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

July 11, 2013

Cockpit Display – Recorded Flight Data

Specialist's Factual Report
By Bill Tuccio

1. EVENT SUMMARY

Location: Hoxie, Kansas
Date: April 26, 2013
Aircraft: Beech G36
Registration: N222GL
Operator: Garmin International Inc.
NTSB Number: CEN13LA245

On April 26, 2013, about 1835 central daylight time (CDT), a Beech G36 airplane, N222GL, conducted a forced landing near Hoxie, Kansas. The commercial pilot and two passengers were not injured. The airplane was registered to and operated by Garmin International Inc., under the provisions of 14 *Code of Federal Regulations* Part 91, as a business flight. Visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules flight plan. The flight originated from the Centennial Airport (KAPA), Englewood, Colorado, about 1605 mountain daylight time (MDT), and was en route to the New Century AirCenter Airport (KIXD), Olathe, Kansas.

2. RECORDED FLIGHT DATA GROUP

A recorded flight data group was not convened.

3. DETAILS OF FLIGHT DATA INVESTIGATION

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

Recorder Manufacturer/Model: **Garmin G1000**
Recorder Serial Number: **SDHC CARD N222GL**

3.1. Garmin G1000 SD Data Card

The Garmin G1000 Integrated Flight Deck is a collection of multiple avionics units which include flight displays, air data computers, attitude/heading reference system (AHRS), communications and other systems. A typical installation includes a primary flight display (PFD) and a multi-function display (MFD). Each display includes two SD card slots, an

upper and a lower slot. The lower SD card slot is used by the system for software updates and various databases[1].

Depending on the display unit software, the aircraft can include a data logging feature. The data logging feature must be enabled by the aircraft operator. If the data logging feature is available and enabled, a SD card has to be installed in the upper slot of the MFD. Depending on the airframe and engine combination as many as 64 parameters can be stored at a rate of one sample per second (1Hz). According to the manufacturer of the display unit, one flight hour can be stored in approximately 2 MB. The SD card typically used is 2 GB in size and can store over 1,000 flight hours.

3.1.1. Recorder Condition

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

3.1.2. Recording Description

The G1000 SD card stores flight data in individual flight logs. The SD card contained 111 log files. The incident flight recording was identified and was approximately 1 hour and 32 minutes.

3.1.3. Engineering Units Conversions

The flight log data stored in the individual files was converted to engineering units by the display unit.

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

3.2. Time Correlation

The G1000 records time with the first data sample based on the units' internal clock. This clock is set and updated by the unit and is based off GPS time, corrected to local time as determined by the unit.

Correlation of the data to the event local time, CDT, was established by using the recorded time and then adding 1 hour to offset MDT to CDT. Therefore, for the rest of this report, all times are referenced as CDT, not recorded time.

3.3. Plots and Corresponding Tabular Data

The following four figures contain data recorded during the April 26, 2013 event.

Figure 1 shows the entire incident flight. The flight departed at about 1704 and climbed to 11,000 feet. From about 1704 until about 1730, the left tank fuel quantity decreased. From 1730 until about 1815, the right tank fuel quantity decreased. From about 1815 until the reduction in engine output at about 1826, the left tank fuel quantity decreased.

Figure 2 shows a plot focused around the time period of the reduction in engine output, and figure 3 shows the period starting from the reduction in engine output until the end of the recording. Between 1826:04 and 1826:35, the recorded fuel flow decreased from

[1] Databases can include terrain data, obstacle data, SafeTaxi charts, flight charts and airport terrain databases

about 15 gph to about 1 gph; during this same time period exhaust gas temperatures (EGTs) and cylinder head temperatures (CHTs) also began to decrease. The reduction in engine output began when the aircraft was at about 11,000 feet. The aircraft lost altitude from about 1826:21 until 1834:39; the altitude loss ended when the airspeed rapidly decreased at an altitude of about 2,800 feet. During the descent, after about 1827, when the aircraft passed through about 10,500 feet, the airspeed remained at about 82 knots indicated airspeed until 1834:49.

Figure 4 shows the descent of the aircraft after the reduction in engine power. After the reduction in engine power occurred near Rexford, Kansas at about 11,000 feet, the aircraft continued about 13.3 nautical miles in an easterly direction before landing near Hoxie, Kansas at an altitude of about 2,800 feet. The 13.3 nautical miles were traversed between about 1826:21 until 1834:39, or about 8 minutes and 18 seconds.

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

[2] Comma Separated Value format.

Figure 1. Plot of basic parameters during entire incident flight.

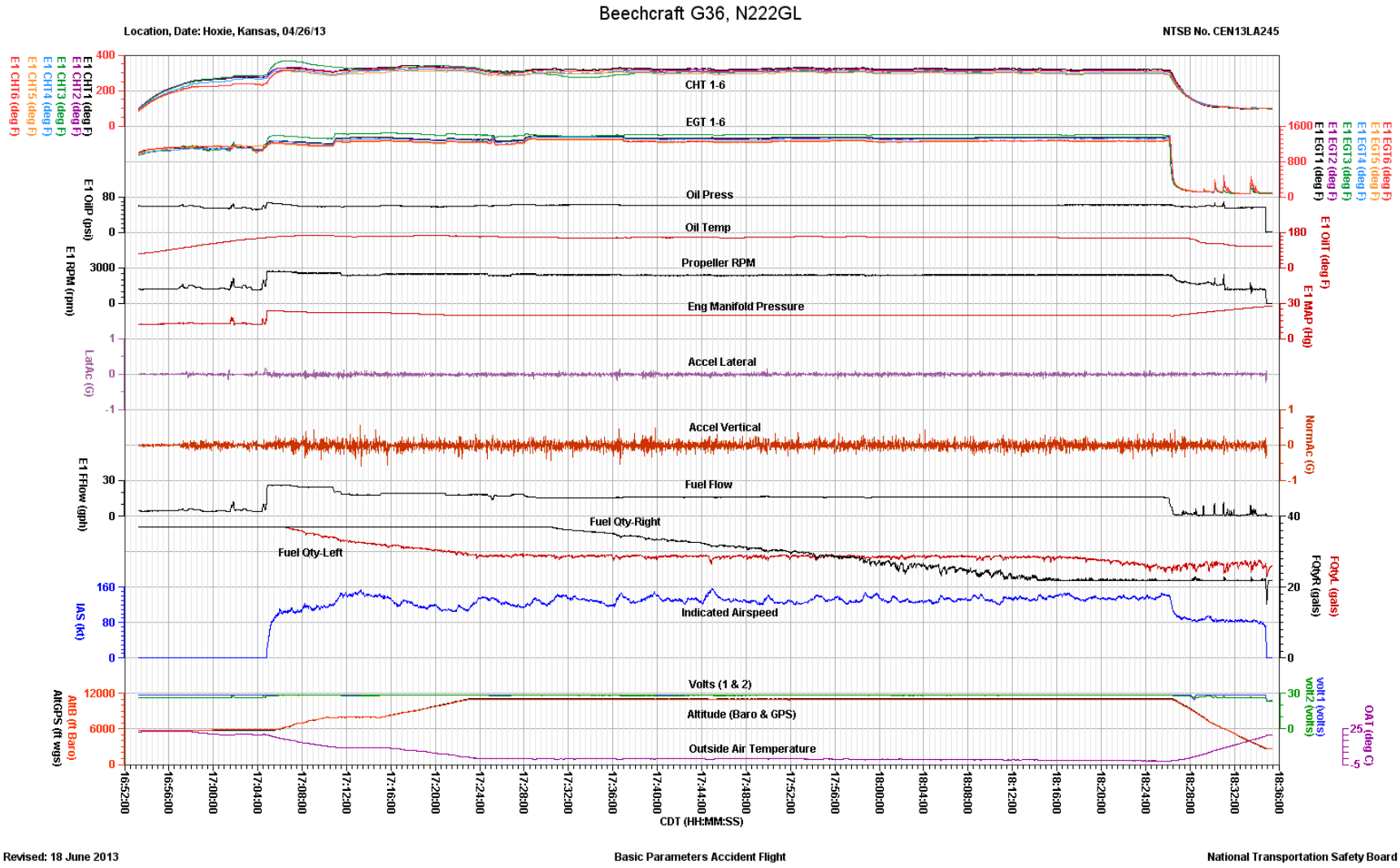

Figure 2. Plot of basic parameters, reduction in engine power focus.

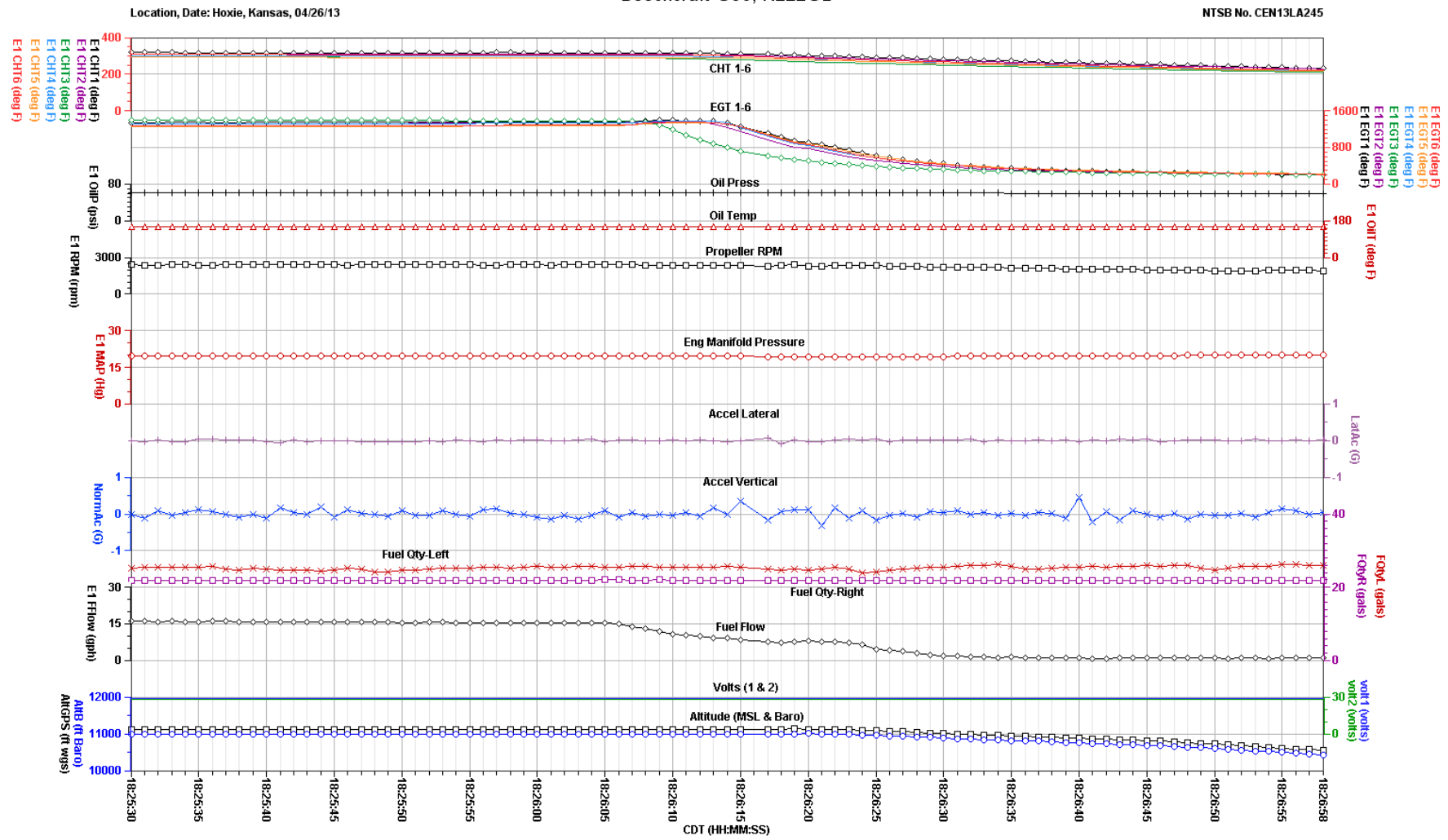

Figure 3. Plot of basic parameters, reduction in engine power to end of recording.

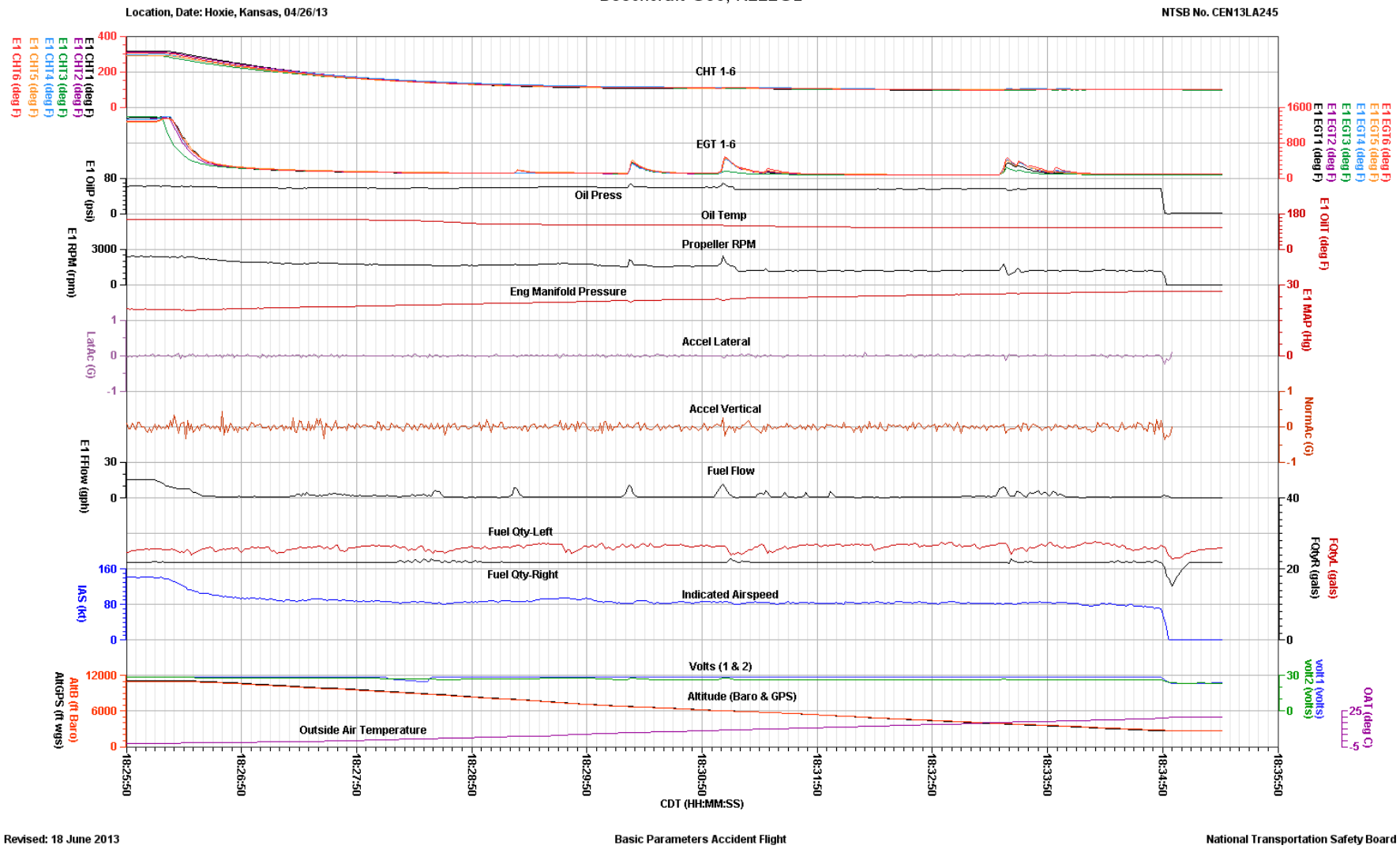

Figure 4. Google Earth overlay of descent following reduction in engine power.

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. LatAc (g)	Lateral Acceleration
2. NomAc (g)	Vertical Acceleration
3. IAS (kts)	Indicated Airspeed
4. AltB (ft)	Barometric Corrected Altitude
5. AltGPS (ft)	GPS Altitude
6. E1 CHT-# (deg)	Cylinder Head Temperature Cylinder #[3]
7. E1 EGT-# (deg)	Exhaust Gas Temperature Cylinder #[3]
8. E1 FFlow (gph)	Engine Fuel Flow
9. FQtyL (gal)	Left Fuel Quantity
10. FQtyR (gal)	Right Fuel Quantity
11. E1 MAP (inHg)	Engine Manifold Pressure
12. E1 OilP (psi)	Engine Oil Pressure
13. E1 OilT (degF)	Engine Oil Temperature
14. E1 RPM (rpm)	Engine Revolutions per minute
15. Latitude (deg)	Latitude
16. Longitude (deg)	Longitude
17. OAT (degC)	Outside Air Temperature
18. Volt1 (V)	Bus 1 Voltage
19. Volt2 (V)	Bus 2 Voltage
20. Time Local (HH:MM:SS)	Recorded Time
21. UTCOfst (hrs)	UTC Time Offset

Table A-2. Unit abbreviations.

Units Abbreviation	Description
deg	degrees
degC	degrees Celsius
degF	Degrees Fahrenheit
ft	feet
g	g
gal	gallons
gph	gallons per hour
hrs	hours
inHg	inches of Mercury
kts	knots
psi	pounds per square inch
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.