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

August 7, 2012

17 – Engine Monitor Report

by Bill Tuccio

A. EVENT

Location:	Lake Wales, Florida
Date:	March 31, 2012, 1810 Eastern Daylight Time (EDT)
Aircraft:	Cessna 210-5 (205)
Registration:	N224AL
Operator:	Chalet Suzanne Aviation Inc.
NTSB Number:	ERA12LA261

B. GROUP - No Group

C. SUMMARY

On March 31, 2012, about 1810 eastern daylight time (EDT), a Cessna 210-5 (205), N224AL, operated by Chalet Suzanne Aviation Inc., was substantially damaged during a forced landing to a field, following a total loss of engine power during climb from Chalet Suzanne Air Strip (X25), Lake Wales, Florida. The certificated commercial pilot and six passengers were not injured. The commercial skydive flight was conducted under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed and no flight plan was filed for the planned local flight.

D. DETAILS OF INVESTIGATION

On April 16, 2012, the NTSB Vehicle Recorder Laboratory received the following device:

GPS Manufacturer/Model:	JPI EDM-730
Serial Number:	31908

JPI EDM-730 Device Description

The J.P. Instruments EDM-730 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 a USB memory stick and decoded using J.P. Instruments software.

Data Recovery

The unit was in good condition and the data were extracted normally. Figure 1 shows a picture of the unit data plate, indicating the firmware revision of 3.29, the number "6" inscribed next to the letter "C," a dot next to the letter "F," and a dot next to the letter "L." There were no entries on the data plate adjacent to the letters "OT," "OP", "A," "T," "I," or "R/M." The number inscribed adjacent to "MFG" was "8/2011". Figure 2 shows the unit with power applied in the NTSB Vehicle Recorder Laboratory.

Figure 1. Unit data plate.

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

Figure 2. Unit with power applied.

Data Description

The unit contained about 93.4 hours of recorded data over 241 power cycles. The recorded data spanned dates of January 29, 2011 through the accident flight on March 31, 2012, as recorded by the unit internal clock. The parameters recorded were EGT, CHT, fuel flow, and battery voltage. Additionally, the calculated shock cooling rate was also recorded. No other parameters were recorded by the unit.

In agreement with the IIC, only the accident flight is included in this report.

Engineering Units Conversion

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.

Time Correlation

The JPI records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator. Examination of the recorded data, and comparison with the reported accident time provided by the IIC indicated the JPI internal clock was set to Coordinated Universal Time (UTC).

Correlation of the JPI data to the event local time, EDT, was established by using the recorded time and then subtracting a 4 hour offset to change UTC to EDT. Therefore, for the rest of this report, all times are referenced as EDT, not recorded time.

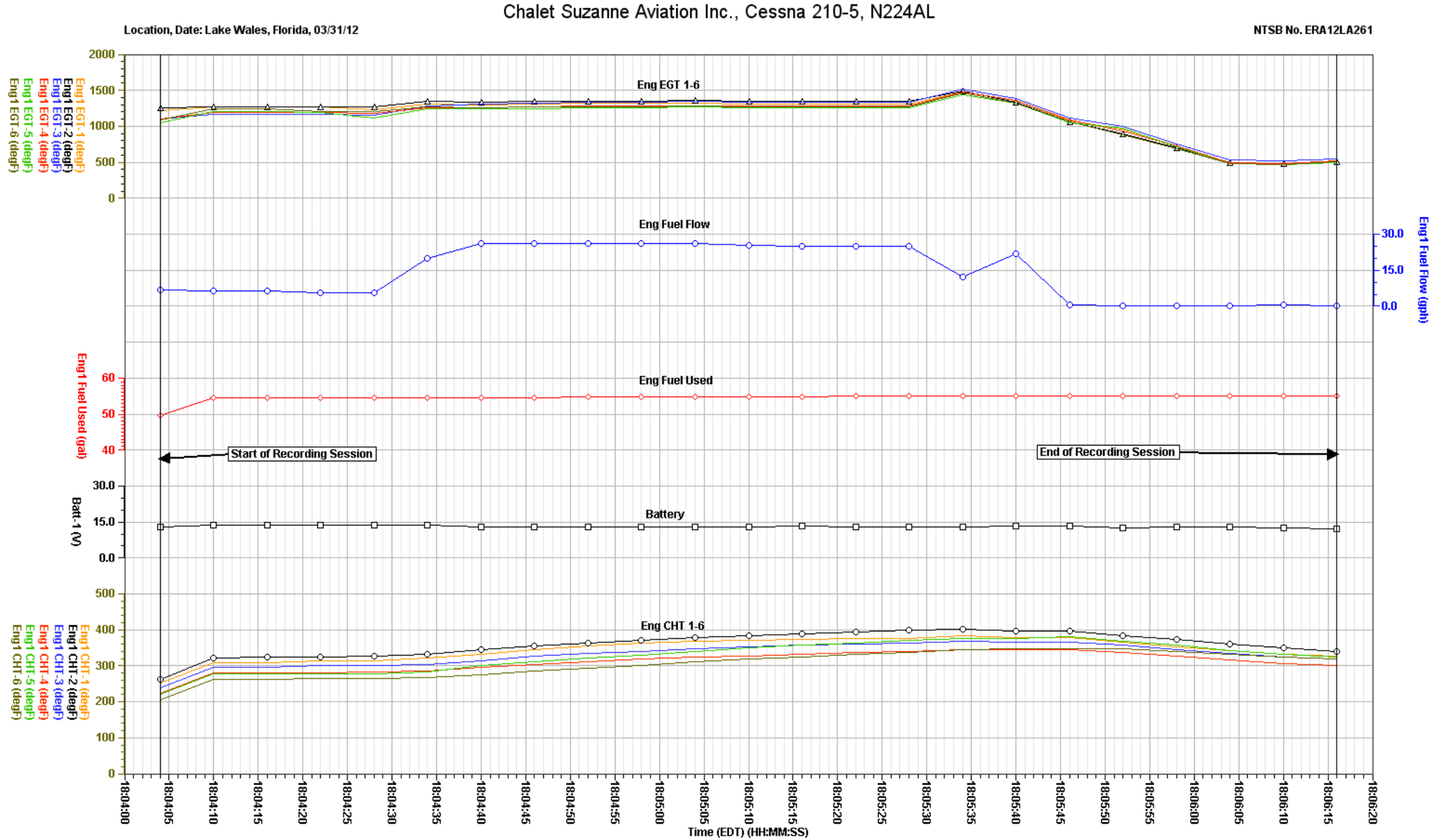
Plots and Corresponding Tabular Data

Figure 3 shows the plot of the accident flight. The recording session began at 18:04:04 on March 31, 2012 and continued for about 2 minutes 12 seconds until 18:06:16. The recording shows a steady-state EGT across all six cylinders averaging about 1,300 degF until about 18:05:27. After a brief rise in EGT, the EGT decreases from about 18:05:33 until the end of the recording. Also at 18:05:33, the fuel flow changes from a steady-state value of 24.8 gph to 0.0 gph by about 18:05:57. The CHT similarly shows a decrease. The fuel used begins at 50 gals and increases to a steady-state value of 55 gals.

The corresponding tabular data used to create figure 3 is provided in electronic (*.csv[2]) format as Attachment 1 to this report.

[2] Comma Separated Value format.

Figure 3. Plot of accident flight.



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 JPI parameters.

Parameter Name	Parameter Description
1. Batt-1 (V)	Battery Voltage Input 1
2. Eng1 CHT-1 (degF)	Cylinder Head Temperature Cylinder 1
3. Eng1 CHT-2 (degF)	Cylinder Head Temperature Cylinder 2
4. Eng1 CHT-3 (degF)	Cylinder Head Temperature Cylinder 3
5. Eng1 CHT-4 (degF)	Cylinder Head Temperature Cylinder 4
6. Eng1 CHT-5 (degF)	Cylinder Head Temperature Cylinder 5
7. Eng1 CHT-6 (degF)	Cylinder Head Temperature Cylinder 6
8. Eng1 EGT-1 (degF)	Exhaust Gas Temperature Cylinder 1
9. Eng1 EGT-2 (degF)	Exhaust Gas Temperature Cylinder 2
10. Eng1 EGT-3 (degF)	Exhaust Gas Temperature Cylinder 3
11. Eng1 EGT-4 (degF)	Exhaust Gas Temperature Cylinder 4
12. Eng1 EGT-5 (degF)	Exhaust Gas Temperature Cylinder 5
13. Eng1 EGT-6 (degF)	Exhaust Gas Temperature Cylinder 6
14. Eng1 Fuel Flow (gph)	Fuel Flow
15. Eng1 Fuel Used (gal)	Fuel Used

Table A-2. Unit abbreviations.

Units Abbreviation	Description
degF	degrees Fahrenheit
gal	gallons
gph	gallons per hour
V	Volts DC

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.