

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

October 18, 2018

Engine Monitor Device

Specialist's Factual Report
By Ben Hsu

1. EVENT

Location: Topeka, Kansas
Date: July 31, 2017
Aircraft/ID: Piper PA-30 / N22HW
Operator: Private
NTSB Number: CEN17FA297

2. EVENT SUMMARY

On July 31, 2017, about 2030, a Piper PA-30, N22HW, impacted terrain at Philip Billard Municipal Airport (TOP), Topeka, Kansas. The student pilot and the flight instructor sustained fatal injuries and the airplane was destroyed by impact forces. The airplane was operated by a private individual who was the registered owner of the airplane, under the provisions of 14 *Code of Federal Regulations* Part 91 as an instructional flight that was not operating on a flight plan. Visual meteorological conditions prevailed at the time of the accident. The flight originated from TOP.

3. DETAILS OF DEVICE INVESTIGATION

The National Transportation Safety Board's (NTSB) Vehicle Recorder Division received the following device:

Device: J.P. Instruments EDM-760
Device Serial Number: 18066

The J.P. Instruments (JPI) EDM-700 arrived at the NTSB's laboratory in good condition. Figure 1 shows the condition of the device as it arrived. The device was inspected, and power was applied normally using laboratory hardware. Data was downloaded from the device using the manufacturer's tools.

Figure 1. JPI EDM-760



3.1. JPI EDM-760 Device Description

The JPI EDM-760 is a panel-mounted gauge that allows the operator to 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 (RPM)
- Compressor Discharge Temperature
- Fuel Flow
- Carburetor Temperature
- Battery Voltage

The unit can also calculate, in real time, percent of maximum horsepower, fuel used, shock cooling rate, and EGT differentials between 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. The data can then be downloaded by the operator using the J. P. Instruments software.

3.1.1. JPI EDM-760 Data Description

The data extracted included 37 sessions from May 26, 2017 through August 1, 2017. The last recorded session was determined to be related to the accident and is included in this report.

3.1.2. JPI EDM-760 Parameters Provided

Table 1 describes data parameters recorded by the device. The recorded time is based on the unit's internal clock, which is set and updated by the user.

Table 1. JPI EDM-760 Recorded Parameters

Parameter Name	Parameter Description
Time	Time for recorded data point (UTC)
BAT (V)	Battery Voltage (Volts)
L/R-CHT# (degF)	Left (L) or Right (R) Cylinder Head Temperature Cylinder # (degrees Fahrenheit)
L/R-EGT# (degF)	Left (L) or Right (R) Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
L/R-CHT Cooling (degF/min)	Left (L) or Right (R) CHT Cooling Rate (degrees Fahrenheit per minute)
L/R-OilT (degF)	Left (L) or Right (R) Engine Oil Temperature (degrees Fahrenheit)
L/R-Fuel Flow (GPH)	Left (L) or Right (R) Fuel Flow (gallons per hour)
L/R-Diff (degF)	Left (L) or Right (R) Difference Between Highest and Lowest EGTs (degrees Fahrenheit)

The R-CHT1 parameter contained invalid data and is not included in this report.

3.1.3. JPI EDM-700 Data Time Correlation

The date and time on the device is manually adjusted by the operator. The device begins recording data when power is applied and stops when power is disconnected. Time displayed on the device was determined to be 4 hours and 32 minutes ahead of a reference clock. All times included in this report have been adjusted to reflect this offset. The device's display only provides time to the nearest minute, therefore, the precision of the adjustment is limited to the nearest minute.

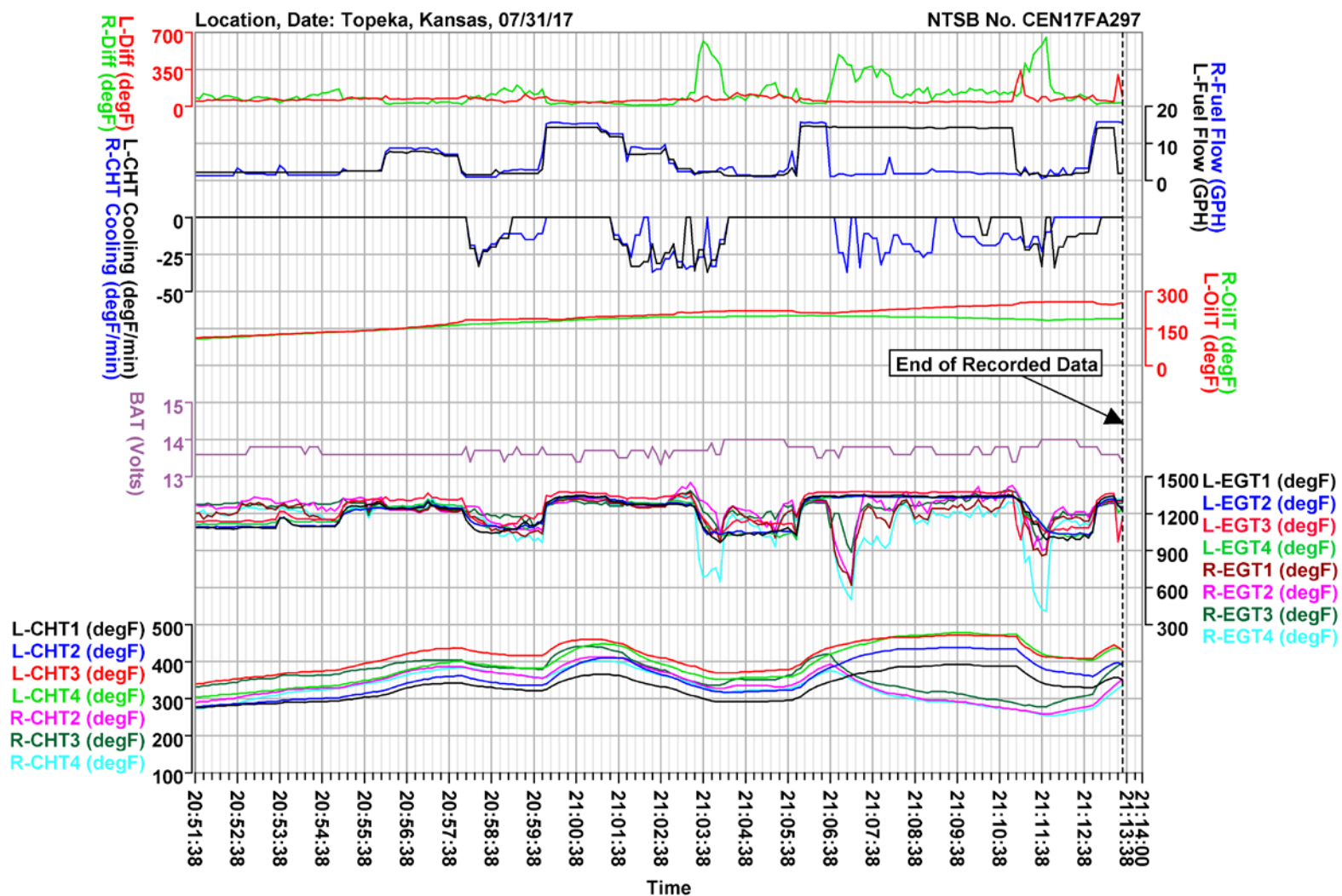
¹ Non-volatile memory is semiconductor memory that does not require external power for data retention.

4. OVERLAYS AND TABULAR DATA

Figure 2 is a plot of engine parameters from the accident flight recorded on the JPI EDM-760 device.

The tabular data from the accident flight recorded by the JPI EDM-760 device is included as Attachment 1. This attachment is provided in electronic comma separated value (CSV) format.

Private, Piper PA30, N22HW



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National Transportation Safety Board

Figure 2. Plot of accident flight data from JPI EDM-760