

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



DCA25LA055

FLIGHT DATA RECORDER

Specialist's Factual Report

April 17, 2025

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A. ACCIDENT

Location: Pacific Ocean
Date: December 3, 2024
Time: 2230 coordinated universal time (UTC)
Airplane: Boeing 787-9, United Airlines Inc, N29975

B. FLIGHT DATA RECORDER SPECIALIST

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

C. FEDERAL CARRIAGE REQUIREMENTS

The event aircraft, N29975, was operating under Title 14 *Code of Federal Regulations* (CFR) Part 121. The event aircraft was manufactured in 2020 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 an electronic file containing the continuous parameter logging (CPL) data from the N29975 aircraft.

1.0 Recorder Data Description

The CPL data is recorded on the B787-9's mass storage device (MSD). The CPL data records in a format similar to ARINC 767 and contains the mandatory FDR parameters plus additional parameters.

1.1 Recording Description

The CPL recording contained one session of flight data. The CPL data contained intrinsic timing information in milliseconds from the start of the recording session. The session included the event flight which was approximately 15.2 hours in duration. 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 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 CPL parameters verified and provided in this report. Additionally in appendix A, table 2 describes the unit abbreviations used in this report.

1.3 Time Correlation

Correlation of the CPL time to UTC was established by using the recorded UTC Hours, UTC Minutes, and UTC Seconds. Accordingly, the time offset for the event flight data from CPL time to UTC is the following: $UTC = CPL\ time + 26,717$. Therefore, for the rest of this report, all times are referenced as UTC.

E. FIGURES AND TABULAR DATA

Figures 1 to 4 contain FDR data recorded during the event on December 3, 2024. All the parameters listed in table 1 are plotted except UTC Hours, UTC Minutes, and UTC Seconds.

Figures 1 and 3 include the basic parameters. Figures 2 and 4 include the flight control parameters. Figures 1 and 2 have a 37-minute time span and start when the aircraft is descending through a pressure altitude of about 30,000 feet (ft) through landing and continue until the data ends. Figures 3 and 4 have an 11-minute time span focusing on the vertical acceleration excursion.

Figures 1 to 4 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 CPL data indicated the aircraft encountered an upset from about 22:11:50 UTC to about 22:12:00 UTC while descending through a pressure altitude of approximately 10,100 ft. During this time, the maximum vertical acceleration deviation from 1 g was 1.57 g at 22:11:56 UTC. About 19 minutes after the upset, the aircraft landed.

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 = +.

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

Submitted by:

Cassandra Johnson
Mechanical Engineer

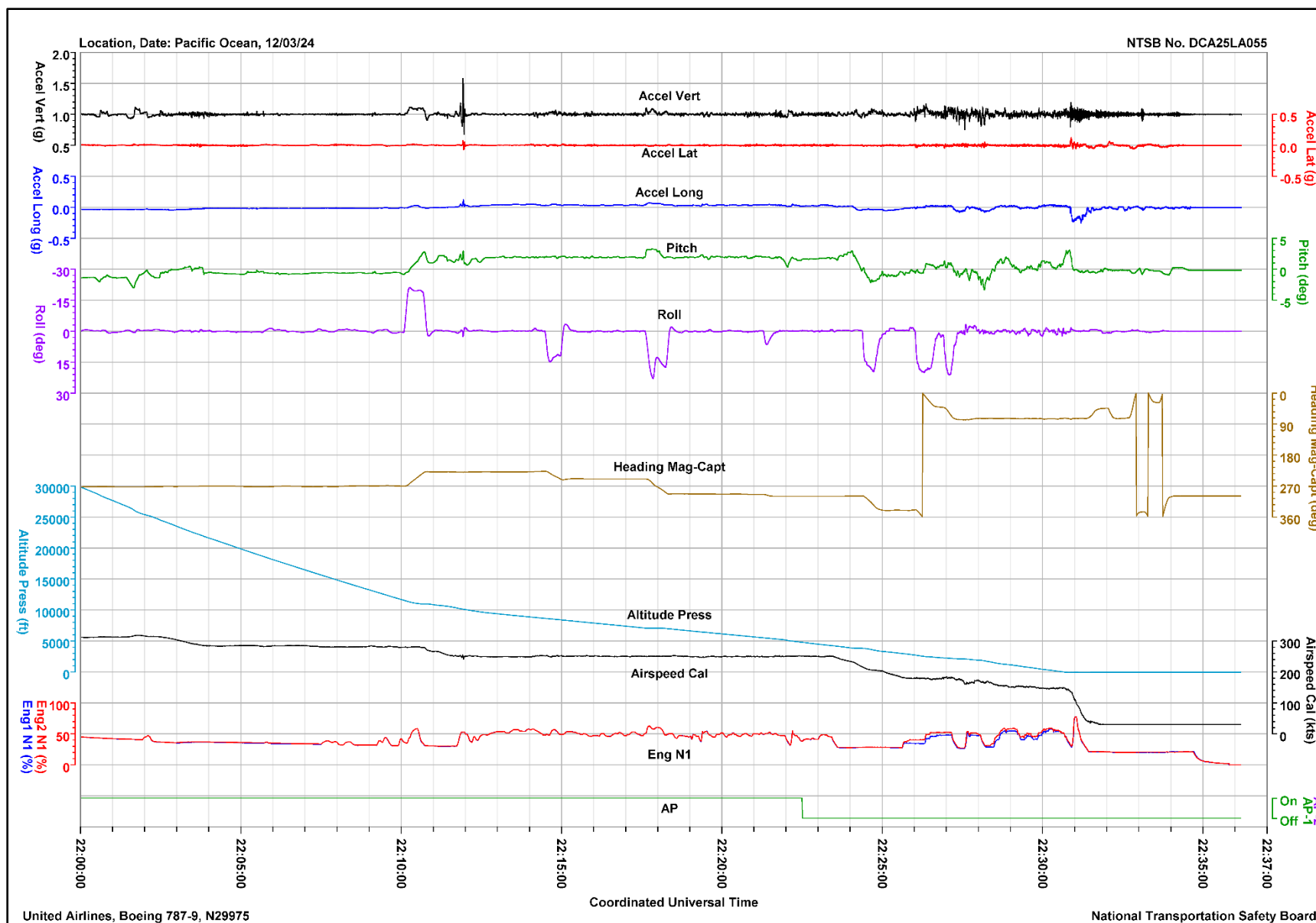


Figure 1. Plot of basic parameters with a 37-minute time span starting during descent from about 30,000 feet to end of data.

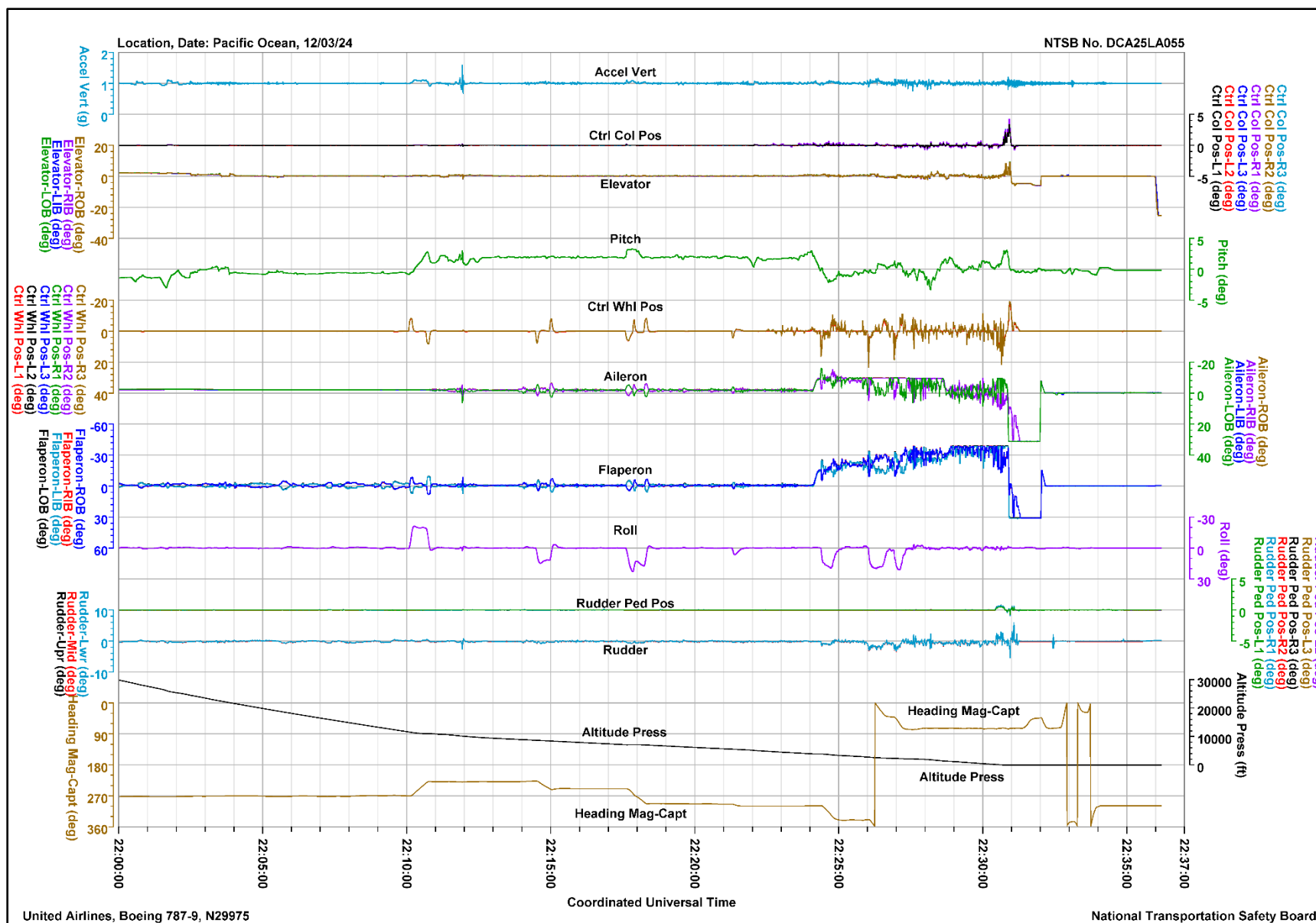


Figure 2. Plot of flight control parameters with a 37-minute time span starting during descent from about 30,000 feet to end of data.

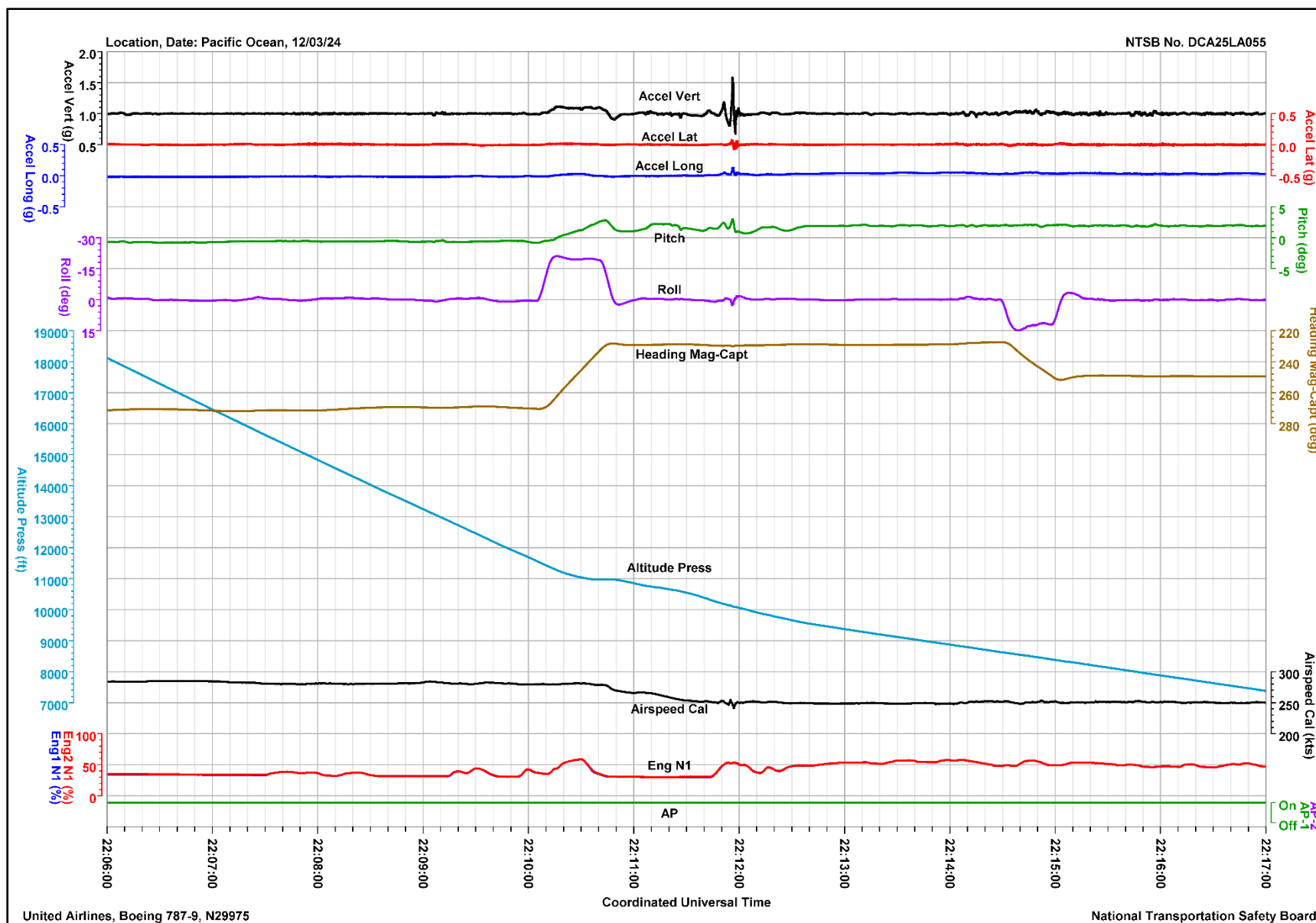


Figure 3. Plot of basic parameters with a 11-minute time span focusing on the upset event.

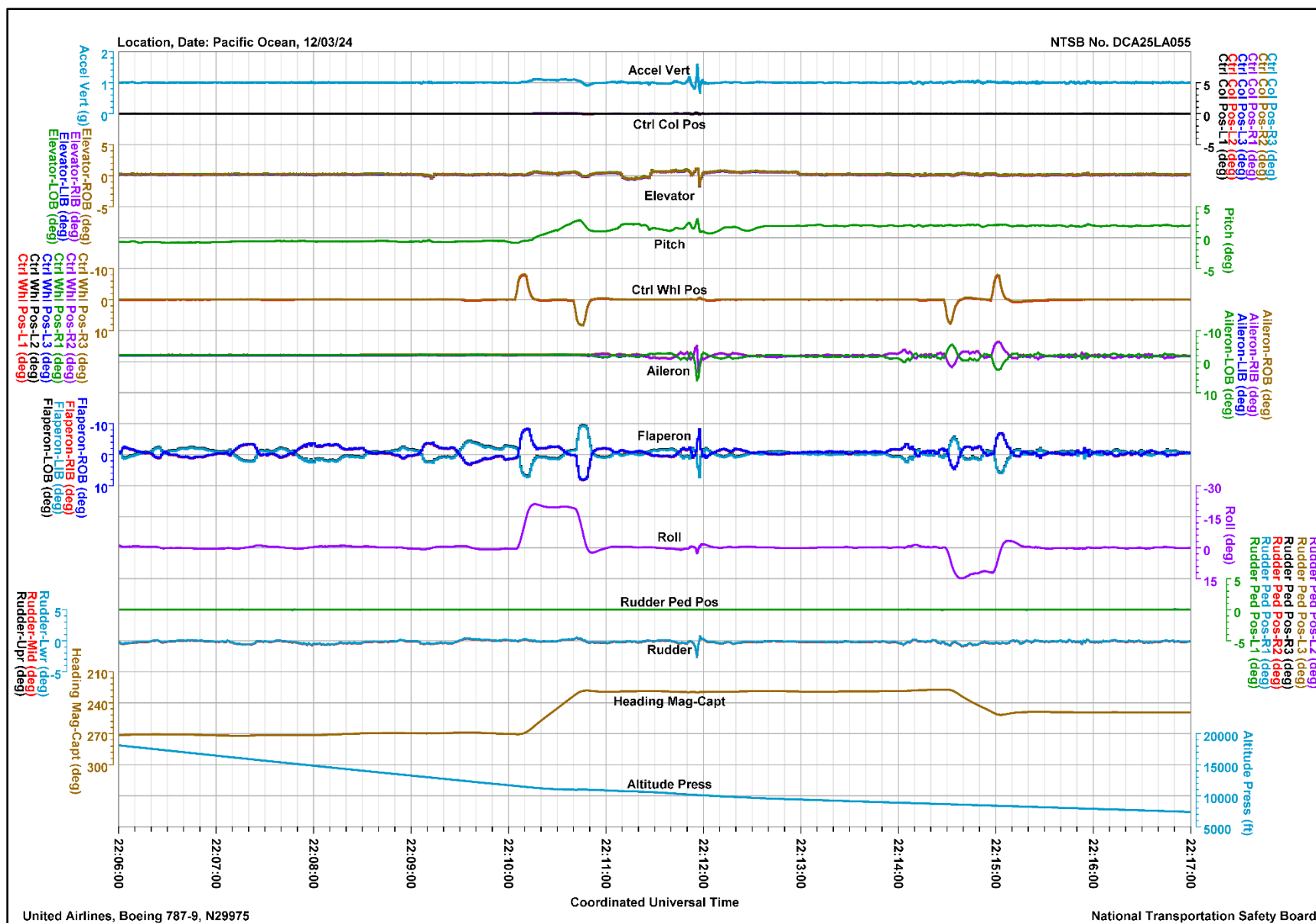


Figure 4. Plot of flight control parameters with a 11-minute time span focusing on the upset event.

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. In table 1, 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 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
Aileron-LIB	Aileron Position-Left Inboard	deg
Aileron-LOB	Aileron Position-Left Outboard	deg
Aileron-RIB	Aileron Position -Right Inboard	deg
Aileron-ROB	Aileron Position -Right Outboard	deg
Airspeed Cal	Calibrated Airspeed	kts
Altitude Press ²	Pressure Altitude	ft
AP-1	Autopilot-1	
AP-2	Autopilot-2	
Ctrl Col Pos-L1 ³	Control Column Position-Left 1	deg
Ctrl Col Pos-L2	Control Column Position-Left 2	deg
Ctrl Col Pos-L3	Control Column Position-Left 3	deg
Ctrl Col Pos-R1	Control Column Position-Right 1	deg
Ctrl Col Pos-R2	Control Column Position-Right 2	deg
Ctrl Col Pos-R3	Control Column Position-Right 3	deg
Ctrl Whl Pos-L1	Control Wheel Position-Left 1	deg
Ctrl Whl Pos-L2	Control Wheel Position-Left 2	deg
Ctrl Whl Pos-L3	Control Wheel Position-Left 3	deg
Ctrl Whl Pos-R1	Control Wheel Position-Right 1	deg
Ctrl Whl Pos-R2	Control Wheel Position-Right 2	deg
Ctrl Whl Pos-R3	Control Wheel Position-Right 3	deg
Elevator-LIB	Elevator Position-Left Inboard	deg
Elevator-LOB	Elevator Position-Left Outboard	deg
Elevator-RIB	Elevator Position -Right Inboard	deg
Elevator-ROB	Elevator Position -Right Outboard	deg
Eng1 N1	Engine 1 Fan Speed	%
Eng2 N1	Engine 2 Fan Speed	%
Flaperon-LIB	Flaperon Position-Left Inboard	deg
Flaperon-LOB	Flaperon Position-Left Outboard	deg
Flaperon-RIB	Flaperon Position -Right Inboard	deg
Flaperon-ROB	Flaperon Position -Right Outboard	deg
Heading Mag-Capt	Magnetic Heading-Captain	deg
Pitch	Pitch Angle	deg

² Pressure altitude is based on a standard altimeter setting of 29.92 inches of mercury (in Hg). The pressure altitude information presented in the plots and in the electronic data have not been corrected for the local altimeter setting at the time of the event.

³ Each control input (control column, control wheel, and rudder pedal) has 3 separate rotary variable differential transformers (RVDTs) that are used together for control surface commands.

Plot/Table Labels	Parameter Names	Units
Roll	Roll Angle	deg
Rudder Ped Pos-L1	Rudder Pedal Position-Left 1	deg
Rudder Ped Pos-L2	Rudder Pedal Position-Left 2	deg
Rudder Ped Pos-L3	Rudder Pedal Position-Left 3	deg
Rudder Ped Pos-R1	Rudder Pedal Position-Right 1	deg
Rudder Ped Pos-R2	Rudder Pedal Position-Right 2	deg
Rudder Ped Pos-R3	Rudder Pedal Position-Right 3	deg
Rudder-Lwr	Rudder Surface Position-Lower	deg
Rudder-Mid	Rudder Surface Position-Mid	deg
Rudder-Upr	Rudder- Surface Position-Upper	deg
Time UTC Hr-L	Coordinated Universal Time Hour-Left	hour
Time UTC Min-L	Coordinated Universal Time Minutes-Left	min
Time UTC Sec-L	Coordinated Universal Time Seconds-Left	sec

Table 2. Unit abbreviations.

Unit Abbreviations	Descriptions
%	percent
deg	degrees
ft	feet
g	unit of gravitation acceleration
kts	knots
min	minutes
sec	seconds