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

May 31, 2013

Engine Monitor Factual Report

Specialist's Factual Report
by Bill Tuccio

A. EVENT

Location:	Cordova, Illinois
Date:	March 23, 2013
Aircraft:	Beech A36
Registration:	N6038R
Operator:	Private
NTSB Number:	CEN13LA204

B. GROUP - No Group

C. SUMMARY

On March 23, 2013, at 1352 central daylight time (CDT), a Beech A36 single-engine airplane, N6038R, impacted terrain following a loss of engine power while maneuvering near Cordova, Illinois. The private pilot was not injured. The airplane sustained substantial damage to the right wing and fuselage. The airplane was registered to Romeo Aviation LLC, Bettendorf, Iowa, and operated by the pilot under the provisions of 14 *Code of Federal Regulations* Part 91 as a personal flight. Visual meteorological conditions prevailed, and a flight plan was not filed. The flight originated from the Davenport Municipal Airport (DVN), Davenport, Iowa, and was en route to Sterling, Illinois.

D. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Laboratory received the following device:

GPS Manufacturer/Model:	Insight GEM-610
Serial Number:	3610

Insight GEM-610 Device Description

The Insight Avionics GEM-610 engine monitor provides the crew with exhaust gas and cylinder head temperatures from each of the engine cylinders. The instrument can display, depending on the installation and engine type, up to 13 engine

temperatures in a bar graph or digital display. Temperatures include exhaust gas temperature (EGT), cylinder head temperature (CHT) and turbine inlet temperature (TIT). The unit also operates in two modes, “Lean Mode” and “Monitor Mode”. Depending on the firmware version, the unit can record historical information. Historical and configuration information are retrieved and decoded using proprietary GEMCOM software and an infrared, wireless connection using a Hewlett Packard 200LX handheld device.

Insight GEM-610 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had not sustained any damage. External power was applied to the unit and information extracted normally using the manufacturer’s software.

Insight GEM-610 Data Description

The unit was configured to monitor and record exhaust gas temperatures (EGT) and cylinder head temperatures (CHT). The recording interval was set to 6 seconds. The device internal clock was set to eastern daylight time (EDT). The device had recorded three flights on March 3, 8, and 23, 2013. The last recording was the accident flight. The March 8 and March 23, 2013 flights were examined for this report.

Insight GEM-610 Engineering Units Conversion

The data reported by the GEM-610 was in engineering units. No further conversions were done for this report.

Appendix A lists the GEM-610 parameters verified and provided in this report.

Insight GEM-610 Time Correction

The GEM-610 internal clock was set to EDT. For this report, 1 hour was subtracted from EDT to convert to CDT. The internal clock of the GEM-610 was compared to local time and was accurate to within +/- 5 minutes.

OVERLAYS AND TABULAR DATA

Figure 1 shows the March 8, 2013 flight, labeled by the GEM-610 as flight 584. The March 8, 2013 flight was the flight recorded prior to the accident flight. About 1 minute and 46 seconds (0146) after the start of the recording, all but EGT 5 & 6 leveled off; EGT 6 was colder and continued a gradual rise; EGT 5 rose, and then decreased. About 0600 into the recording, all the EGTs spiked for a moment, then decreased; again EGTs 1-4 were level, while EGTs 5 and 6 trended differently. About 0957 into the recording, all the EGTs rose, trended down for about 2 minutes, and then at 1236 into the recording, rose to between 1400 and 1600 degF. At this point, all the EGTs began to trend the same for the remainder of the recording. The CHTs climbed from the start of the recording until about 0619 into the recording, then generally leveled off until about 1236 into the recording, when they rose. Thereafter, the recording continued for a significantly longer duration than the accident flight.

Figure 2 shows the March 23, 2013 accident flight, labeled by the GEM-610 as flight 585. About 0048 after the start of the recording, EGTs 1-4 generally leveled out; EGT 5 exceeded the temperature of EGTs 1-4 (a different behavior than the March 8, 2013 flight), and EGT 6 was the coldest, with a slightly different trend than the other cylinders in this period. EGTs 1-4 remained rather steady until about 0518 into the recording, when they increased; EGT 5 and 6 also increased with a different trend. By about 0823 into the recording, EGT 5's temperature decreased, and it became the coldest EGT. At about 1102 into the recording, all the EGTs reduced, then by 1252 into the recording, increased to between 1400 and 1600 degF. The EGTs all remained rather steady in this range until about 1810 into the recording, when the EGTs all dropped off rapidly, and the CHTs gradually began to decrease.

From the start of the recording, the CHTs trended up, with some level offs, until about 1101 into the recording, when they leveled off a bit, coincident with the EGT reduction. At about 1221 into the recording, the CHTs rose, as did the EGTs, and then by 1419 into the recording, the CHTs all stabilized between 300 and 400 degF (higher for most cylinders than the March 8, 2013 flight). The CHTs remained fairly constant until they started to drop off gradually at about 1810 into the recording, when the EGTs rapidly decreased.

Tabular data used to generate figure 1 is included as Attachment 1; tabular data used to generate figure 2 is included as Attachment 2. These attachments are provided in electronic comma-delimited value (.CSV) format.

Figure 1. Flight prior to the accident flight, March 8, 2013.

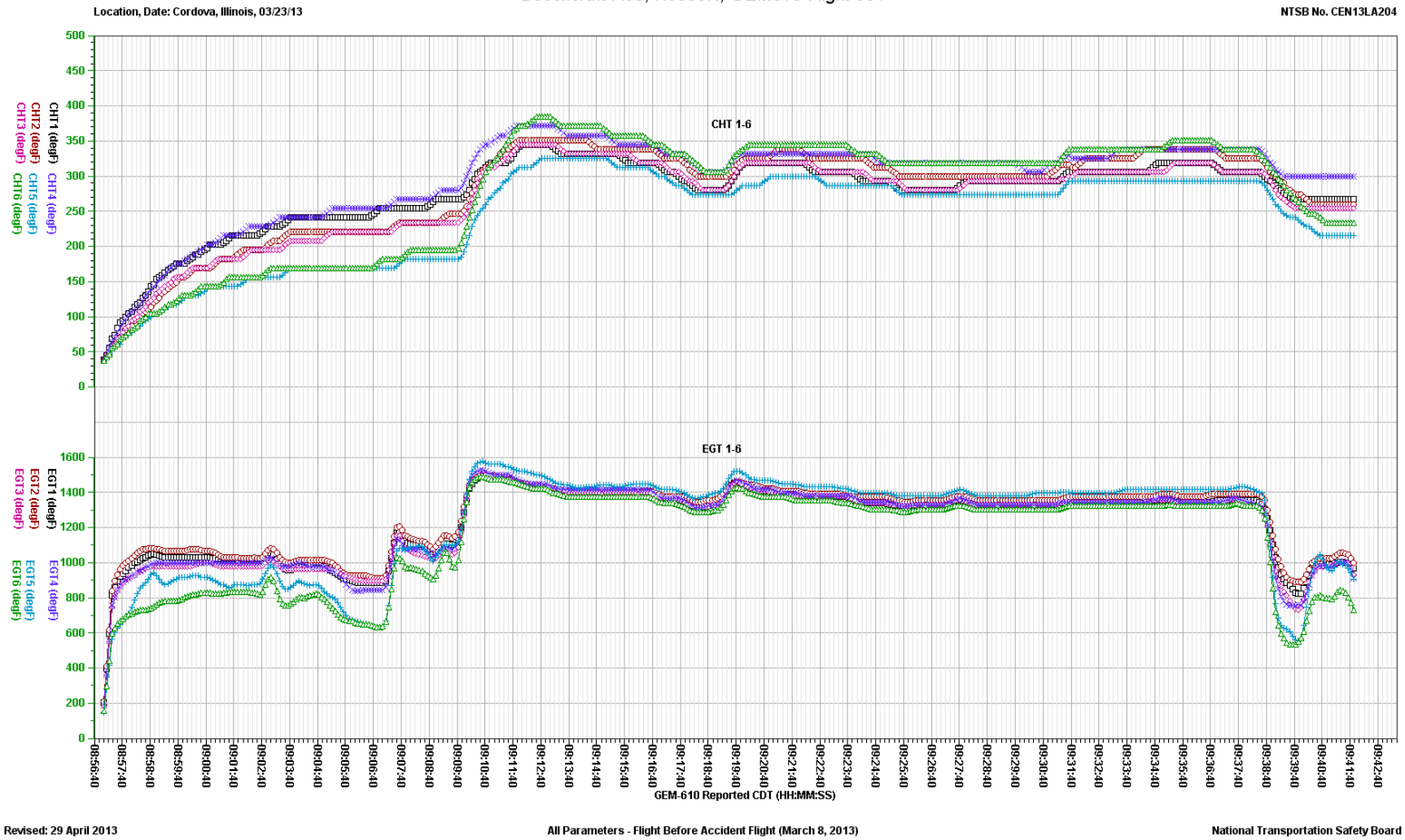
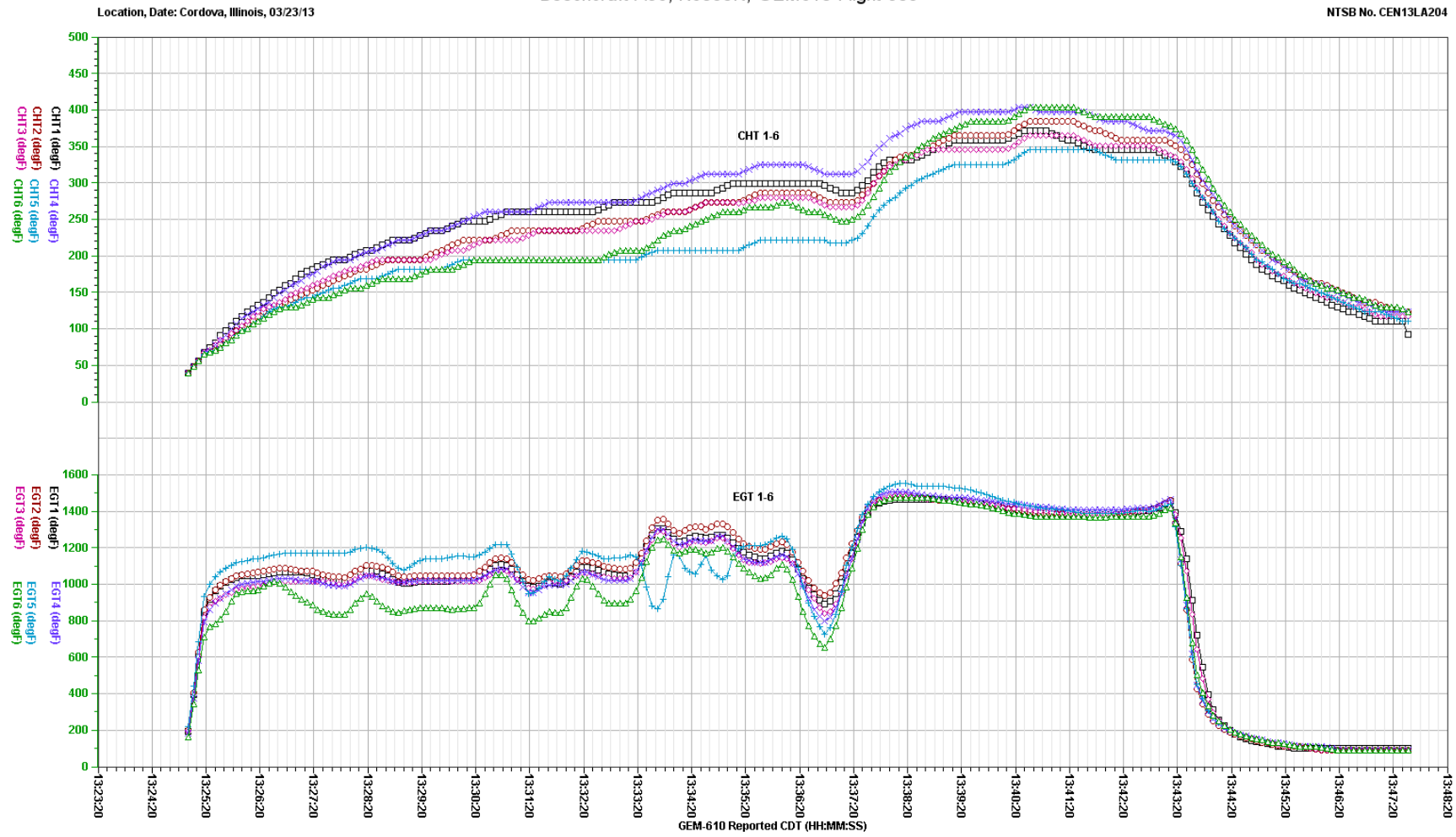


Figure 2. Accident Flight.

Beechcraft A36, N6038R, GEM610 Flight 585



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 GEM-610 parameters.

Parameter Name	Parameter Description
1. CHT1 (degF)	Cylinder Head Temperature Cylinder 1
2. CHT2 (degF)	Cylinder Head Temperature Cylinder 2
3. CHT3 (degF)	Cylinder Head Temperature Cylinder 3
4. CHT4 (degF)	Cylinder Head Temperature Cylinder 4
5. CHT5 (degF)	Cylinder Head Temperature Cylinder 5
6. CHT6 (degF)	Cylinder Head Temperature Cylinder 6
7. EGT1 (degF)	Exhaust Gas Temperature Cylinder 1
8. EGT2 (degF)	Exhaust Gas Temperature Cylinder 2
9. EGT3 (degF)	Exhaust Gas Temperature Cylinder 3
10. EGT4 (degF)	Exhaust Gas Temperature Cylinder 4
11. EGT5 (degF)	Exhaust Gas Temperature Cylinder 5
12. EGT6 (degF)	Exhaust Gas Temperature Cylinder 6

Table A-2. Unit abbreviations.

Units Abbreviation	Description
degF	degrees Fahrenheit