

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

February 25, 2016

Electronic Devices

Specialist's Factual Report By Sean Payne

1. EVENT SUMMARY

Location: Knoxville, Tennessee
Date: October 07, 2015
Aircraft: Beech S35
Registration: N449CT
Operator:
NTSB Number: ERA16LA003

On October 7, 2015 about 0530 eastern daylight time, a Beech S35, N449CT, was substantially damaged when it impacted trees and terrain during initial climb near Knoxville, Tennessee. The pilot and passenger were seriously injured. Night visual meteorological conditions prevailed, and no flight plan was filed for the personal flight conducted under Title 14 *Code of Federal Regulations* Part 91, which departed Knoxville Downtown Island Airport (DKX), Knoxville, Tennessee, destined for Moore-Murrell Airport (MOR), Morristown, Tennessee.

2. DETAILS OF INVESTIGATION

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

Recorder Manufacturer/Model: **JPI EDM-930**
Recorder Serial Number: **04080**

Recorder Manufacturer/Model: **Garmin GDU 620 (Does not record data)**
Recorder Serial Number: **165203513**

Recorder Manufacturer/Model: **Garmin GTN 750 (Does not record data)**
Recorder Serial Number: **1ZA013980**

2.1. EDM 930 Description

The J. P. Instruments EDM-930 is a panel mounted display that the operator can monitor and record multiple engine parameters related to engine operations and GPS parameters, if connected. 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
- Fuel Pressure
- Fuel Level
- 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 rate at which the data is stored is selectable by the operator from 2 to 500 seconds per sample. Data recording typically begins when EGTs are greater than 500°F or RPM is greater than 500 rpm. The memory can store up to 100 hours of data at a 6 second sample rate. For a non-damaged unit, the data can then be downloaded by the operator using a USB flash drive and following the instructions on the unit.

2.1.1. Data Recovery

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

Figure 1. Undamaged exterior of flight recorder.



2.1.2. Data Description

The EDM recording contained data for 293 power cycles. The event flight was the last flight of the recording and its duration was approximately 5 minutes and 54 seconds.

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. This clock is set and updated by the operator.

Correlation of the EDM data to the event local time, eastern daylight time (EDT), was established by using the recorded Time and then applying an additional 5 hours offset to change GMT to EDT. Therefore, for the rest of this report, all times are referenced as EDT, not recorded time.

2.3. Plots and Corresponding Tabular Data

The following two figures contain EDM data recorded during the October 7, 2015, event.

Figure 2 is a plot containing engine data recovered from the JPI EDM-930 from the accident flight on October 7, 2015. The plot begins at 05:25 EDT and ends at 05:32 EDT.

Figure 3 is a plot containing engine data recovered from the JPI EDM-930 from the flight previous to the accident flight on September 16, 2015. The plot begins at 15:00 EDT and ends at 16:15 EDT.

The corresponding tabular data used to create the plot for the accident flight is provided in electronic (*.csv¹) format as Attachment 1 to this report.

¹ Comma Separated Value format.

Figure 2. Plot of engine parameters recovered from the JPI EDM-930 from the accident flight.

Private, Beechcraft S35, N449CT

Location, Date: Knoxville, TN, 10/07/15

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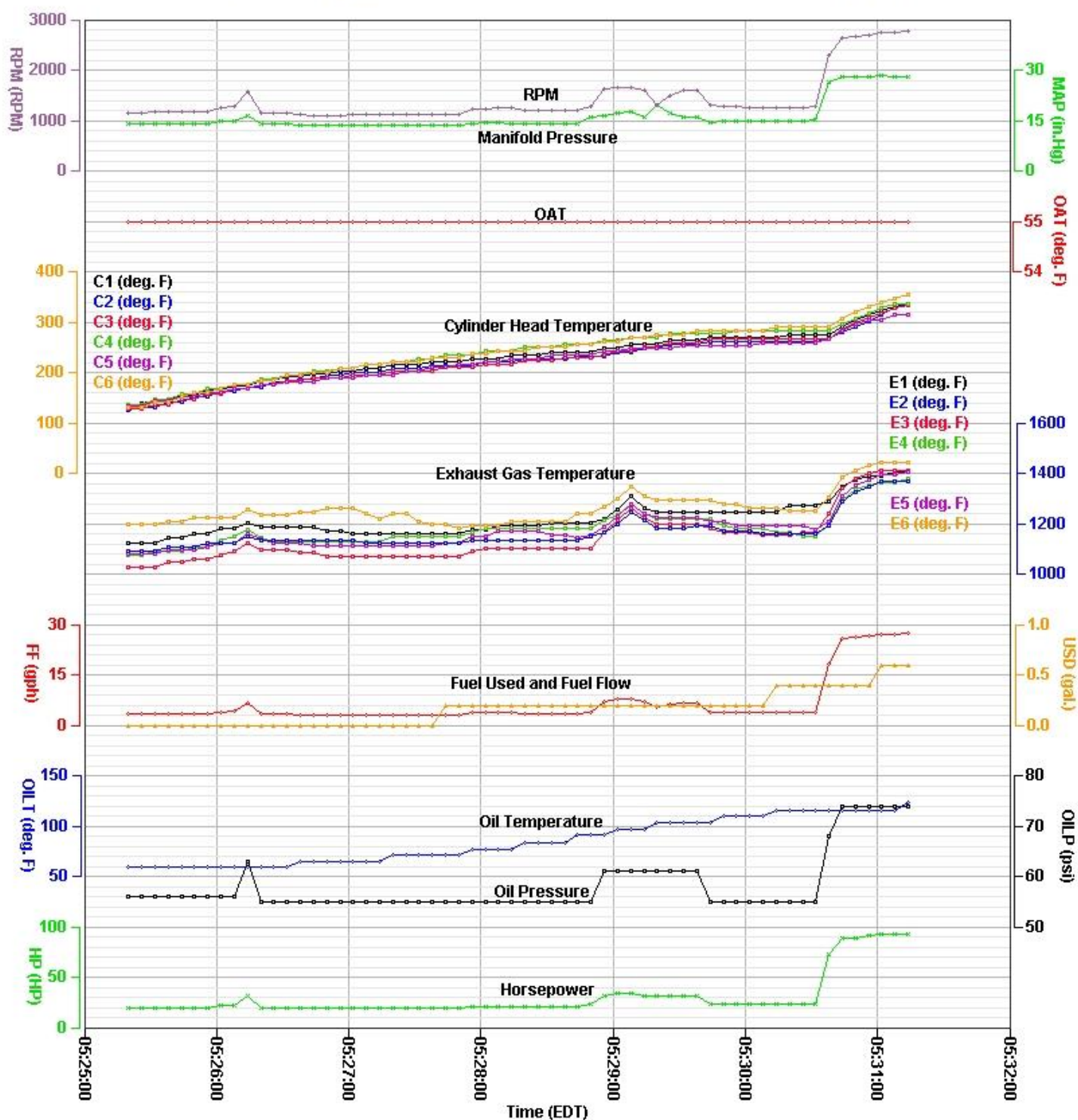
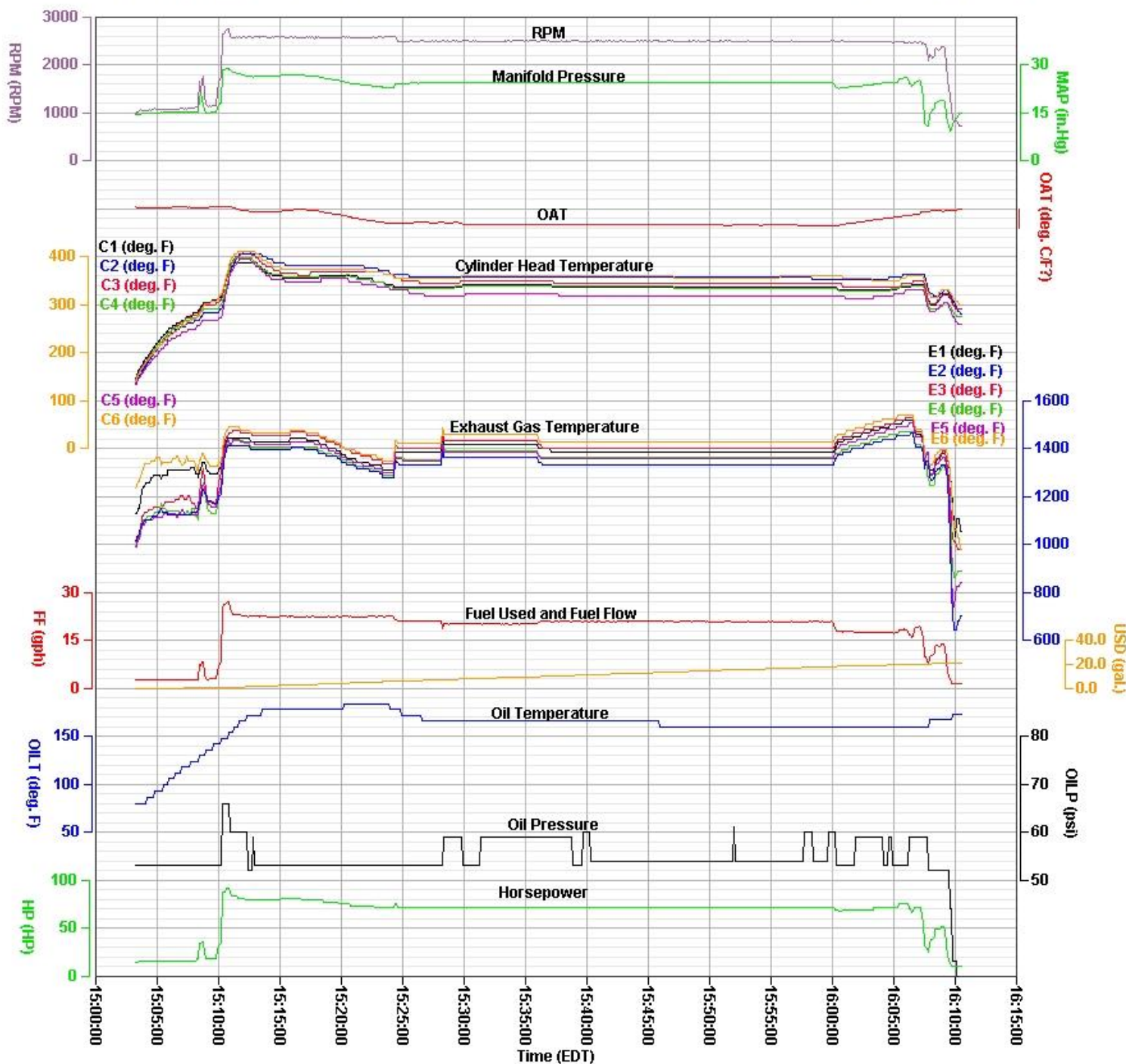


Figure 3. Plot of engine parameters recovered from the JPI EDM-930 from the flight previous to the accident.

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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. Alt (ft)	Altitude
2. AMP (Amperes)	Amps
3. BAT (VDC)	Battery bus voltage
4. C# (deg. F)	Cylinder head temperature – cylinder #
5. CLD (deg. F/min)	Shock cooling rate
6. DIF (deg. F)	Maximum exhaust Gas temperature differential between cylinders
7. E# (deg. F)	Exhaust gas temperature – cylinder #
8. FF (gph)	Fuel flow rate
9. HP (HP)	Horsepower
10. Lat (deg)	Latitude
11. Lon (deg.)	Longitude
12. LFL (gal.)	Left tank fuel level
13. RFL (gal.)	Right tank fuel level
14. MAP (in.Hg)	Manifold pressure
15. OAT (deg. F)	Outside air temperature
16. OILP (deg. F)	Oil pressure
17. OILT (deg. F)	Oil temperature
18. RPM (RPM)	Engine revolutions per minute
19. SPD (kts)	GPS groundspeed
20. USD (gal.)	Amount of fuel used

Table A-2. Unit abbreviations.

Units Abbreviation	Description
ft	feet
Amperes	Amperes
VDC	Volts direct current
deg. F	degrees Fahrenheit
deg. F/min	degrees Fahrenheit per minute
gph	gallons per hour
HP	horsepower
gal.	gallons
in.Hg	inches of mercury
kts	knots

NOTE: For parameters with a unit description of discrete, a discrete is typically a 1-bit parameter that is either a 0 state or a 1 state where each state is uniquely defined for each parameter.