

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

July 31, 2019

Multiple Electronic Devices – Recorded Flight Data

**Or Specialist's Factual Report
By Christopher Babcock**

1. EVENT SUMMARY

Location: Kennesaw, Georgia
Date: November 29, 2018
Aircraft: Cirrus SR22
Registration: N597CP
Operator: Private
NTSB Number: ERA19LA057

On November 29, 2018, at 19:55 eastern standard time, a Cirrus SR22, N597CP, was substantially damaged when it impacted terrain after the Cirrus Airframe Parachute System (CAPS) was deployed near Kennesaw, Georgia. The private pilot and passenger sustained minor injuries. The airplane was registered to and operated by Cavern Aviation LLC. under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight. Night visual meteorological conditions prevailed, and a visual flight rules flight plan was filed for the flight, which originated from Johnson County Executive Airport (OJC), Olathe, Kansas, about 17:15, and was destined for Dekalb-Peachtree Airport (PDK), Chamblee, Georgia.

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 devices:

Recorder Manufacturer/Model: **SD Memory Card**
Recorder Serial Number: **NA**

Recorder Manufacturer/Model: **Cirrus Recoverable Data Module (RDM)**
Recorder Serial Number: **900276652**

3.1. Garmin G1000 SD Data Card Description

The Garmin G1000 Integrated Flight Deck is a collection of multiple avionics units which include flight displays, air data computers, attitude/heading reference system (AHRS), communications and other systems. A typical installation includes a primary flight display (PFD) and a multi-function display (MFD). Each display includes two SD card slots, an upper

and a lower slot. The lower SD card slot is used by the system for software updates and various databases¹.

Depending on the display unit software, the G1000 can include a data logging feature. The data logging feature must be enabled by the aircraft operator. If the data logging feature is available and enabled, an SD card has to be installed in the upper slot of the MFD. Depending on the airframe and engine combination as many as 64 parameters can be stored at a rate of one sample per second (1Hz). According to the manufacturer of the display unit, one flight hour can be stored in approximately 2 MB. The SD card typically used is 2 GB in size and can store over 1,000 flight hours.

3.1.1. SD Card Data Recovery

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

3.1.2. SD Card Data Description

The G1000 SD card stores flight data in individual flight logs. The SD card contained 286 log files. Not all log files correspond to an actual flight. The accident/incident flight recording was identified and was approximately 2 hours and 46 minutes.

3.1.3. Engineering Units Conversions

The flight log data stored in the individual files was converted to engineering units by the display unit.

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

3.2. Cirrus Recoverable Data Module (RDM) Description

The Cirrus RDM is designed to record flight data in a crash and fire-resistant housing. Depending on the recording software, over 75 parameters may be recorded (Figure 1).

¹ Databases can include terrain data, obstacle data, SafeTaxi charts, flight charts and airport terrain databases
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Figure 1. RDM, as received.

3.2.1. RDM Data Recovery

Data was recovered normally using the RDM download software.

3.2.2. RDM Data Description

The RDM contained data recorded from October 26, 2014, to July 27, 2015, with additional data between Aug 3, 2015 and Aug 11, 2015, appended to the end of the data file. The accident flight was not recorded.

Cirrus Mandatory Service Bulletin SB 2X-31-05 R2, released August 27, 2009, was applicable to this airplane to correct a potential software issue on the RDM that causes the RDM to fail to store data correctly. The Service Bulletin required the removal of the RDM and replacement with a new RDM with a part number 24618-005. The RDM removed from the accident aircraft was 24618-002 (Figure 2). Additionally, the SR22 annual inspection calls for an operational test of the RDM which includes an inspection of diagnostic LEDs. If the LEDs indicate the RDM is not functioning correctly, the operational test checklist calls for RDM replacement and contact with Cirrus for further disposition.



Figure 2. RDM part number.

3.3. Time Correlation

The G1000 records time with the first data sample based on the unit's internal clock. This clock is set and updated by the unit and is based off GPS time, converted to local time.

3.4. Plots and Corresponding Tabular Data

Figure 3 shows flight data from the end of the flight superimposed over the Atlanta Terminal Area Chart. Figure 4 shows the flight data at the end of the flight superimposed over aerial imagery. Weather and lighting conditions are not representative of those encountered during the flight. Figures 5 and 6 show engine related data and basic flight data from 19:40 EST to the end of flight at 19:53:26 EST. Figures 7 and 8 show engine related and basic flight data zoomed in to 19:43 EST to 19:47 EST. Figures 9 and 10 show engine related and basic flight data zoomed in to 19:49:20 EST and the end of the recording at 19:53:26 EST.

The aircraft departed Olathe, KS, at about 17:15 EST and turned southeast. The aircraft climbed to about 18000 feet MSL. The aircraft started to descend around 18:50 EST over eastern Tennessee. At about 19:44:30 EST, the oil pressure dropped from about 44 psi to about 15 psi over the course of a minute. The aircraft was at about 7500 feet MSL and 2.5 nautical miles north of Cartersville Airport, Cartersville, GA. The engine speed dropped from 2400 rpm down to 2000 rpm and then rose back to 2400 rpm during this time. At 19:45:30 EST, the aircraft had descended to about 6100 feet and turned to the south, followed by a turn to the north east at about 19:47:00 EST when the aircraft had descended to 5000 feet MSL. At 19:50:30 EST, the aircraft turned to the south. At 19:51:45 EST, engine rpm and fuel flow dropped to zero. The last data point recorded was at 19:53:26 EST, about 1.9 nautical miles north of Cobb County-McCollum Airport.

The corresponding tabular data used to create Figures 3-10 are provided in electronic (*.csv²) format as Attachment 1 to this report.

² Comma Separated Value format.

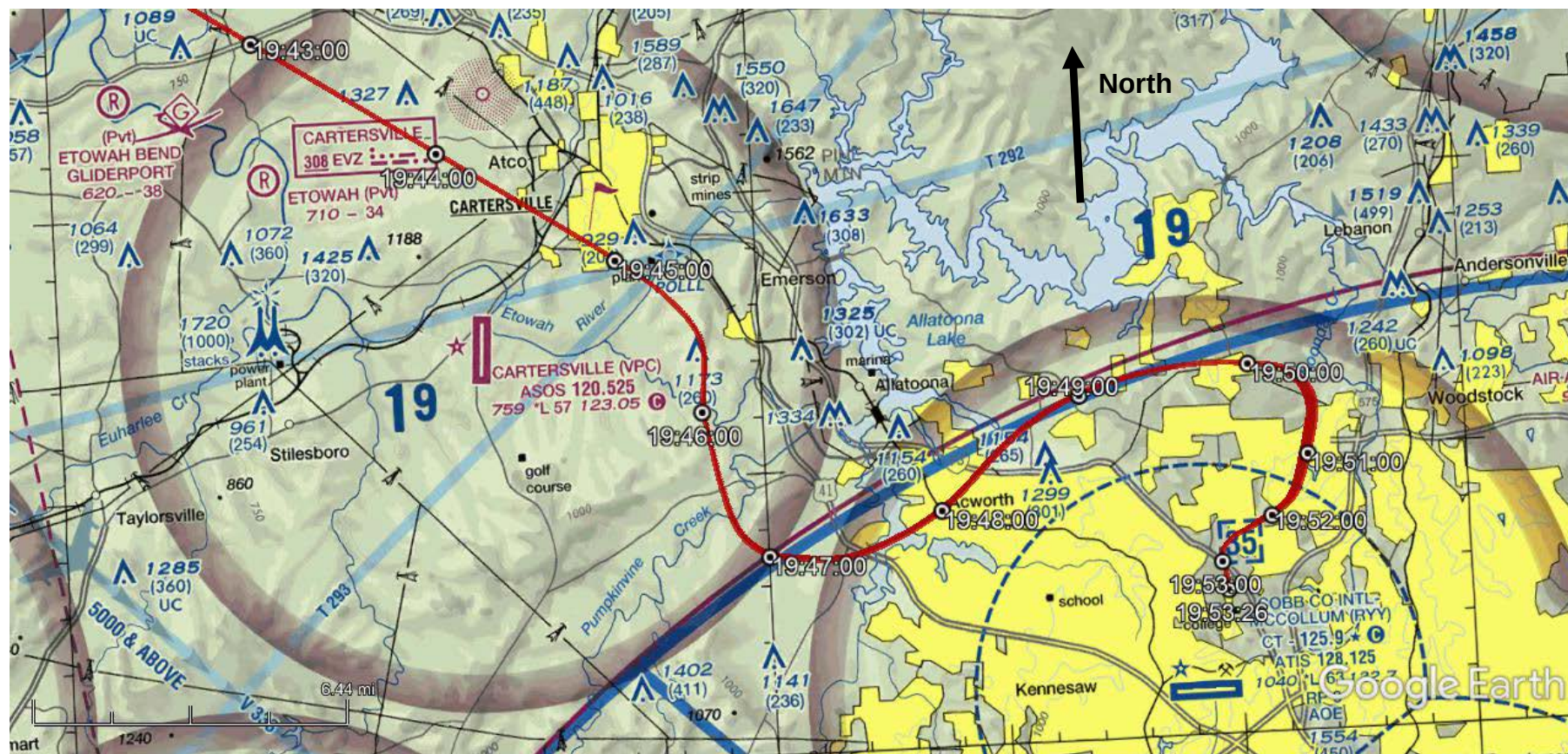


Figure 3. End of flight path overlaid on Terminal Area Chart.



Figure 4. Last two minutes of flight.

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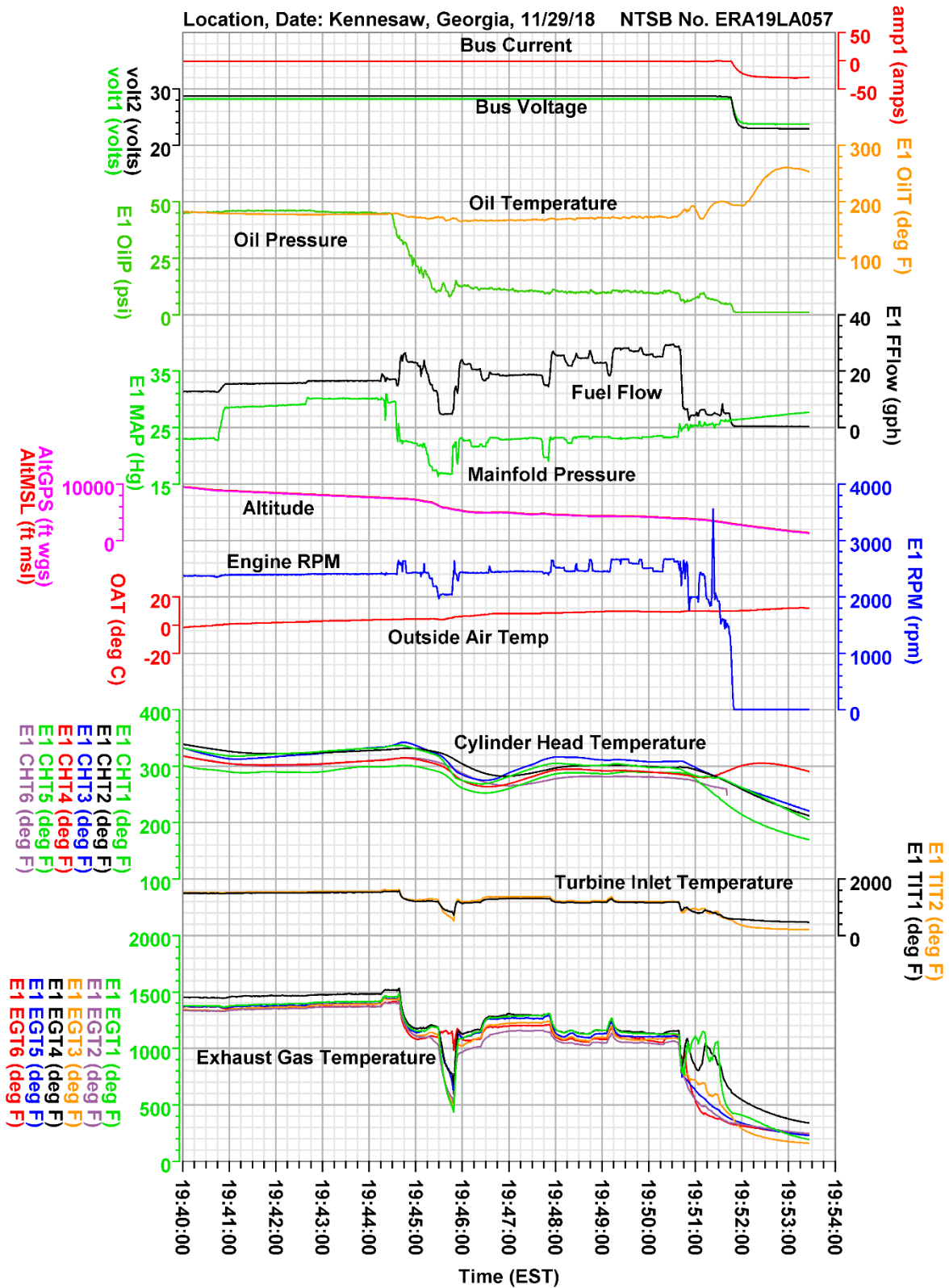


Figure 5. Engine data from end of flight.

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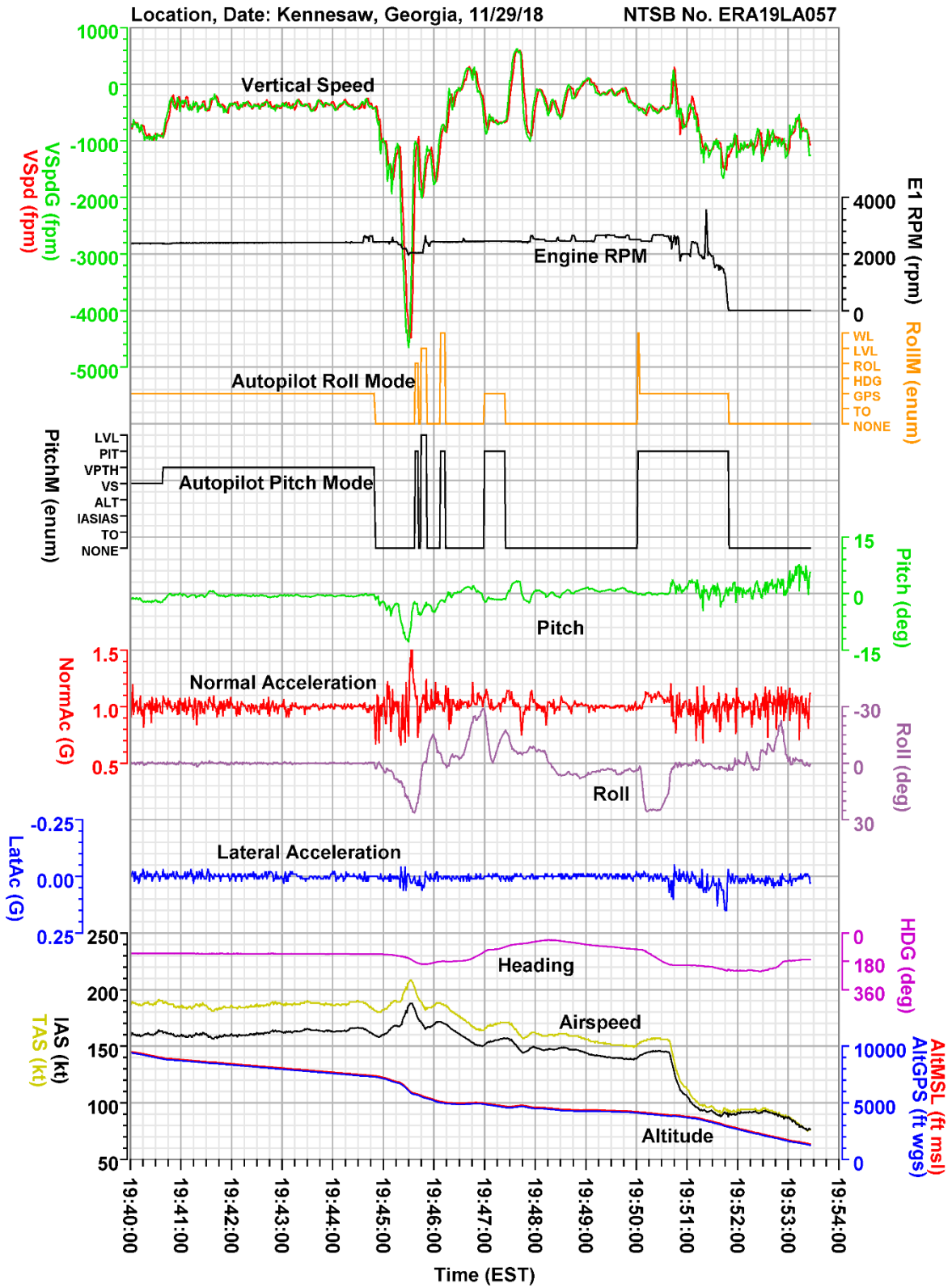


Figure 6. Basic flight data from end of flight.

Cirrus SR22, N597CP

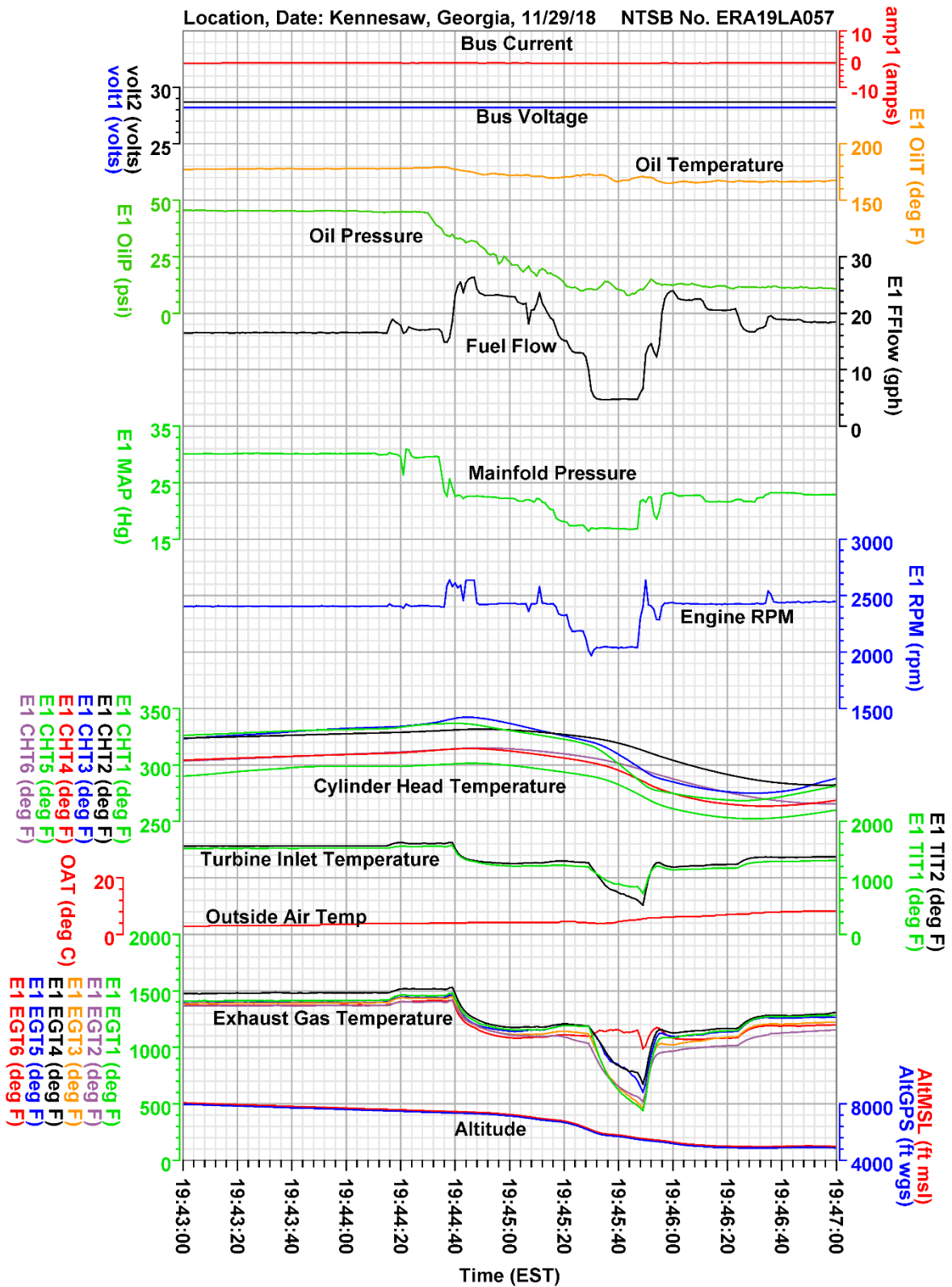


Figure 7. Engine data from 19:43 EST to 19:47 EST.

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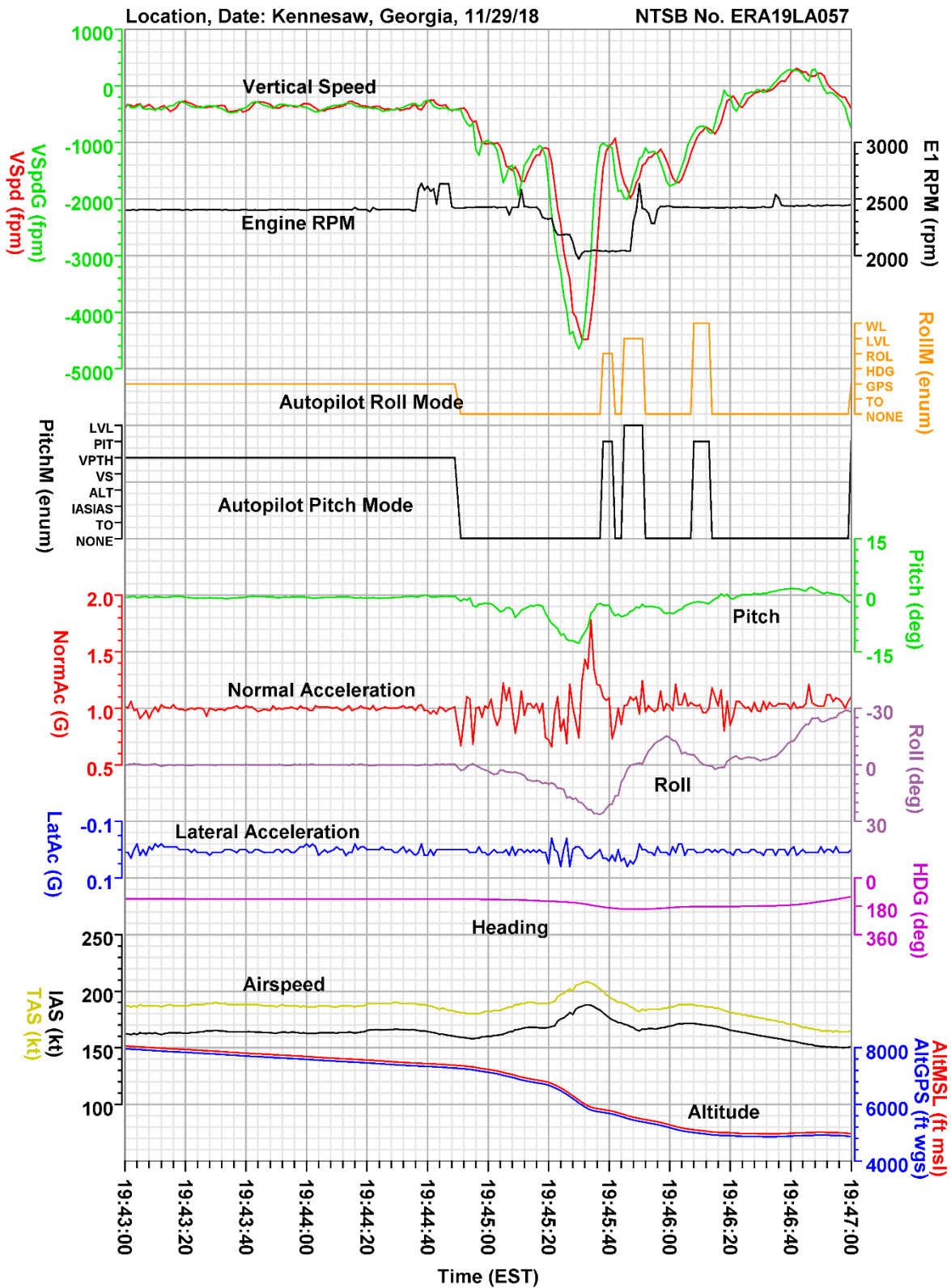


Figure 8. Basic flight data from 19:43 EST to 19:47 EST.

Cirrus SR22, N597CP

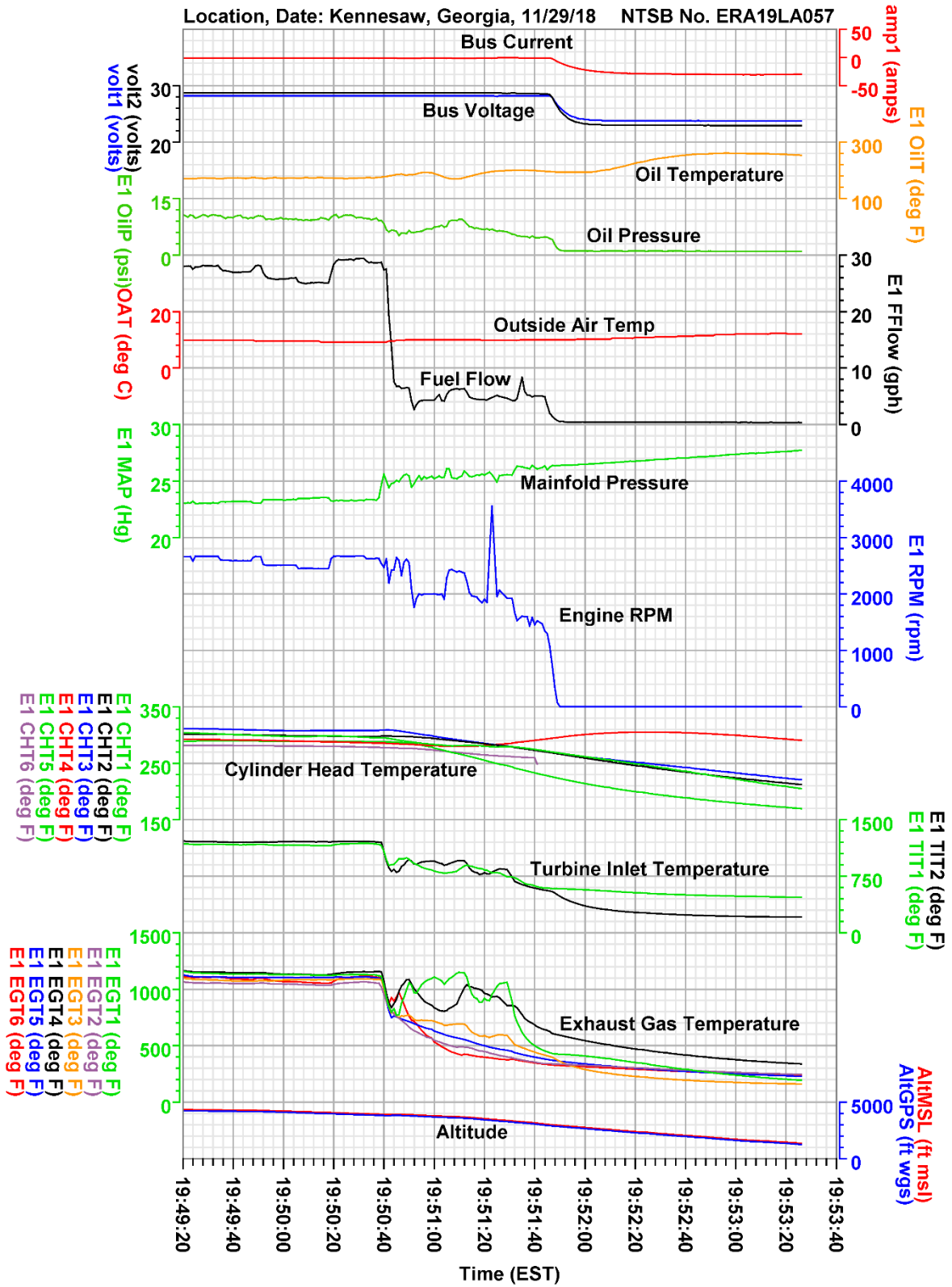


Figure 9. Engine data from 19:49:20 EST to end of flight.

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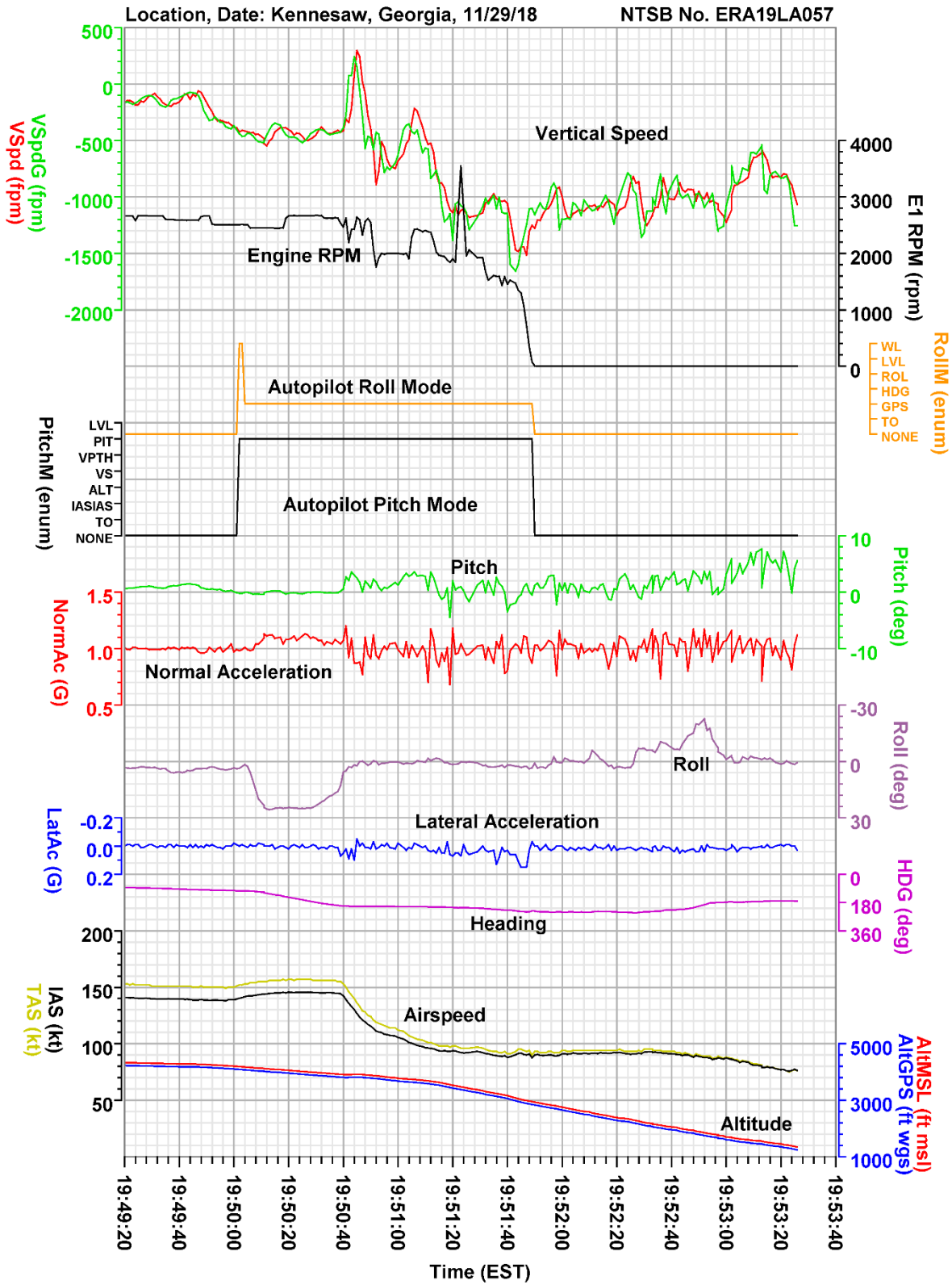


Figure 10. Basic flight data from 19:49:20 EST to end of flight.

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 parameters.

Parameter Name (unit)	Parameter Description
1. AltGPS (ft wgs)	GPS Altitude above ellipsoid
2. AltMSL (ft msl)	Pressure Altitude Above Mean Sea Level
3. Amp1 (amps)	Bus Current
4. AfcsOn (discrete)	Automatic Flight Control System On
5. E1 CHT# (deg F)	Cylinder Head Temperature Cylinder # ³
6. E1 EGT# (deg F)	Exhaust Gas Temperature Cylinder # ³
7. E1 FFlow (gph)	Engine Fuel Flow
8. E1 MAP (inHg)	Engine Manifold Pressure
9. E1 OilP (psi)	Engine Oil Pressure
10. E1 OilT (deg F)	Engine Oil Temperature
11. E1 RPM (rpm)	Engine Revolutions per minute
12. E1 TIT1 (deg F)	Turbine Inlet Temperature-1
13. E1 TIT2 (deg F)	Turbine Inlet Temperature-2
14. HDG (deg)	Magnetic Heading
15. IAS (kt)	Indicated Airspeed
16. LatAc (g)	Lateral Acceleration
17. Latitude (deg)	Latitude ⁴
18. Longitude (deg)	Longitude ⁴
19. NormAc (g)	Vertical Acceleration
20. OAT (deg C)	Outside Air Temperature
21. Pitch (deg)	Pitch
22. PitchM	Autopilot Pitch Mode
23. Roll (deg)	Roll
24. RollM	Autopilot Roll Mode
25. TAS (kt)	True Airspeed
26. Volt1 (V)	Bus 1 Voltage
27. Volt2 (V)	Bus 2 Voltage
28. VSpd (fpm)	Vertical Speed
29. VSpdG (fpm)	GPS Vertical Speed

³ Depending on aircraft configuration number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.

⁴ Only available in tabular data

Table A-2. Unit abbreviations.

Units Abbreviation	Description
rpm	revolutions per minute
amps	Amperes
deg	degrees
deg C	degrees Celsius
deg F	Degrees Fahrenheit
ft wgs	Feet above ellipsoid
ft msl	Feet above mean sea level
gph	gallons per hour
Hg	inches of Mercury
kt	knots
psi	pounds per square inch
volts	Volts DC

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.