

National Transportation Safety Board

Office of Research and Engineering

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ELECTRONIC DEVICES

Specialist's Factual Report

July 1, 2025

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A. ACCIDENT

Location: Doylestown, Pennsylvania
Date: November 18, 2024
Time: 1221 eastern standard time (EST)
1721 coordinated universal time (UTC)
Airplane: Beech A36, private operator, N8152R

B. ELECTRONIC DEVICES SPECIALIST

Specialist: Tatum Butler
Aerospace Engineer (Recorder Specialist)
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

An electric devices group was not convened. The NTSB Vehicle Recorder Division received the following devices:

Recorder Manufacturer/Model: J.P. Instruments EDM-900
Part Number: 790000-A-1862
Recorder Serial Number: 03051

Recorder Manufacturer/Model: Shadin DigiData
Part Number: 912802
Recorder Serial Number: 087

Recorder Manufacturer/Model: Garmin Aera 796
Recorder Serial Number: 2CY014482

1.0 JPI EDM 900 Description

The J. P. Instruments EDM-900 is a panel mounted display that the operator can monitor and record multiple engine parameters related to engine operations and GPS parameters, if connected. Depending on the installation, the engine parameters monitored can include:

- Battery Voltage
- Compressor Discharge Temperature
- Cylinder Head Temperature (CHT)
- Engine Revolutions per Minute
- Exhaust Gas Temperature (EGT)
- Fuel Flow

- Fuel Level
- Fuel Pressure
- Manifold Pressure
- Oil Pressure and Temperature
- Outside Air Temperature
- Turbine Inlet Temperature

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 (NVM) 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 800 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 instructions on the unit.

1.1 JPI EDM 900 Data Recovery

The EDM 900 was in good condition as shown in figure 1, and the data were downloaded using the manufacturer's procedure.



Figure 1. JPI EDM-900 as received by the NTSB Vehicle Recorder Laboratory.

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

1.2 JPI EDM 900 Data Description

The EDM 900 recording contained approximately 70 hours of data over 76 sessions from October 12, 2023, to November 18, 2024. The event flight was the last flight of the recording, and its duration was approximately 32 minutes.

1.2.1 JPI EDM 900 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 in appendix A lists the EDM 900 parameters verified and provided in this report. Additionally, in appendix A, table 2 describes the unit and discrete state abbreviations used in this report.

1.3 JPI EDM 900 Time Correlation

The EDM 900 records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator.

Correlation of the EDM 900 data to the event local time, EST, was established by powering on the device and comparing the live device time to UTC and then applying an additional 5 hours offset to change UTC to EST. The total offset from device time to EST was 16,461 seconds. Therefore, for the rest of this report, all times are referenced as EST, not recorded time.

2.0 Shadin DigiData Description

The Shadin DigiData is a digital fuel management system designed to provide fuel management information under real flight conditions without manual entry of data (after entry of the initial fuel on board). It connects to the engine's fuel flow transducers for fuel flow information and to a Loran-C or GPS receiver serial port for navigation data.

The system includes NVM that retains fuel remaining information, display brightness settings, the currently selected Airdata page, and the latest barometric pressure setting.

2.1 Shadin DigiData Data Recovery

The Shadin DigiData was in good condition and the data were recovered using the manufacturer's procedure. After powering on normally, the unit flashed a low fuel remaining warning. Figure 2 shows the following values for fuel remaining and fuel used displayed on the device once the warning was dismissed.



Figure 2. Shadin DigiData Fuel Remaining (left) at 0.0 gallons and Fuel Used (right) at 0.7 gallons.

3.0 Garmin Aera 796

The Garmin Aera 796 is a handheld GPS which may be configured to record position data. In discussion with the Investigator-in-Charge, it was determined that the data recorded on this device would be of equal or less quality to that of the Automatic Dependent Surveillance-Broadcast (ADS-B) data. Therefore, the Aera 796 was not downloaded. Figure 3 shows the Garmin Aera 796 as received by the NTSB Vehicle Recorder Laboratory.



Figure 3. Garmin Aera 796 as received by the NTSB Vehicle Recorder Laboratory.

D. FIGURES AND TABULAR DATA

Figures 4 and 5 contain flight data recorded during the event on November 18, 2024. All the parameters listed in table 1 are plotted.

Figure 4 is a plot of JPI EDM 900 data from the entire accident flight from 11:50:00 EST to 12:24:00 EST.

Figure 5 is a plot of JPI EDM 900 data from the last 50 seconds of the accident flight from 12:22:00 EST to 12:22:55 EST.

These figures are configured such that right turns are indicated by the trace moving toward the bottom of the page, left turns towards the top of the page, and nose up attitudes towards the top of the page.

The recording started at 11:50:25 EST and includes the departure from Doylestown Airport (KDYL), Doylestown, Pennsylvania. At 12:22:35 EST, several parameters abruptly dip, including all EGTs, engine RPM, horsepower, manifold pressure, oil pressure, and fuel flow. The final data points were recorded at 12:22:50 EST. The last recorded fuel levels in the left and right tanks were 27.1 gallons and 34.2 gallons respectively.

The corresponding tabular data used to create figures 4 and 5 are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

Submitted by:

Tatum Butler
Aerospace Engineer - Recorder Specialist

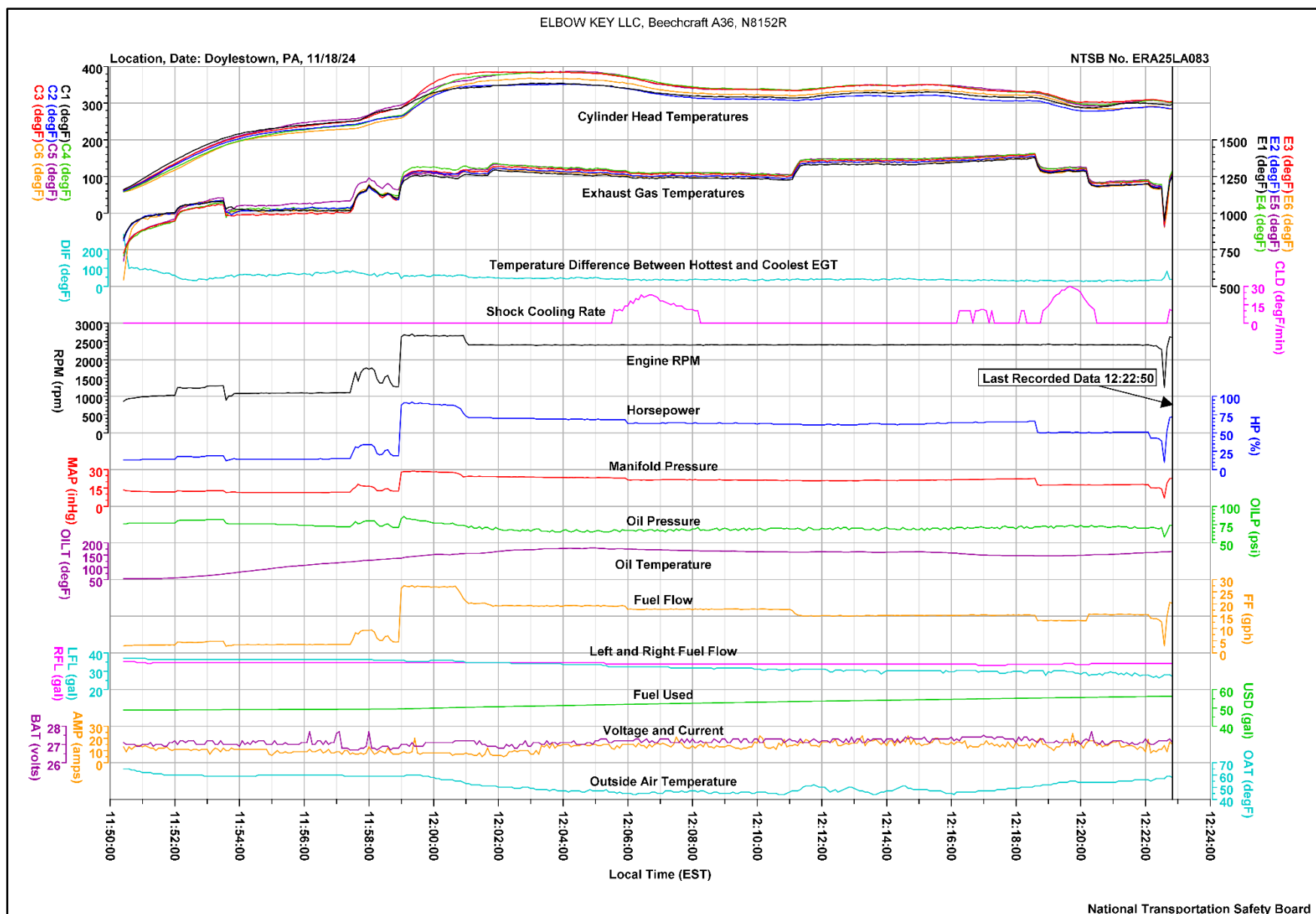


Figure 4. Plot of JPI EDM-900 data from the entire accident flight on November 18, 2024.

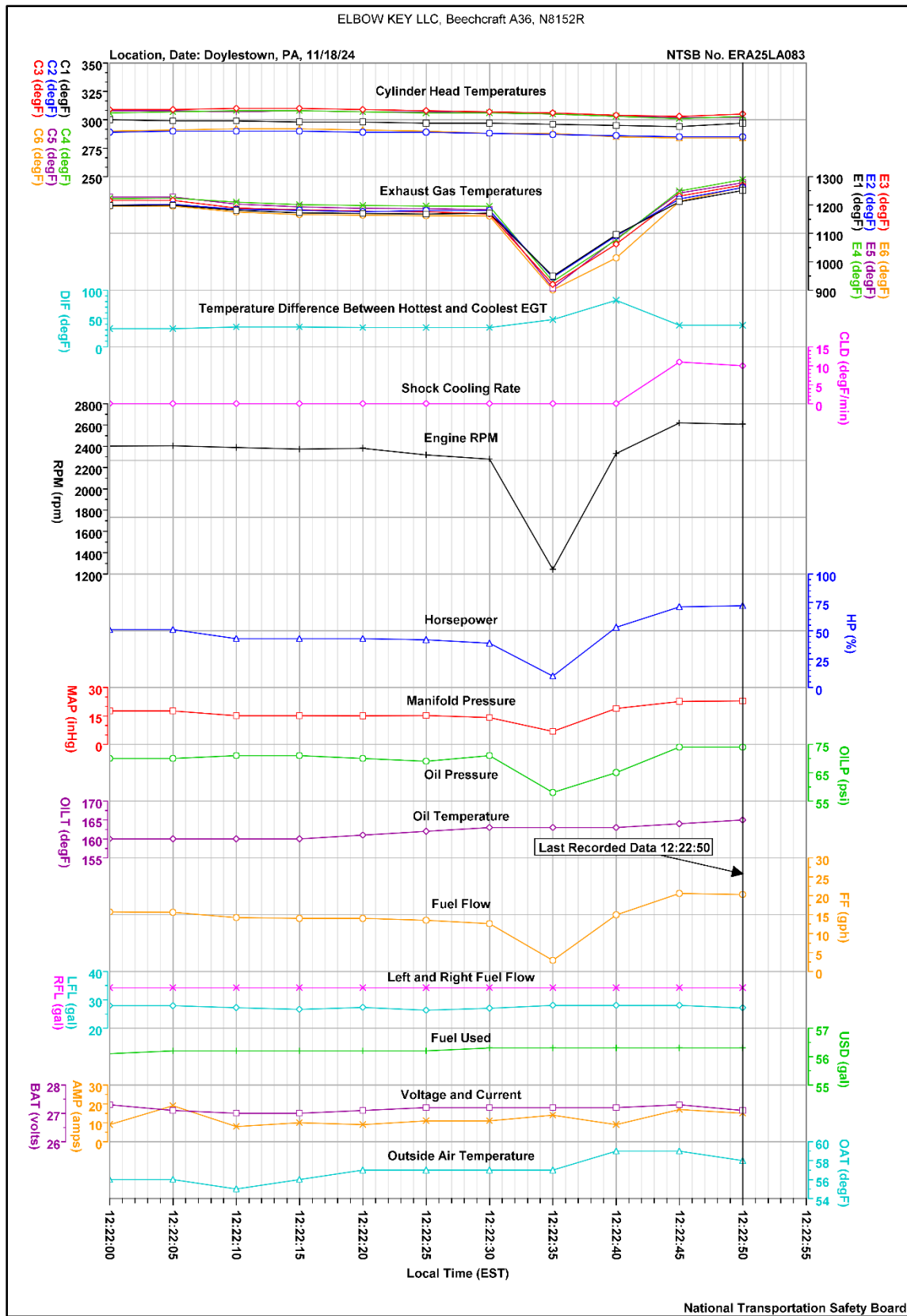


Figure 5. Plot of JPI EDM-900 data from the last 50 seconds of the accident flight on November 18, 2024.

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS

This appendix describes the parameters provided and verified in this report. Table 1 lists the parameters and table 2 describes the unit abbreviations used in this report.

Table 1. Verified and provided parameters.

Parameter Name (units)	Parameter Description
LFL (gal)	Left Tank Fuel Level
RFL (gal)	Right Tank Fuel Level
AMP (amps)	Bus Current Input
BAT (volts)	Battery Voltage Input
C# (degF)	Cylinder Head Temperature Cylinder # ²
E# (degF)	Exhaust Gas Temperature Cylinder #
FF (gph)	Fuel Flow
USD (gal)	Fuel Used
HP (%)	Horsepower
MAP (inHg)	Manifold Pressure
OILP (psi)	Oil Pressure
OILT (degF)	Oil Temperature
RPM (rpm)	Revolutions per minute
CLD (degF/min)	Shock Cooling Rate
DIF (degF)	Temperature Difference Between Hottest and Coolest EGT
OAT (degF)	Outside Air Temperature

Table 2. Unit abbreviations.

Unit Abbreviations	Descriptions
%	percent
rpm	revolutions per minute
amps	Amperes
degF/min	degrees Fahrenheit per minute
degF	degrees Fahrenheit
gal	gallons
gph	gallons per hour
inHg	inches of Mercury
psi	pounds per square inch
volts	Volts DC

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