

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



WPR22FA332

ENGINE DATA MONITOR

Specialist's Factual Report

March 20, 2023

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A. ACCIDENT

Location: Galt, California
Date: September 4, 2022
Time: 0840 Pacific Daylight Time
Airplane: (PDT) Beech BE-58, N142DR

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: 068745

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 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. 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.

1.2 JPI EDM-760 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an external examination revealed the device sustained minor impact damage, as shown in Figure 1. An internal examination revealed further damage to internal components. The damage was repaired using laboratory tools and data were downloaded normally using the manufacturer's procedures.



Figure 1. Front and back of the JPI EDM-760 as received.

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

1.3 JPI EDM-760 Data Description

The EDM contained 11 sessions recorded from August 26, 2022, through September 4, 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. Upon powering, the internal time was found to be offset from Coordinated Universal Time (UTC) by approximately 8 minutes. Precise correlation to UTC was calculated by utilizing location data from available Automatic Dependent Surveillance-Broadcast (ADS-B) data and correlating it to when EDM parameters indicated that takeoff power was applied. This yielded a 313 second offset (5 minutes and 13 seconds) that was applied to EDM data such that it would be displayed in UTC. All data from this point forward are expressed in UTC. 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 accident session started at 13:56:57 UTC and ended at 15:40:51 UTC, on September 4, 2022, and is included in this report. The session included four takeoffs. The accident flight corresponded to the final takeoff of the session until the end of the recording.

1.3.1 JPI EDM-760 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.

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

D. FIGURES AND TABULAR DATA

Figures 2 through 7 contain data from the last session recorded on the EDM.

For all sessions recorded, including all previous flights reviewed, data for right engine cylinder number 6 exhibited behavior similar to plotted values in Figures 5 through 7.

Figure 2 is a plot of left engine parameters for the entire session. The time range displayed is 13:55:00 to 15:45:00 UTC.

Figure 3 is a plot of left engine parameters for the final takeoff portion of the session until the end of the recording. The time range displayed is 15:21:00 to 15:41:00 UTC.

Figure 4 is a plot of left engine parameters for the final four minutes of the accident session. The time range displayed is 15:37:00 to 15:41:00 UTC.

Figure 5 is a plot of right engine parameters for the entire session. The time range displayed is 13:55:00 to 15:45:00 UTC.

Figure 6 is a plot of right engine parameters for the final takeoff portion of the session until the end of the recording. The time range displayed is 15:21:00 to 15:41:00 UTC.

Figure 7 is a plot of right engine parameters for the final four minutes of the accident session. The time range displayed is 15:37:00 to 15:41:00 UTC.

The corresponding tabular data used to create figures 2 through 7 are provided in electronic comma separated value (CSV) format as attachment 1 to this report.

Submitted by:

Gerald Kawamoto
Recorder Specialist

Private, Beech BE58, N142DR

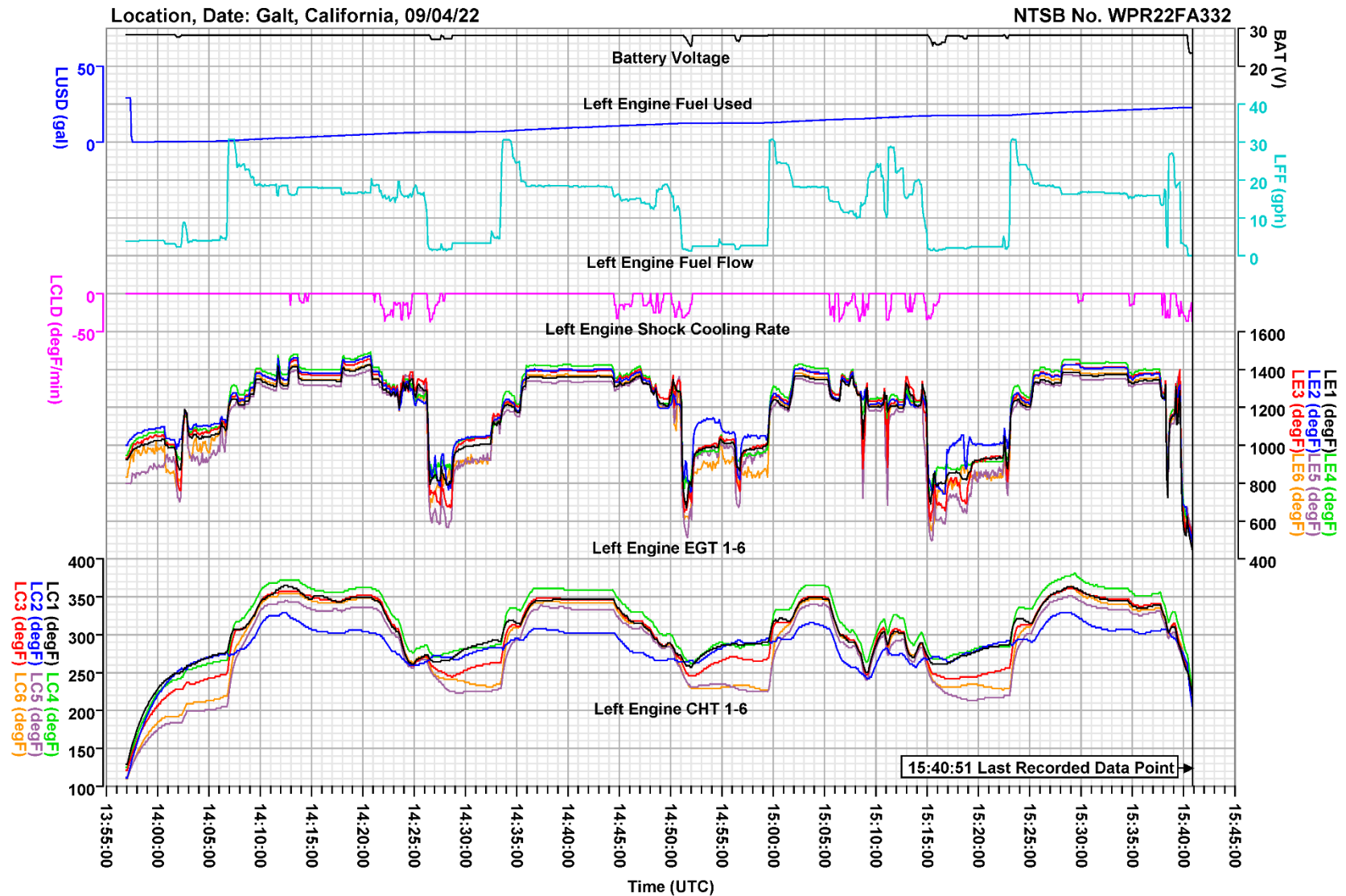


Figure 2. Plot of left engine parameters of the accident session recorded on September 4, 2022.

Private, Beech BE58, N142DR

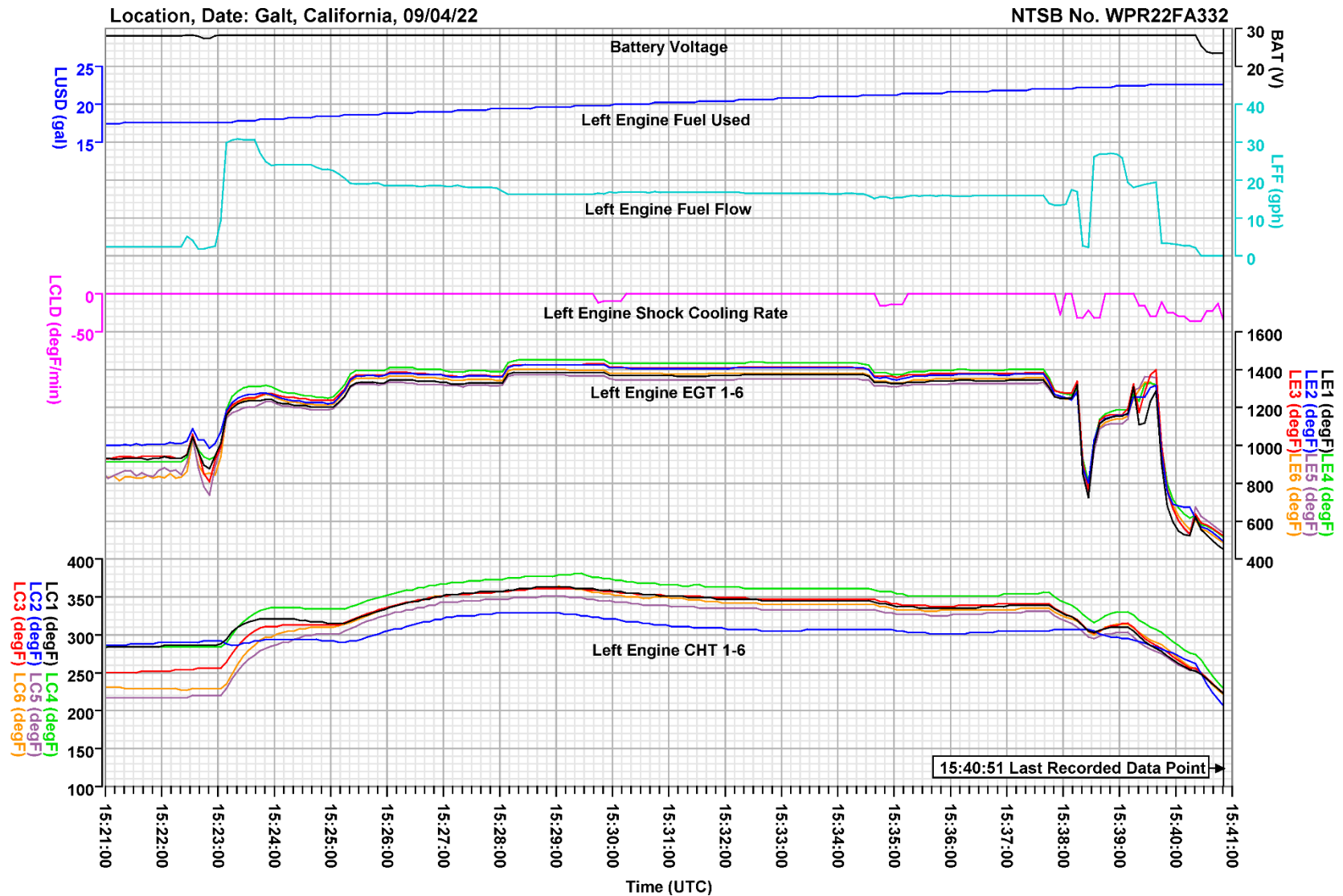


Figure 3. Plot of left engine parameters of the final flight portion of the accident session recorded on September 4, 2022.

Private, Beech BE58, N142DR

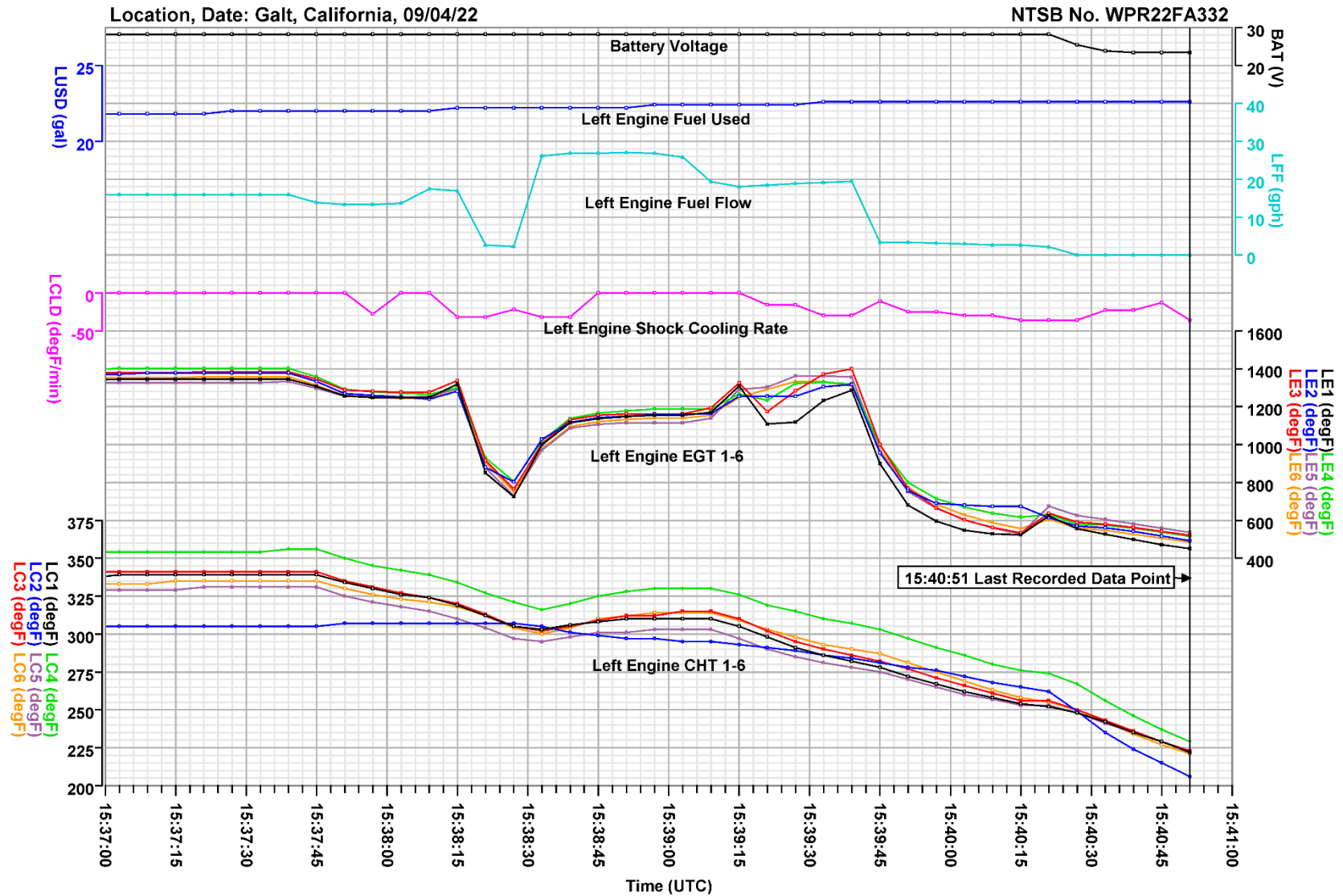


Figure 4. Plot of left engine parameters of the final four minutes of the accident session recorded on September 4, 2022.

Private, Beech BE58, N142DR

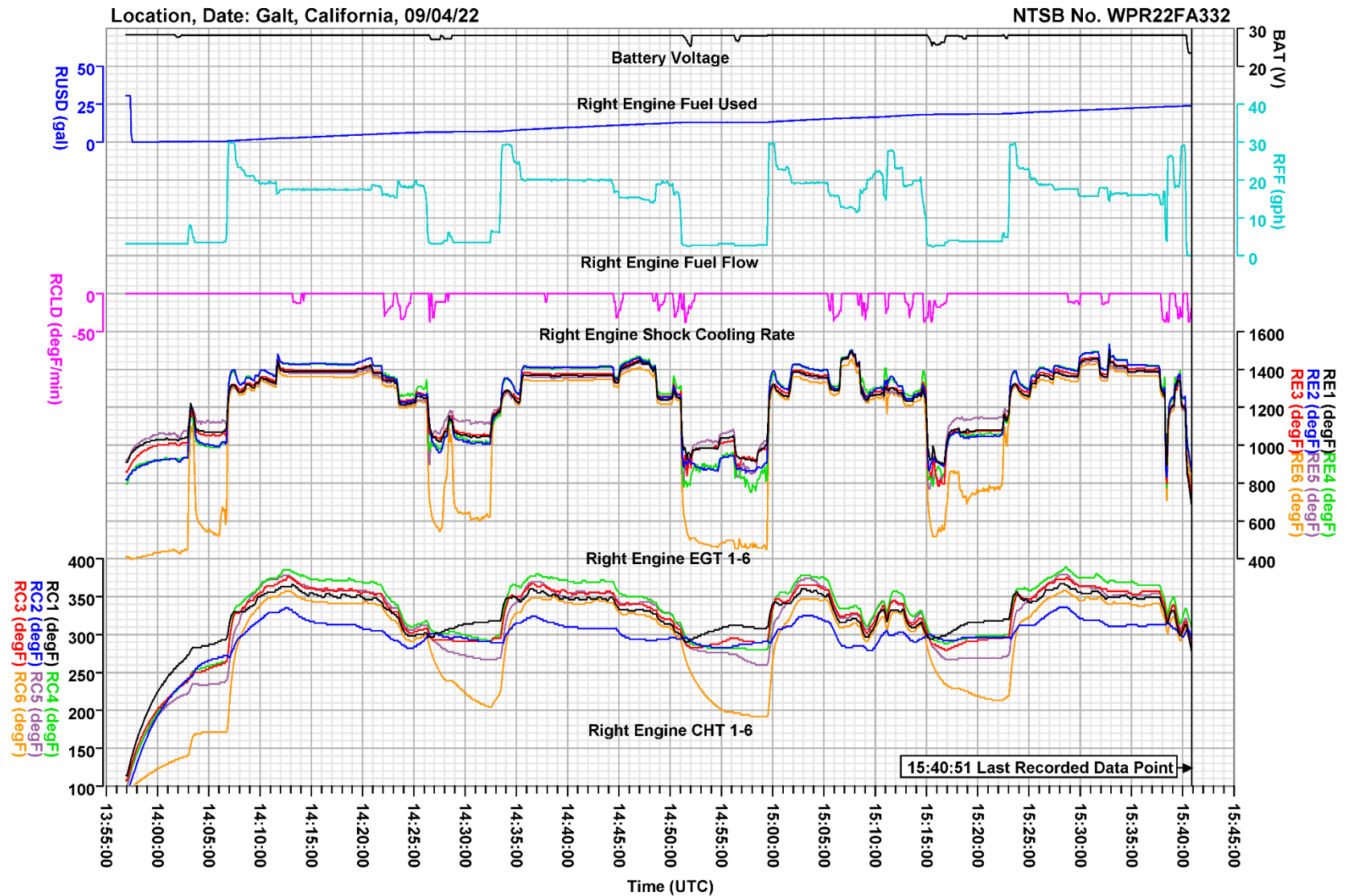


Figure 5. Plot of right engine parameters of the accident session recorded on September 4, 2022.

Private, Beech BE58, N142DR

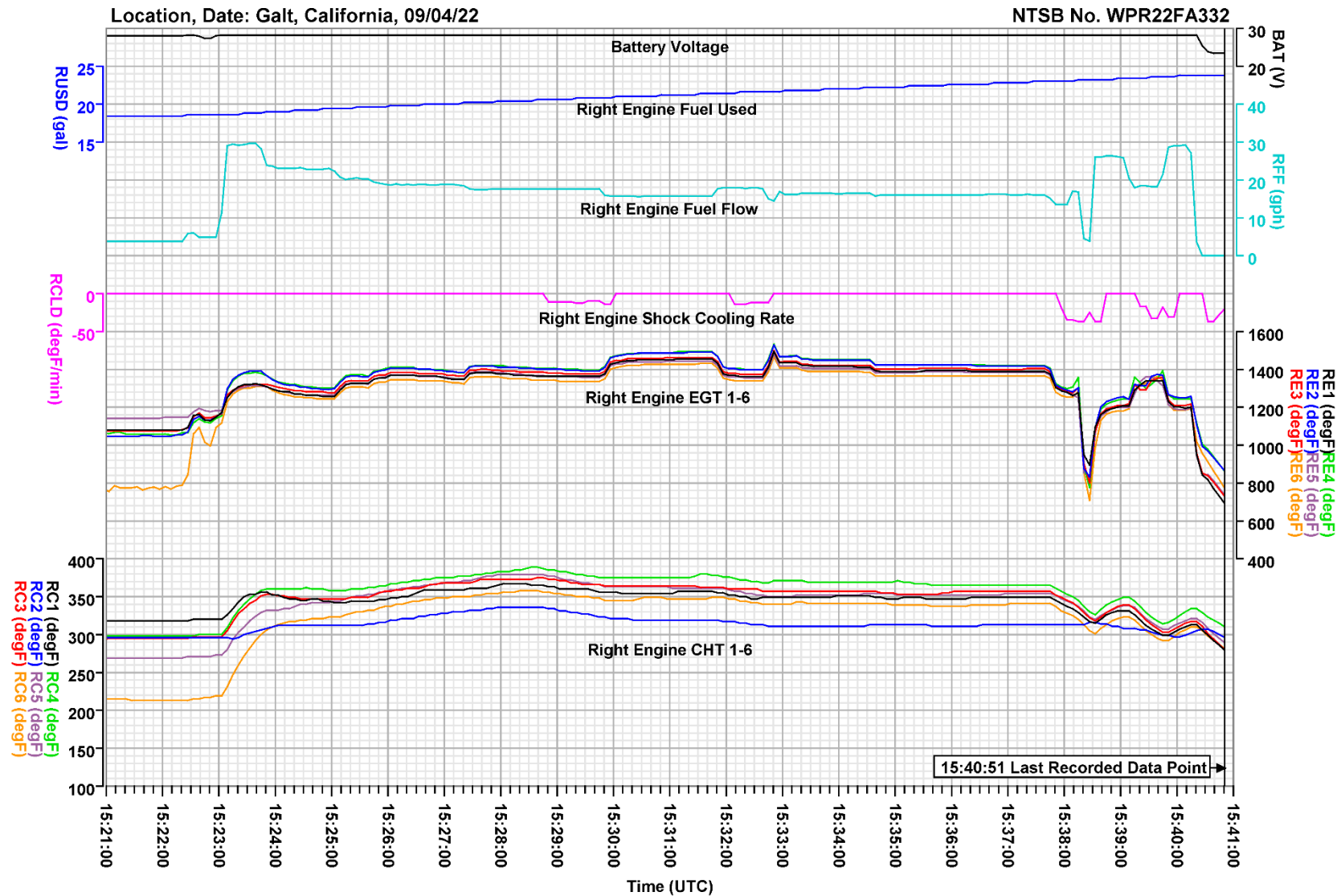


Figure 6. Plot of right engine parameters of the final flight portion of the accident session recorded on September 4, 2022.

Private, Beech BE58, N142DR

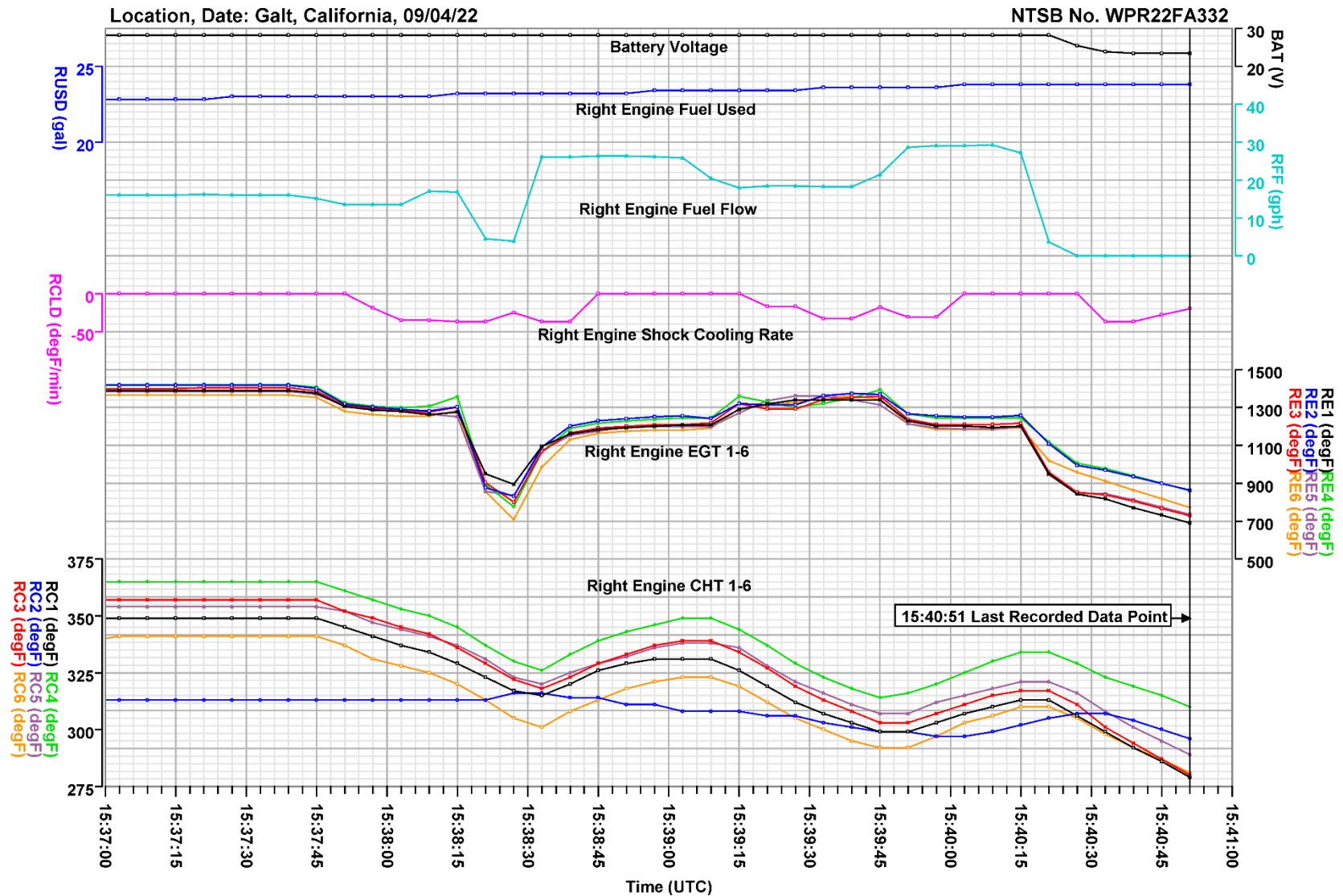


Figure 7. Plot of right engine parameters of the final four minutes of the accident session recorded on September 4, 2022.

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 ²	Parameter Description
C-# (degF)	Cylinder Head Temperature Cylinder # ³ (degrees Fahrenheit)
E-# (degF)	Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
FF (gph)	Engine Fuel Flow (gallons per hour)
USD (gal)	Engine Fuel Used (gallons)
CLD (degF/min)	Engine Shock Cooling (degrees Fahrenheit per minute)
BAT (V)	Battery Voltage (volts)

² Parameters preceded by an "L" or "R" refer to Left or Right engine parameters respectively.

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