

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

February 9, 2021

Cockpit Displays – Recorded Flight Data

Specialist's Factual Report
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1. EVENT

Location: Marysville, WA
Date: August 14, 2019
Aircraft: Murphy Moose
Registration: N525SG
Operator: Private
NTSB Number: WPR19FA219

2. RECORDED FLIGHT DATA GROUP

A recorded flight data group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received two electronic comma-separated value (CSV) files containing data from two AF-5600 cockpit displays that were installed on the accident aircraft.

3.1. Advanced Flight Systems AF-5600 Device Description

The AF-5600 is a flight and navigation instrumentation system that provides information to a pilot via 10.4" screens shown on panel-mounted hardware. The displays can be configured as either a primary flight display (PFD), showing only information critical to flight, or a multifunction display (MFD) capable of showing a variety of system, navigation, and weather information screens. 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 and Coordinated Universal Time (UTC) offset for the clock display are initially set by the operator and maintained by the aircraft battery or optional backup power module between power cycles. However, when power is applied and the unit is connected to a GPS, the internal clock will automatically be set to UTC by the GPS. Thereafter the clock will advance based on the internal microprocessor. When connected to another Advanced Flight Systems device discrete data parameters are shared and recorded between both units, except time.

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

3.1.1. Data Description

The provided files included flight data from 8 days in July and August 2019, including the event flight on August 14, 2019. The event flight was the final data recorded by the device. The flight data were sampled once every second.

The data recorded in each file were compared and determined to be similar, except for the time parameter, as expected for an installation in which the two devices are connected. Therefore, only data from the unit configured as an MFD is plotted and provided as tabular data.

3.1.2. Engineering Units Conversions

The AF-5600 records parameters in engineering units; therefore, no conversions were necessary. Table A-1 in Appendix A lists the parameters verified and provided in this report.

3.2. Time Correlation

Each data record contained a GPS date and time stamp recorded in UTC. For the remainder of this report, all times are referenced as UTC.

3.3. Plots and Tabular Data

The following four figures contain flight data during the August 14, 2019 event.

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 event.

Figures 1 and 2 are Google Earth presentations of the flight track of the event aircraft obtained from GPS data recorded on the MFD. The event aircraft departed from Frontier Airpark (WN53), Lake Stevens, Washington at about 01:43 UTC. The last data point was recorded at about 01:53 UTC, ten minutes later, at a GPS altitude of 286 feet and an airspeed of 157 knots. The location of the wreckage is also shown for reference.

Figure 3 is a graphical presentation of the basic flight parameters including airspeed, groundspeed, altitude, pitch, roll, aileron/elevator trim, heading, baro/altimeter setting, and vertical speed recovered from the MFD for the entire event flight.

Figure 4 is a graphical presentation of engine parameters recovered from the MFD for the entire event flight. Airspeed, groundspeed, and altitude are also depicted in the figure for reference.

The corresponding tabular data used to create figures 1 to 4 are provided in CSV format as attachment 1 to this report.

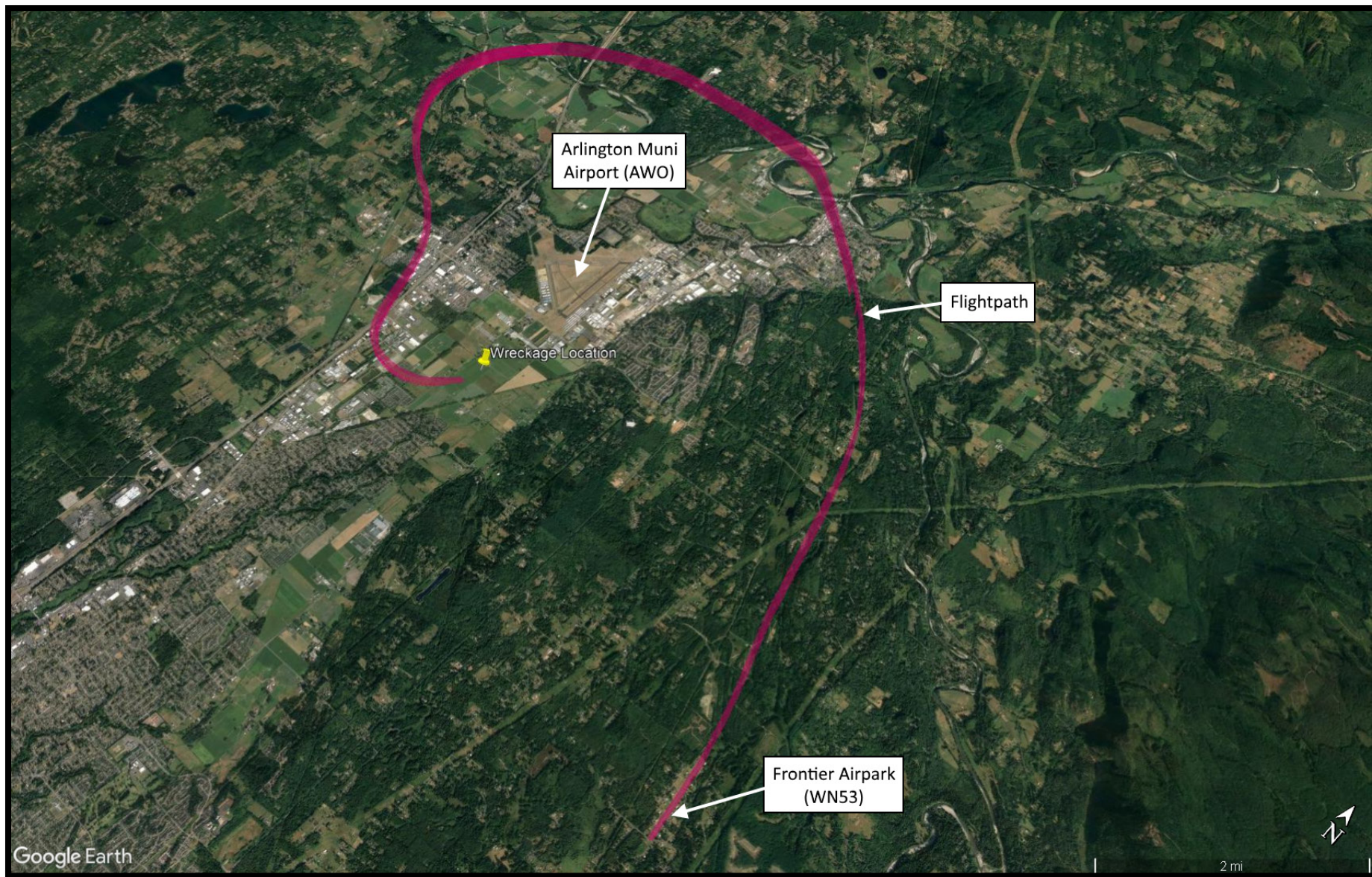


Figure 1. Google Earth overview of event flight track.

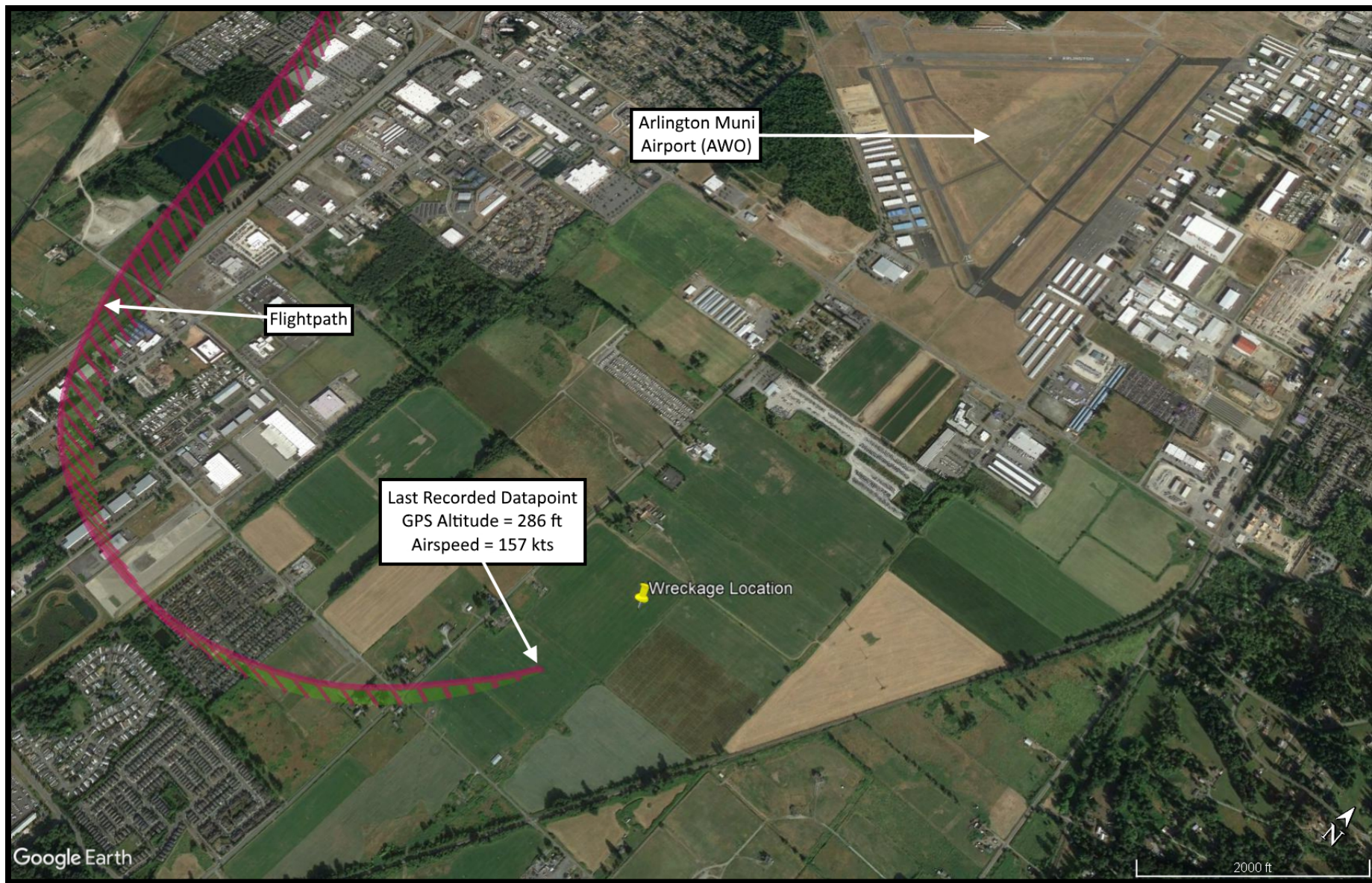


Figure 2. Google Earth overview of final recorded data on event flight.

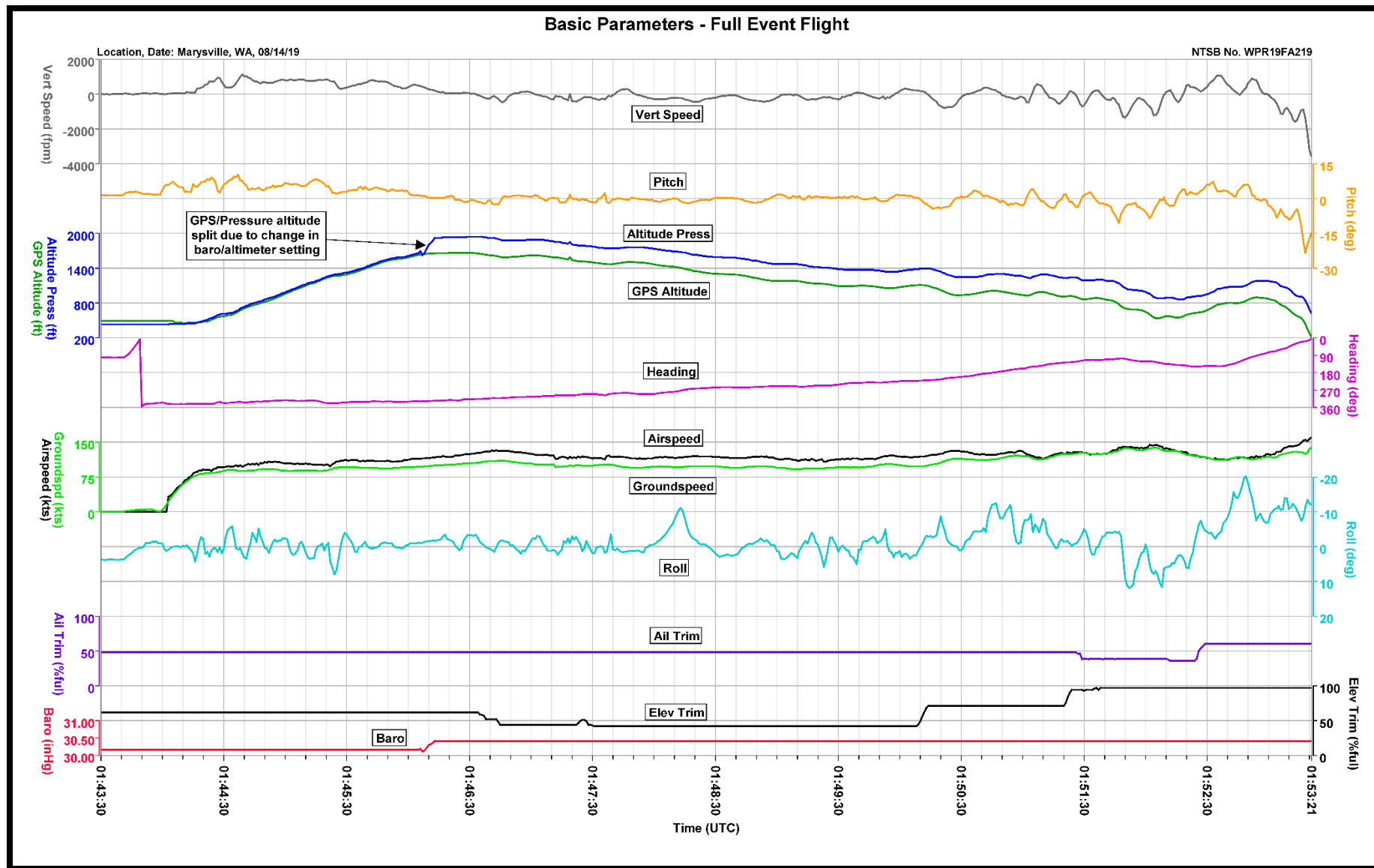


Figure 3. Plot of MFD basic parameters for full event flight.

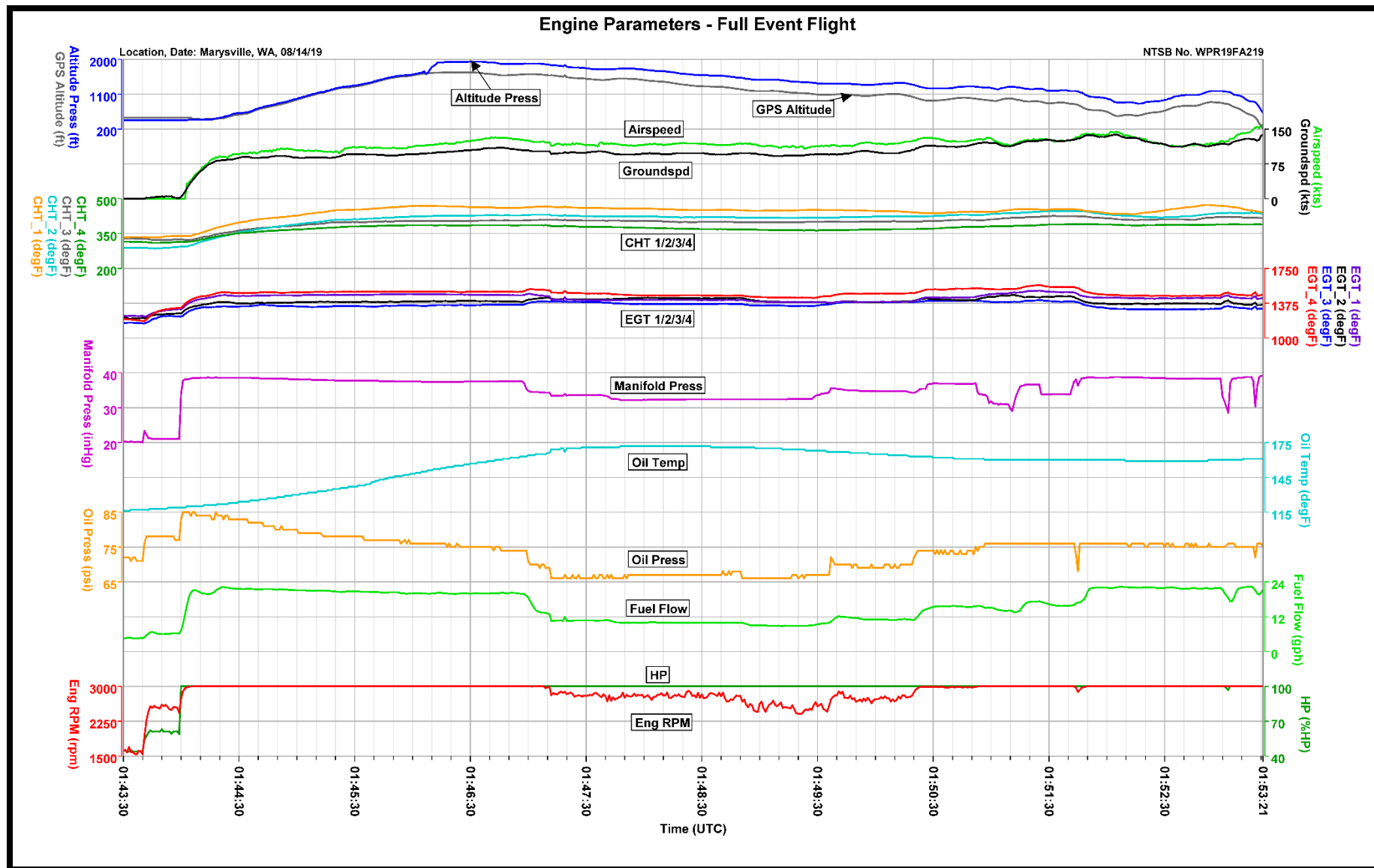


Figure 4. Plot of MFD engine parameters for full event flight.

APPENDIX A

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

Table A-1. Verified and provided parameters.

Plot/Table Labels	Parameter Names	Units
Ail Trim	Aileron Trim	%ful
Airspeed	Indicated Airspeed	kts
Altitude Press	Pressure Altitude	ft
Baro	Baro/Altimeter Setting	inHg
CHT 1/2/3/4	Cylinder Head Temperature 1/2/3/4	degF
EGT 1/2/3/4	Exhaust Gas Temperature 1/2/3/4	degF
Elev Trim	Elevator Trim	%ful
Fuel Flow	Fuel Flow	gph
Fuel Press	Fuel Pressure	psi
GPS Altitude	GPS Altitude	ft
Groundspd	Groundspeed	kts
Heading	Heading	deg
HP	Horsepower (%)	%HP
Latitude	Latitude	deg
Longitude	Longitude	deg
Manifold Press	Manifold Pressure	inHg
Oil Press	Oil Pressure	psi
Oil Temp	Oil Temperature	degF
Pitch	Pitch Angle	deg
Roll	Roll Angle	deg
Eng RPM	Engine RPM	rpm
Vertical Speed	Vertical Speed	fpm

Table A-2. Unit abbreviations.

Unit Abbreviations	Descriptions
%ful	percent of full
%HP	percent horsepower
degF	degrees Fahrenheit
ft	feet
hrs	hours
inHg	inches of mercury
kts	knots
min	minutes
rpm	revolutions per minute
sec	seconds