

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

August 25, 2015

Engine Data Monitor (EDM)

Specialist's Factual Report
By Doug Mansell

1. EVENT SUMMARY

Location: West Memphis, Arkansas
Date: October 15, 2014
Aircraft: Cessna P210N
Registration: N731QV
Operator: Private
NTSB Number: CEN15LA015

On October 15, 2014, about 1730 central daylight time (CDT), a Cessna P210N airplane, N731QV, sustained substantial damage following a forced landing and impact with terrain after a reported loss of manifold pressure and subsequent loss of engine power during initial climb out from West Memphis Municipal Airport (AWM), West Memphis, Arkansas. The pilot, who was the registered owner and sole occupant of the airplane, was not injured. Visual meteorological conditions prevailed for the flight, which was being operated in accordance with 14 *Code of Federal Regulations* Part 91, and a flight plan had been filed.

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-830**
Recorder Serial Number: **33405**

3.1. JPI EDM-830 Description

The J. P. Instruments EDM-830 is a panel mounted LCD display that the operator can monitor and record up to 24 parameters related to engine operations. Recording begins when Exhaust Gas Temperatures (EGTs) are greater than 500 degrees Fahrenheit. Depending on the installation, engine parameters monitored may 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 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. For a non-damaged unit, the data can be downloaded by the operator using a USB flash drive and following the instructions on the unit.

3.1.1. Data Recovery

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

3.1.2. Data Description

The EDM recording contained approximately 32 hours of data over 51 power cycles. The event flight was the last flight of the recording and its duration was approximately 18 minutes 30 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. Table 1 lists the EDM-830 parameters verified and provided in this report.

3.1.4. Time Correlation

The EDM-830 records time with the first data sample based on the units' internal clock. This clock is set and updated by the operator. The internal clock on this device was found to be approximately 13 minutes behind coordinated universal time (UTC).

Correlation of the EDM data to the event local time, CDT, was established by applying an offset of 4 hours 47 minutes (5 hours to convert UTC to CDT, and 13 minutes to correct for internal clock setting). Therefore, for the rest of this report, all times are referenced as CDT, not recorded time.

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

3.2. Plots and Corresponding Tabular Data

Figures 1 and 2 contain EDM data recorded during the October 15, 2014 event.

Figure 1 shows the engine data from the entire recording of the accident flight. Between 1712 and 1713 CDT, an increase in manifold pressure, engine RPM, and exhaust gas temperatures occurred. Just prior to 1714 CDT, manifold pressure increased, and engine RPM increased to 2700, consistent with takeoff. Approximately six minutes later, engine RPM began fluctuating; another minute after that, exhaust gas temperatures increased. By 1723 CDT, engine RPM decreased, voltage decreased, and manifold pressure increased.

Figure 2 shows the engine data from the final three minutes of recording of the accident flight. Each unique data point is depicted with a symbol, at 6-second intervals.

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

Table 1. JPI EDM-830 parameters

Parameter Name	Parameter Description	Units
TIME	Date and Time	CDT
E# *	Exhaust Gas Temperature, Cylinder # *	deg F
C# *	Cylinder Head Temperature, Cylinder # *	deg F
T1	Engine Turbine Inlet Temperature-Input 1	deg F
OAT	Outside Air Temperature	deg C
DIF	EGT Span	deg F
CLD	Engine Shock Cooling	deg F / min
MAP	Engine Manifold Pressure	in Hg
RPM	Engine Revolutions per Minute	RPM
HP	Engine Horsepower	percent (%)
FF	Engine Fuel Flow	gal / hour
BAT	Battery Voltage	Volts DC
OILT	Engine Oil Temperature	deg F
USD	Engine Fuel Used	gal

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

Figure 1. Plot of engine parameters, entire flight

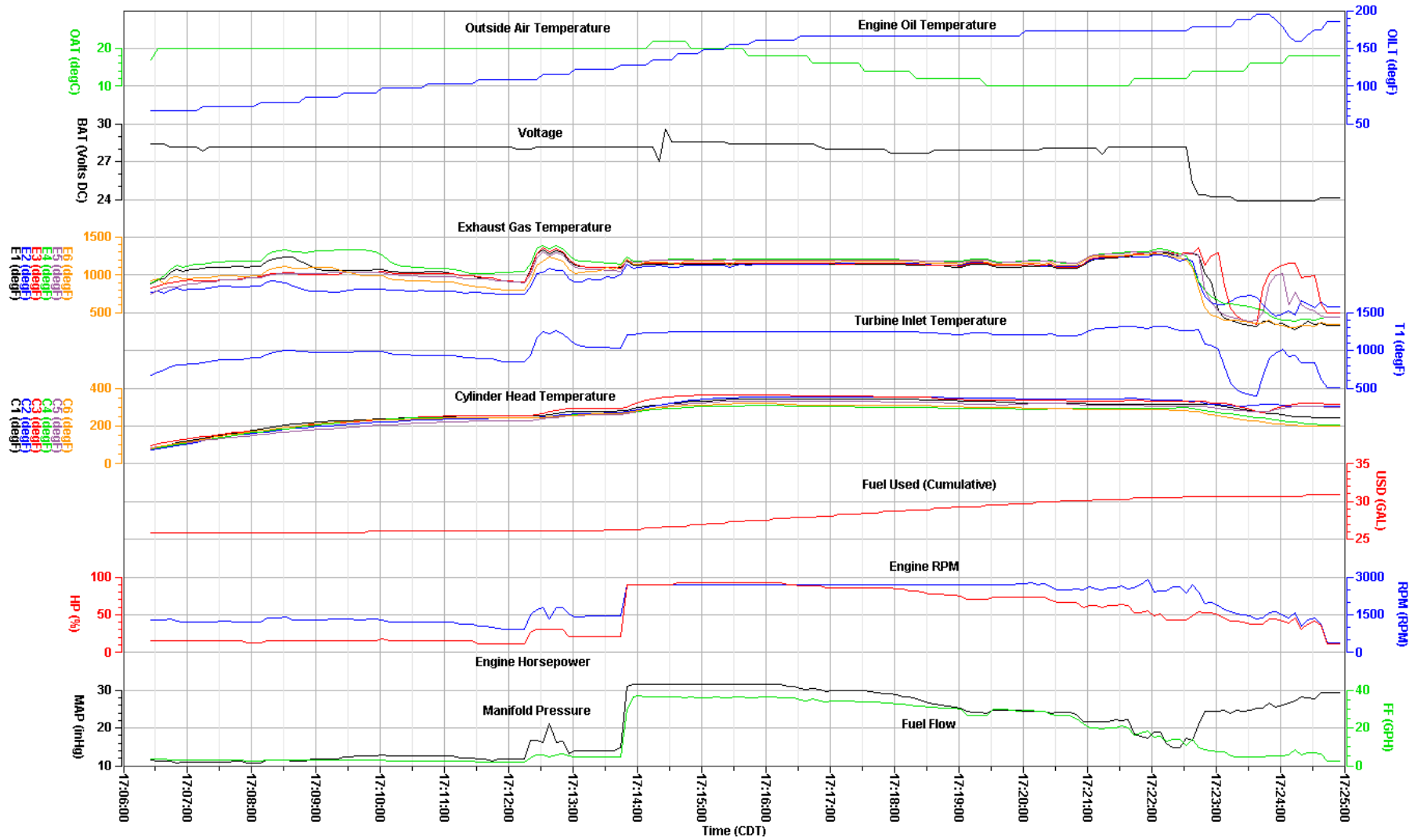


Figure 2. Plot of engine parameters, final three minutes of recording

