

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

October 7, 2019

Engine Data Monitor (EDM)

Specialist's Factual Report
By Gerald Kawamoto

1. EVENT SUMMARY

Location: Pahokee, FL
Date: March 8, 2019
Aircraft: Piper PA-23-250
Registration: N5894Y
Operator: Private
NTSB Number: WPR19FA093

On March 8, 2019, about 1526 eastern standard time, a Piper PA-23-250 airplane, N5894Y, impacted a lake during an emergency landing at the Palm Beach County Glades Airport (PHK), Pahokee, Florida. The commercial pilot and four passengers were fatally injured, and the airplane was destroyed. The airplane was registered to L-Holding LLC, and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 flight. Visual meteorological conditions prevailed at the time of the accident and the flight was operated on an instrument flight rules flight plan. The flight originated from the Tampa International Airport (TPA), Tampa, Florida about 1420 and was destined for North Palm Beach County General Aviation Airport (F45), West Palm Beach, Florida.

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-760**
Recorder Serial Number: **03094**

3.1. JPI EDM-760 Description

The J. P. Instruments EDM-760 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, for both engines, 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 memory¹ 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. Data Recovery

The device was examined upon arrival at the Vehicle Recorder Division. The device exhibited water damage to the display. The circuit boards were intact and the device was cleaned and dried. The device did not power on normally and the non-volatile memory chips were removed and a binary image was created using laboratory tools.

Figure 1. JPI EDM-760 as received.



3.3. Data Description

The data extracted included 107 sessions from June 5, 2015, through March 8, 2019. The recorded time is based on the unit's internal clock, which is set and updated by the user. The device begins recording data when power is applied and stops when power is disconnected. Due to the condition of the device, the user set time was unable to be verified and is referred to as JPI Time in this report. The last recorded session was determined to be related to the accident and is included in this report. The data was recorded at a 1 minute-per-sample rate.

3.4. Parameters Provided

Table 1 describes data parameters recorded by the device. The engineering units conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM.

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

Table 1: JPI EDM-700 Data Parameters

Parameter Name	Parameter Description
JPI Time	Device time for recorded data point (HH:MM:SS)
Eng1 EGT 1-6 (degF)	Left Engine Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
Eng1 CHT 1-6 (degF)	Left Engine Cylinder Head Temperature Cylinder # (degrees Fahrenheit)
Eng1 CLD (degF/min)	Left Engine Shock Cooling Rate (degrees Fahrenheit per minute)
Eng1 Fuel Flow (gph)	Left Engine Fuel Flow (gallons per hour)
Eng1 Fuel Used (gal)	Left Engine Fuel Used (gallons)
Eng1 Oil Temp (degF)	Left Engine Oil Temperature (degrees Fahrenheit)
Eng2 EGT 1-6 (degF)	Right Engine Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
Eng2 CHT 1-6 (degF)	Right Engine Cylinder Head Temperature Cylinder # (degrees Fahrenheit)
Eng2 CLD (degF/min)	Right Engine Shock Cooling Rate (degrees Fahrenheit per minute)
Eng2 Fuel Flow (gph)	Right Engine Fuel Flow (gallons per hour)
Eng2 Fuel Used (gal)	Right Engine Fuel Used (gallons)
Eng2 Oil Temp (degF)	Right Engine Oil Temperature (degrees Fahrenheit)
OAT (degF)	Outside Air Temperature (degrees Fahrenheit)
Voltage (V)	Battery Voltage (Volts)

3.5. Plots and Corresponding Tabular Data

The following four figures contain EDM data recorded during the March 8, 2019, event.

Figure 2 is a plot of Engine 1 parameters from the accident flight recorded on the device for the entire flight. The time interval is 18:20:00 to 19:45:00 JPI Time.

Figure 3 is a plot of Engine 1 parameters from the accident flight recorded on the device at the end of the flight. The time interval is 19:28:00 to 19:44:00 JPI Time.

At about 19:29, EGT and CHT values for all cylinders decrease. Between 19:30 and 19:35, the EGT values are approximately 800 degrees lower than their previous state. After 19:35, the EGT and CHT values increase to close to their previous values until about 19:37. The values then once again decrease until the end of the recording at 19:43:18.

Figure 4 is a plot of Engine 2 parameters from the accident flight recorded on the device for the entire flight. The time interval is 18:20:00 to 19:45:00 JPI Time.

Figure 5 is a plot of Engine 2 parameters from the accident flight recorded on the device at the end of the flight. The time interval is 19:28:00 to 19:44:00 JPI Time.

The tabular data from the accident flight recorded by the JPI EDM-760 device is included as Attachment 1. This attachment is provided in electronic comma-delimited (.csv) format.

Figure 2. Plot of Engine 1 parameters during the entire flight.

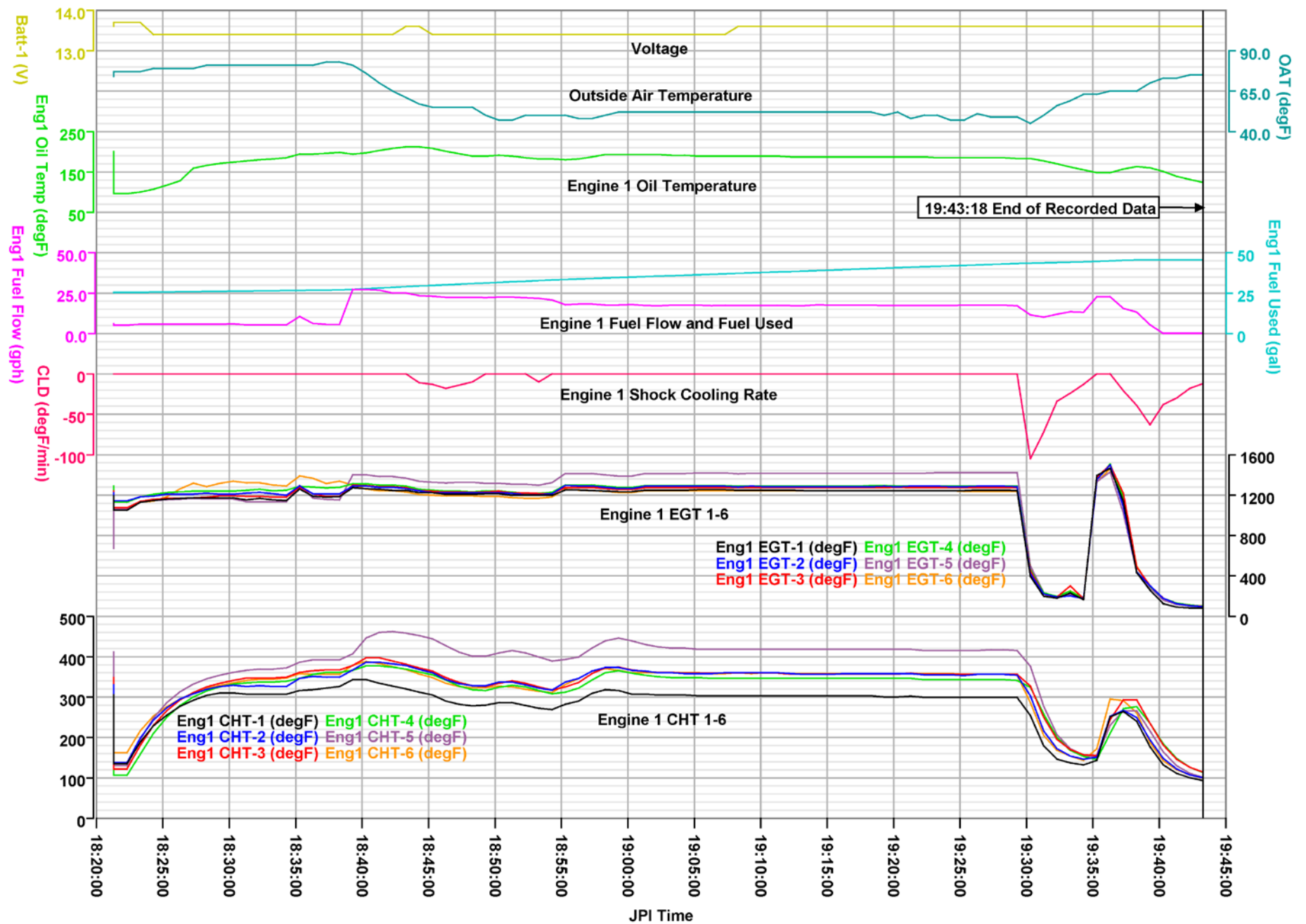


Figure 3. Plot of Engine 1 parameters at the end of the flight.

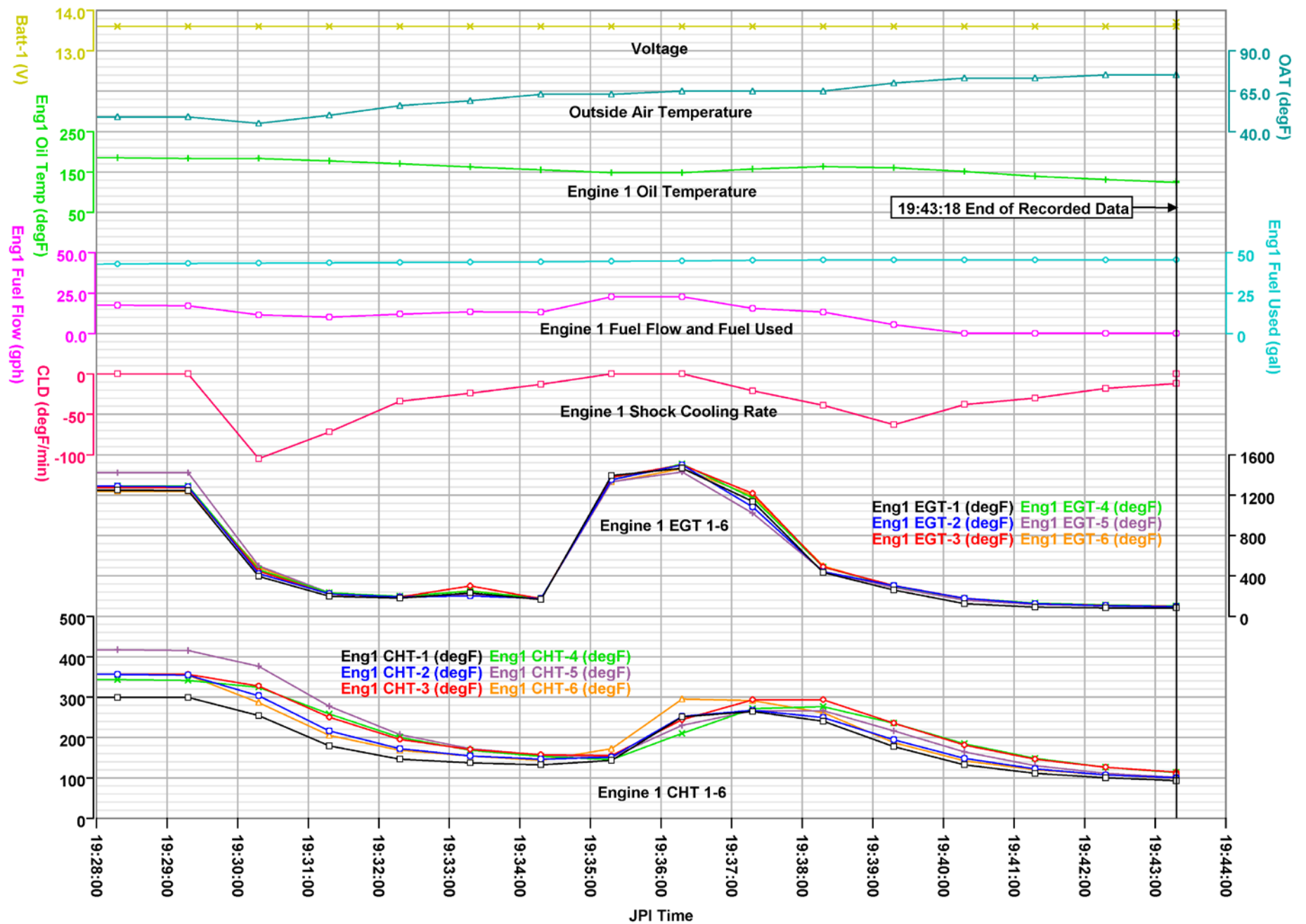


Figure 4. Plot of Engine 2 parameters during the entire flight.

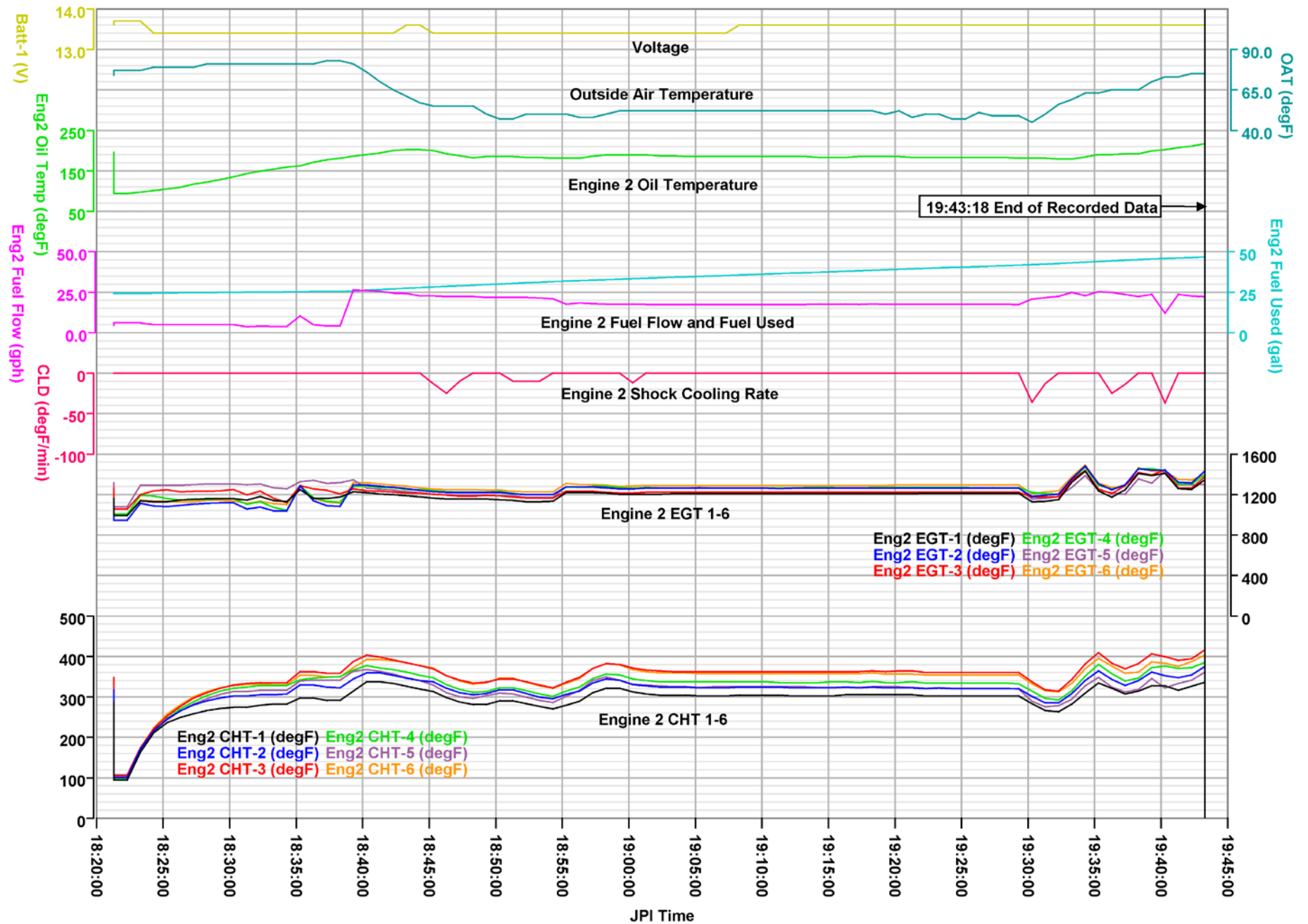


Figure 5. Plot of Engine 2 parameters at the end of the flight.

