

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

November 28, 2017

Engine Data Monitor (EDM)

Specialist's Factual Report **By Sean Payne**

1. EVENT SUMMARY

Location: Moss Beach, California
Date: November 18, 2016
Aircraft: Cessna 172N
Registration: N6610D
Operator: Private
NTSB Number: WPR17FA023

On November 18, 2016, about 1120 Pacific standard time (PST), a Cessna 172N, N6610D, sustained substantial damage after impacting terrain and objects in a residential area near Moss Beach, California, following a loss of control while on final approach to Half Moon Bay Airport (HAF), Half Moon Bay, California. The private pilot sustained serious injuries, and the non-pilot rated passenger was fatally injured. The personal cross-country flight was being operated in accordance with 14 *Code of Federal Regulation* Part 91, and a flight plan was not filed. Visual meteorological conditions prevailed for the flight, which originated from the Sacramento Executive Airport (SAC), Sacramento, California, about 1015, with HAF as the destination.

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-760**
Recorder Serial Number: **27819**

3.1. EDM 700 Description

The J. P. Instruments EDM-700 is a panel mounted gauge that records 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 memory¹ (NVM) 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 using the manufacturer's software.

Figure 1. Exterior of JPI EDM 700.



3.1.2. Data Description

The EDM recording contained data for 18 power cycles of the unit. The event flight was the last flight file and its duration was approximately 1 hour and 10 minutes.

¹ Non-volatile memory – semi-conductor memory that does not need power applied to retain data.

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 offsetting the recorded time to the accident time provided by the investigator-in-charge. The following time correlation was established.

JPI EDM 700 Recorded Time – 27,766 seconds = PST

For the rest of this report, all times are referenced as PST, not recorded time.

3.3. Plots and Corresponding Tabular Data

The following two figures contain EDM data recorded during the November 18, 2016 event.

Figure 2 is a plot of all the parameters recorded by the JPI EDM 700 for the accident flight. The plotted time interval begins at 10:10:00 PST and ends at 11:20:00 PST.

Figure 3 is a plot of all the parameters recorded by the JPI EDM 700 for last five minutes of the accident flight. The plotted time interval begins at 11:15:00 PST and ends at 11:20:00 PST. There was an increase in fuel flow and an increase in both CHT and EGT for all cylinders around 11:19:30. Through the last five minutes of flight, all CHTs and EGTs appear nominal.

The corresponding tabular data used to create these two plots are provided in electronic (*.csv²) format as Attachment 1 to this report.

² Comma Separated Value format.

Figure 2. Plot of basic parameters during entire flight.

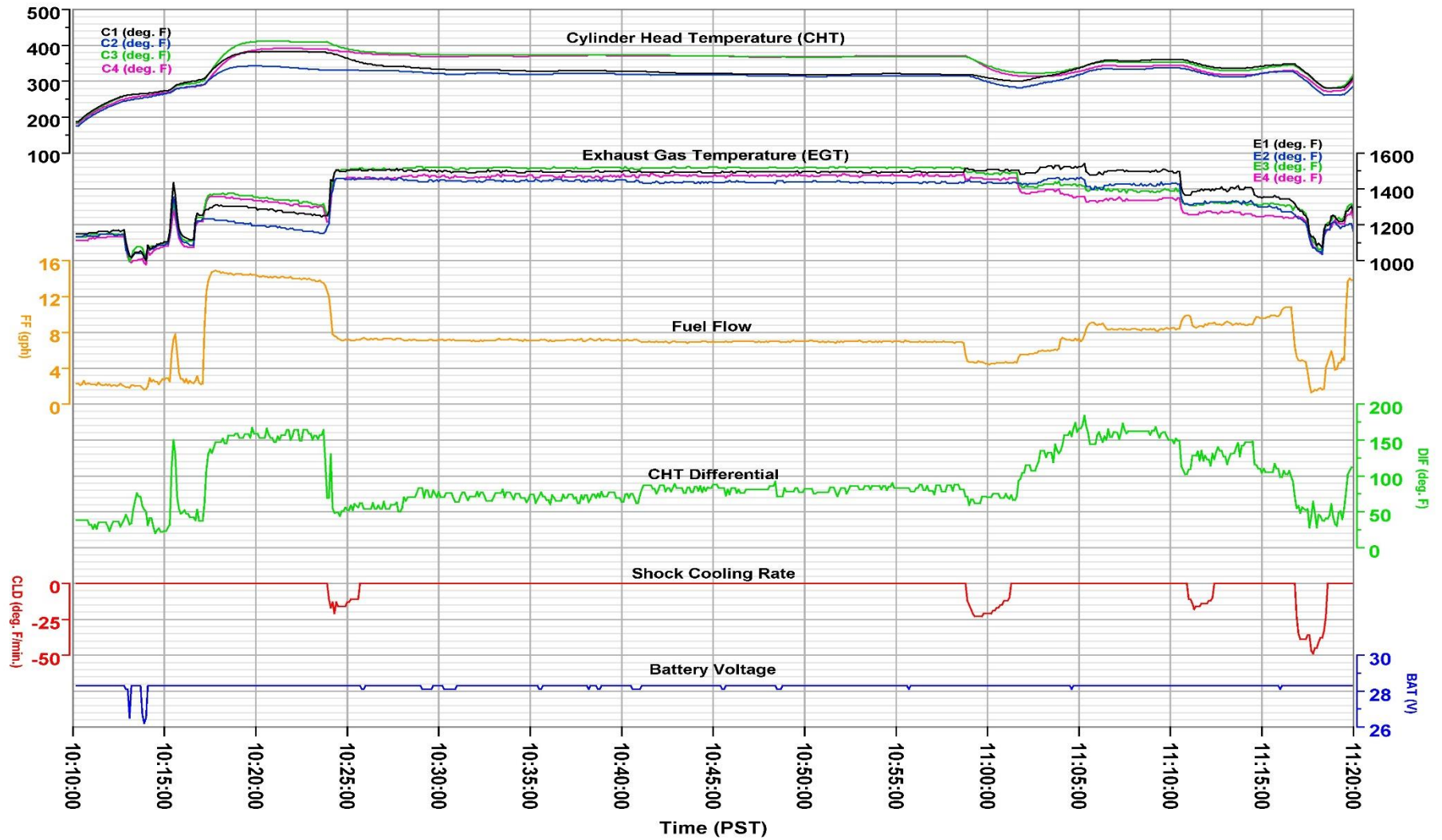
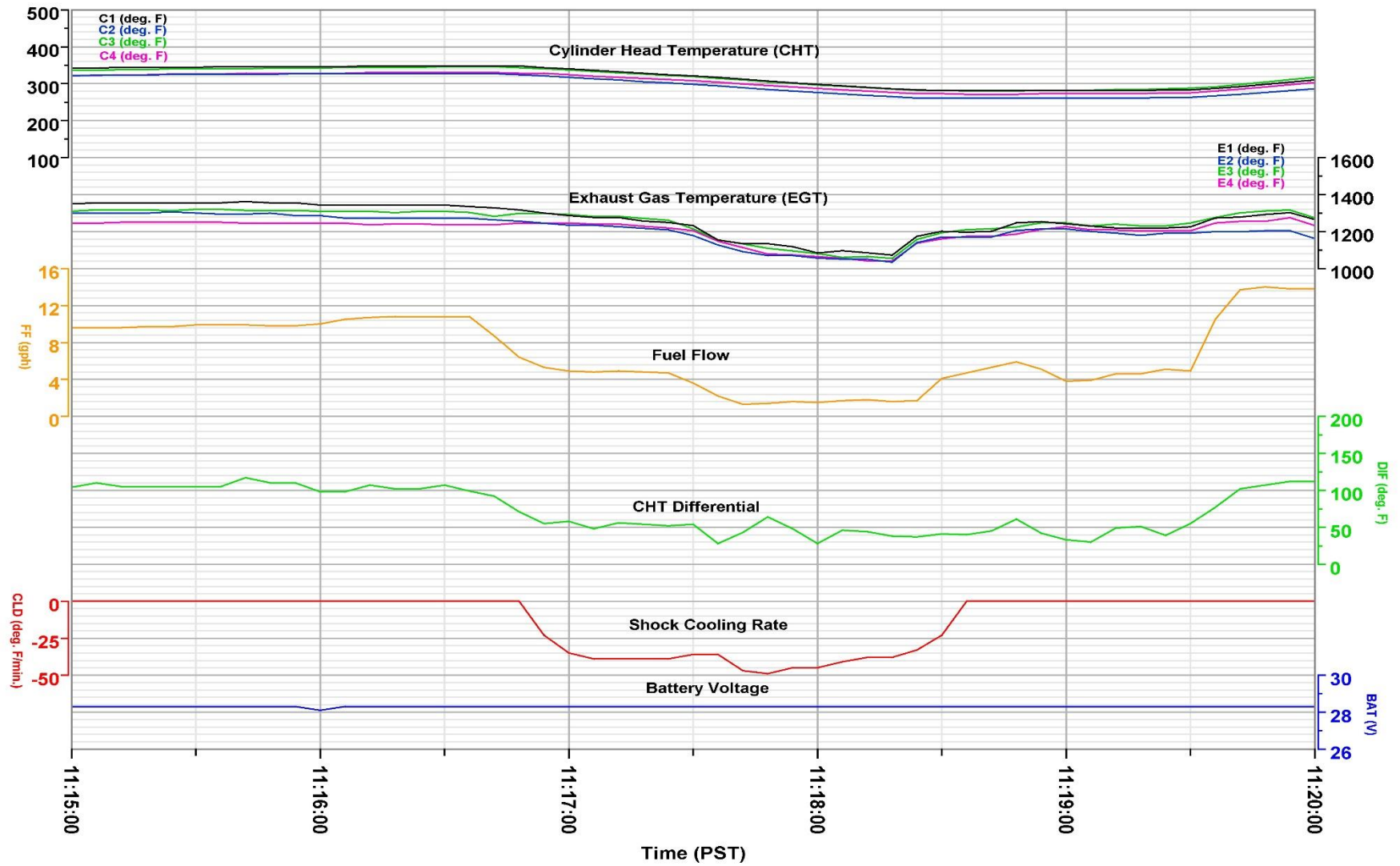


Figure 3. Plot of basic parameters during the last five minutes of flight.



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
E#	Exhaust Gas Temperature – Cylinder #
C#	Cylinder Head Temperature – Cylinder #
DIF	Cylinder Head Temperature Differential
CLD	Shock Cooling Rate
FF	Fuel Flow
BAT	Battery Voltage
USD	Fuel Used

NOTE: The symbol “#” indicates the corresponding cylinder or exhaust manifold as instrumented on the aircraft.

Table A-2. Unit abbreviations.

Units Abbreviation	Description
deg. F	degrees Fahrenheit
deg. F/min.	degrees Fahrenheit per minute
gph	gallons per hour
V	volts DC
gal.	gallons