

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



DCA24LA318

FLIGHT DATA RECORDER

Specialist's Factual Report

July 7, 2025

TABLE OF CONTENTS

A. INCIDENT	3
B. FLIGHT DATA RECORDER SPECIALIST	3
C. FEDERAL CARRIAGE REQUIREMENTS.....	3
D. DETAILS OF THE INVESTIGATION	3
1.0 Universal Avionics CVFDR Description	3
1.1 Recorder Condition	4
1.2 Recording Description	4
1.2.1 Engineering Unit Conversions	4
1.3 Time Correlation	4
E. FIGURES AND TABULAR DATA.....	5
APPENDIX A. VERIFIED AND PROVIDED PARAMETERS	13

A. INCIDENT

Location: Chicago, Illinois
Date: September 25, 2024
Time: 1526 central daylight time (CDT)
2026 coordinated universal time (UTC)
Airplane: Embraer ERJ 170-100 LR, Envoy Air Inc., N772MR

B. FLIGHT DATA RECORDER SPECIALIST

Specialist: Steven Smith
Mechanical Engineer (Recorder Specialist)
National Transportation Safety Board (NTSB)

C. FEDERAL CARRIAGE REQUIREMENTS

The event aircraft, N772MR, was operating as a Title 14 *Code of Federal Regulations* (CFR) Part 121 scheduled passenger flight. The event aircraft was manufactured in 2006 and was operating such that it was required to be equipped with a flight data recorder (FDR) that recorded, at a minimum, 88 parameters, as cited in 14 CFR Part 121.344(f).

D. DETAILS OF THE INVESTIGATION

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

Recorder Manufacturer/Model: Universal Avionics CVFDR
Part Number: 1605-01-00
Recorder Serial Number: 2430

1.0 Universal Avionics CVFDR Description

The Universal Avionics cockpit voice flight data recorder (CVFDR) with recorder independent power supply (RIPS) is a dual function recorder providing both FDR and cockpit voice recorder (CVR) functions with an integrated RIPS. The FDR function records airplane flight information in a digital format using solid-state flash memory as the recording medium. The Universal Avionics CVFDR 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 512 12-bit words of digital information 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, altitude, heading, airspeed) has a specifically assigned word number within the subframe. The CVFDR is designed to meet the crash-survivability requirements of TSO-C123b and TSO-C124b. For the rest of this report, the CVFDR 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 140.61 hours of data. Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals one elapsed second. There were 8 flights that were recorded after the event flight. The event flight duration was approximately 2 hours and 9 minutes. The parameters evaluated for the purpose of 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 1 in appendix A lists the FDR parameters verified and provided in this report. Additionally, table 2 in appendix A describes the unit and discrete state abbreviations used in this report.

1.3 Time Correlation

Correlation of the FDR data from SRN to the event local time, CDT, was established by using the recorded Greenwich mean time (GMT) Hours, GMT Minutes, and GMT Seconds and then applying an additional 5 hours offset to change GMT to CDT.²

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 Greenwich mean time which is also known as UTC.

Accordingly, the time offset for the event flight data from SRN to local CDT is the following: $CDT = SRN - 376,092$. Therefore, for the rest of this report, all times are referenced as CDT, not SRN.

In addition to the event flight, a second flight (the next flight in the recording) was reviewed. The additional flight was from Chicago O'Hare International Airport (KORD) to Wichita Dwight D. Eisenhower National Airport (KICT) on the event date. Accordingly, the time offset for this flight data from SRN to local CDT is the following: $CDT = SRN - 373,901$. All times in the additional plots will be referenced as CDT, not SRN.

E. FIGURES AND TABULAR DATA

Figures 1 to 4 contain FDR data recorded during the event on September 25, 2024. Figures 6 and 7 contain FDR data recorded for the next flight on September 25, 2024. All the parameters listed in table 1 are plotted except GMT Hours, GMT Minutes, GMT Seconds, Latitude, and Longitude.

Figure 1 and 2 are time history plots of navigation and automation parameters from 15:14:00 CDT to 15:28:00 CDT for the event flight, 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.

The recorded data indicated the following sequence of events:

- **15:14:09 CDT:** The aircraft was descending through 10,000 feet (ft) at 249 knots (kts) calibrated airspeed. The autopilot was engaged. The vertical and lateral modes were flight level change (FLCH) and lateral navigation (LNAV), respectively. Nav1 and Nav2 selected frequencies were 114.2 Megahertz (MHz) and 113.0 MHz, respectively.
- **15:15:50 CDT:** The aircraft was at pressure altitude of 7,032 ft at 248 kts calibrated airspeed. The vertical and lateral modes were altitude hold (ALT HOLD) and LNAV, respectively. Nav1 selected frequency was changed to 108.4 MHz.³
- **15:17:50 CDT:** Nav2 selected frequency was changed to 108.4 MHz.
- **15:18:14 CDT:** Nav2 selected frequency was changed to 113.0 MHz.
- **15:19:30 CDT:** The active lateral mode changed from LNAV to heading (HDG).

³ 108.4 MHz is the alternate missed approach fix frequency for DuPage VOR in Chicago/West Chicago, Illinois.

- **15:19:54 CDT:** Nav1 and Nav2 selected frequencies were changed to 108.95 MHz and 108.4 MHz, respectively.⁴
- **15:19:55 CDT:** The glideslope and localizer deviation-1 were 1.4866 dots and -2.8352 dots, respectively, for one second before both changed back to 0 dots.⁵
- **15:19:58 CDT:** Nav1 selected frequency was changed to 108.4 MHz and remained at this frequency for the remainder of the flight.
- **15:20:26 CDT:** Nav2 selected frequency was changed to 113.0 MHz and remained at this frequency for the remainder of the flight.
- **15:21:08 CDT:** The captain selected primary navigation changed from FMS1 to VOR/LOC1. One second later, the first officer's primary navigation changed from FMS2 to VOR/LOC2, where both remained for the remainder of the flight.
- **15:22:54 CDT:** The autopilot was disengaged.
- **15:26:25 CDT:** The aircraft landed on runway 10L at KORD.

Figures 3 and 4 are graphical overlays generated using Google Earth for the downwind leg through landing and final approach through landing, respectively. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

The corresponding tabular data used to create figures 1 to 4, including GMT Hours, GMT Minutes, GMT Seconds, Latitude, and Longitude, are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

Figure 6 and 7 are time history plots of navigation and automation parameters from 18:18:30 CDT to 18:31:30 CDT for the flight from KORD to KICT, respectively.

The corresponding tabular data used to create figures 5 and 6, including GMT Hours, GMT Minutes, GMT Seconds, Latitude, and Longitude, are provided in electronic CSV format as attachment 2 to this report.

Submitted by:

Steven Smith
Mechanical Engineer

⁴ The localizer navigation frequency for ILS (instrument landing system) or LOC runway 10C at KORD is 108.95 MHz.

⁵ Positive localizer deviation is left of the localizer (fly right) and positive glideslope deviation is below the beam (fly up).

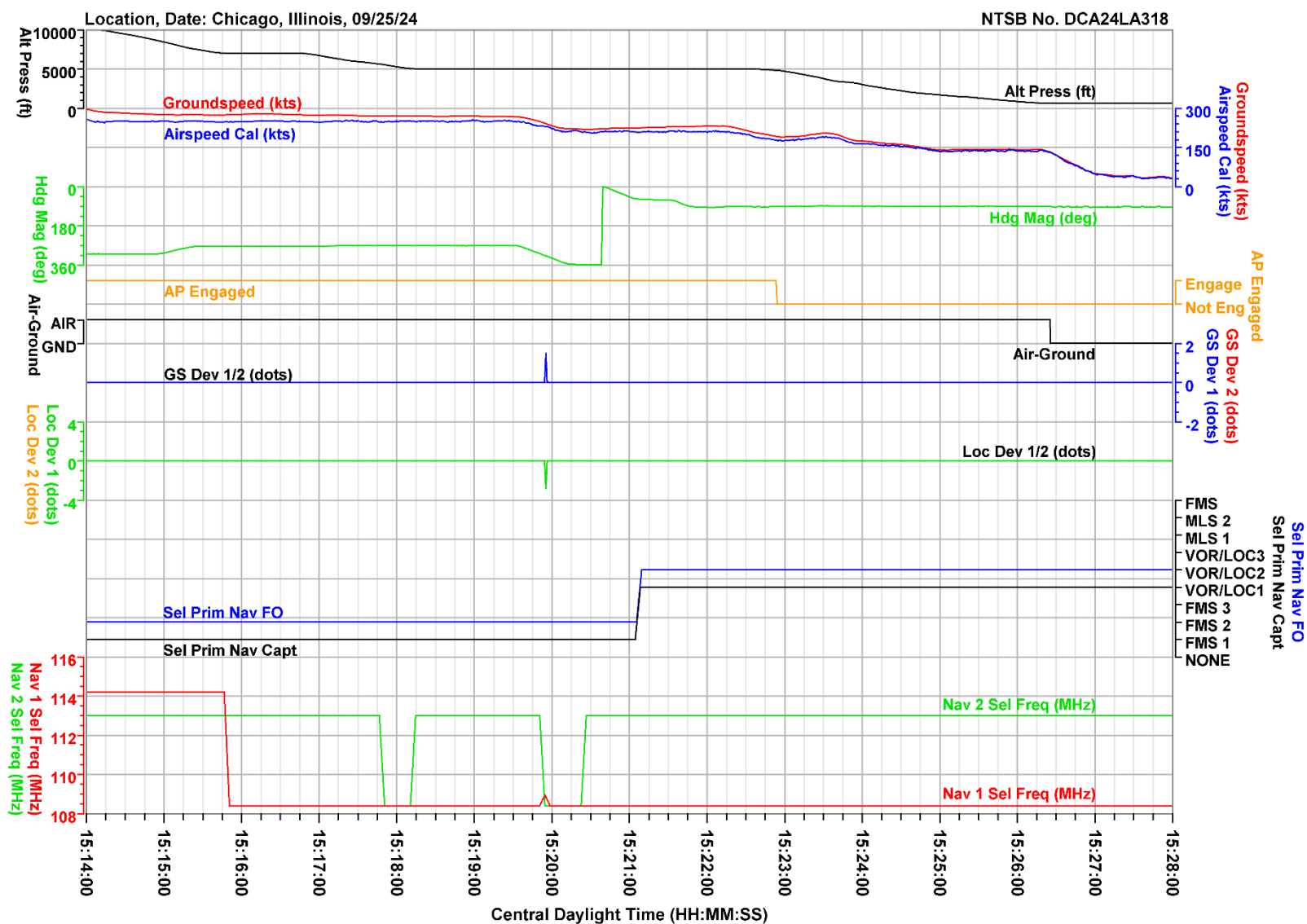


Figure 1. Time history plot of navigation parameters from 15:14:00 CDT to 15:28:00 CDT for the event flight.

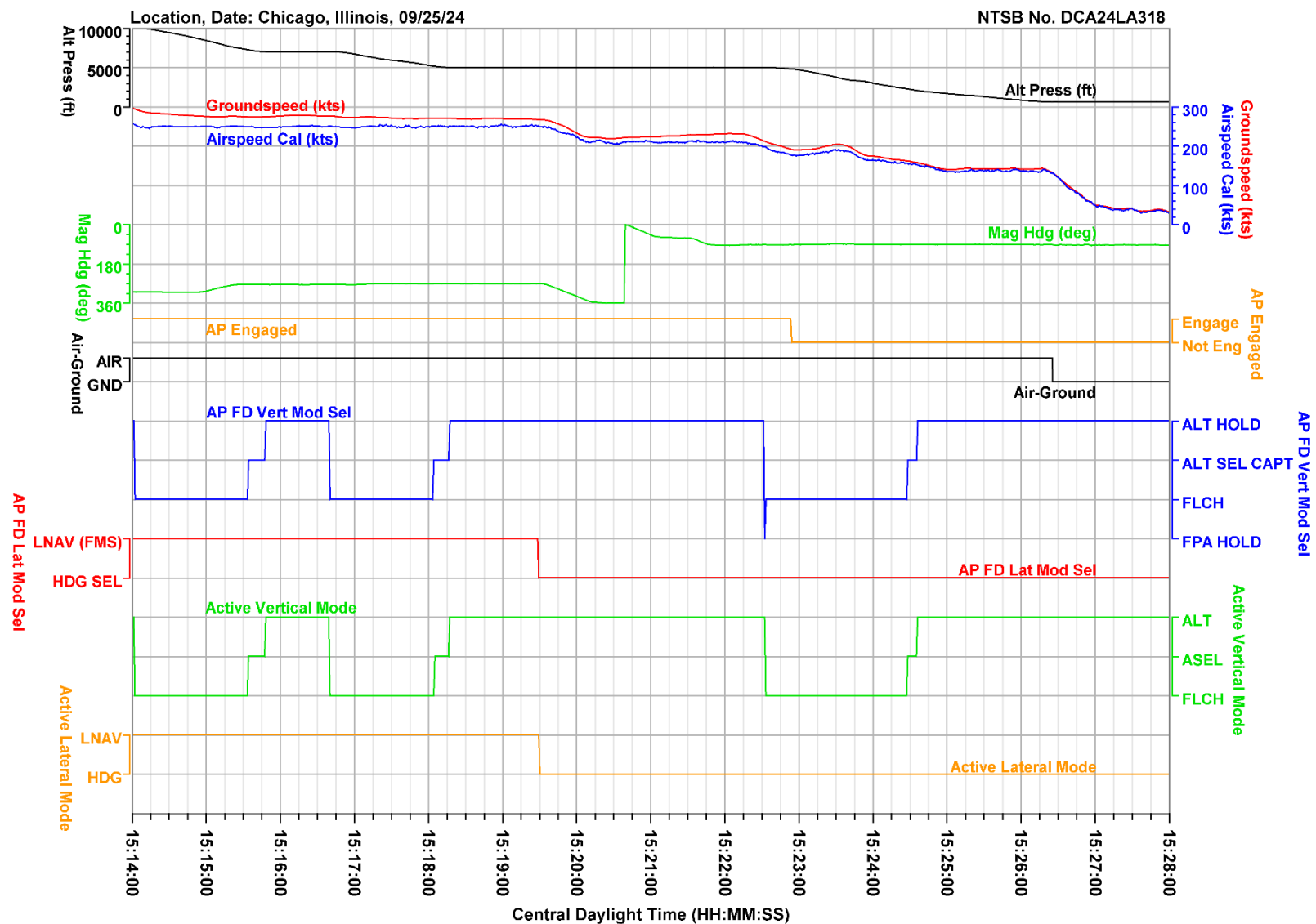


Figure 2. Time history plot of automation parameters from 15:14:00 CDT to 15:28:00 CDT for the event flight.

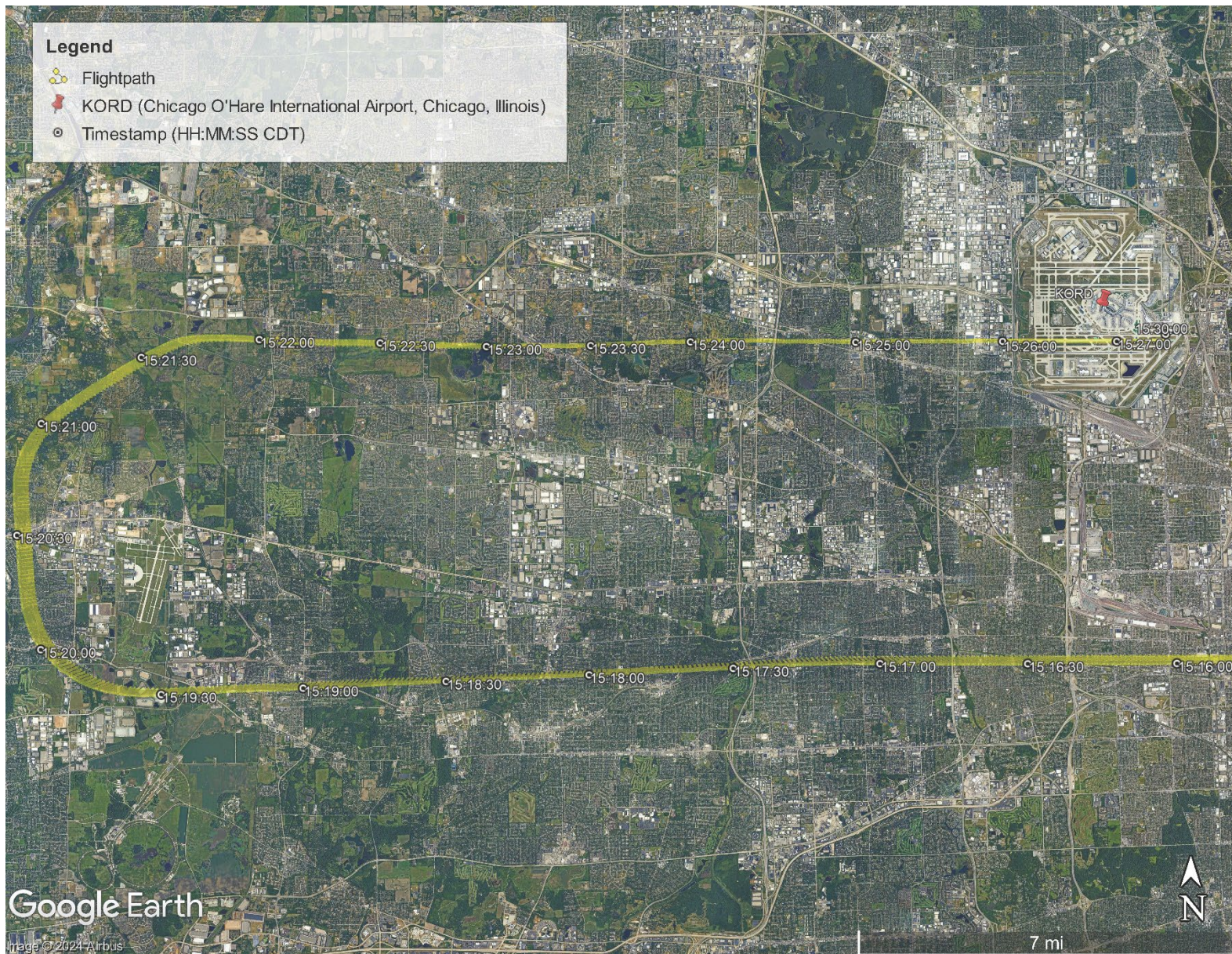


Figure 3. Google Earth overlay of the downwind leg, base leg, final approach, and landing at KORD runway 10L.

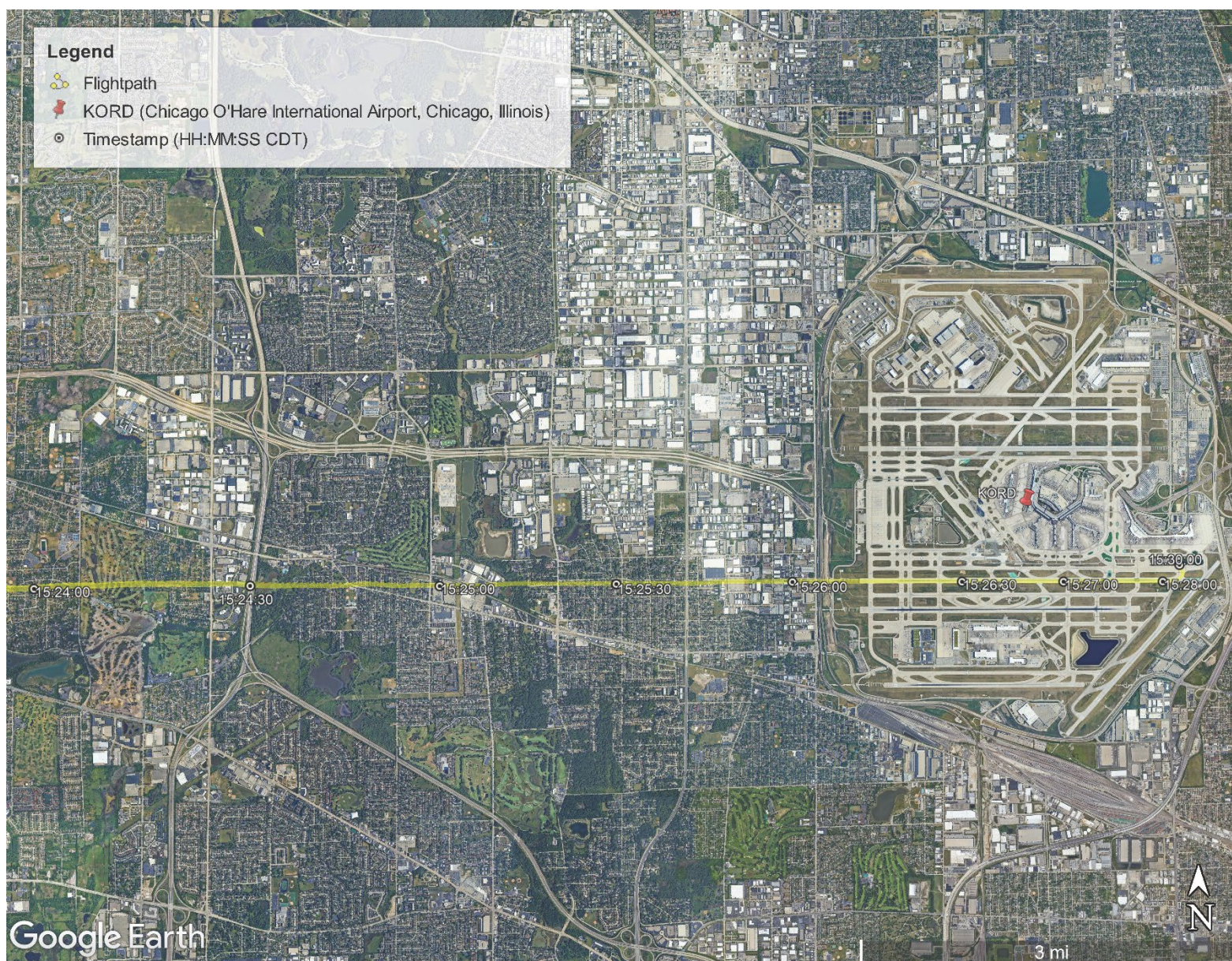


Figure 4. Google Earth overlay of the final approach and landing at KORD runway 10L.

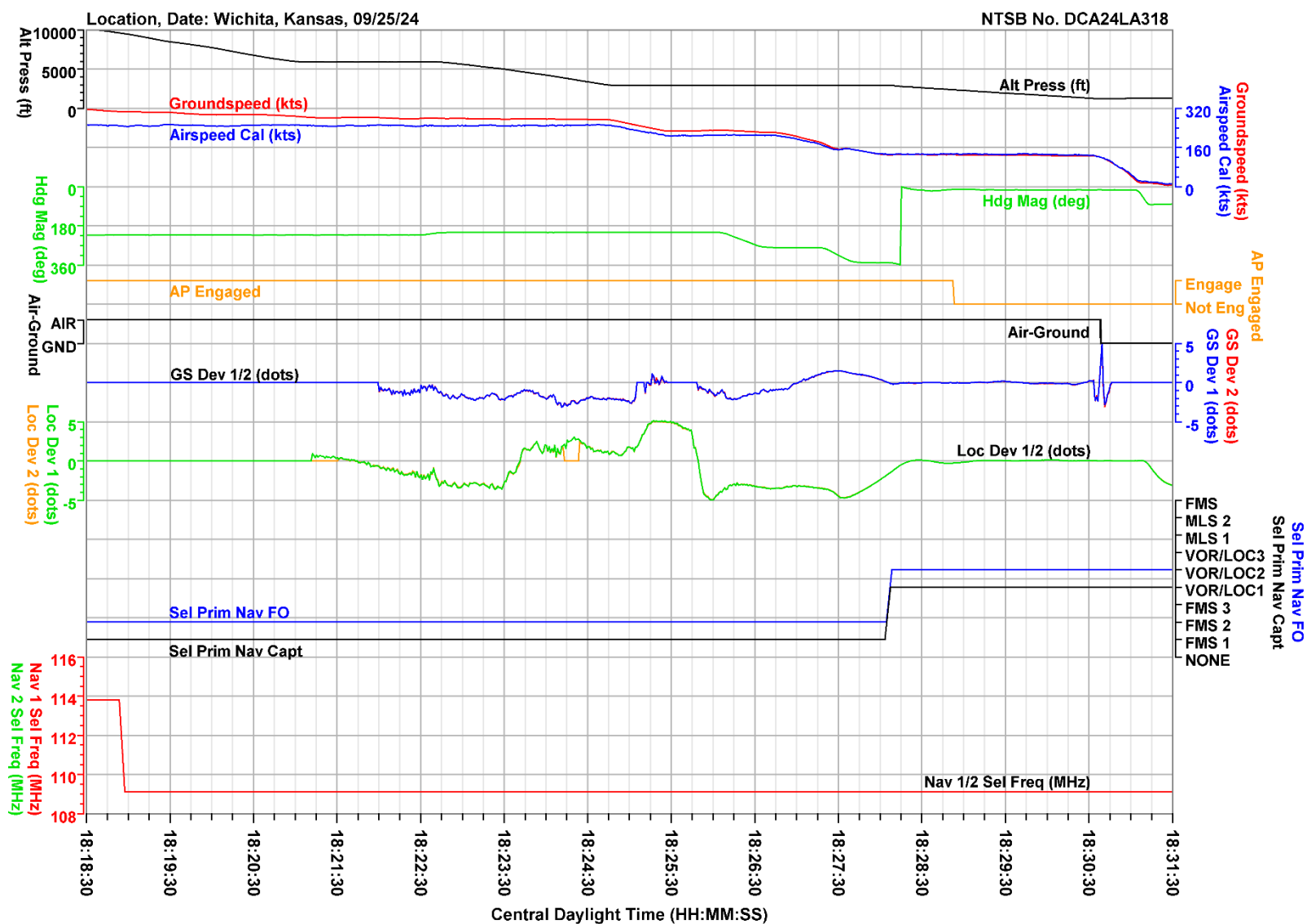


Figure 5. Time history plot of navigation parameters for the flight from KORD to KICT from 18:18:30 CDT to 18:31:30 CDT.

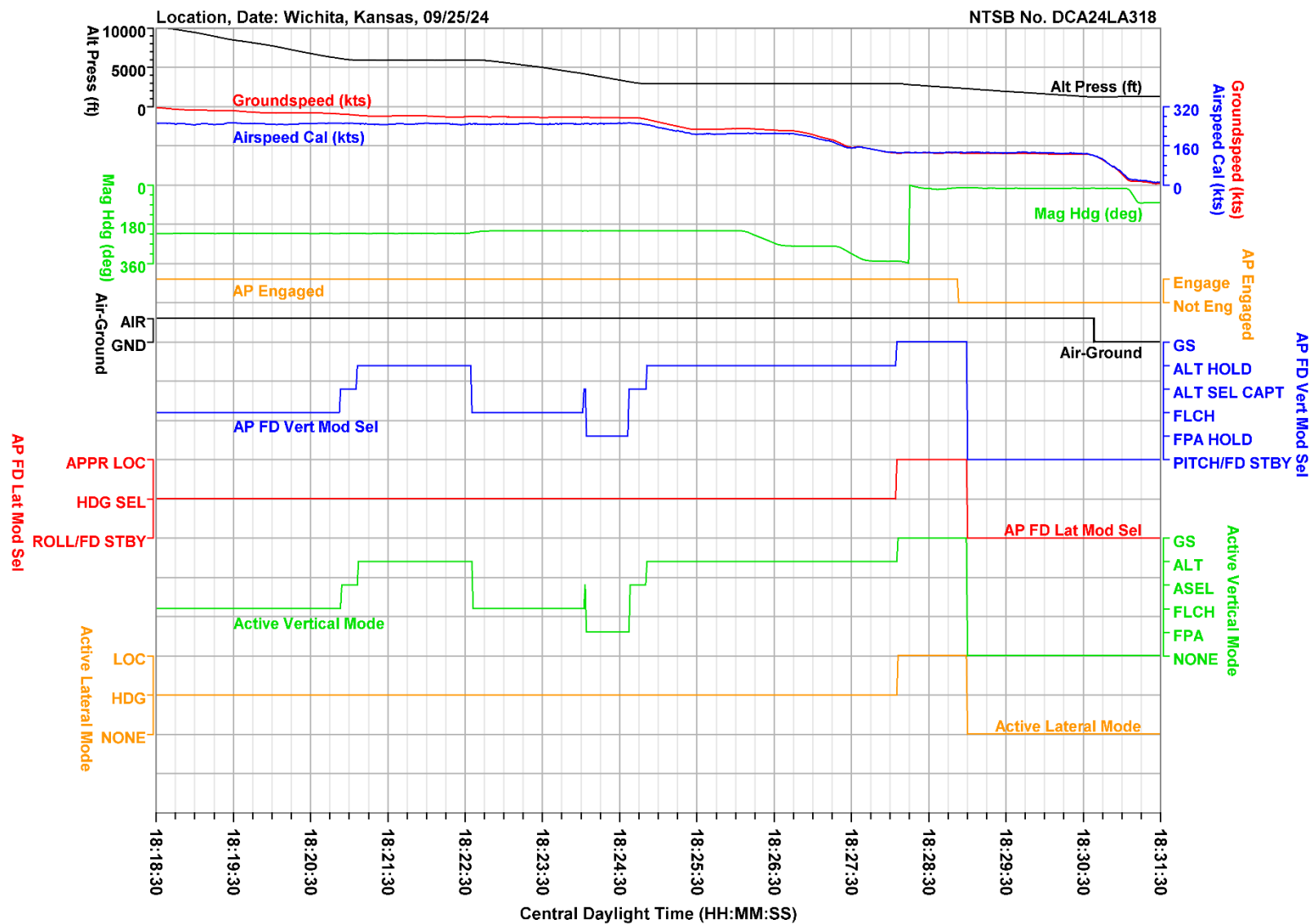


Figure 6. Time history plot of automation parameters for the flight from KORD to KICT from 18:18:30 CDT to 18:31:30 CDT.

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
Active Lateral Mode	Autopilot Lateral Mode Selected	
Active Vertical Mode	Autopilot Vertical Mode Selected	
Air-Ground	Air-Ground Sensor	
Airspeed Cal	Airspeed Calibrated	kts
Alt Press	Pressure Altitude	ft
AP Engaged	Autopilot Engaged	
AP FD Lat Mod Sel	Autopilot/Flight Director Lateral Mode Selected	
AP FD Vert Mod Sel	Autopilot/Flight Director Vertical Mode Selected	
Groundspeed	Ground Speed	kts
GS Dev 1	Glideslope Deviation 1	dots
GS Dev 2	Glideslope Deviation 2	dots
Latitude	Latitude Coordinate	deg
Loc Dev 1	Localizer Deviation 1	dots
Loc Dev 2	Localizer Deviation 2	dots
Longitude	Longitude Coordinate	deg
Mag Hdg	Magnetic Heading	deg
Nav 1 Sel Freq	Nav 1 Selected Frequency	MHz
Nav 2 Sel Freq	Nav 2 Selected Frequency	MHz
Sel Prim Nav Capt	Primary Nav System Captain	
Sel Prim Nav FO	Primary Nav System First Officer	
Time GMT Hrs	Greenwich Mean Time Hours	hrs
Time GMT Min	Greenwich Mean Time Minutes	min
Time GMT Sec	Greenwich Mean Time Seconds	sec

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 discrettes. 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
ALT	Altitude Hold
ALT HOLD	Altitude Hold
ALT SEL CAPT	Altitude Select Captured
APPR LOC	Approach Mode Localizer
ASEL	Altitude Select
deg	degrees
dots	dots of deviation
Eng	Engaged
FLCH	Flight Level Change
FMS	Flight Management System
FPA	Flight Path Angle
FPA HOLD	Flight Path Angle Hold
ft	feet
GND	Ground
GS	Glideslope
HDG	Heading
HDG SEL	Heading Select
hrs	hours
ILS	Instrument Landing System
inHg	inches of Mercury
kts	knots
LNAV	Lateral Navigation
LOC	Localizer
MHz	Megahertz
min	minutes
MLS	Microwave Landing System
PITCH/FD STBY	Pitch/Flight Director Standby
ROLL/FD STBY	Roll/Flight Director Standby
sec	seconds
VHF	Very High Frequency
VOR	VHF Omnidirectional Range