

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



DCA23LA096

QUICK ACCESS RECORDER

Specialist's Factual Report

May 17, 2023

A. ACCIDENT

Location: Kahului, Hawaii
Date: December 18, 2022
Time: 1007 Hawaii-Aleutian Standard Time (HST)
2007 Coordinated Universal Time (UTC)
Airplane: Airbus 330-243, HAL 35, N393HA

B. QUICK ACCESS RECORDER SPECIALIST

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

C. FEDERAL CARRIAGE REQUIREMENTS

QARs (Quick Access Recorders) are typically used in Flight Data Monitoring or Flight Operations Quality Assurance programs. QARs have no Federal Aviation Administration carriage requirements.

D. DETAILS OF THE INVESTIGATION

A QAR group was not convened.

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received an electronic file containing the QAR data from the N393HA aircraft.

1.0 QAR Data File Description

The QAR data in the electronic file was configured such that 1024 12-bit words of digital information were recorded every second. Each grouping of 1024 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 1024-word intervals. Each data parameter (for example, pressure altitude, pitch angle, roll angle, and magnetic heading) has a specifically assigned word number within the subframe.

1.1 Recording Description

The QAR recording contained approximately 42.5 hours of data. Timing of the QAR 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 6 hours and 35 minutes.

1.1.1 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 QAR parameters verified and provided in this report. Additionally, table 2 describes the unit and discrete state abbreviations used in this report.

1.1.2 Non-Computed Data Pattern

Some parameters record a non-computed data (NCD) pattern. An NCD pattern is indicative that the raw data is no longer reliable or not available. An NCD pattern is typically recorded when the aircraft is on the ground.

When the aircraft was on the ground, the following parameter recorded a NCD pattern: computed airspeed (Airspeed Comp).

1.2 Time Correlation

Correlation of the QAR data from SRN to the event time in UTC, was established by using the recorded coordinated universal time (UTC) Hours, UTC Minutes, and UTC Seconds.

Accordingly, the time offset for the event flight data from SRN to UTC is the following: UTC = SRN + 13568. Therefore, for the rest of this report, all times are referenced as UTC.

E. FIGURES AND TABULAR DATA

Figures 1 to 8 contain QAR data recorded during the event on December 18, 2022. All the parameters listed in table 1 are plotted except UTC Hours, UTC Minutes and UTC Seconds.

Figure 1 is a time history plot of the entire flight.

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 = +.

Figures 2 and 3 present the same parameters as in figure 1, but have time windows of one minute and thirty seconds, respectively.

Figure 4 is a time history plot of the entire flight but containing flight control inputs, such as flight surfaces.

Figures 5 and 6 present the same parameters as in figure 4, but have time windows of one minute and thirty seconds, 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.

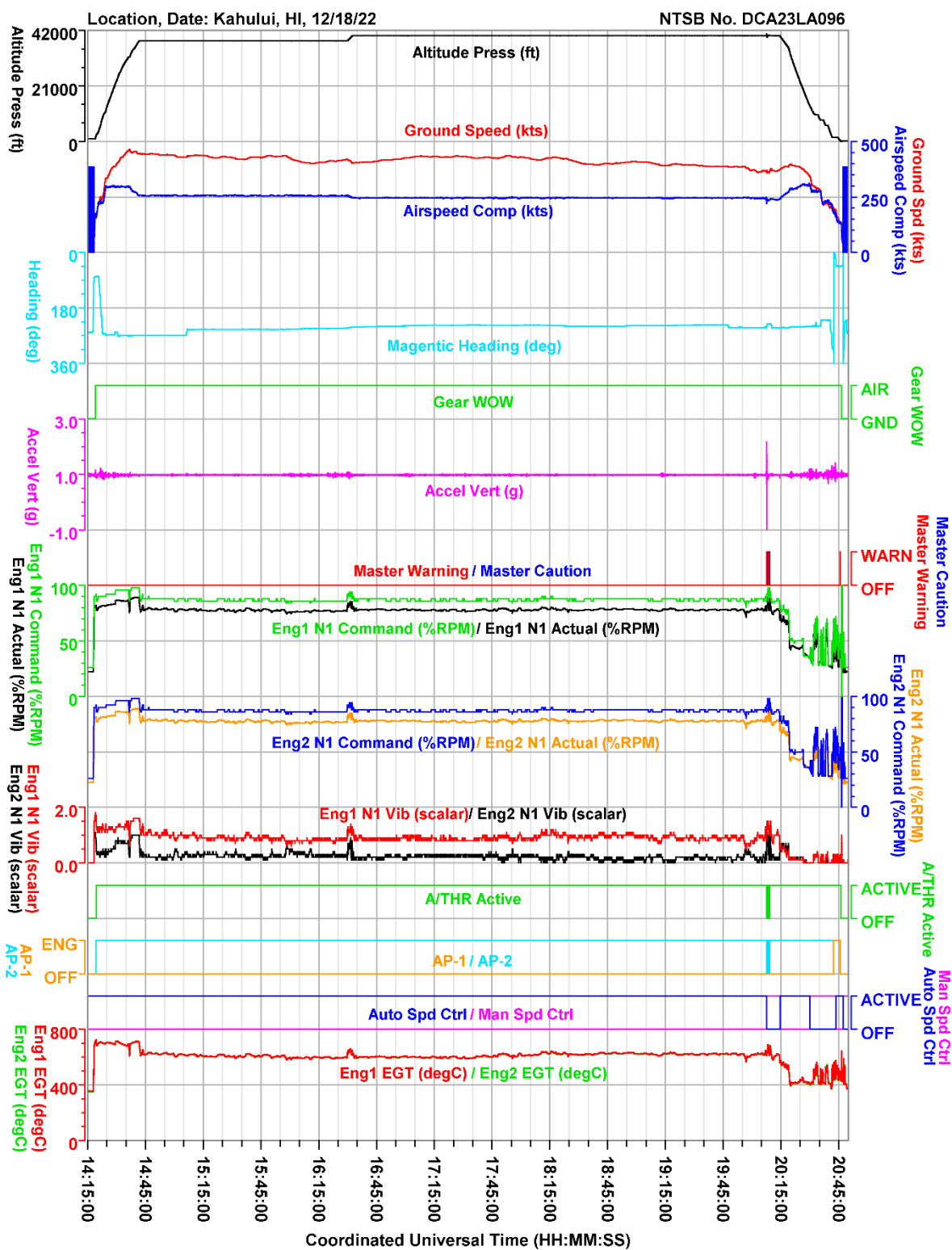
Figures 7 and 8 are graphical overlays generated using Google Earth showing the entire flight and event time window, respectively. Weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

The aircraft departed Phoenix Sky Harbor International Airport (PHX) at approximately 14:18:30 UTC. At 15:39:47, Hawaiian Airlines Flight 35 made their last radio transmission until 19:41:51, which was approximately 26 minutes before the event. At 20:07:38, the vertical acceleration began to slightly decrease. At 20:07:42, the aircraft registered a 68 ft altitude gain (40020 ft to 40088 ft), while the vertical acceleration reduced to 0.6914 g. One second later, the aircraft displayed an altitude of 248 ft more (40,088 ft to 40336 ft). At that same time, the aircraft displayed a spike in vertical acceleration of 1.2734 g. At 20:07:44, the autopilot was disengaged (AP-2). At that same time, the vertical acceleration was recorded at 2.1758 g. At 20:07:45 both the Master Caution and Master Warning were active. At 20:07:46, the vertical acceleration was -0.9844 g. The aircraft continued enroute and landed safely on Runway 4R at Daniel K. Inouye International Airport (HNL) at 20:46:25 UTC.

The corresponding tabular data used to create figures 1 to 8, 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:

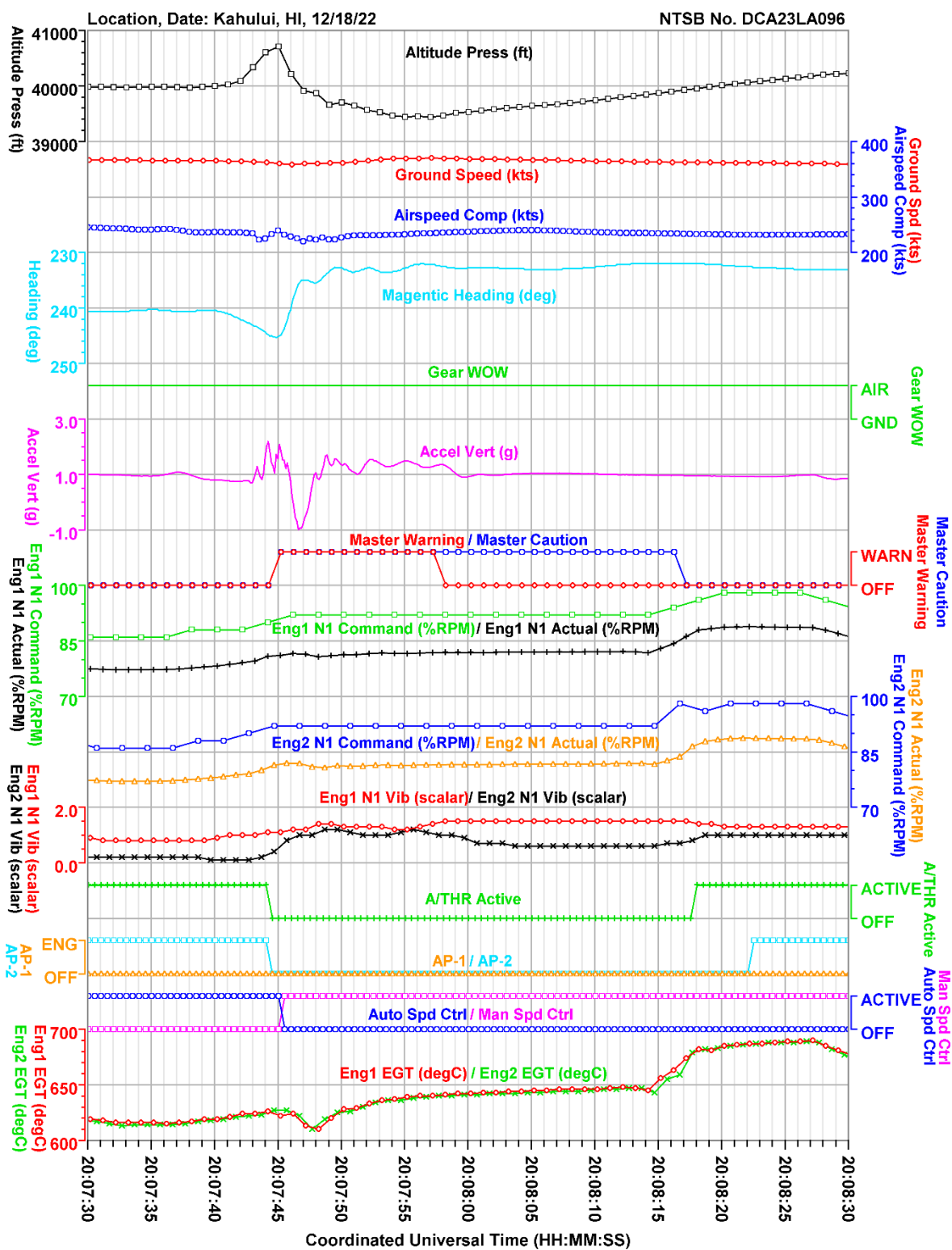
Steven Smith
Mechanical Engineer (Recorder Specialist)



Hawaiian Airlines Inc., Airbus A330-243, HAL 35, N393HA

National Transportation Safety Board

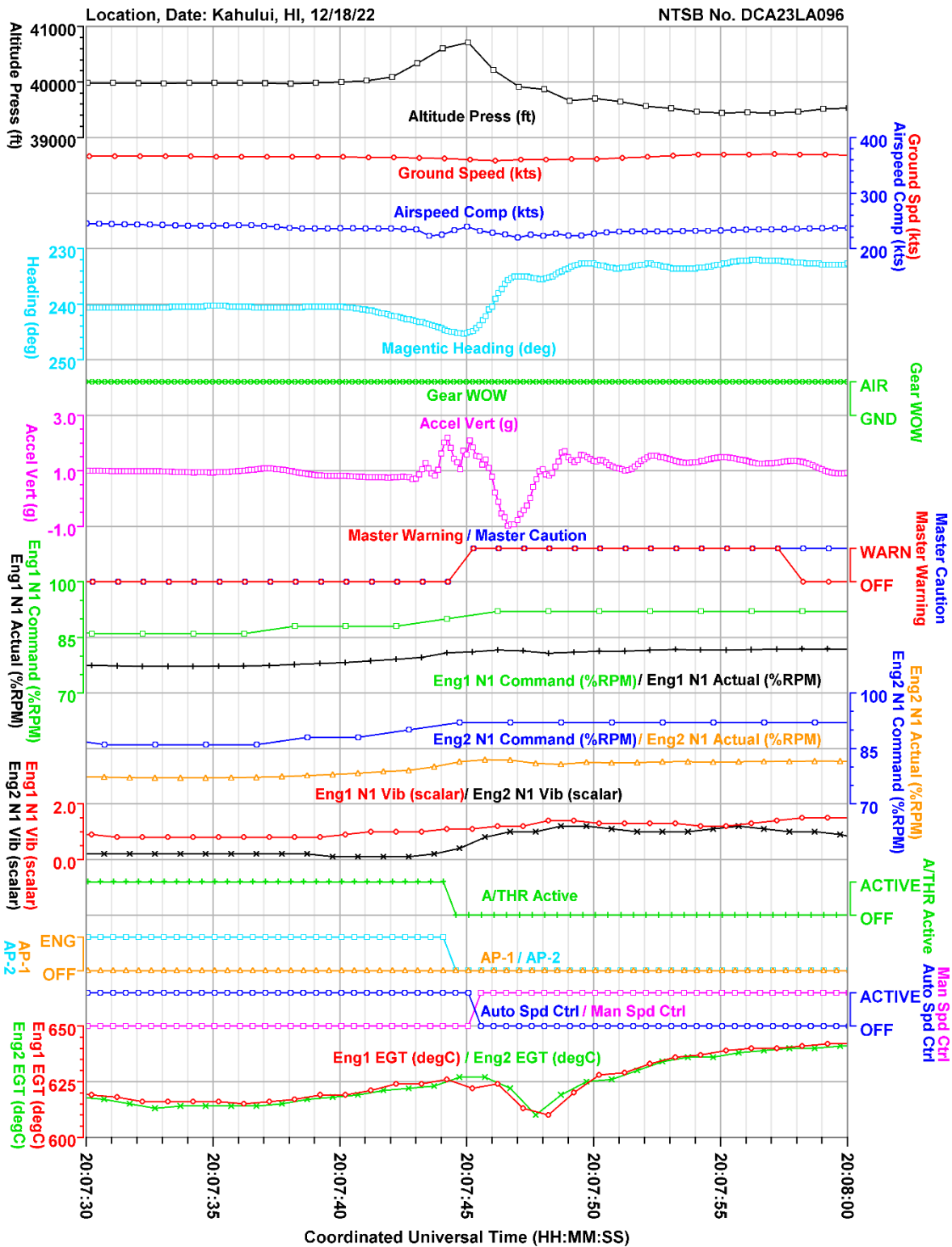
Figure 1. Time history plot of the entire flight.



Hawaiian Airlines Inc., Airbus A330-243, HAL 35, N393HA

National Transportation Safety Board

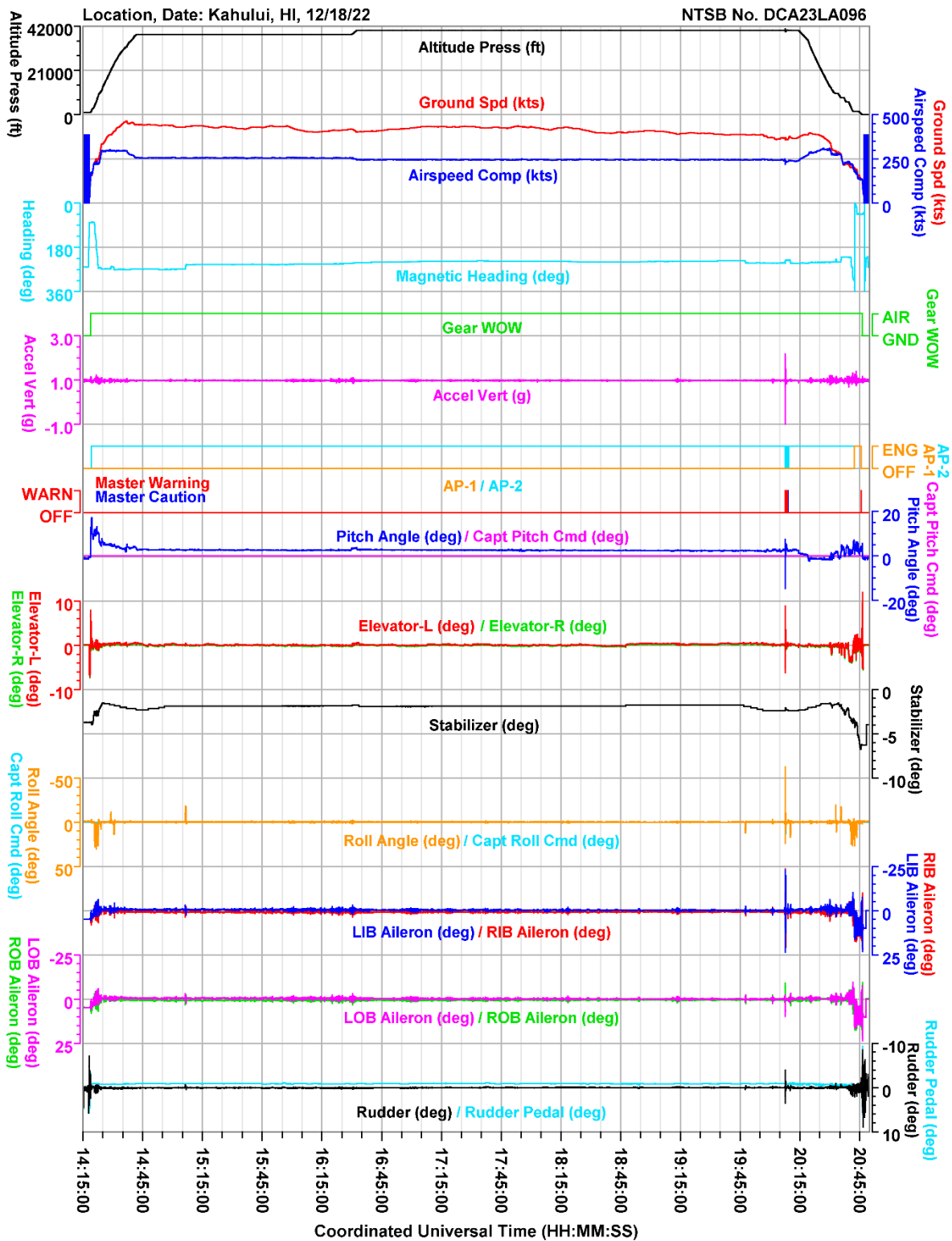
Figure 2. One minute time history plot surrounding the event time.



Hawaiian Airlines Inc., Airbus A330-243, HAL 35, N393HA

National Transportation Safety Board

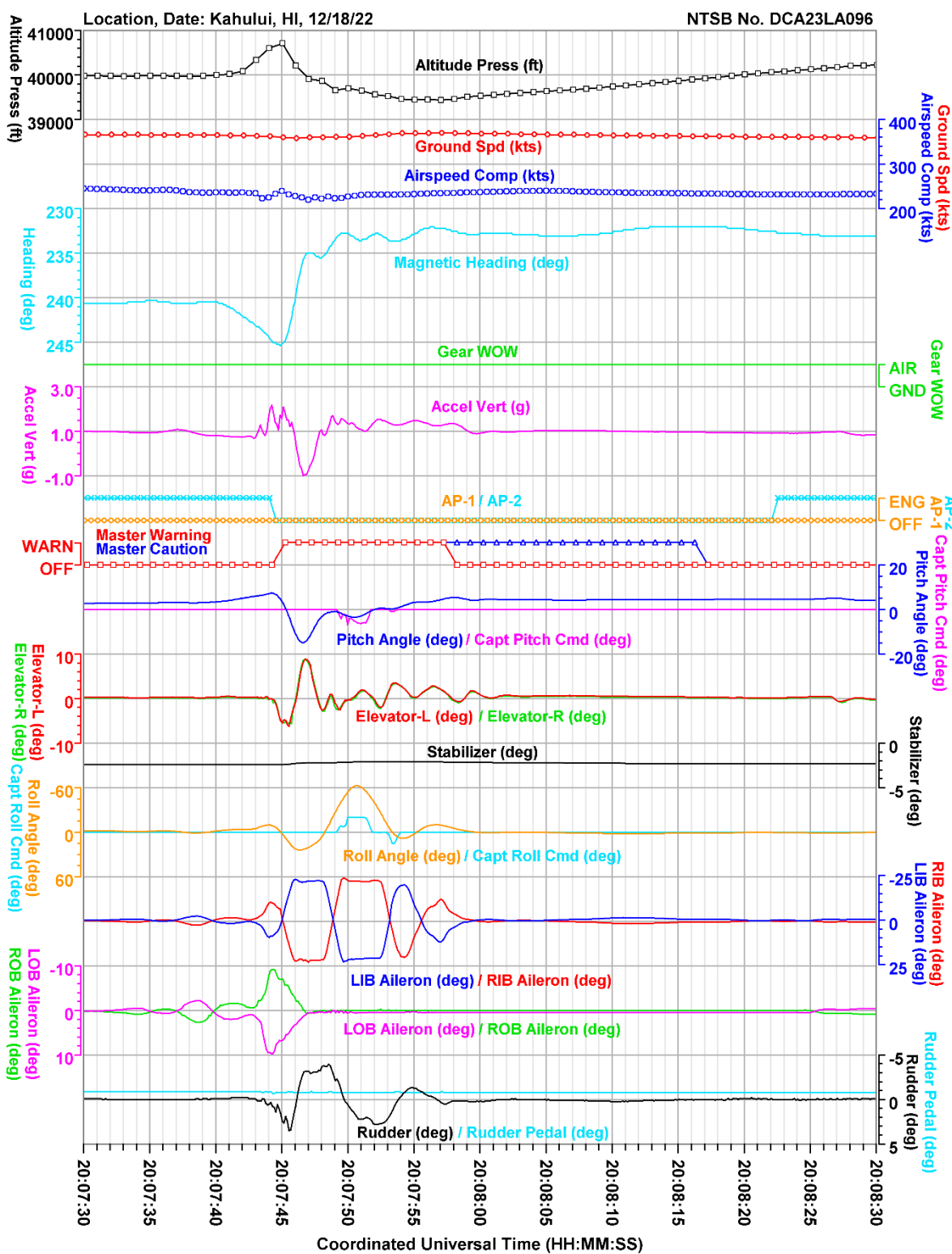
Figure 3. Thirty second time history plot surrounding the event time.



Hawaiian Airlines Inc., Airbus A330-243, HAL 35, N393HA

National Transportation Safety Board

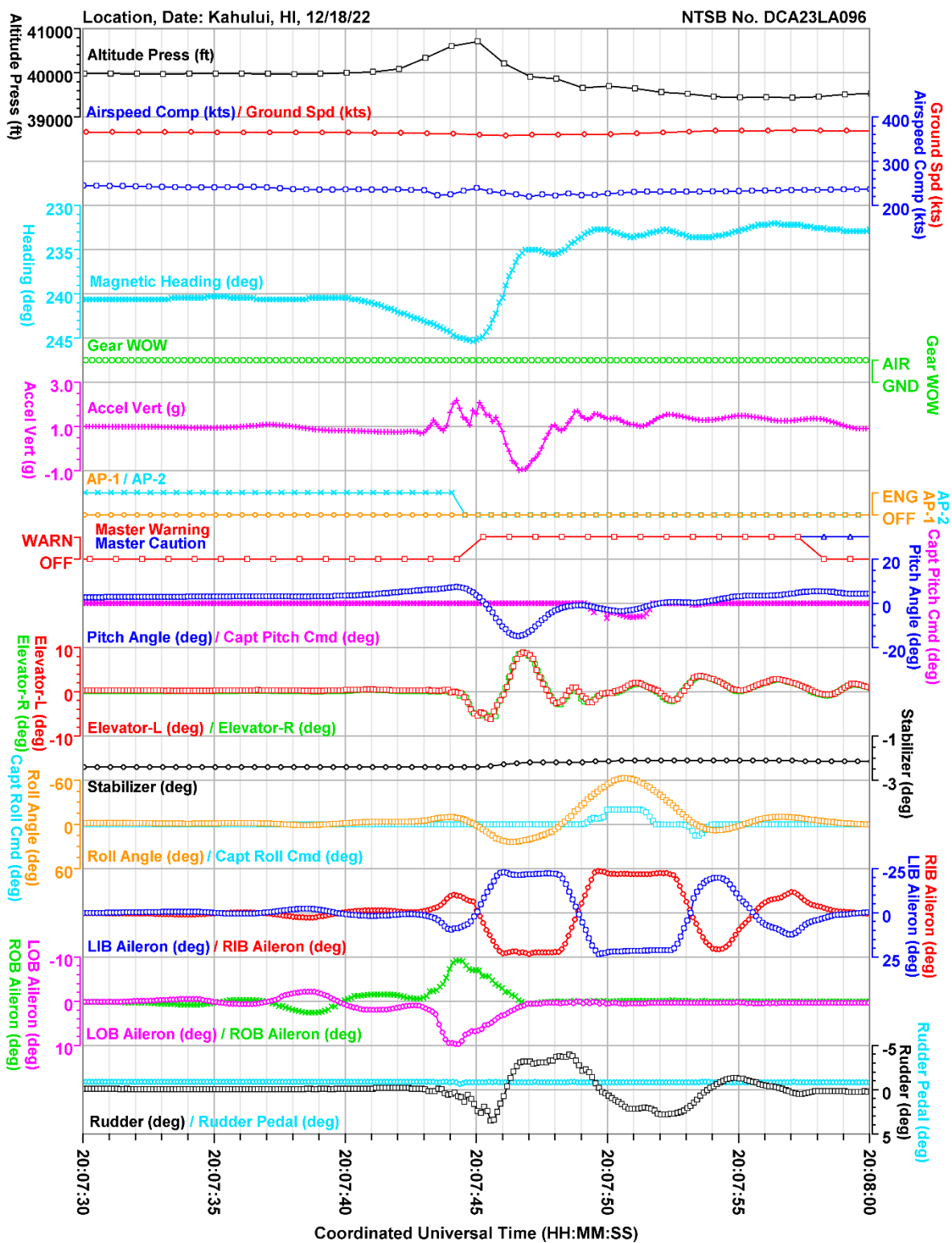
Figure 4. Time history plot of the entire flight with control inputs.



Hawaiian Airlines Inc., Airbus A330-243, HAL 35, N393HA

National Transportation Safety Board

Figure 5. One minute time history plot surrounding the event time with control inputs.



Hawaiian Airlines Inc., Airbus A330-243, HAL 35, N393HA

National Transportation Safety Board

Figure 6. Thirty second time history plot surrounding the event time with control inputs.

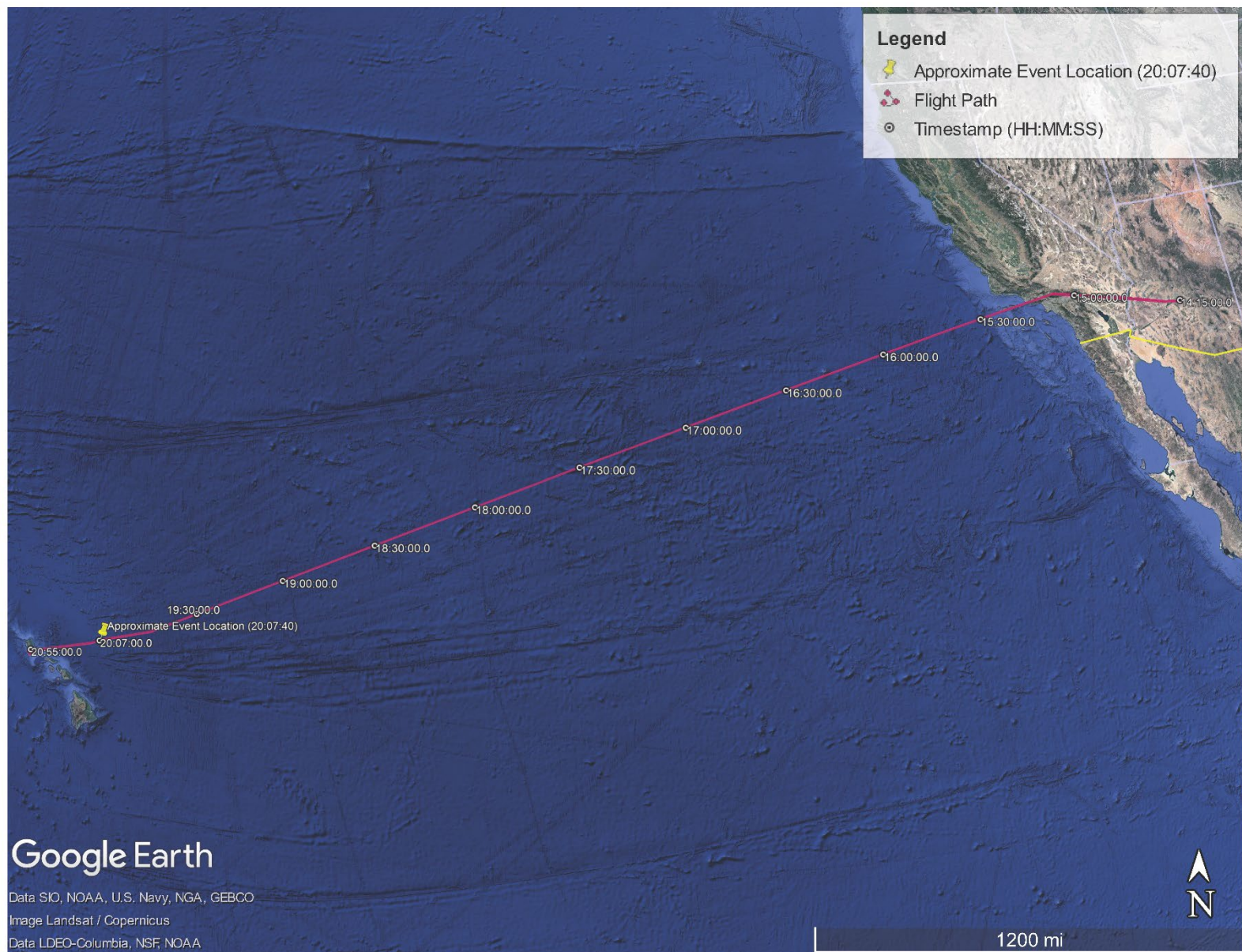


Figure 7. Google Earth overlay of the entire event flight (all times in UTC).

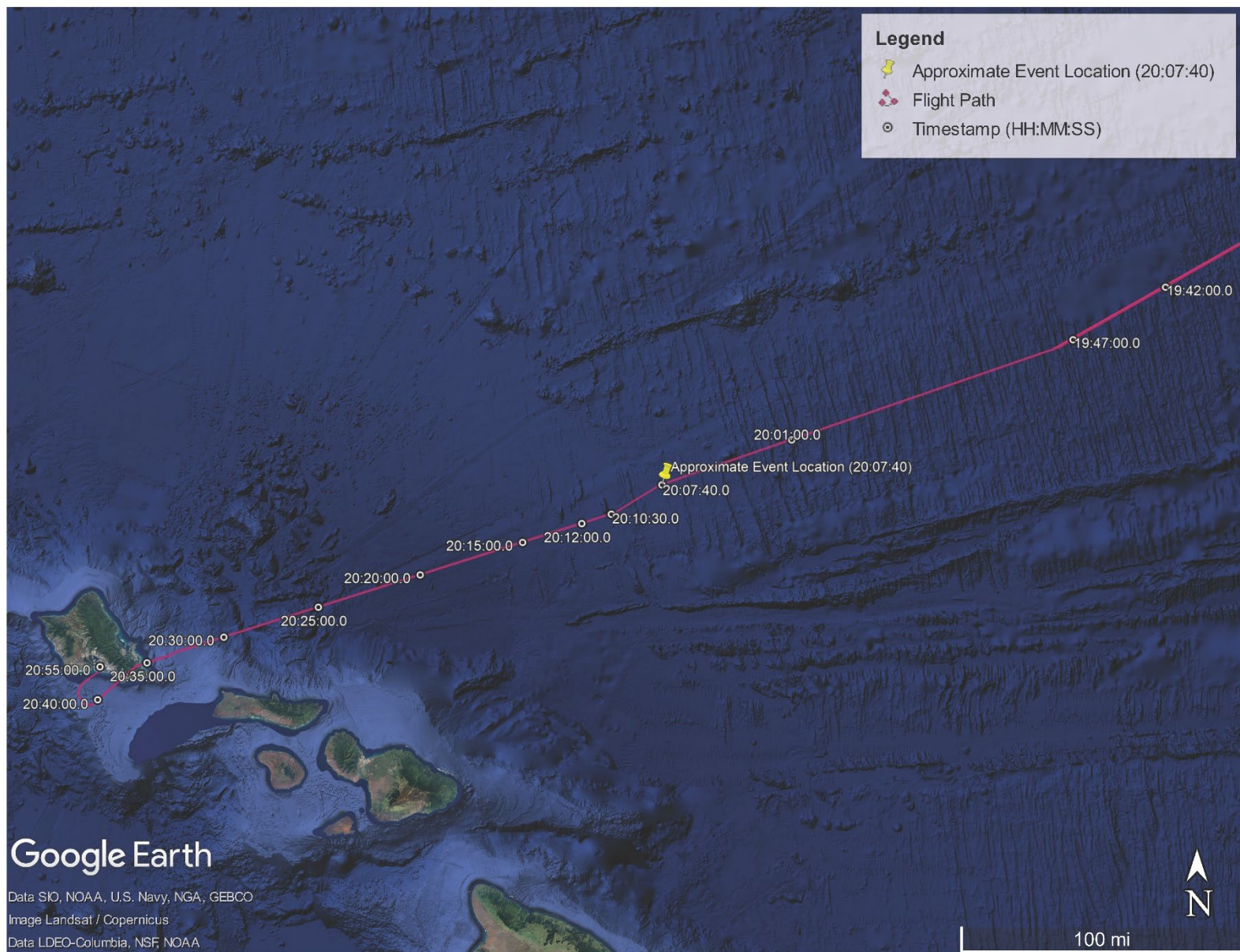


Figure 8. Google Earth overlay of the approximate event location (all times in UTC).

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 and discrete state abbreviations used in this report.

Table 1. Verified and provided QAR parameters.

Plot/Table Labels	Parameter Names	Units
A/THR Active	Automatic Throttle Active	
Accel Vert	Vertical Load Factor	g
Airspeed Comp	Computed Airspeed	kts
Altitude Press	Pressure Altitude	ft
AP-1	Autopilot 1 Engaged	
AP-2	Autopilot 2 Engaged	
Auto Spd Ctrl	Automatic Speed Control	
Capt Pitch Cmd	Captain Pitch Command	deg
Capt Roll Cmd	Captain Roll Command	deg
Elevator-L	Left Elevator Position	deg
Elevator-R	Right Elevator Position	deg
Eng1 N1 Actual	Engine 1 Fan Speed Actual	%RPM
Eng1 N1 Command	Engine 1 Fan Speed Command	%RPM
Eng1 N1 Vib	Engine 1 Fan Speed Vibration	
Eng1 EGT	Engine 1 Exhaust Gas Temperature	degC
Eng2 N1 Actual	Engine 2 Fan Speed Actual	%RPM
Eng2 N1 Command	Engine 2 Fan Speed Command	%RPM
Eng2 N1 Vib	Engine 2 Fan Speed Vibration	
Eng2 EGT	Engine 2 Exhaust Gas Temperature	degC
Gear WOW	Weight on Wheels Gear Status	
Ground Spd	Ground Speed-1	kts
Heading	Magnetic Heading	deg
Latitude	Latitude Coordinate	deg
LIB Aileron	Left Inboard Aileron Position	deg
LOB Aileron	Left Outboard Aileron Position	deg
Longitude	Longitude Coordinate	deg
Man Spd Ctrl	Manual Speed Control	
Master Caution	Master Caution	
Master Warning	Master Warning	
Pitch Angle	Pitch Angle	deg
RIB Aileron	Right Inboard Aileron Position	deg
ROB Aileron	Right Outboard Aileron Position	deg
Roll Angle	Roll Angle	deg
Rudder	Rudder Position	deg
Rudder Ped	Rudder Pedal Position	deg
Stabilizer	Stabilizer Position	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
VHF 1	Microphone Keying 1	
VHF 2	Microphone Keying 2	

Note: This QAR 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 QAR 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 discrete values. 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
%RPM	percent revolutions per minute
AIR	in air (WOW designation)
deg	degrees
degC	degrees Celsius
Eng	engaged
ft	feet
g	unit of gravitation acceleration
GND	on ground (WOW designation)
hrs	hours
kts	knots
min	minutes
sec	seconds
WARN	warning
WOW	weight on wheels