

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

February 29, 2016

Recorded Flight Data

Specialist's Factual Report By Charles Cates

1. EVENT SUMMARY

Location: Fayetteville, Arkansas
Date: November 3, 2015
Aircraft: Cirrus SR22T
Registration: N857SW
Operator: Private
NTSB Number: CEN16LA026

On November 3, 2015, a Cirrus SR22T airplane, N857SW, descended under the canopy of the Cirrus airframe parachute system (CAPS) and landed on a road in Fayetteville, Arkansas. The pilot, pilot rated passenger and one person on the ground received minor injuries. One passenger in the back right seat was uninjured. The airplane was substantially damaged. The airplane was registered to WG Aviation LLC, Rogers, Arkansas, and operated by a private individual under the provisions of 14 *Code of Federal Regulations* (CFR) Part 91 as a personal flight. Visual meteorological conditions prevailed at the time of the accident and an instrument flight rules (IFR) flight plan was filed. The flight departed from the Bentonville Municipal Airport (VBT), Bentonville, Arkansas, at 09:34 central standard time (CST) and was en route to the Waco Regional Airport (ACT), Waco, Texas.

2. RECORDED FLIGHT DATA GROUP

A flight data group was not convened.

3. DETAILS OF INVESTIGATION

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

Recorder Manufacturer/Model: **Heads Up Technologies RDM**
Recorder Serial Number: **4892**

Recorder Manufacturer/Model: **Garmin G1000**
Recorder Serial Number: **SD Card**

3.1. Heads Up Technologies RDM Description

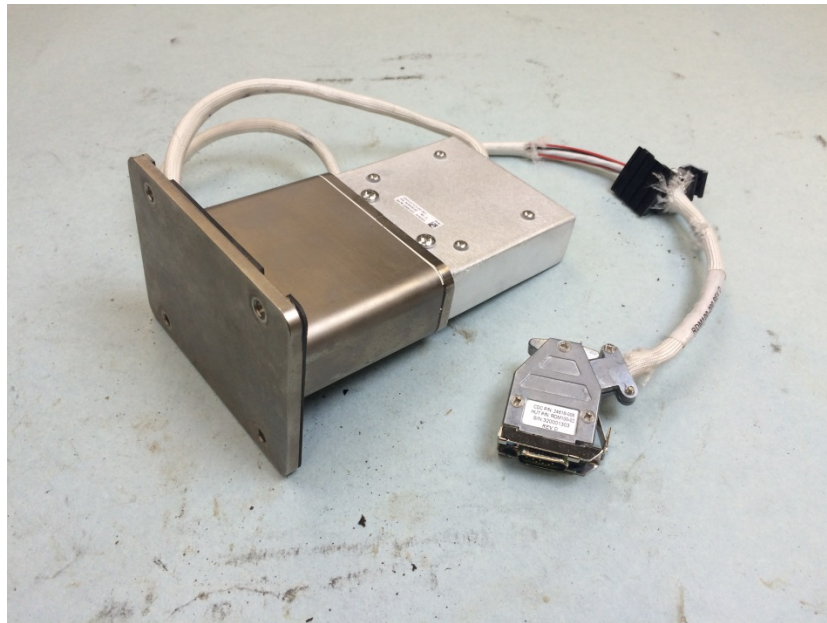
The Heads Up Technologies recoverable data module (RDM) is a crash hardened unit installed in the tail of some Cirrus aircraft. The unit records flight, engine, and autopilot

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 and the data were extracted normally from the recorder. See Figure 1 for the as-received condition of the RDM.

Figure 1. As-received condition of RDM.



3.1.2. 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 parameters verified and provided in this report. Additionally, table A-2 describes the unit and discrete abbreviations used in this report.

3.2. 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, altitude/heading reference system (AHRS), communications, and other systems. A typical installation includes a primary flight display (PFD) and a multi-function display (MFD).

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 = +.

Depending on the display unit software, the aircraft 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, a 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 (1 Hz).

3.2.1. Data Recovery

The SD card was in good condition and the data were extracted normally from the recorder. The G1000 SD card stores flight data in individual flight logs.

The logs were compared to the data from the RDM and were determined to contain no additional information relevant to the investigation. Therefore, all data referenced in this report is from the RDM, and not the G1000 SD card.

3.3. Time Correlation

Correlation of the data to the event local time, CST, was established by using the recorded 24 hour coordinated universal time (UTC) and then subtracting 6 hours to change UTC to CST.

3.4. FDR Plots and Corresponding Tabular Data

Figures 2 through 5 contain flight data recorded during the November 3, 2015 event.

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

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

Figure 2 shows that the aircraft was maneuvering on the ground for about 15 minutes before takeoff. The aircraft took off and climbed at constant speed until about 09:44 CST, at which time it made a turn to the left and initiated a descent. Figure 3 shows an expanded scale from this point. The aircraft descended for about 7 minutes, and then CAPS was deployed at a pressure altitude of about 2,200 ft.

Figure 4 shows the engine parameters for the full period from engine start until the end of the recording. After takeoff, the oil pressure was about 50 psi during the climb, then started to drop at about 9:43:30 CST, as the aircraft was climbing through about 9,500 ft. Figure 5 shows an expanded scale from this point. Thirty seconds later, with the oil pressure at 36 psi, the pilot stopped the climb, reaching a peak altitude of 9,830 ft. Oil pressure dropped at about 0.5 psi/sec until it reached a pressure of about 3 psi, at which point the rate of oil pressure drop decreased. Engine RPM dropped to 0 as oil pressure dropped below 1 psi at 9:50:30 CST.

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 four plots are provided in electronic comma separated value (*.csv) format as attachment 1 to this report.

Figure 2. Plot of basic parameters from engine start to end of recording.

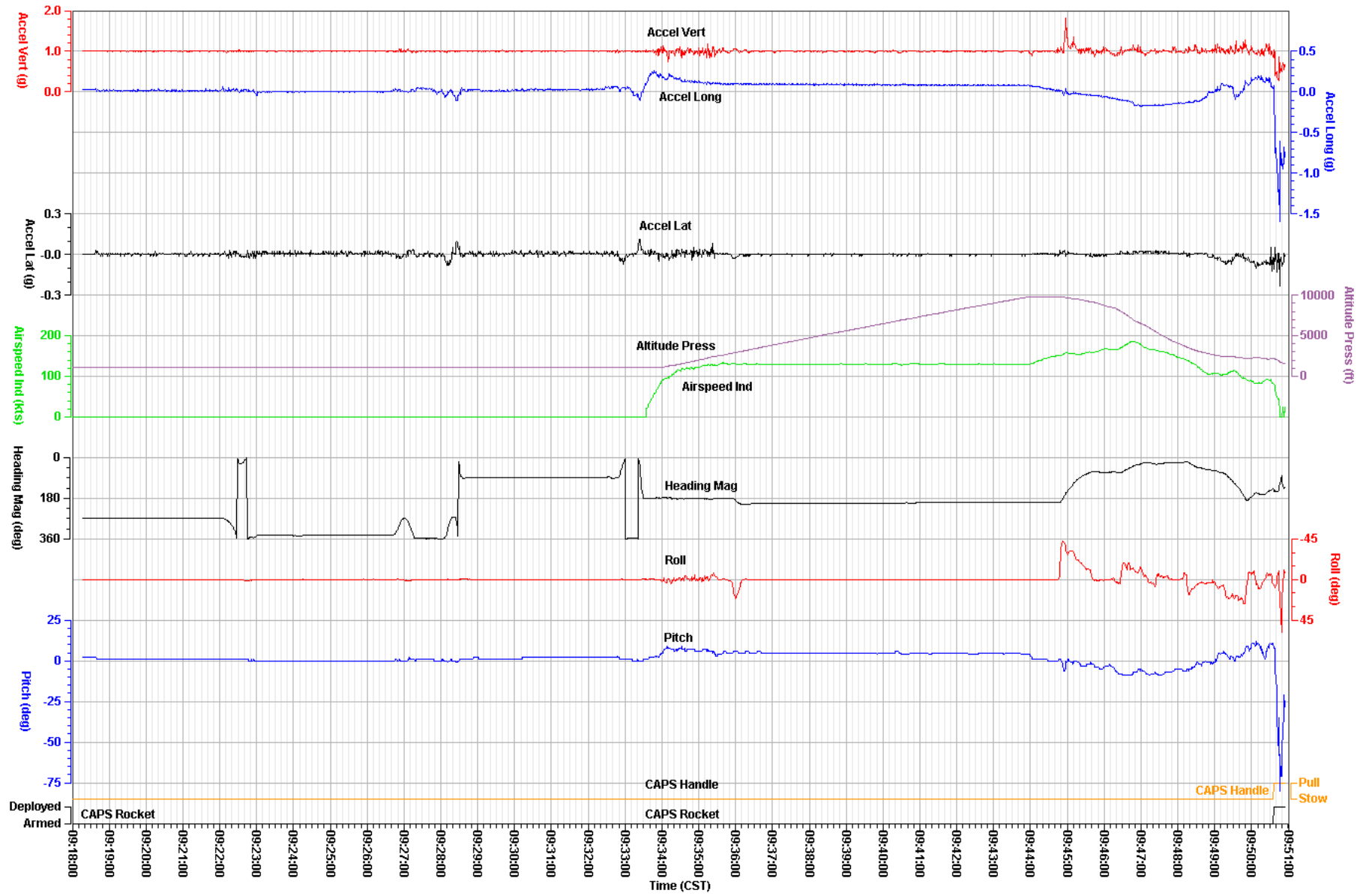


Figure 3. Plot of basic parameters with expanded scale of final seven minutes of recorded data.

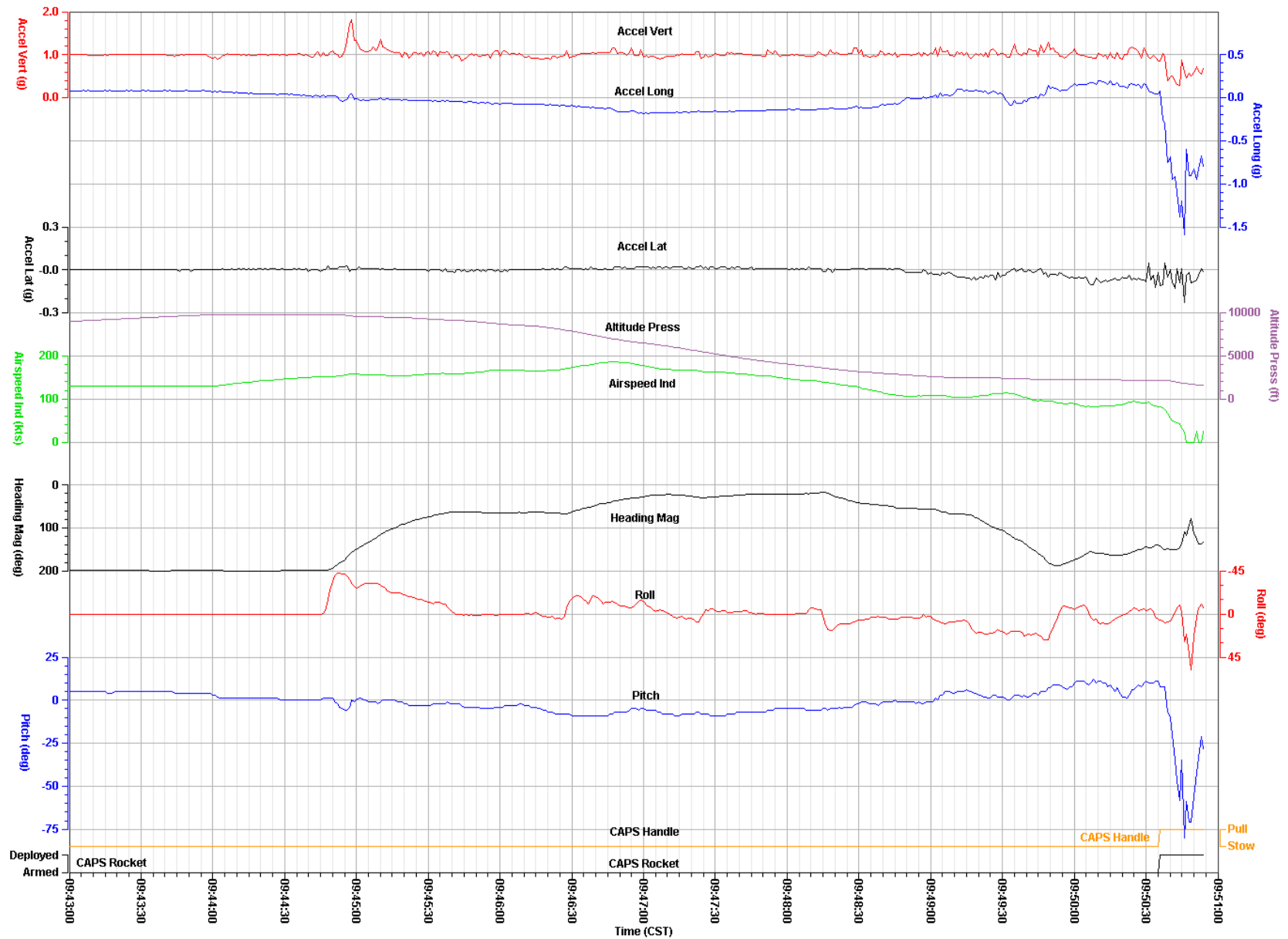


Figure 4. Plot of engine parameters from engine start to end of recording.

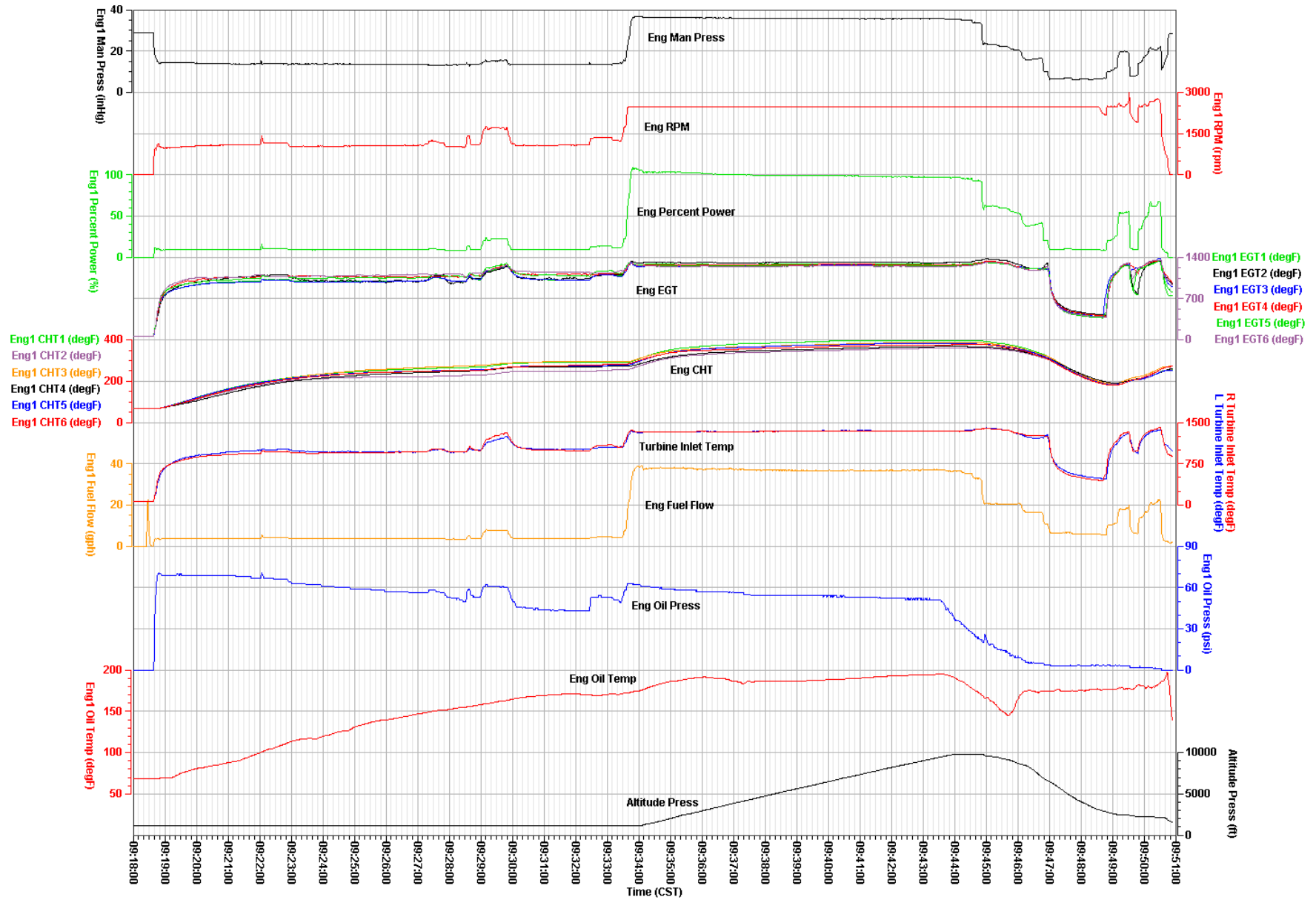
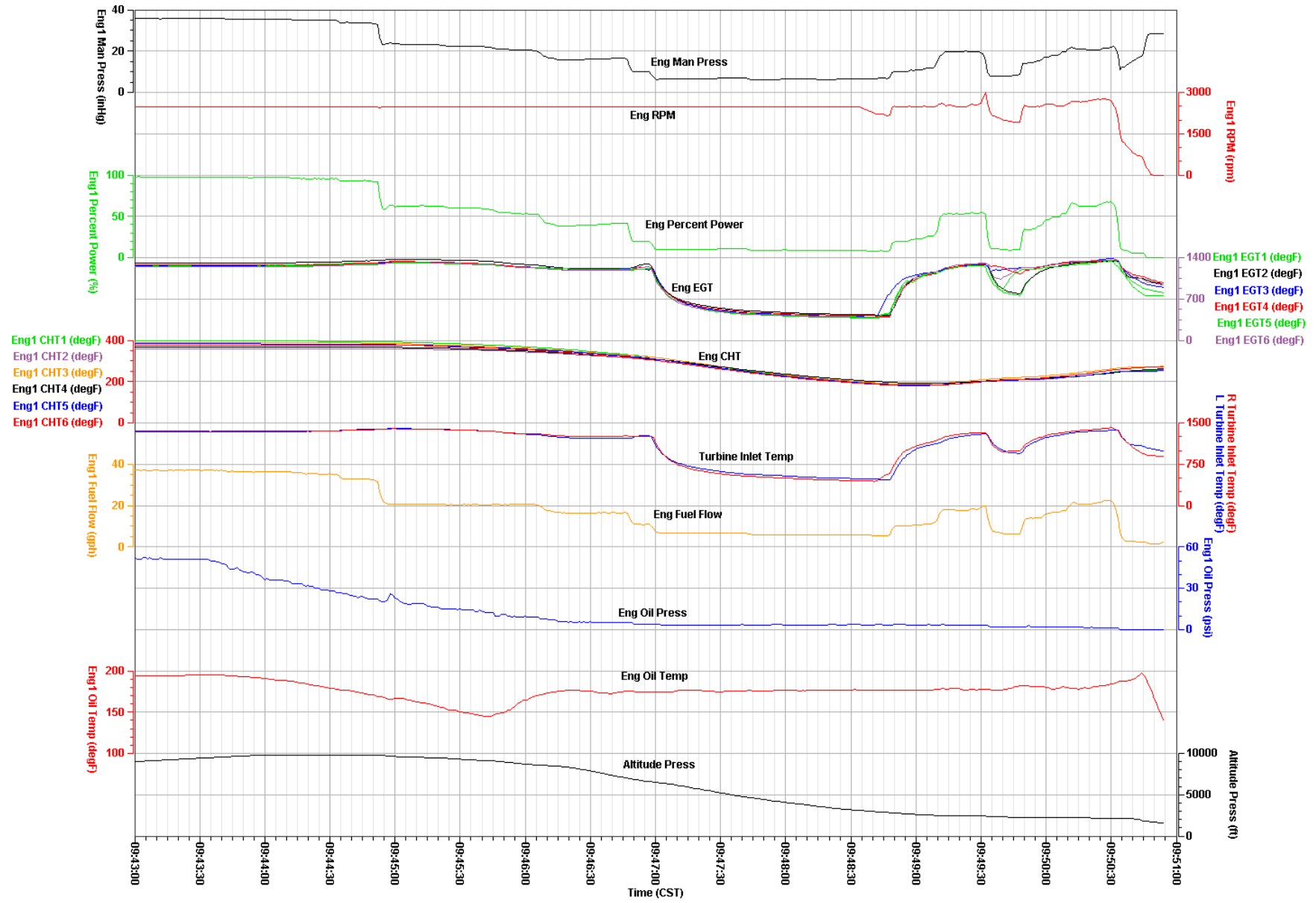


Figure 5. Plot of engine parameters with expanded scale of final seven minutes of recorded data.



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 and discrete abbreviations used in this report.

Table A-1. Verified and provided parameters.

Parameter Name	Parameter Description
1. Accel Lat (g)	Lateral Acceleration
2. Accel Long (g)	Longitudinal Acceleration
3. Accel Vert (g)	Vertical Acceleration
4. Airspeed Ind (kts)	Indicated Airspeed
5. Altitude Press (ft)	Pressure Altitude
6. CAPS Handle (discrete)	CAPS Handle Pulled
7. CAPS Rocket (discrete)	CAPS Rocket Deployed
8. Eng1 Fuel Flow (gph)	Engine Fuel Flow
9. Eng1 Oil Press (psi)	Engine Oil Pressure
10. Eng1 Oil Temp (degF)	Engine Oil Temperature
11. Eng1 CHT # (degF)	Engine Cylinder Head Temperature at cylinder #
12. Eng1 EGT # (degF)	Engine Exhaust Gas Temperature at cylinder #
13. Eng1 Man Press (inHg)	Manifold Pressure
14. Eng1 Percent Power (%)	Engine Power
15. Eng1 RPM (rpm)	Engine Speed
16. Heading Mag (deg)	Magnetic Heading
17. L Turbine Inlet Temp (degF)	Turbocharger Turbine Inlet Temperature, Left Cylinder Bank
18. Pitch (deg)	Pitch Angle
19. R Turbine Inlet Temp (degF)	Turbocharger Turbine Inlet Temperature, Right Cylinder Bank
20. Roll (deg)	Roll Angle

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 Abbreviation	Description
%	percent
deg	degrees
degF	degrees Fahrenheit
ft	feet
g	g
inHg	inches of Mercury
kts	knots
gph	gallons per hour
psi	pounds per square inch
rpm	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.