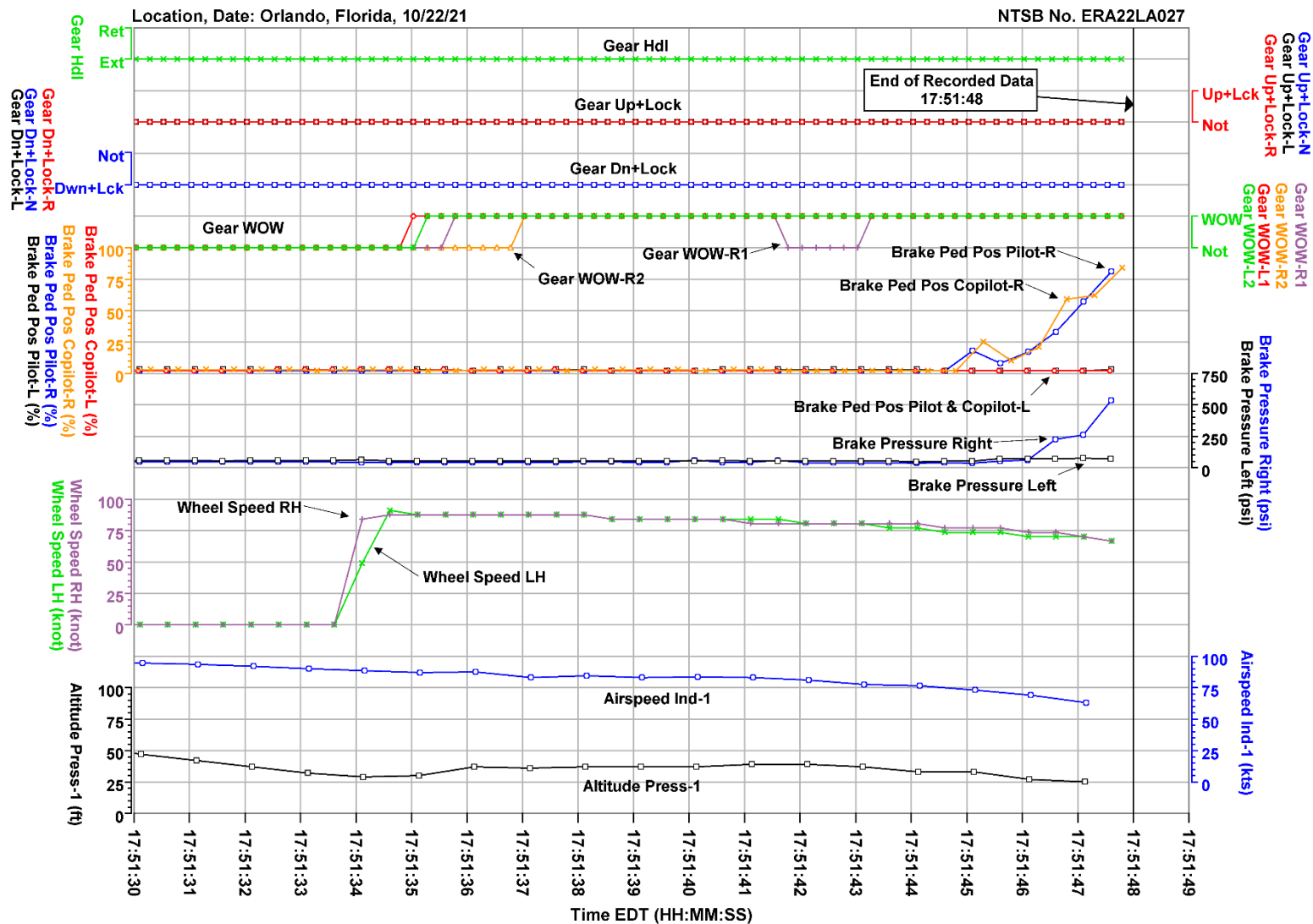


Scout About, LLC, Embraer EMB-500, N925DR

Landing Gear, Final Approach

National Transportation Safety Board

Figure 5. Plot of landing gear related parameters for the final approach.



Scout About, LLC, Embraer EMB-500, N925DR

Landing Gear, Touchdown and Rollout

National Transportation Safety Board

Figure 6. Plot of landing gear related parameters for the landing and rollout.

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 discrete state abbreviations used in this report.

Table 1. Verified and provided FDR parameters.

Plot/Table Labels	Parameter Names	Units
Accel Lat-1	Lateral Load Factor	g
Accel Long-1	Longitudinal Load Factor	g
Accel Vert-1	Vertical Load Factor	g
Airspeed Ind-1	Indicated Airspeed	kts
Altitude Press-1	Pressure Altitude	ft
Brake Ped Pos Copilot-L	Brake Pedal Position - Copilot Left Brake	%
Brake Ped Pos Copilot-R	Brake Pedal Position - Copilot Right Brake	%
Brake Ped Pos Pilot-L	Brake Pedal Position - Pilot Left Brake	%
Brake Ped Pos Pilot-R	Brake Pedal Position - Pilot Right Brake	%
Brake Pressure Left	Brake Pressure Left	psi
Brake Pressure Right	Brake Pressure Right	psi
Eng1 N1	Engine 1 Fan Speed	%
Eng2 N1	Engine 2 Fan Speed	%
Gear Dn+Lock-L	Left Landing Gear Down and Locked	
Gear Dn+Lock-N	Nose Landing Gear Down and Locked	
Gear Dn+Lock-R	Right Landing Gear Down and Locked	
Gear Hdl	Landing Gear Handle Position	
Gear Up+Lock-L	Left Landing Gear Up and Locked	
Gear Up+Lock-N	Nose Landing Gear Up and Locked	
Gear Up+Lock-R	Right Landing Gear Up and Locked	
Gear WOW-L1	Left Gear Weight on Wheels-1	
Gear WOW-L2	Left Gear Weight on Wheels-2	
Gear WOW-R1	Right Gear Weight on Wheels-1	
Gear WOW-R2	Right Gear Weight on Wheels-2	
Heading Mag-1	Magnetic Heading	deg
Latitude-1	Latitude Coordinate	deg
Longitude-1	Longitude Coordinate	deg
Master Caution	Master Caution	
Master Warning	Master Warning	
Pitch-1	Pitch Angle	deg
Roll-1	Roll Angle	deg
Time UTC-Hr	Coordinated Universal Time Hour	hrs
Time UTC-Min	Coordinated Universal Time Minutes	min
Time UTC-Sec	Coordinated Universal Time Seconds	sec
Wheel Speed LH	Left Landing Gear Wheel Speed	kts
Wheel Speed RH	Right Landing Gear Wheel 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 discrete state abbreviations.

Unit and Discrete State Abbreviations	Descriptions
%	percent
deg	degrees
degC	degrees Celsius
Dwn+Lck	down and locked
Ext	extended
ft	feet
g	unit of gravitation acceleration
hrs	hours
kts	knots
min	minutes
psi	pounds per square inch
Ret	retracted
sec	seconds
Up+Lck	up and locked
WOW	weight on wheels