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

October 1, 2020

# Flight Data Recorder

**Specialist's Factual Report**
**By Cassandra Johnson**

## 1. EVENT SUMMARY

Location: Presque Isle, Maine
Date: March 4, 2019
Aircraft: Embraer EMB-145XR
Registration: N14171
Operator: CommutAir
NTSB Number: DCA19FA089

On March 4, 2019, about 11:29 eastern standard time (EST), CommutAir flight 4933, dba United Express, an EMB-145XR, registration N14171, landed at Presque Isle Airport (KPQI), Maine, to the right side of the runway 01, in light to moderate snow. On board were the captain, the first officer, one flight attendant, and 28 passengers. Two passengers and one crewmember received minor injuries, and the airplane received substantial damage. The regularly scheduled domestic passenger flight was operating under the provisions of 14 *Code of Federal Regulations* Part 121 from Newark International Airport (KEWR), Newark New Jersey.

The First Officer (FO) was the Pilot Flying and the Captain (CPT) was the Pilot Monitoring during the flight from KEWR. The crew opted to go around during their first approach to the instrument landing system (ILS) runway 01at KPQI and touched down to the right side of the runway during the second approach.

## 2. FLIGHT DATA RECORDER GROUP

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

## 3. FDR CARRIAGE REQUIREMENTS

The event aircraft, N14171, was manufactured in 2004, and was operating such that it was required to be equipped with an FDR that recorded, at a minimum, 88 parameters, as cited in 14 CFR Part 121.344(f).

## 4. DETAILS OF FDR INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following FDR:

Recorder Manufacturer/Model: **Honeywell 4700**
Recorder Serial Number: **SSFDR-08917**

## 4.1. Honeywell 4700 Description

The Honeywell solid state flight data recorder (SSFDR) records airplane flight information in a digital format using solid-state flash memory as the recording medium. The SSFDR 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 256 12-bit words of digital information every second. Each grouping of 256 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 256-word intervals. Each data parameter (for example, altitude, heading, and airspeed) has a specifically assigned word number within the subframe. The SSFDR 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 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 1 hours and 24 minutes. The parameters evaluated for the purpose of this report appeared to be in accordance with federal FDR carriage requirements.

### 4.1.3. 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 A-1 lists the FDR parameters verified and provided in this report. Additionally, table A-2 describes the unit and discrete abbreviations used in this report.

### 4.1.4. Non-Computed Data Pattern

Some parameters recorded 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.

The following 4 parameters recorded an NCD pattern when the aircraft was on the ground:

- Wind Direction - 1 (Wind Dir-1)
- Wind Direction - 2 (Wind Dir-2)
- Wind Speed - 1 (Wind Spd-1)
- Wind Speed - 2 (Wind Spd-2)

[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 = +.

Due to the severity of the event, the following 4 parameters recorded an NCD pattern after touchdown:

- Inboard Wheel Speed - 1 (Wheel Spd Inbd-1)
- Inboard Wheel Speed - 2 (Wheel Spd Inbd-2)
- Outboard Wheel Speed - 1 (Wheel Spd Outbd-1)
- Outboard Wheel Speed - 2 (Wheel Spd Outbd-2)

### 4.1.5. Radio Altitude - 2

Due to the severity of the event, Radio Altitude - 2 (Altitude Radio-2) recorded 2,550 feet (ft) after touchdown.

## 4.2. Time Correlation

Correlation of the FDR data from SRN to the event local time, EST, was established by using the recorded GMT[2] hours, GMT Minutes, and GMT Seconds and then applying an additional 5 hours offset to change GMT to EST.

Accordingly, the time offset for the event flight data from SRN to local EST is the following: EST = SRN – 56,345. Therefore, for the rest of this report, all times are referenced as EST, not SRN.

## 4.3. FDR Plots and Corresponding Tabular Data

Figures 1 to 10 contain FDR data recorded during the event on March 4, 2019. All the parameters listed in table A-1 are plotted except Latitude - Flight Management System (FMS) 1, Longitude - FMS 1, Latitude - FMS 2, Longitude - FMS 2, GMT Hours, GMT Minutes, and GMT Seconds.

Figures 1 to 5 cover the first attempted approach starting at a pressure altitude[3] of 4,802 feet (ft) and includes the go-around and the final approach through the landing event. These figures cover 27 minutes of data from 11:03:30 EST to 11:30:30 EST.

Figures 6 to 10 focus on the final approach through the landing event. These figures cover 13 minutes of data from 11:17:35 EST to 11:30:35 EST.

Additionally, 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 FDR data indicated at 11:06:58 EST (about 1 hour and three minutes after takeoff), the aircraft began its first approach into KPQI. During this approach, the aircraft descended to a minimum pressure altitude of 703 ft before it began its ascent and go-around at 11:10:04 EST.

At approximately 11:25:42 EST while at a pressure altitude of approximately 3,400 ft, the aircraft started its final descent to KPQI. At 11:28:56 EST, the air to ground switch

[2] GMT is Greenwich Mean Time which is also known as Coordinated Universal Time (UTC).
[3] This FDR records pressure altitude which is based on a standard altimeter setting of 29.92 inches of mercury (in Hg).

(Air/Ground Switch) changed from Air to Ground (Grnd) and about 1 second later at 11:28:57 EST, the vertical acceleration (Accel Vert) peaked at a maximum value of 3.35 g's. At 11:29:14 EST, the ground speed (Ground Spd) decreased to 0 knots (kts) when the aircraft came to a complete rest.

The tabular data for all the parameters listed in table A-1 for the entire flight from 10:00:00 EST to 11:30:35 EST are provided in electronic comma separated value (.csv) format as attachment 1 to this factual report.

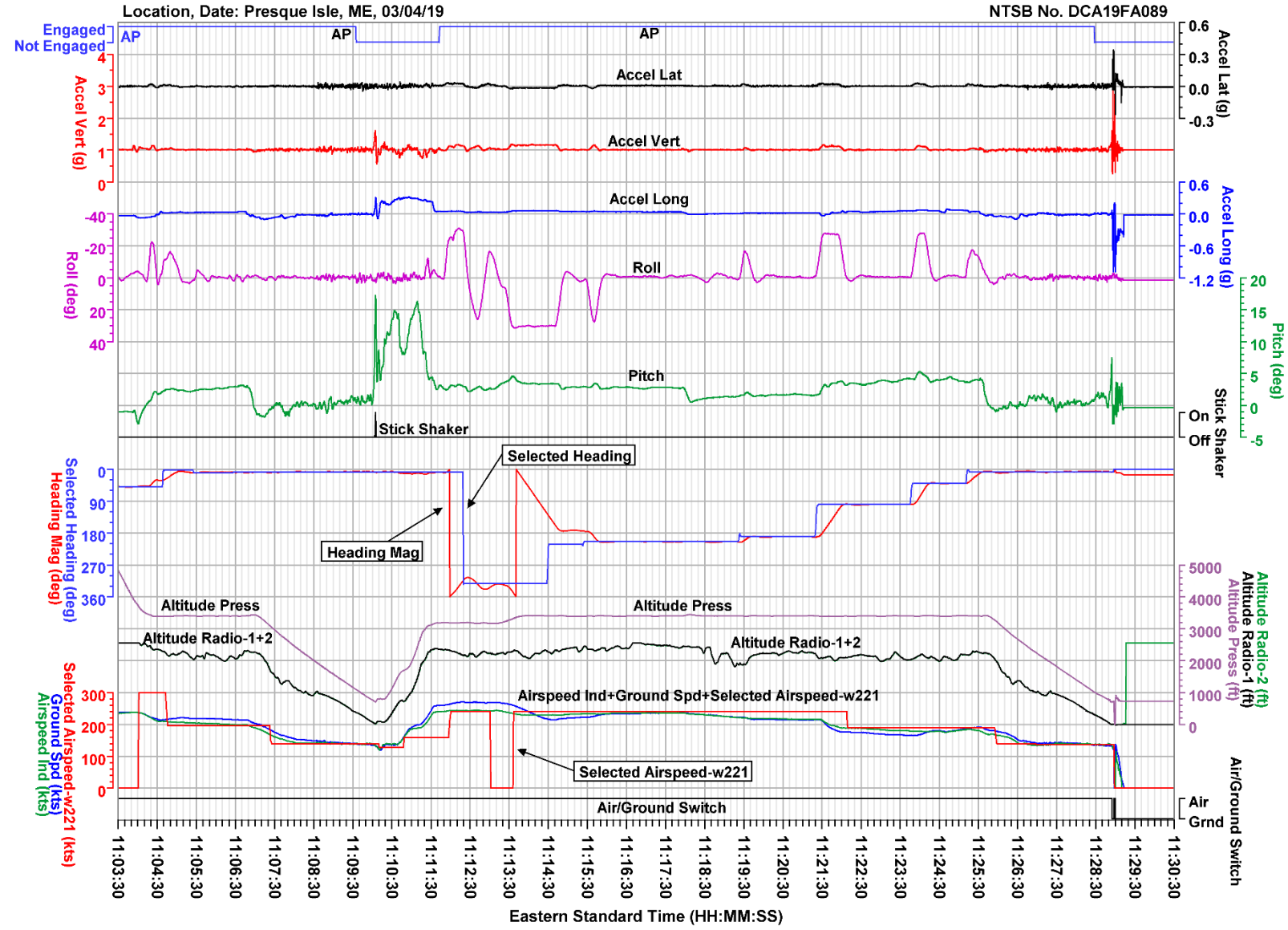


**Figure 1. Plot of basic parameters (first attempted approach to landing).**

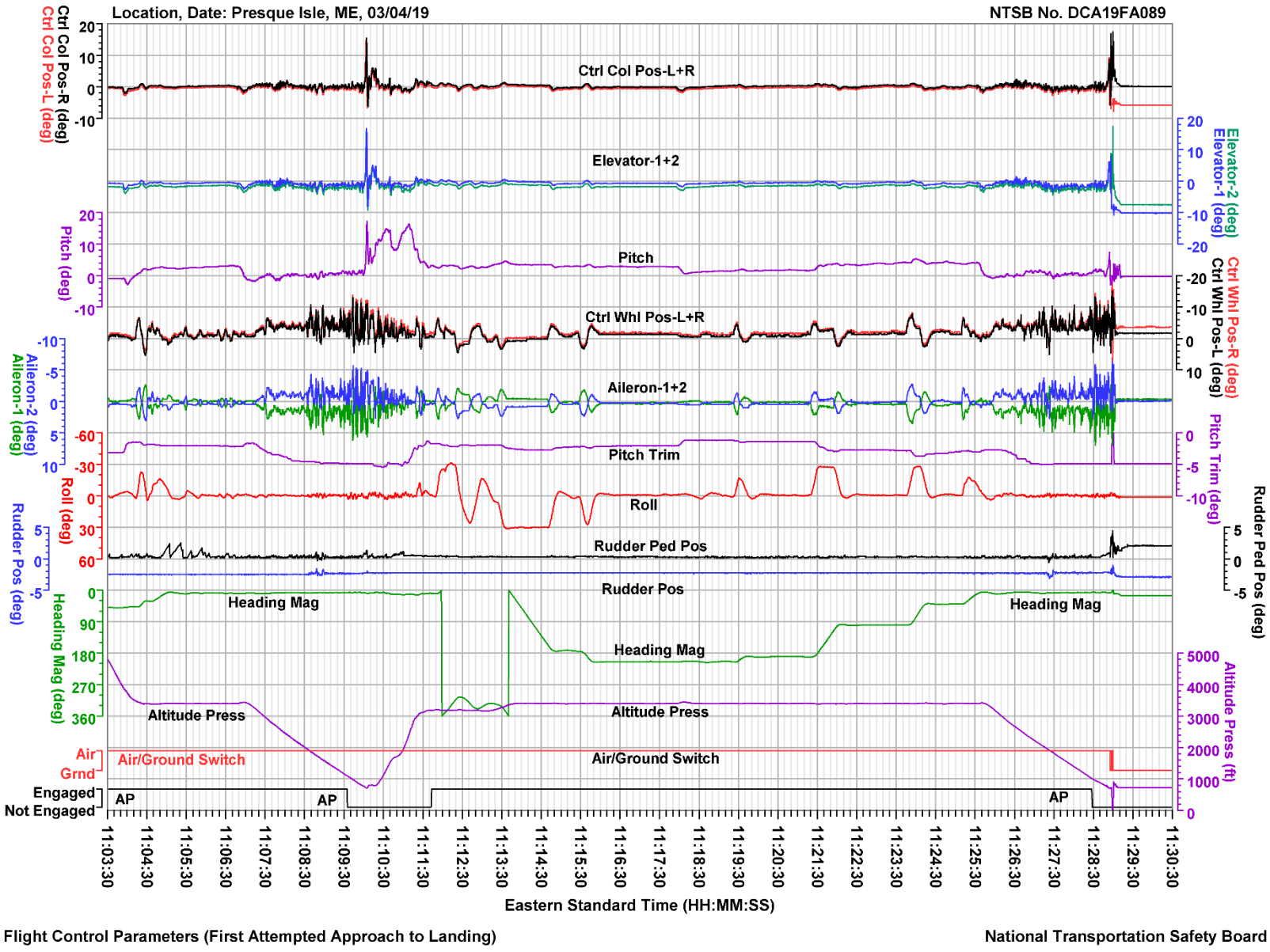


**Figure 2. Plot of flight control parameters (first attempted approach to landing).**

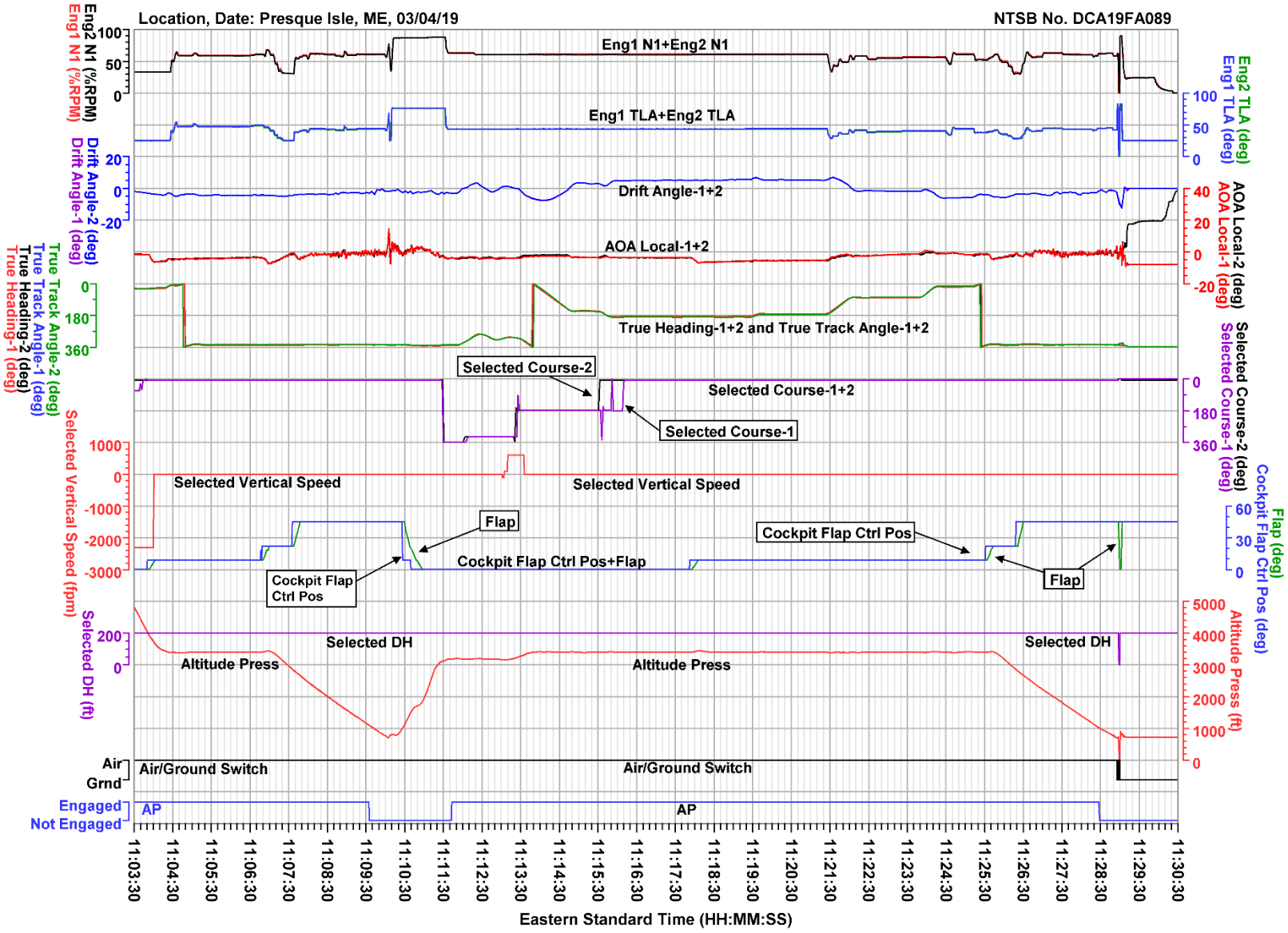


**Figure 3. Plot of select parameters (first attempted approach to landing).**

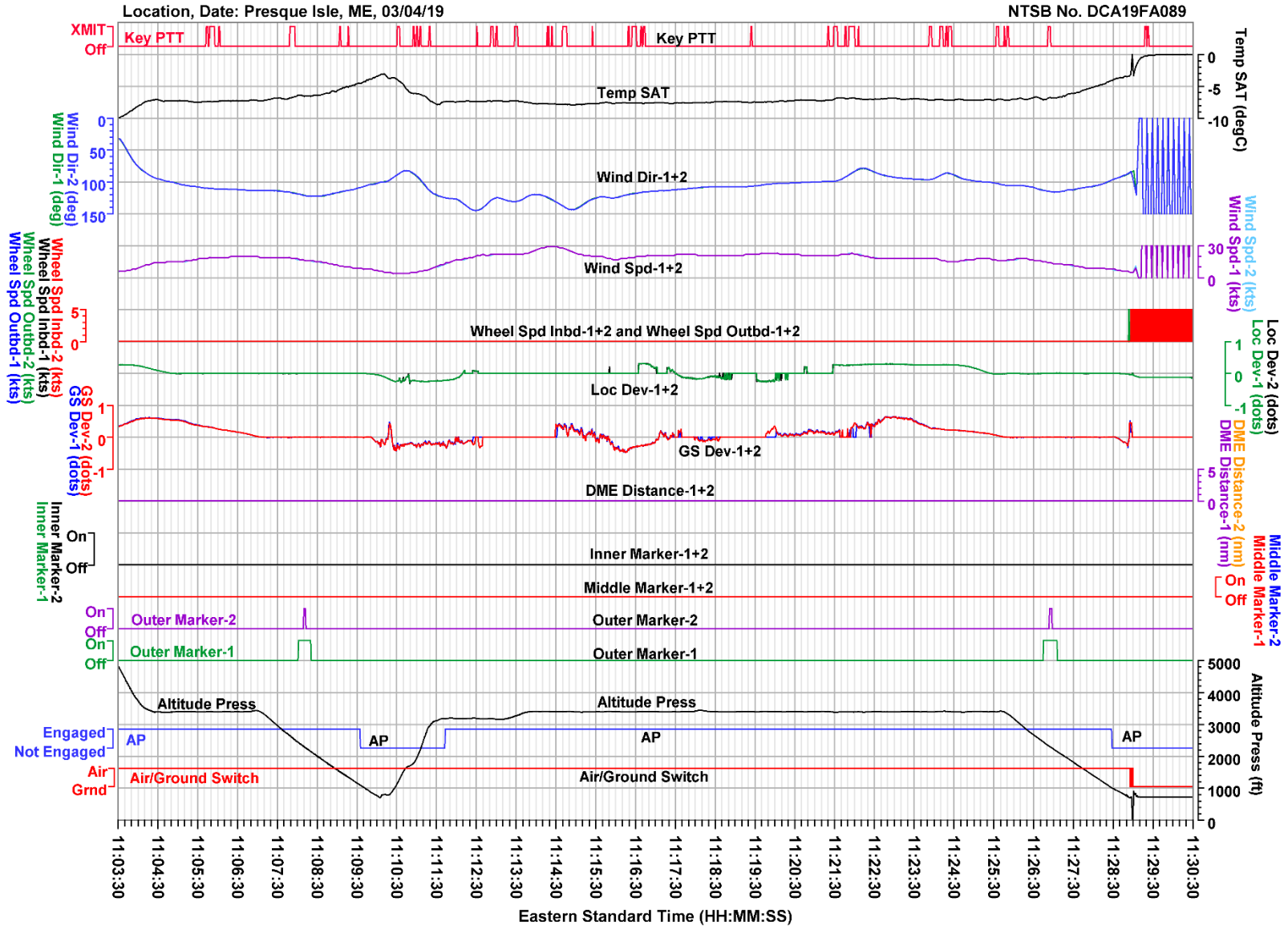


**Figure 4. Plot of additional parameters (first attempted approach to landing).**

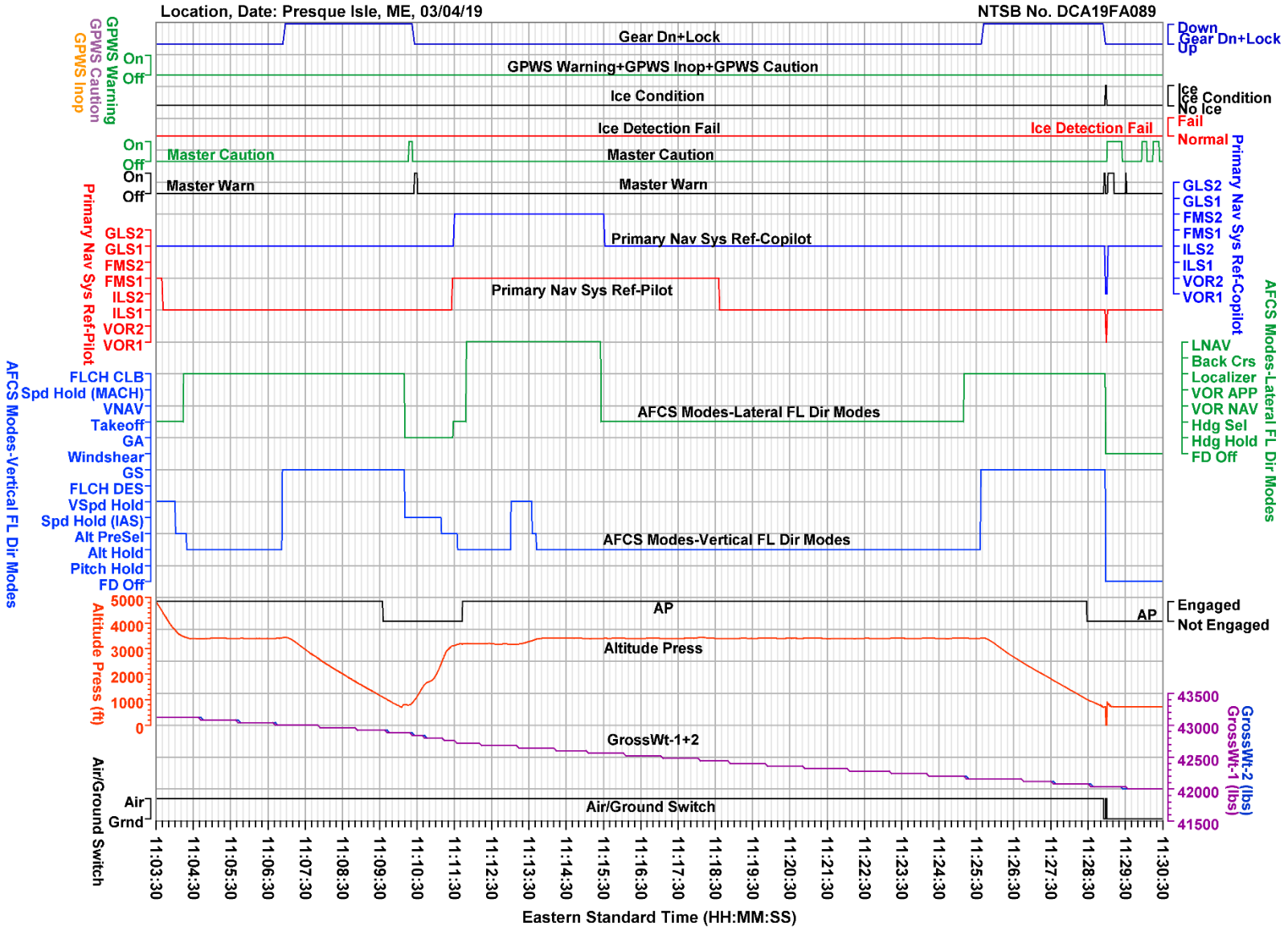


**Figure 5. Plot of additional parameters continued (first attempted approach to landing).**

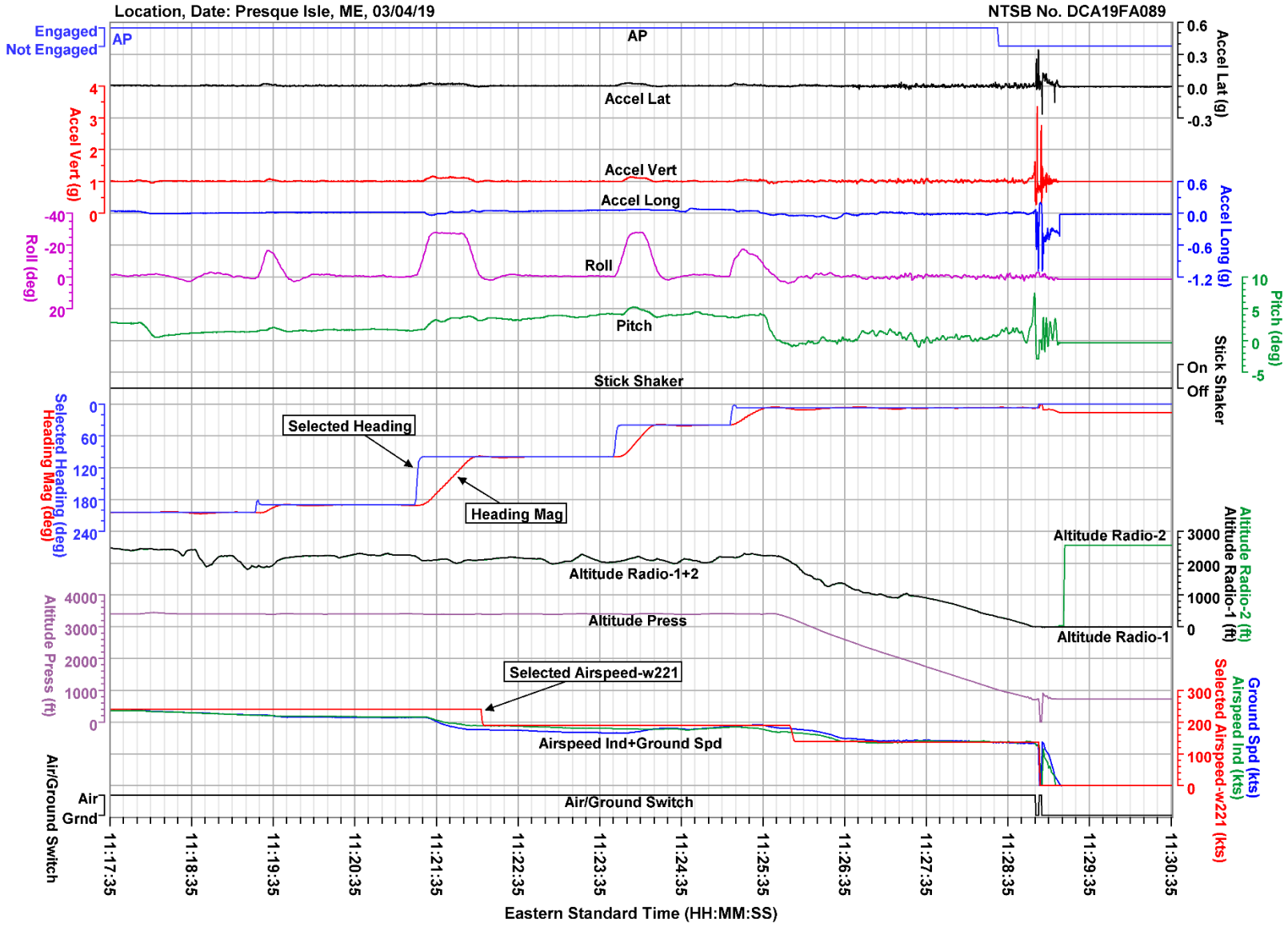


**Figure 6. Plot of basic parameters (final approach to landing).**

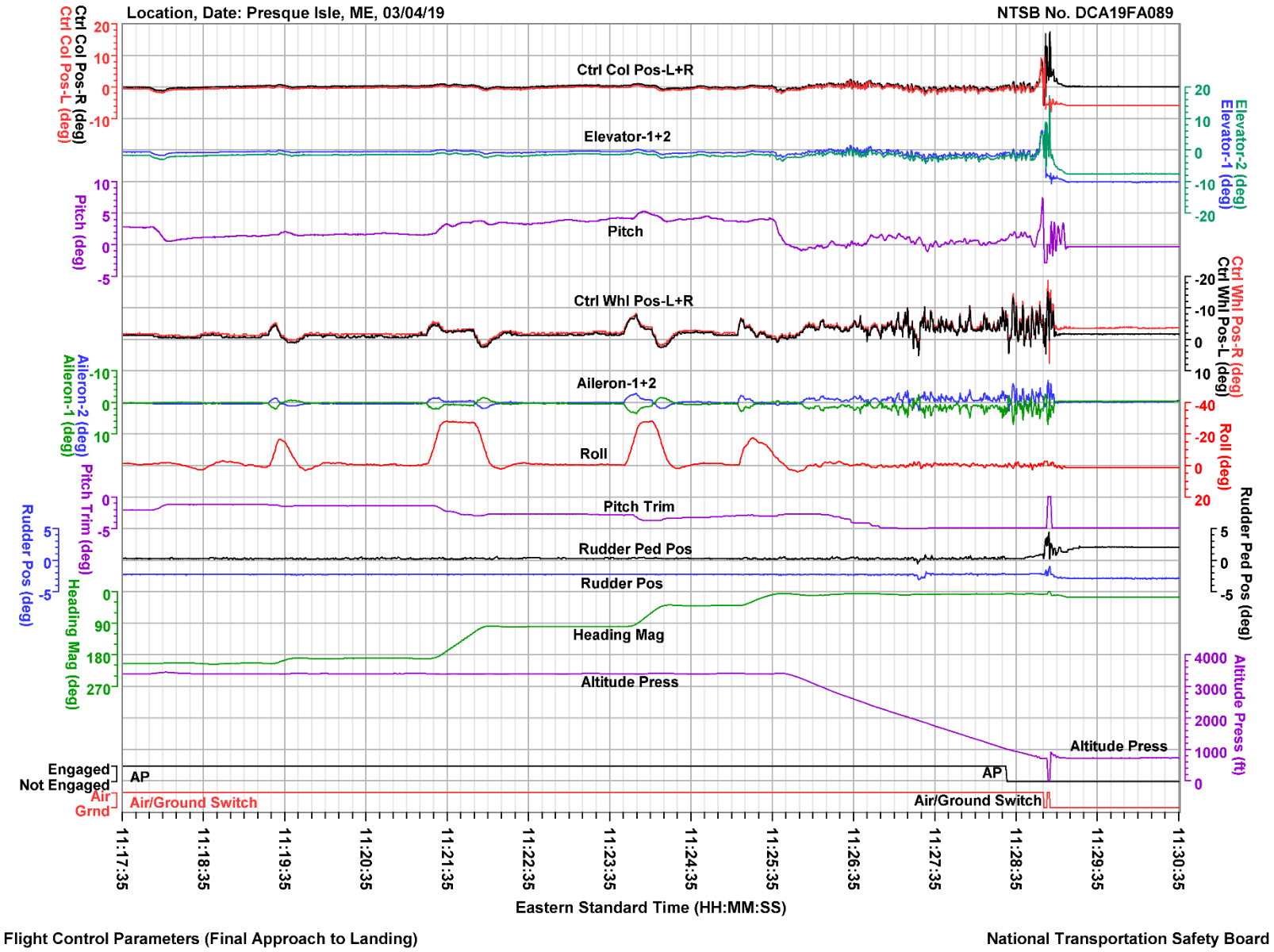


**Figure 7. Plot of flight control parameters (final approach to landing).**

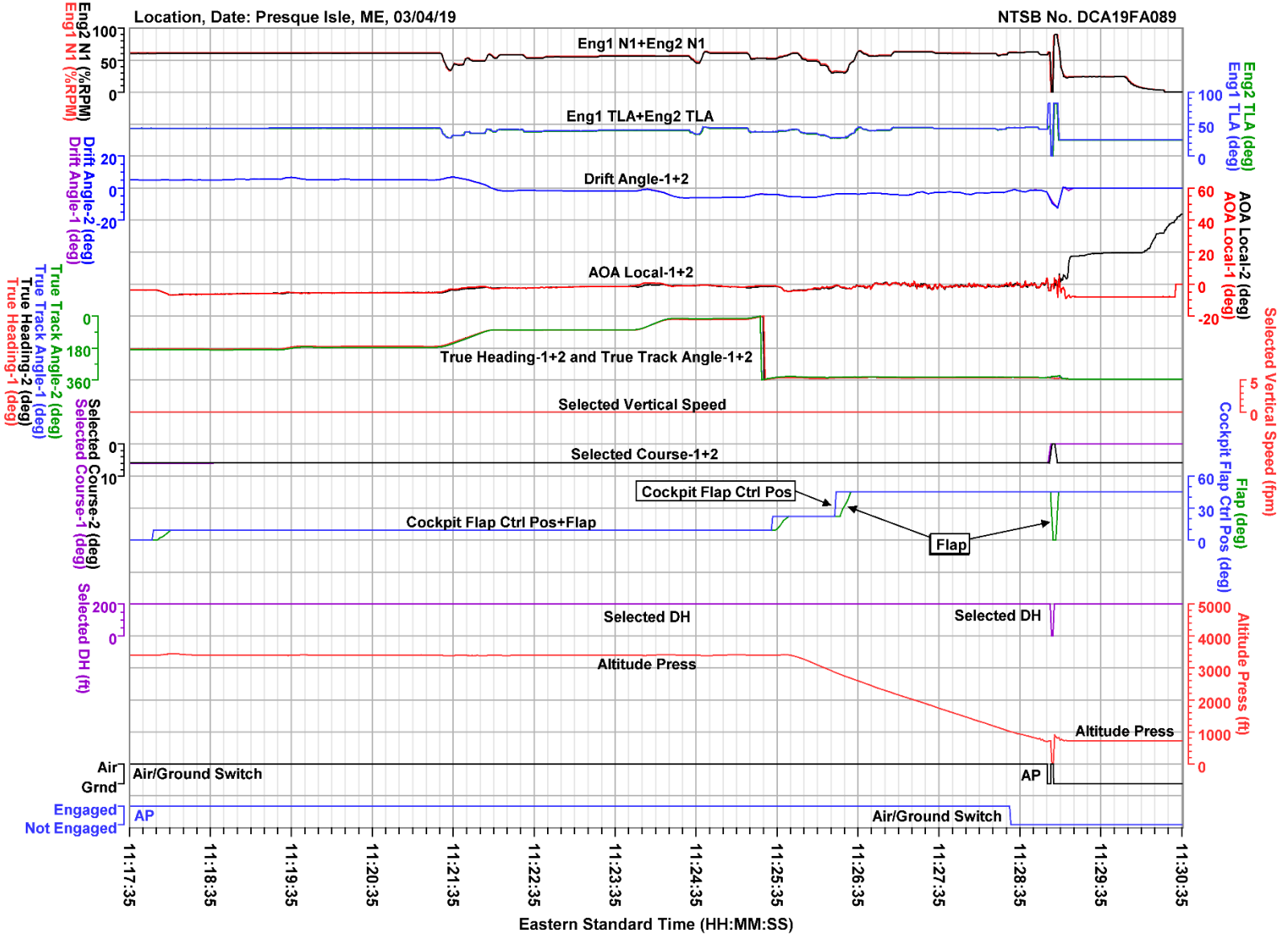


**Figure 8. Plot of select parameters (final approach to landing).**

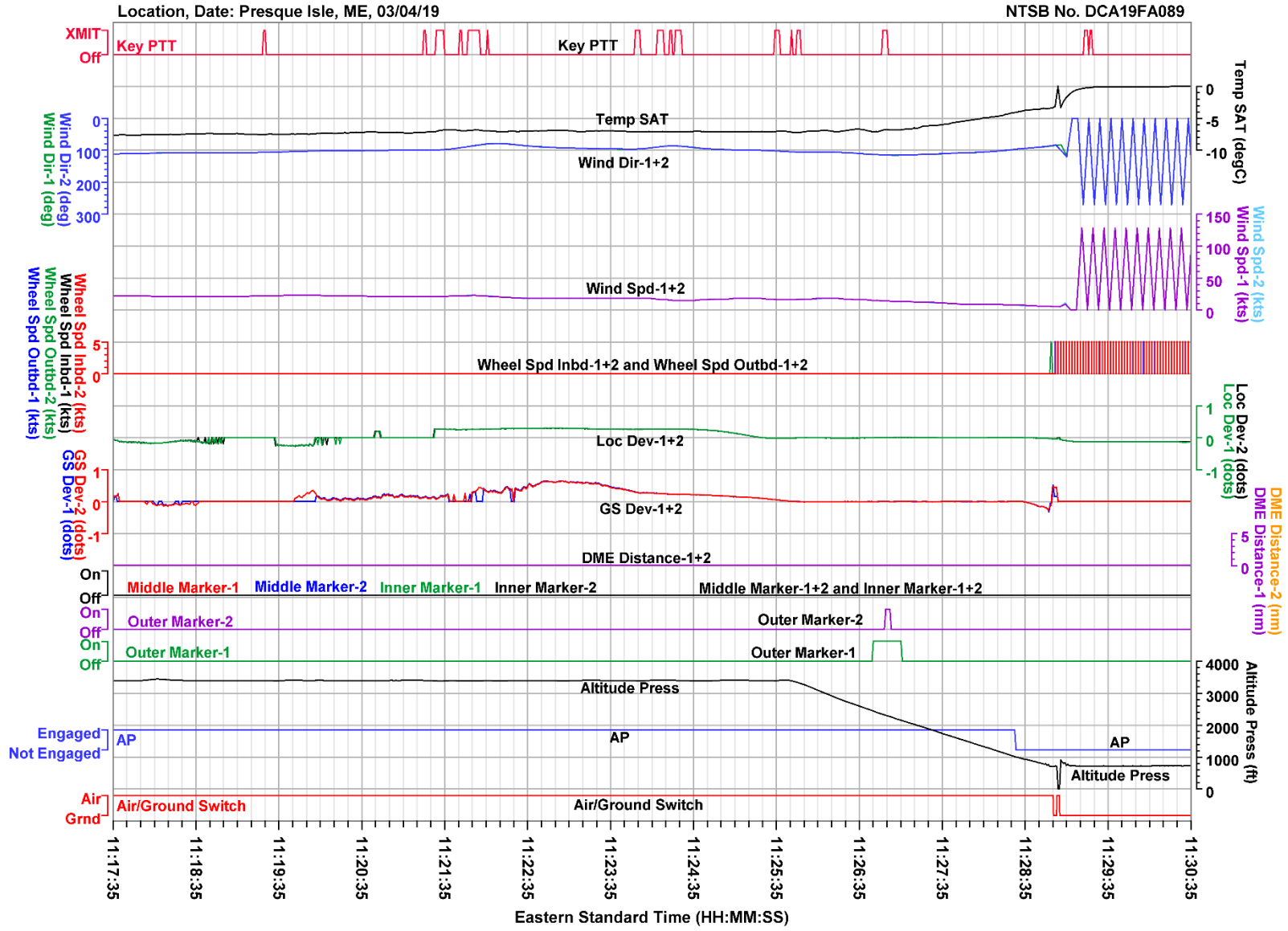


**Figure 9. Plot of additional parameters (final approach to landing).**

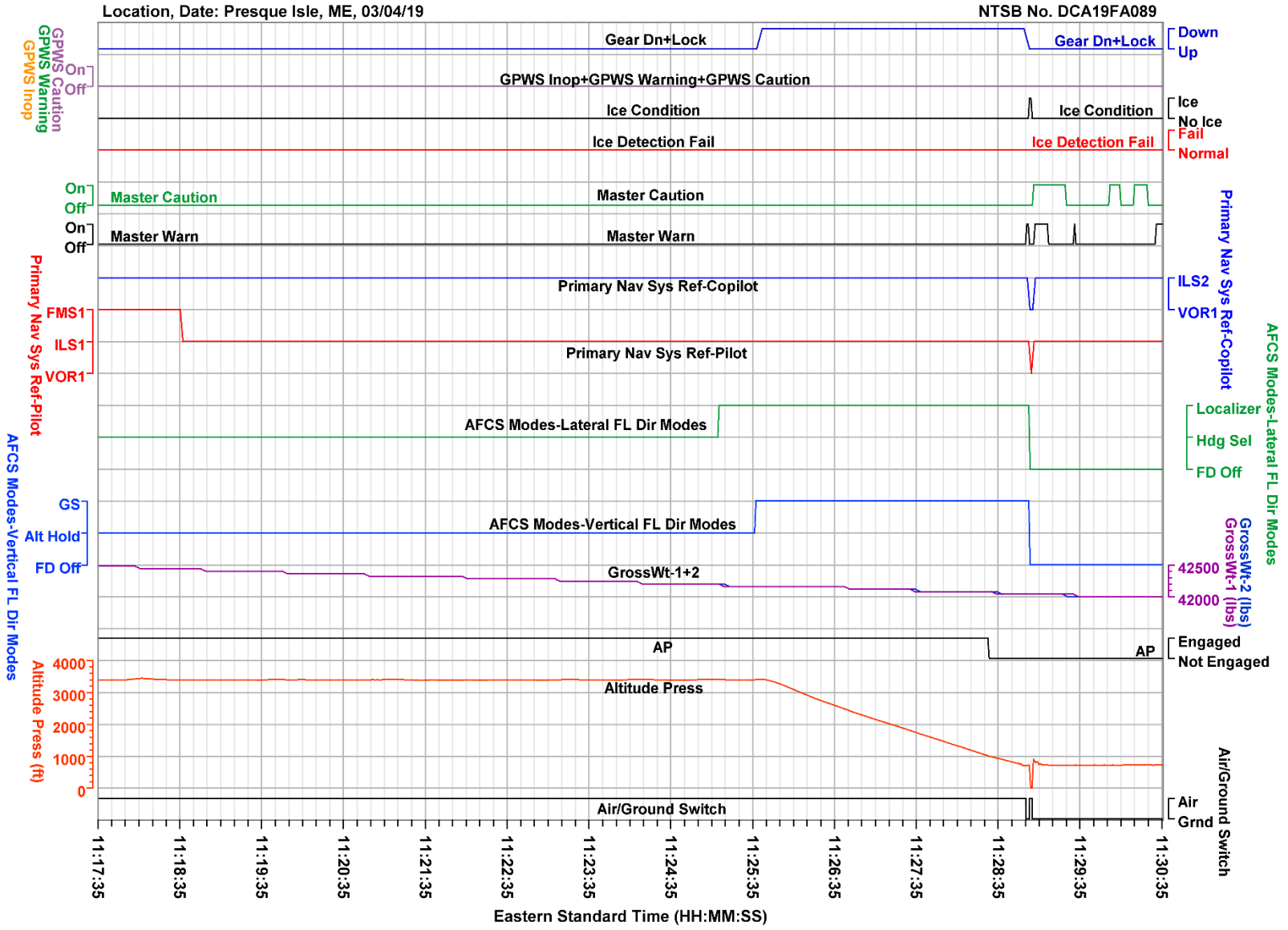


**Figure 10. Plot of additional parameters continued (final approach to landing).**

# APPENDIX A

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

**Table A-1. Verified and provided FDR parameters.**

| Plot/Table Labels | Parameter Description | Units |
|---|---|---|
| Accel Lat | Lateral Acceleration | g |
| Accel Long | Longitudinal Acceleration | g |
| Accel Vert | Normal Acceleration | g |
| AFCS Modes-Lateral FL Dir Modes | Automatic Flight Control System Modes - Lateral Flight Director Modes | |
| AFCS Modes-Vertical FL Dir Modes | Automatic Flight Control System Modes - Vertical Flight Director Modes | |
| Aileron-1 | Aileron Surface Position-1 | deg |
| Aileron-2 | Aileron Surface Position-2 | deg |
| Air/Ground Switch | Air to Ground Switch | |
| Airspeed Ind | Indicated Airspeed | kts |
| Altitude Press | Pressure Altitude | ft |
| Altitude Radio-1 | Radio Altitude - 1 | ft |
| Altitude Radio-2 | Radio Altitude - 2 | ft |
| AOA Local-1 | Local Angle of Attack - 1 | deg |
| AOA Local-2 | Local Angle of Attack - 2 | deg |
| AP | Autopilot Engaged | |
| Cockpit Flap Ctrl Pos | Cockpit Flap Control Position | deg |
| Ctrl Col Pos-L | Control Column Position - Pilot Side | deg |
| Ctrl Col Pos-R | Control Column Position - Copilot Side | deg |
| Ctrl Whl Pos-L | Control Wheel Position – Pilot Side | deg |
| Ctrl Whl Pos-R | Control Wheel Position – Copilot Side | deg |
| DME Distance-1 | Distance Measuring Equipment Distance-1 | nm |
| DME Distance-2 | Distance Measuring Equipment Distance-2 | nm |
| Drift Angle-1 | Drift Angle-1 | deg |
| Drift Angle-2 | Drift Angle-2 | deg |
| Elevator-1 | Elevator Surface Position - 1 | deg |
| Elevator-2 | Elevator Surface Position - 2 | deg |
| Eng1 N1 | Engine 1 Fan Speed | %RPM |
| Eng1 TLA | Engine 1 Thrust lever Angle | deg |
| Eng2 N1 | Engine 2 Fan Speed | %RPM |
| Eng2 TLA | Engine 2 Thrust lever Angle | deg |
| Flap | Flap Position | deg |
| Gear Dn+Lock | Landing Gear Down and Locked | |
| GPWS Caution | Ground Proximity Warning System Caution | |
| GPWS Inop | Ground Proximity Warning System Inoperative | |
| GPWS Warning | Ground Proximity Warning System Warning | |
| GrossWt-1 | Gross Weight - 1 | lbs |
| GrossWt-2 | Gross Weight - 2 | lbs |
| Ground Spd | Ground Speed | kts |
| GS Dev-1 | Glide Slope Deviation - 1 | dots |
| GS Dev-2 | Glide Slope Deviation - 2 | dots |
| Heading Mag | Magnetic Heading | deg |
| Ice Condition | Ice Condition | |
| Ice Detection Fail | Ice Detection Fail | |
| Inner Marker-1 | Inner Marker-1 | |
| Inner Marker-2 | Inner Marker-2 | |
| Key PTT | Microphone Keying - Push To Talk | |

# APPENDIX A

| Plot/Table Labels | Parameter Description | Units |
|---|---|---|
| Latitude - FMS 1 | Latitude Position - Flight Management System 1 | |
| Latitude - FMS 2 | Latitude Position - Flight Management System 2 | |
| Loc Dev-1 | Localizer Deviation - 1 | dots |
| Loc Dev-2 | Localizer Deviation - 2 | dots |
| Longitude - FMS 1 | Longitude Position - Flight Management System 1 | |
| Longitude - FMS 2 | Longitude Position - Flight Management System 2 | |
| Master Caution | Master Caution | |
| Master Warn | Master Warn | |
| Middle Marker-1 | Middle Marker-1 | |
| Middle Marker-2 | Middle Marker-2 | |
| Outer Marker-1 | Outer Marker-1 | |
| Outer Marker-2 | Outer Marker-2 | |
| Pitch | Pitch Attitude | deg |
| Pitch Trim | Pitch Trim Position | deg |
| Primary Nav Sys Ref-Copilot | Primary Navigation System Reference - Copilot | |
| Primary Nav Sys Ref-Pilot | Primary Navigation System Reference - Pilot | |
| Roll | Roll Attitude | deg |
| Rudder Ped Pos | Rudder Pedal Position | deg |
| Rudder Pos | Rudder Surface Position | deg |
| Selected Airspeed-w221 | Selected Airspeed | kts |
| Selected Course-1 | Selected Course - 1 | deg |
| Selected Course-2 | Selected Course - 2 | deg |
| Selected DH | Selected Decision Height | ft |
| Selected Heading | Selected Heading | deg |
| Selected Vertical Speed | Selected Vertical Speed | fpm |
| Stick Shaker | Stick Shaker | |
| Temp SAT | Static Air Temperature | degC |
| Time GMT Hrs | Greenwich Mean Time Hours | hrs |
| Time GMT Min | Greenwich Mean Time Minutes | min |
| Time GMT Sec | Greenwich Mean Time Seconds | sec |
| True Heading-1 | True Heading - 1 | deg |
| True Heading-2 | True Heading - 2 | deg |
| True Track Angle-1 | True Track Angle - 1 | deg |
| True Track Angle-2 | True Track Angle - 2 | deg |
| Wheel Spd Inbd-1 | Inboard Wheel Speed - 1 | kts |
| Wheel Spd Inbd-2 | Inboard Wheel Speed - 2 | kts |
| Wheel Spd Outbd-1 | Outboard Wheel Speed - 1 | kts |
| Wheel Spd Outbd-2 | Outboard Wheel Speed - 2 | kts |
| Wind Dir-1 | Wind Direction - 1 | deg |
| Wind Dir-2 | Wind Direction - 2 | deg |
| Wind Spd-1 | Wind Speed - 1 | kts |
| Wind Spd-2 | Wind Speed - 2 | kts |

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 A-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 A-2. Unit and discrete abbreviations.**

| Unit and discrete Abbreviations | Descriptions |
|---|---|
| %RPM | percent revolutions per minute |
| Alt Hold | Altitude Hold |

# APPENDIX A

| Unit and discrete Abbreviations | Descriptions |
|---|---|
| Alt PreSel | Altitude Preselect |
| Back Crs | Back Course |
| deg | degrees |
| degC | degrees Celsius |
| FD Off | Flight Director Off |
| FLCH CLB | Flight Level Change Climb |
| FLCH DES | Flight Level Change Descend |
| FMS1 | Flight Management System 1 |
| FMS2 | Flight Management System 2 |
| fpm | feet per minute |
| ft | feet |
| GA | Go Around |
| GLS1 | Ground Based Augmentation System Landing System 1 |
| GLS2 | Ground Based Augmentation System Landing System 2 |
| Grnd | Ground |
| GS | Glide Slope |
| Hdg Hold | Heading Hold |
| Hdg Sel | Heading Select |
| hrs | hours |
| ILS1 | Instrument Landing System 1 |
| ILS2 | Instrument Landing System 2 |
| kts | knots |
| lbs | pounds |
| LNAV | Lateral Navigation |
| min | minutes |
| nm | nautical miles |
| sec | seconds |
| Spd Hold | Speed Hold |
| Spd Hold (IAS) | Speed Hold (Indicated Airspeed) |
| VNAV | Vertical Navigation |
| VOR APP | Very High Frequency (VHF) Omni-Directional Range Approach |
| VOR NAV | Very High Frequency (VHF) Omni-Directional Range Navigation |
| VOR1 | Very High Frequency (VHF) Omni-Directional Range System 1 |
| VOR2 | Very High Frequency (VHF) Omni-Directional Range System 2 |
| VSpd Hold | Vertical Speed Hold |
| XMIT | Transmit |