

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

February 20, 2018

Electronic Devices

**Specialist's Factual Report
by Jane Foster**

1. EVENT

Location: Clermont, Florida
Date: March 12, 2016
Aircraft: Sheahen RV-8A
Registration: N838RV
Operator: Private
NTSB Number: ERA16FA127

On March 12, 2016, about 0847 eastern standard time, an experimental amateur-built Sheahen RV-8A, N838RV, operated by a private individual, was substantially damaged after it impacted the ground near Clermont, Florida. The private pilot and the pilot-rated rear-seat passenger were fatally injured. Visual meteorological conditions prevailed and no flight plan had been filed for the flight that originated from Spruce Creek Airport (7FL6), Port Orange, Florida, at about 0825. The local personal flight, destined for Winter Haven's Gilbert Airport (GIF), Winter Haven, Florida, was conducted under the provisions of 14 *Code of Federal Regulations* Part 91.

2. DETAILS OF INVESTIGATION

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

Device 1: Advanced Flight Systems 5800T EERV
Device 1 Serial Number: 71338
Device 2: Apple iPad Air 2
Device 2 Serial Number: DMPNP5J2G5YL
Device 3: Apple iPhone 6
Device 3 Serial Number: Unknown
Device 4: Apple iPad 2
Device 4 Serial Number: DLXGHYTGDFJ3

2.1. Advanced Flight Systems 5800T EE-RV Device Description

The Advanced Flight Systems Inc. AF-5800T EE-RV is a multifunction, liquid crystal display (LCD) capable of displaying aircraft attitude, altitude, heading, navigation, moving

map, engine information, and airway and approach databases, depending on options and installation. The units can record dynamic flight information on internal flash non-volatile memory¹ at a pilot selectable interval. The unit records approximately 50 discrete data parameters to the internal non-volatile memory.

The time in the units is set by the operator and maintained by an internal lithium-ion battery between power cycles. Displayed and recorded times are from the internal clock on each unit. However, when power is applied and the unit is connected to a GPS, the internal clock will automatically be set to GPS time. Thereafter, the clock will advance based on the internal microprocessor. When connected to another Advanced Flight Systems Inc. device, discrete data parameters are shared and recorded (except time).

2.1.1. Advanced Flight Systems 5800T EE-RV Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the unit had sustained severe damage. Figures 1 through 5 show the extent of the damage. The Solid State Drive (SSD) was removed from the unit and read out with an eSATA adapter. The data was sent to the manufacturer to be converted to engineering units.

Figure 1. Advanced Flight Systems 5800T EE-RV as received.



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

Figure 2. Advanced Flight Systems 5800T EE-RV as received.

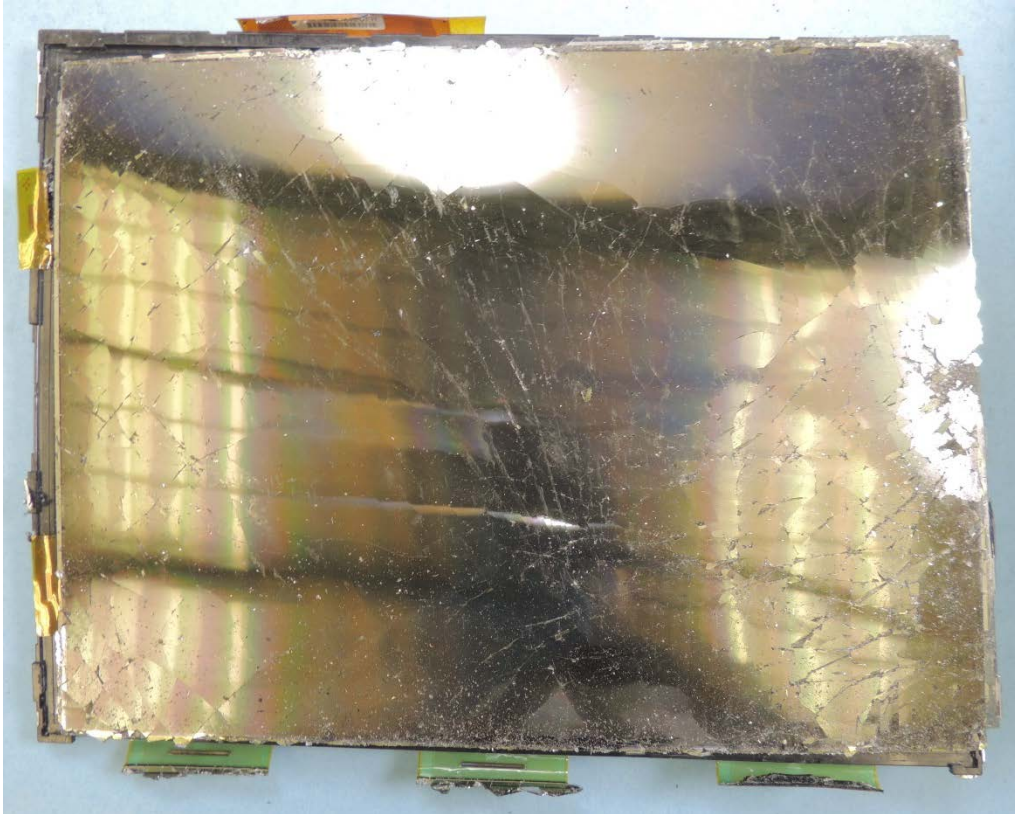


Figure 3. Advanced Flight Systems 5800T EE-RV as received.

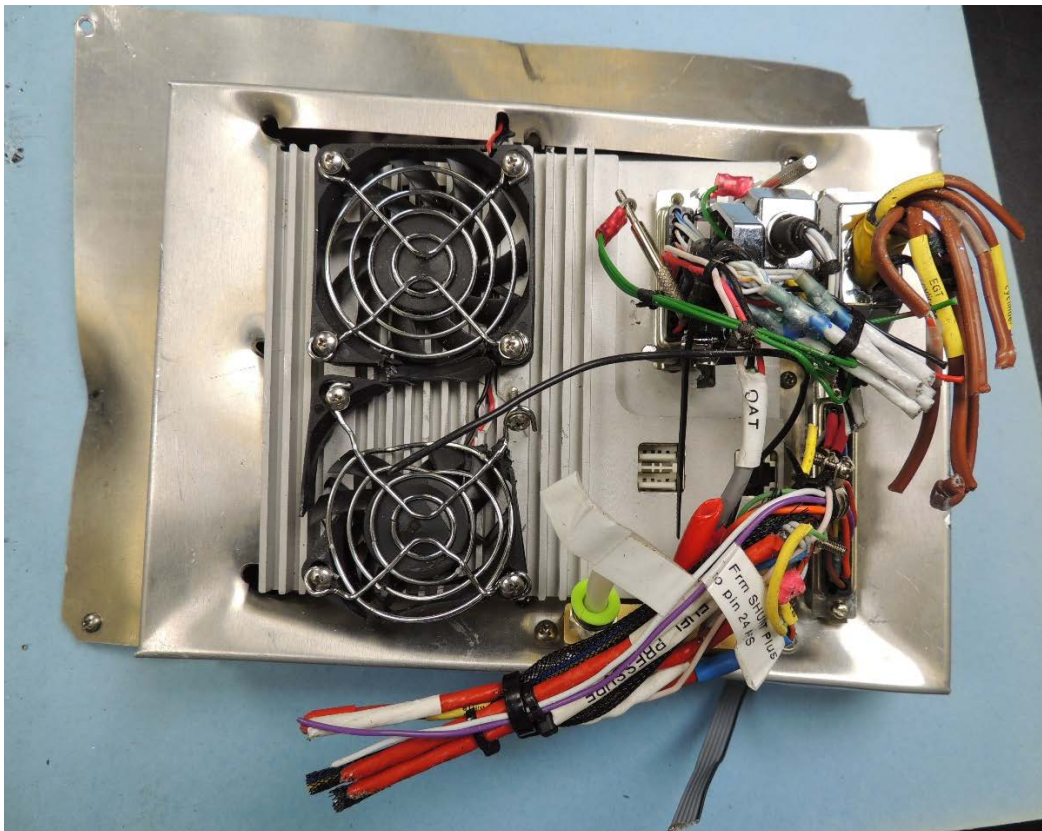


Figure 4. Advanced Flight Systems 5800T EE-RV as received.



Figure 5. Advanced Flight Systems 5800T EE-RV as received.



2.1.2. Advanced Flight Systems 5800T EE-RV Data Description

The data extracted included 3599 total data points from February 13, 2016² through March 12, 2016. The accident flight was the last session, recorded starting at 13:19:19 UTC and ending at 13:37:30 UTC on March 12, 2016.

2.1.3. Advanced Flight Systems 5800T EE-RV Parameters Provided

Table 1 describes data parameters provided by the device.

² All dates and times are referenced to Coordinated Universal Time (UTC).

Table 1: Advanced Flight Systems 5800T EE-RV Data Parameters

Parameter Name	Parameter Description
Date	Date for recorded data point (MM/DD/YYYY)
Time	Time (UTC) for recorded data point (HH:MM:SS)
Latitude	Recorded Latitude (degrees)
Longitude	Recorded Longitude (degrees)
Altitude	Recorded Altitude (feet)
Groundspeed	Groundspeed (knots)
Airspeed	Airspeed (knots)
Volts	Volts (volts)
OAT	Outside Air Temperature (deg F)
VertSpeed	Vertical Speed (ft/min)
RPM	RPM (rotations per minute)
Manifold	Manifold pressure (in Hg)
Fuel PSI	Fuel Pressure (psi)
Fuel Flow	Fuel Flow (gal/hr)
Oil PSI	Oil Pressure (psi)
Oil Temp	Oil Temperature (deg F)
EGT 1	Exhaust Gas Temperature 1 (deg F)
EGT 2	Exhaust Gas Temperature 2 (deg F)
EGT 3	Exhaust Gas Temperature 3 (deg F)
EGT 4	Exhaust Gas Temperature 4 (deg F)
CHT 1	Cylinder Head Temperature 1 (deg F)
CHT 2	Cylinder Head Temperature 2 (deg F)
CHT 3	Cylinder Head Temperature 3 (deg F)
CHT 4	Cylinder Head Temperature 4 (deg F)
Flight Time	Flight Time (hours)
Pitch	Pitch (deg)
Roll	Roll (deg)
Heading	Heading (deg)
Tach Time	Tach Time (hours)
Hobbs Time	Hobbs Time (hours)
Today Time	Today Time (hours)

2.1.4. Advanced Flight Systems 5800T EE-RV Overlays and Tabular Data

Multiple flights were recorded on the Advanced Flight Systems 5800T EE-RV. Table 2 shows the recorded dates and the flight length. Flights less than 0.1 hour in duration are not included in this table.

Table 2. Flight date and duration.

Flight Date	Flight Length (hours)
2/13/16	1.3
2/14/16	1.4
2/18/16	0.7
2/18/16	0.6
2/26/16	1.1
2/26/16	1.1
2/28/16	0.6
2/28/16	0.5
3/7/16	0.6
3/7/16	0.9
3/7/16	0.4
3/7/16	0.1
3/8/16	0.6
3/8/16	0.7
3/12/16	0.1
3/12/16	0.3

Figure 6 is a graphical overlay generated using Google Earth for the accident flight. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

The flight departed Spruce Creek Airport at approximately 13:24:40 UTC. The last recorded parameter was as at 13:37:30 UTC on March 12, 2016. The data recording may have ended before the accident event.

Figure 7 is a graphical overlay generated using Google Earth zoomed in on the beginning of the flight. Figure 8 highlights the end of the recorded data.

Figure 9 is a plot of the parametric data for the accident flight. Figure 10 is a plot of the end of the data for the accident flight.

Tabular data used to generate figures 6 through 10 are included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

Figure 6. Google Earth Plot showing accident flight on March 12, 2016.

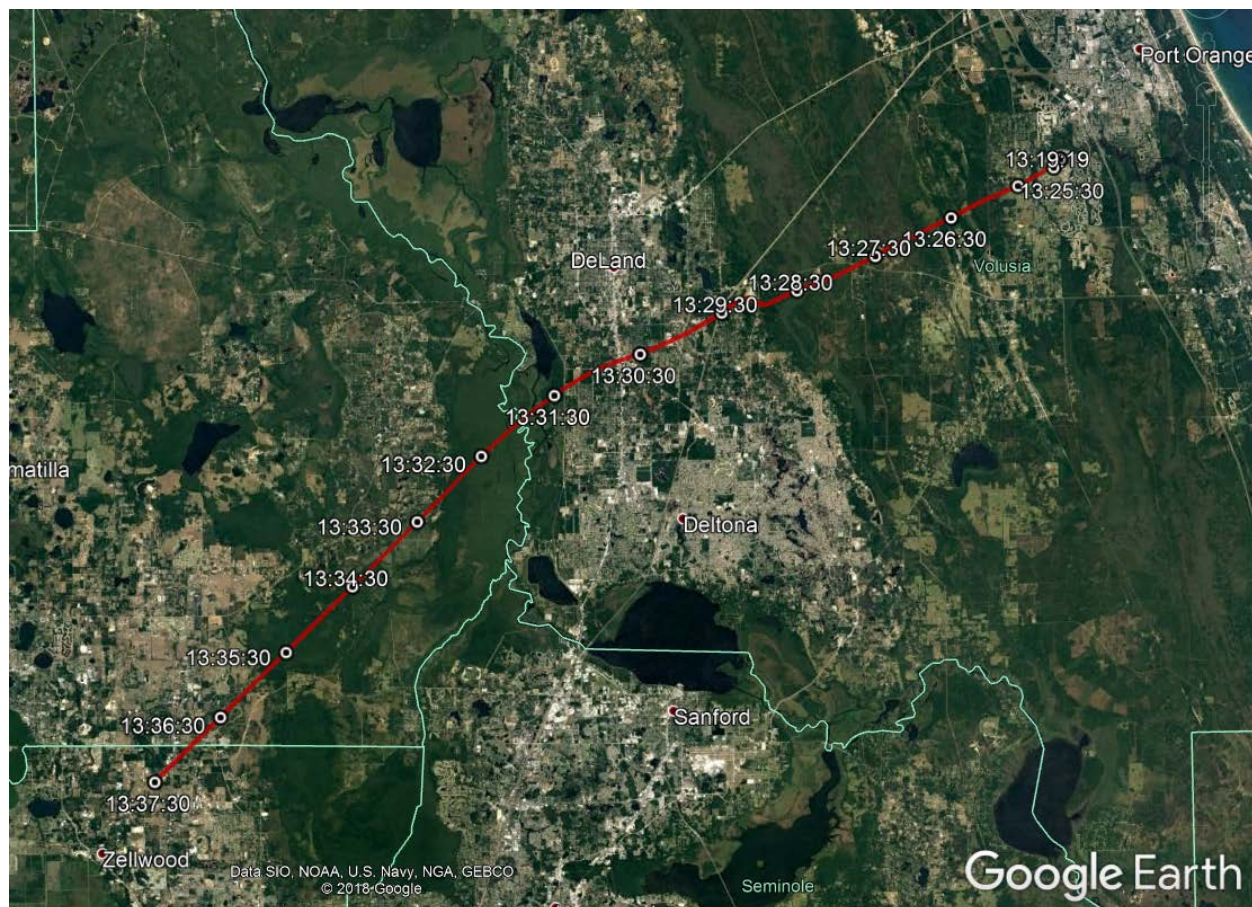


Figure 7. Google Earth Plot showing beginning of accident flight on March 12, 2016.

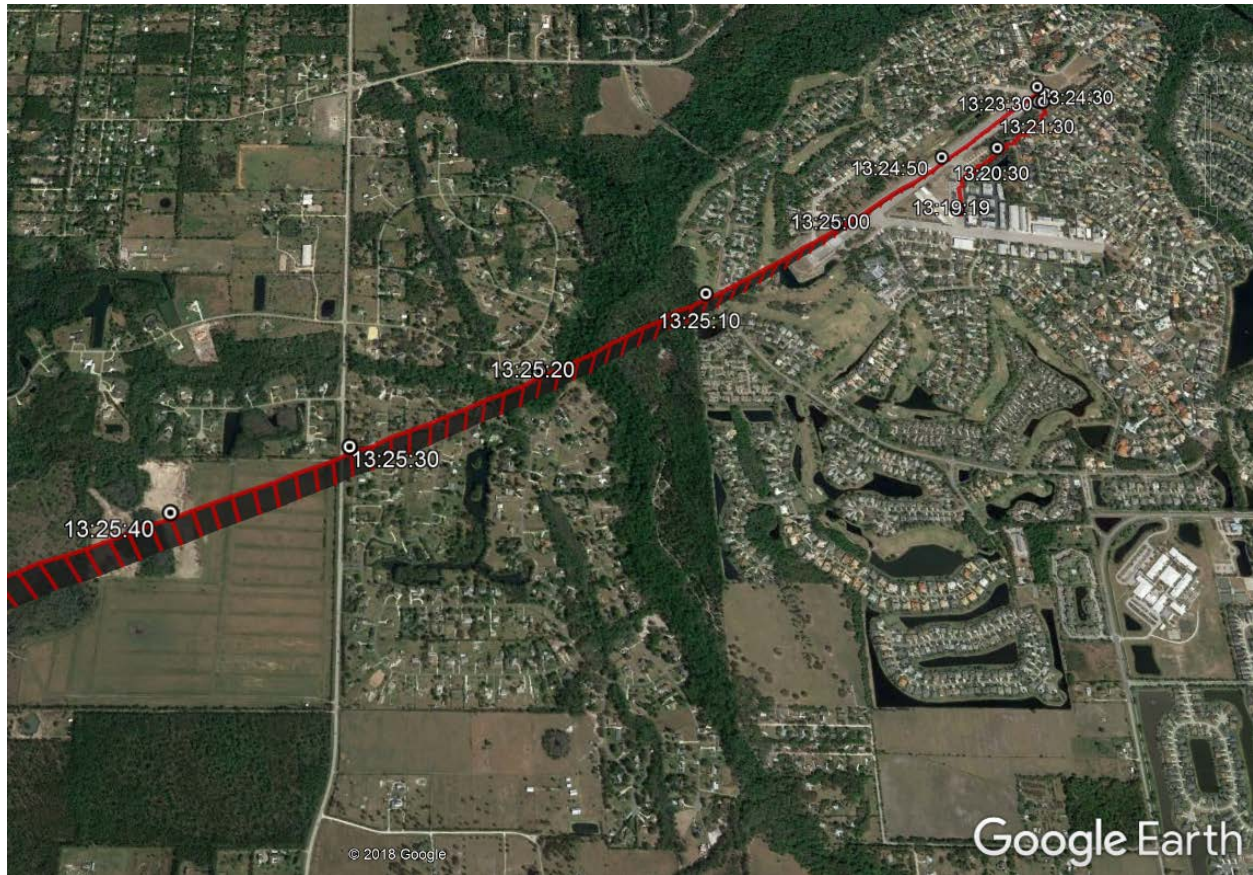


Figure 8. Google Earth Plot showing end of the data for the accident flight on March 12, 2016.

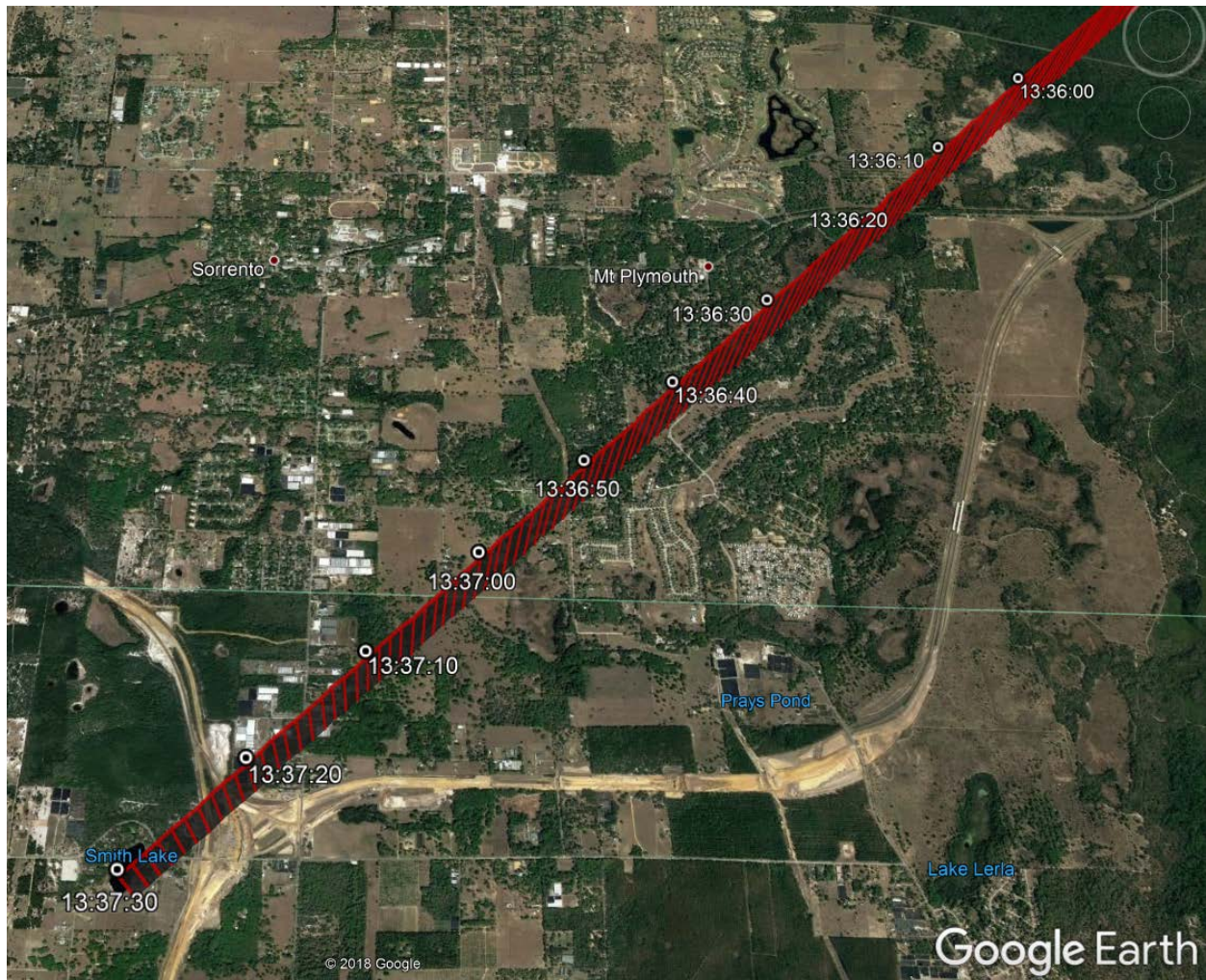


Figure 9. Plot of parametric data for accident flight.

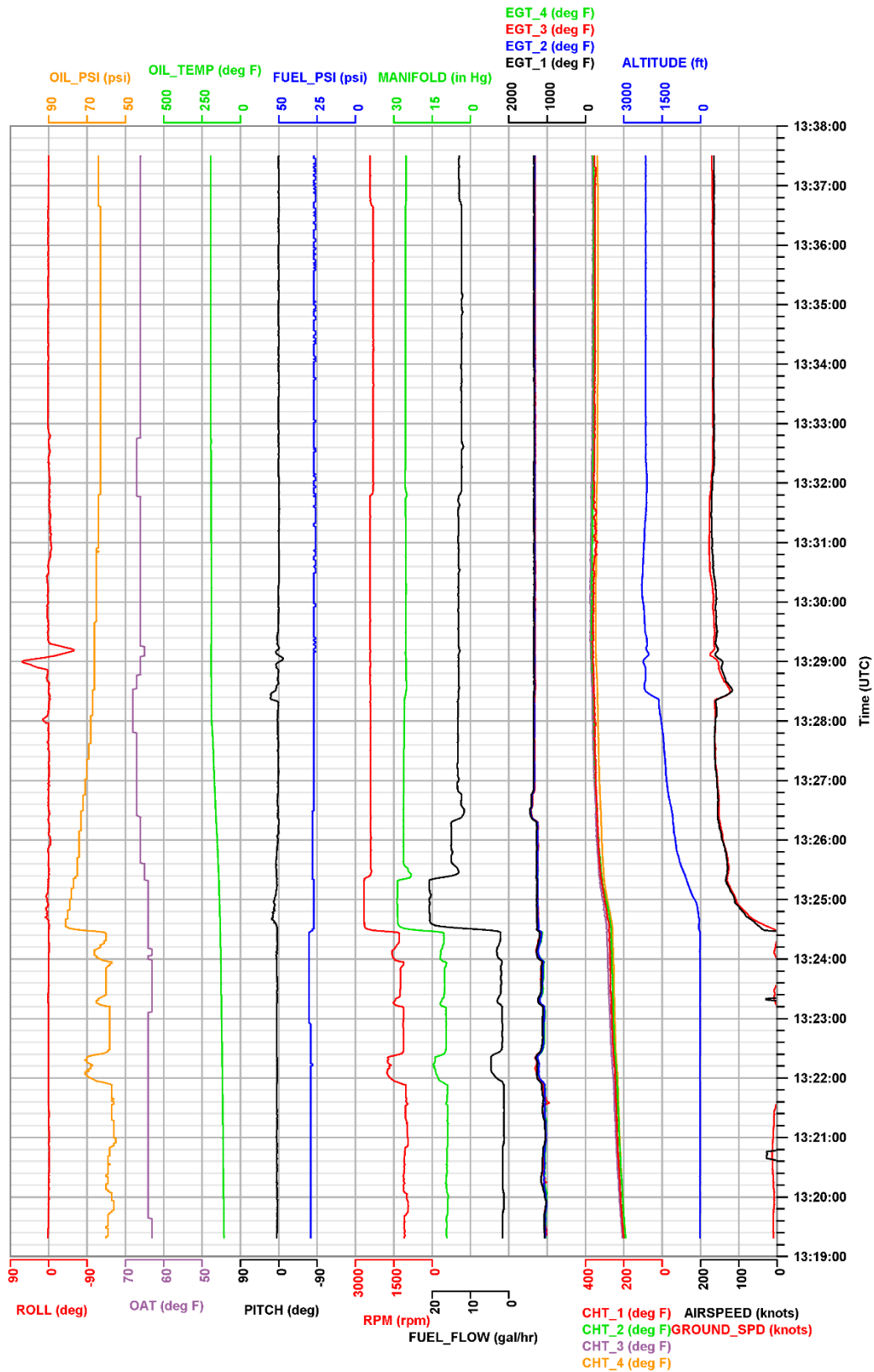
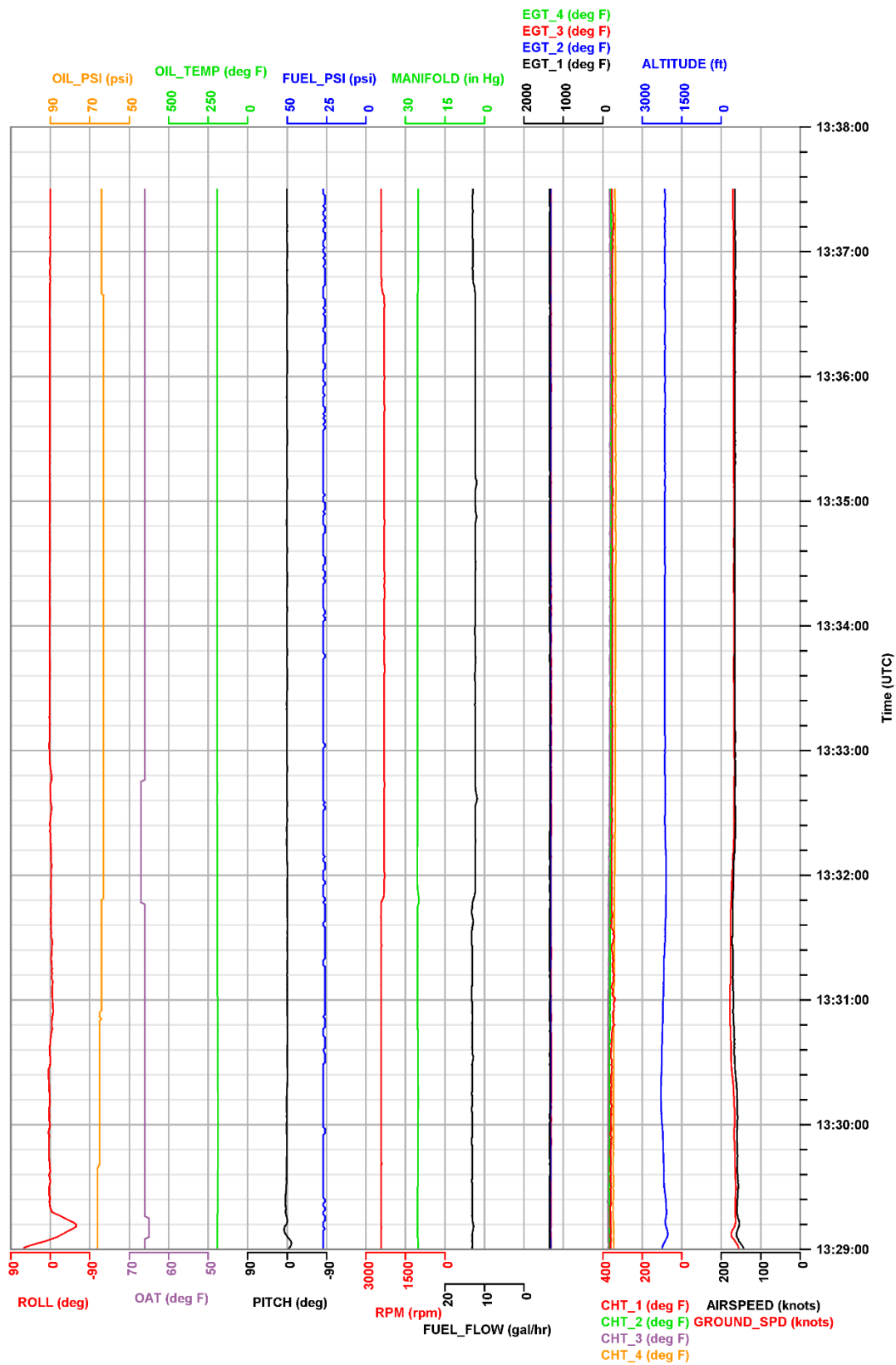


Figure 10. Plot of parametric data for end of recorded data.



2.2. Apple iPad Air 2 Device Description

The Apple iPad Air 2 is a tablet computer with a high-resolution color touch-screen interface. All iPad devices support WiFi and Bluetooth connectivity, and use non-volatile memory for storage. Some devices also support data connectivity via existing cell-phone networks. The iPad Air 2 also includes front and back cameras. The iPad Air 2 implements its functionality by running programs called “Apps” capable of supporting web-browsing, email, audio/video playback, contact and calendar management, and numerous other specialized functions. User-installed Apps can be used to support functionality for electronic flight bags, flight planning and filing, aviation weather depiction, and electronic flight charts. Application data is stored in non-volatile memory and may include image, video, and position location information. Specialized application data may be stored in a proprietary file structure using numerous proprietary file formats. The amount and type of data stored varies based on the software version and configuration of the specific device.

2.2.1. Apple iPad Air 2 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained severe damage. The extent of the damage is shown in figures 11 and 12.

Figure 11. Front of Apple iPad Air 2 as received.

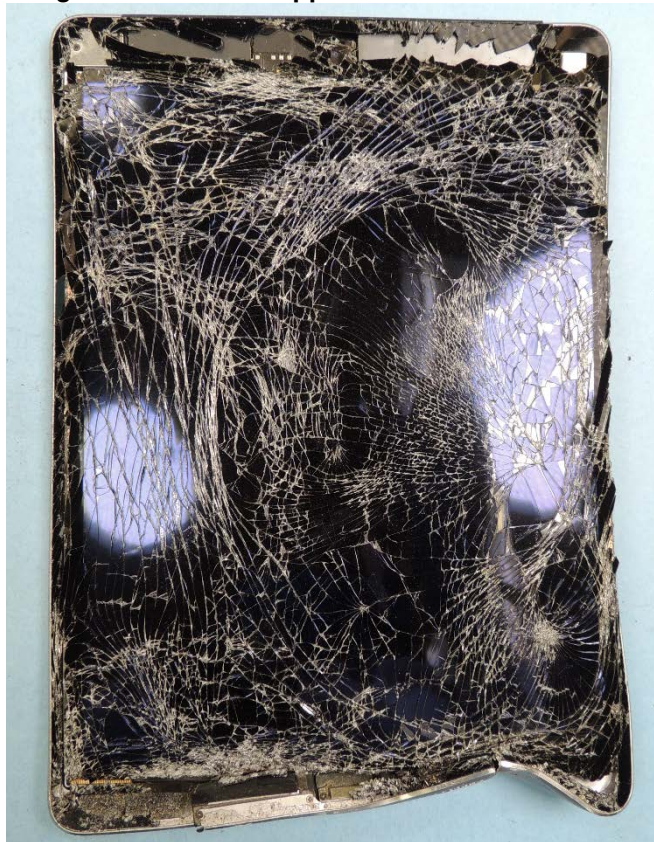


Figure 12. Back of Apple iPad Air 2 as received.



2.2.2. Apple iPad Air 2 Data Description

The extent of the damage precluded normal recovery procedures and additional attempts were unsuccessful in yielding usable data. Therefore, no data pertinent to the event were recovered.

2.3. Apple iPhone 6 Device Description

The Apple iPhone 6 is a touch-screen smart-phone capable of voice calling, text messaging, email, photo/video recording, audio (music) playback, and numerous other specialized functions depending on configuration. Specialized functions are supported by additional user-installed program applications (Apps). Application data is stored in non-volatile memory and may include call logs, text messaging logs, image, video, and position location information. In addition, the specialized application data may be stored in a proprietary file structure using numerous file formats. The amount and type of data stored varies based on the software version and configuration of the specific device.

2.3.1. Apple iPhone 6 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained severe damage. The extent of the damage is shown in figures 13 and 14.

Figure 13. Front of Apple iPhone 6 as received.



Figure 14. Back of Apple iPhone 6 as received.



2.3.2. Apple iPhone 6 Data Description

The extent of the damage precluded normal recovery procedures and additional attempts were unsuccessful in yielding usable data. Therefore, no data pertinent to the event were recovered.

2.4. Apple iPad 2 Device Description

The Apple iPad 2 is a tablet computer with a high-resolution color touch-screen interface. All iPad devices support WiFi and Bluetooth connectivity, and use non-volatile memory for storage. Some devices also support data connectivity via existing cell-phone networks. The Apple iPad 2 includes front and back cameras. The Apple iPad 2 implements its functionality by running programs called “Apps” capable of supporting web-browsing, email, audio/video playback, contact and calendar management, and numerous other specialized functions. User-installed Apps can be used to support functionality for electronic flight bags, flight planning and filing, aviation weather depiction, and electronic flight charts. Application data is stored in non-volatile memory and may include image, video, and position location information. Specialized application data may be stored in a proprietary file structure using numerous proprietary file formats. The amount and type of data stored varies based on the software version and configuration of the specific device.

2.4.1. Apple iPad 2 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained severe damage. The extent of the damage is shown in figures 15 and 16.

Figure 15. Front of Apple iPad 2 as received.



Figure 16. Back of Apple iPad 2 as received.



2.4.2. Apple iPad 2 Data Description

The extent of the damage precluded normal recovery procedures and additional attempts were unsuccessful in yielding usable data. Therefore, no data pertinent to the event were recovered.