

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

January 3, 2022

Engine Data Monitor (EDM)

Specialist's Factual Report
By Sean Payne

1. EVENT SUMMARY

Location: Brent, AL
Date: November 21, 2021
Aircraft: Cessna C210
Registration: N5779J
Operator: Private
NTSB Number: ERA22LA071

2. ENGINE DATA MONITOR GROUP

An Engine Data Monitor (EDM) group was not convened.

3. DETAILS OF INVESTIGATION

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

Recorder Manufacturer/Model: **JPI EDM-730/830**
Recorder Serial Number: **39201**

3.1. EDM 730/830 Description

The J. P. Instruments EDM-730/830 is a panel mounted gauge that the operator can monitor and record up to 24 parameters related to engine operations. Depending on the installation engine parameters monitored can include:

- Exhaust Gas Temperature (EGT)
- Cylinder Head Temperature (CHT)
- Oil Pressure and Temperature
- Manifold Pressure
- Outside Air Temperature
- Turbine Inlet Temperature
- Engine Revolutions per Minute
- Compressor Discharge Temperature

- Fuel Flow
- Carburetor Temperature
- Battery Voltage
- Latitude
- Longitude

The unit can also calculate, in real-time, horsepower, fuel used, shock cooling rate and EGT differentials between the highest and lowest cylinder temperatures. The calculations are also based on the aircraft installation.

The unit contains non-volatile memory for data storage of the parameters recorded and calculated. The rate at which the data is stored is selectable by the operator from 2 to 500 seconds per sample. The memory can store up to 20 hours of data at a 6-second sample rate. The data can then be downloaded by the operator using the J.P. Instruments software.

3.1.1. Data Recovery

The device appeared undamaged. The device was downloaded normally, using the manufacturer's recommended procedure and software.

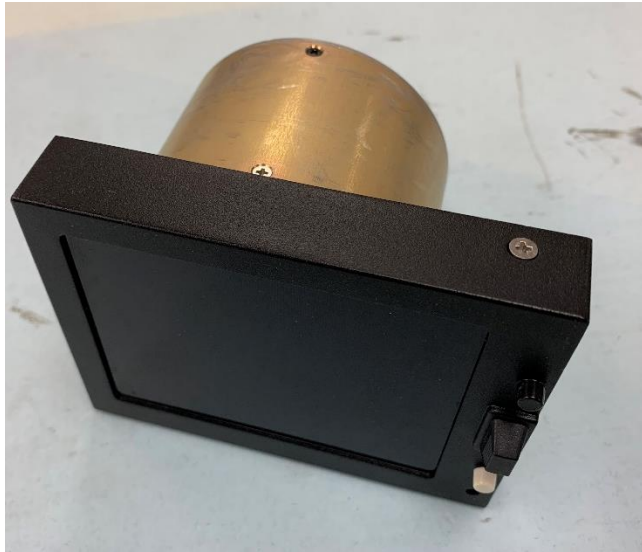


Figure 1. Photo of EDM.

3.1.2. Data Description

The EDM recording contained a number of hours of data over multiple power cycles. The event flight was the last flight of the recording.

3.1.3. Engineering Units Conversions

The engineering units conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM.

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

3.2. Time Correlation

The EDM records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator. The recorded time of the accident flight was offset to eastern daylight time (EDT). The time correlation was made by correlating the last recorded data point from the EDM to the reported time of the accident.

All times in this report are given in EDT.

3.3. Plots and Corresponding Tabular Data

The following five figures contain EDM data recorded during the November 21, 2021, event.

Figure 2 is a north-up oriented Google Earth overlay showing the aircraft's tracklogs during the accident flight. The recording originated at Tuscaloosa National Airport (KTCL) in Tuscaloosa, Alabama, at 7:58:06 EST. The data shows the aircraft departed around 8:06 EST. The aircraft took a southwesterly heading for the next approximately 10 minutes. The aircraft climbed to approximately 7000 feet. Around 8:20:30, the aircraft turned to a northerly heading. As the aircraft turned to the north, it began a gradual descent which eventually terminated near the reported wreckage location. The last data point was recorded at 8:26:00 EST.

Figure 3 is a north-up oriented Google Earth overlay showing the final portion of the aircraft's descent toward the accident site from 8:23:48 EST, until the last recorded data point at 8:26:00 EST.

Figure 4 is a Google Earth overlay oriented to show the aircraft's descent profile toward the accident site.

Figure 5 is a plot of engine parameters recorded on the JPI EDM-730/830. The data describes nominal piston engine operation up until approximately 8:18 EST. Around this time, oil pressure began to drop from approximately 49 psi. Shortly thereafter, manifold pressure decreased. There was a corresponding reduction in recorded values for most other engine parameters. Around this time, recorded GPS data connected to the unit shows the aircraft began a descent from approximately 7000 feet. Values for engine parameters later came back to moderate levels. The data ended at 8:26:00 EST.

Figure 6 is a plot of engine parameters for an expanded timescale. The plotted time range begins at 8:17:00 EST and ends at 8:26:00 EST which was the last recorded data point.

The corresponding tabular data used to create these two plots are provided in electronic (*.csv¹) format as Attachment 1 to this report.

¹ Comma Separated Value format.

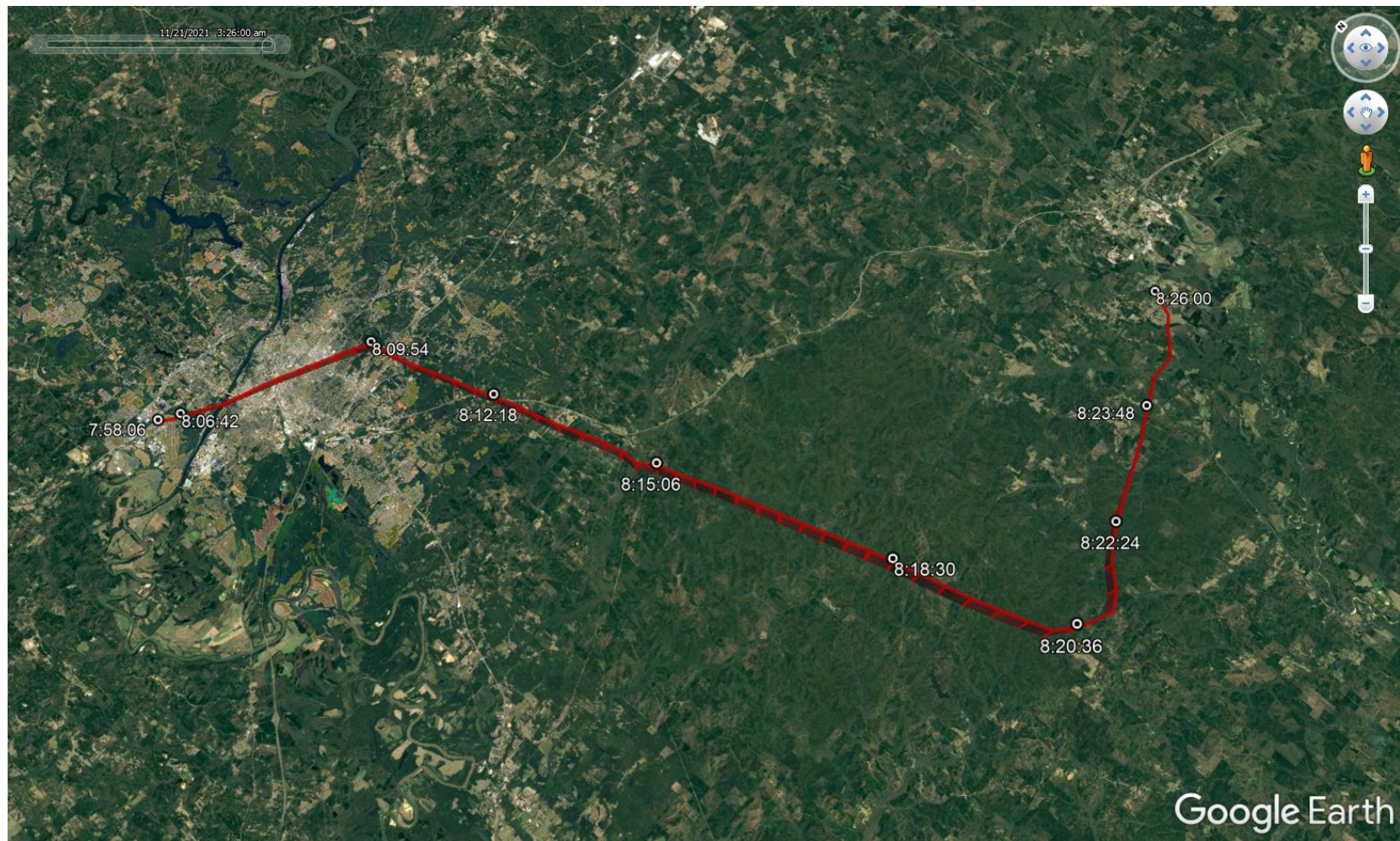


Figure 2. A Google Earth overlay showing the GPS tracklog recovered from the entire accident flight.

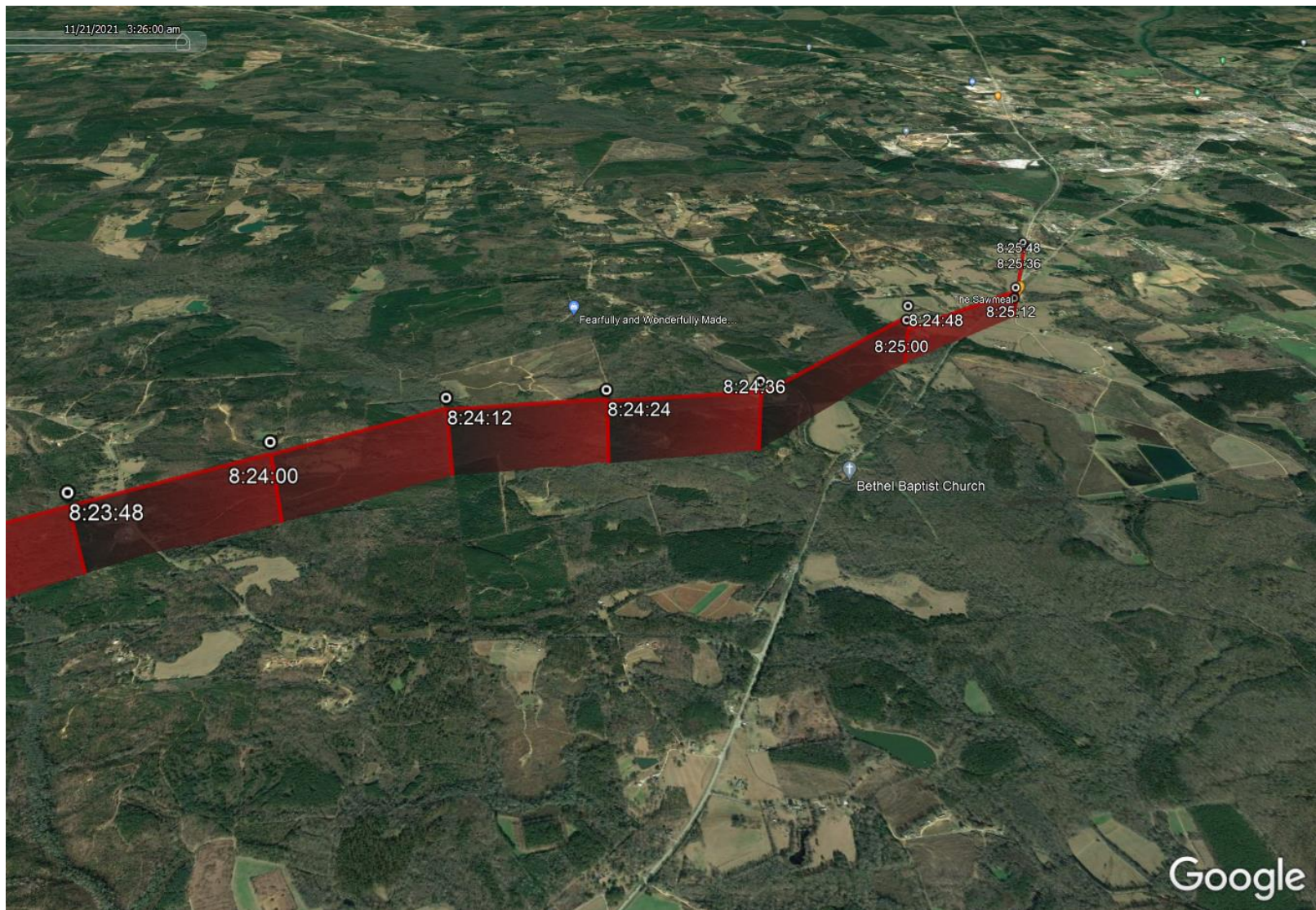


Figure 3. A Google Earth overlay showing the aircraft's final descent toward the accident flight.

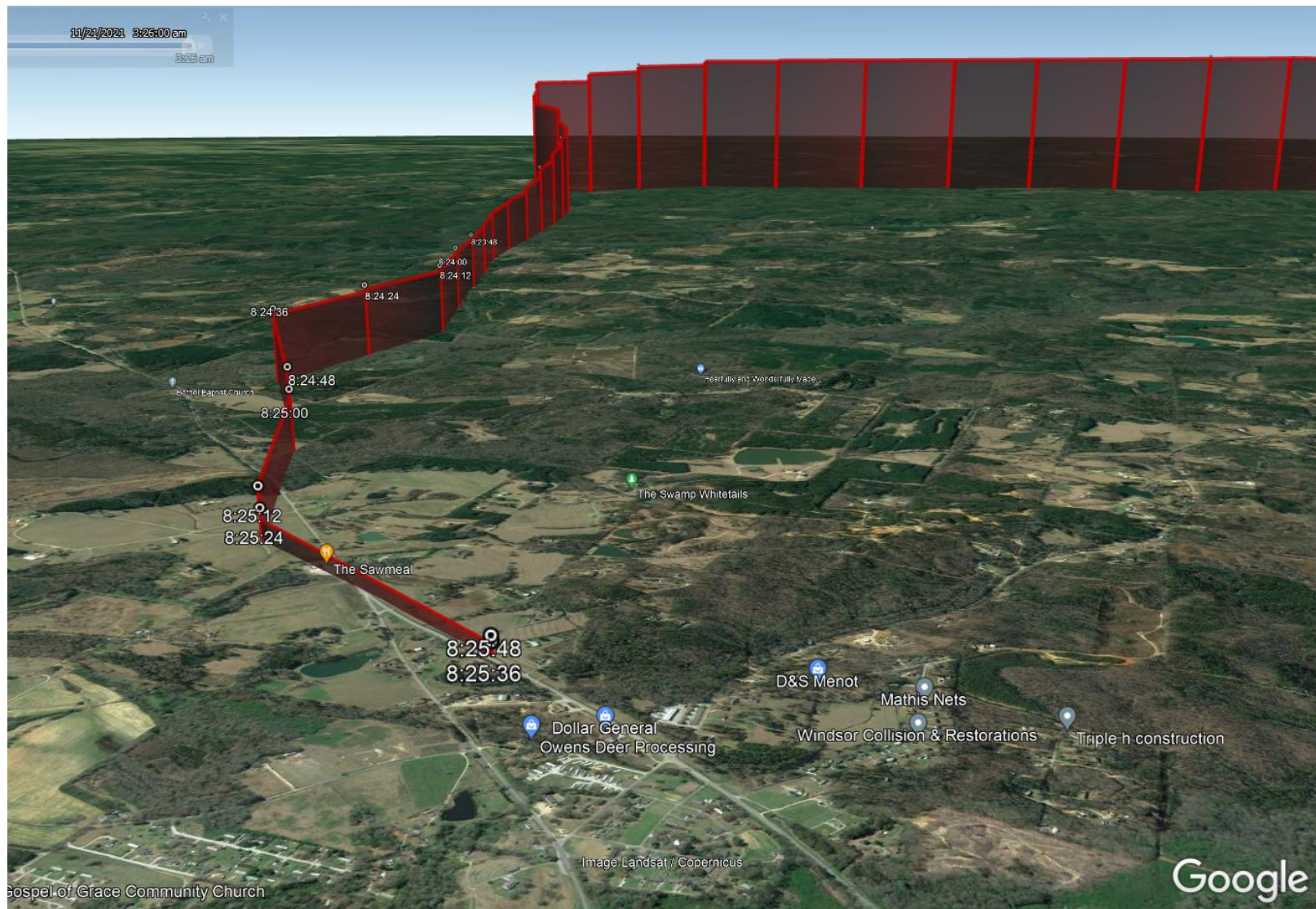


Figure 4. A Google Earth overlay showing the aircraft's descent profile toward the accident site.

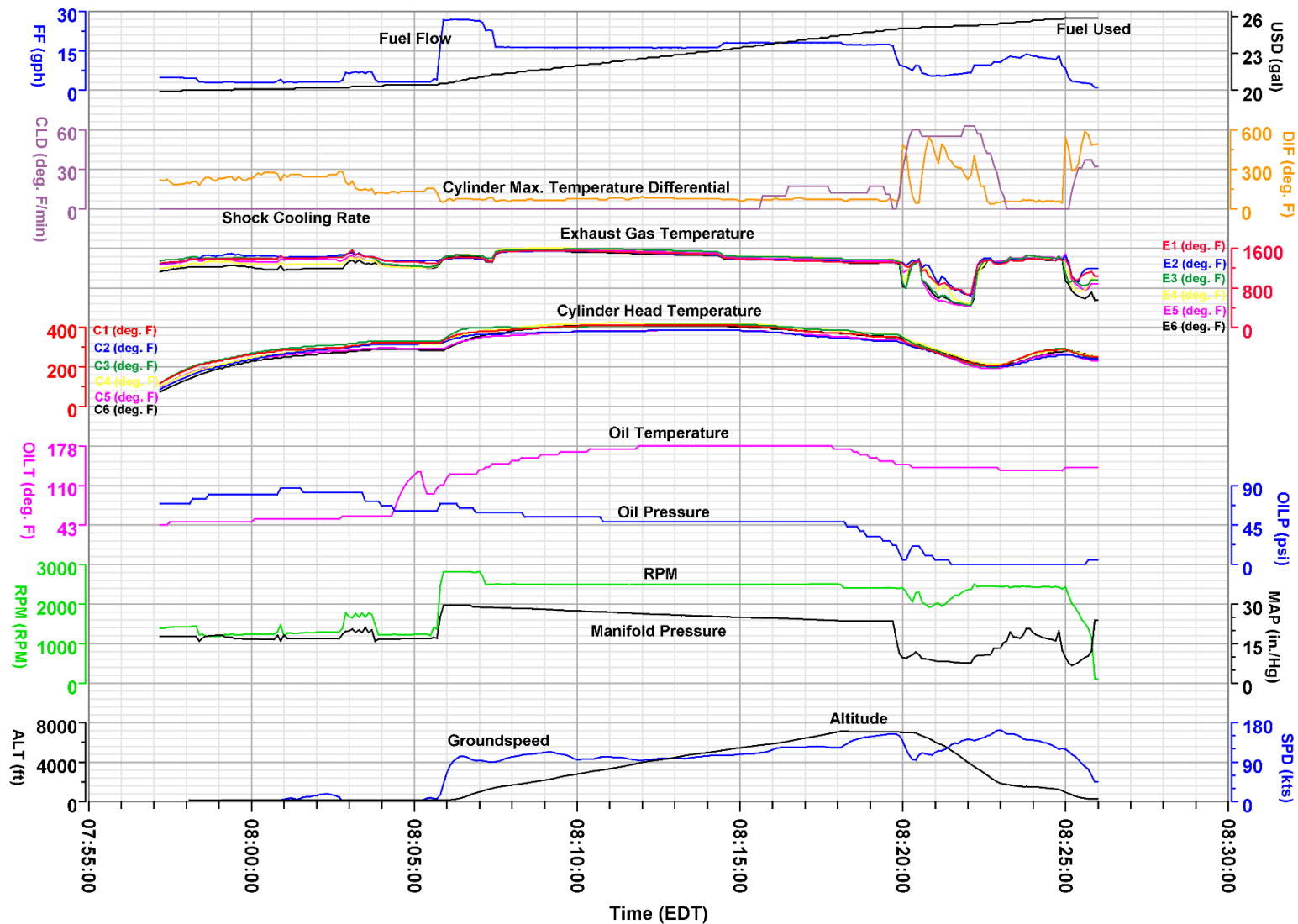


Figure 5. Plot of engine parameters for the entire accident recording.

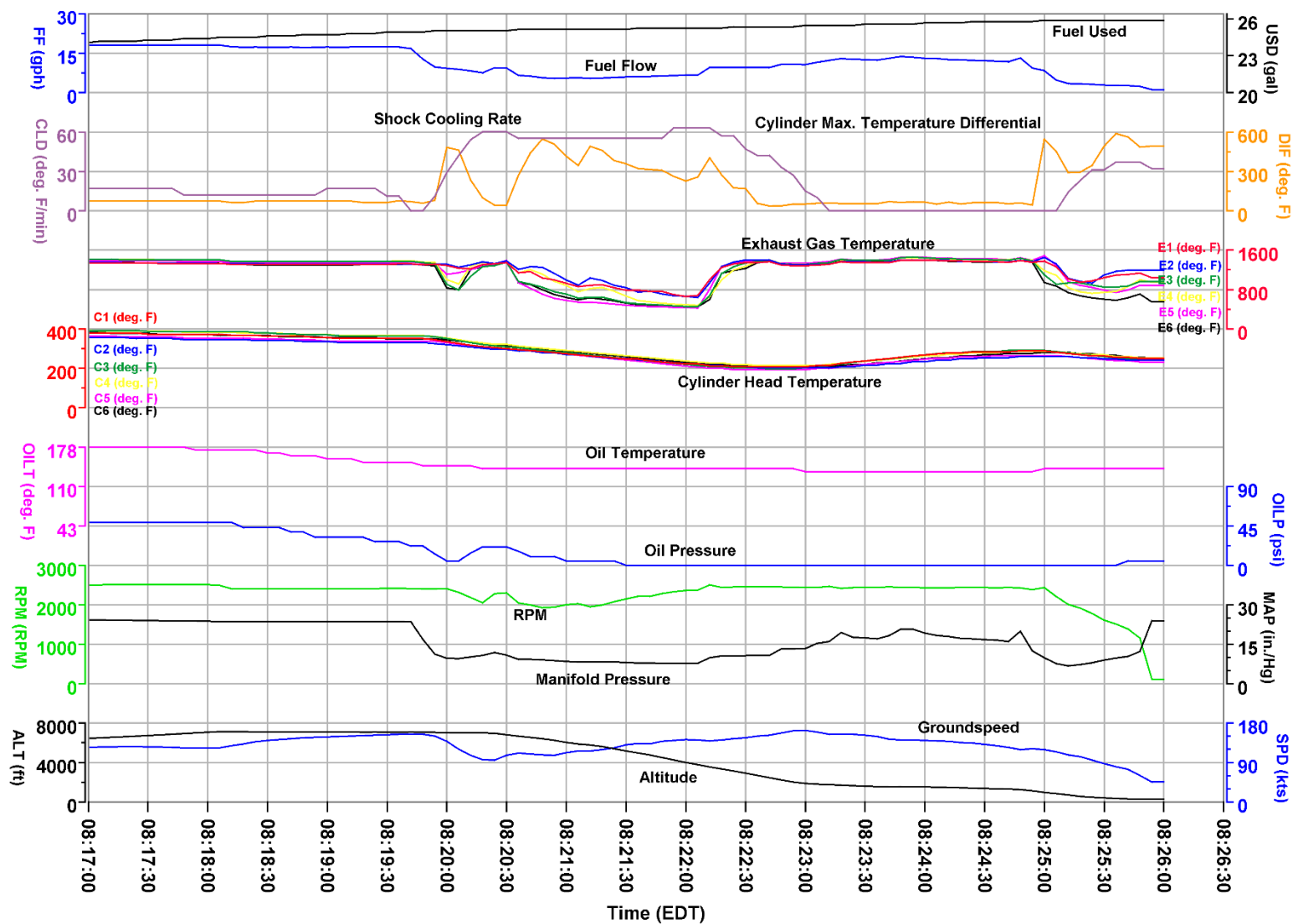


Figure 6. Plot of engine parameters for the final nine minutes of flight.

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 (units)	Parameter Description (units)
1. C-# (deg F)	Cylinder Head Temperature Cylinder # ² (degrees Fahrenheit)
2. E-# (deg F)	Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
3. FF (gph)	Engine Fuel Flow (gallons per hour)
4. USD (gal)	Engine Fuel Used (gallons)
5. CLD (deg F/min)	Engine Shock Cooling (degrees Fahrenheit per minute)
6. DIF (deg F)	Engine Cylinder Maximum Temperature Differential (degrees Fahrenheit)
7. OIL T (deg F)	Oil Temperature (degrees Fahrenheit)
8. OIL P (psi)	Oil Pressure (pounds per square inch)
9. RPM (rpm)	Propellor Revolutions per Minute
10. MAP (In.Hg)	Engine Manifold Pressure (inches of Mercury)
11. ALT (ft)	Altitude (feet)
12. SPD (kts)	Derived Groundspeed (knots)
13. LAT (deg)	Latitude (degrees)
14. LON (deg)	Longitude (degrees)

² Depending on aircraft configuration number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.