

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN22FA376

ENGINE DATA MONITOR

Specialist's Factual Report

March 24, 2023

A. ACCIDENT

Location: Centennial, Colorado
Date: August 9, 2022
Time: 1250 mountain daylight time (MDT)
Airplane: Cessna 182Q, N727PC

B. ENGINE DATA MONITOR SPECIALIST

Specialist: W. Deven Chen
National Transportation Safety Board (NTSB)
Washington, DC

C. DETAILS OF THE INVESTIGATION

A recorder group was not convened. The NTSB Vehicle Recorder Division received the following engine data monitor (EDM):

Manufacturer/Model:	J.P. Instrument EDM-830
Serial Number:	29712

1.0 Recorder Description

The J.P. Instrument (JPI) EDM 830 is a panel-mounted gauge with color display 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), Fuel Flow, Amperage Load, and Bus Voltage, etc.

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 memory¹ for data storage of the parameters recorded and calculated. The rate at which the data is stored is selectable by the operator from 1 to 500 seconds per sample. The memory can store up to 30 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.

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

1.1 Recorder Condition and Data Recovery

The device had sustained impact damage upon arrival at the Vehicle Recorder Division, as shown in figure 1. The non-volatile memory (NVM) chip was recovered from the unit. A binary image was created and then converted into engineering units using laboratory tools.



Figure 1. Front and back of the JPI EDM-830 as received.

1.2 Recording Description

The recovered data included two flight recordings. The last flight recording, recorded on August 9, 2022, was determined to be related to the accident. The other flight recording, recorded on August 6, 2022, is also included in this report. The data were recorded at a 6 second-per-sample rate.

1.2.1 Parameters Provided

Table 1 lists the recorder parameters verified and provided in this report.

Table 1. JPI EDM-830 data parameters provided.

Parameter Name (unit)	Parameter Description (unit)
BAT (V)	Bus Voltage (volts)
CHT 1-4 (degF)	Cylinder Head Temperature Cylinder # (degrees Fahrenheit)
CLD (degF/min)	Shock Cooling Rate (degrees Fahrenheit per minute)
EGT 1-4 (degF)	Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
FF (GPH)	Fuel Flow Rate (gallons per hour)
MAP (inHg)	Manifold Pressure (inches of mercury)
OIL P (PSI)	Engine Oil Pressure (pounds per square inches)
OIL T (degF)	Engine Oil Temperature (degrees Fahrenheit)
OAT (degF)	Outside Air Temperature (degrees Fahrenheit)
RPM (rpm)	Engine RPM (revolutions per minute)
USD (Gal)	Fuel Used (gallons)

1.3 Time Correlation

There is usually a time offset between the device time and the real time. Since the device was damaged and could not power up, the time offset could not be determined. The times in the report are presented in device time.

D. FIGURES AND TABULAR DATA

Figures 2 and 3 contain data recorded during the accident flight on August 9, 2022.

Figure 4 contains data recorded during the flight on August 6, 2022.

Note that the parameter for fuel used is user dependent, and relies on the operator to properly set, or reset, the condition upon power up of the instrument. In general, if no operator setting is selected, the instrument will count fuel used from the end condition of the previous data session.

The corresponding tabular data used to create figures 2 and 3 are provided in electronic comma separated value (CSV) format as attachment 1 to this report. The corresponding tabular data used to create figure 4 is provided as attachment 2 to this report.

Submitted by:

W. Deven Chen
Electrical Engineer - Recorder Specialist

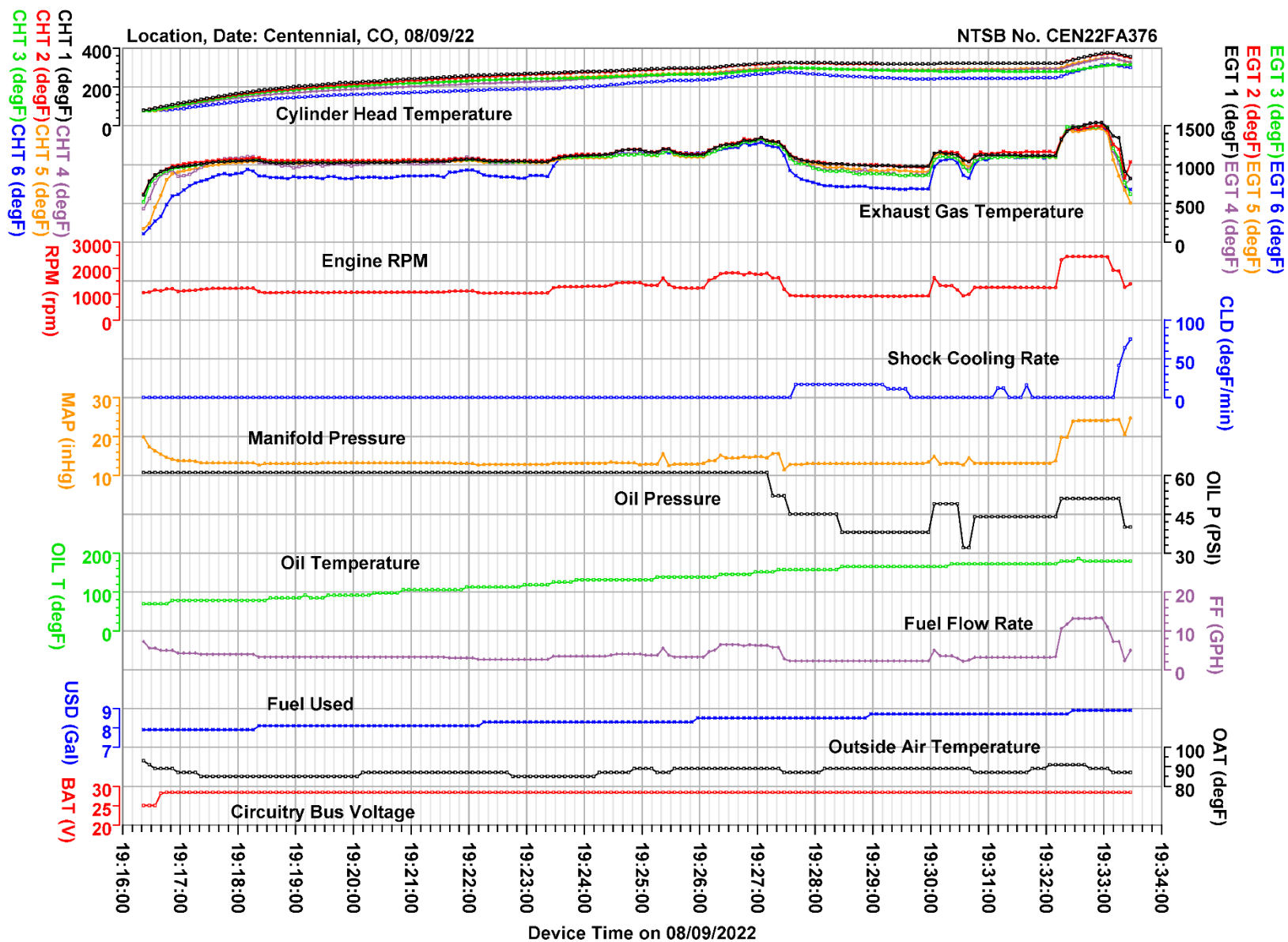


Figure 2. Plot of data parameters for the entire accident flight recording.

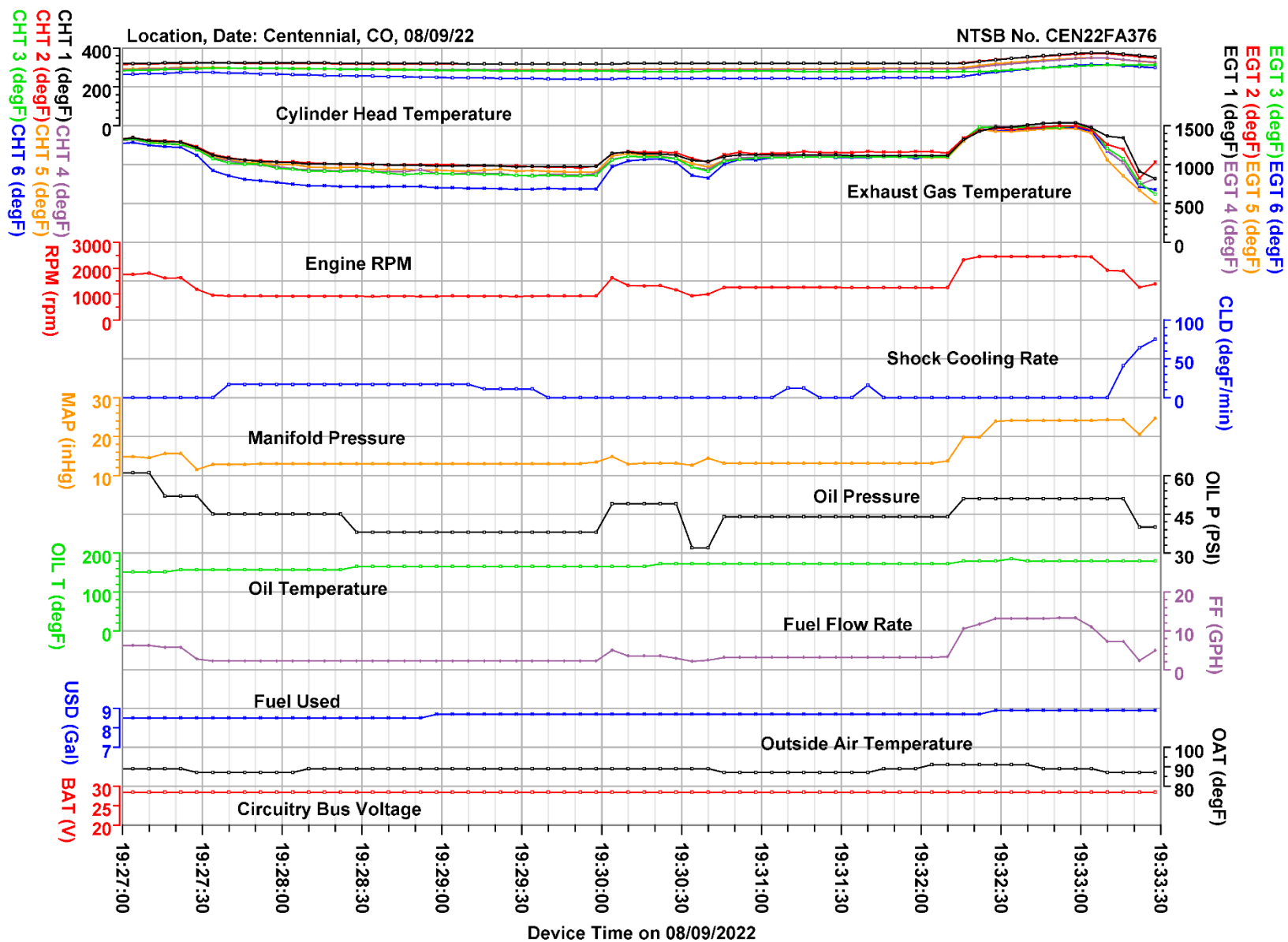


Figure 3. Plot of data parameters for the final portion of the accident flight recording.

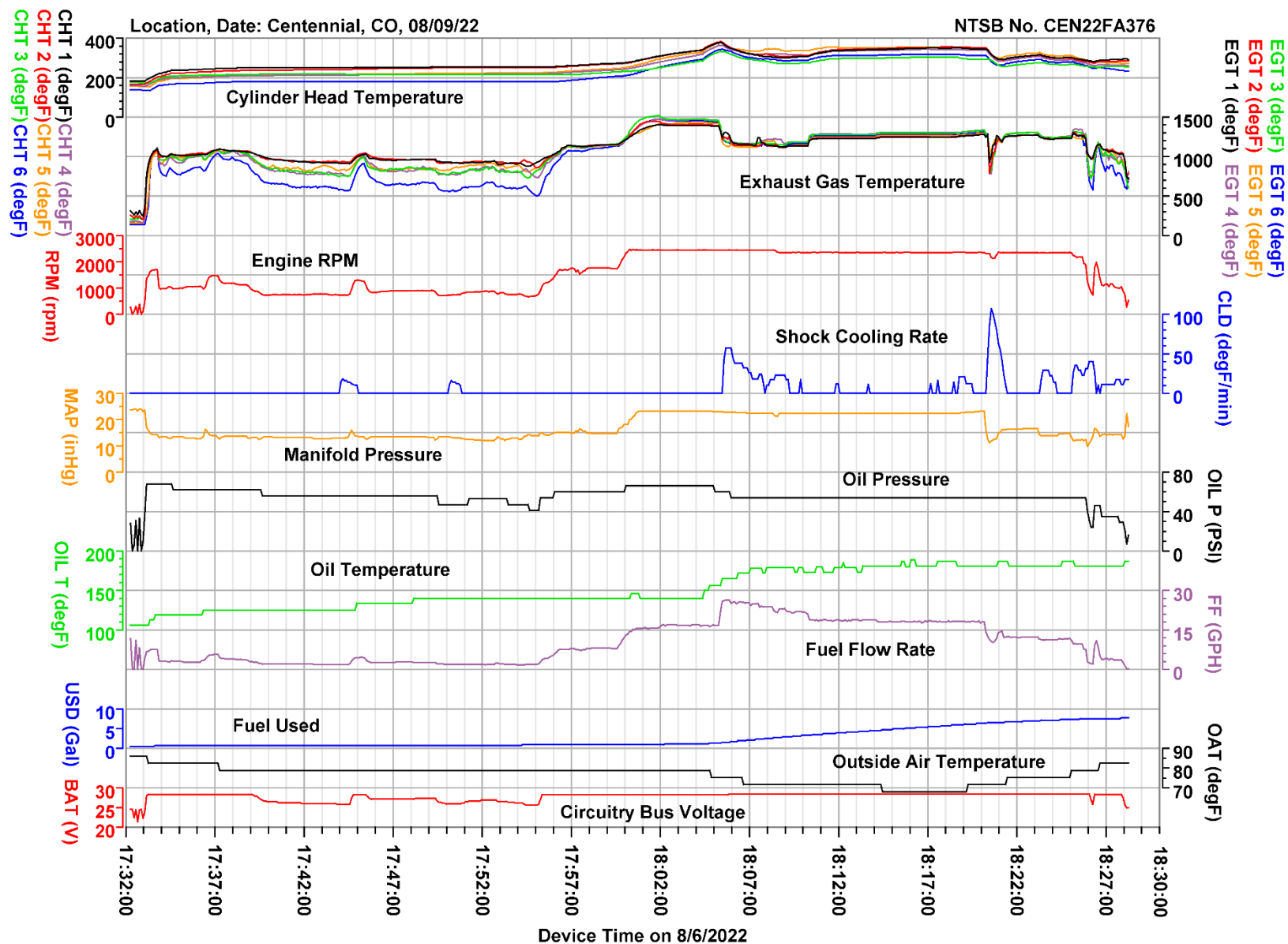


Figure 4. Plot of data parameters for the entire flight recorded on August 6, 2022.