

# NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division  
Washington, D.C. 20594

December 6, 2022

## Electronic Devices

### Specialist's Factual Report By Gerald Kawamoto

#### 1. EVENT SUMMARY

Location: Sausalito, California  
Date: May 6, 2022  
Aircraft: Vans Aircraft RV10  
Registration: N54MG  
Operator: Private  
NTSB Number: WPR22FA172

#### 2. GROUP

A group was not convened.

#### 3. DETAILS OF INVESTIGATION

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

Recorder Manufacturer/Model: **Avidyne IFD540**

Recorder Serial Number: **M162691801**

Recorder Manufacturer/Model: **Advanced Flight Systems AF-5600T**

Recorder Serial Number: **71761**

Recorder Manufacturer/Model: **Advanced Flight Systems AF-5600T**

Recorder Serial Number: **71763**

Recorder Manufacturer/Model: **Advanced Flight Systems AF-5700T**

Recorder Serial Number: **71765**

##### 3.1.1. Avidyne IFD540 Device Description

The Avidyne IFD 540 is a GPS NAV/COM radio whose primary function is to conduct nav-com-transponder tuning and communication and serve as the principal navigation sensor/system for all IFR VHF and GPS-based navigation and instrument flying, provided it is connected to an external navigation source selection annunciator and a CDI/HSI indicator that is installed in the required field of view.

Supplemental functions include a moving-map, flight management system (FMS), checklists, electronic charts and checklists along with a number of timer and calculator types of utilities. The system includes terrain alerting as well as an option for TAWS.

### 3.1.2. Avidyne IFD540 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an external examination revealed the device has sustained impact damage, as shown in Figure 1. The device powered on normally and data were downloaded using the manufacturer's procedures.



Figure 1. Avidyne IFD540 as received.

### 3.1.3. Avidyne IFD540 Data Description

The device contained data recorded from September 26, 2021, through May 6, 2022.<sup>1</sup> The final session started at 18:26:02 UTC and ended at 19:09:44 UTC and corresponded to the accident event. The last valid GPS position data were recorded at 19:06:03. After this point, the recorded values for both latitude and longitude became 0 and didn't change in value for the remainder of the recorded data. Data parameters recorded at various sampling frequencies, which are noted in Table 1.

### 3.1.4. Avidyne IFD540 Parameters Provided

Table 1 shows parameters recorded by the device. Not all parameters recorded were validated by the recorder specialist and are not included in this report.

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<sup>1</sup> Coordinated Universal Time (UTC).

**Table 1. Avidyne IFD540 Parameters**

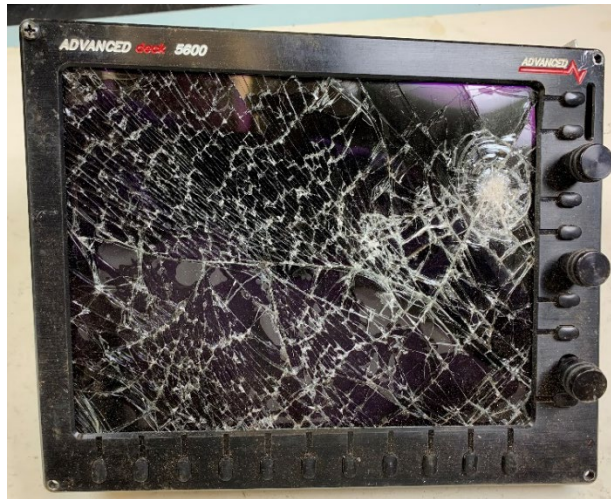
| Parameter Name (units) | Parameter Description (units) - Sampling Frequency |
|------------------------|----------------------------------------------------|
| Date                   | Date for recorded data point (MM/DD/YYYY)          |
| Time                   | Time (UTC) for recorded data point (HH:MM:SS)      |
| Latitude (deg)         | Recorded Latitude (degrees) - 5 Hz                 |
| Longitude (deg)        | Recorded Longitude (degrees) - 5 Hz                |
| Pressure Altitude (ft) | Pressure Altitude (feet) - 5 Hz                    |
| GPSAltitude (ft)       | GPS Altitude (feet) - 1 Hz                         |
| GPS MSL Altitude (ft)  | Above Mean Sea Level Altitude (feet) - 1 Hz        |
| GPS AGL Altitude (ft)  | Above Ground Level Altitude (feet) - 1 Hz          |
| GroundSpeed (kts)      | Averaged derived ground speed (knots)              |
| Magnetic Heading (deg) | Magnetic Heading (degrees) - 5 Hz                  |
| Fuel Used (gal)        | Fuel Used (gallons) - 0.25 Hz                      |
| Fuel Remaining (gal)   | Fuel Remaining (gallons) - 0.25 Hz                 |
| Fuel Flow (gph)        | Fuel Flow (gallons per hour) - 0.25 Hz             |

### **3.2. Advanced Flight Systems 5600T/5700T Device Description**

The Advanced Flight Systems AF-5600T and AF5700T are multifunctional displays capable of serving as a Primary Flight Display (PFD) with Synthetic Vision, an Engine Monitoring System (EMS), and a Moving Map in a variety of customizable screen layouts. The AF-5600 uses a 10.4" display and the AF-5700 uses a 12.1" display. Data is provided to the units from various connected modules and devices. An SD slot on the front of the displays can be used for transferring files recorded to the internal memory. When multiple displays are utilized, certain settings and actions are synchronized throughout the system.

#### **3.2.1. Advanced Flight Systems 5600T/5700T Data Recovery**

Upon arrival at the Vehicle Recorder Laboratory, external examinations revealed the devices had sustained impact damage, as shown in Figures 2 through 4. The damage sustained by AFS 5600T S/N 71761 and AFS 5700T S/N 71765 rendered them inoperable. AFS 5600T S/N 71763 powered on normally and data were exported using the manufacturer's procedure. Discussions with the manufacturer indicated that data recorded on each of the three devices would be redundant because each records all flight and engine data. Therefore, further attempts at data recovery on AFS 5600T S/N 71761 and AFS 5700T S/N 71765 were not pursued.



**Figure 2. AFS 5600T S/N 71761 as received.**



**Figure 3. AFS 5600T S/N 71763 as received.**



**Figure 4. AFS 5700T S/N 71765 as received.**

### 3.2.2. Advanced Flight Systems Data Description

AFS 5600T S/N 71763 contained data recorded from January 23, 2022, through May 6, 2022 UTC. The final session started at 18:26:49 and ended at 19:09:47 on May 6, 2022 UTC and corresponded to the accident event. Data were sampled once every second. The “Baro” setting recorded during the accident flight was 30.05 inHg.

### 3.2.3. Advanced Flight Systems Parameters Provided

Table 2 shows parameters recorded by the device.

**Table 2. AF-5600T Parameters**

| Parameter Name (units) | Parameter Description (units)                    |
|------------------------|--------------------------------------------------|
| Date                   | Date for recorded data point (MM/DD/YYYY)        |
| Time                   | Time (UTC) for recorded data point (HH:MM:SS)    |
| LATITUDE (deg)         | Recorded Latitude (degrees)                      |
| LONGITUDE (deg)        | Recorded Longitude (degrees)                     |
| ALTITUDE (ft)          | MSL Altitude (feet)                              |
| GPS_ALTITUDE (ft)      | GPS Altitude (feet)                              |
| GROUND_SPD (kts)       | Averaged derived ground speed (knots)            |
| AIRSPEED (kts)         | Indicated Airspeed (knots)                       |
| TAS_KNOTS (kts)        | True Airspeed (knots)                            |
| HEADING (deg)          | Magnetic Heading (degrees)                       |
| PITCH (deg)            | Pitch Angle (degrees)                            |
| ROLL (Deg)             | Roll Angle (degrees)                             |
| VERTSPEED (fpm)        | Vertical Speed (feet per minute)                 |
| G_METER (G)            | Vertical Acceleration (G)                        |
| CHT 1-6 (degF)         | Cylinder Head Temperature # (degrees Fahrenheit) |
| EGT 1-6 (degF)         | Exhaust Gas Temperature # (degrees Fahrenheit)   |
| FUEL_FLOW (gpm)        | Fuel Flow (gallons per minute)                   |
| HP (%)                 | Horsepower (percentage)                          |
| RPM                    | Engine Revolutions Per Minute                    |
| MANIFOLD (inHg)        | Manifold Pressure (inches of Mercury)            |
| OIL_PSI (psi)          | Oil Pressure (pounds per square inch)            |
| OIL_TEMP (degF)        | Oil Temperature (degrees Fahrenheit)             |

### **3.3. Plots and Corresponding Tabular Data**

The following 8 figures contain data recorded during the May 6, 2022, event.

Figures 5 through 7 are graphical overlays generated using Google Earth showing the entire accident flight. Weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Flight paths generated from the Avidyne data and the AFS data aligned, however, since the AFS provided about three additional minutes of GPS location data, it is depicted in the Google Earth overlays.

Figure 5 shows the entire accident track log. The aircraft departed Sacramento Executive Airport (SAC), Sacramento, CA, at about 18:28 UTC and the final data point was recorded at 19:09:47 UTC, about 1 mile south of Sausalito, CA.

Figure 6 is a Google Earth overlay that shows the final nine minutes of the accident track log.

Figure 7 is a Google Earth overlay that shows the final four minutes of the accident track log and the reported wreckage location.

Figures 8 through 11 were created using data from the AFS 5600T.

Figure 8 is a plot of basic parameters for the entire accident flight. The time shown is 18:25:00 to 19:10:00 UTC.

Figure 9 is a plot of basic parameters at the end of the accident flight. The time shown is 19:03:00 to 19:10:00 UTC.

Figure 10 is a plot of engine parameters for the entire accident flight. The time shown is 18:25:00 to 19:10:00 UTC.

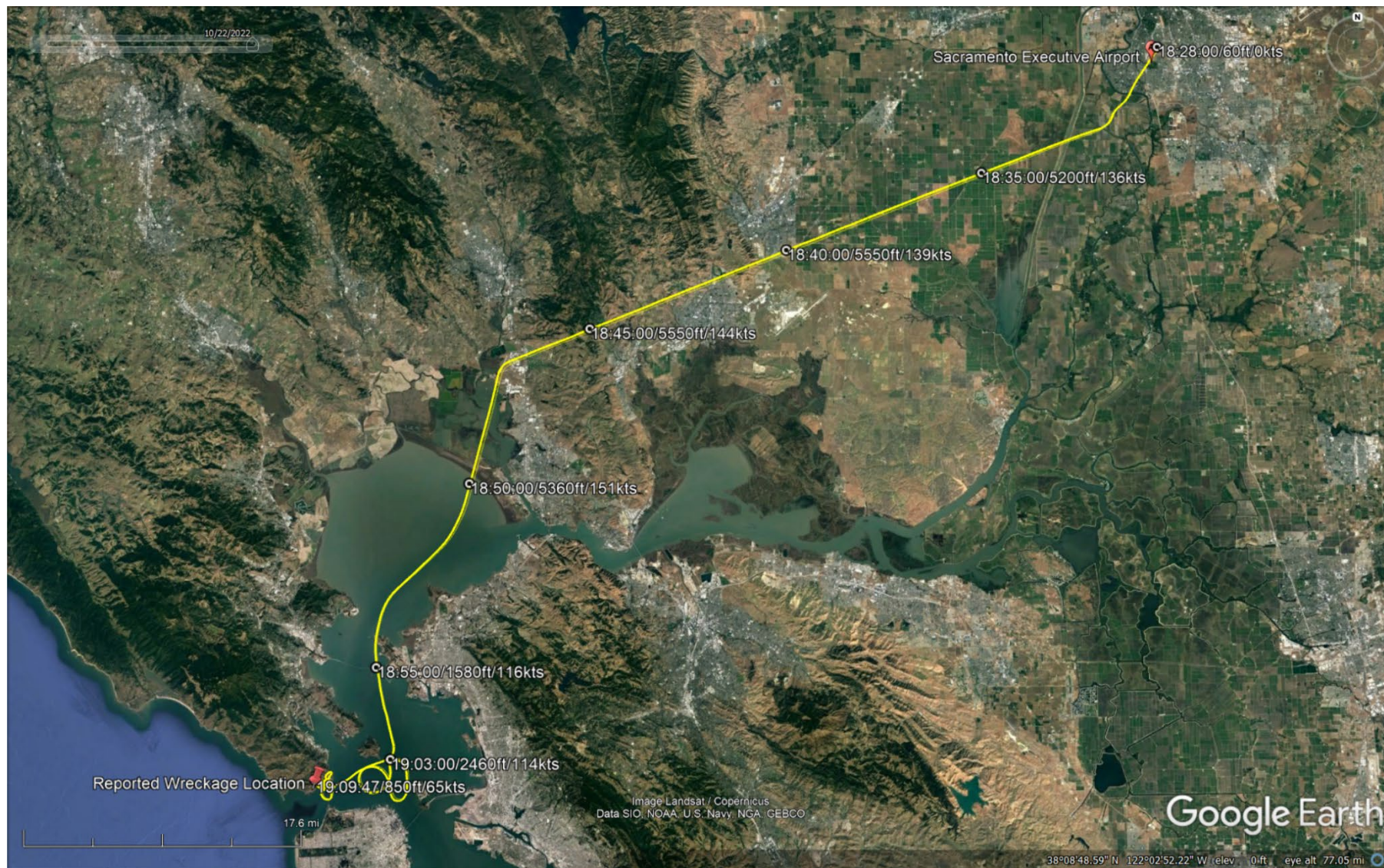
Figure 11 is a plot of engine parameters at the end of the accident flight. The time shown is 19:03:00 to 19:10:00 UTC.

Figure 12 is a plot of Avidyne parameters for the entire accident flight. The time shown is 18:25:00 to 19:10:00 UTC.

The data from the AFS 5600T are provided in electronic comma delimited (\*.csv<sup>2</sup>) format as Attachment 1 to this report. The data from the Avidyne are provided as Attachment 2 to this report.

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<sup>2</sup> Comma Separated Value format.



**Figure 5. Google Earth overlay of the entire accident flight.**



**Figure 6. Google Earth overlay of the final nine minutes of the accident flight.**



**Figure 7. Google Earth overlay of the final four minutes of the accident flight and the reported wreckage location.**

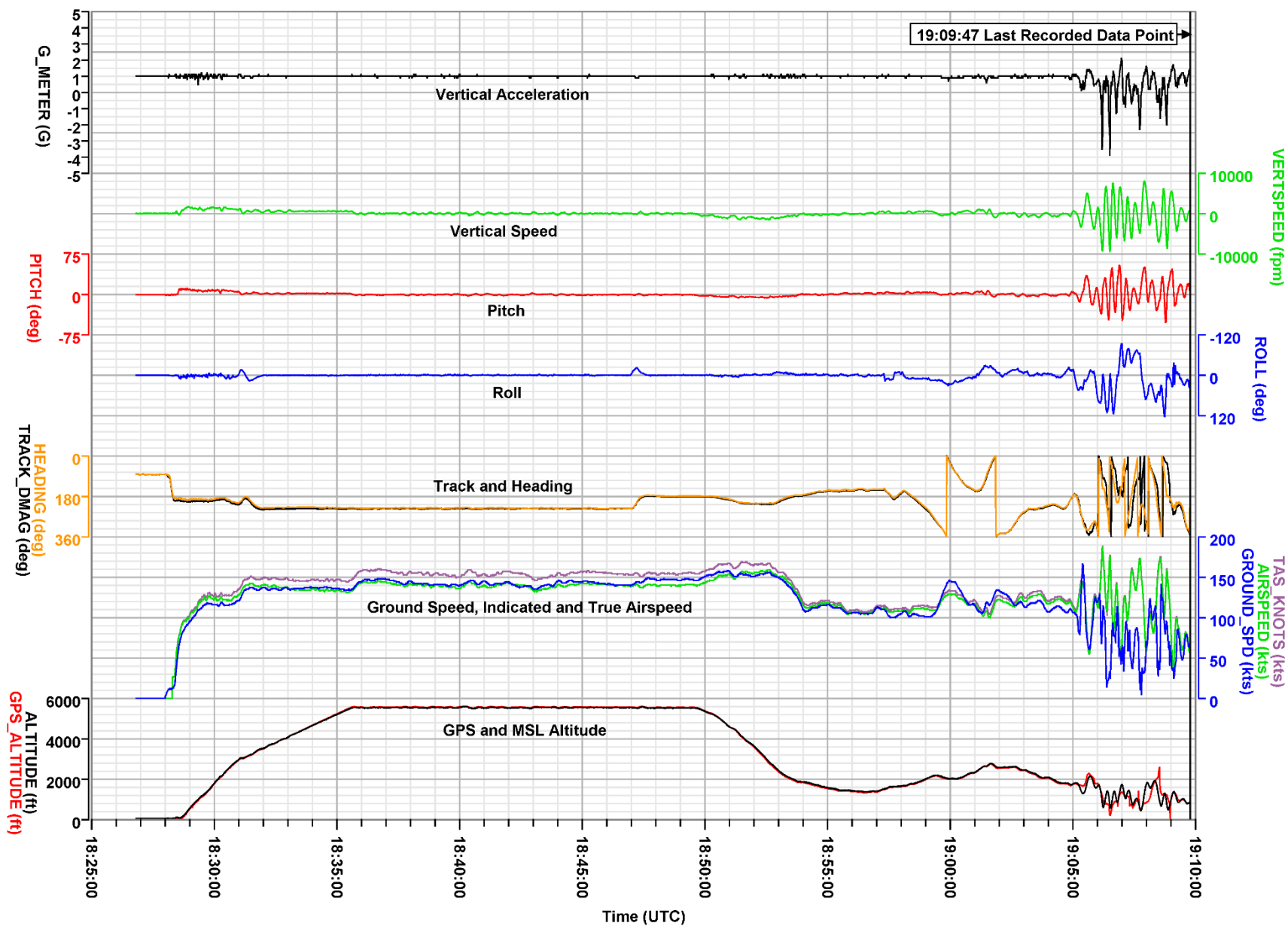
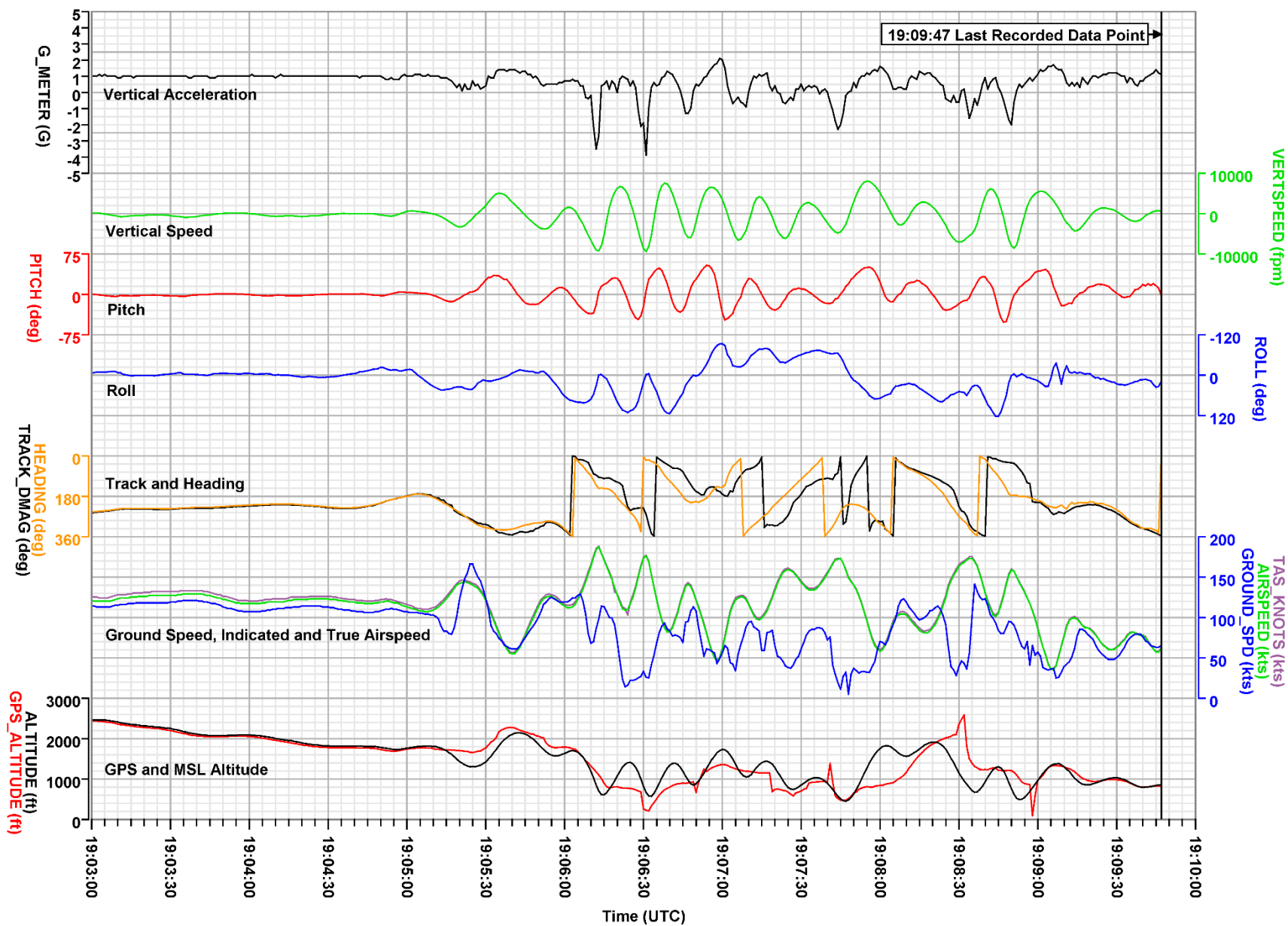


Figure 8. Plot of basic parameters for the entire accident flight recorded on the AFS 5600T.



**Figure 9. Plot of basic parameters at the end of the accident flight recorded on the AFS 5600T.**

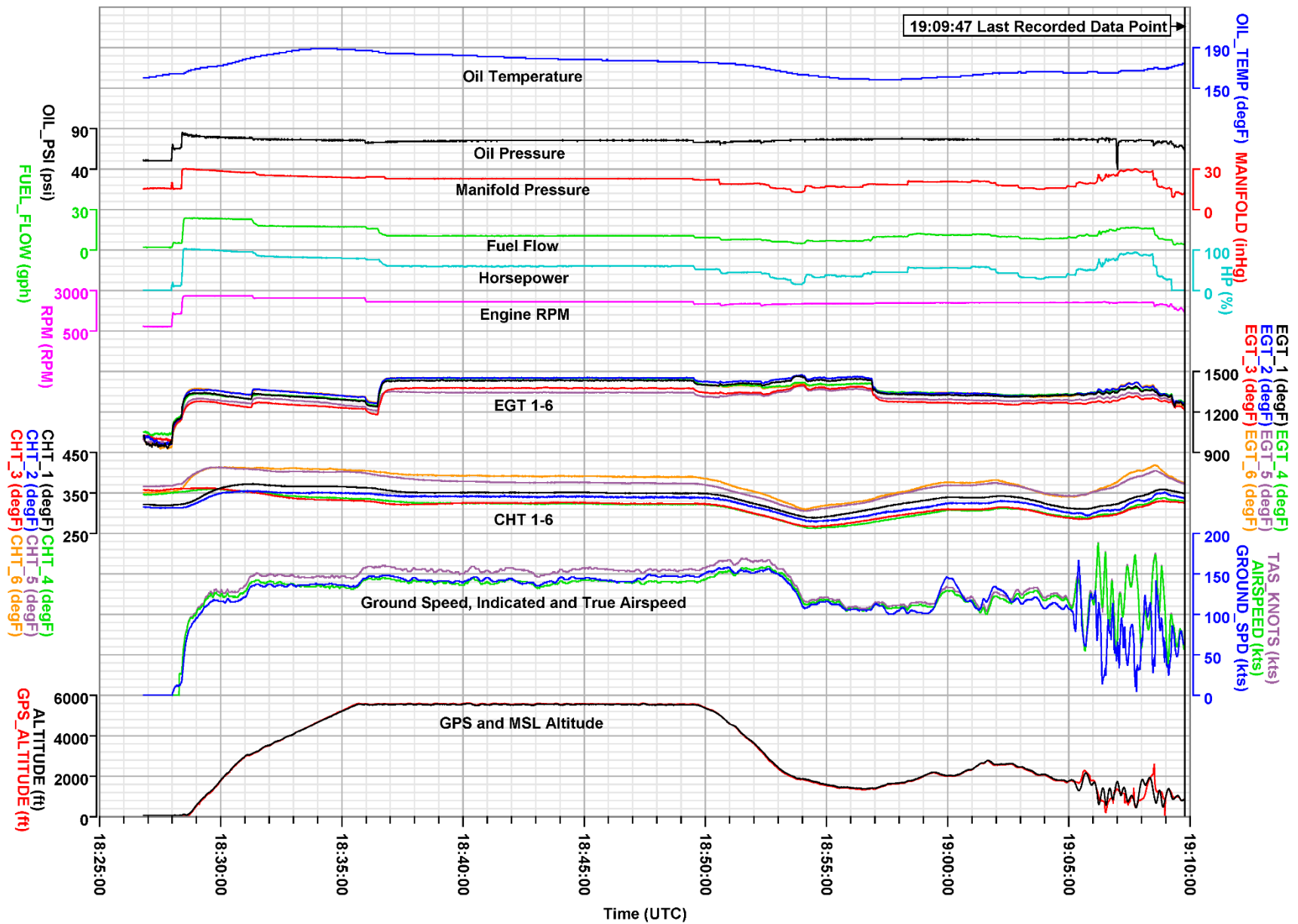


Figure 10. Plot of engine parameters for the entire accident flight recorded on the AFS 5600T.

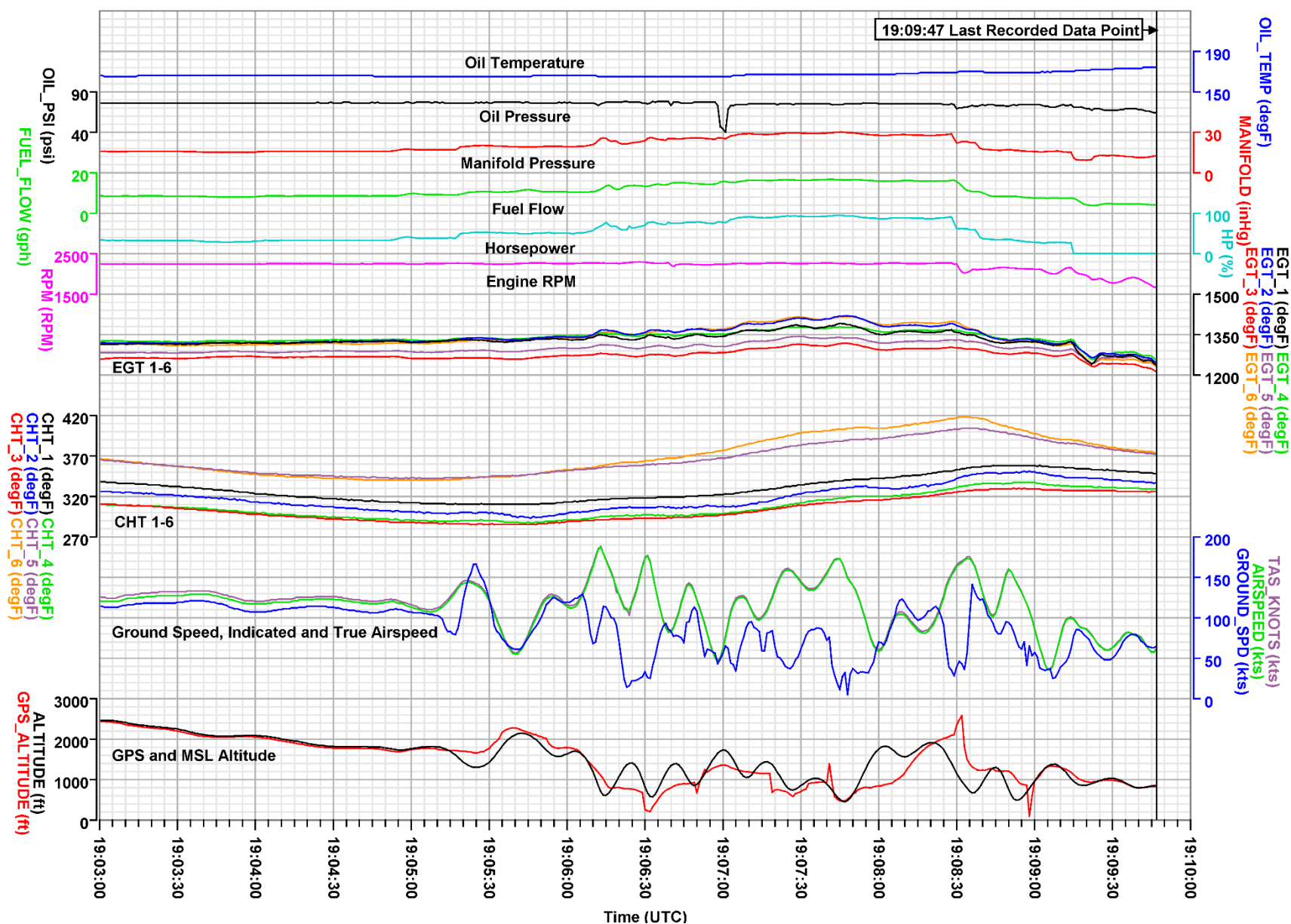
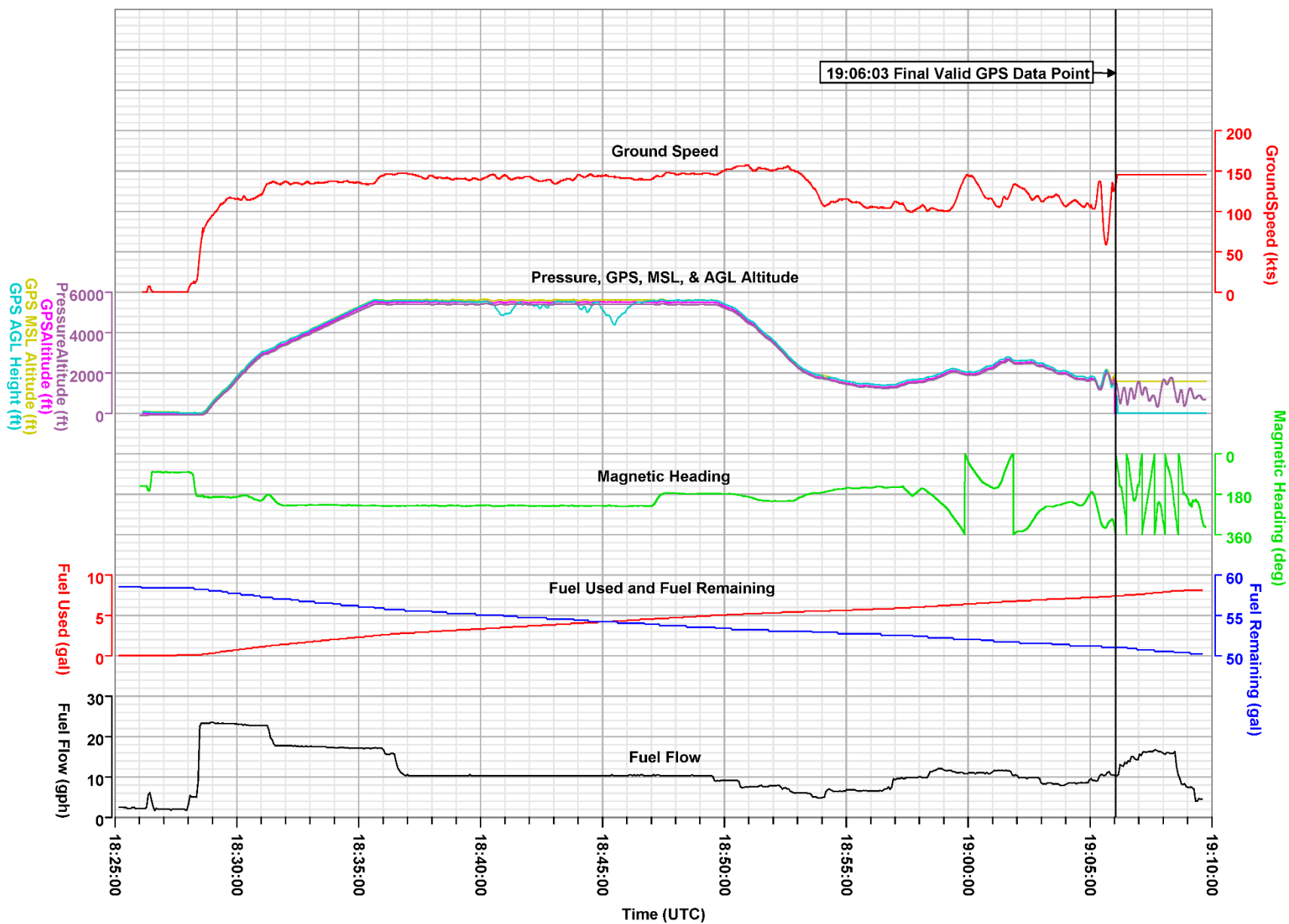


Figure 11. Plot of engine parameters at the end of the accident flight recorded on the AFS 5600T.



**Figure 12. Plot of Avidyne parameters for the entire accident flight.**