

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

August 10, 2012

Flight Data Recorder - 10

Specialist's Factual Report
By Paul Wirkowski

1. EVENT SUMMARY

Location: Philadelphia, Pennsylvania
Date: June 07, 2012
Aircraft: Boeing 757-200
Registration: N936UW
Operator: US Airways
NTSB Number: DCA12FA086

On June 7, 2012, at approximately 1216 EDT, a Boeing 757-200, US registration N936UW, operated by USAirways as flight 1078 from San Juan, Puerto Rico to Philadelphia, PA, encountered turbulence on descent into PHL. During the encounter, a flight attendant in the aft galley suffered a serious injury and the flight attendant jumpseat occupant suffered a minor injury. The other four flight attendants, two pilots, and 178 passengers were not injured. The airplane landed normally at PHL, and the passengers deplaned normally. There was no damage to the aircraft.

2. FLIGHT DATA RECORDER GROUP

A flight data recorder (FDR) group was not convened.

3. FDR Carriage Requirements

The event aircraft, N936UW, was manufactured in March, 1994, and was operating such that it was required to be equipped with an FDR that recorded, at a minimum, 34 parameters, as cited in Title 14 *Code of Federal Regulations* Part 121.344.

4. DETAILS OF FLIGHT DATA RECORDER INVESTIGATION

The Safety Board's Vehicle Recorder Division received the following FDR:

Recorder Manufacturer/Model: **L-3/Fairchild FA2100 64 wps**
Recorder Serial Number: **000285547**

4.1. L-3/Fairchild FA2100 64 wps Description

This model FDR records airplane flight information in a digital format using solid-state flash memory as the recording medium. The FA2100 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 64 12-bit words of digital information every second. Each grouping of 64 words (each second) is called a subframe. Each subframe has a unique 12-bit

synchronization (sync) word identifying it as either 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 64-word intervals. Each data parameter (e.g. altitude, heading, airspeed) has a specifically assigned word number within the subframe. The FA2100 is designed to meet the crash-survivability requirements of TSO-C124a.

4.1.1. Recorder Condition

The recorder was in good condition and the data were extracted normally from the recorder.

4.1.2. Recording Description

The FDR recording contained approximately 172 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 second to last flight of the recording and its duration was approximately 3 hours and 25 minutes.

4.1.3. Engineering Units Conversions

The engineering units 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=+).¹

Appendix A lists the FDR parameters verified and provided in this report.

4.2. Time Correlation

Correlation of the FDR data from SRN to the event local time, EDT, was established by using the recorded Time GMT² hours, Time GMT Minutes, and Time GMT Seconds and then applying an additional 4 hours offset to change GMT to EDT.

Accordingly, the time offset for the event flight data from SRN to local EDT is the following: EDT = SRN – 559008.0. Therefore, for the rest of this report, all times are referenced as EDT, not SRN.

4.3. FDR Plots and Corresponding Tabular Data

The following six figures contain FDR data recorded during the 06/07/2012 event.

Figure one contains a plot of basic flight and engine parameters for the entire flight while figure two contains a plot of basic flight parameters for a 30 second period.

Figure three contains a plot of pitch parameters for a 30 second period and figure four contains a plot of roll and yaw parameters for the same time period.

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 = +, Pitch Up = +, Elevator Trailing Edge Up = +, Right Rudder = +.

² GMT is Greenwich Mean Time which is also known as Coordinated Universal Time (UTC).

Figure five contains a plot of weather parameters for a two minute period and figure six contains a plot of autopilot parameters for a two minute period as well.

In figures one through six, the turbulence event takes place from approximately 11:58:38 EDT to 11:58:40 EDT.

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 corresponding tabular data used to create these six plots are provided in electronic (*.csv³) format as Attachments 1, 2, and 3 to this report.

³ Comma Separated Value format.

Figure 1. Plot of basic parameters for entire flight.

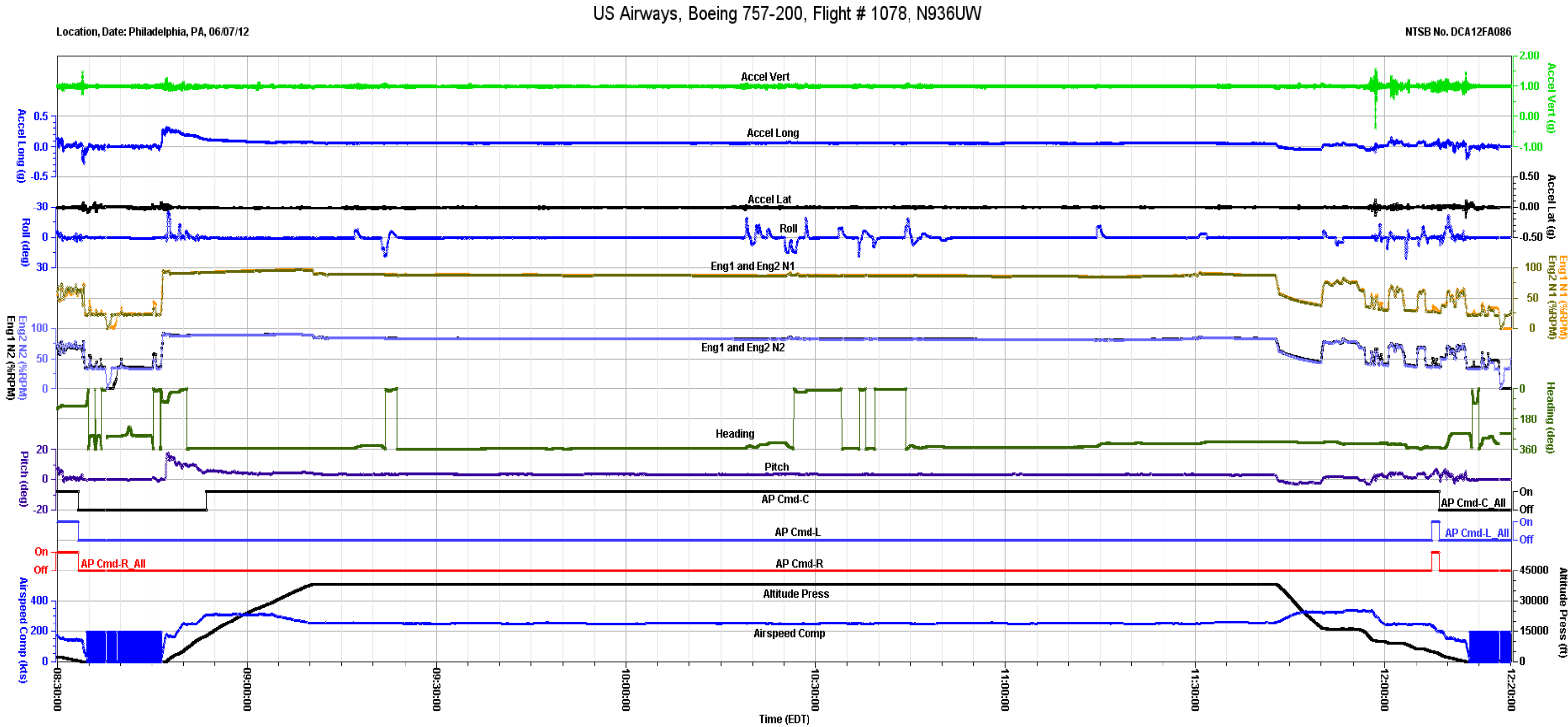


Figure 2. Plot of basic parameters for 30 seconds of flight.

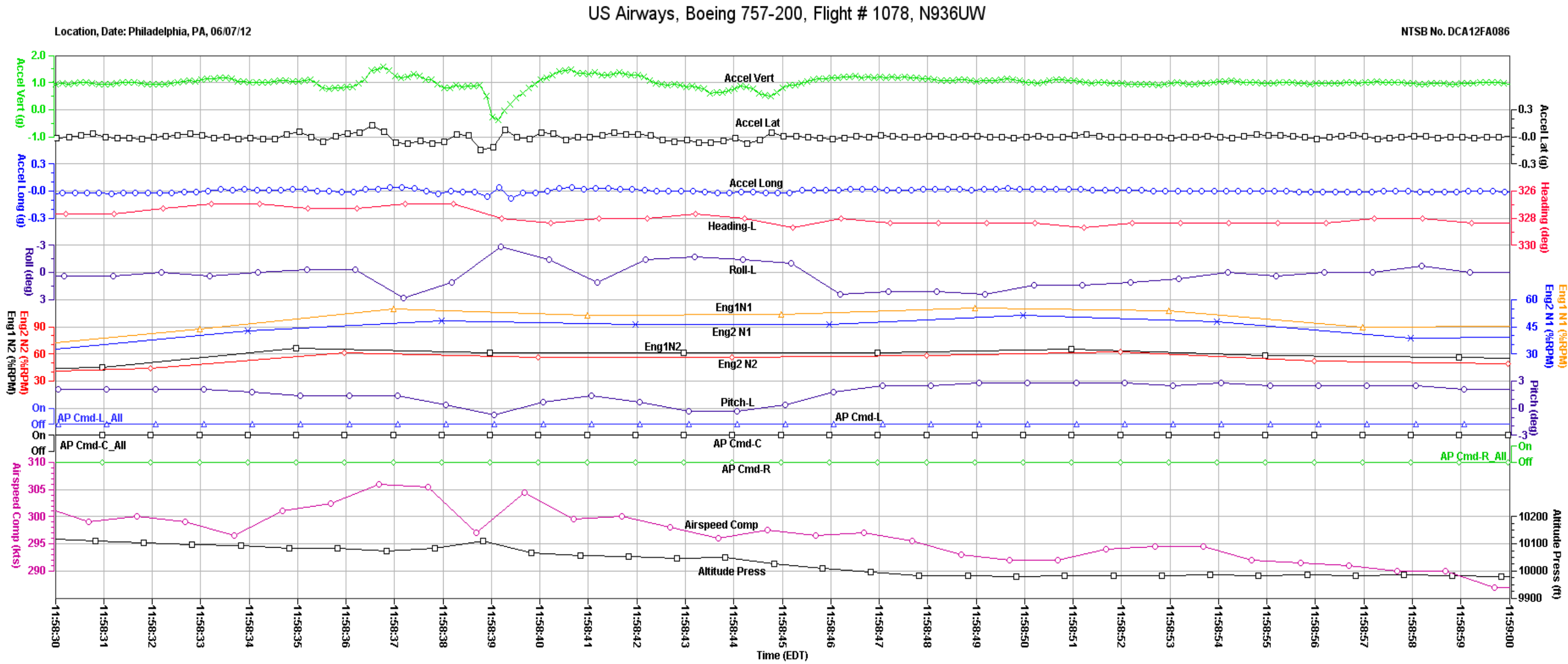


Figure 3. Plot of pitch parameters for 30 seconds of flight.

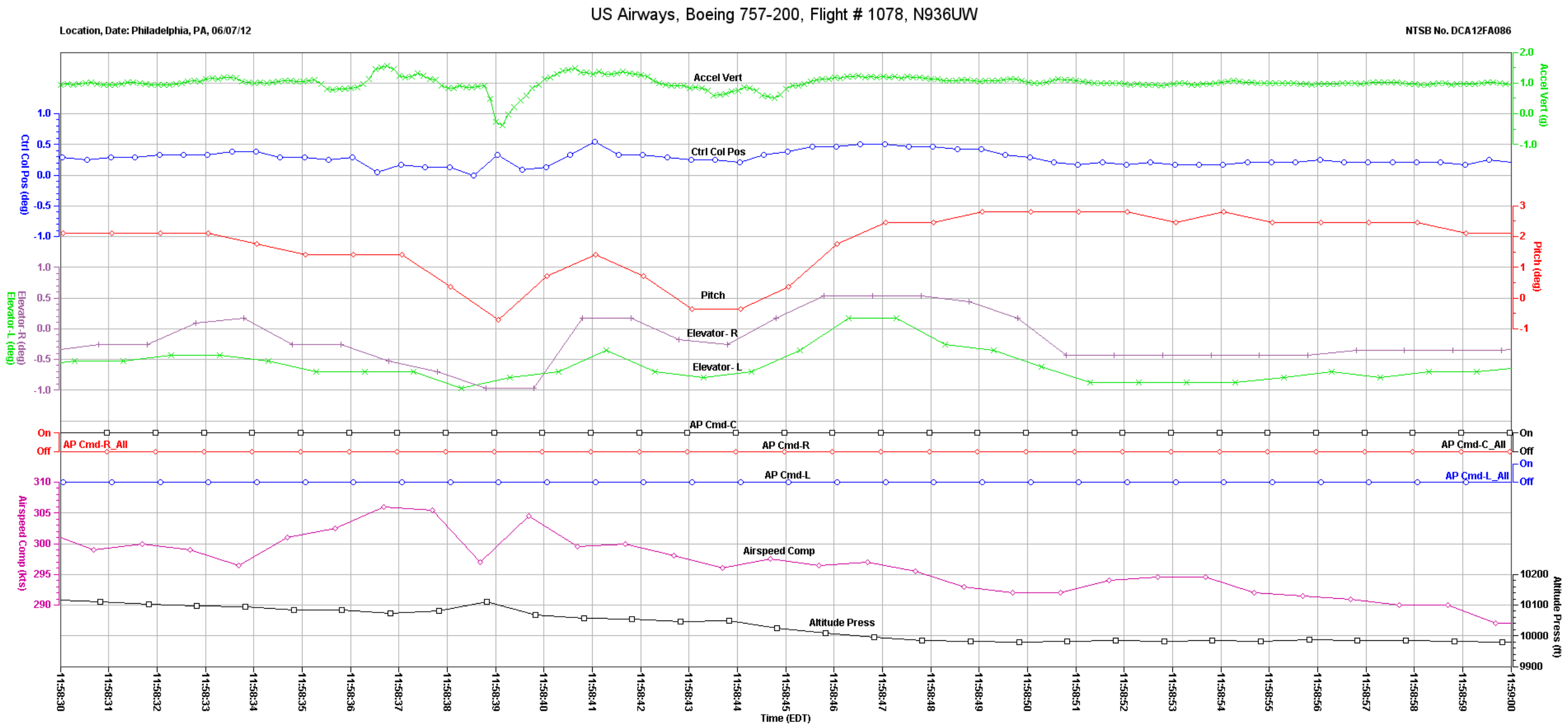


Figure 4. Plot of roll and yaw parameters for 30 seconds of flight.

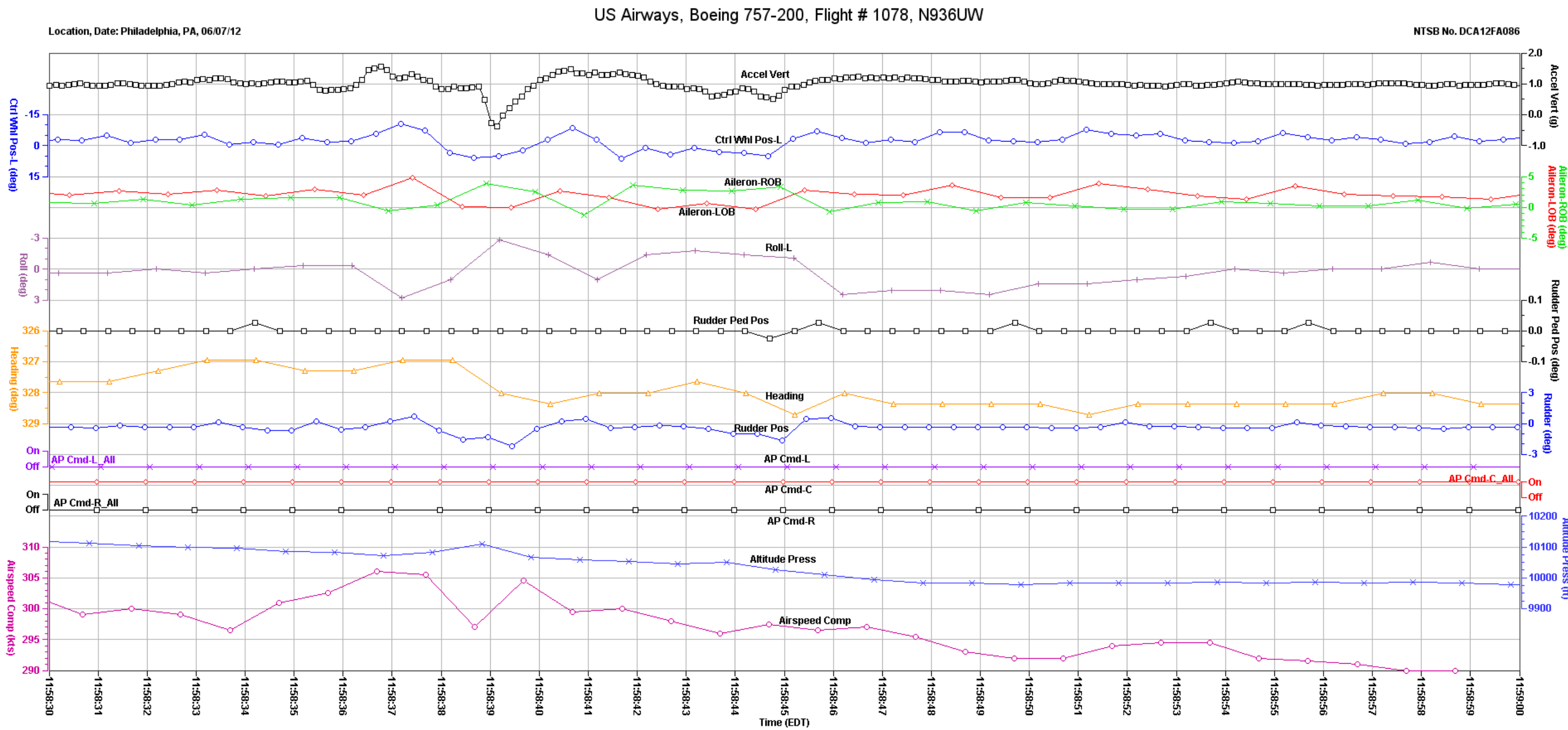


Figure 5. Plot of weather parameters for 2 minutes of flight.

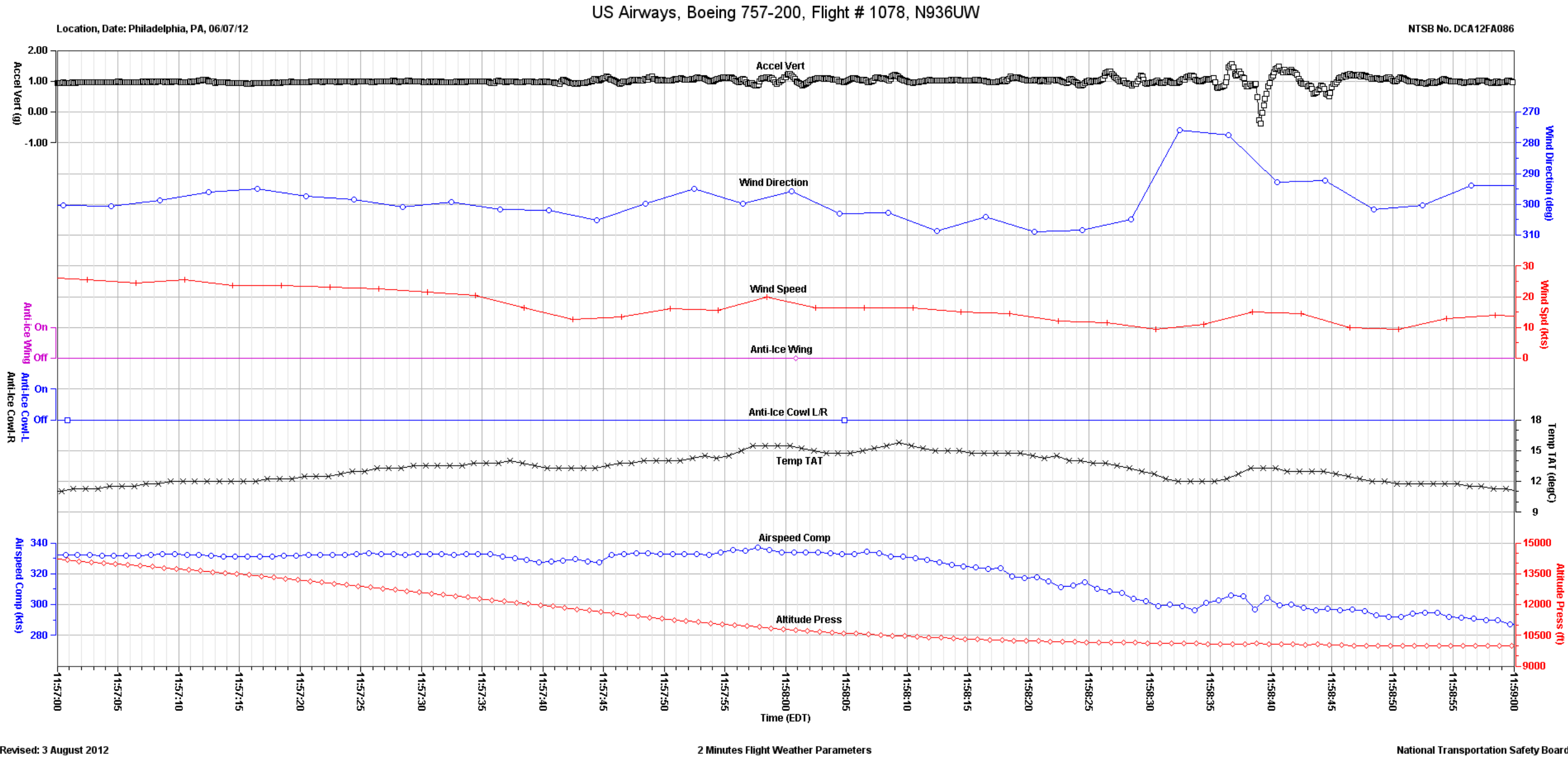
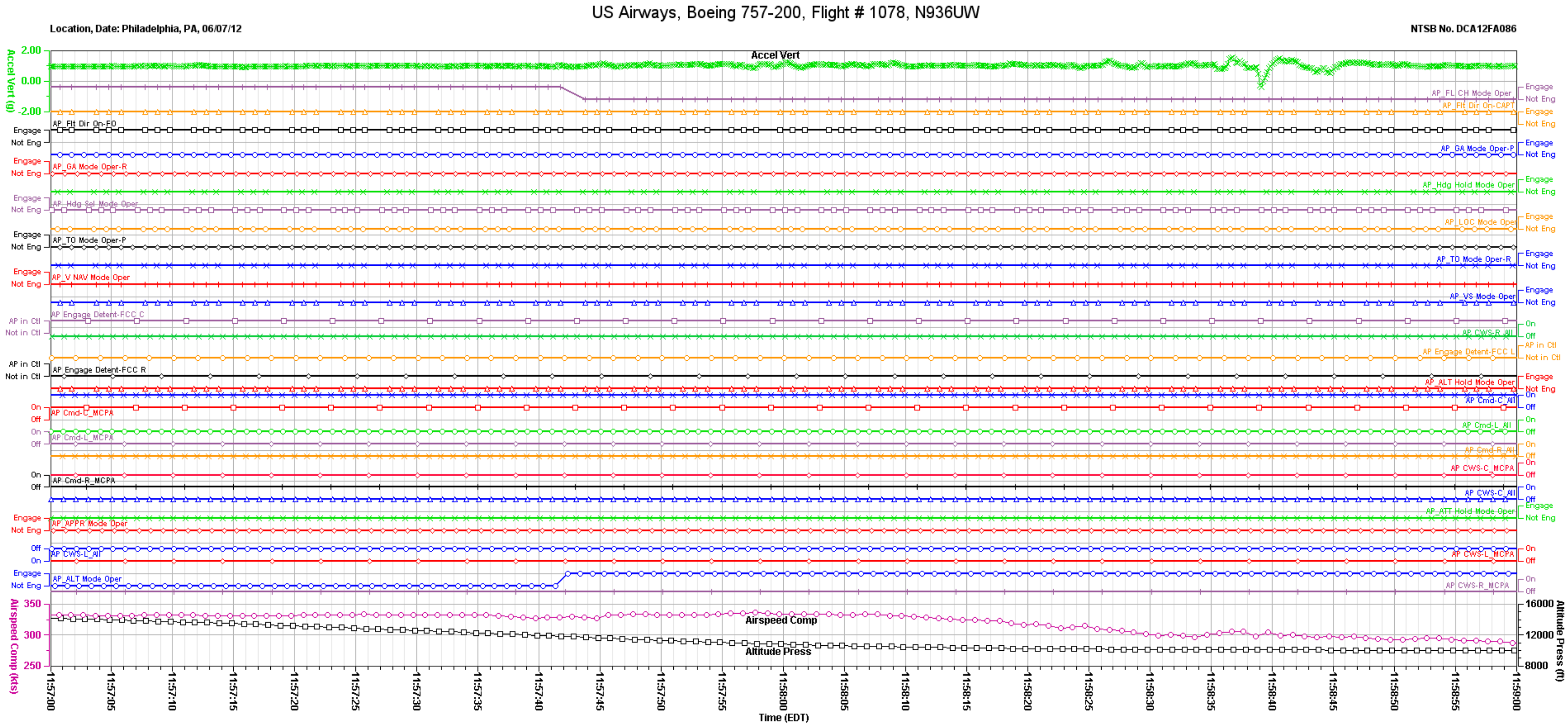


Figure 6. Plot of autopilot parameters for 2 minutes of flight.



APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameters and table A-2 describes the unit abbreviations used in this report.

Table A-1. Verified and provided FDR parameters.

Parameter Name	Parameter Description
1. Accel Lat (g)	Lateral Acceleration
2. Accel Long (g)	Longitudinal Acceleration
3. Accel Vert (g)	Vertical Acceleration
4. Aileron-LOB (deg)	Left Outboard Aileron Position
5. Aileron-ROB (deg)	Right Outboard Aileron Position
6. Airspeed Comp (kts)	Computed Airspeed
7. Altitude Press (ft)	Pressure Altitude
8. Anti-Ice Cowl-L (discrete)	Anti-Ice Cowl Left
9. Anti-Ice Cowl-R (discrete)	Anti-Ice Cowl Right
10. Anti-ice Wing (discrete)	Anti-Ice on Wing
11. AP Cmd-C_All (discrete)	Autopilot Command-Center All
12. AP Cmd-C_MCPA (discrete)	Autopilot Command-Center_Mode Control Panel
13. AP Cmd-L_All (discrete)	Autopilot Command-Left All
14. AP Cmd-L_MCPA (discrete)	Autopilot Command-Left_Mode Control Panel
15. AP Cmd-R_All (discrete)	Autopilot Command-Right All
16. AP Cmd-R_MCPA (discrete)	Autopilot Command-Right_Mode Control Panel
17. AP CWS-C_All (discrete)	Autopilot Control Wheel Steering- Center_All
18. AP CWS-C_MCPA (discrete)	Autopilot Control Wheel Steering-Center_Mode Control Panel
19. AP CWS-L_All (discrete)	Autopilot Control Wheel Steering-Left_All
20. AP CWS-L_MCPA (discrete)	Autopilot Control Wheel Steering-Left_Mode Control Panel
21. AP CWS-R_All (discrete)	Autopilot Control Wheel Steering-Right_All
22. AP CWS-R_MCPA (discrete)	Autopilot Control Wheel Steering-Right_Mode Control Panel
23. AP Engage Detent-FCC C (discrete)	Autopilot Engage Detent- Flight Control Computer Center
24. AP Engage Detent-FCC L (discrete)	Autopilot Engage Detent- Flight Control Computer Left
25. AP Engage Detent-FCC R (discrete)	Autopilot Engage Detent- Flight Control Computer Right
26. AP_ALT Hold Mode Oper (discrete)	Autopilot_Altitude Hold Mode
27. AP_ALT Mode Oper (discrete)	Autopilot_Altitude Mode
28. AP_APPR Mode Oper (discrete)	Autopilot_Approach Mode
29. AP_ATT Hold Mode Oper (discrete)	Autopilot_Attitude Mode
30. AP_FL CH Mode Oper (discrete)	Autopilot_Flight Level Change Mode
31. AP_Flt Dir On-CAPT (discrete)	Autopilot_Flight Director On- Captain
32. AP_Flt Dir On-FO (discrete)	Autopilot_Flight Director On- First Officer

Parameter Name	Parameter Description
33. AP_GA Mode Oper-P (discrete)	Autopilot_Go Around Mode
34. AP_GA Mode Oper-R (discrete)	Autopilot_Go Around Mode
35. AP_Hdg Hold Mode Oper (discrete)	Autopilot_Heading Hold Mode
36. AP_Hdg Sel Mode Oper (discrete)	Autopilot_Heading Select Mode
37. AP_LOC Mode Oper (discrete)	Autopilot_Localizer Mode
38. AP_TO Mode Oper-P (discrete)	Autopilot_Takeoff Mode
39. AP_TO Mode Oper-R (discrete)	Autopilot_Takeoff Mode
40. AP_V NAV Mode Oper (discrete)	Autopilot_Vertical Navigation Mode
41. AP_VS Mode Oper (discrete)	Autopilot_Vertical Speed Mode
42. Ctrl Col Pos (deg)	Control Column Position
43. Ctrl Whl Pos-L (deg)	Left Control Wheel Position
44. Elevator-L (deg)	Left Elevator Position
45. Elevator-R (deg)	Right Elevator Position
46. Eng 1 N1 (%RPM)	Left Engine N1
47. Eng 2 N1 (%RPM)	Right Engine N1
48. Eng 1 N2 (%RPM)	Left Engine N2
49. Eng 2 N2 (%RPM)	Right Engine N2
50. Heading (deg)	Heading
51. Pitch (deg)	Pitch Angle
52. Roll (deg)	Roll Angle
53. Rudder (deg)	Rudder Position
54. Rudder Ped Pos (deg)	Rudder Pedal Position
55. Temp TAT (degC)	True air Temperature
56. Wind Direction (deg)	Wind Direction
57. Wind Spd (kts)	Wind Speed

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.

Table A-2. Unit abbreviations.

Units Abbreviation	Description
deg	degrees
kts	knots
g	unit of gravity
discrete	discrete
degC	degrees Celsius
ft	feet
%RPM	percent revolutions per minute

NOTE: For parameters with a unit description of discrete, 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.