

**NATIONAL TRANSPORTATION SAFETY BOARD**

Vehicle Recorder Division  
Washington, D.C. 20594

May 21, 2019

## **Non-Volatile Memory Devices**

**Specialist's Factual Report**  
**Marie Moler**

### **1. Event**

Location: Franklin, Virginia  
Date: December 10, 2016  
Aircraft/ID: MATHIAS LINDA B LIGHTNING / N59JL  
Operator: Private  
NTSB Number: ERA17LA067

### **2. Event Summary**

On December 10, 2016, about 1219 eastern standard time, a privately owned and operated experimental amateur-built Lightning, N59JL, was substantially damaged when it impacted terrain while maneuvering in the traffic pattern at Franklin Municipal-John Beverly Rose Airport, Franklin, Virginia. The commercial pilot sustained minor injuries and the pilot-rated passenger sustained a serious injury. The airplane was operated under the provisions of 14 *Code of Federal Regulations* (CFR) Part 91 as a personal flight. Visual meteorological conditions prevailed at the time and no flight plan was filed for the local flight which originated about 2 minutes earlier.

### **3. Details of Device Investigation**

The NTSB Vehicle Recorder Division received the following devices:

Device 1: Genesys Aerosystems IDU-450 PFD  
Device 1 Serial Number: 66-000144  
Device 2: Genesys Aerosystems IDU-450 MFD  
Device 2 Serial Number: 66-000145  
Device 3: Grand Rapids Technology 6000  
Device 3 Serial Number: 18644

All devices were found in good condition. Figure 1 shows all three devices. Power was applied to each unit using NTSB laboratory equipment. Device startup was consistent with normal operation. Data was downloaded from both devices using normal methods.

### 3.1. Genesys Aerosystems IDU-450 Device Description

The Genesys Aerosystems IDU-450 is a panel-mounted Electronic Flight Instrumentation System (EFIS) consisting of Primary Flight Display (PFD) and Multi-Function Display (MFD) units. The device is capable of displaying EFIS data on a 5" x 4" LCD display. Data is stored on *non-volatile*<sup>1</sup> memory.

The Grand Rapids Technology 6000 is a display device only and does not contain data.

#### 3.1.1. Genesys Aerosystems IDU-450 Data Description

The data extracted 14 minutes of data from the day of the accident, of which 2 minutes and 15 seconds of data that was determined to be the accident flight. The rest of the data recorded the airplane on the ground before take-off. Also included is the prior recorded flight dated October 13<sup>th</sup>, 2016 and included 1 hour and 51 minutes of flight and ground data.

#### 3.1.2. Genesys Aerosystems IDU-450 Parameters Provided

Table 1 describes data parameters provided by the EFIS device. The Genesys Aerosystems IDU-450 are configured to record data from connected AHRS (attitude and heading reference system), ADC (air data computer), and GPS (global positioning system) devices.

**Table 1: Data Parameters**

| Parameter Name | Parameter Description    |
|----------------|--------------------------|
| Date           | Universal date           |
| Time           | Universal time           |
| Latitude       | Latitude (deg)           |
| Longitude      | Longitude (deg)          |
| Altitude       | Altitude, corrected (ft) |
| Pitch          | Pitch (deg)              |
| Bank           | Bank (deg)               |
| Heading        | Heading (deg), magnetic  |
| Track          | Track (deg), magnetic    |
| IAS            | Indicated airspeed (kts) |
| TAS            | True airspeed (kts)      |
| Groundspeed    | Groundspeed (kts)        |
| VSI            | Vertical speed (m/s)     |
| Glidepath      | Glide path (deg)         |
| Gforce         | Vertical load factor (g) |
| Windspeed      | Wind speed (kts)         |

<sup>1</sup> Non-volatile memory is semiconductor memory that does not require external power for data retention.

|                    |                                |
|--------------------|--------------------------------|
| Winddir            | Wind direction (deg)           |
| OAT                | Outside air temperature (degF) |
| Density Altitude   | Density Altitude (ft)          |
| Fuel Totalizer Qty | Fuel totalizer quantity (gal)  |
| RPM                | Rotations per minute           |
| Fuelflow           | Fuel flow (gph)                |
| Left fuel          | Left fuel (gal)                |
| Right fuel         | Right fuel (gal)               |
| Fuel pressure      | Fuel pressure (psi)            |
| Oil Temperature    | Oil Temperature (°F)           |
| Oil Pressure       | Oil Pressure (psi)             |
| Volts              | Volts                          |
| EGT #1             | EGT #1 (°F)                    |
| CHT #1             | CHT #1 (°F)                    |
| EGT #2             | EGT #2 (°F)                    |
| CHT #2             | CHT #2 (°F)                    |
| EGT #3             | EGT #3 (°F)                    |
| CHT #3             | CHT #3 (°F)                    |
| EGT #4             | EGT #4 (°F)                    |
| CHT #4             | CHT #4 (°F)                    |
| EGT #6             | EGT #6 (°F)                    |
| CHT #6             | CHT #6 (°F)                    |
| Aux Temp 1         | Aux Temp 1 (°F)                |
| Aux Temp 2         | Aux Temp 2 (°F)                |

### 3.2. Grand Rapids Technology 6000 Device Description

The GRT 6000 is a panel-mounted Engine Information System (EIS). The device can display EIS data to the pilot. Data is not stored on the device, but engine data was sent to the Genesys Aerosystems IDU-450.

#### 4. OVERLAYS AND TABULAR DATA

Figure 2 is a Google Earth overlay of the accident taxi and flight path.

Figure 3 - Figure 6 are plots of data downloaded from the Genesys Aerosystems IDU-450. Figure 3 and Figure 4 show the last two and a half minutes of data which focus on the in-flight portion of the data, while Figure 5 and Figure 6 show the full 14 minutes of recorded data for the day.

Figure 7 is a Google Earth overlay of the prior recorded flight. Figure 8 through Figure 11 show the full 1 hour and 51 minutes recorded that day.

Tabular data used to generate Figure 3 through Figure 6 are included as Attachment 1. Tabular data used to generate Figure 8 through Figure 11 are included as Attachment 2. These attachments are provided in electronic comma-separated value (.CSV) format.

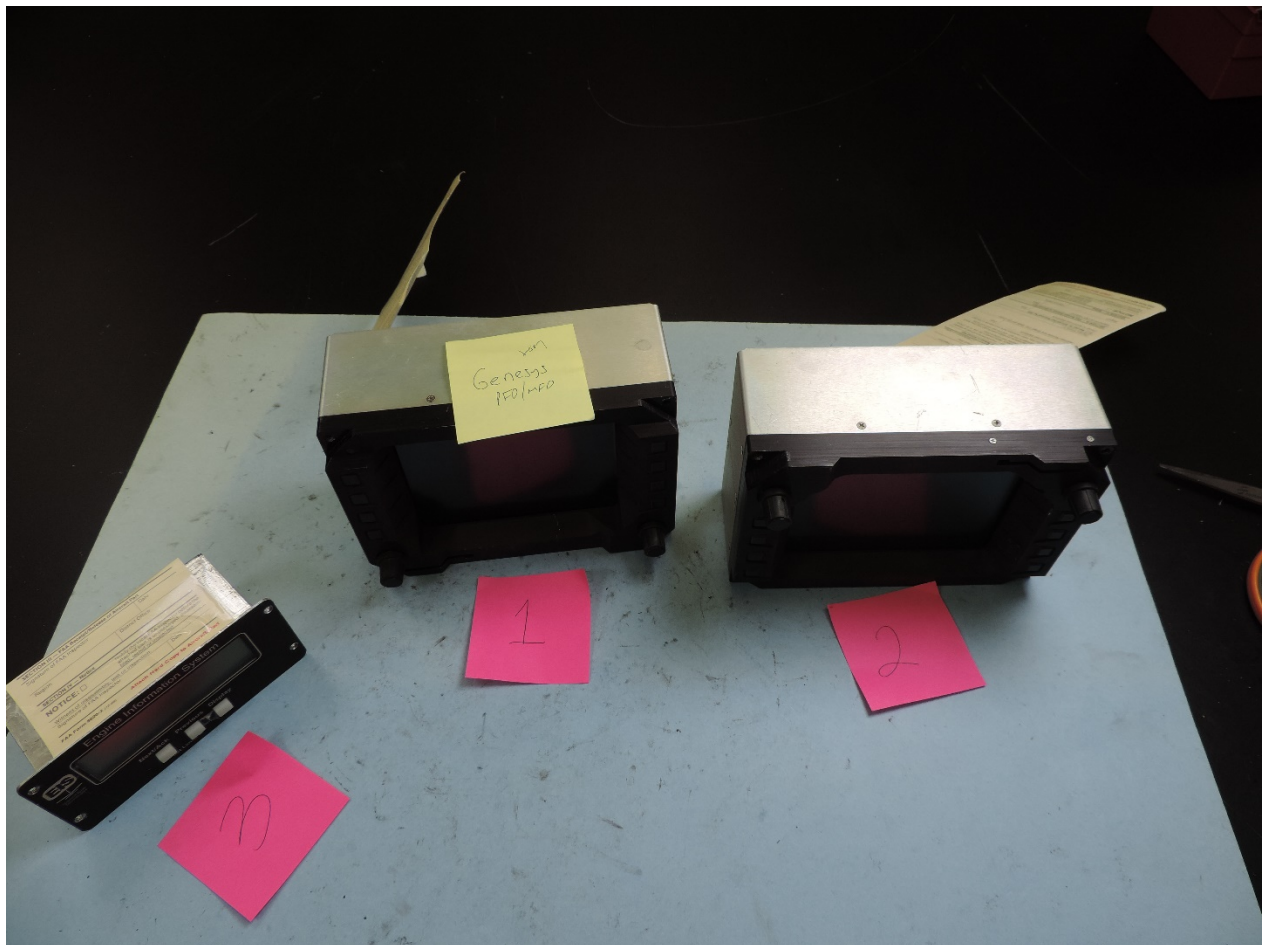


Figure 1: Device 1, 2, and 3.

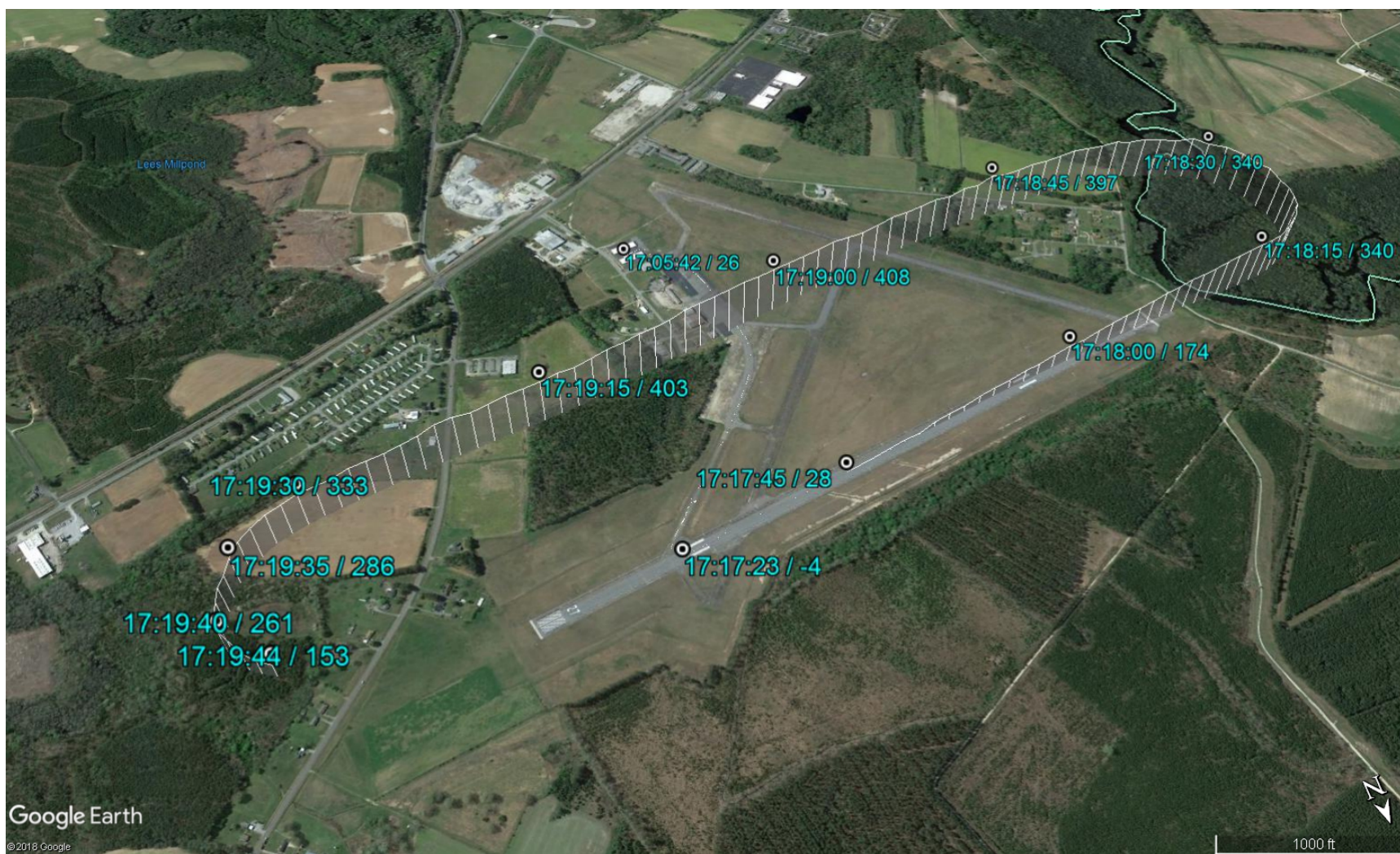


Figure 2: Accident Flight on December 10<sup>th</sup>, 2016 from latitude, longitude, and altitude.

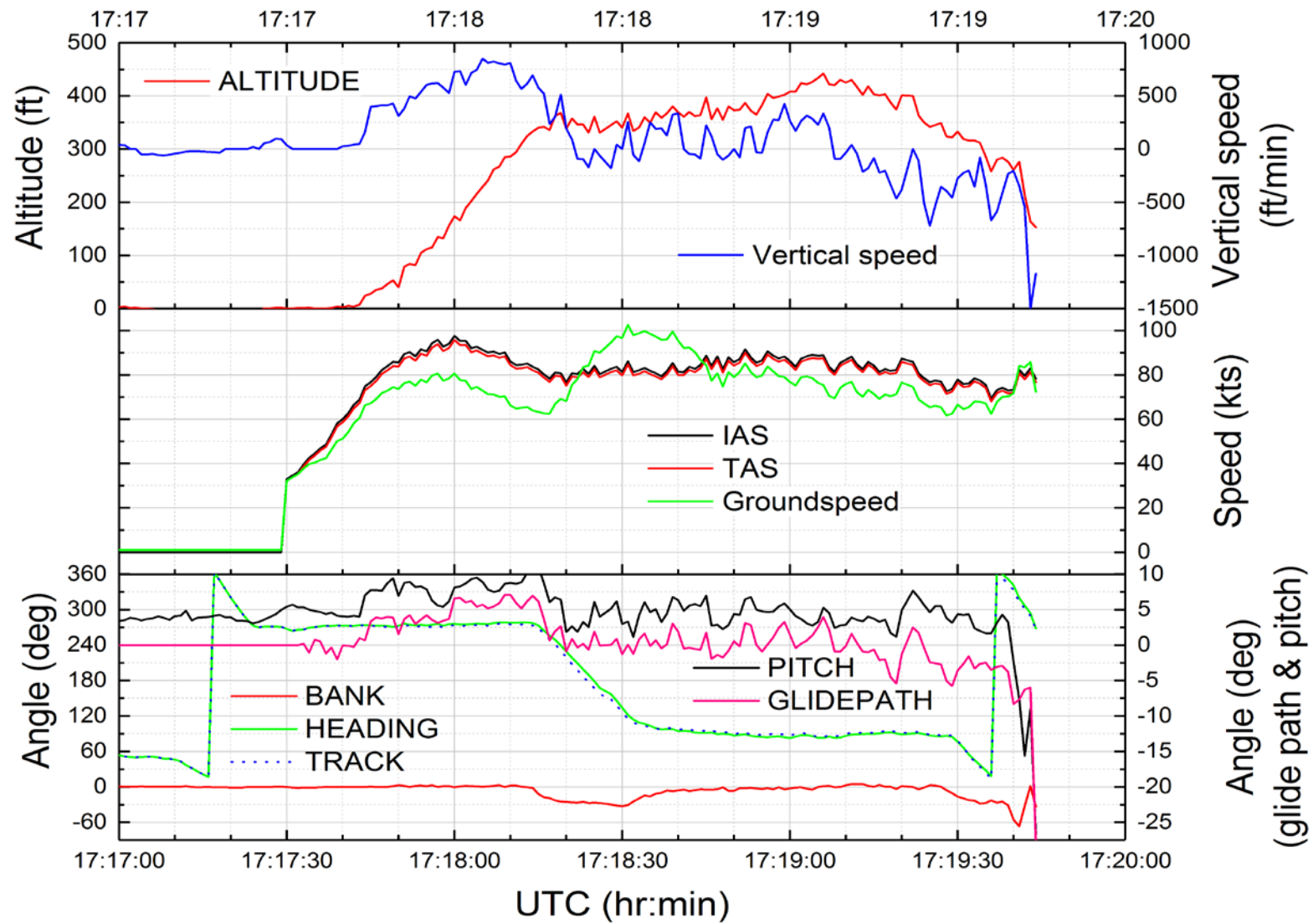


Figure 3: Plot of Data from Accident Flight on December 10<sup>th</sup>, 2016.

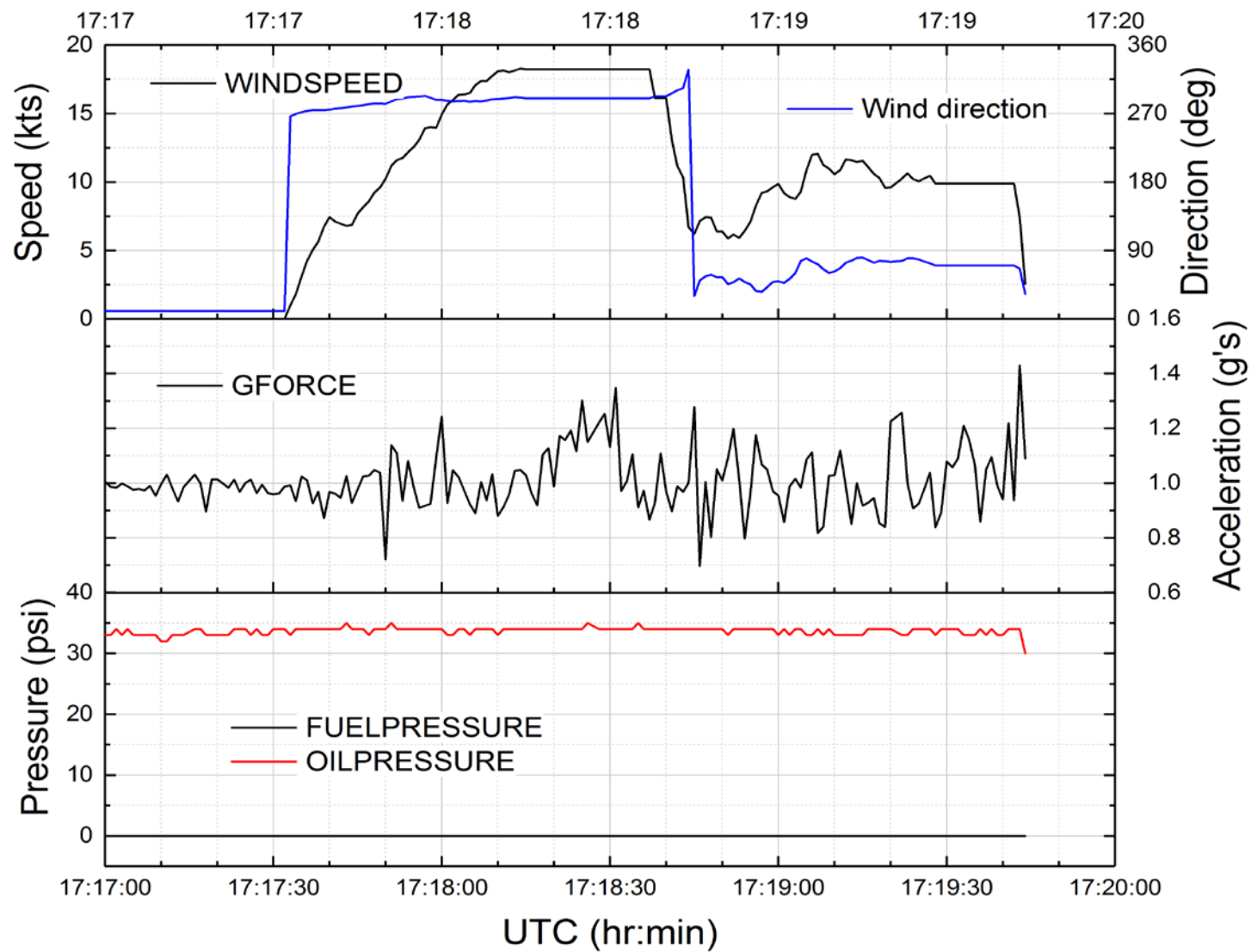


Figure 4: Plot of Data from Accident Flight on December 10<sup>th</sup>, 2016.

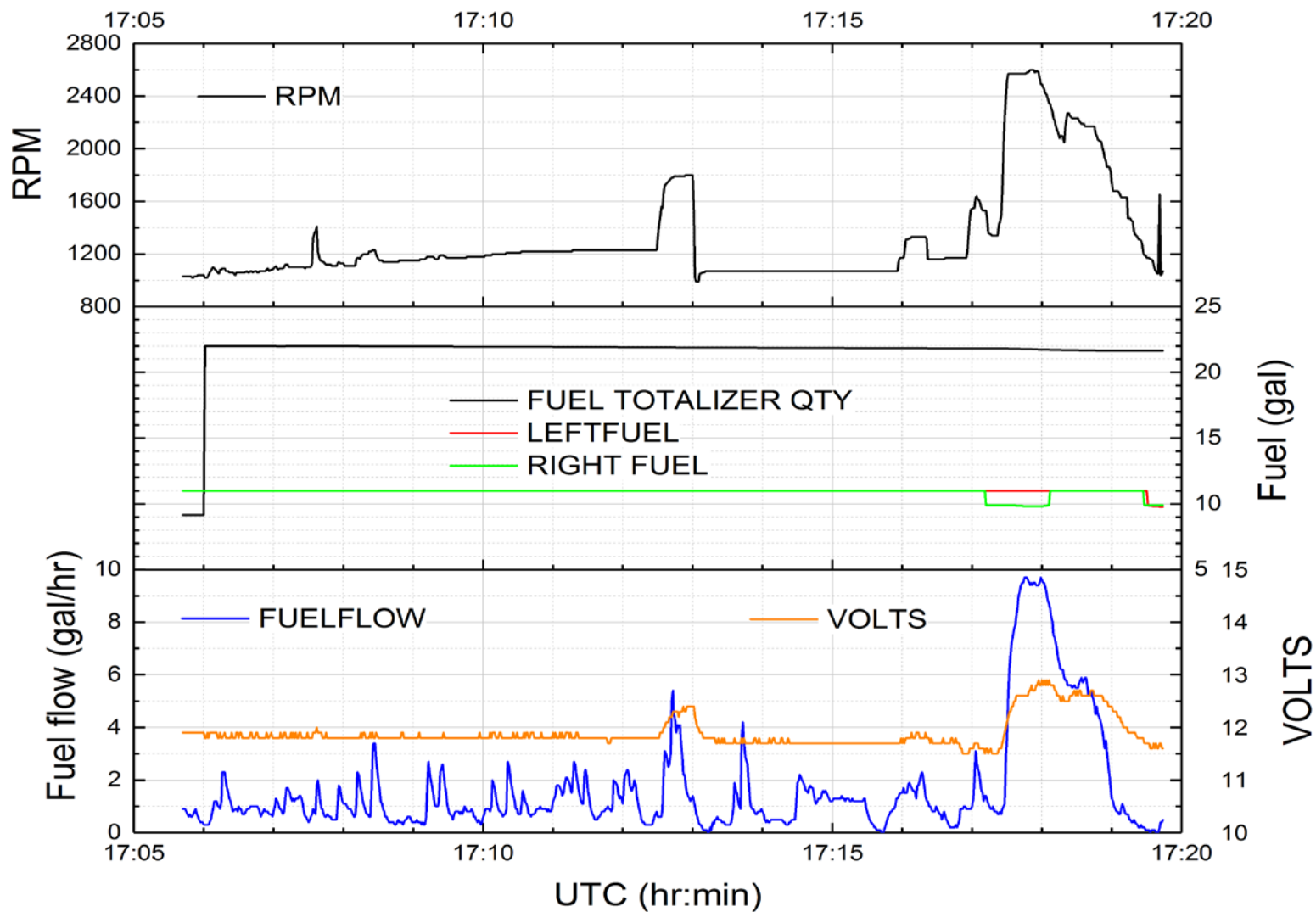


Figure 5: Plot of Data from Accident Day on December 10<sup>th</sup>, 2016.

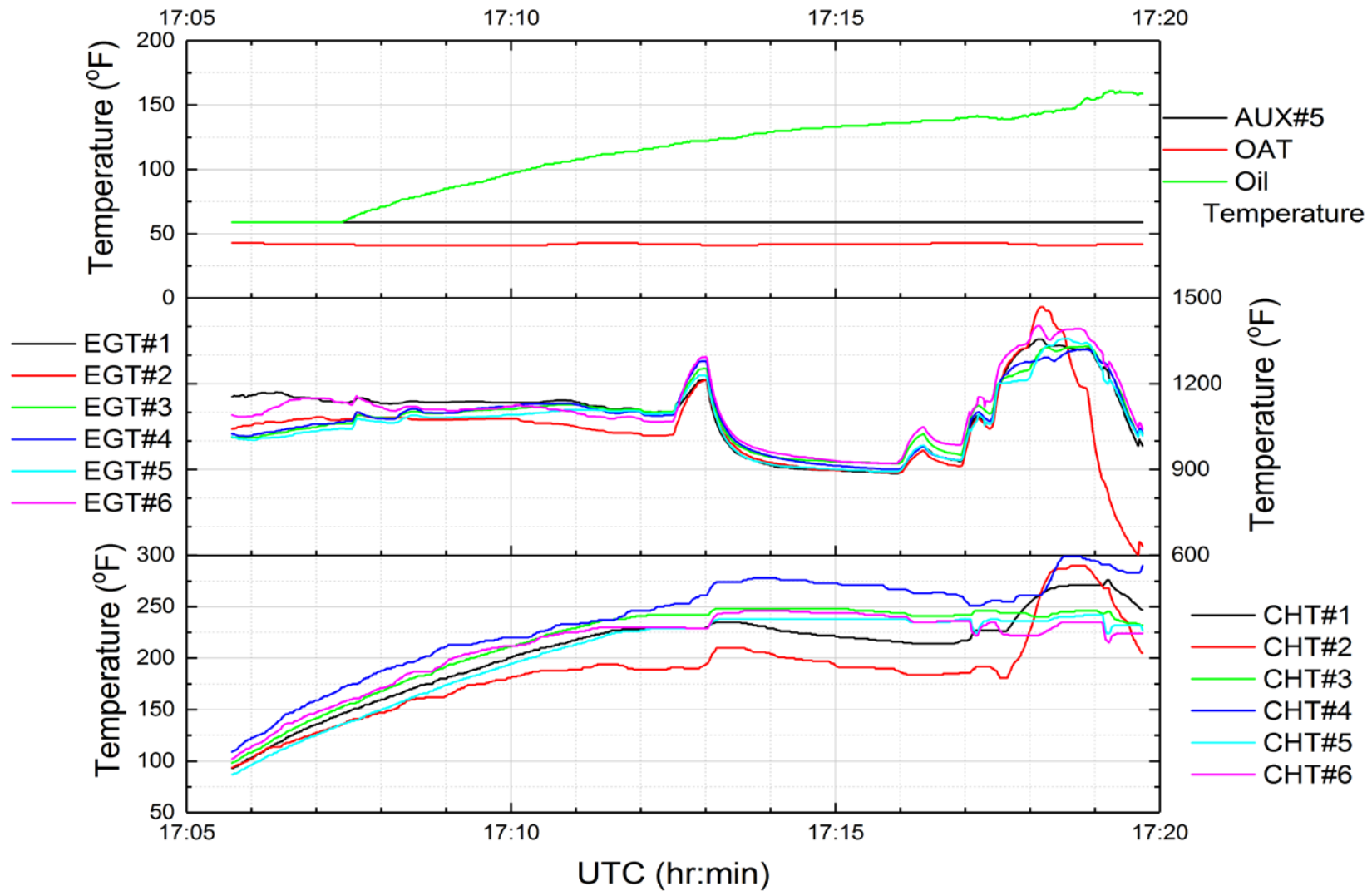


Figure 6: Plot of Data from Accident Day on December 10<sup>th</sup>, 2016.



**Figure 7: Prior Recorded Flight on October 13<sup>th</sup>, 2016 from latitude, longitude, and altitude. Flight path is clock-wise and Franklin Municipal-John Beverly Rose Airport marked with an arrow.**

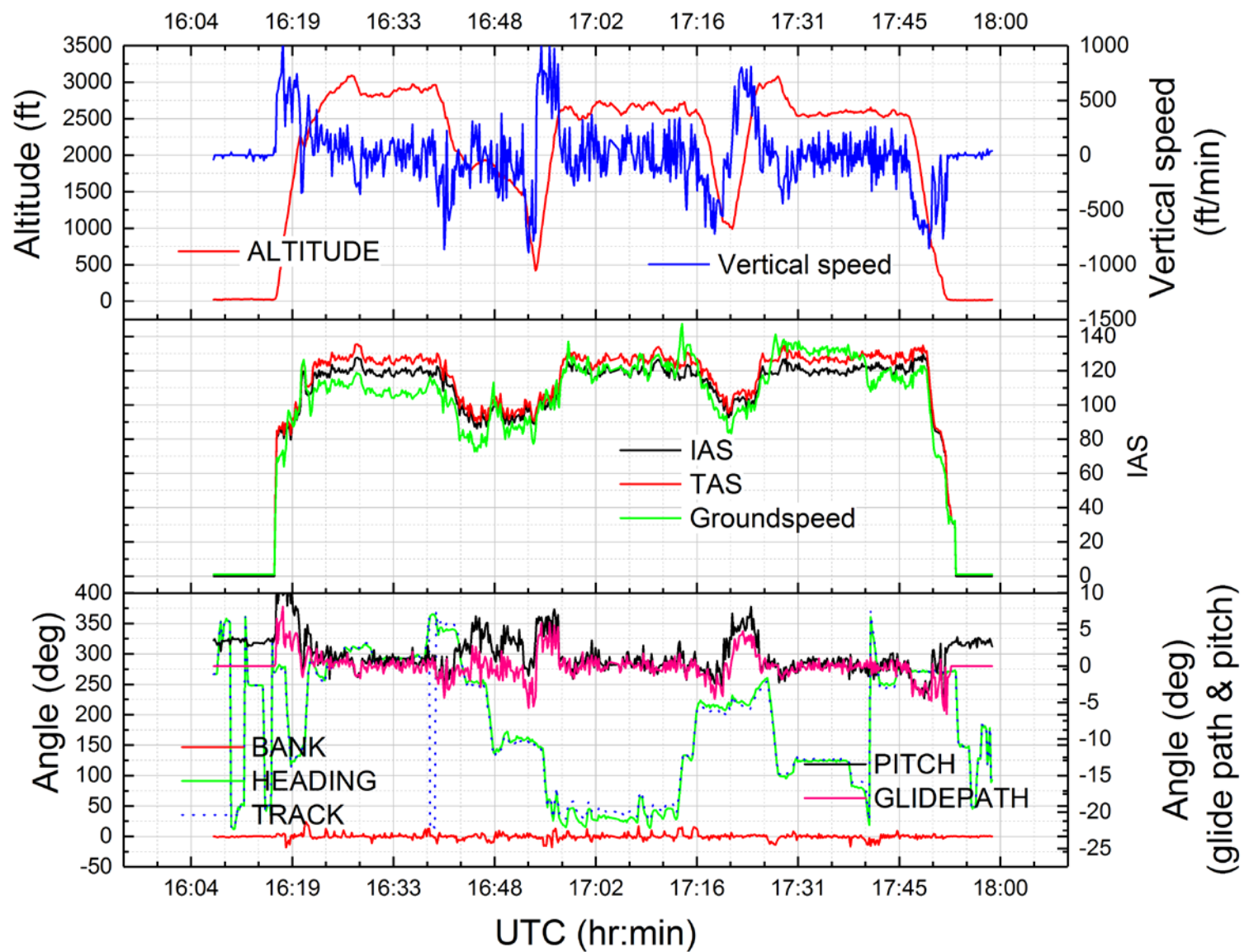


Figure 8: Plot of Data from Prior Recorded Flight on October 13<sup>th</sup>, 2016.

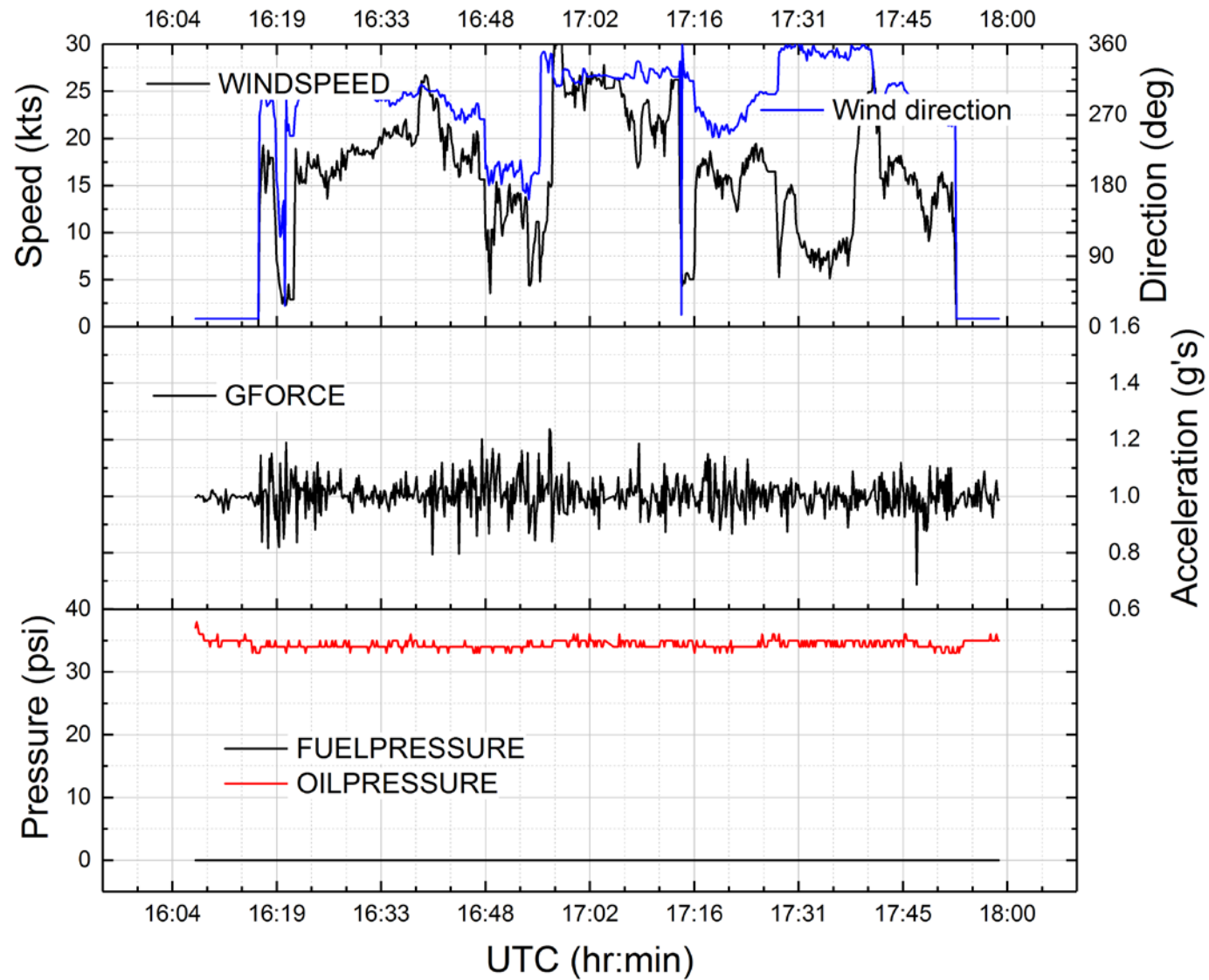


Figure 9: Plot of Data from Prior Recorded Flight on October 13<sup>th</sup>, 2016.

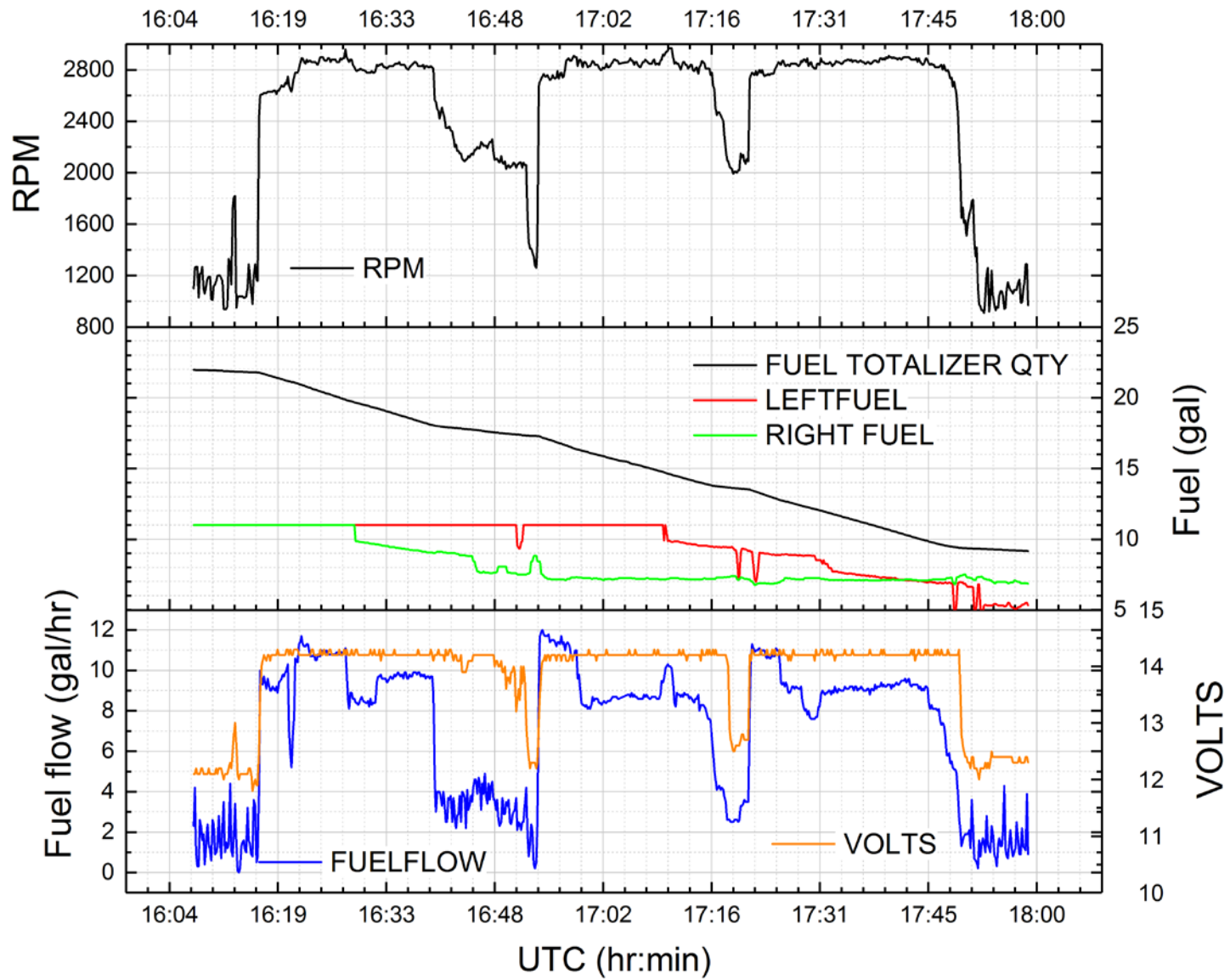


Figure 10: Plot of Data from Prior Recorded Flight on October 13<sup>th</sup>, 2016.

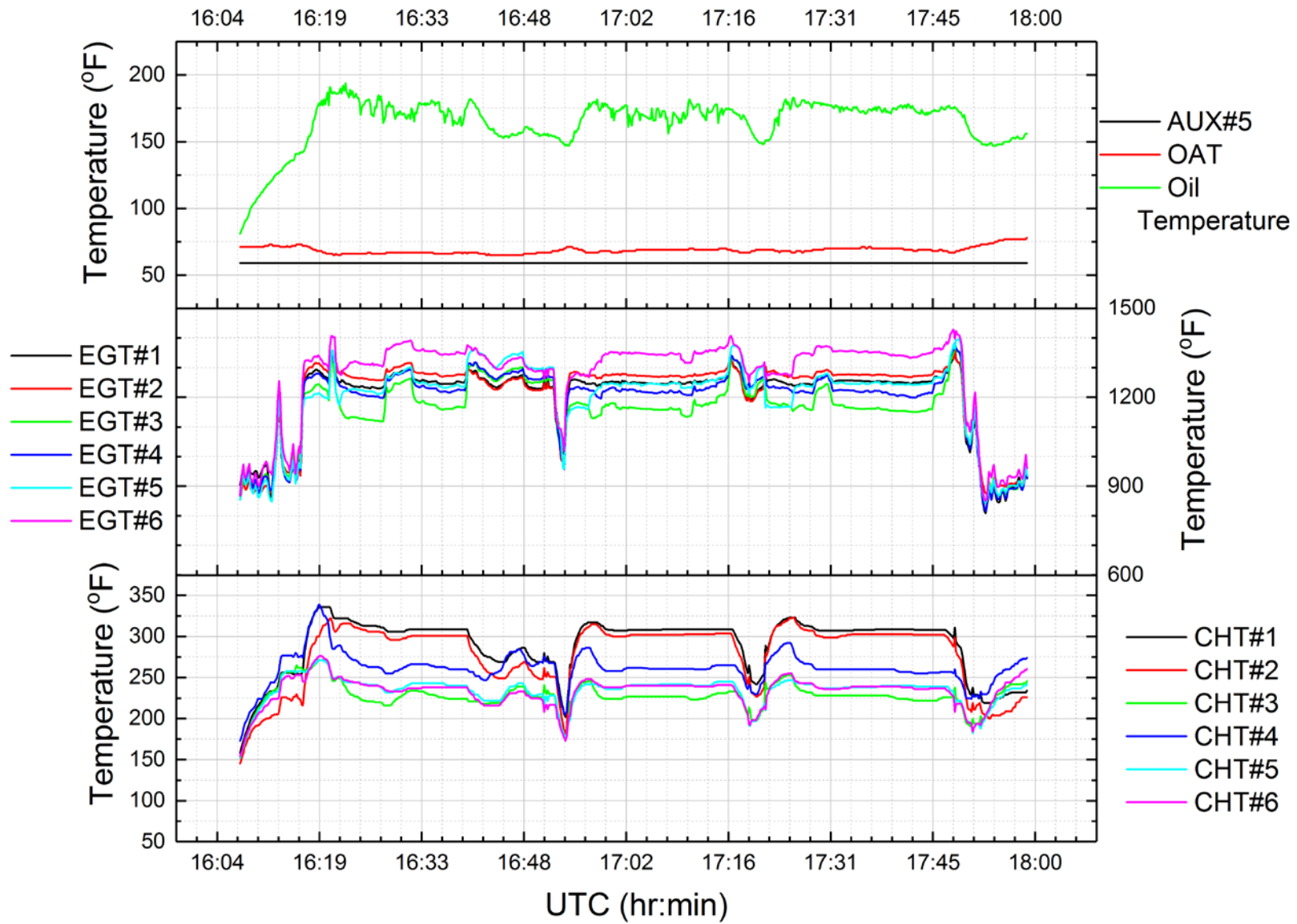


Figure 11: Plot of Data from Prior Recorded Flight on October 13<sup>th</sup>, 2016.