

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

March 15, 2019

Recorded Flight Data

Specialist's Factual Report By Charles Cates

1. EVENT SUMMARY

Location: San Diego, California
Date: February 21, 2018
Aircraft: Cirrus SR22
Registration: N707DF
Operator: Private
NTSB Number: WPR18FA093

On February 21, 2018, about 0631 Pacific standard time, a Cirrus SR22T airplane, N707DF, impacted terrain shortly after taking off from Montgomery-Gibbs Executive Airport (MYF), San Diego, California. The pilot was fatally injured and the airplane sustained substantial damage throughout. The airplane was registered to and operated by the pilot as a 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed. The flight originated from MYF and was destined for Yuma, Arizona.

2. RECORDED FLIGHT DATA GROUP

A recorded flight data group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following data recording device:

Recorder Manufacturer/Model: **Heads Up Technologies RDM**
Recorder Serial Number: **29688-056**

Recorder Manufacturer/Model: **Garmin FlightStream 510**
Recorder Serial Number: **402003410**

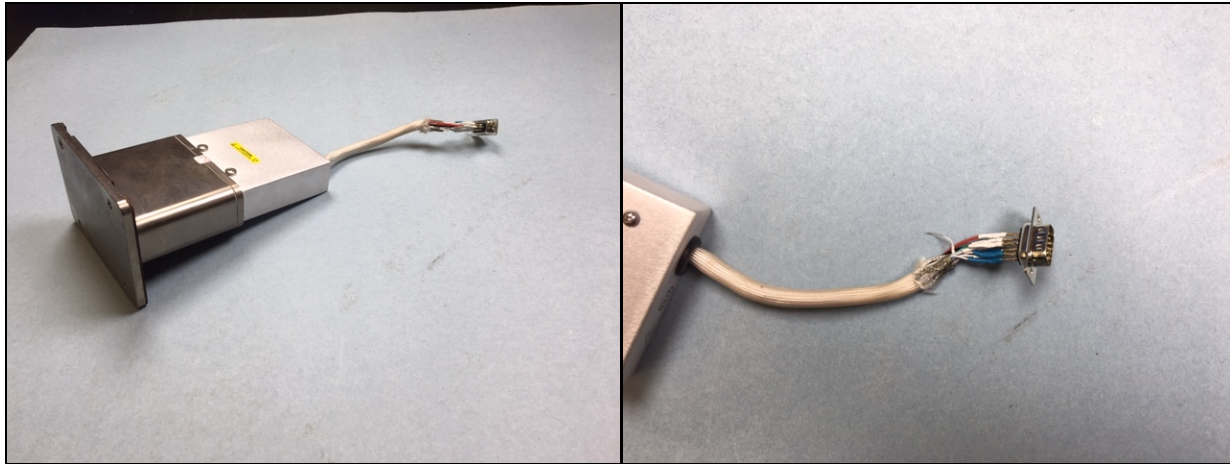
3.1. Heads Up Technologies RDM Description

The Heads Up Technologies recoverable data module (RDM) is a crash-hardened data storage unit installed in the tail of some Cirrus aircraft. The unit records flight, engine, and autopilot parameters. Data is logged once per second and stored internally on four thin small outline package (TSOP) memory devices inside the crash-hardened enclosure. When the storage limit of the memory device is reached, the oldest recording is deleted.

3.1.1. Recorder Condition

The recorder was in good condition, however the cable was severed from the device during the accident or the recovery. A new connector was attached using wiring diagrams provided by the manufacturer and the data were extracted normally from the recorder. See figure 1 for a view of the RDM with new connector attached.

Figure 1. RDM with new connector attached for readout.



3.1.2. Data Description

The RDM recording contained approximately 71.8 hours of data over 47 power cycles. The event flight was the last power cycle of the recording and its duration was approximately 7 minutes from engine start.

3.1.3. Engineering Units Conversions

Conversion of the RDM data from the raw recorded information to engineering units was based on documentation from the manufacturer of the device. 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 RDM parameters verified and provided in this report. Additionally, table A-2 describes the unit and discrete abbreviations used in this report.

3.2. Garmin FlightStream 510 Description

The Garmin FlightStream 510 is a SD memory card that contains Wi-Fi and Bluetooth connectivity capability. When installed in a Garmin display, the device can connect to a mobile device operating Garmin Pilot software. The device is only used for connectivity and does not store any data. The device was not pertinent to the investigation.

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 = +.

3.3. Time Correlation

Correlation of the event flight data to the event local time, PST, was established using the recorded 24 hour coordinated universal time (UTC) and then subtracting 7 hours to change UTC to PST.

Previous takeoff data was not time correlated and is presented in recorder time.

3.4. Plots and Corresponding Tabular Data

Figures 2 to 5 contain RDM data recorded during the February 21, 2018 event. Figure 6 contains RDM data recorded during the previous takeoff. Figure 7 contains RDM data recorded during the second previous takeoff. All the parameters listed in table A-1 are plotted except UTC Hours, UTC Minutes, and UTC Seconds.

Figures 2 and 4 contain aircraft basic parameters. Figures 3, 5, 6 and 7 contain engine parameters.

Figures 2 and 3 cover a time period from engine start until the end of the recording. Figures 4 and 5 contain the same parameters as figures 2 and 3, respectively, and have an expanded time scale from the time of takeoff until the end of the recording.

The data show that the engine was started at 0625 PST. It ran between 1000-1750 rpm for slightly over 5 minutes before accelerating to takeoff power.

The aircraft turned on to the runway heading at 0630:35 PST. The engine stabilized at around 2,490 rpm and about 35.3 inHg manifold pressure. Fuel flow stabilized at an abnormally high value, over 46 gph. The aircraft accelerated and rotated at 0630:57 PST at 84 kts indicated. The aircraft began climbing and speed stabilized at 100 kts indicated.

At 0631:04 PST manifold pressure began to rise, reaching 36.6 inHg. Fuel flow began to increase at the same time, reaching a peak value of 50.1 gph. At 0631:13 PST manifold pressure decreased to its previous level, but fuel flow stayed at its previous level.

At 0631:16 PST engine RPM, manifold pressure, EGT, and fuel flow began a sharp decrease. Simultaneously the aircraft began to decelerate and roll to the right, with the heading deviating to the right. Climb rate decreased. Maximum recorded altitude was about 300' above ground level (AGL) based upon global positioning system (GPS) altitude measurements.

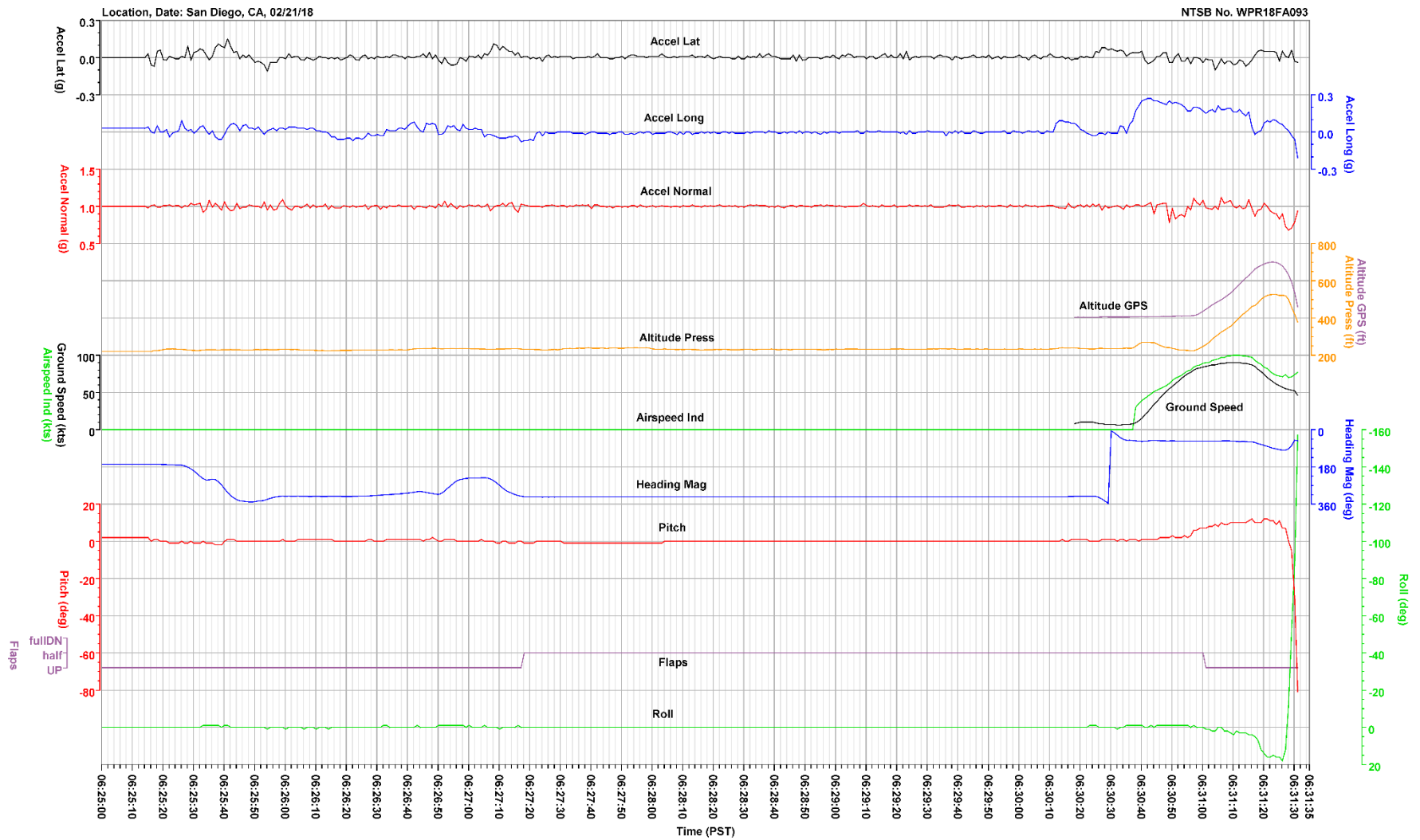
At 0631:27 PST roll suddenly broke to the left and pitch suddenly became nose down. Indicated airspeed was 74 kts. At the final recorded point at 0631:31 the aircraft was about 50' AGL with 81 degrees nose down pitch and inverted to the left at 157 degrees.

Engine data from the previous two takeoffs shows that upon accelerating to power the engine stabilized at about 2,490 rpm and 35.8 inHg manifold pressure. Fuel flow stabilized at 38-40 gph in both previous takeoffs. There were no step increases in manifold pressure, gas temperatures, or fuel flow similar to those seen in the event takeoff.

The corresponding tabular data used to create these six plots are provided in electronic (*.csv²) format as Attachment 1 to this report.

² Comma Separated Value format.

Figure 2. Plot of basic parameters during entire flight.



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Figure 3. Plot of engine parameters during entire flight.

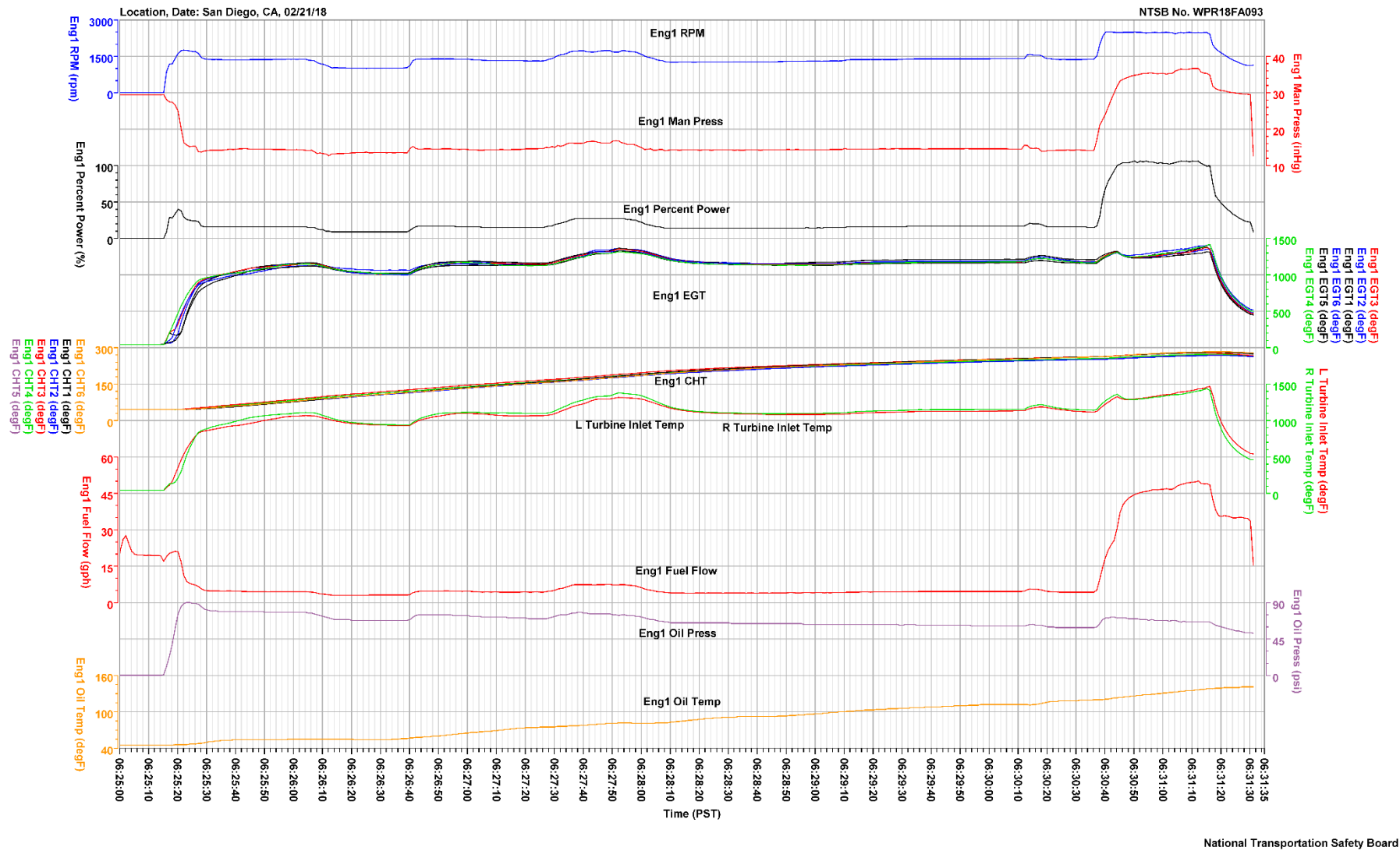


Figure 4. Plot of basic parameters from takeoff to the end of the recording.

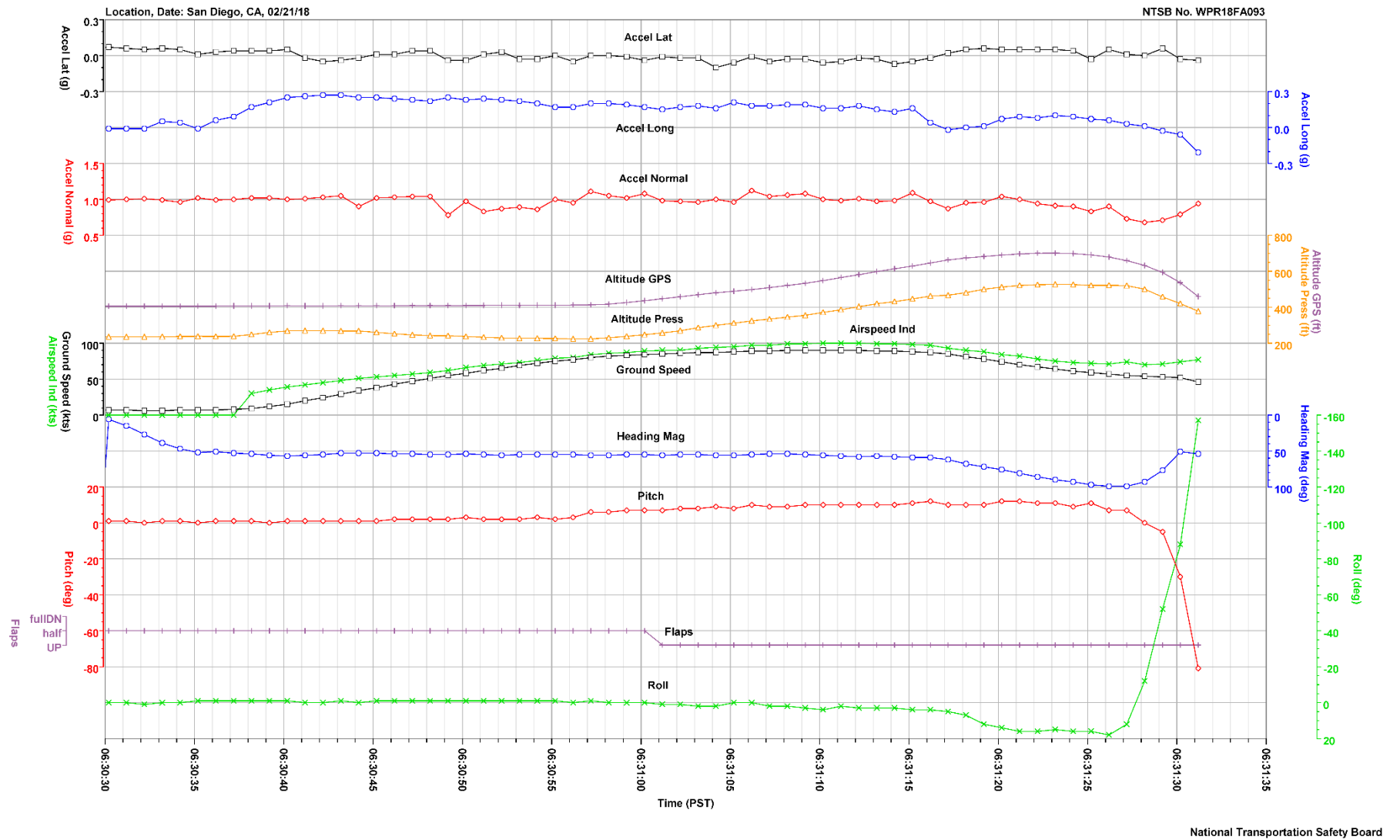
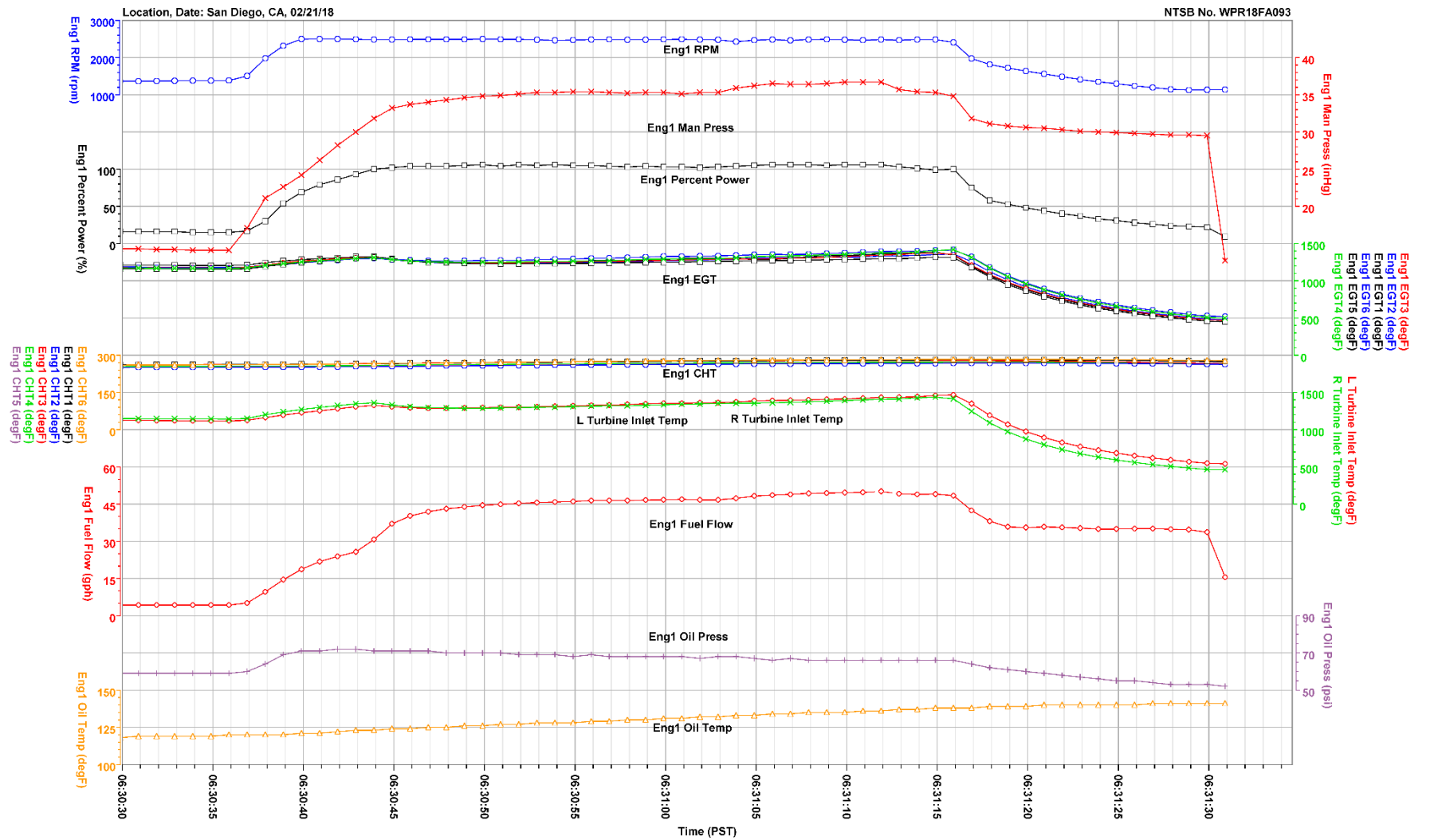
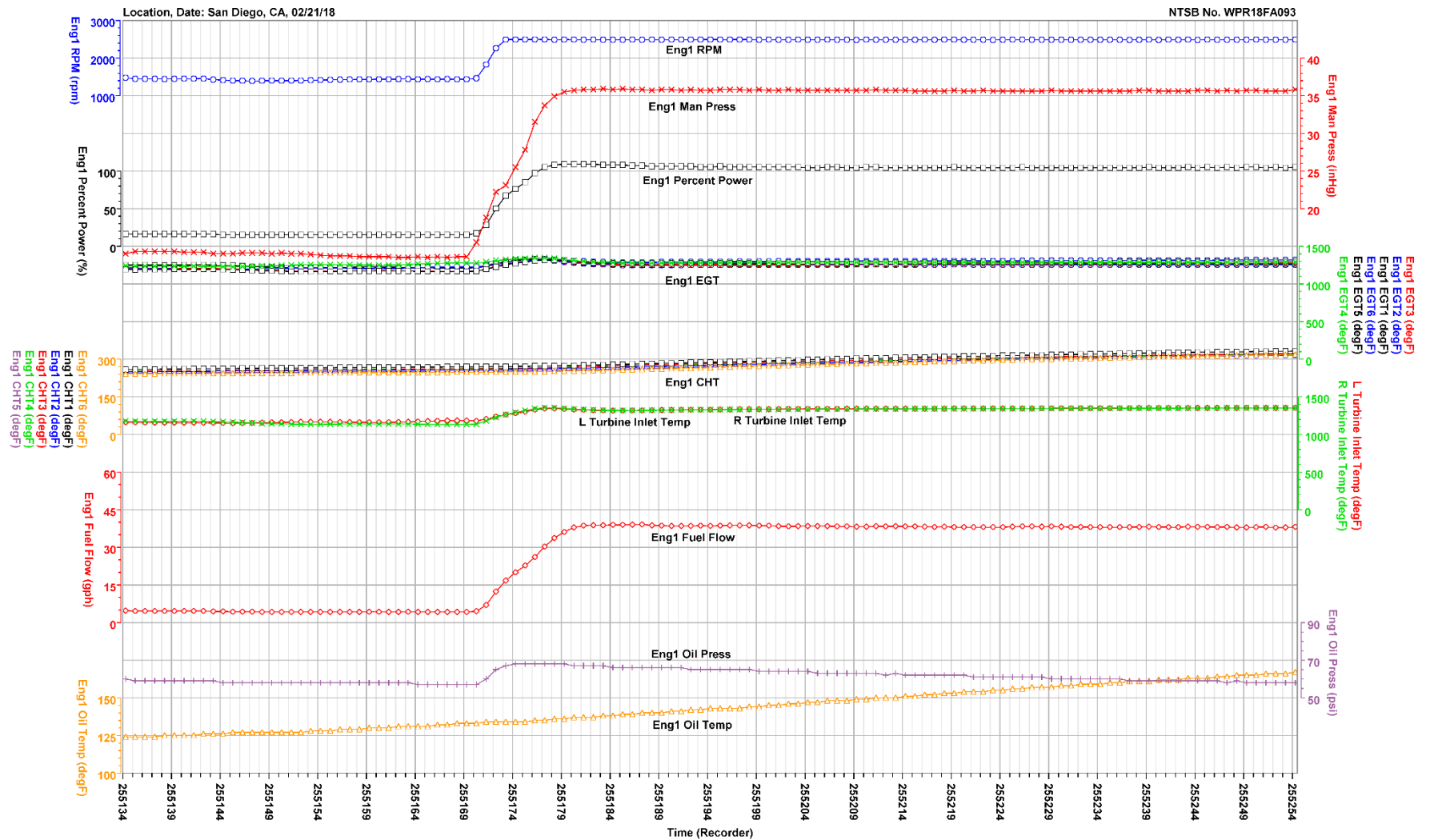


Figure 5. Plot of engine parameters from takeoff to the end of the recording.



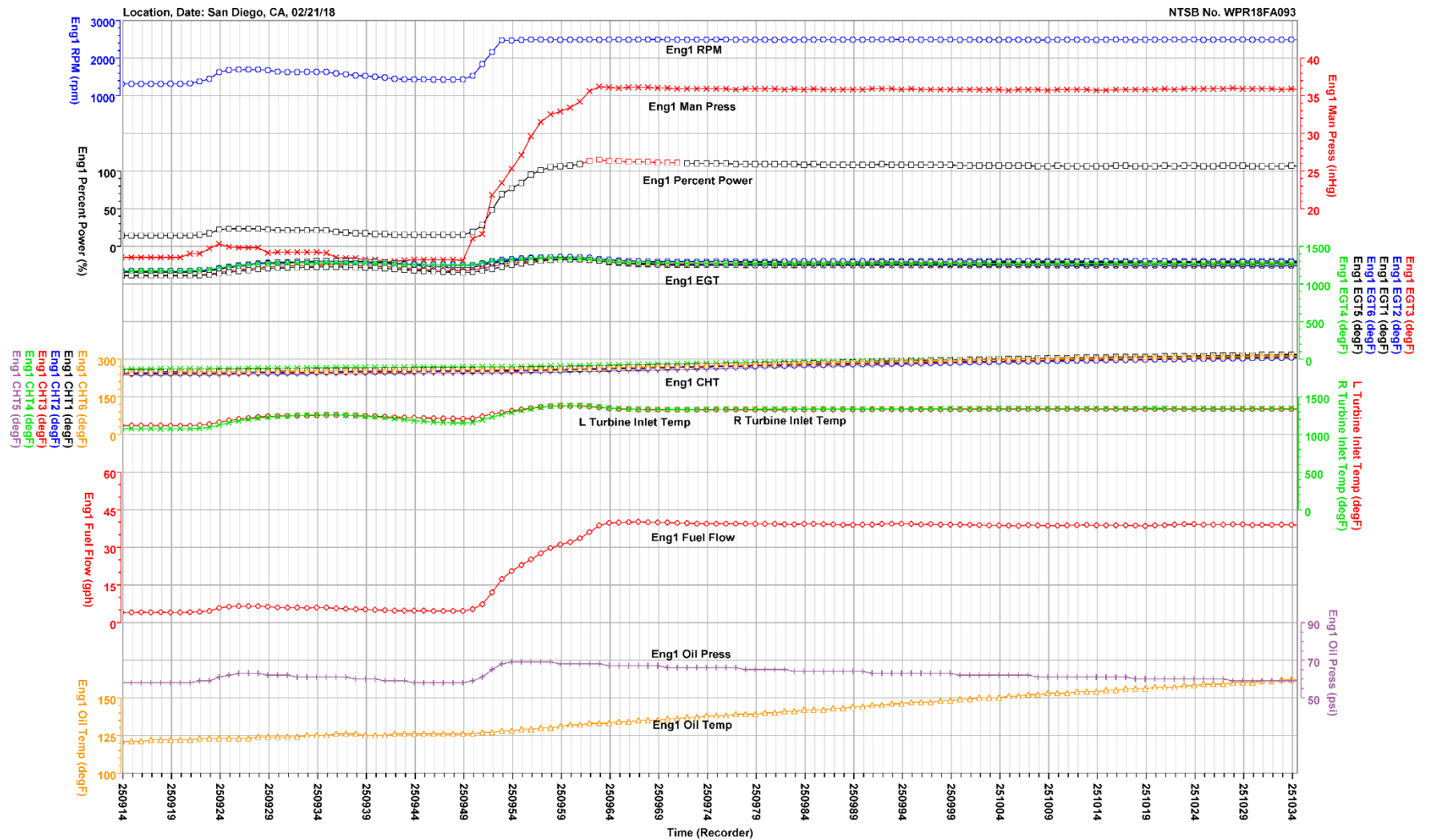
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Figure 6. Plot of engine parameters from first previous takeoff.



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Figure 7. Plot of engine parameters from second previous takeoff.



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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 parameters.

Parameter Name	Parameter Description
Accel Lat (g)	Lateral Acceleration
Accel Long (g)	Longitudinal Acceleration
Accel Normal (g)	Vertical Acceleration
Airspeed Ind (kts)	Indicated Airspeed
Altitude GPS (ft)	GPS-based altitude
Altitude Press (ft)	Pressure Altitude
Eng1 CHT# (degF)	Cylinder Head Temperature of Engine Cylinder #
Eng1 EGT# (degF)	Exhaust Gas Temperature of Engine Cylinder #
Eng1 Fuel Flow (gph)	Fuel Flow
Eng1 Man Press (inHg)	Engine Intake Manifold Pressure
Eng1 Oil Press (psi)	Oil Pressure
Eng1 Oil Temp (degF)	Oil Temperature
Eng1 Percent Power (%)	Calculated Engine Power
Eng1 RPM (rpm)	Engine Speed
Flaps (discrete)	Flap Position
Heading Mag (deg)	Magnetic Heading
L Turbine Inlet Temp (degF)	Left Cylinder Bank Turbine Inlet Temperature
Pitch (deg)	Pitch Attitude
R Turbine Inlet Temp (degF)	Right Cylinder Bank Turbine Inlet Temperature
Roll (deg)	Roll Attitude

Table A-2. Unit abbreviations.

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.

Units/Discrete	Description
deg	degrees
degF	degrees Fahrenheit
ft	feet
fullDN	Flaps fully deployed
gph	gallons per hour
inHg	inches of mercury
kts	knots
UP	Flaps up