

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA23LA035

ENGINE DATA MONITOR

Specialist's Factual Report

June 12, 2023

A. ACCIDENT

Location: Shellman Bluff, Georgia
Date: October 22, 2022
Time: 1817 eastern daylight time (EDT)
Airplane: Beech V35A, private operator, N7893R

B. ENGINE DATA MONITOR SPECIALIST

Specialist: Steven Smith
Mechanical Engineer (Recorder Specialist)
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

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

Recorder Manufacturer/Model: EDM-700
Part Number: EGR-701
Recorder Serial Number: 29368

1.0 JPI 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 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
- 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 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.

1.1 JPI EDM Data Recovery

The EDM was recovered from the Medway River, and the extent of the water damage rendered the device inoperable. The circuit board containing the non-volatile memory chips, shown in figure 1, was cleaned and non-volatile memory chips were removed, read out, and converted to engineering units using laboratory tools.¹

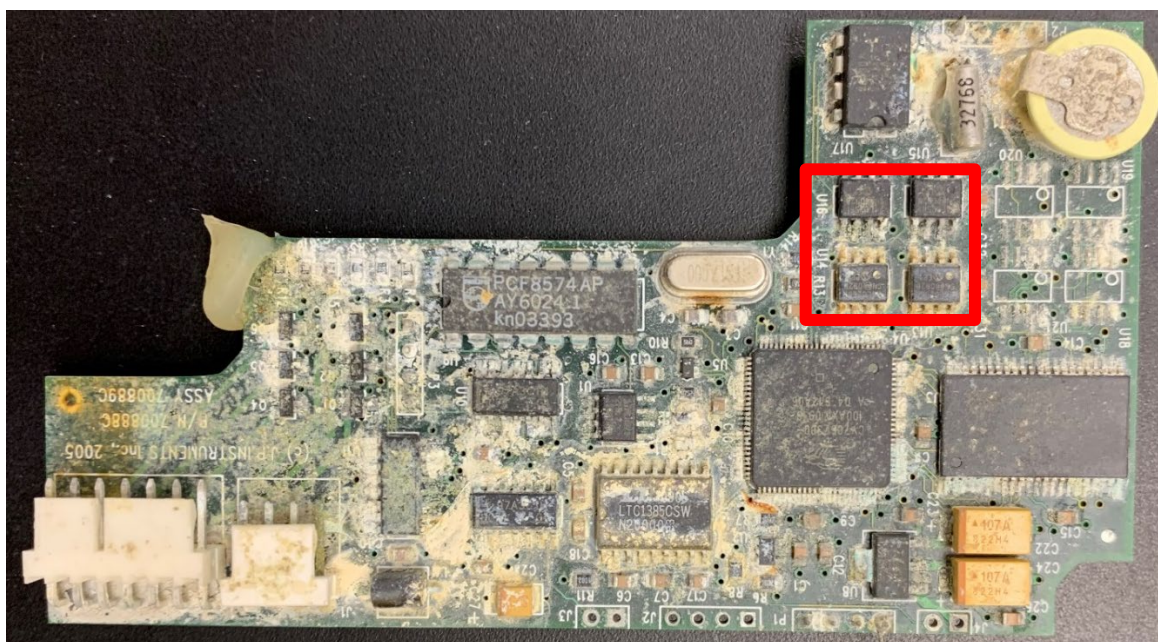


Figure 1. JPI EDM-700 non-volatile memory chips are highlighted in the red square.

1.2 JPI Recording Description

The EDM contained 32 sessions recorded from May 28, 2022, through October 22, 2022. The EDM recorded 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

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

session recorded on October 22 started at 21:39:52 and ended at 22:45:52 JPI Time and is included in this report.

1.3 JPI EDM Engineering Unit Conversions

The engineering unit conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM. Table 1 describes data parameters converted by the and validated for the JPI EDM-700 device.

Table 1. Verified and provided parameters.

Parameter Name (units)	Parameter Description (units)
Eng CHT-# (degF)	Cylinder Head Temperature Cylinder # ² (degrees Fahrenheit)
Eng EGT-# (degF)	Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)

D. FIGURES AND TABULAR DATA

Figures 2 and 3 contain data from the last session recorded on the device.

Figure 2 is a plot of engine cylinder head temperature and exhaust gas temperature for the entire session. The time displayed is 21:39:30 to 22:47:30 JPI Time.

Figure 3 is a plot of parameters for the final 4 minutes and 52 seconds of the session. The time displayed is 22:42:00 to 22:47:00 JPI Time.

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.

Submitted by:

Steven Smith
Mechanical Engineer (Recorder Specialist)

² Depending on aircraft configuration number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.

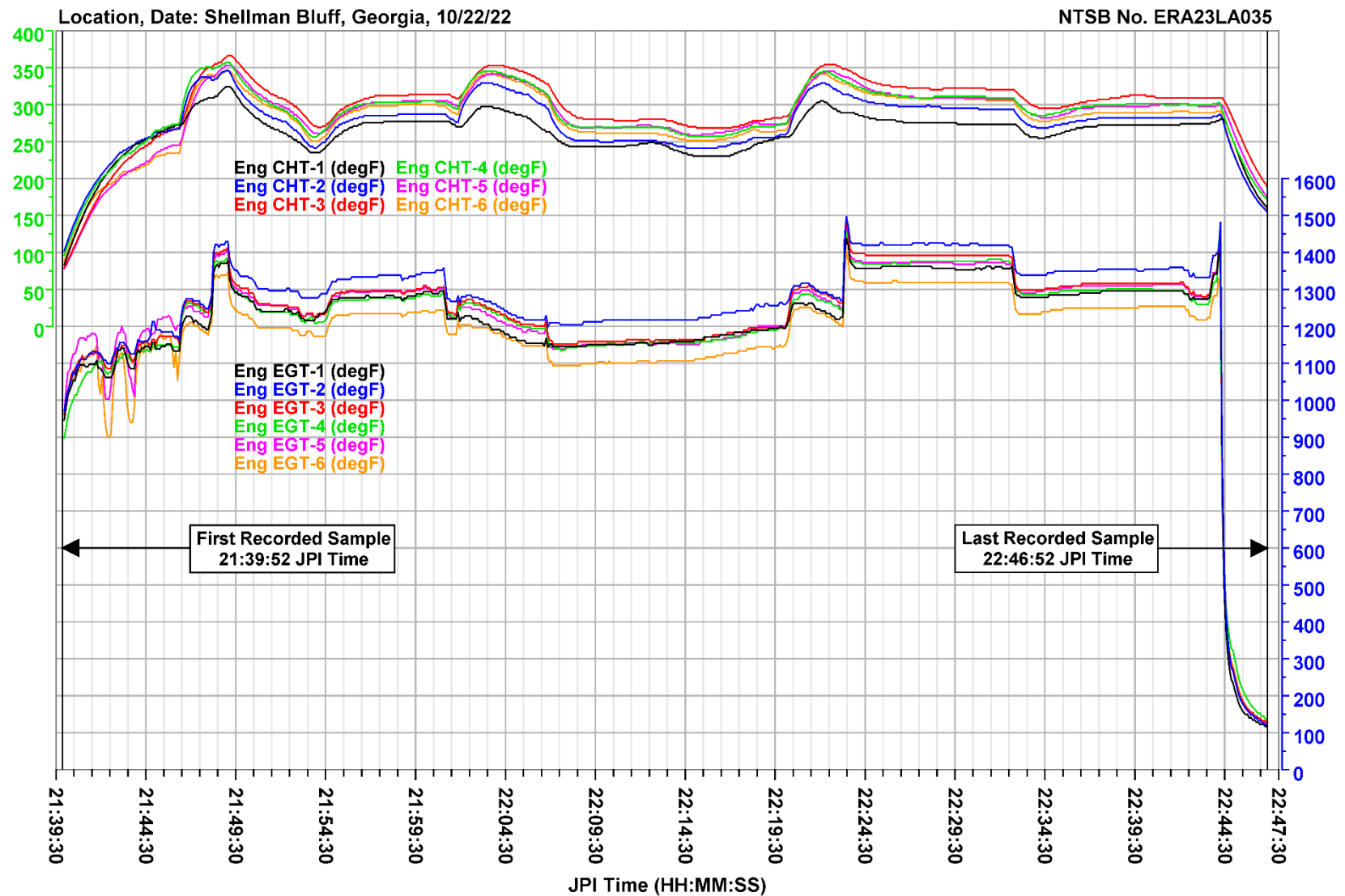


Figure 2. Plot of JPI parameters of the entire session on October 22, 2022.

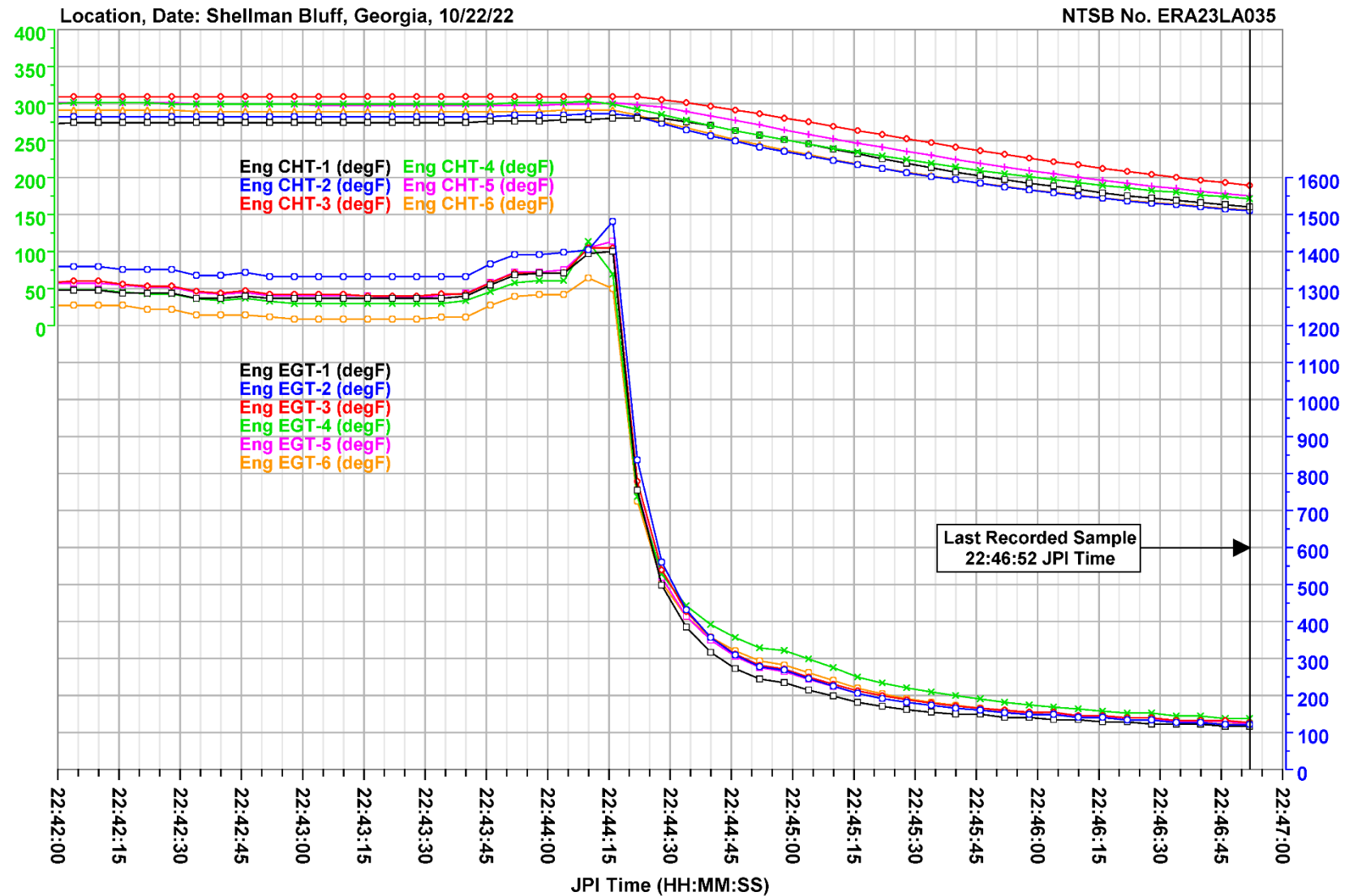


Figure 3. Plot of JPI parameters at the end of the session on October 22, 2022.