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

April 23, 2018

Flight Data Recorder

Specialist's Factual Report
By Charles Cates

1. EVENT SUMMARY

Location:	San Francisco, California
Date:	July 7, 2017
Aircraft:	Airbus A320
Registration:	C-FKCK
Operator:	Air Canada
NTSB Number:	DCA17IA148

On July 7, 2017, about 2356 Pacific daylight time, Air Canada flight 759 (ACA759), an Airbus A320, Canadian registration C-FKCK, was cleared to land on runway 28R at San Francisco International Airport, San Francisco, California, but instead lined up on parallel taxiway C, where four air carrier airplanes (a Boeing 787 followed by an Airbus A340, another Boeing 787, and a Boeing 737) were awaiting takeoff clearance. ACA759 overflew the first airplane on the taxiway and descended below 100 ft above the ground, and the ACA759 flight crew initiated a go around. The flight was operated under the provisions of 14 *Code of Federal Regulations* Part 129 as an international scheduled passenger flight from Toronto/Lester B. Pearson International Airport, Toronto, Canada, with 135 passengers and 5 crewmembers on board. Night visual meteorological conditions prevailed at the time of the incident. The airplane was not damaged, and no injuries were reported.

2. FLIGHT DATA RECORDER GROUP

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

3. FDR Carriage Requirements

The event aircraft, C-FKCK, was delivered on January 17, 1992, and was operating such that it was required to be equipped with an FDR that recorded, at a minimum, 34 parameters, as cited in 14 CFR Part 129.20.

4. DETAILS OF FDR INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received an electronic file containing the FDR data from the C-FKCK aircraft.

4.1. FDR Data File 64 wps Description

The FDR data in the electronic file was configured such that 64 12-bit words of digital information were recorded 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 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 (for example, pressure altitude, magnetic heading, vertical acceleration) has a specifically assigned word number within the subframe.

4.1.1. Recording Description

The FDR recording contained approximately 108 hours of data. Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals one elapsed second. Because the aircraft continued to fly before the FDR was downloaded, the event flight was not the last flight of the recording. The event flight was the 9th from the last flight of the recording, and its duration was approximately 5 hours and 15 minutes. The FDR continued to record more than 41 hours of data in the 8 flights after the event flight.

4.1.2. Engineering Units Conversions

The engineering units conversions used for the data contained in this report are based on documentation from the aircraft manufacturer, Airbus. 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 A-1 lists the FDR parameters verified and provided in this report. Specifically, table A-1 lists the parameter names, parameter descriptions, and units. Additionally, table A-2 describes the unit and discrete abbreviations used in this report.

4.2. Time Correlation

Correlation of the FDR data from SRN to the event local time, pacific daylight time (PDT), was established with an offset generated with the air traffic control recordings transcript provided by the Air Traffic Control Group Chairman.

Accordingly, the time offset for the event flight data from SRN to local PDT is the following: PDT = SRN – 154,571. Therefore, for the rest of this report, all times are referenced as PDT, not SRN.

4.3. FDR Plots and Corresponding Tabular Data

Figures 1 to 8 contain FDR data recorded during the event. All the parameters listed in table A-1 are plotted except Latitude and Longitude. For more information on Latitude and Longitude position information, see the Aircraft Performance Specialist's Factual Report, located in the docket for this event.

[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 = +.

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 1-3 contain data from the full flight of aircraft basic parameters, engine parameters, and autoflight parameters, respectively.

Figures 4-5 contain data from the first approach in to SFO and the go around of aircraft basic parameters and autoflight parameters, respectively.

Figures 6-8 contain data from the time immediately before and after the go around of aircraft basic parameters, engine parameters, and flight control parameters, respectively.

The event flight departed at about 18:57 PDT, and climbed to 32,000 ft. The autopilot was engaged shortly after takeoff and remained engaged throughout the flight until the approach to SFO. Lateral navigation modes selected included NAV and HDG. Vertical modes selected included CLB, ALT, and DESC.

At about 21:08 PDT the aircraft climbed to 36,000 ft, where it cruised until the descent began at about 23:27 PDT. Engines were matched and followed commands throughout the flight.

Prior to the start of the descent, at 23:24 PDT, autopilot Altitude Selected jumped from the cruise altitude down to 8,000 ft. When the descent began, the autopilot lateral mode remained in Nav and vertical mode changed to Desc. According to the aircraft manufacturer, this is consistent with the autopilot operating in a managed descent profile mode. As the aircraft descended through about 14,500 ft at 23:36:30 PDT Altitude Selected increased to 10,944 ft. At 23:38:01 PDT Nav Lateral Mode changed to Hdg with no corresponding change in Nav Vertical mode. According to the aircraft manufacturer, this is consistent with the autopilot operating in an open descent profile at this time. Between 8,040 and 1,456 ft, the data shows that the aircraft could either be operating in an open descent profile, or in a managed descent profile without constraints.

During the descent leading up to the final approach, the autopilot was disengaged at about 23:53:28 PDT and then the aircraft leveled at about 1200 ft. At 23:54:02 PDT the flight directors were disengaged and the aircraft began its final approach in to SFO. The ILS radios were not tuned. When the flight directors disengaged, the FDR navigation mode parameters recorded a non-computed data (NCD) pattern which is indicative that the raw data was not available.

At 23:56:02 PDT the Radio Altitude recorded a value of 0 ft for a single point. This was due to a data dropout from the radio altimeter.

At 23:56:05 PDT the throttles were advanced. Radio Altitude, indicative of height above ground level (AGL), was about 84 ft at that time. The aircraft continued to descend as engine power and aircraft pitch increased over the next several seconds until the aircraft reached its minimum recorded altitude of 59 ft AGL at 23:56:07.4 PDT.

Left stick position of the pilot flying during the final descent was +/-5 degrees of neutral. When the go around was commanded, the left stick moved full forward for several seconds

and then moved to full back stick. The flight directors were engaged in the pitch and roll go around modes. Once the aircraft was climbing, the left stick moved back to neutral when the autopilot was reconnected at 23:56:28 PDT.

The aircraft circled SFO and returned for a landing at 00:11 PDT.

The corresponding tabular data used to create figures 1 to 8 including latitude and longitude are provided in electronic comma separated value (*.csv) format as attachment 1 to this report.

Figure 1. Plot of basic parameters during entire flight.

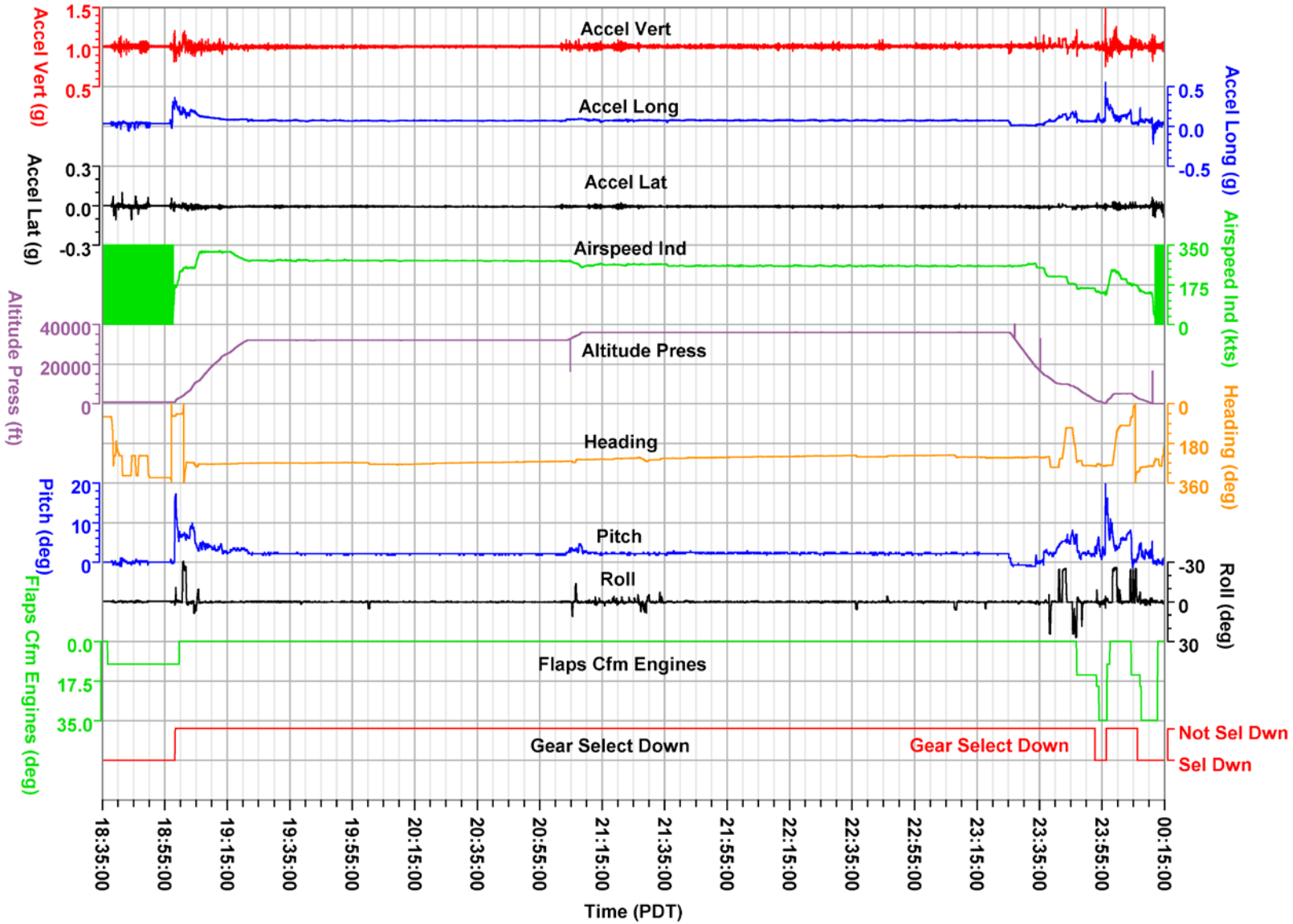


Figure 2. Plot of engine parameters during entire flight.

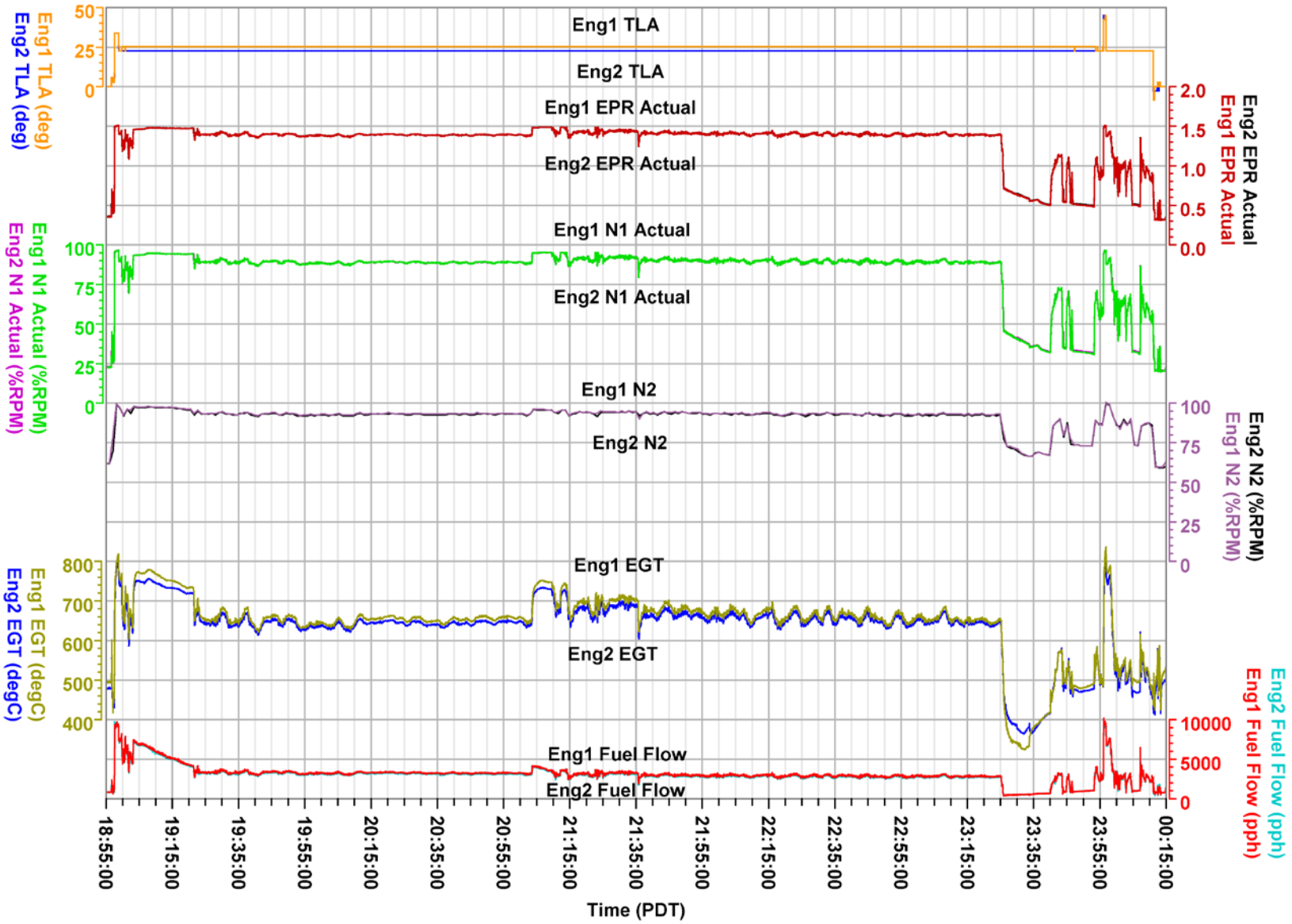


Figure 3. Plot of autoflight parameters during entire flight.

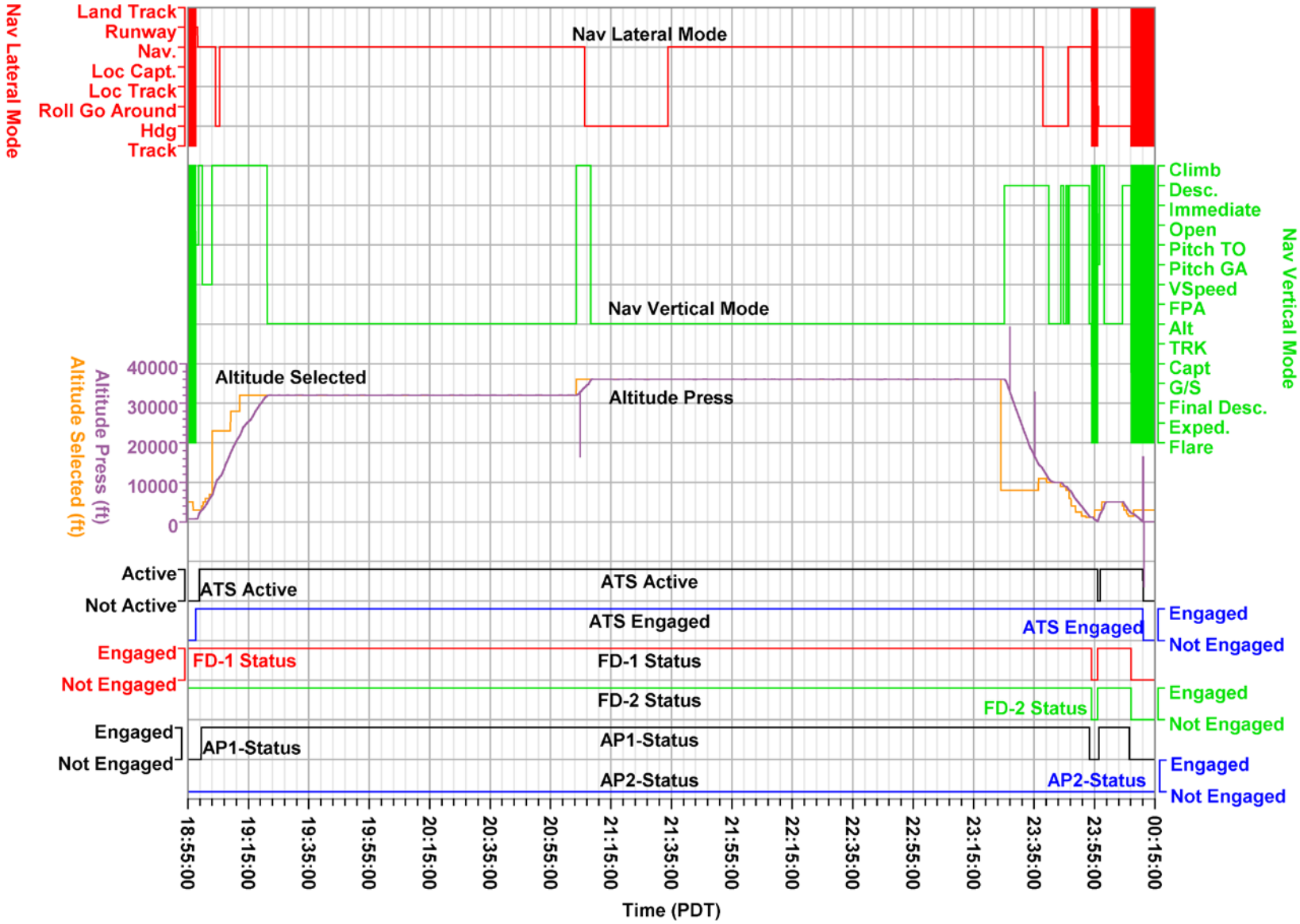


Figure 4. Plot of basic parameters during first approach and go-around.

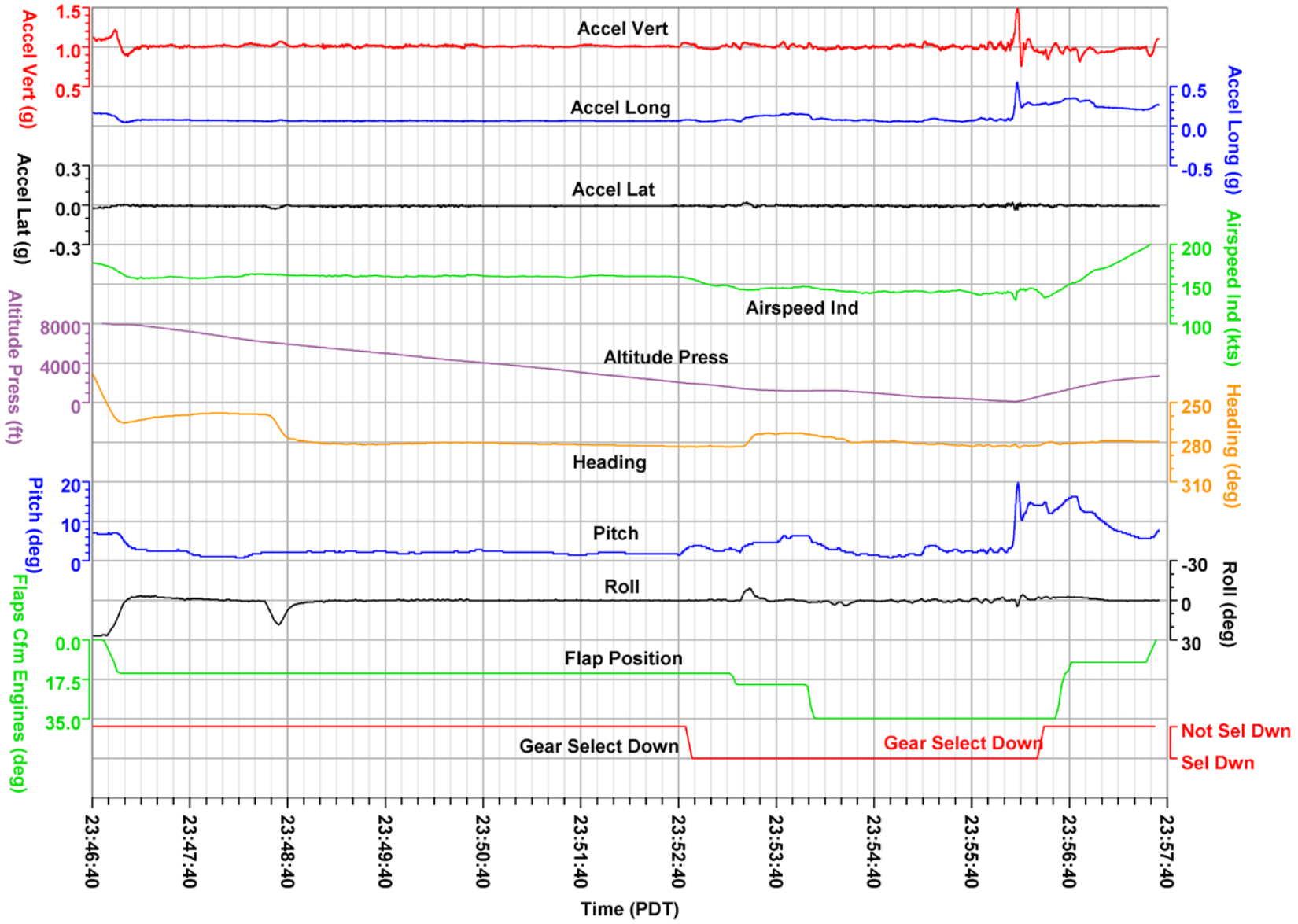


Figure 5. Plot of autoflight parameters during first approach and go-around.

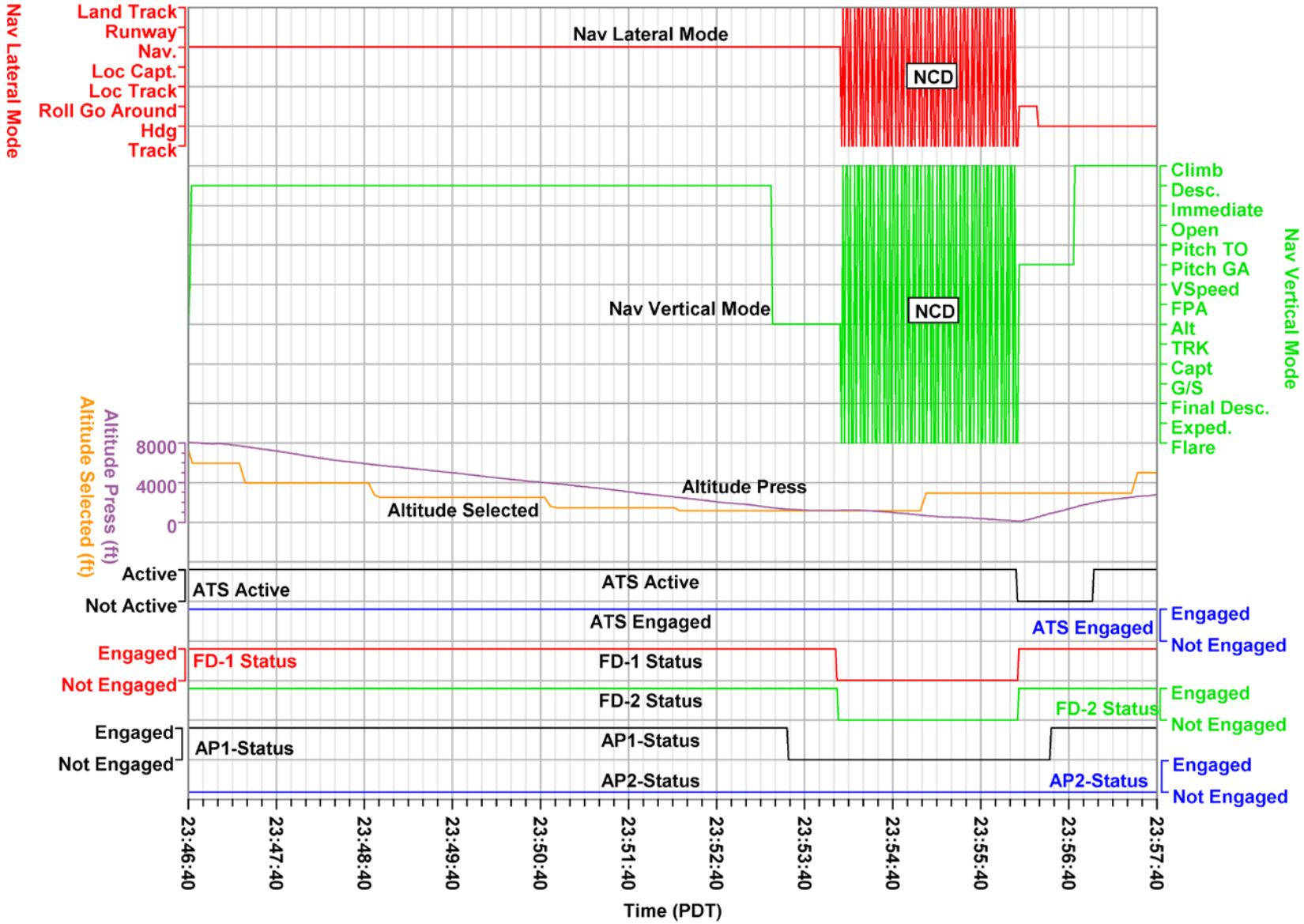


Figure 6. Plot of basic parameters during the go-around.

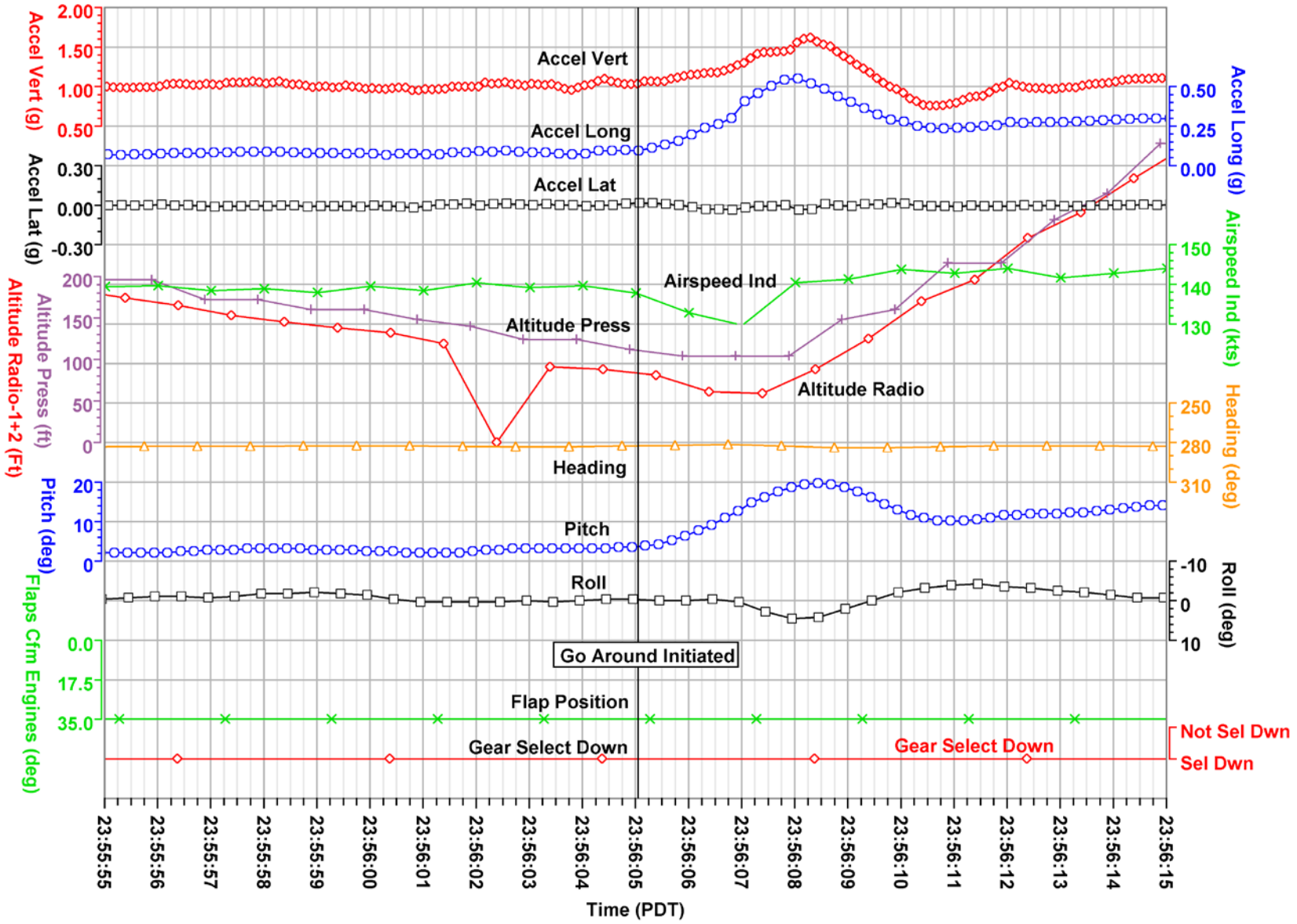


Figure 7. Plot detailing engine response during the go-around.

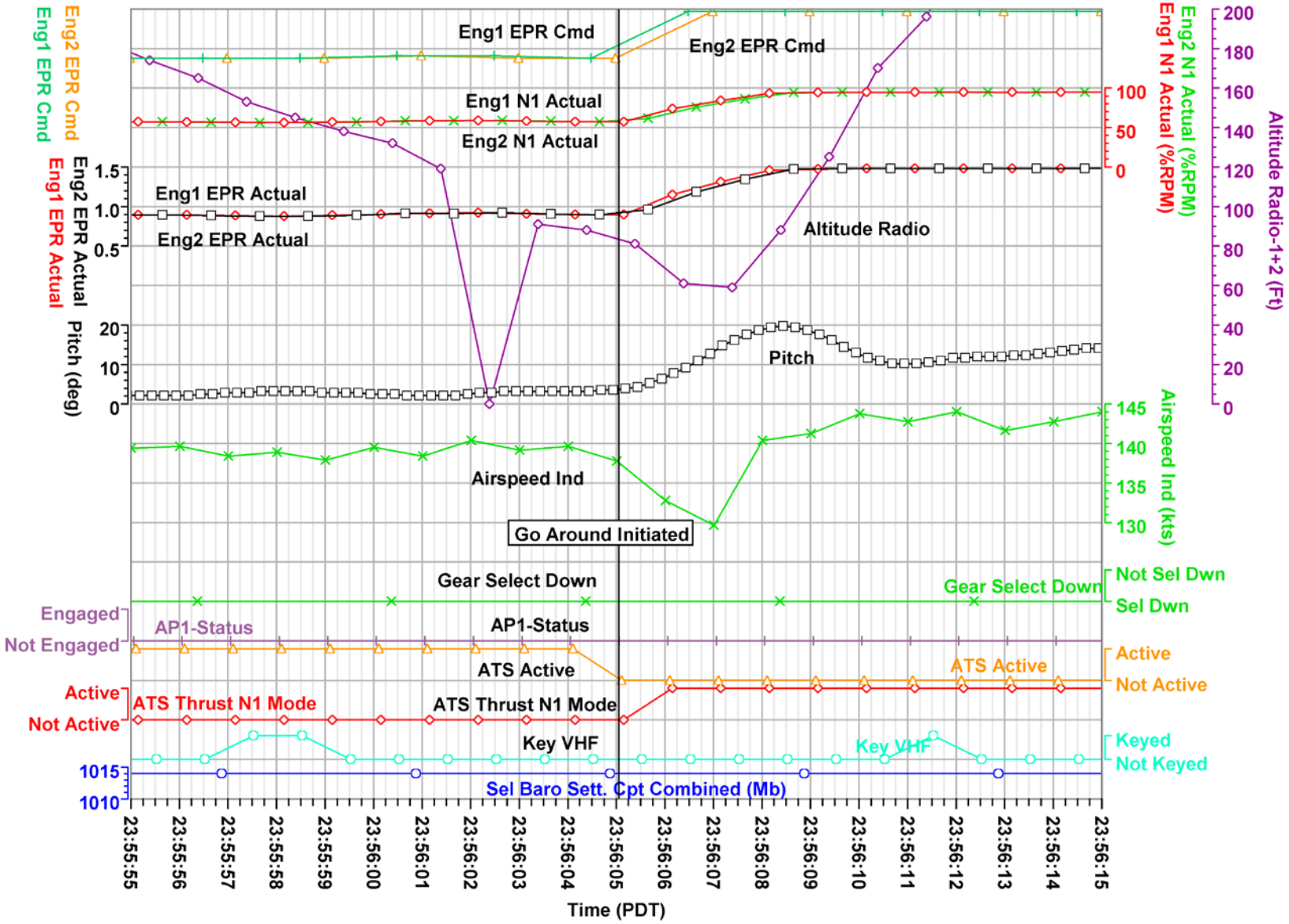
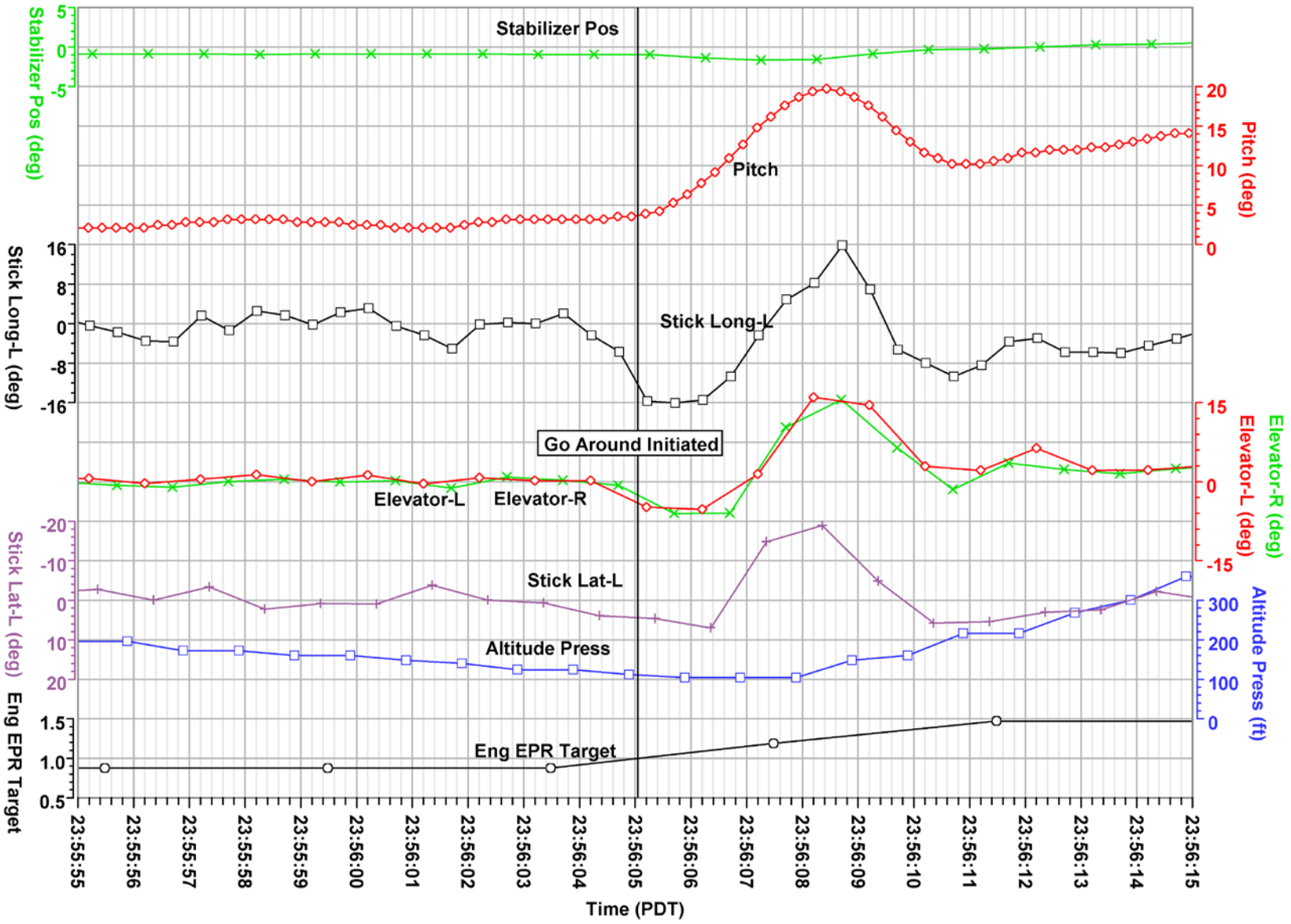


Figure 8. Plot detailing stick positions during the go around.



APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameter names, parameter descriptions, and units. Additionally, table A-2 describes the unit and discrete abbreviations used in this report.

Table A-1. Verified and provided FDR parameters.

Parameter Name	Parameter Description	Units
1. Accel Lat	Lateral Acceleration	g
2. Accel Long	Longitudinal Acceleration	g
3. Accel Vert	Vertical Acceleration	g
4. Airspeed Ind	Indicated Airspeed	kts
5. Altitude Press	Pressure Altitude	ft
6. Altitude Radio-1+2	Radio Altitude	ft
7. AP1-Status	Autopilot 1 Off/On	discrete
8. AP2-Status	Autopilot 2 Off/On	discrete
9. ATS Active	Autothrust system active	discrete
10. ATS Engaged	Autothrust system engaged	discrete
11. Elevator-L	Left Elevator Position	deg
12. Elevator-R	Right Elevator Position	deg
13. Eng EPR Target	Engine Exhaust Pressure Ratio Target	ratio
14. Eng# EGT	Engine # Exhaust Gas Temperature	deg C
15. Eng# EPR Actual	Engine # Actual Exhaust Pressure Ratio	ratio
16. Eng# EPR Cmd	Engine # Commanded Exhaust Pressure Ratio	ratio
17. Eng# Fuel Flow	Engine # Fuel Flow	pph
18. Eng# N1 Actual	Engine # Actual Fan Speed	%
19. Eng# N2	Engine # Core Speed	%
20. Eng# TLA	Engine # Throttle Lever Angle	deg
21. FD-1 Status	Flight Director 1 Off/On	discrete
22. FD-2 Status	Flight Director 2 Off/On	discrete
23. Flaps Cfm Engines	Flap Position	deg
24. Gear Select Down	Landing Gear Selected Down	discrete
25. Gear Select Up	Landing Gear Selected Up	discrete
26. Ground Speed	Ground Speed	kts
27. Heading	Magnetic Heading	deg
28. ILS1 Freq	Instrument Landing System 1 Tuned Frequency	MHz
29. ILS2 Freq	Instrument Landing System 2 Tuned Frequency	MHz
30. Key VHF	VHF Radio Transmit	discrete
31. Latitude	Latitude	deg
32. Longitude	Longitude	deg
33. Nav Lateral Mode	Autopilot Lateral Navigation Mode	discrete
34. Nav Vertical Mode	Autopilot Vertical Navigation Mode	discrete

Parameter Name	Parameter Description	Units
35. Pitch	Pitch Angle	deg
36. Roll	Roll Angle	deg
37. Stabilizer Pos	Stabilizer Position	deg
38. Stick Lat-L	Left Lateral Stick Position	deg
39. Stick Lat-R	Right Lateral Stick Position	deg
40. Stick Long-L	Left Longitudinal Stick Position	deg
41. Stick Long-R	Right Longitudinal Stick Position	deg

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 and discrete abbreviations.

Unit and discrete Abbreviations	Description
Alt	Altitude
deg	degrees
deg C	degrees Celsius
Desc	Descent
dwn	Down
Exped	Expedite
FPA	Flight Path Angle
ft	feet
G/S	Glideslope
Hdg	Heading
kts	knots
Loc Capt	Localizer Capture
MHz	Megahertz
Nav	Navigation
NCD	No Computed Data
Pitch GA	Go-Around Pitch
Pitch TO	Takeoff Pitch
pph	pounds per hour
rpm	revolutions per minute
TRK	Track
Vspeed	Vertical Speed