

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

October 23, 2019

Recorded Flight Data

Group Chairman's Factual Report By Kyle Garner

1. EVENT SUMMARY

Location: Littlefield Lake, Michigan
Date: July 27, 2019
Aircraft: Icon A5
Registration: N663BA
Operator: Icon Aircraft, Inc.
NTSB Number: CEN19LA242

On July 27, 2019, about 1320 eastern daylight time (EDT), an amphibious, light sport Icon Aircraft, Inc. A5 airplane, N663BA, sustained substantial damage during an impact with trees shortly after departure from Littlefield Lake, Michigan. The airplane was registered to and operated by Icon Aircraft, Inc. as a Title 14 *Code of Federal Regulations* Part 91 business flight. The airline transport rated pilot sustained minor injuries and the pilot rated passenger sustained serious injuries. Visual meteorological conditions prevailed and no flight plan had been filed.

2. RECORDED FLIGHT DATA GROUP

A recorded flight data group was convened on August 22, 2019 at the National Transportation Safety Board (NTSB) Vehicle Recorders Laboratory in Washington, DC.

Chairman: Kyle Garner
Aerospace Engineer
National Transportation Safety Board

Member: Bret Davenport
Engineering Test Pilot
Icon Aircraft, Inc.

3. RECORDED FLIGHT DATA CARRIAGE REQUIREMENTS

Although not required by regulation the Icon A5 was equipped with a flight data monitoring device, an Icon digital-to-analog converter (DAC) memory unit (MU).

4. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorders Division received the following Icon DAC MU:

Recorder Manufacturer/Model: **Icon DAC MU**
Recorder Serial Number: **0051**

4.1. Icon DAC MU Description

The Icon DAC MU is a proprietary flight data monitoring device owned by Icon Aircraft, Inc. and installed on all Icon aircraft. The Icon DAC MU records parametric data including GPS information, flight data, engine data, discrete parameters, and faults at a frequency of up to 10 Hz. The DAC MU has a proprietary interface and encrypted file structure. Accessing the files requires the use of hardware and software owned by Icon Aircraft, Inc.

4.1.1. Device Condition

The DAC MU arrived at the NTSB Vehicle Recorders Laboratory dry and in good condition (ref Figure 1).

Figure 1. DAC MU Received Condition



4.1.2. Recording Description

Files corresponding to the accident flight and two previous flights were downloaded from the DAC MU. These files were then converted to engineering units by Icon Aircraft, Inc. under the supervision of a NTSB investigator.

The conversion software produced a Keyhole Markup Language (kml) file and a comma separated value (csv) text file containing the recorded data sampled at 10 Hz. Examination of the kml file revealed that the kml file contained additional precision in the latitude and longitude values. Additionally, the placemarks included in the kml file contained snapshots of the parametric data.

The csv file contained GPS hours, minutes and seconds parameters. However, according to the manufacturer the GPS second parameter may not be reliable.

4.1.3. Engineering Units Conversions

The engineering units conversions used for the data contained in this report are completed inside the software from the manufacturer.

Table A-1 in Appendix A lists the parameters verified and provided in this report.

4.2. Time Correlation

In order to apply a proper local time stamp to the data, the elapsed time of the data record for which the GPS second parameter first incremented on the accident flight was adjusted to match the recorded GPS time, 17:03:13, with subsequent records occurring at 0.1 second intervals thereafter. The data was then converted to local EDT by subtracting 4 hours.

4.3. Plots and Corresponding Tabular Data

Figures 2 to 4 contain data recorded on the Icon DAC MU during the July 27, 2019 event.

Figure 2 is an overview of the path of the accident flight retrieved from the kml file on the DAC MU. Google Earth was used to overlay the data on satellite imagery. The weather, season, and lighting conditions in Google Earth are not representative of the conditions at the time of the accident.

Figure 3 contains data from the entire accident flight, including water taxi time, and Figure 4 contains data from the final 50 seconds of the accident recording. Figures 3 and 4 are configured such that right turns are indicated by the trace moving toward the bottom of the page, left turns towards the top of the page and nose up attitudes towards the top of the page.

In Figure 3, data shows that the aircraft was powered on at approximately 13:04:40. The aircraft then taxied on the water for approximately ten minutes. At 13:14:37 the flaps were set at zero degrees and the throttle was advanced to its maximum position (100%). Two seconds later engine speed increased to a maximum of approximately 5300 rpm and remained at that speed until the throttle position and engine speed started to decrease at 13:14:49.

At 13:14:53 the flaps were extended to 30 degrees and the aircraft continued to taxi on the water for approximately three minutes. At 13:17:43 the throttle position was set to 100% and the engine speed began to increase to approximately 5300 rpm. At 13:17:52 the aircraft reported an indicated airspeed of 37 knots and an angle of attack of 3.8 degrees, however, GPS height did not change. At 13:17:57 the throttle position began to decrease followed by a decrease in engine speed.

In Figure 4, at the beginning of the plot at 13:18:55 the throttle position was set at 87%, engine speed was approximately 4300 rpm and the indicated airspeed was 27 knots. Four seconds later, at 13:18:59, the throttle position was set to 100%, where it remained for the duration of the recording, and engine speed started to increase. At 13:19:06 engine speed

was 5200 rpm, indicated airspeed was 30 knots, and the angle of attack increased from zero to about 4 degrees nose-up. Approximately thirty seconds later, at 13:19:32, indicated airspeed was 45 knots, angle of attack was 17 degrees and GPS height started to increase.

From 13:19:32 to the end of the recording the variations in indicated airspeed and angle of attack increased in magnitude. During this time period the maximum indicated airspeed was 55 knots, the maximum angle of attack was 21 degrees and the maximum GPS height was 947 feet. The largest magnitude vertical acceleration of 3.03 g's occurred at 13:19:44. The recording then ended at 13:19:45 with the aircraft reporting an angle of attack of 21 degrees, engine speed of 4800 rpm, indicated airspeed of 25 knots and a GPS height of 929 feet.

The corresponding tabular data used to create Figures 2 to 4 are provided in electronic comma separated value (*.csv) format as Attachment 1 to this report.

Figure 2. Google Earth Path of Accident Water Taxi & Flight

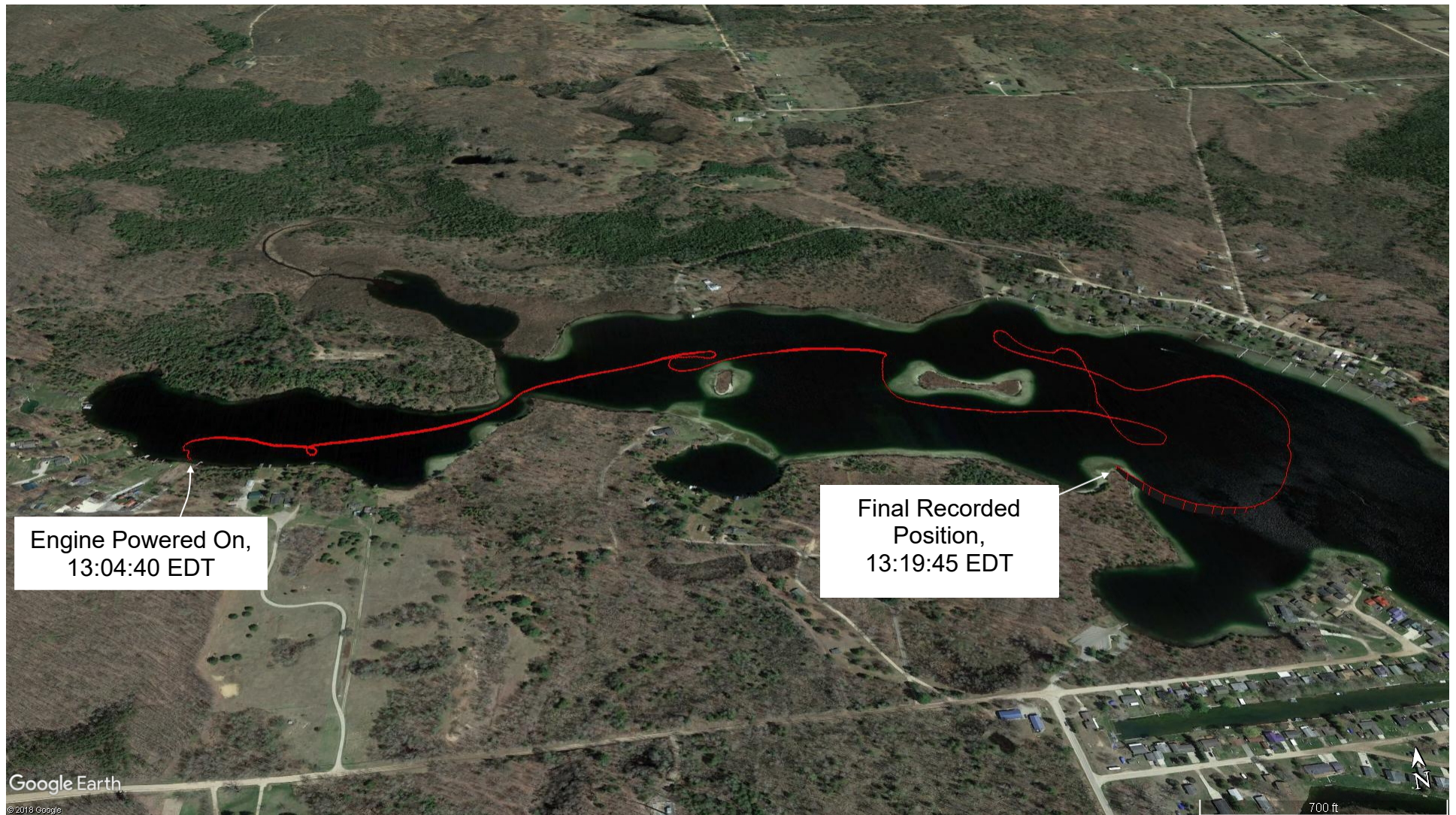


Figure 3. DAC MU Parameters for Duration of Accident Water Taxi & Flight

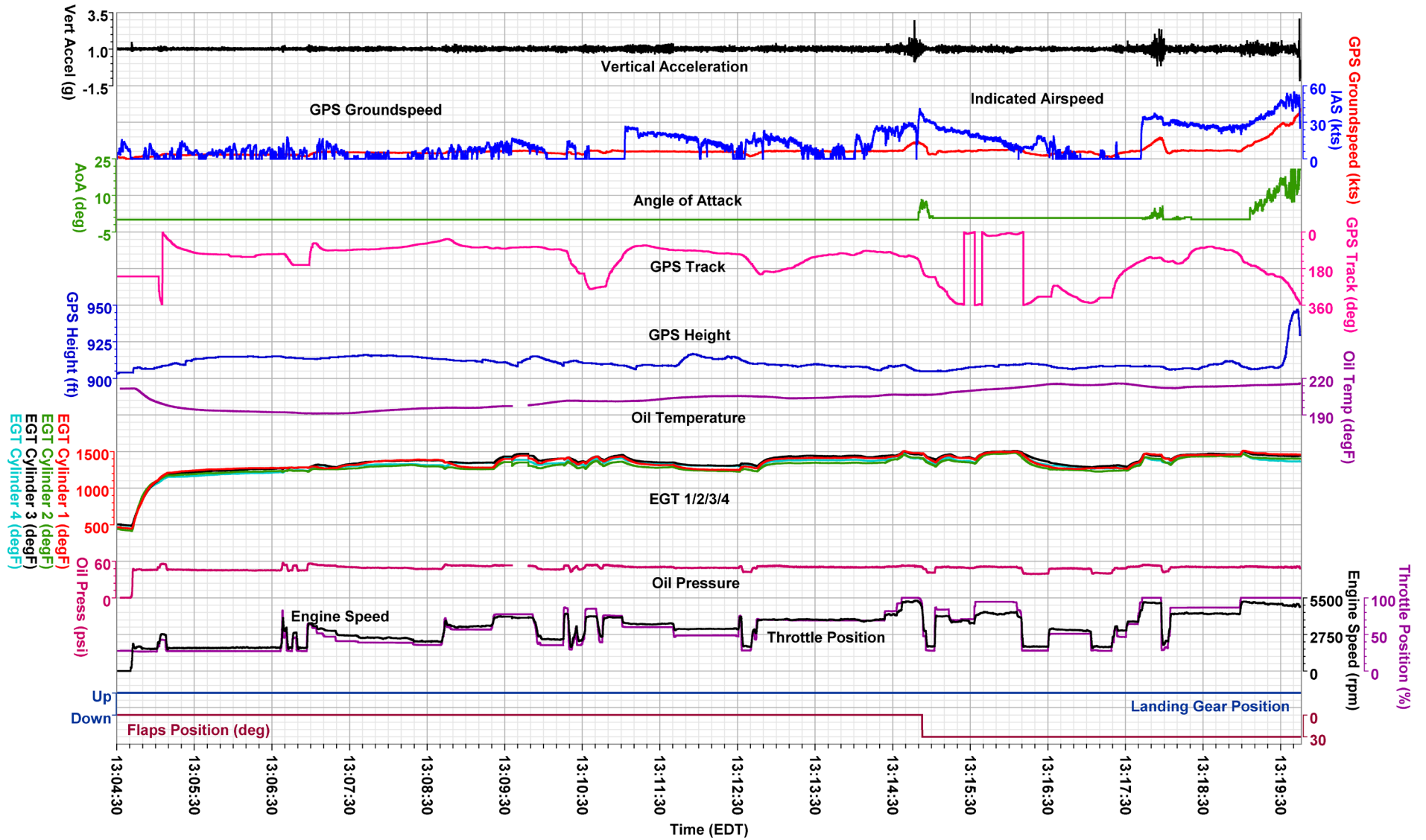
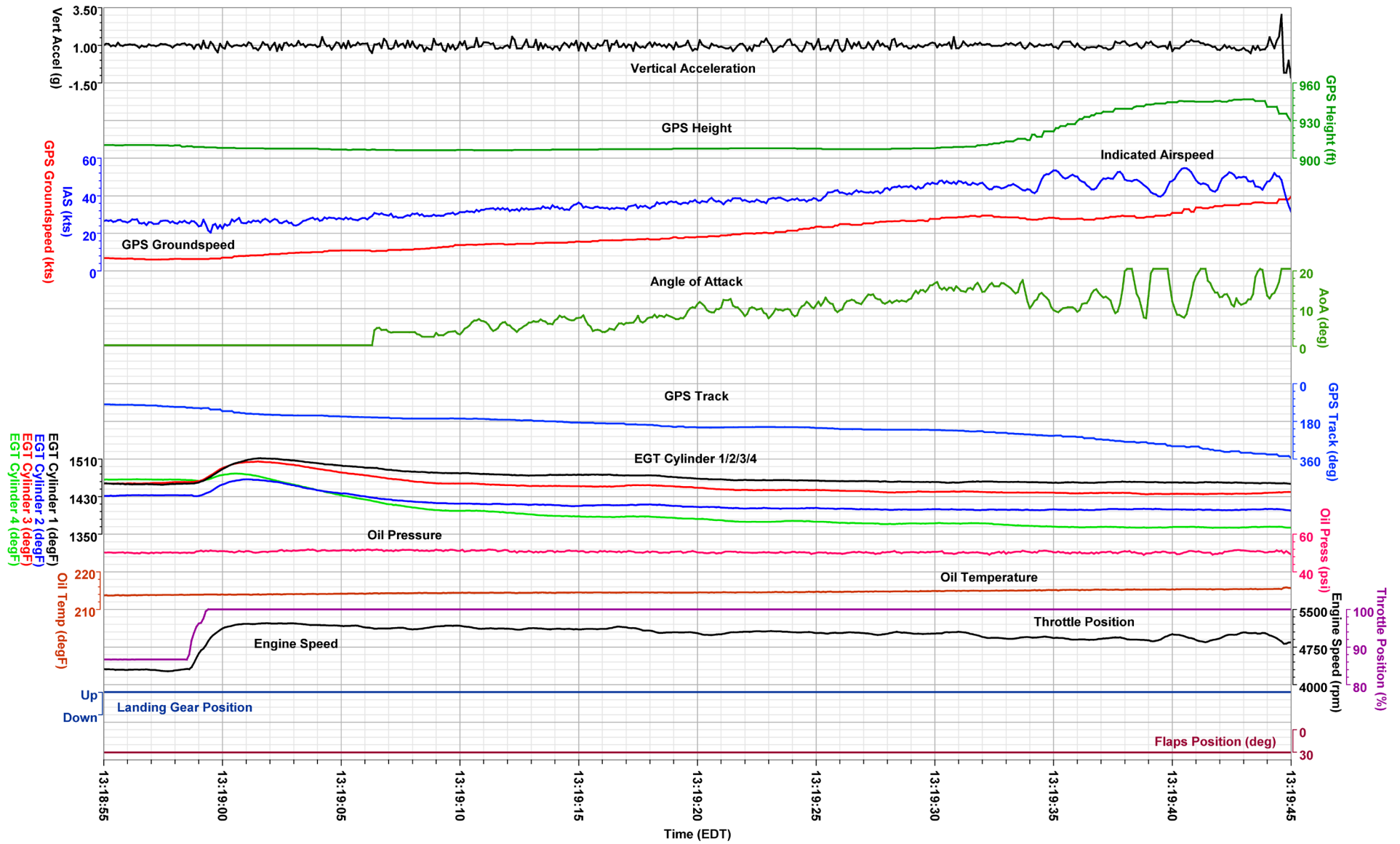


Figure 4. DAC MU Parameters for Last 50 Seconds of Recording



APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameter names, plot/table labels, and units. Additionally, Table A-2 describes the unit abbreviations used in this report.

Table A-1. Verified and provided DAC MU parameters.

Parameter Names	Plot/Table Labels	Units
Angle of Attack	AoA	deg
Engine Rotational Speed	Engine Speed	rpm
Exhaust Gas Temperature Cylinder 1/2/3/4	EGT 1/2/3/4	degF
Flaps Position	Flaps Position	deg
GPS Height	GPS Height	ft
GPS Groundspeed	GPS Groundspeed	kts
GPS Track	GPS Track	deg
Indicated Airspeed	IAS	kts
Landing Gear Position	Landing Gear Position	-
Oil Pressure	Oil Press	psi
Oil Temperature	Oil Temp	degF
Throttle Position	Throttle Position	-
Vertical Acceleration	Vert Accel	g

NOTE: Parameters with a blank unit description in Table A-1 are discretes. 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.

Table A-2. Unit abbreviations.

Unit Abbreviations	Descriptions
deg	degrees
degF	degrees Fahrenheit
kts	knots
g	gravitational constant
ft	feet
psi	pounds per square inch
rpm	revolutions per minute