

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

April 22, 2020

Engine Data Monitor (EDM)

Specialist's Factual Report

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1. EVENT SUMMARY

Location: Olathe, Kansas
Date: December 31, 2019
Aircraft: Mooney M20S
Registration: N602TF
Operator: Private
NTSB Number: CEN20FA049

On December 31, 2019, about 1606 central standard time (CST), a Mooney M20S airplane, N602TF, impacted terrain during takeoff from runway 18 at the Johnson County Executive Airport (OJC), near Olathe, Kansas. A subsequent ground fire occurred. The private pilot and passenger sustained fatal injuries. The airplane was destroyed during the ground fire. The airplane was registered to and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Day visual meteorological conditions prevailed in the area about the time of the accident, and the flight was not operated on a flight plan. The flight was originating from OJC at the time of the accident and was destined for the North Little Rock Municipal Airport, North Little Rock, Arkansas.

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

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

Device Manufacturer/Model:	JPI EDM-800
Serial Number:	N/A

3.1. Device Description

The JPI EDM-800 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, and Battery Voltage etc.

The unit can also calculate in real time, percent of maximum horsepower, fuel used, shock cooling rate, engine hours (Hobbs time), and EGT differentials between highest and lowest cylinder temperatures. The calculations are also based on the aircraft installation.

The unit includes a GPS interface to any GPS device.

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 1 to 500 seconds per sample. The memory can store up to 30 hours of data at a 6 second-per-sample rate. The data can then be downloaded by the operator using the J.P. Instruments software.

3.2. Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the unit had severe impact and post-crash fire damage, as shown in Figure 1. The non-volatile memory chips were recovered from the unit, and a binary image was created then converted into engineering units using laboratory tools.



Figure 1: JPI EDM-800 as received (front and back).

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

3.3. Data Description

The data extracted included 12 sessions from August 1, 2006 through December 31, 2019. The recorded time was in Coordinated Universal Time (UTC), however, the unit was not wired to the GPS devices on the aircraft for syncing time², so there might be time offset. This offset could not be determined, because the device was damaged and could not power up normally. The last recorded session was determined to be related to the accident based on the facts that the recorded date was on December 31, 2019 and the recording duration was short. This recorded session is included in this report. The data was recorded at a 6 second-per-sample rate.

3.4. Parameters Provided

Table 1 describes validated data parameters recorded by the device.

Table 1: Validated data parameters recorded by the device.

Parameter Name	Parameter Description
Time	Time (UTC) for recorded data point (HH:MM:SS)
CHT 1-6 (degF)	Cylinder Head Temperature Cylinder # (degrees Fahrenheit)
EGT 1-6 (degF)	Exhaust Gas Temperature Cylinder # (degrees Fahrenheit)
MAP (hg)	Manifold Pressure (inch of mercury)
OAT (degF)	Outside Air Temperature (degrees Fahrenheit)
RPM	Engine RPM (revolutions per minute)
HP	Engine Power Output (horsepower)
Fuel Flow (GPH)	Fuel Flow Rate (gallons per hour)
Fuel Used (gal)	Engine Fuel Used (gallons)
Volts (V)	Bus Voltage (volts)

3.5. OVERLAYS AND TABULAR DATA

Figure 2 is a plot of validated data parameters from the device for the accident flight. The time stamps were in central standard time (CST) converted from the device time but contained offset which could not be determined (See section 3.3 for details). Therefore, the displayed time is approximate.

Tabular data used to generate figure 2 is included as Attachment 1. This attachment is provided in electronic comma-delimited (.csv) format.

² Confirmed by one of the previous owners of the accident aircraft.

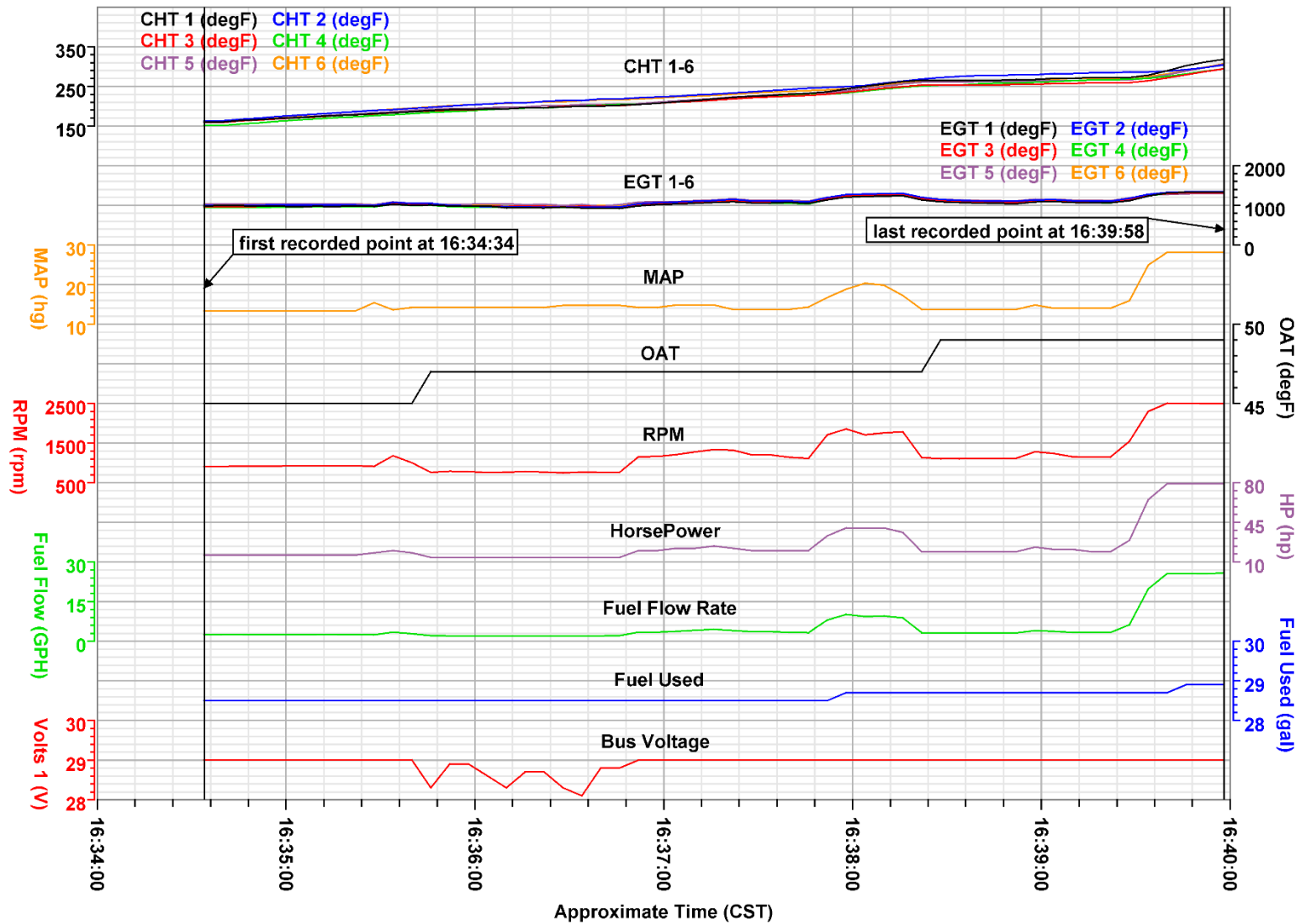


Figure 2: Plot of validated data parameters for the accident flight.