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

January 16, 2018

Multiple Electronic Devices

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

1. EVENT

Location: Iola, Kansas
Date: October 1, 2016
Aircraft: Lancair Evolution
Registration: N83DM
Operator: Aero Smart Solutions, Inc.
NTSB Number: CEN17LA009

On October 1, 2016, about 1735 central daylight time (CDT), a Lancair Evolution, N38DM, experienced a total loss of engine power during cruise flight. The pilot made a forced landing onto a roadway near Iola, Kansas. The airplane sustained substantial damage to the left and right wings, and tail section during the landing sequence. The private pilot was not injured and the passenger suffered minor injuries. The airplane was registered to, and operated by, Aero Smart Solutions, Inc. under the provisions of 14 *Code of Federal Regulations* Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight, and an instrument flight rules flight plan was filed.

2. DETAILS OF INVESTIGATION

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

Device 1:   Electronics International MVP-50P
Device 1 Serial Number: 144950

Device 2:   SD Card from Garmin G900X Display
Device 2 Serial Number: BE1229821860D (SD Card serial number)

Device 3:   Electronics International EDC-33T
Device 3 Serial Number: 144951

The Electronics International EDC-33T is a data collector/converter, which did not record any data; accordingly, it is not further discussed in this report.

2.1. Electronics International MVP-50P Device Description

The Electronics International (EI) MVP-50P is a panel-mounted, active TFT matrix, color, electronic engine display allowing the operator to monitor and record parameters related to engine operations and user customizable parameters. The device is available in both a TSO'd and non-TSO'd version.[1] Depending on the installation, engine parameters monitored may include: turbine engine parameters, Oil Pressure and Temperature, Outside Air Temperature, Propeller Revolutions Per Minute (RPM), Fuel Flow, Fuel Levels, and Battery Voltage and Amperage. User customizable parameters may be defined by installation, examples include but are not limited to sensors for door states, annunciators, and flight control positions.

The unit can also calculate, in real time, percent of maximum horsepower, fuel used, and fuel remaining. The calculations are also based on the aircraft installation.

The unit contains non-volatile memory[2] for data storage of the parameters recorded and calculated. The rate at which the data is stored is selectable by the operator. The recording function also records minimum and maximum values for each flight. The data is stored in engineering units in (.CSV)[3] format on an internal compact flash card, using a Linux file system format. The (.CSV) data can be downloaded to a FAT16[4] USB memory device via a USB port on the front of the unit and MVP-50P built-in menu options. Each set of recorded data is grouped by power cycle and identified by an MVP-50P assigned sequential flight number.

2.1.1. Electronics International MVP-50P Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the unit had not sustained any damage and information was extracted using the manufacturer's software normally, without difficulty.

2.1.2. Electronics International MVP-50P Data Description

The data extracted included 1,022 sessions from 2013 through the accident flight on October 1, 2016. The accident flight was the last recorded flight and was about 16 minutes. Table 1 shows MVP-50P parameters in this report for the accident flight and included as tabular data in attachment 1 for the accident flight.

Table 1. MVP-50P parameters.

Parameter Abbreviation	Description
Flaps	Flaps (deg (degrees))
Fuel Flow	Fuel Flow (gph (gallons per hour))
FUEL L	Fuel in left tank (Gal (gallons))
FUEL Press	Fuel Pressure (psi (pounds per square inch))

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[1] Equipment installed in a manufactured airplane is defined by a Technical Standard Order (TSO).
[2] Non-volatile memory is semiconductor memory that does not require external power for data retention.
[3] Comma separated value format.
[4] FAT means File Allocation Table and is a method of organizing files on an electronic device. The FAT16 format is an older format using a 16-byte addressing scheme.

Parameter Abbreviation	Description
FUEL R	Fuel in right tank (Gal (gallons))
Fuel Rem	Fuel remaining (Gal (gallons))
FUEL XFER	Fuel transfer (Gal (gallons))
GPS Altitude	GPS Altitude (feet)
HP	Horsepower (percent)
ITT	Inter-turbine Temperature (degrees Celsius)
MSTR_WRN	Master Warning (discrete ("warning" or blank))
NG	Gas Generator Speed (percent)
OIL Press	Oil Pressure (psi (pounds per square inch))
OIL Temp	Oil Temperature (degrees Celsius)
PROP	Propeller RPM (RPM (revolutions per minute))
TORQ	Torque (ft/lbs (foot pounds))

Note: The electromechanical source and accuracy of FUEL L, FUEL R, Fuel Rem, and FUEL XFER could not be verified for this report.

2.2. Garmin G900X Device Description

The Garmin G900X is an avionics suite, similar to the Garmin G1000, for experimental aircraft. The system includes two LCD displays, one for primary flight display information, the other for multi-function display information, including engine and navigation information. When an SD card is installed in the front panel display, historical information is recorded to the SD card.

2.2.1. Garmin G900X Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the SD card had not sustained any damage and information was extracted using the manufacturer's software normally, without difficulty.

2.2.2. Garmin G900X Data Description

The data extracted included 379 sessions from 2013 through the accident flight. The accident flight was the last flight recorded and was about 15 minutes. Table 2 shows MVP-50P parameters in this report and included as tabular data in attachment 2 for the accident flight.

Table 2. Garmin G900X parameters.

Parameter Abbreviation	Description
AltB	Pressure Altitude (ft (feet))
AltGPS	GPS Altitude (ft (feet))
AltMSL	Altitude (altimeter corrected) (ft (feet))
GndSpd	Groundspeed (kt (knots))
HDG	Heading (deg (degrees))
IAS	Indicated Airspeed (kt (knots))
NormAc	Normal Acceleration (g)
OAT	Outside Air Temperature (deg C (degrees Celsius))
Pitch	Pitch (deg (degrees))

Parameter Abbreviation	Description
Roll	Roll (deg (degrees))
TAS	True Airspeed (kt (knots))
TRK	Track (deg (degrees))

3. Timing

Metadata in the Garmin G900X indicated the unit was recording as central standard time (CST). Garmin G900X time, as recorded in CST, was used in this report. EI MVP-50P data were compared to the Garmin G900X data. Both units recorded GPS altitude. Maximum altitudes were compared, resulting in 15 minutes and 29 seconds being added to EI MVP-50P times to align with Garmin G900X CST.

4. Plots and Overlays

Figures 1 through 3 show geospatial overlays of Garmin G900X recorded data. Weather and lighting conditions are not necessarily representative of the conditions at the time of the recording. Figure 4 shows a plot of Garmin G900X data.

Figures 5 and 6 show plots of the EI MVP-50P engine data, with figure 6 showing a zoomed view near the time of the engine power loss.

Collectively, these figures show:

- The recording began on the ground at Allen County airport (K88) at 16:20:27 CST.
- By 16:24:09 CST, the aircraft began its takeoff run at K88.
- By 16:25:43 CST, the aircraft was climbing westerly.
- At 16:29:33 CST, fuel flow decreased.
- By 16:29:40 CST, oil pressure began to decrease.
- At 16:29:45 CST, the aircraft reached a maximum GPS altitude of 11,860 feet. At about this time, the aircraft started a right turn, and began to head easterly.
- Between 16:29:45 CST and the end of the recording at 16:35:45 CST, the aircraft descended, and then turned left towards the north.
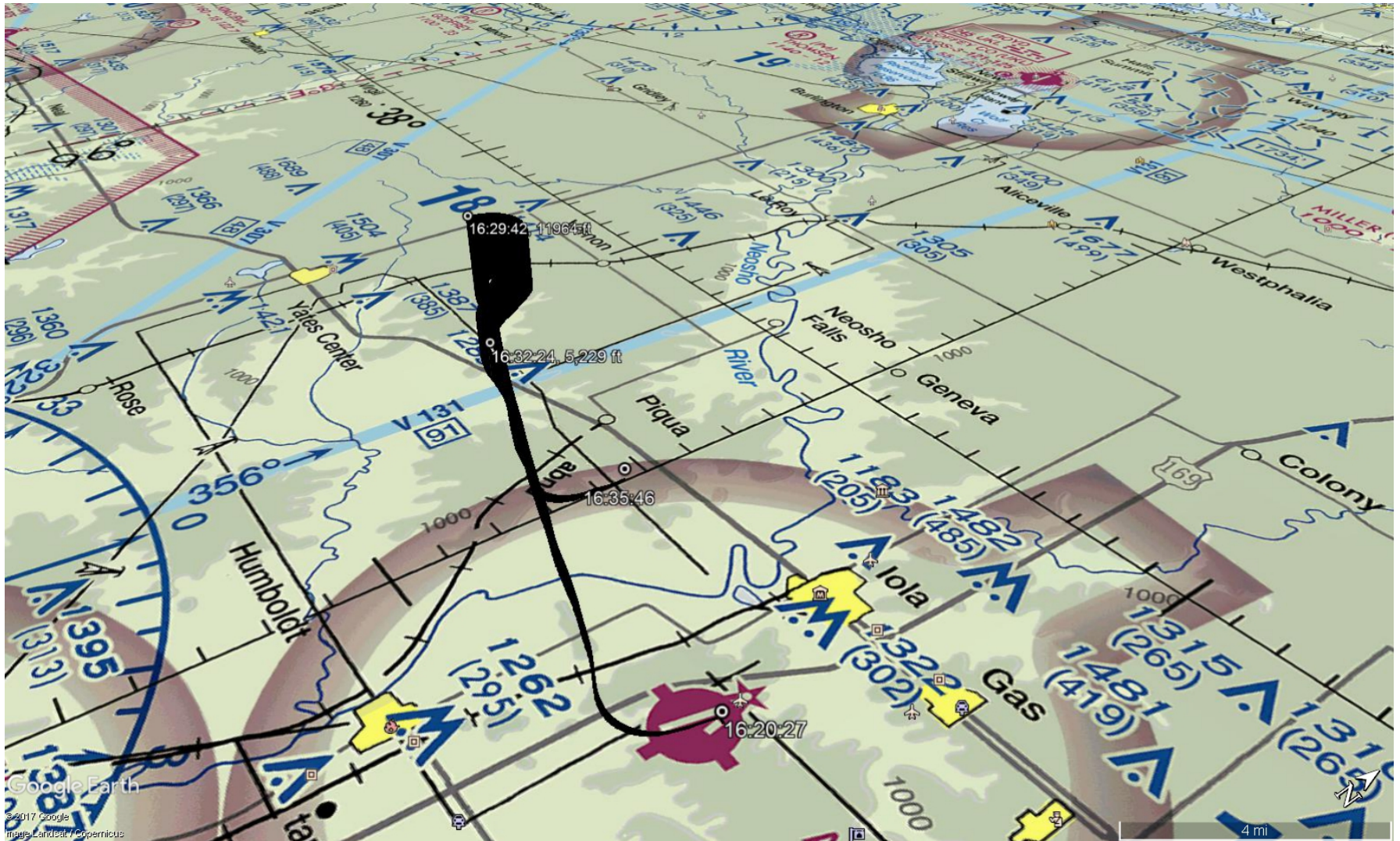
Figure 1. Overlay of accident flight.

16:29:42, 11964ft

16:32:24, 5,229 ft

16:35:46

16:20:27

Figure 2. Overlay of start of accident recording.

16:23:59
16:23:37
16:23:13
16:22:42
16:20:27
16:24:09
16:24:12, 35 kts Indicated Airspeed
16:24:18, 58 kts Indicated Airspeed

Google Earth

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500 ft

N

Figure 3. Overlay of end of accident recording.

16:35:46

16:35:18, 104 kts Indicated Airspeed, 1,435 ft

16:35:07, 101 kts Indicated Airspeed, 1,683 ft

Google Earth

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1 mi

Figure 4. Plot of Garmin G900X data.
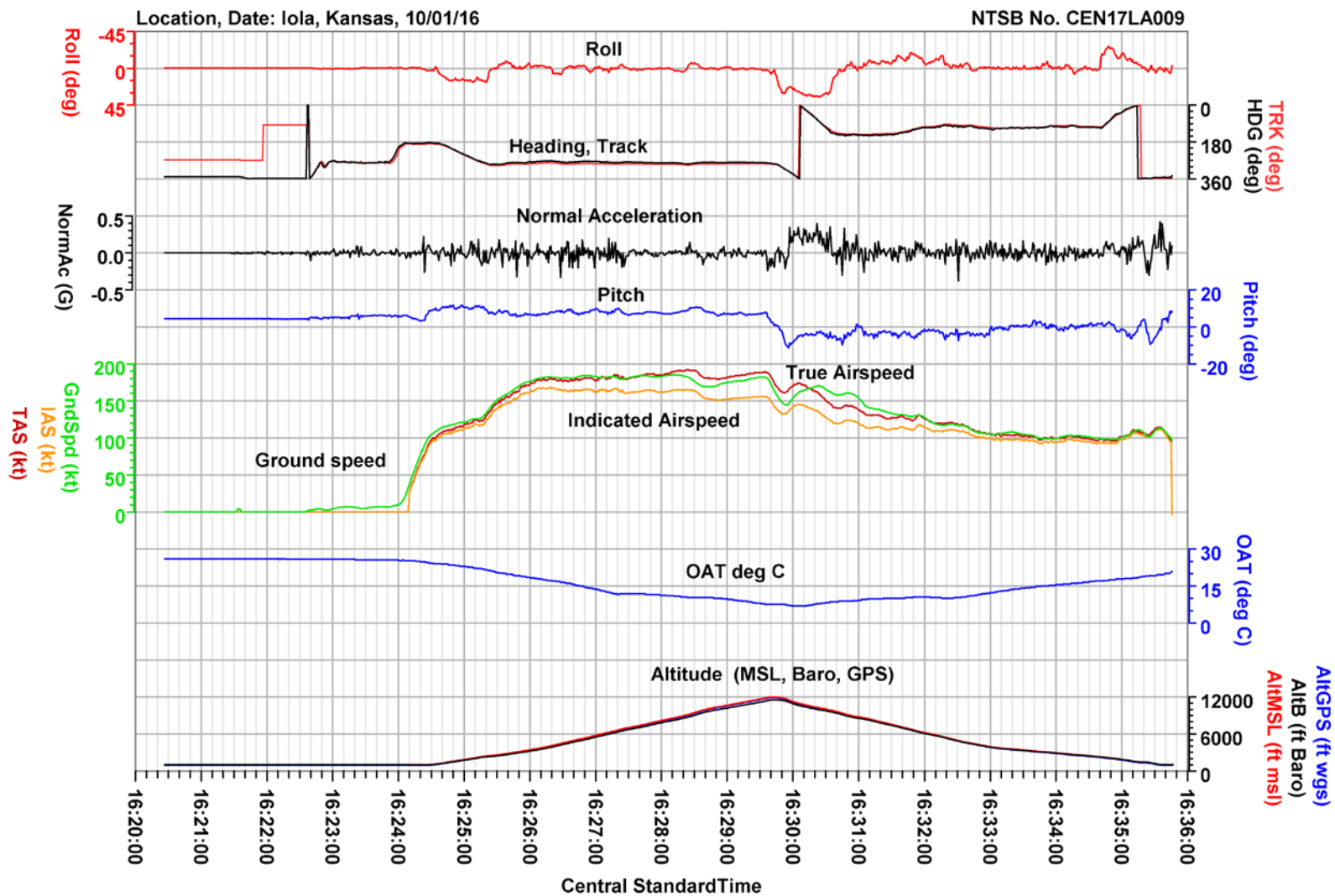
Figure 5. Plot of EI MVP-50P data for entire accident recording.

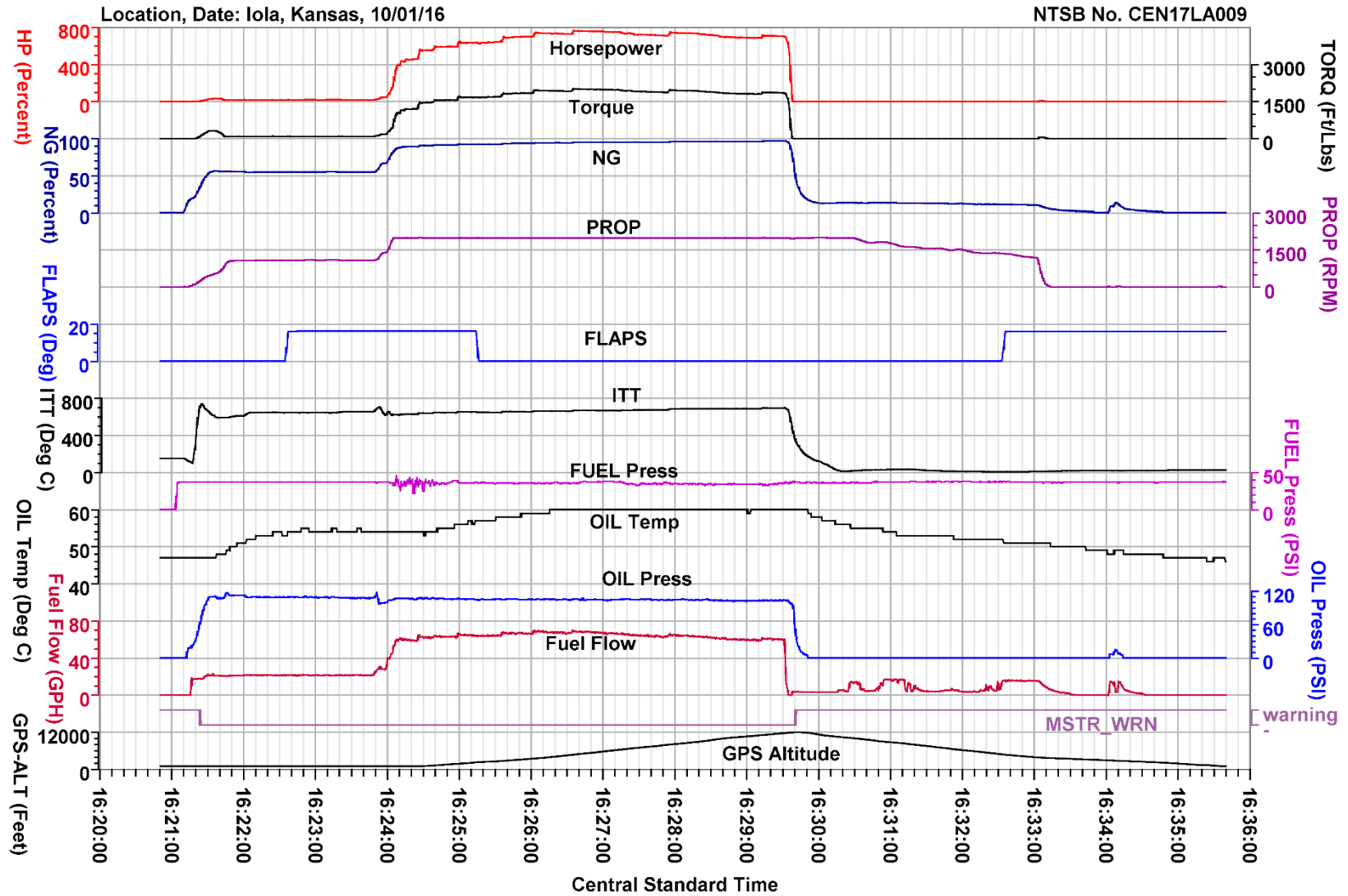Location, Date: Iola, Kansas, 10/01/16

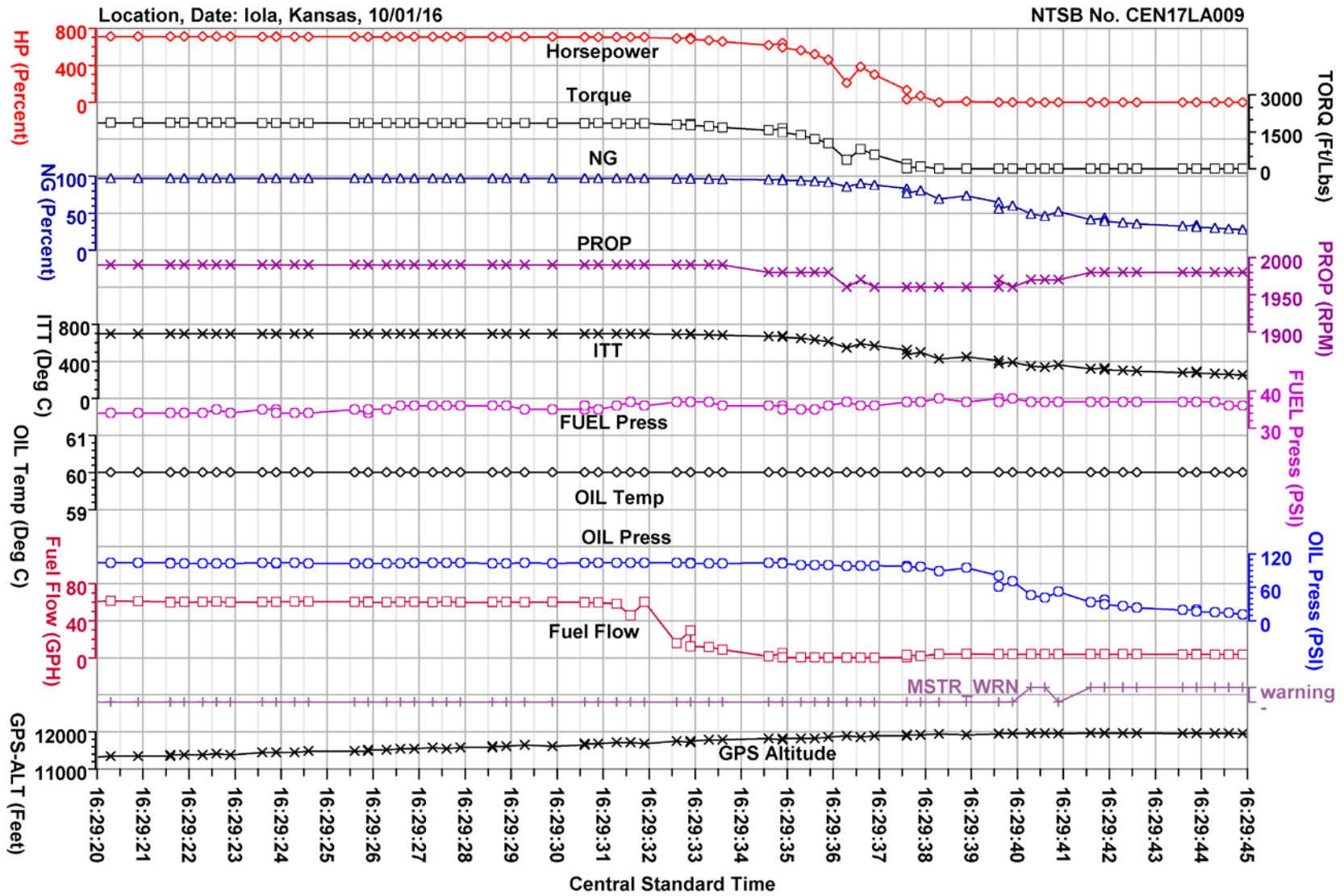NTSB No. CEN17LA009

Figure 6. Plot of EI MVP-50P data at time of power loss.

Figure 7. Plot of EI MVP-50P fuel-related data.