

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

June 2, 2014

Engine Data Monitor (EDM)

Specialist's Factual Report By George Haralampopoulos

1. EVENT SUMMARY

Location: Amarillo, Texas
Date: November 11, 2013
Aircraft: Beechcraft B36TC
Registration: N4245D
Operator: Private
NTSB Number: CEN14FA047

On November 11, 2013, about 00:55 central standard time, a Beechcraft B36TC, N4245D, was destroyed when it impacted terrain about 2 nautical miles northeast of the Rick Husband Amarillo International Airport (AMA), Amarillo, Texas, during a missed approach. The private pilot and two passengers received fatal injuries. The airplane was registered and operated by the pilot under the provisions of the 14 Code of Federal Regulations as a Part 91 personal flight. Night instrument meteorological conditions prevailed at the time of the accident, and an instrument flight rules (IFR) flight plan was filed. The airplane departed from the Lubbock Preston Smith International Airport (LBB) about 2351 on November 10, 2013.

2. DETAILS OF ENGINE DATA MONITOR INVESTIGATION

The Safety Board's Vehicle Recorder Division received the following EDM:

Recorder Manufacturer/Model: **JPI EDM-730**
Recorder Serial Number: **28489**

2.1. EDM 700/800 Description

The J. P. Instruments EDM-730/830 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 that are monitored 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 memory can store up to 30 hours of data at a 6 second sample rate. The front face of the unit contains a USB port allowing quick retrieval of flight data.

2.1.1. EDM Condition

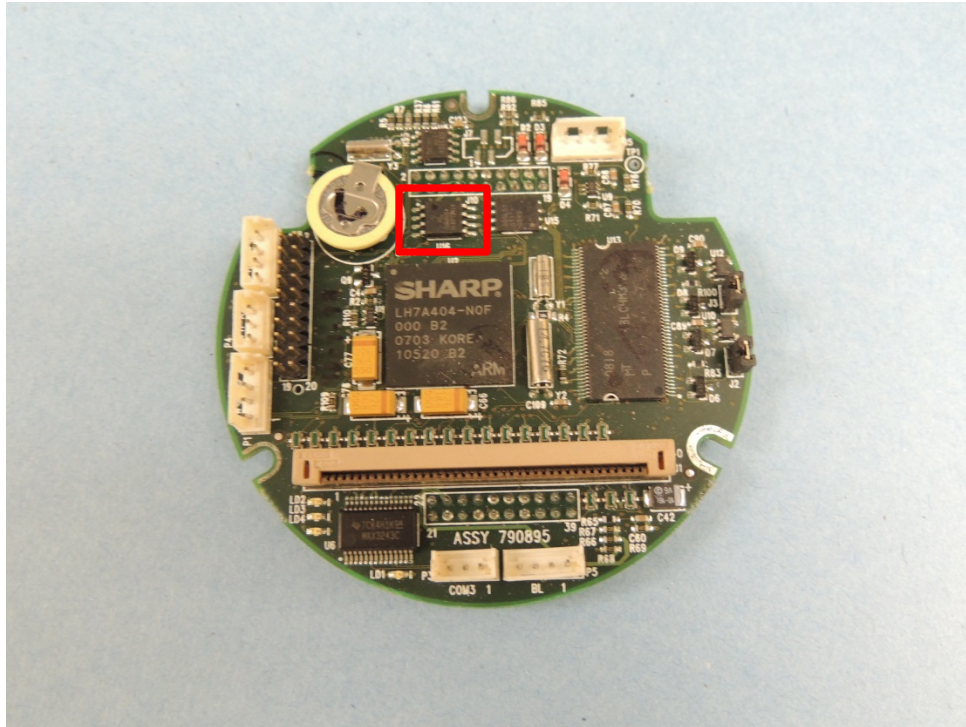
Upon arrival at the Vehicle Recorder Laboratory, an exterior inspection revealed that the JPI-730 had sustained impact damage, with the screen separated from the rest of the device (figure 1). An interior inspection was performed, and the chip containing the unit's NVM was located and removed from the internal circuit board (figure 2). The memory chip was imaged using laboratory software. The imaged file was a standard Windows FAT12¹ format which was mounted as a virtual drive and read out normally.

Figure 1. JPI 730 as received.



¹ File Allocation Table (FAT) is the name of a computer file system architecture which is part of an industry standard file system.

Figure 2. JPI 730 internal circuit board containing NVM.



2.1.2. Recording Description

The EDM recording contained 121 recorded flight logs. The event flight was located from the data recorded on November 11, 2013, and contained approximately 753 valid points of data over a span of about 75 minutes.

2.1.3. 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.

2.2. Time Correlation

The EDM records time with the first data sample based on the unit's internal clock. The internal clock is set and updated by the operator and displayed upon power up. Due to the damage, the device could not be powered on to observe the time; however, the extracted data contained a recorded time that appeared to be set to Coordinated Universal Time (UTC).

Correlation of the EDM data to the event local time, central standard time (CST), was established by using the unit's internal time and then applying a 6 hour offset. All times are referenced as CST for the rest of this report.

2.3. EDM Plots and Corresponding Tabular Data

The following figure contains EDM data recorded during the November 11, 2013, event.

Figure 3 shows the aircraft's engine parameters during the event flight starting from the previous day at 23:46:30 CST, to 01:01:42 CST, when the unit was powered off. At about 23:54:36 CST, the CHT and EGT parameters increase with a correlated increase in RPM consistent with takeoff power. Starting at 00:44:18 CST, the aircraft's recorded Fuel Flow began to gradually decrease, with a corresponding decrease in EGT, CHT and RPM. At 00:59:48 CST, the Fuel Flow rapidly increased to about 37 gallons per hour, and maintained this value until the end of the recording.

The values of CHT-6 were observed to be about 100 degrees less than the recorded values of the other Cylinder Head Temperatures. When contacted, the manufacturer noted that, based on the installation of the EDM's sensors, the CHT's value can read lower than expected.

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

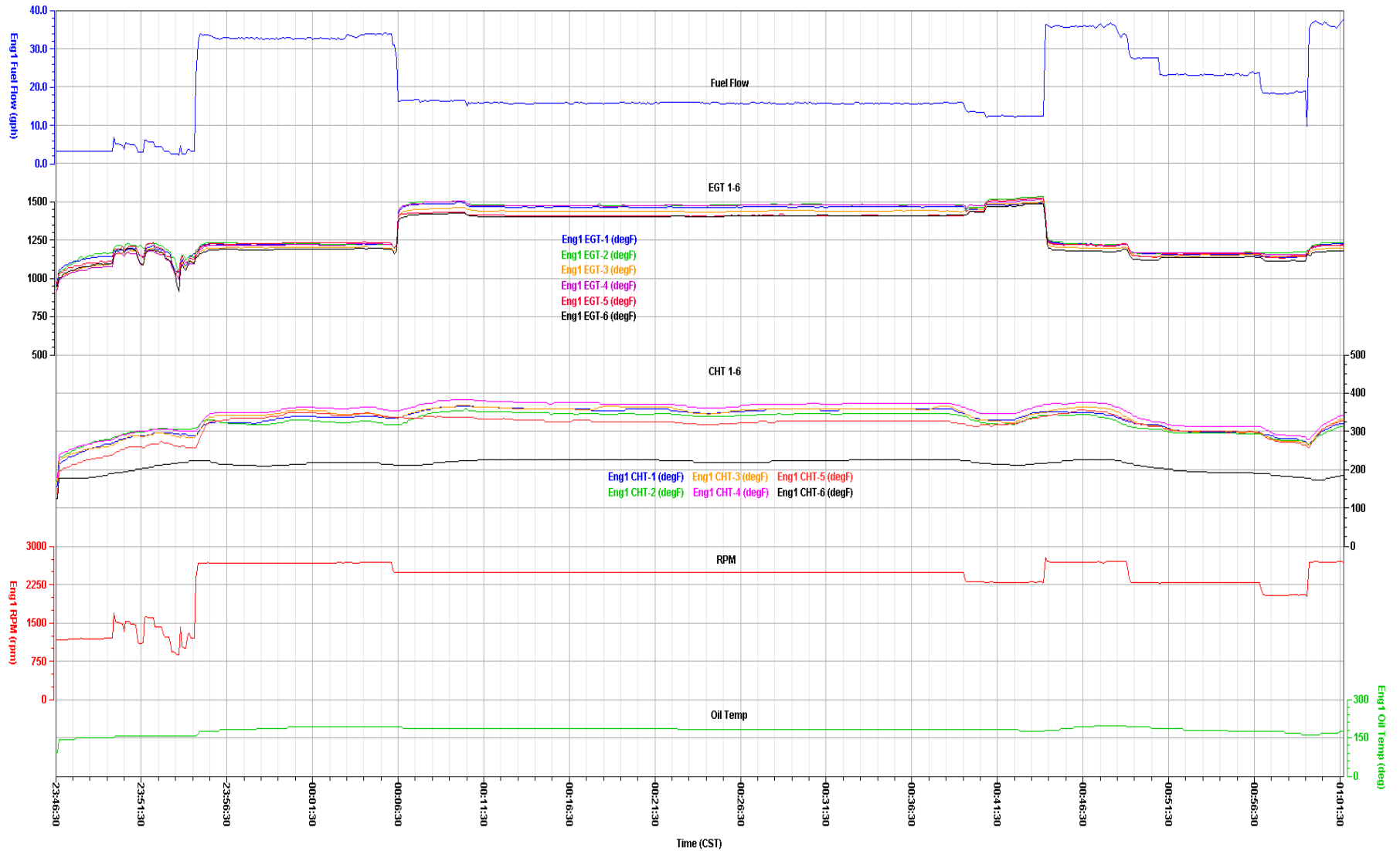
² Comma Separated Value format.

Figure 3. Plot of JPI parameters from event flight.

Private, Beechcraft B36, N4245D

Location, Date: Amarillo TX, 11/11/13

NTSB No. CEN14FA047



Revised: 24 March 2014

National Transportation Safety Board

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. Eng1 CHT-# (degF)	Engine Cylinder Head Temperature Cylinder #
2. Eng1 EGT-# (degF)	Engine Exhaust Gas Temperature Cylinder #
3. Eng1 Oil Temp (degF)	Engine Oil Temperature
4. Eng1 RPM (rpm)	Engine RPM
5. Eng 1 Fuel Flow (gph)	Engine Fuel Flow

Table A-2. Unit abbreviations.

Units Abbreviation	Description
degF	Degrees Fahrenheit
rpm	Revolutions per minute
gph	Gallon per Hour