

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



WPR24FA083

FLIGHT DATA RECORDER

Specialist's Factual Report

May 1, 2025

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A. ACCIDENT

Location: Westwater, UT
Date: February 7, 2024
Time: 1048 mountain standard time (MST)
Airplane: Hawker Beechcraft Corp Hawker 900XP, Clay Lacy Aviation, Inc.,
N900VA

B. FLIGHT DATA RECORDER SPECIALIST

Specialist Charles Cates
Mechanical Engineer/Recorder Specialist
National Transportation Safety Board (NTSB)

C. FEDERAL CARRIAGE REQUIREMENTS

The event aircraft, N900VA, was operating under Title 14 *Code of Federal Regulations* (CFR) Part 91: General aviation. The event aircraft was manufactured in 2007 and was operating such that it was not required to be equipped with a flight data recorder (FDR) based on the number of occupant seats.

D. DETAILS OF THE INVESTIGATION

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

Recorder Manufacturer/Model:	Honeywell AR-FDR
Part Number:	980-4710-003
Recorder Serial Number:	Unknown (dataplate destroyed)

1.0 Recorder Description

The AR Series Solid State Flight Data Recorder (AR-FDR) is a light weight crash survivable recording device that operates from 28 VDC aircraft power and is intended for installation in general aviation aircraft and helicopters.

The AR-FDR records, at a minimum, the most recent 25 hours of flight data information. This installation was configured to record 256 words per second of ARINC-717 data provided by the Flight Data Acquisition Unit.

The AR-FDR is certified to TSO C-124A for FDRs utilizing solid state memory as the recording medium.

1.1 Recorder Condition

The recorder sustained severe heat damage as shown in figure 1. The memory module was removed from the recorder (see figure 2). The memory module's red rubberized RTV was peeled back to reveal the temperature dot underneath (see figure 3).¹ The temperature dot had not turned black thus indicating the memory module was unlikely to have been compromised by heat exposure. Following detailed visual and electrical inspections of the board and circuitry, a new ribbon cable was attached to the memory module and the memory module was successfully downloaded using the NTSB's equipment and the recorder manufacturer's software.



Figure 1. Damaged exterior of flight data recorder.

¹ The temperature dot or temperature sensor helps to indicate the potential for the memory board being exposed to a temperature in excess of 149° Celsius (C) (300° Fahrenheit (F)). If the temperature exceeds 149° C (300° F), the dot will change color to black. In this instance it is possible for the solder of the components to reflow and may cause shorting.

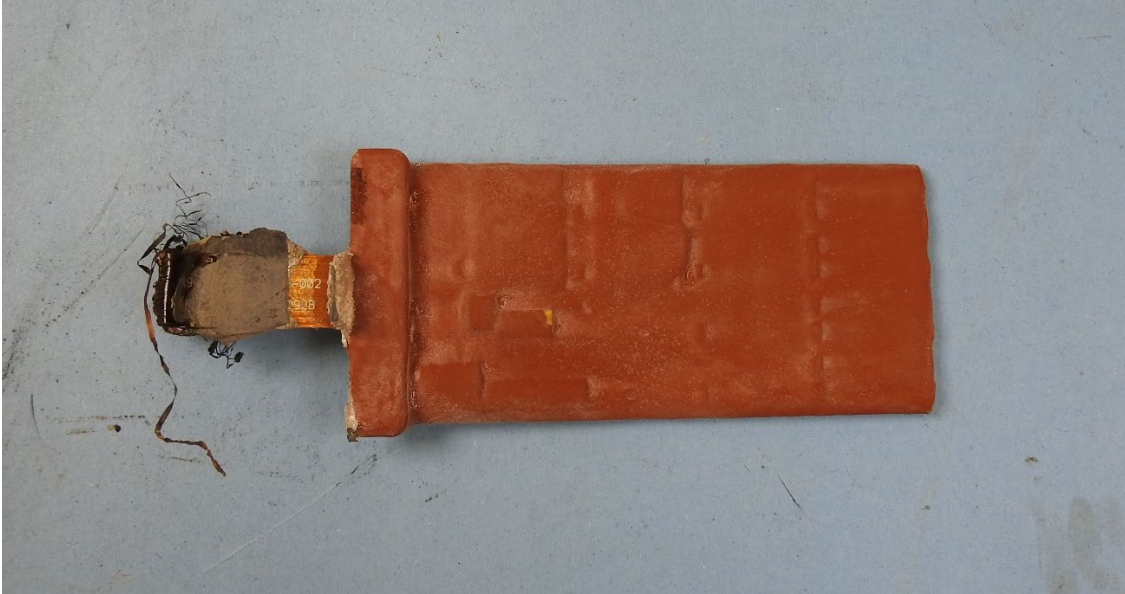


Figure 2. Memory module removed from the recorder.

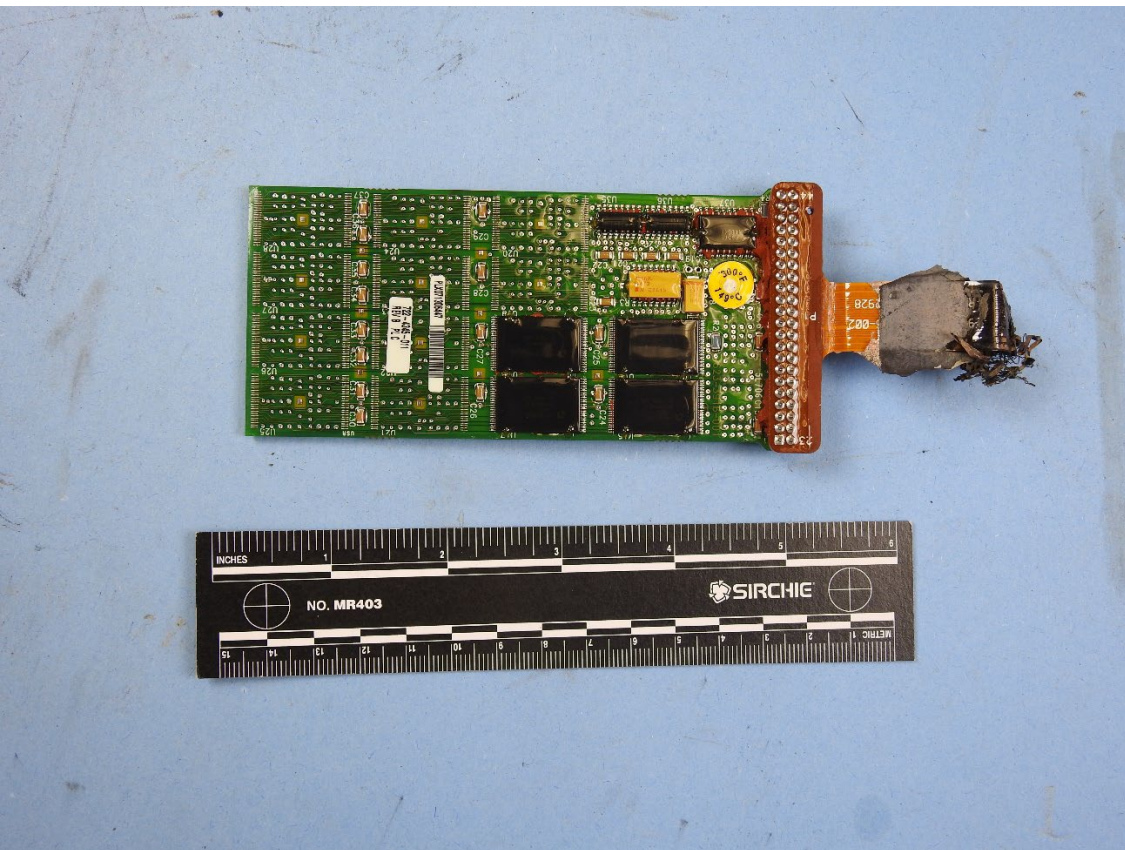


Figure 3. Memory module with part of the red rubberized RTV removed and temperature dot exposed.

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 flight was the last flight of the recording, and its duration was approximately 12 minutes. Nearly all the 27 hours of data on the recorder was of the aircraft on ground during maintenance activities. The accident flight was the first flight following the extended on-ground recording. The parameters evaluated for the purpose of this report appeared to be in accordance with federal FDR carriage requirements.

1.3 Engineering Unit Conversions

The engineering unit conversions used for the data contained in this report are based on documentation from the manufacturer of the data acquisition unit installed in the aircraft. 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=+).²

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.

1.4 Time Correlation

Correlation of the FDR data from SRN to the event local time, mountain standard time (MST), was established by using the recorded Greenwich mean time (GMT) Hours, GMT Minutes, and GMT Seconds and then applying an additional -7 hours offset to change GMT to MST.³

Accordingly, the time offset for the event flight data from SRN to MST is the following: $MST = SRN - 59150.5$. Therefore, for the rest of this report, all times are referenced as MST, not SRN.

E. FIGURES AND TABULAR DATA

Figures 4 to 10 contain FDR data recorded during the event on February 7, 2024. All the parameters listed in table 1 are plotted except GMT Hours, GMT Minutes, and GMT Seconds.

² 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 = +.

³ GMT is Greenwich mean time which is also known as coordinated universal time (UTC).

Table 1. Description of plots.

Plot	Description	Time Span (MST)
Figure 4	Basic parameters	10:36:00 - End
Figure 5	Engine parameters	10:36:00 - End
Figure 6	Flight control and surface parameters	10:36:00 - End
Figure 7	Basic parameters	10:46:00 - 10:47:45
Figure 8	Engine parameters	10:46:00 - 10:47:45
Figure 9	Flight control and surface parameters	10:46:00 - 10:47:45
Figure 10	Cautions	10:46:00 - 10:47:45

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 data show that the aircraft departed at 10:37 MST and arrived at an altitude of between 19,900 and 20,000 ft at 10:43:50. Beginning at 10:44:00, airspeed began steadily decreasing from 219 kts as aircraft pitch attitude and angle of attack began to increase.

At 10:46:37 at an airspeed of 114 kts and left and right AOA readings of 0.93 and 0.92 respectively, the aircraft abruptly rolled to the right beyond 45 degrees, at a roll rate in exceedance of 40 degrees per second. Heading also began to turn to the right. Vertical acceleration decreased to about 0.6 g and pitch decreased from about 15 degrees to about 6 degrees. Engine PLA was advanced from the idle setting. Also at this time, Stall Valve A was recorded as being in the Open state, consistent with the aircraft stick shaker being active⁴.

In the next second, pitch continued to decrease, and roll reached a 64-degree right bank. Recorded angle of attack decreased to 0.85 and 0.78 on the left and right and Stall Valve A and B were in the Not Open state.

At 10:46:39 at an airspeed of 115 kts and left and right AOA readings of 0.80 and 0.90 respectively, both Stall Valve A and B transitioned to the Open state, consistent with the aircraft stick pusher being active. Roll reached 72 degrees right bank and pitch reached 7.7 degrees nose down. A Master Caution was recorded from the Right PFD. The next second also recorded both stall valves Open along with a Right PFD Roll Compare Warning.

At 10:46:41, right roll reached 84.7 degrees and then began rolling back to the left. Pitch continued to decrease past 20 degrees nose down. AOA was at 0.97 and 0.88 for left and right, and both stall values were Not Open.

⁴ According to the documentation, when either Stall Valve A or Stall Valve B are open the stick shaker is active. When both Stall Valve A and Stall Valve B are open the stick pusher is active.

Over the next ten seconds the aircraft rapidly rolled to the left through fully inverted and back upright while the pitch angle remained nose down, reaching a peak of -75.4 degrees. Both AOA values were 1.0 for the remainder of the recording, and both stall valves remained open for the duration of the recording, consistent with stick pusher activation.

At 10:46:51, air data (altitude and airspeed) from both PFDs became invalid. Altitude recorded a constant value of -1871 feet and airspeed recorded a constant value of 255 kts. Heading began to spin to the left, making a full rotation every 15-20 seconds. The aircraft was upright during this spin. At 10:47:12 one final valid pressure altitude of 13,694 feet was recorded before becoming invalid for the remainder of the recording.

At 10:47:34, the radio altimeter began to record valid data consistent with the aircraft being below 2,500 ft AGL. At the end of the recording, several EGPWS warnings were recorded as the aircraft approached the ground. The recording ended at 10:47:44.

The corresponding tabular data used to create figures 4 to 10, including GMT Hours, GMT Minutes, and GMT Seconds, are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

Submitted by:

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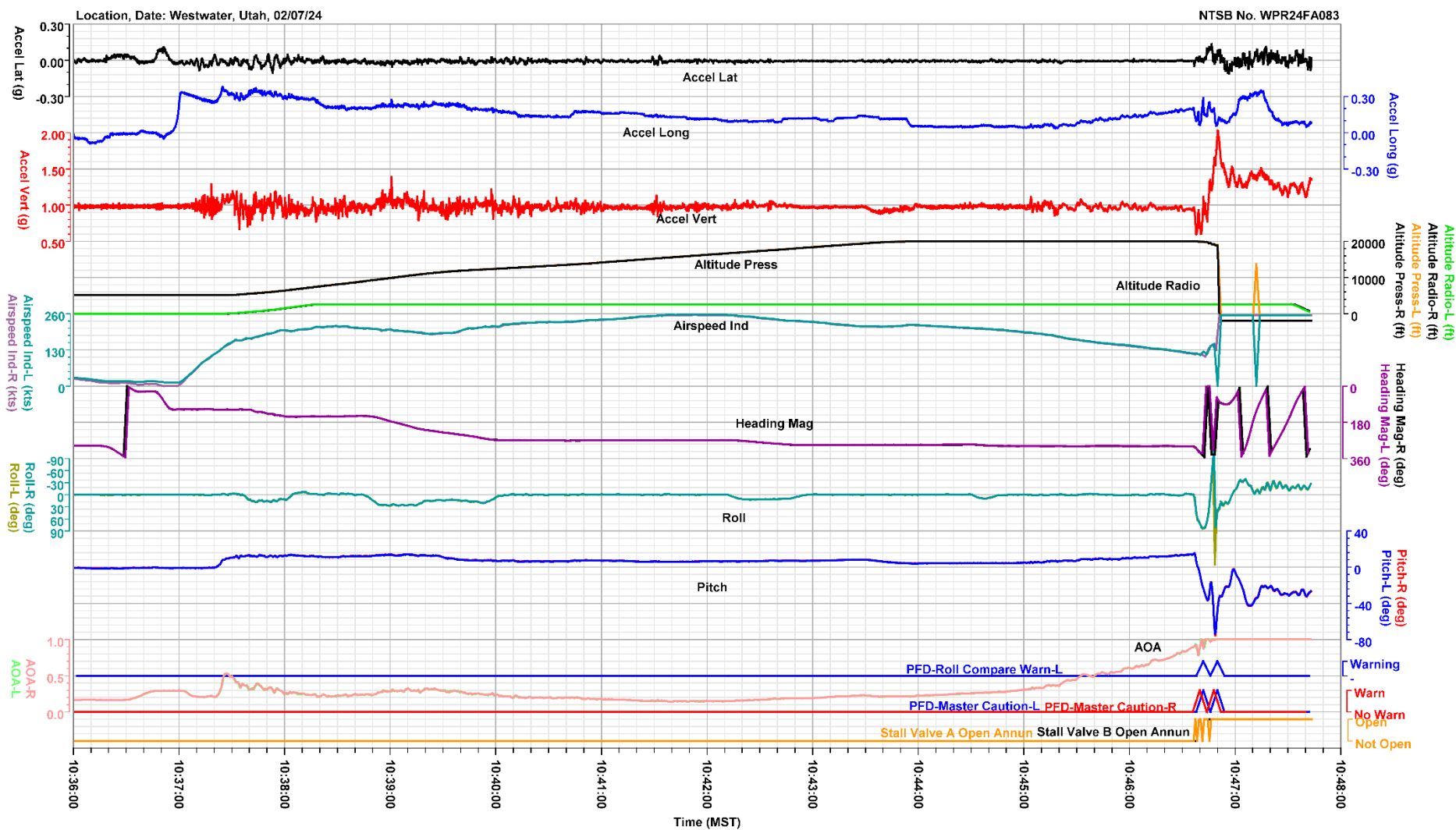


Figure 4. Plot of basic parameters from full recorded flight.

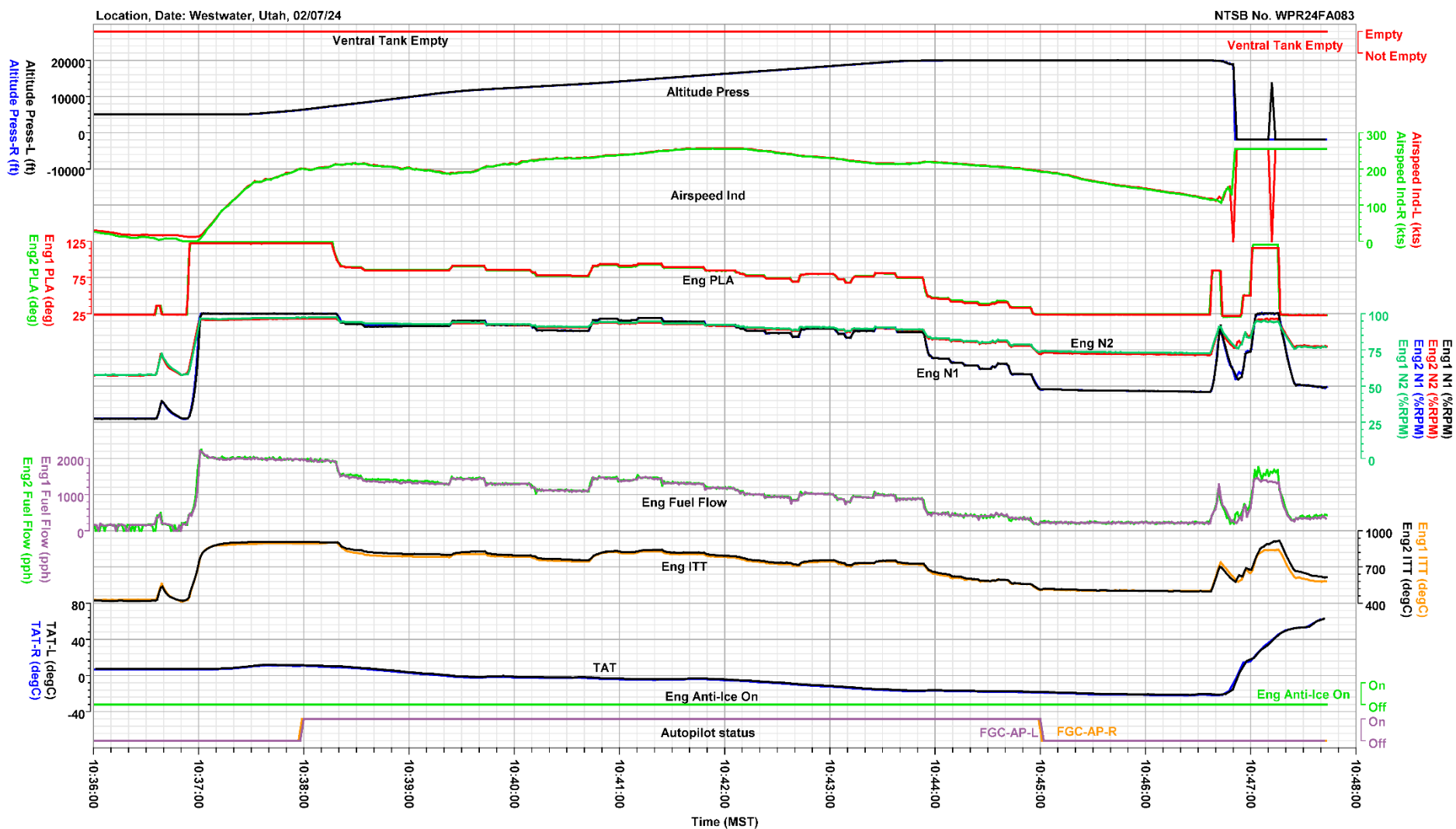


Figure 5. Engine parameters from full recorded flight.

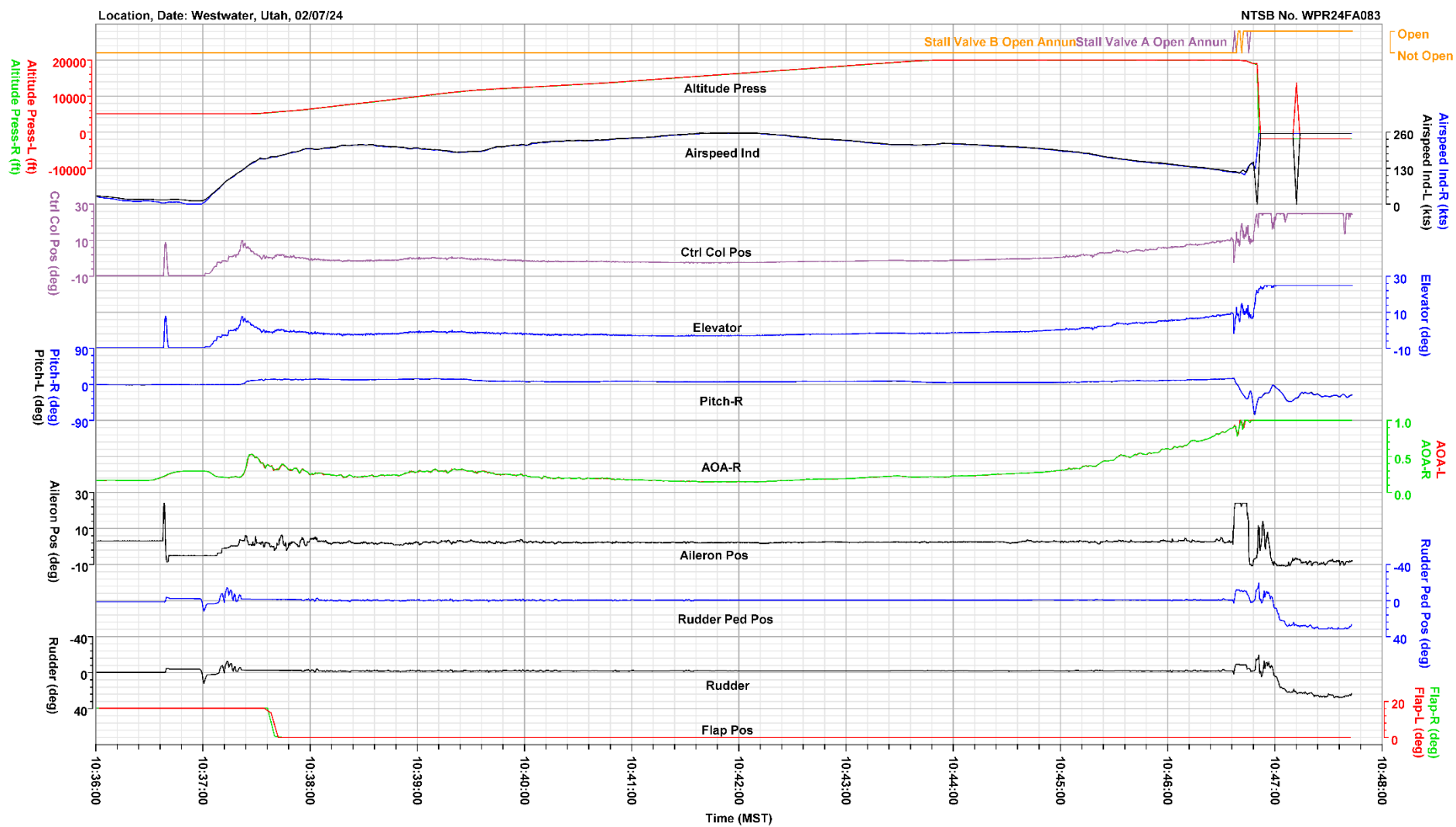


Figure 6. Flight control and surface positions from full recorded flight.

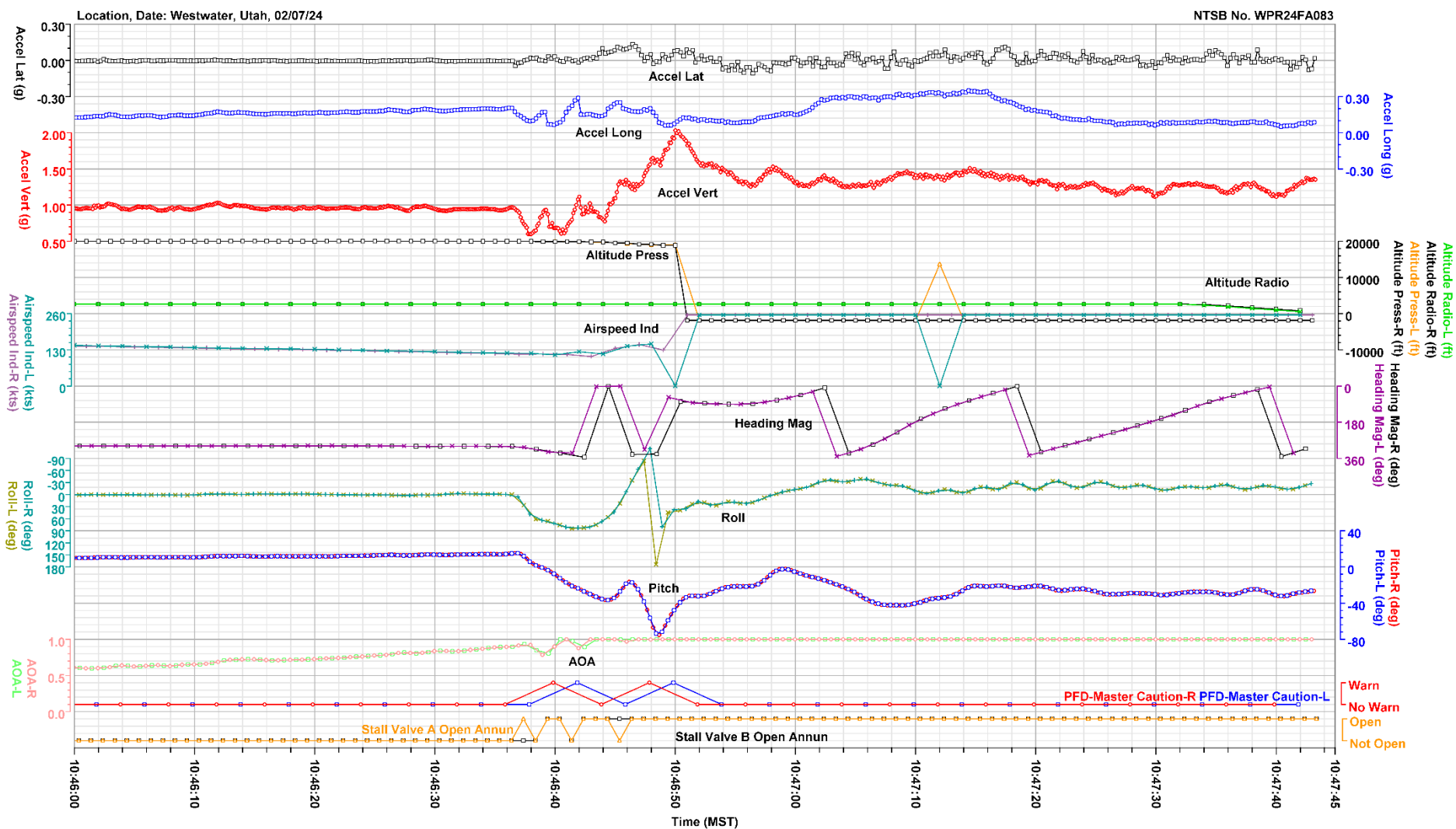


Figure 7. Aircraft basic parameters from time of aircraft upset.

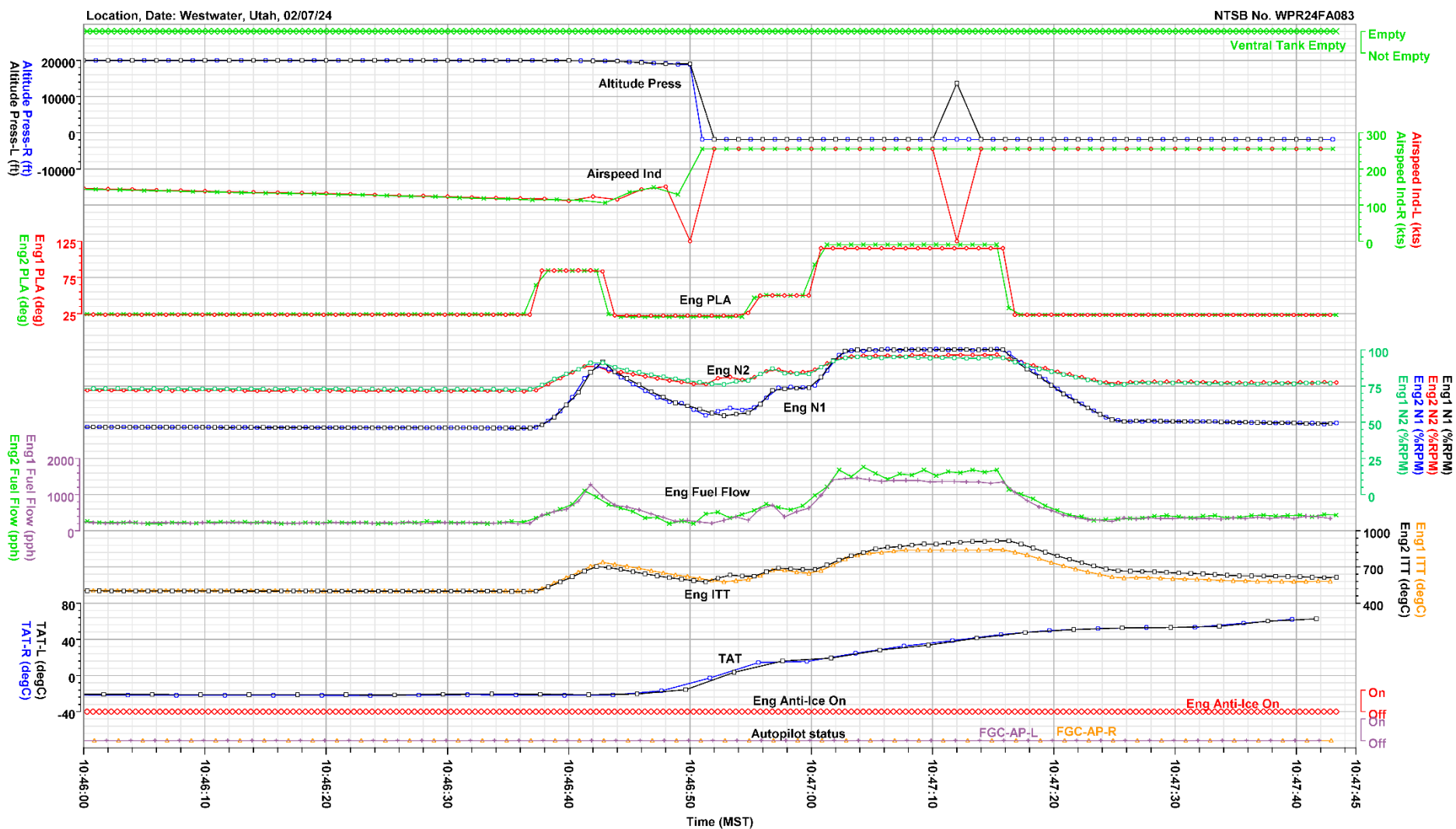


Figure 8. Engine parameters from time of aircraft upset.

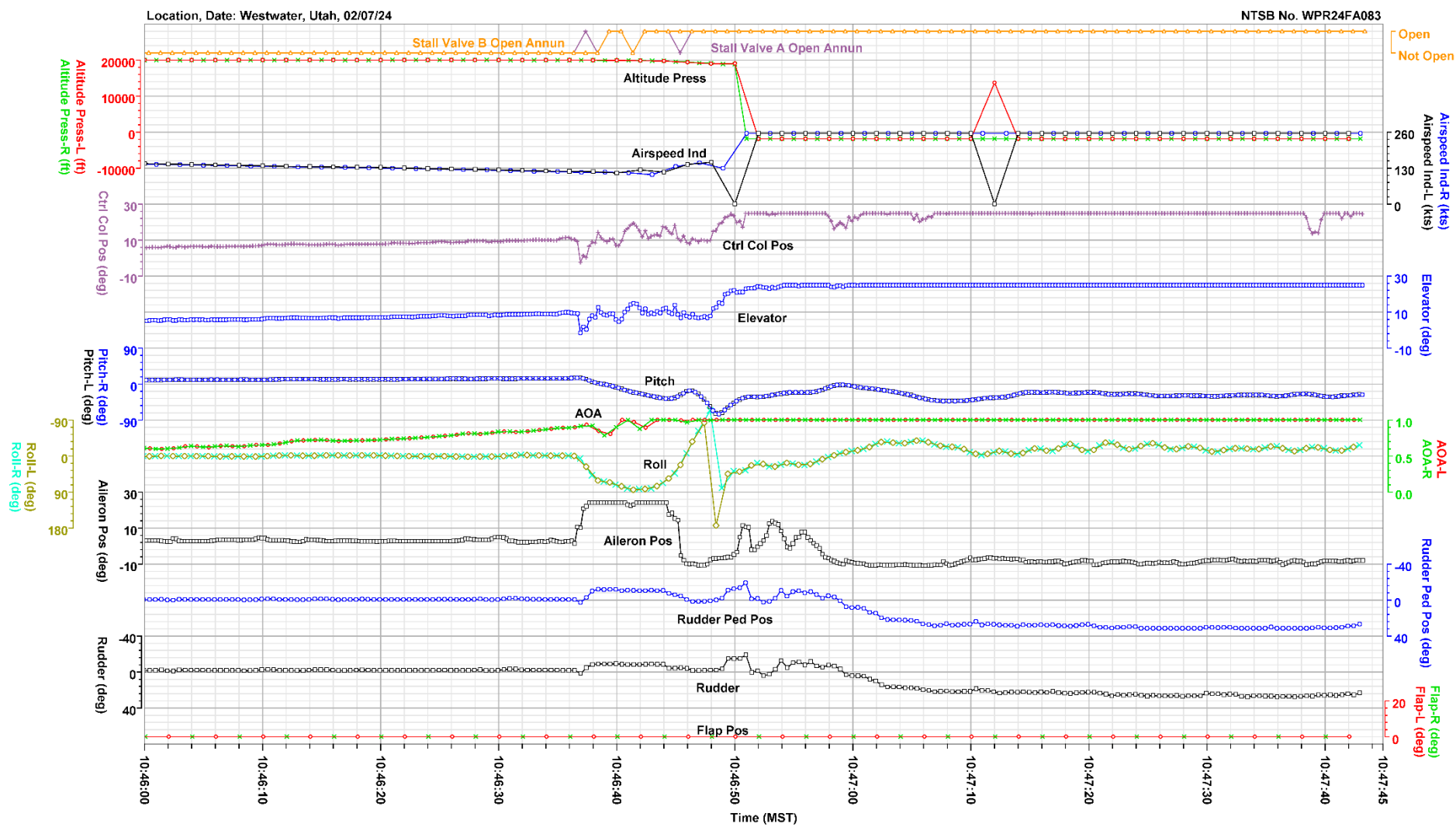


Figure 9. Flight control and surface positions from time of aircraft upset.

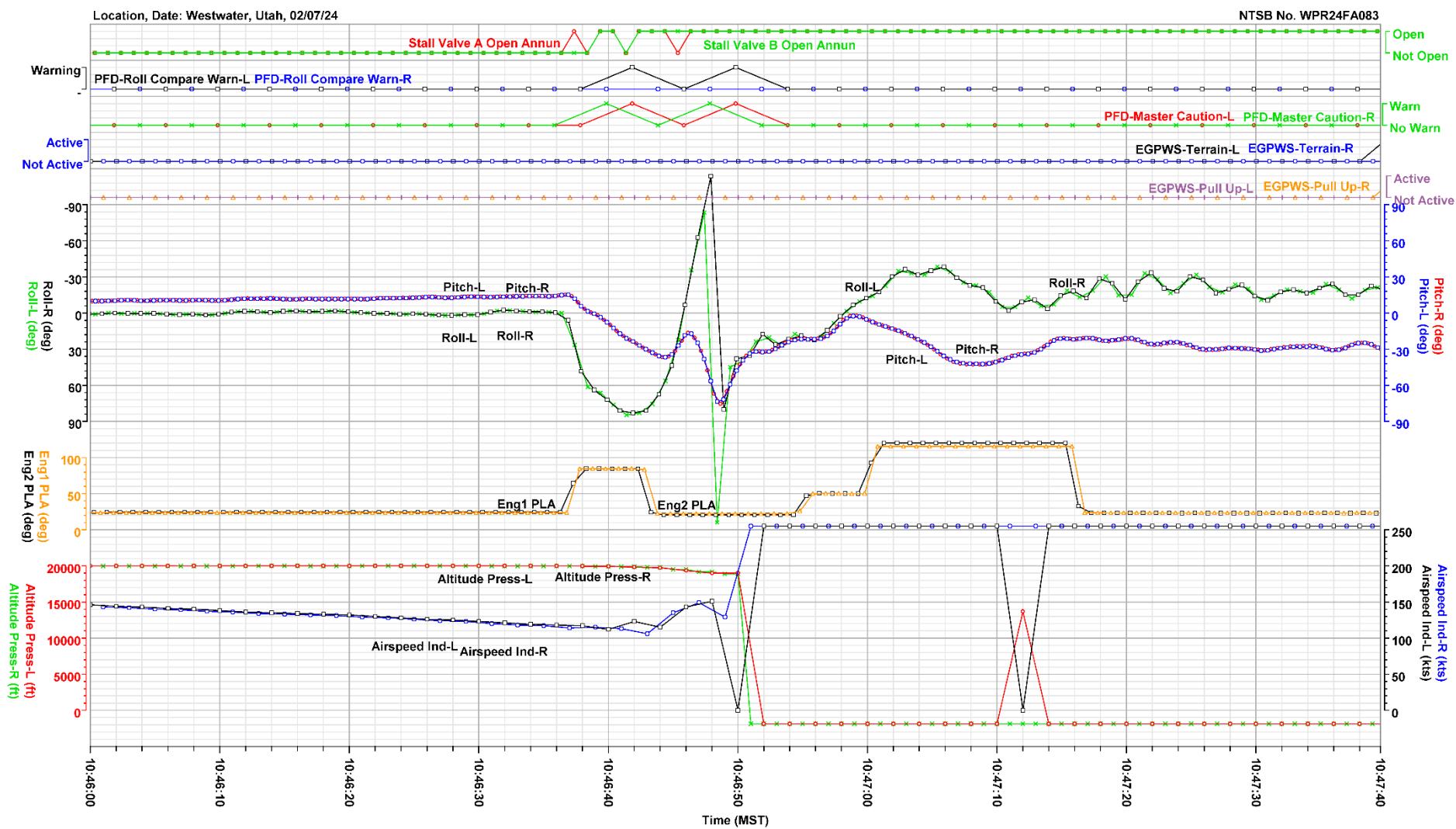


Figure 10. Plot of caution parameters active from time of aircraft upset.

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 2. Verified and provided FDR parameters.

Plot/Table Labels	Parameter Description	Units
1. Accel Lat	Lateral Acceleration	g
2. Accel Long	Longitudinal Acceleration	g
3. Accel Vert	Vertical Acceleration	g
4. Aileron Pos	Aileron Position	deg
5. Airspeed Ind-L	Indicated Airspeed - Left ADC	kts
6. Airspeed Ind-R	Indicated Airspeed - Right ADC	kts
7. Altitude Press-L	Pressure Altitude - Left ADC	ft
8. Altitude Press-R	Pressure Altitude - Right ADC	ft
9. Altitude Radio-L	Radio Altitude - Left PFD	ft
10. Altitude Radio-R	Radio Altitude - Right PFD	ft
11. AOA-L	Left Normalized Angle of Attack	
12. AOA-R	Right Normalized Angle of Attack	
13. Ctrl Col Pos	Control Column Position	deg
14. EGPWS-Pull Up-L	Pull Up callout active - Left PFD	
15. EGPWS-Pull Up-R	Pull Up callout active - Right PFD	
16. EGPWS-Terrain-L	Terrain callout active - Left PFD	
17. EGPWS-Terrain-R	Terrain callout active - Right PFD	
18. Elevator	Elevator Position	deg
19. Eng Anti-Ice On	Engine Anti-Ice switched On	
20. Eng1 Fuel Flow	Engine 1 Fuel Flow	pph
21. Eng1 ITT	Engine 1 Interturbine Temperature	degC
22. Eng1 N1	Engine 1 Fan Speed	%RPM
23. Eng1 N2	Engine 1 Core Speed	%RPM
24. Eng1 PLA	Engine 1 Power Lever Angle	deg
25. Eng2 Fuel Flow	Engine 2 Fuel Flow	pph
26. Eng2 ITT	Engine 2 Interturbine Temperature	degC
27. Eng2 N1	Engine 2 Fan Speed	%RPM
28. Eng2 N2	Engine 2 Core Speed	%RPM
29. Eng2 PLA	Engine 2 Power Lever Angle	deg
30. FGC-AP-L	Left Autopilot Engaged	
31. FGC-AP-R	Right Autopilot Engaged	
32. Flap-L	Left Flaps Position	deg

Plot/Table Labels	Parameter Description	Units
33. Flap-R	Right Flaps Position	deg
34. Heading Mag-L	Magnetic Heading - Left PFD	deg
35. Heading Mag-R	Magnetic Heading - Right PFD	deg
36. PFD-Master Caution-L	Master Caution active - Left PFD	
37. PFD-Master Caution-R	Master Caution active - Right PFD	
38. PFD-Roll Compare Warn-L	Roll Miscompare Warning - Left PFD	
39. PFD-Roll Compare Warn-R	Roll Miscompare Warning - Right PFD	
40. Pitch-L	Pitch Angle - Left PFD	deg
41. Pitch-R	Pitch Angle - Right PFD	deg
42. Roll-L	Roll Angle - Left PFD	deg
43. Roll-R	Roll Angle - Right PFD	deg
44. Rudder	Rudder Position	deg
45. Rudder Ped Pos	Rudder Pedal Position	deg
46. Stall Valve A Open Annun	Stall Valve A Open	
47. Stall Valve B Open Annun	Stall Valve B Open	
48. TAT-L	Total Air Temperature - Left ADC	degC
49. TAT-R	Total Air Temperature - Right ADC	degC
50. Ventral Tank Empty	Ventral Fuel Tank Empty	

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 3. Unit abbreviations.

Unit Abbreviations	Descriptions
%RPM	Percent revolutions per minute
deg	degrees
degC	degrees Celsius
EGPWS	Enhanced Ground Proximity Warning System
ft	feet
g	gravitational constant
kts	knots
PFD	Primary Flight Display
pph	Pounds per hour