

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

November 2, 2020

## **Electronic Devices**

**Specialist's Factual Report**  
**By W. Deven Chen**

### **1. EVENT SUMMARY**

Location: Phoenix, Arizona  
Date: May 13, 2020  
Aircraft: Mooney M20J  
Registration: N201HH  
NTSB Number: WPR20LA144

On May 13, 2020, about 0842 mountain standard time (MST), a Mooney M20J airplane, N201HH, was substantially damaged when it was involved in an accident near Phoenix Deer Valley Airport (DVT), Deer Valley, Arizona. The commercial pilot and passenger were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

### **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:

Device 1 Manufacturer/Model: **Horizon Instrument P-1000**  
Serial Number: **0239101**

Device 2 Manufacturer/Model: **J.P. Instruments EDM-700**  
Serial Number: **5673**

#### **3.1. Horizon Instrument P-1000 Description**

The Horizon Instruments P-1000 is a digital tachometer which provides diagnostic and performance information about the aircraft's engine and ignition system. The system provides a means to electronically monitor engine rotational speed in a digital representation. The device also records aircraft engine hours. The device can store engine hour information and highest RPM achieved during a power cycle.

### 3.1.1. Horizon Instrument P-1000 Data Recovery

The device arrived undamaged at the Vehicle Recorder Division, as shown in Figure 1. The device only retains tach time and highest recorded RPM value. In an agreement with the investigator in charge (IIC), the pursuit of downloading the tach time was not attempted.



Figure 1: Horizon Instrument P-1000 as received.

### 3.2. J.P. Instruments EDM-700 Description

The J. P. Instruments EDM-700 is a panel mounted gauge that the operator can monitor and record up to 24 parameters related to twin 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, and Battery Voltage.

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<sup>1</sup> 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.

#### 3.2.1. J.P. Instruments EDM-700 Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the unit had no damage, as shown in Figure 2. The device powered up normally and data were downloaded using the manufacturer's software.

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



**Figure 2: JPI EDM 700 as received.**

### 3.2.2. J.P. Instruments EDM-700 Data Description

The recovered data contained 37 sessions from July 29, 2019 to May 13, 2020. There were total of 4 sessions recorded in May 2020. The last session recorded on May 13 was determined to be the accident flight. The other 3 sessions were recorded on May 6, May 11 and May 12 respectively. All those 4 sessions are included in this report.

### 3.2.3. J.P. Instruments EDM-700 Time Correlation

The date and time on JPI EDM 700 devices are manually adjusted by the user. Devices begin recording data when power is applied and stops when power is disconnected. Time displayed on the accident device was found to be 1 hour and 22 minutes ahead of Coordinated Universal Time (UTC). The device only provided time to the nearest minutes. All times for this device have been adjusted to reflect this offset and are referred to as Mountain Standard Time (MST) for the rest of this report. The difference between UTC and MST is 7 hours.

### 3.2.4. J.P. Instruments EDM-700 Parameters Provided

**Table 1: JPI EDM 700 Data Parameters.**

| Parameter Name | Parameter Description                                                        |
|----------------|------------------------------------------------------------------------------|
| Date           | Date for recorded data point (MM/DD/YYYY)                                    |
| Time           | Corrected mountain standard time (MST) for recorded data point (HH:MM:SS)    |
| C1-6 (degF)    | Cylinder Head Temperature Cylinder # (degrees Fahrenheit)                    |
| E1-6 (degF)    | Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)                      |
| DIF (degF)     | Difference between low and high Exhaust Gas Temperature (degrees Fahrenheit) |
| CLD (degF/MIN) | Shock Cooling Rate (degrees Fahrenheit per minute)                           |
| OILT (degF)    | Oil Temperature (degrees Fahrenheit)                                         |
| BAT (V)        | Bus Battery Voltage (voltage)                                                |

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

Figure 3 is a plot of parameters from the JPI device for the entire accident flight. The time interval is 08:05:00 to 08:40:00 MST on May 13, 2020.

Figure 4 is a plot of parameters from the JPI device for the final portion of the accident flight. The time interval is 08:30:00 to 08:39:00 MST on May 13, 2020.

Figure 5 is a plot of parameters from the JPI device for the session prior to the accident flight. The time interval is 08:09:00 to 08:23:00 MST on May 12, 2020.

Figure 6 is a plot of parameters from the JPI device for the second session prior to the accident flight. The time interval is 11:07:30 to 11:12:00 MST on May 11, 2020.

Figure 7 is a plot of parameters from the JPI device for the third session prior to the accident flight. The time interval is 10:43:30 to 10:46:30 MST on May 13, 2020.

The corresponding tabular data used to create figures 3 through 7 are provided in electronic comma-delimited (.csv) format as Attachment 1 to this report.

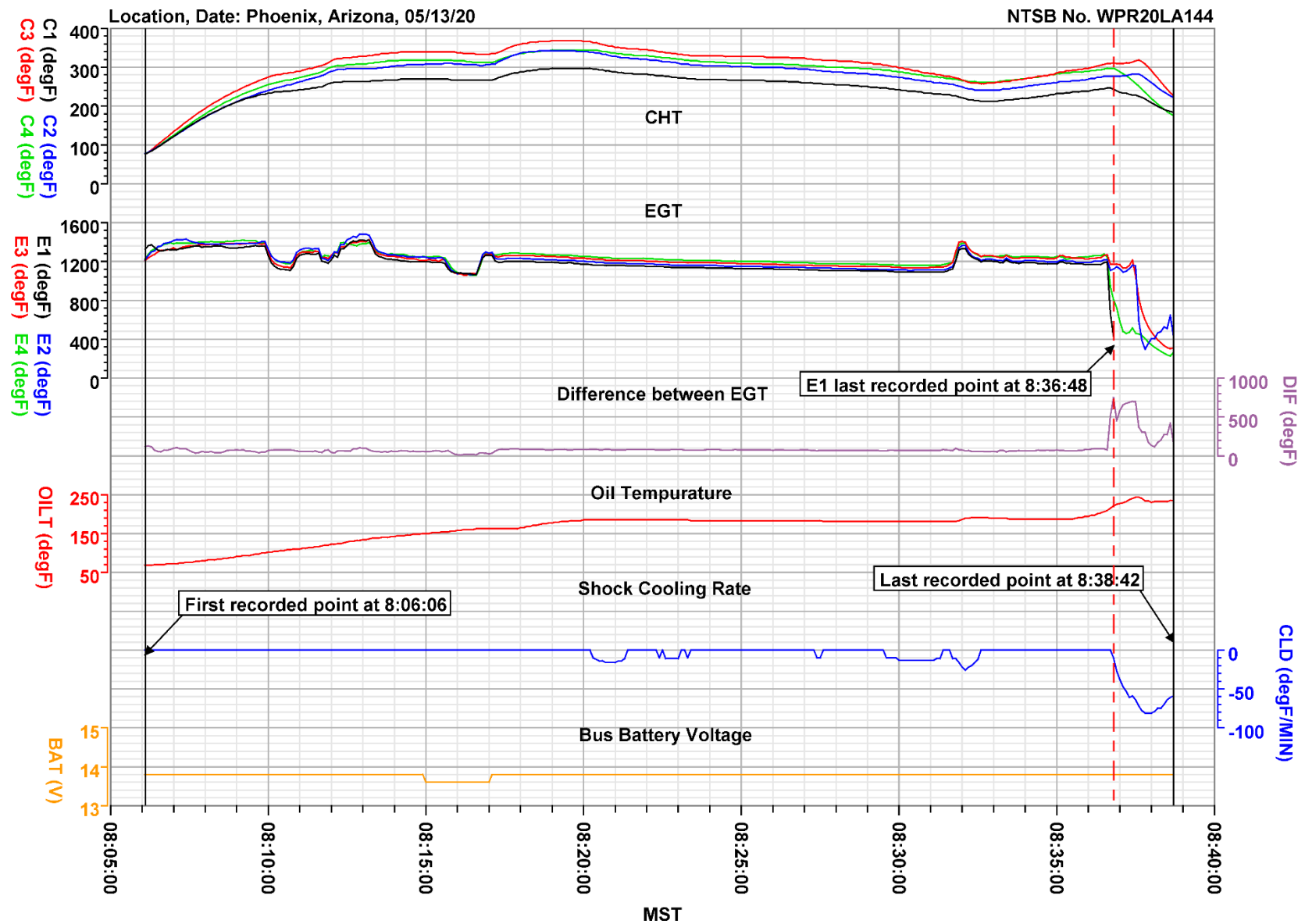


Figure 3: Plot of JPI EDM 700 data for the entire accident flight recorded on May 13, 2020.

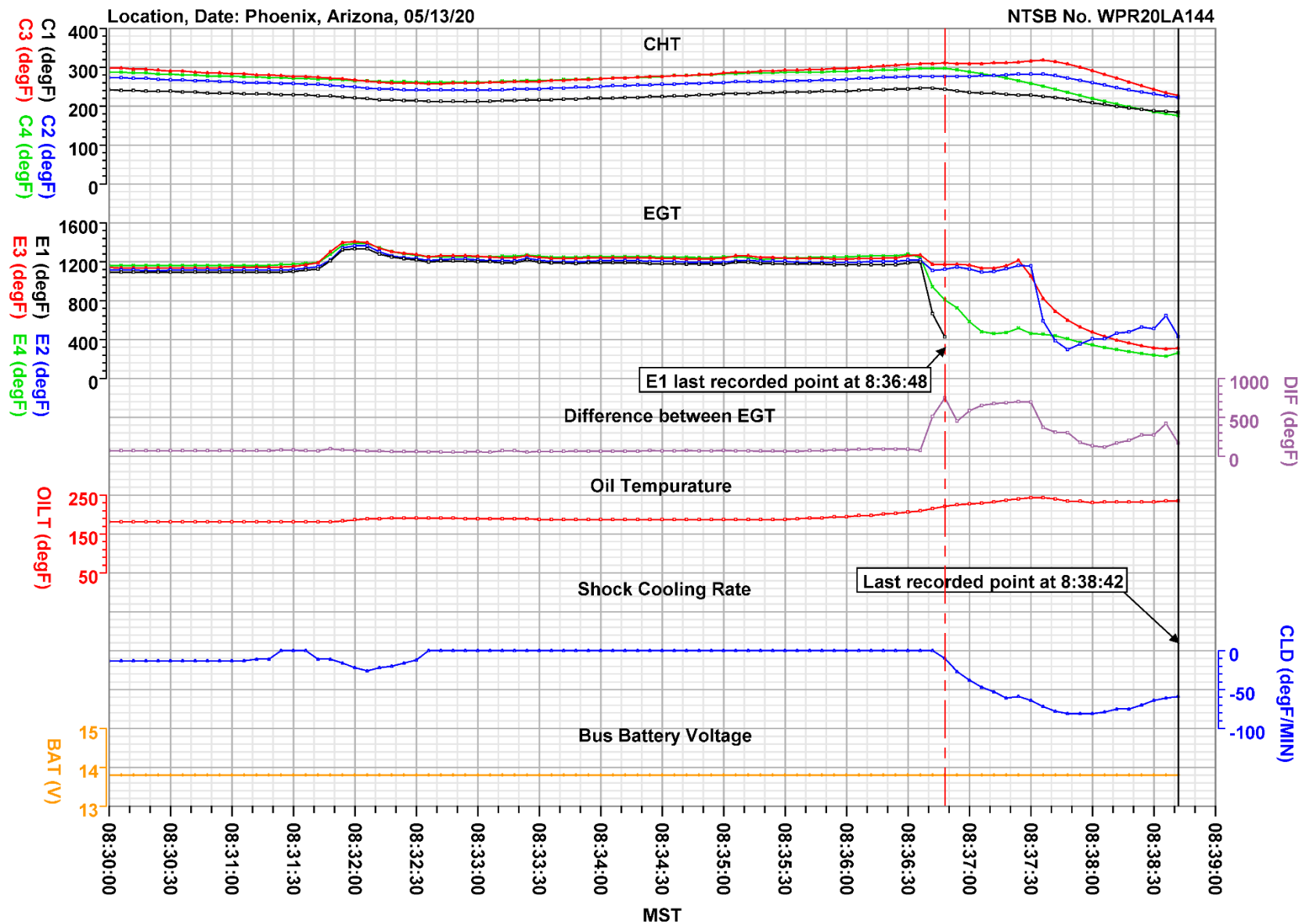
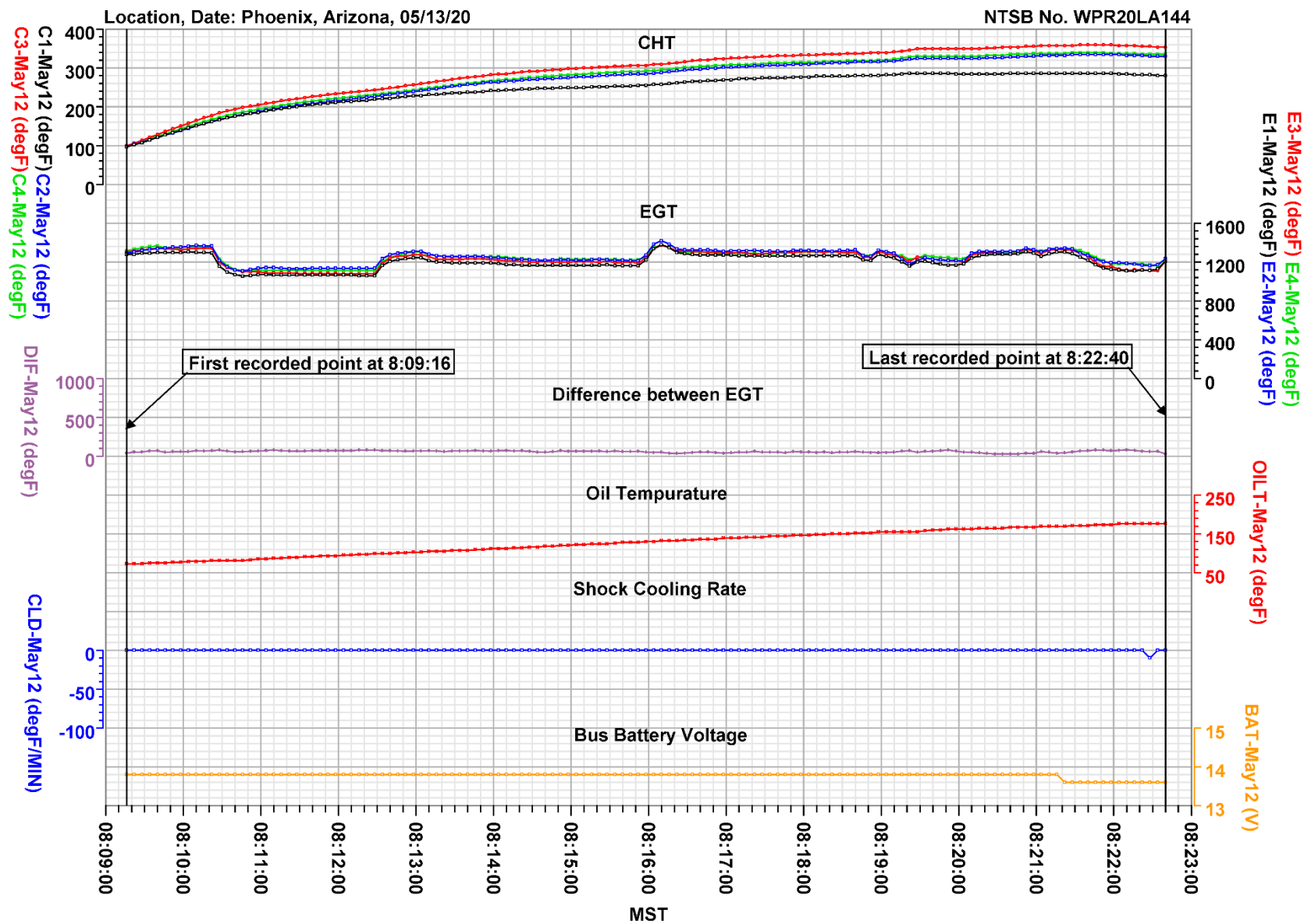


Figure 4: Plot of JPI EDM 700 data for the final portion of the accident flight recorded on May 13, 2020.



Mooney M20J, N201HH, 5/12/2020 flight National Transportation Safety Board  
**Figure 5: Plot of JPI EDM 700 data for the session recorded on May 12, 2020.**

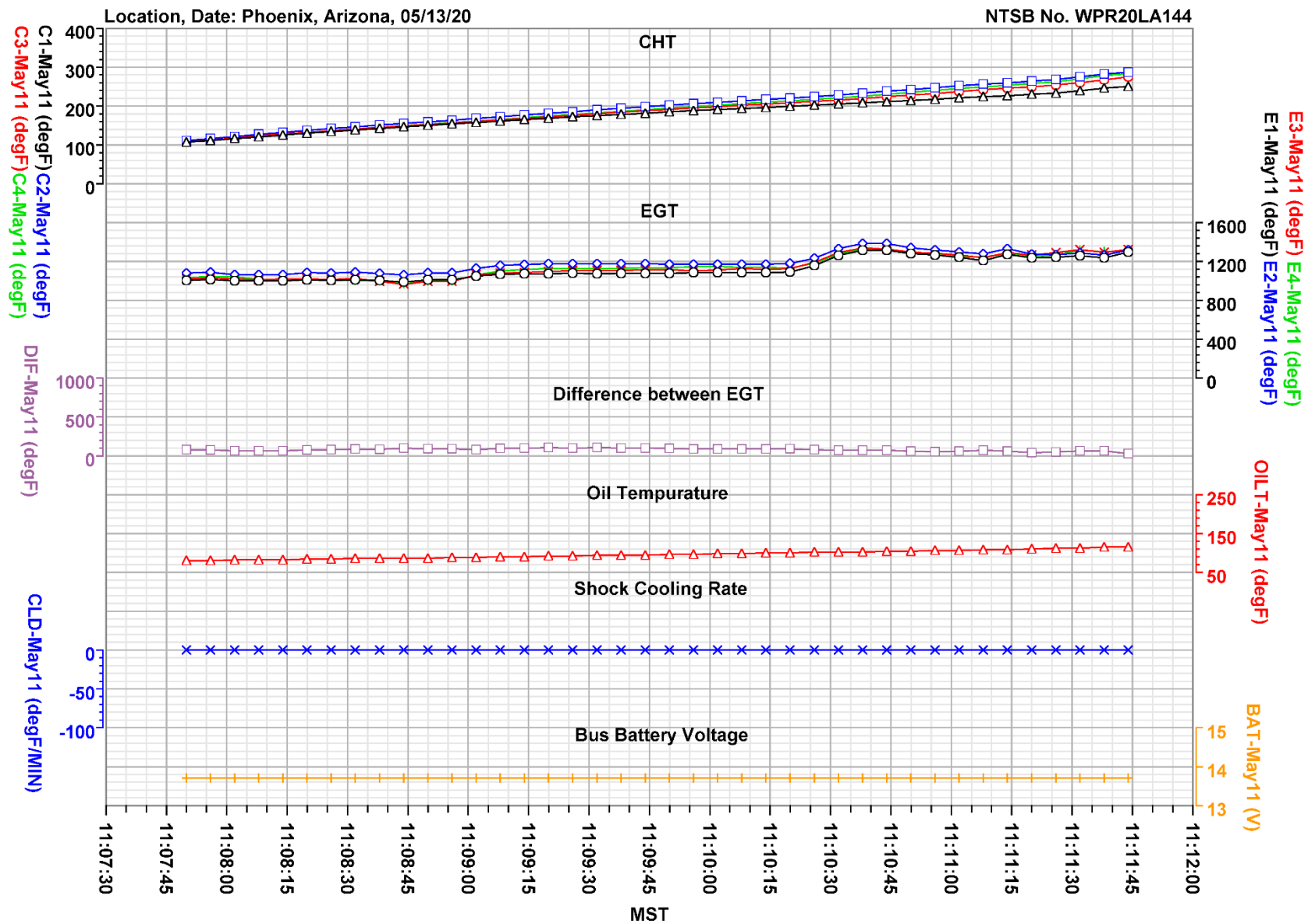


Figure 6: Plot of JPI EDM 700 data for the session recorded on May 11, 2020.

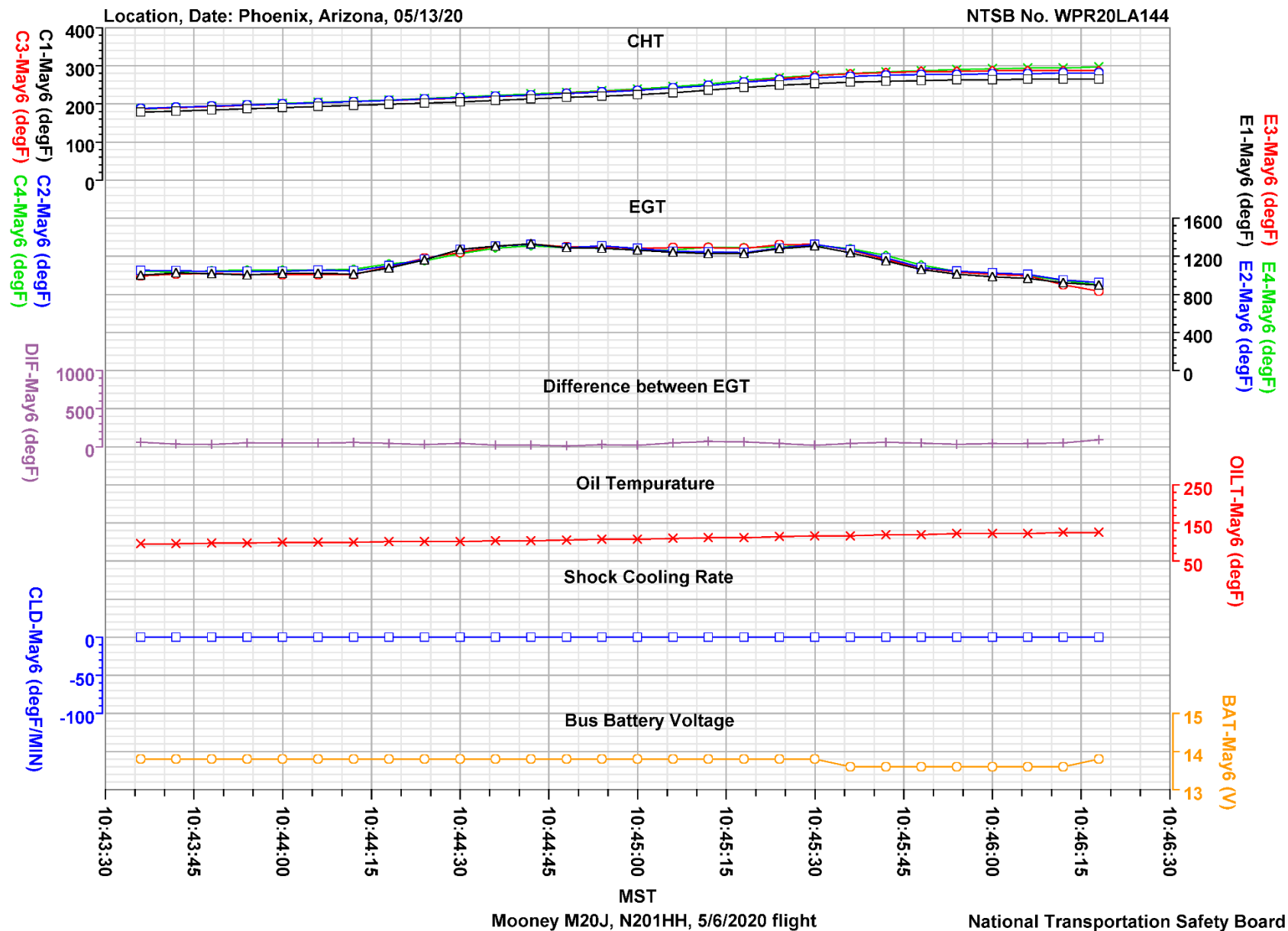


Figure 7: Plot of JPI EDM 700 data for the session recorded on May 6, 2020.