

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

July 13, 2021

Engine Data Monitor (EDM)

Specialist's Factual Report
By Gerald Kawamoto

1. EVENT SUMMARY

Location: Columbia, South Carolina
Date: January 13, 2021
Aircraft: Beech F33
Registration: N266DC
Operator: Private
NTSB Number: ERA21LA101

2. ENGINE DATA MONITOR GROUP

An Engine Data Monitor 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-700
Recorder Serial Number:	Unknown

3.1. JPI EDM-700 Description

The JPI EDM-700 is a panel-mounted gauge that allows the operator to 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 (RPM), Compressor Discharge Temperature, Fuel Flow, Carburetor Temperature, and Battery Voltage.

The unit can also calculate in real time, percent of maximum horsepower, fuel used, shock cooling rate, and EGT differentials between 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.¹ The rate at which the data is stored is selectable by the operator from 2 to 500

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

seconds per sample. The memory can store up to 20 hours of data at a 6 second-per-sample rate. The data can then be downloaded by the operator using the J.P. Instruments software.

3.1.1. Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an external examination revealed the device had sustained fire damage, as shown in Figure 1. An internal examination revealed fire damage to the internal components, as shown in Figure 2. The non-volatile memory chips were removed, cleaned, readout, and converted to engineering units using laboratory tools.



Figure 1. Damaged exterior of EDM.



Figure 2. Damaged interior of EDM.

3.1.2. Data Description

The EDM contained 16 sessions recorded from October 26, 2020, through January 13, 2021. The EDM records time with the first data sample based on the unit's internal clock, which is set and updated by the operator. Due to the condition of the device, the time could not be correlated to a standard time and is referred to as JPI Time in this report. The device recorded at a 6 second-per-sample rate. The engineering unit conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM. The session recorded on January 13 is included in this report.

3.2. Parameters Provided

Table 1 describes data parameters recorded by the device.

Table 1: JPI EDM-700 Data Parameters

Parameter Name	Parameter Description
Date	Date for recorded data point (MM/DD/YYYY)
Time	JPI Time for recorded data point (HH:MM:SS)
EGT 1-6 (degF)	Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
CHT 1-6 (degF)	Cylinder Head Temperature Cylinder # (degrees Fahrenheit)
TIT (degF)	Turbine Inlet Temperature (degrees Fahrenheit)
CLD (degF/min)	Shock Cooling Rate (degrees Fahrenheit per minute)
FF (gph)	Fuel Flow (gallons per hour)
Oil Temp (degF)	Oil Temperature (degrees Fahrenheit)
Fuel Used (gallons)	Fuel Used (gallons)
Voltage (V)	Battery Voltage (Volts)

3.3. Plots and Corresponding Tabular Data

The following two figures contain EDM data recorded on January 13, 2021.

Figure 3 is a plot of the entire session. The recording started at 17:07:24 JPI Time and ended at 20:15:12 JPI Time. Between 17:48:24 and 19:07:48, data were not recorded at a 6 second-per-sample rate and a total of 20 data points were recorded during that span. Data after 17:48:24 JPI Time could not be validated. It is unclear whether the data recorded after this point were affected by the damage sustained to the device causing a malfunction in the recording logic, or if the abnormalities in recorded data are an artifact of the engineering units conversion from the binary file. The valid data portion from 17:07:24 to 17:48:24 JPI Time roughly correlates to the length of the accident. After 17:48:24, EGT 2 began recording large negative values for the remainder of the session.

Figure 4 is a plot of the first 41 minutes of the session.

The corresponding tabular data used to create these plots are provided in electronic (*.csv) format as Attachment 1 to this report.²

² Comma Separated Value format.

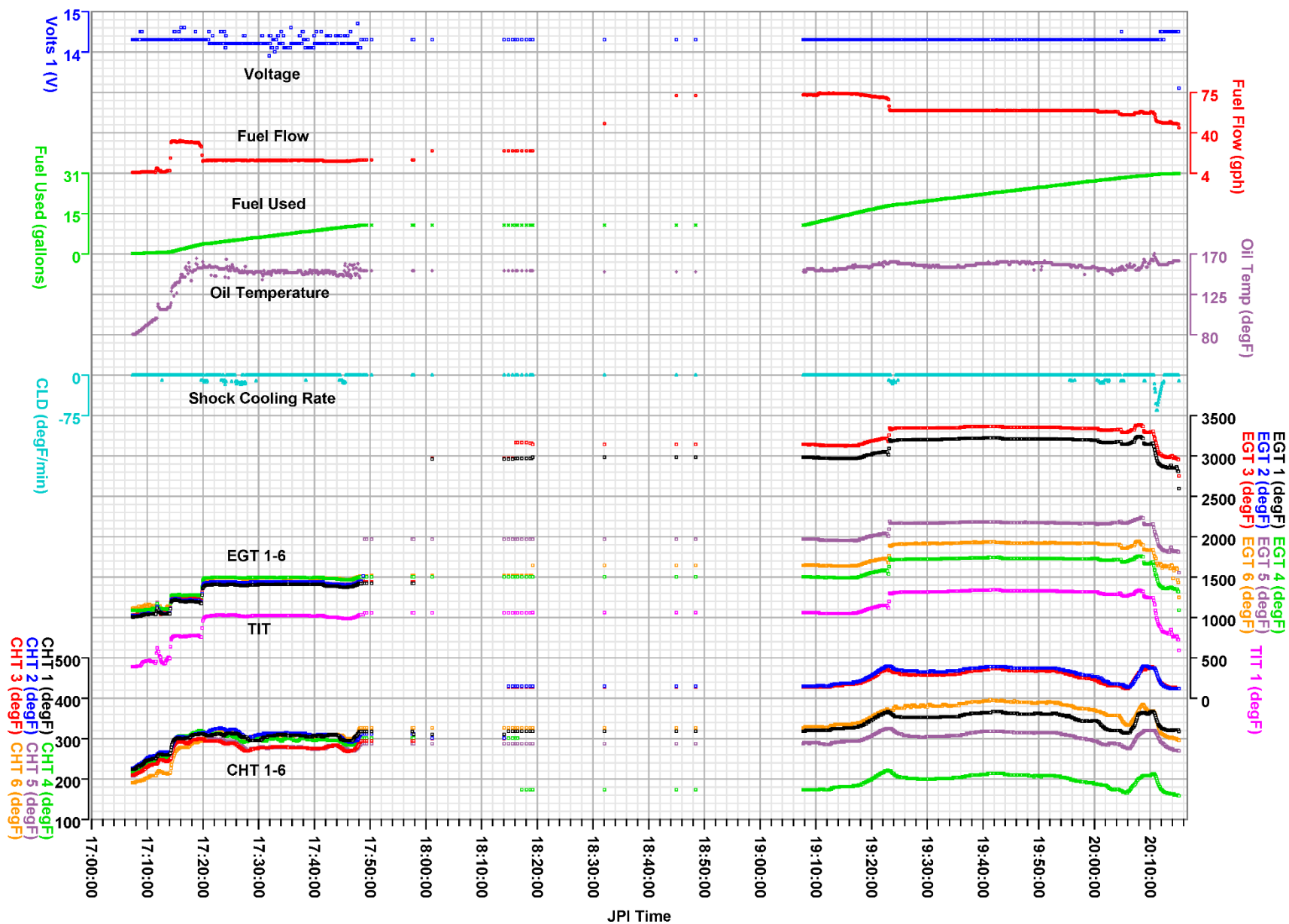


Figure 2. Plot of parameters for the entire session recorded on January 13, 2021.

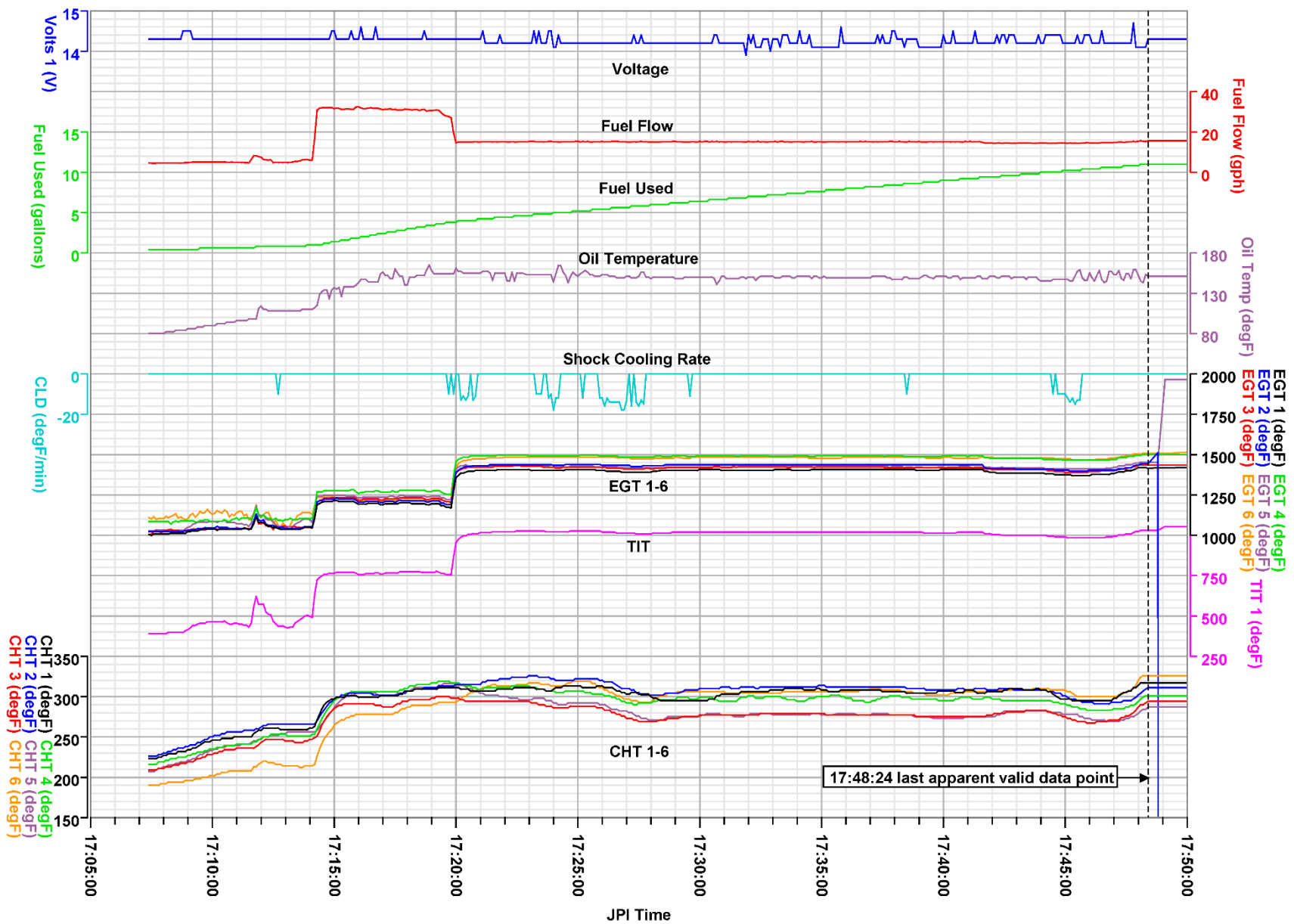


Figure 4. Plot of parameters for the first 41 minutes of the session recorded on January 13, 2021.