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

June 18, 2015

Engine Data Monitor (EDM)

Specialist's Factual Report
By Bill Tuccio, Ph.D.

1. EVENT SUMMARY

Location: Monroe, Louisiana
Date: June 3, 2014
Aircraft: Beechcraft H35
Registration: N653T
Operator: Private
NTSB Number: CEN14LA273

On June 3, 2014, about 1055 central daylight time, a Beech H35 airplane, N653T, impacted a parking lot following a total loss of engine power near Monroe, Louisiana. The commercial pilot was seriously injured and the airplane was substantially damaged. The airplane was registered to WFO Flying Services, and operated by a private individual under the provisions of 14 *Code of Federal Regulations* Part 91 as a maintenance test flight. Visual meteorological conditions prevailed for the flight, which operated with a flight plan. The local flight originated from Monroe Regional Airport (KMLU), Monroe, Louisiana, about 1020.

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-700**
Recorder Serial Number: **27387**

3.1. J. P. Instruments (JPI) EDM-700 Description

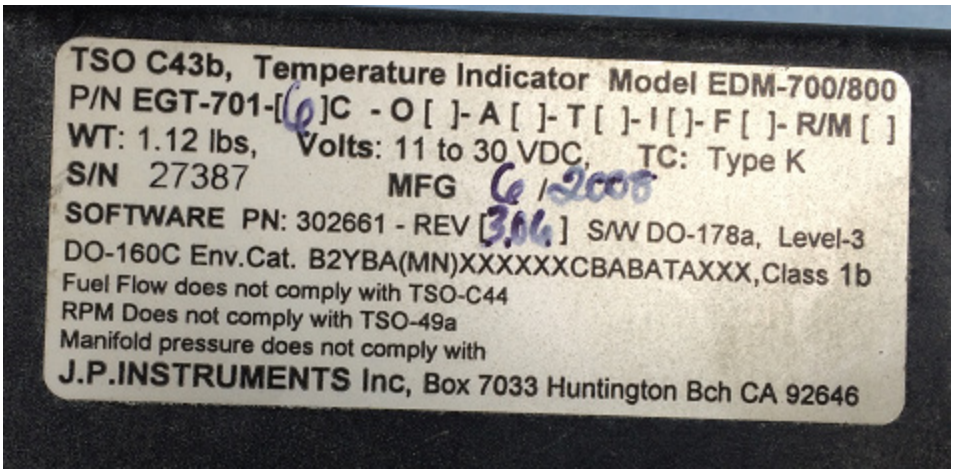
The J. P. Instruments (JPI) EDM-700/800 is a panel mounted gauge that the operator can monitor and record up to 24 parameters related to engine operations. Depending on the installation engine parameters monitored can include: Exhaust Gas Temperature (EGT), Cylinder Head Temperature (CHT), Oil Pressure and Temperature, Manifold Pressure, Outside Air Temperature, Turbine inlet Temperature, Engine Revolutions per Minute, Compressor Discharge Temperature, Fuel Flow, Carburetor Temperature, and 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[1] 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 "EzTrends" software.

3.1.1. Data Recovery

The recorder was in good condition and the data were extracted normally using the manufacturer's EzTrends software. Figure 1 shows the dataplate from the device with a "6" next to the "C" and other fields (O, A, T, I, F, R/M) blank. These markings are consistent with the unit configured to measure CHT, EGT, and battery voltage.

Figure 1. JPI EDM-700 dataplate.



3.1.2. Data Description

The recording contained approximately 24 hours of data over 36 power cycles. The event flight was the last valid recording and its duration was approximately 41 minutes. Two other recordings on November 1, 2013, JPI Recorded Time (see Section 3.2 for an explanation of JPI Recorded Time) were also examined in this report. The JPI internal logic recorded the accident flight as leg 597 and the two prior recordings as legs 586 and 587.

After leg 597 there was approximately 90 minutes of additional recorded data; however, review of the data indicated the data was invalid.

3.1.3. Engineering Units Conversions

The data contained in this report was downloaded in engineering units from the device using EzTrends software.

Appendix A lists the parameters verified and provided in this report.

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

3.2. Time Correlation

The device records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator. For this report, dates and times are reported as "JPI Recorded Time."

3.3. Plots and Corresponding Tabular Data

The following three figures contain JPI EDM-700 data recorded during the June 3, 2014 event (leg 597) and two prior recordings on November 1, 2013, JPI Recorded Time (legs 586 and 587). The time axis of legs 586 and 587 indicate the legs were part of the same flight with a likely power interruption.

Figure 2 shows data recorded during the event flight on June 3, 2014. All recorded CHT values remained below 460 degF. At 15:17:14 JPI Recorded Time, the EGT values began to rise momentarily and then reduced to values below 300 degF within 1 minute; CHT values began to decrease at about the same time the EGT values began to decrease.

Figures 3 and 4 show data recorded during the November 1, 2013, JPI Recorded Time flight. The CHT values increased above 460 degF on some cylinders for the most of the flight, and all cylinders for about 40 seconds at about 14:56:30 JPI Recorded Time. At about 15:20:47 JPI Recorded Time, the CHT values increased while the EGT values decreased.

The corresponding tabular data used to create these three plots are provided in electronic (*.csv[2]) format as Attachment 1 to this report.

[2] Comma Separated Value format.

Figure 2. Accident flight plot of EGT, CHT, and voltage.

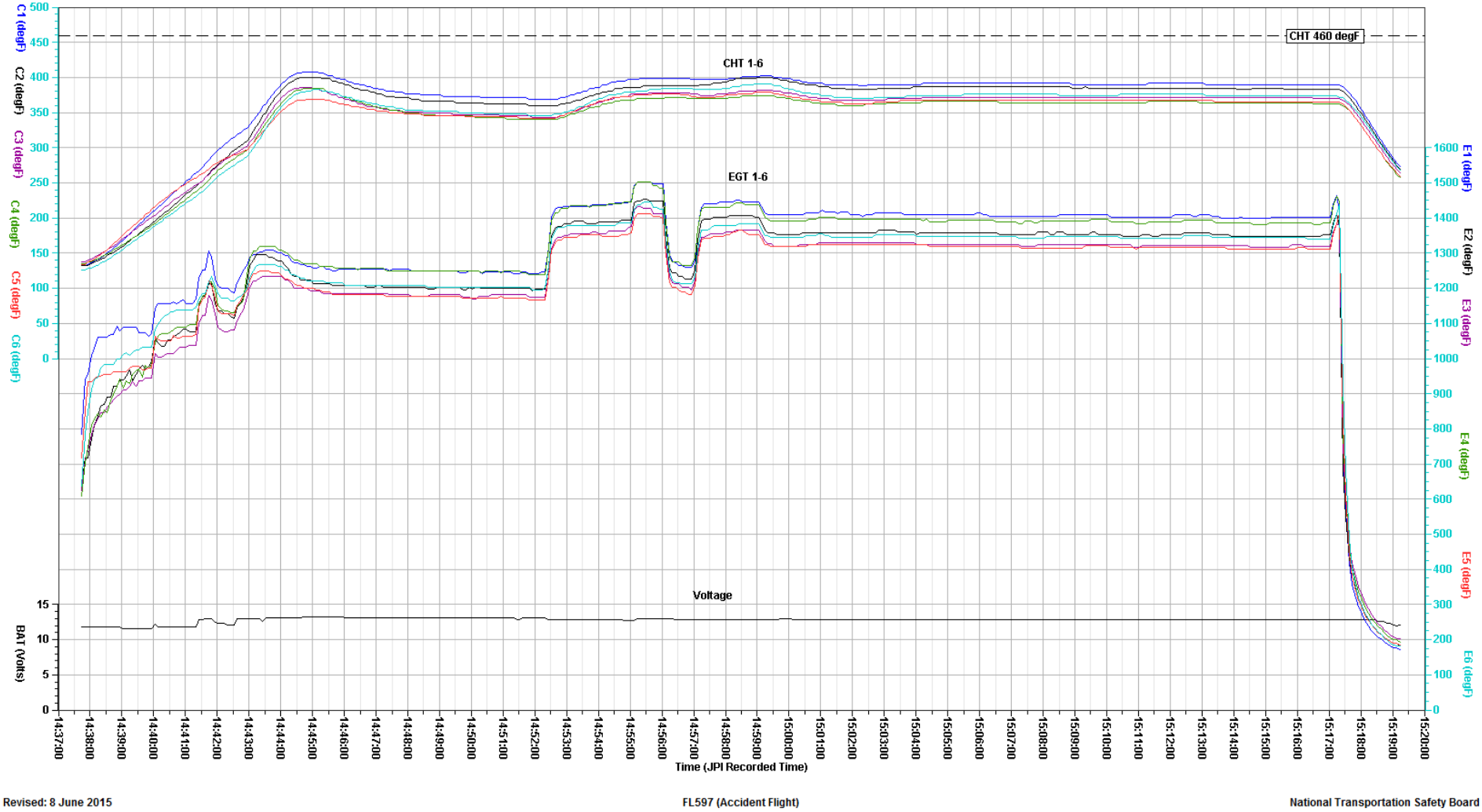


Figure 3. Prior flight (Leg 586) plot of EGT, CHT, and voltage.

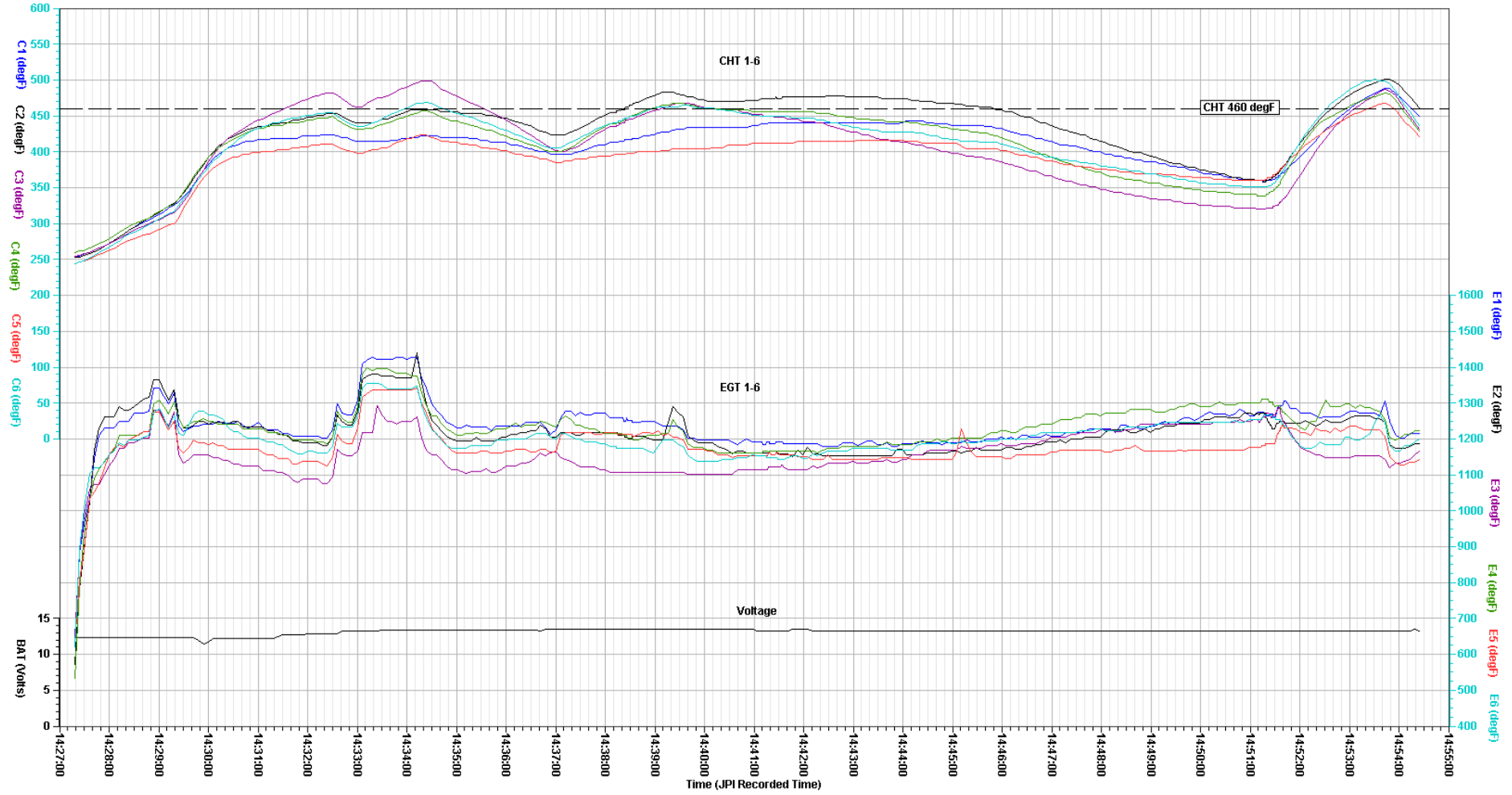
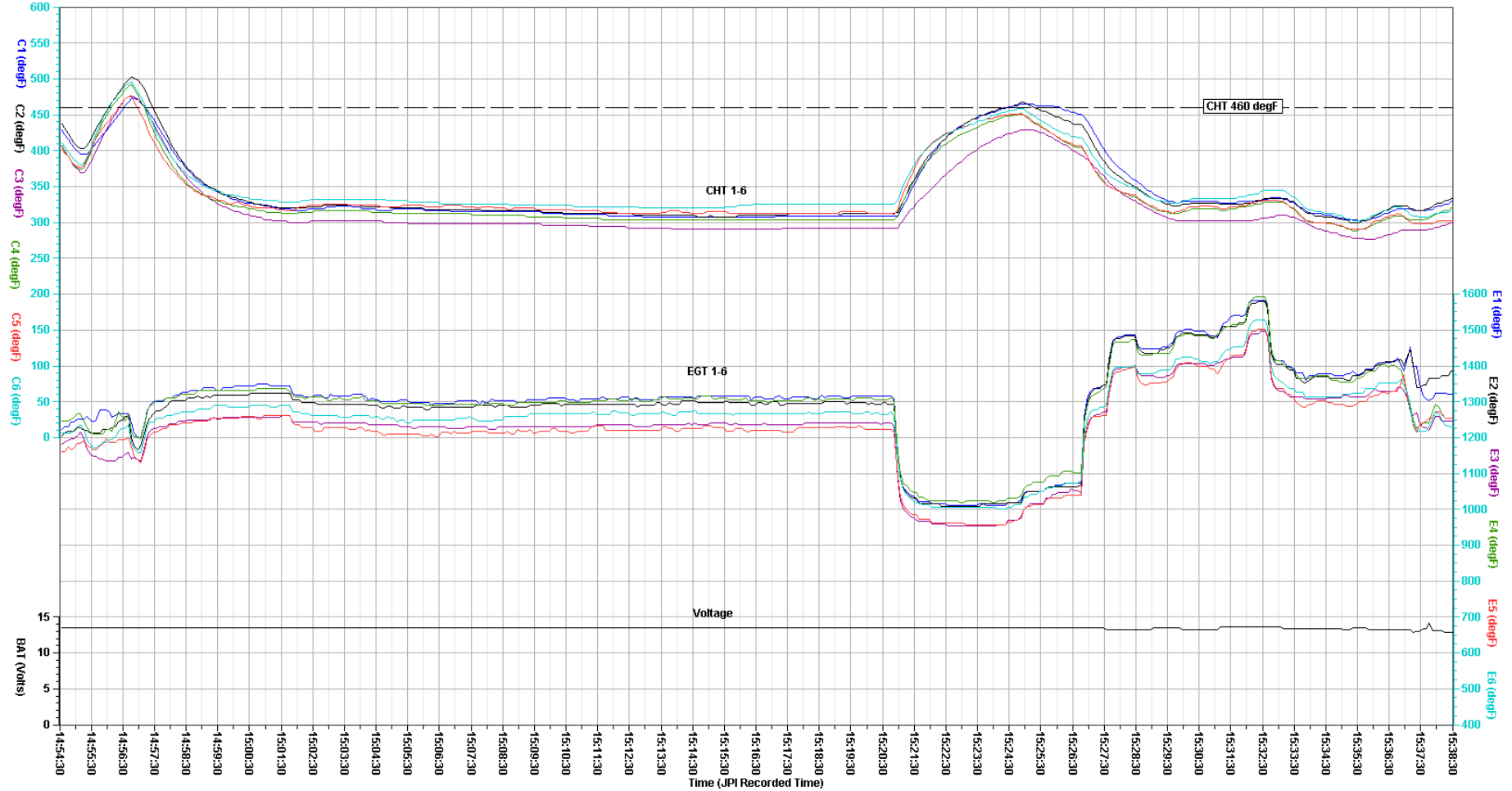


Figure 4. Prior flight (Leg 587) plot of EGT, CHT, and voltage.



Revised: 8 June 2015 FL587 (Prior Flight Nov 1, 2013) 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. BAT (V)	Battery Voltage
2. C# (degF)	Cylinder Head Temperature Cylinder #[3]
3. E# (degF)	Exhaust Gas Temperature Cylinder #[3]

Table A-2. Unit abbreviations.

Units Abbreviation	Description
degF	Degrees Fahrenheit
V	Volts DC

[3] Depending on aircraft configuration number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.