

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



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FLIGHT DATA RECORDER

Specialist's Factual Report

July 25, 2024

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A. INCIDENT

Location: Kahului, Hawaii
Date: November 30, 2023
Time: 0614 Hawaii standard time (HST)
Airplane: Boeing 717-200, Hawaiian Airlines, N494HA

B. FLIGHT DATA RECORDER SPECIALIST

Specialist: Cassandra Johnson
Senior Mechanical Engineer, Recorder Specialist
National Transportation Safety Board (NTSB)

C. FEDERAL CARRIAGE REQUIREMENTS

The event aircraft, N494HA, was operating under Title 14 *Code of Federal Regulations* (CFR) Part 121. The event aircraft was manufactured in 2004 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

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

Recorder Manufacturer/Model:	Honeywell 4700
Part Number:	980-4700-042
Recorder Serial Number:	SSFDR-10673

1.0 Recorder Description

The Honeywell solid state flight data recorder (SSFDR) records airplane flight information in a digital format using solid-state flash memory as the recording medium. The SSFDR 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, and airspeed) has a specifically assigned word number within the subframe. The SSFDR is 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.

1.2 Recording Description

The FDR recording contained approximately 27 hours of data. Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals one elapsed second. The event was the last movement recorded.

The parameters evaluated for the purpose of this report appeared to be in accordance with federal FDR carriage requirements, except heading because there was not a discrete indicating the crew selection of magnetic heading or true heading. The operator, the Federal Aviation Administration, and the aircraft manufacturer were informed of this parameter deficiency.

1.3 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

In appendix A, table 1 lists the FDR parameters verified and provided in this report. Additionally in appendix A, table 2 describes the unit abbreviations used in this report.

1.4 Time Correlation

The timing of the FDR data is in SRN, which is elapsed time based on the four subframe sync codes being sequential and continuous. Before and after the event, data dropouts occurred leading to incomplete subframes and out of order sync codes at the times around the dropouts. In this case, the readout software is unable to calculate the duration of each dropout. Therefore, it was not possible to have one time offset to convert SRN to the event local time, HST. For this reason, time was left in SRN for the plots and tabular data. To identify when an event occurred, the UTC time recorded as a parameter in the dataframe is referenced.

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 = +.

E. FIGURES AND TABULAR DATA

Figure 1 contains FDR data recorded during the event on November 30, 2023. All the parameters listed in table 1 are plotted and the recorded UTC time was annotated before and after each dropout. This figure covers the data from 16:09:42 UTC (97,861 SRN) to the end of the recording at 16:31:55 UTC (97,931 SRN). This figure is configured such that right turns are indicated by the trace moving toward the bottom of the page and left turns towards the top of the page.

In summary, the FDR data indicated the following sequence of events:

- The FDR started recording on 16:09:42 UTC and 14 seconds later at 16:09:56 UTC stopped recording. At 16:14:19 UTC, 4 minutes and 23 seconds later, the FDR started recording.
- At 16:14:28 UTC, 9 seconds later, the groundspeed increased from 0 knots (kts) to a maximum of 8 kts at 16:14:34 UTC. One second later at 16:14:35 UTC, the longitudinal acceleration decreased from 0.05 g to -0.56 g, increased to 0.04 g, and settled at 0.04 g for the rest of the data. Additionally, at 16:14:35 UTC until 16:14:41 UTC, the vertical acceleration oscillated from 1 g with a maximum of 1.29 g and a minimum of 0.68 g before settling back to 1 g for the rest of the data.
- At 16:14:44 UTC, 3 seconds later, the ground speed decreased to 0 kts and remained 0 kts for the rest of the data.
- At 16:14:59 UTC, 15 seconds after the airplane came to a complete stop, the FDR stopped recording and 3 minutes and 55 seconds later, at 16:18:54 UTC, the FDR started recording again.
- At 16:19:01 UTC, 7 seconds later, the FDR stopped recording and 12 minutes and 48 seconds later, at 16:31:49 UTC, started recording again.
- At 16:31:55 UTC, 6 seconds later, the data ended.

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

Submitted by:

Cassandra Johnson
Senior Mechanical Engineer, Recorder Specialist

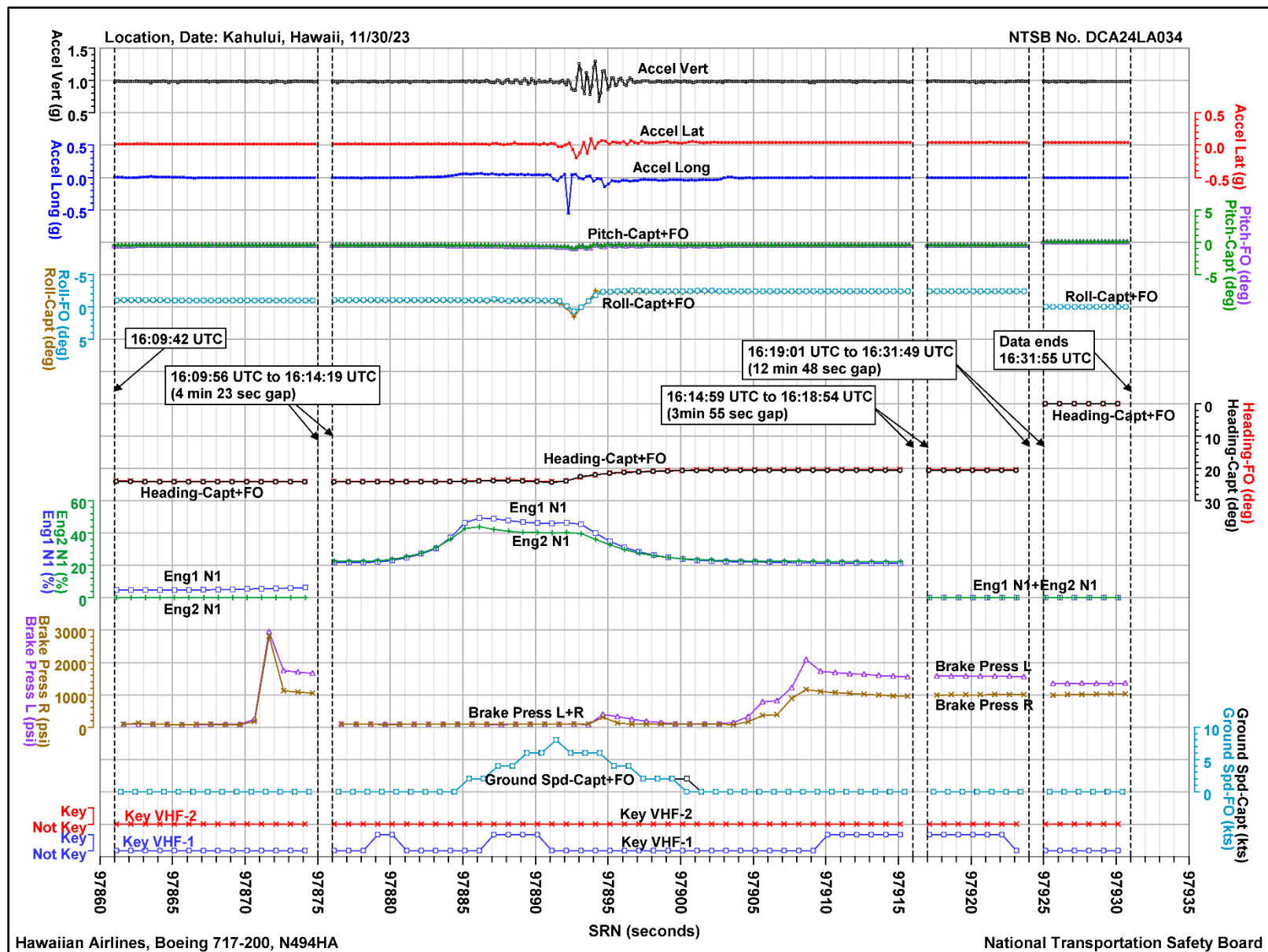


Figure 1. Plot of parameters from 16:09:42 UTC to the end of the recording at 16:31:55 UTC.

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 abbreviations used in this report.

Table 1. Verified and provided FDR parameters.

Plot/Table Labels	Parameter Names	Units
Accel Lat	Lateral Acceleration	g
Accel Long	Longitudinal Acceleration	g
Accel Vert	Vertical Acceleration	g
Brake Press-L	Left Brake Pressure	psi
Brake Press-R	Right Brake Pressure	psi
Eng1 N1	Engine 1 Fan Speed	%
Eng2 N1	Engine 2 Fan Speed	%
Ground Spd-Capt	Ground Speed-Captain	kts
Ground Spd-FO	Ground Speed-First Officer	kts
Heading-Capt	Heading-Captain	deg
Heading-FO	Heading-First Officer	deg
Key VHF-1	Microphone Keying Very High Frequency-1	
Key VHF-2	Microphone Keying Very High Frequency-2	
Pitch-Capt	Pitch Attitude-Captain	deg
Pitch-FO	Pitch Attitude-First Officer	deg
Roll-Capt	Roll Attitude-Captain	deg
Roll-FO	Roll Attitude-First Officer	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

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 abbreviations.

Unit Abbreviations	Descriptions
%	percentage
deg	degrees
ft	feet
g	unit of gravitation acceleration
hrs	hours
kts	knots
min	minutes
psi	pounds per square inch
sec	seconds