

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

February 12, 2018

Engine Data Monitor (EDM)

Specialist's Factual Report
By Sean Payne

1. EVENT SUMMARY

Location: Nipton, California
Date: November 16, 2017
Aircraft: Piper PA 28R-201T
Registration: N5966V
Operator: Private
NTSB Number: WPR18LA033

On November 16, 2017, about 1800 Pacific standard time, a Piper PA-28R-201T, N5966V, was substantially damaged following an emergency landing as a result of a total loss of engine power near Nipton, California. The commercial pilot and the sole passenger were not injured. Instrument meteorological conditions (IFR) prevailed at altitude, while visual meteorological conditions prevailed at the accident site. The cross-country flight was being operated in accordance with 14 Code of Federal Regulations Part 91, and an IFR flight plan was filed and active at the time of the accident. The flight departed North Las Vegas Airport (VGT), Las Vegas, Nevada, about 1655, with an intended destination of Brackett Field (POC), La Verne, California.

2. ENGINE DATA MONITOR GROUP

An Engine Data Monitor (EDM) group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following EDM:

Recorder Manufacturer/Model: **JPI EDM-700**
Recorder Serial Number: **26826**

3.1. EDM 700/800 Description

The J. P. Instruments EDM-700/800 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.

3.1.1. Data Recovery

The recorder was in good condition and the data were extracted normally from the recorder.

Figure 1. Damaged exterior of flight recorder.



3.1.2. Data Description

The EDM recording contained approximately data for 15 power cycles. The event flight was the last flight of the recording and its duration was approximately 59 minutes and 49 seconds.

3.1.3. Engineering Units Conversions

The engineering units 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.

3.2. Time Correlation

The EDM 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 data to the event local time, PST, was established by using the recorded time and then subtracting an additional 9 hours and 8 minutes. Therefore, for the rest of this report, all times are referenced as PST, not recorded time.

$$\text{EDM Internal Time} - 32408 \text{ Seconds} = \text{PST}$$

3.3. Plots and Corresponding Tabular Data

The following two figures contain EDM data recorded during the November 16, 2017 event.

Figure 2 is a plot of recorded parameters from the JPI between 16:50 and 17:55. A rise in cylinder head temperature for cylinder number 5 occurs just after 17:40. EGT values for cylinders number 3, 5 and 1 diverge around the same time. Subsequently, the device calculated a disparity in exhaust gas temperature differential around the same time. RPM starts to drop from 2400 RPM at around 17:43:45. RPM later stabilizes shortly at around 2100 RPM. RPM begins to drop off sharply around 17:51:03. The recording terminates at 17:51:15.

Figure 3 is an expanded time range for the same plotted parameters. The time interval shown is between 17:38 and 17:52.

The corresponding tabular data used to create these two plots are provided in electronic (*.csv¹) format as Attachment 1 to this report.

¹ Comma Separated Value format.

Figure 2. Plot of basic parameters during entire flight.

Private, Piper PA-28R-201T, N5966V

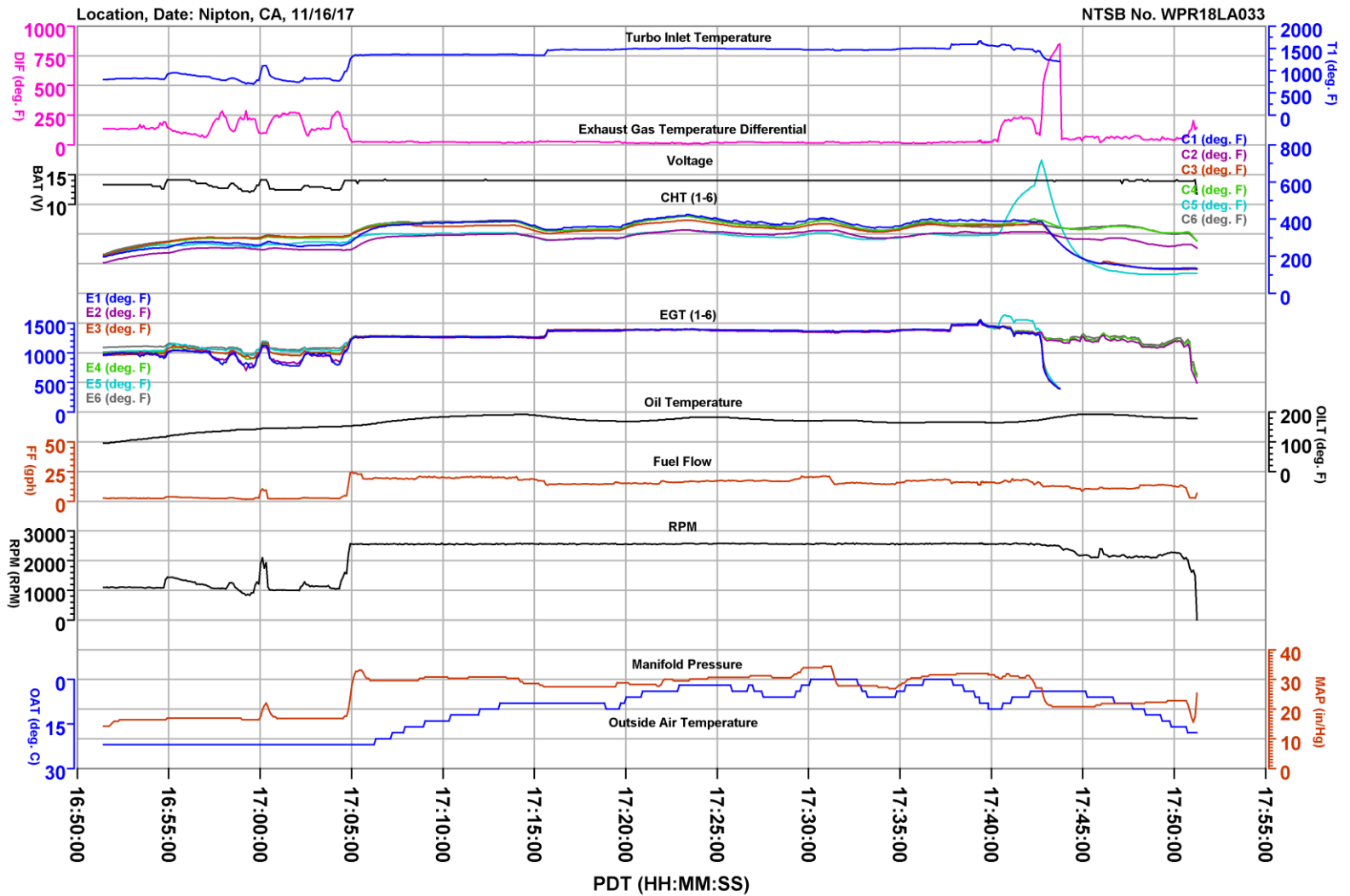
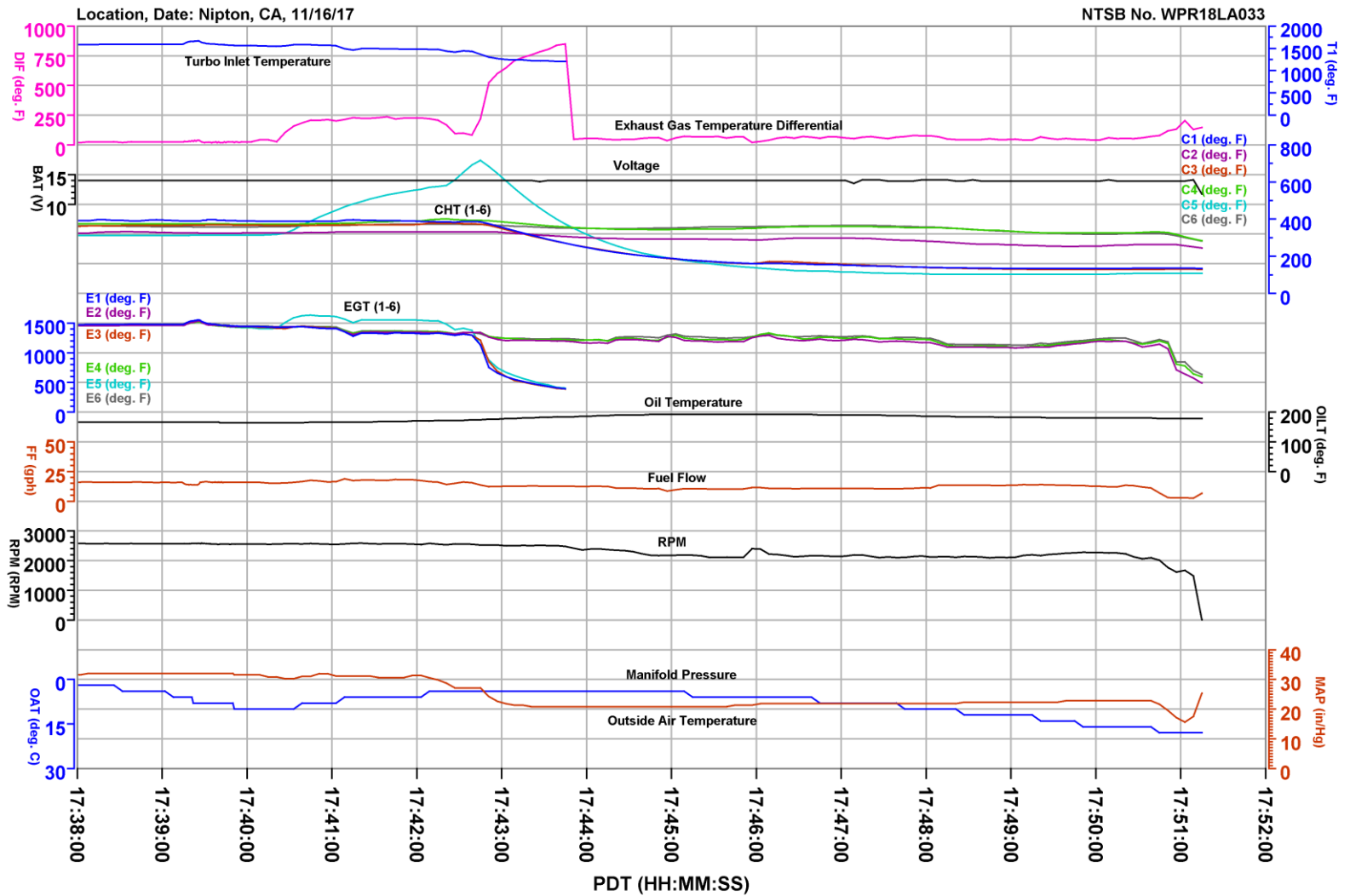


Figure 3. Plot of basic parameters for the last portion of flight.

Private, Piper PA-28R-201T, N5966V



APPENDIX A

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

Table A-1. Verified and provided parameters.

Parameter Name	Parameter Description
1. Bat (V)	Battery Voltage
2. C# (deg)	Cylinder Head Temperature Cylinder # ²
3. E# (deg)	Exhaust Gas Temperature Cylinder #
4. FF (gph)	Engine Fuel Flow
5. Oil Temp (deg)	Engine Oil Temperature
6. RPM (rpm)	Engine Revolutions per minute
7. DIF (deg)	Exhaust Gas Temperature Differential
8. T1 (deg)	Engine Turbo Inlet Temperature
9. OAT (deg)	Outside Air Temperature
10. MAP (inHg)	Engine Manifold Pressure

Table A-2. Unit abbreviations.

Units Abbreviation	Description
rpm	percent revolutions per minute
deg/min	degrees per minute
deg C	degrees Celsius
deg F	degrees Fahrenheit
inHg	inches of Mercury
V	Volts DC

NOTE: For parameters with a unit description of discrete, a discrete is typically a 1-bit parameter that is either a 0 state or a 1 state where each state is uniquely defined for each parameter.

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