

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA22FA114

ENGINE DATA MONITOR

Specialist's Factual Report

April 14, 2023

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. ENGINE DATA MONITOR SPECIALIST.....	3
C. DETAILS OF THE INVESTIGATION	3
1.0 EDM.....	3
1.1 JPI EDM-760 Description.....	3
1.2 JPI EDM Data Recovery.....	4
1.3 JPI EDM Data Description.....	5
D. FIGURES AND TABULAR DATA.....	6
APPENDIX A. VERIFIED AND PROVIDED PARAMETERS JPI EDM-760	9

A. ACCIDENT

Location: Danville, Virginia
Date: February 1, 2022
Time: 10:06 eastern standard time (EST)
Airplane: Cessna 310, N622QT

B. ENGINE DATA MONITOR SPECIALIST

Specialist Gerald Kawamoto
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: JPI EDM-760
Recorder Serial Number: Unknown

1.0 EDM

1.1 JPI EDM-760 Description

The J. P. Instruments (JPI) EDM-760 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 (NVM) 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 seconds per sample. Data recording typically begins when EGTs are greater than 500°F or RPM is greater than 500 rpm. The memory can store up to 100 hours of data at a 6 second sample rate. For a non-damaged unit, the data can then be downloaded by the operator using a USB flash drive and following the manufacturer's procedures.

1.2 JPI EDM Data Recovery

The device broke apart during the accident event. Identifiable parts were recovered and sent to the Vehicle Recorder Laboratory. The circuit board containing the non-volatile memory chips, shown in Figure 1, was identified and the chips were removed, read out, and converted to engineering units using laboratory tools.

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

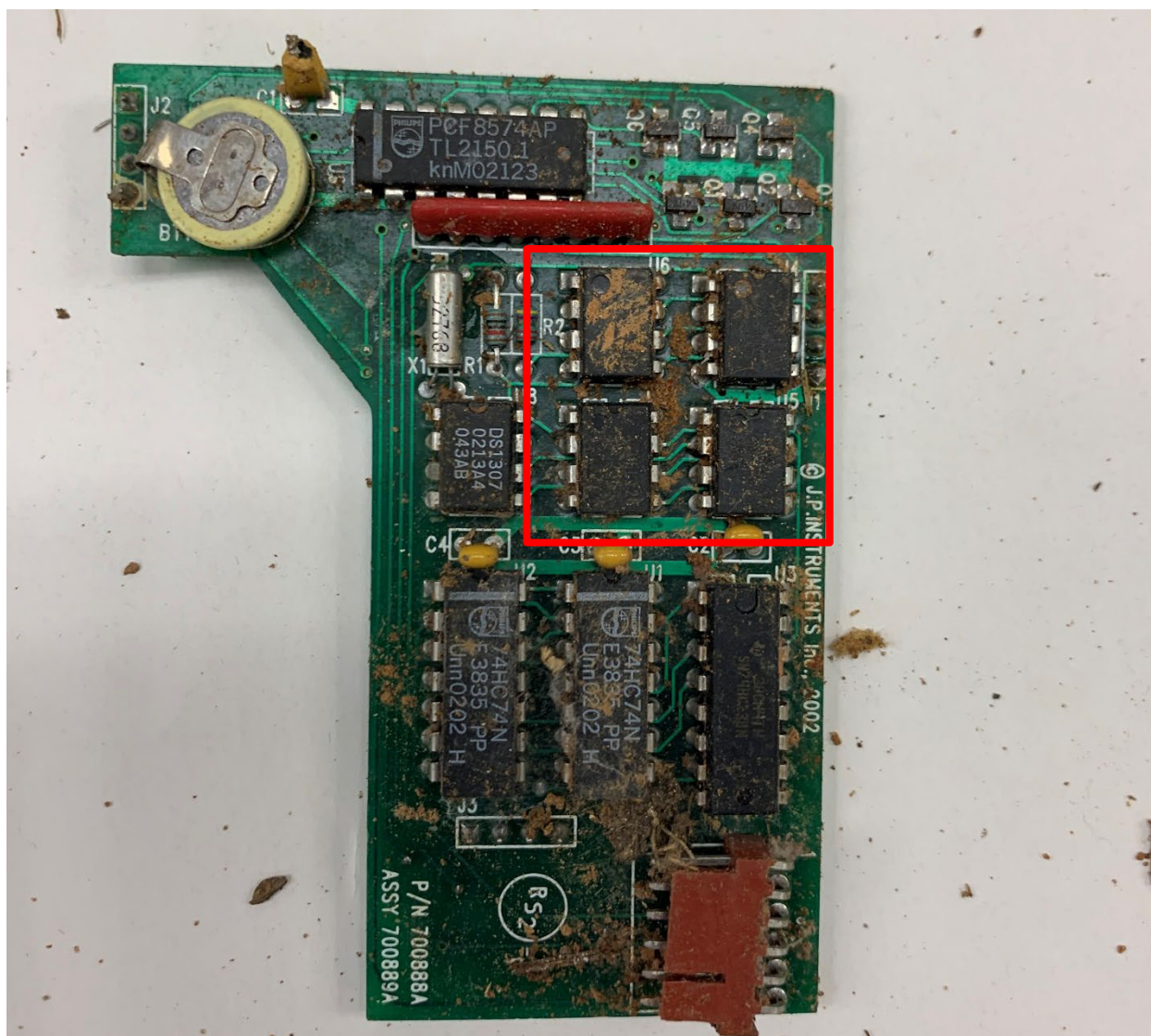


Figure 1. JPI EDM-760 non-volatile memory chips are highlighted in the red square.

1.3 JPI EDM Data Description

The EDM contained 5 sessions recorded from January 28, 2022, through February 1, 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 engineering unit conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM.

The final session, which was recorded on February 1, 2022, is included in this report, however, it could not be determined whether or not this session correlated to the accident event.

Appendix A lists the EDM parameters verified and provided in this report.

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 1 parameters for the entire session. The time displayed is 14:55:00 to 15:11:00 JPI Time.

Figure 3 is a plot of engine 2 parameters for the entire session. The time displayed is 14:55:00 to 15:11:00 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:

Gerald Kawamoto
Recorder Specialist

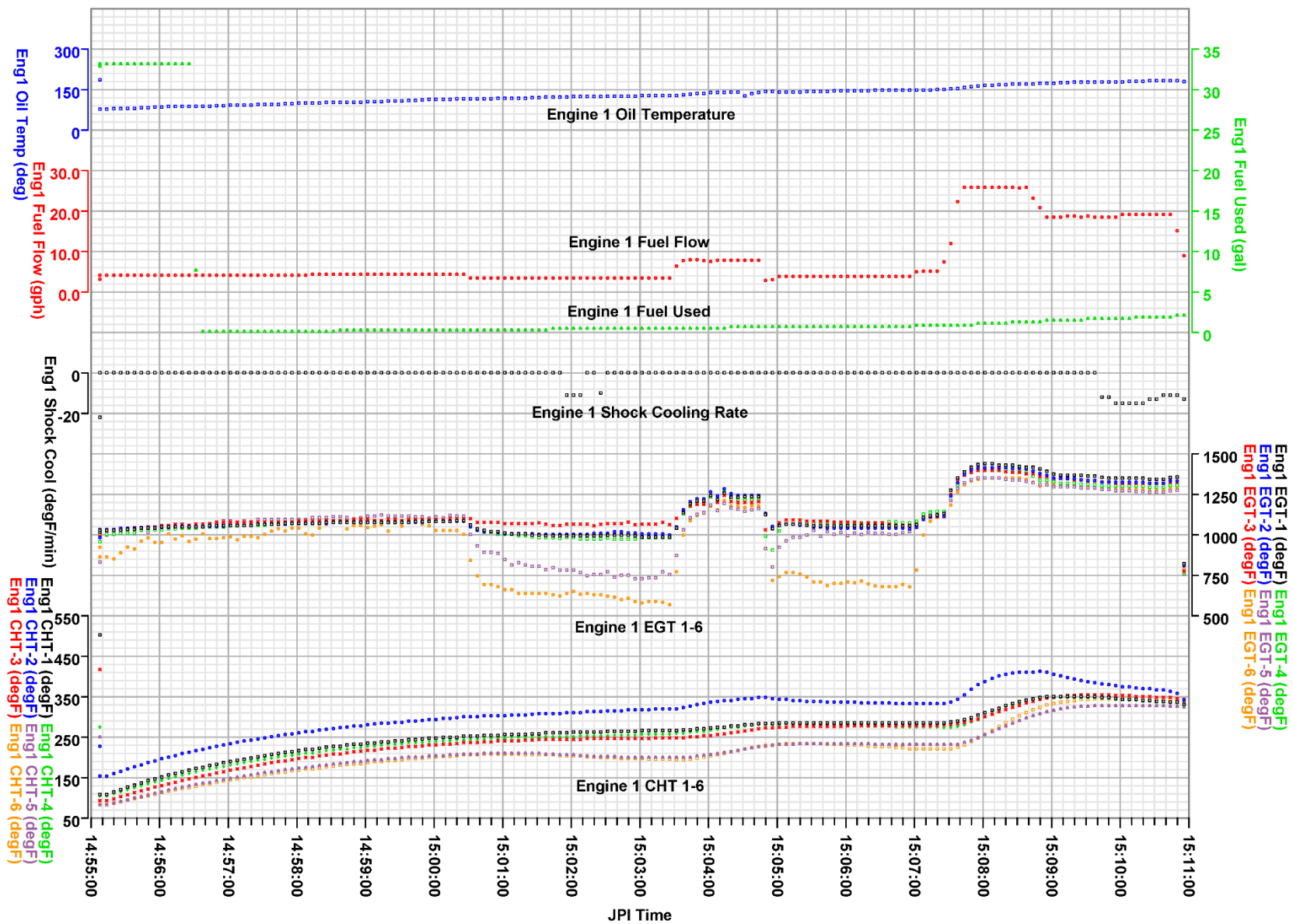


Figure 2. Plot of engine 1 parameters for the last session recorded.

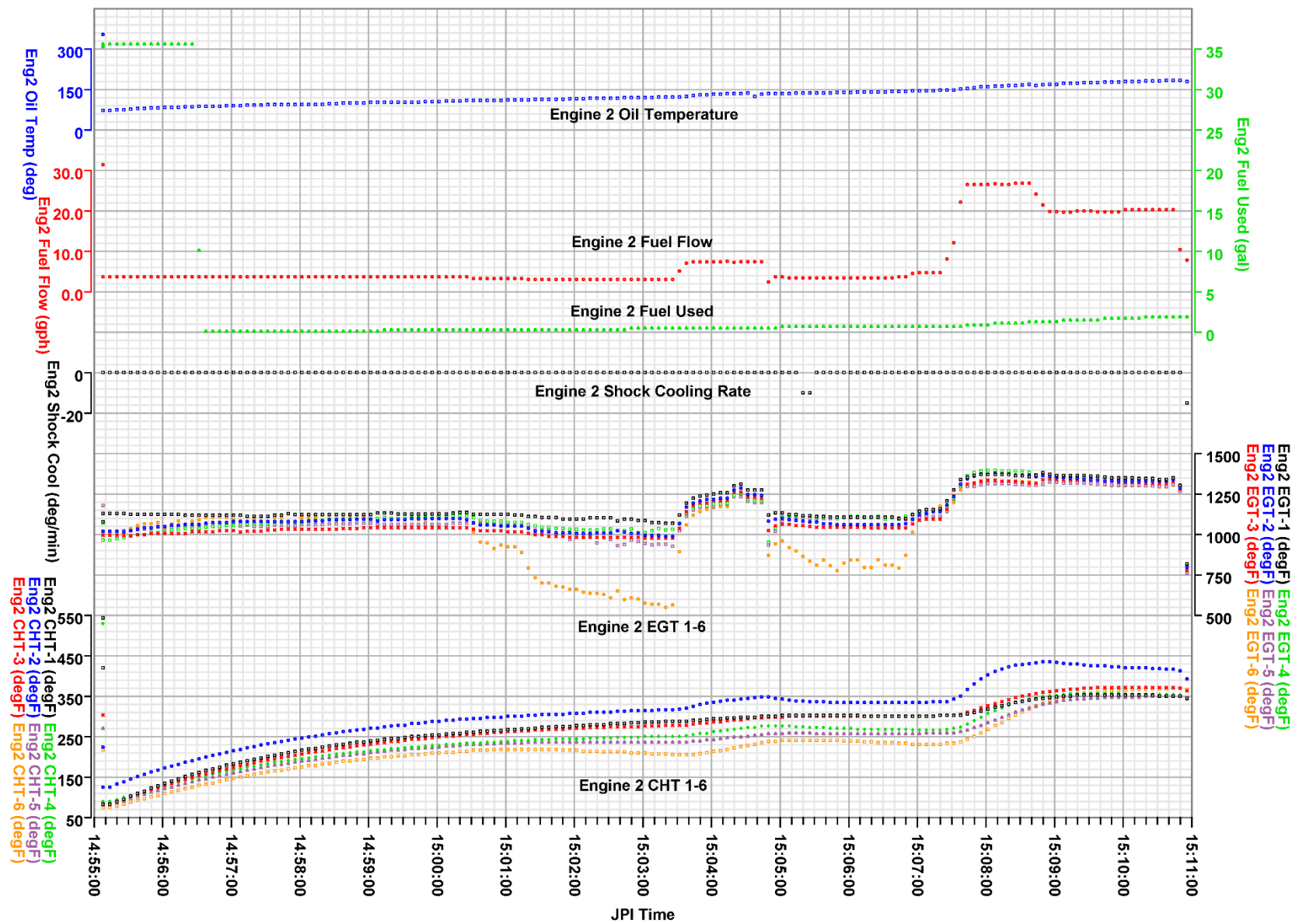


Figure 3. Plot of engine 2 parameters for the last session recorded.

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS JPI EDM-760

This appendix describes the parameters provided and verified in this report. Table 1 lists the EDM parameters.

Table 1. Verified and provided parameters

Parameter Name	Parameter Description
Eng # ² CHT-# (degF)	Cylinder Head Temperature Cylinder # ³ (degrees Fahrenheit)
Eng # EGT-# (degF)	Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
Eng # Fuel Flow (gph)	Engine Fuel Flow (gallons per hour)
Eng # Fuel Used (gal)	Engine Fuel Used (gallons)
Eng # Oil Temp (deg)	Engine Oil Temperature (degrees Fahrenheit)
Eng # Shock Cool (degF/min)	Engine Shock Cooling (degrees Fahrenheit per minute)

² In the data plots the '#' is replaced with the appropriate engine ID.

³ Depending on aircraft configuration, number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.