

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

June 6, 2022

Air Data Computer - Recorded Flight Data

Specialist's Factual Report
By David L. Case

1. EVENT SUMMARY

Location: Ely, NV
Date: July 11, 2020
Aircraft: Schleicher ASW-27-18
Registration: N167TM
Operator: Private
NTSB Number: WPR20LA216

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 the following electronic device:

Recorder Manufacturer/Model: **ClearNav CNv Variometer**
Serial Number: **Unknown**

3.1. ClearNav CNv Variometer Description

The ClearNav CNv is a panel mounted variometer and GPS receiver designed for use in sailplanes. It consists of a panel mounted display, and a separate Air Data Computer (ADC) box that mounts behind the panel. The ADC contains air pressure sensors for pitot, static, and total energy inputs. It also contains a GPS receiver.

The ClearNav CNv is also intended to be used as an FAI/IGC competition data recorder. This data is recorded to a Micro SD card contained within the device. Data is recorded at 1hz intervals, it records the following parameters and derivatives:

- Current UTC time and date
- Latitude

- Longitude
- GPS Altitude
- (GPS) Horizontal Accuracy
- (GPS) Vertical Accuracy
- Pressure Altitude
- Engine Noise Level (cheating detection)
- Main Oil Pressure (same)
- GPS Status
- Ground Speed
- Indicated Airspeed
- True Airspeed
- Wind Strength
- Wind Direction

3.1.1. ADC Data Recovery

The recorder was damaged in the event. The extent of the damage is shown in figure 1. The extraction of the memory module is shown in figure 2. The ADC successfully powered on but did not allow downloading of data because of damage to the GPS antenna coax connector and GPS daughter board. The ADC was disassembled, and the Micro SD card was extracted to be read directly.



Figure 1. Damaged exterior of air data computer.



Figure 2. Disassembled air data computer, Micro SD card

3.1.2. ADC Data Description

The ADC contained records of 68 flights over 5 years. The last recorded flight was from the day and time of the accident. The data was recorded as binary files, one per flight/power cycle. Recording typically started right before takeoff. All parameters are recorded at 1hz.

The accident file started recording at 6:18:02pm GMT. It recorded 1628 Seconds of data, which was a little over 27 minutes in length. There was no existing conversion available for the logs contained on the device, so the data was examined to determine its format and contents. A Unix timestamp time was found, along with values for latitude, longitude, altitude, ground speed and air speed. The manufacturer was contacted to confirm the data found, and determine the units used. The manufacturer responded with complete details of the log file format, which was incorporated into the data conversion.

3.1.3. ADC Engineering Units Conversions

Conversion of the ADC data from the raw recorded information to engineering units was performed, using conversion algorithms provided by the recorder manufacturer.

Where applicable, changes to the conversions have been made to ensure the parameters conform to the Safety Board's standard sign convention that climbing right turns are positive (CRT=+).¹

APPENDIX A lists the ADC parameters verified and provided in this report.

3.2. Time Correlation

Correlation of the PFD data to pacific daylight time (PDT) was established using the recorded timeUTC parameter from the ADC's log of the accident. timeUTC is recorded as seconds since 12am January First 1970 Universal Coordinated Time (UTC) and is taken from the output of the GPS receiver. Every record in the data log has a timestamp in this same format. This UTC timestamp was converted to Pacific Daylight Time (accident time) by subtracting 7 hours (25,200 seconds) from the given time.

¹ CRT=+ means that for any parameter recorded that indicates a climb or a right turn, the sign for that value is positive. Also, for any parameter recorded that indicates an action or deflection, if it induces a climb or right turn, the value is positive. Examples: Right Roll = +, Left Aileron Trailing Edge Down = -, Right Aileron Trailing Edge Up = +, Pitch Up = +, Elevator Trailing Edge Up = +.

3.3. Plots and Corresponding Tabular Data

Figures 3-6 contain ADC data recorded during the event. For figures 3 and 4 time of day and weather conditions depicted are not from the accident.

Figure 3 is the flight path as rendered by Google Earth for the entire flight. Takeoff, towing to altitude, climbing and circling consistent with following a thermal, and flight along a ridge can be seen.

Figure 4 shows the flight path as rendered by Google Earth for the end of the flight. The crash location is marked with a pin.

Figure 5 is a plot of the significant data for the whole flight graphed as trend lines. Data is shown in NTSB standard units.

Figure 6 is a plot of significant data for the last 100 seconds of the flight. The lowest recorded Indicated Air Speed was 36 kts, 2 seconds before recording ended.

The corresponding tabular data used to create these 4 plots are provided in comma separated value format as Attachment 1 to this report.



Figure 3. Overview of Entire Flight Path.

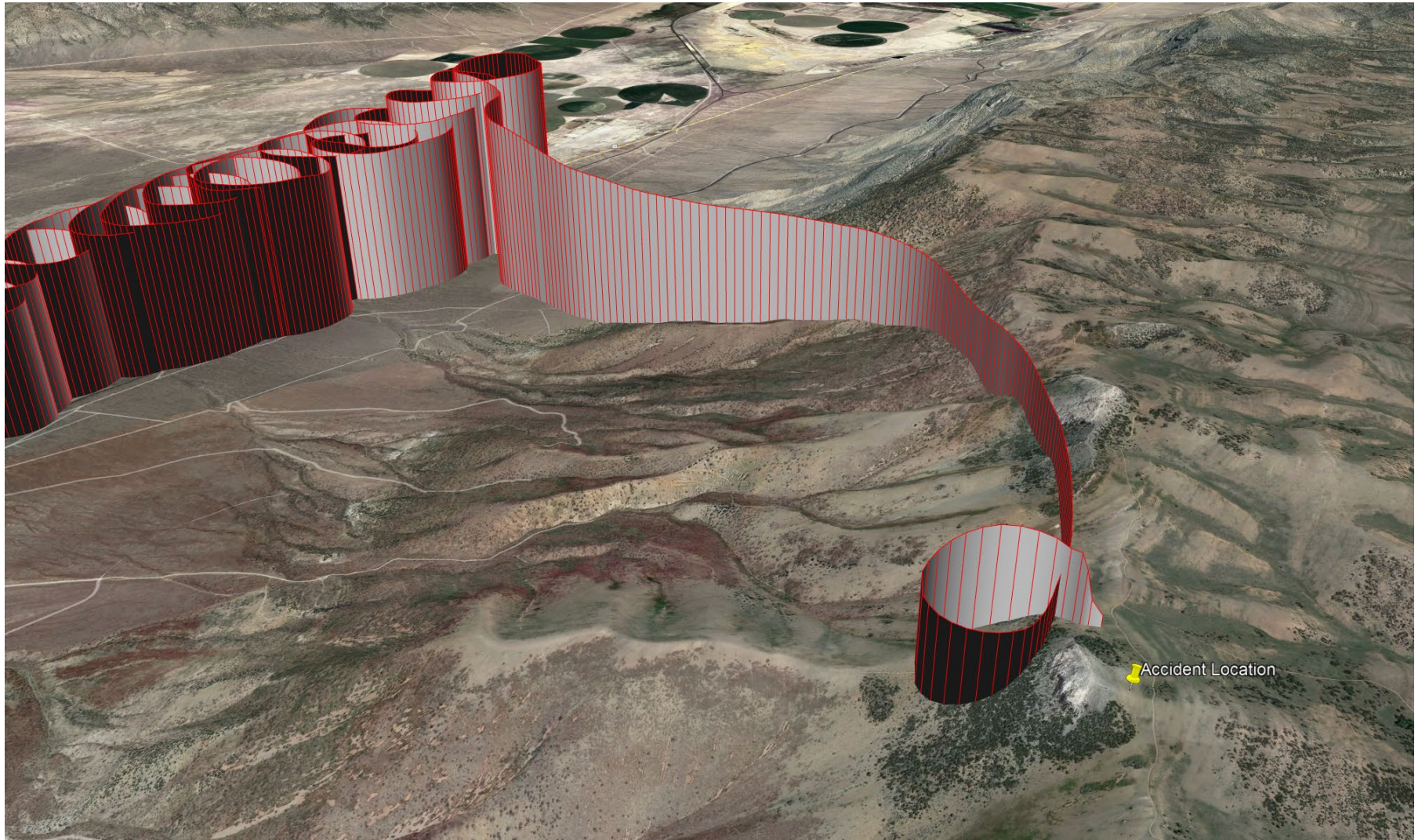
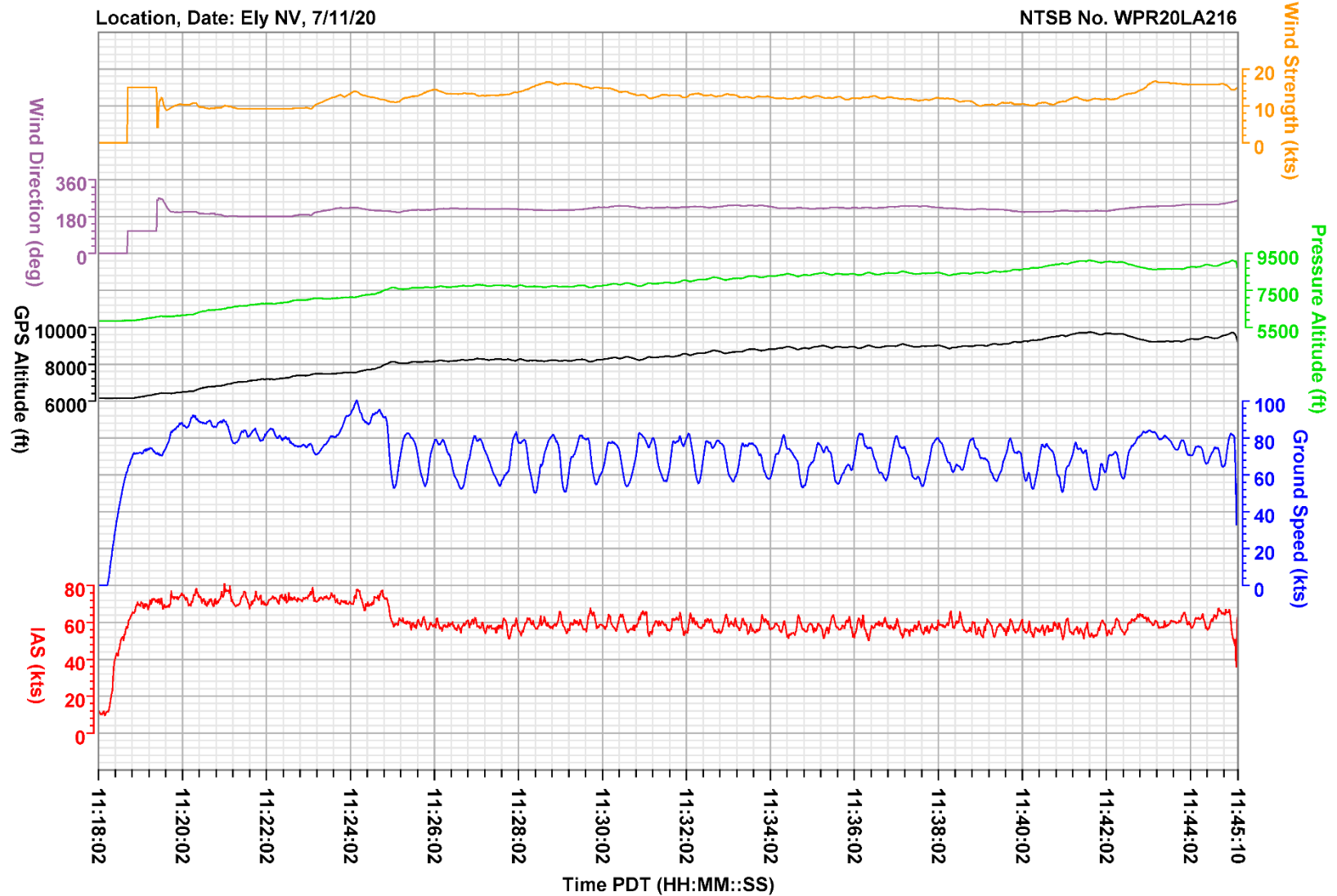


Figure 4. Accident Flight Path.

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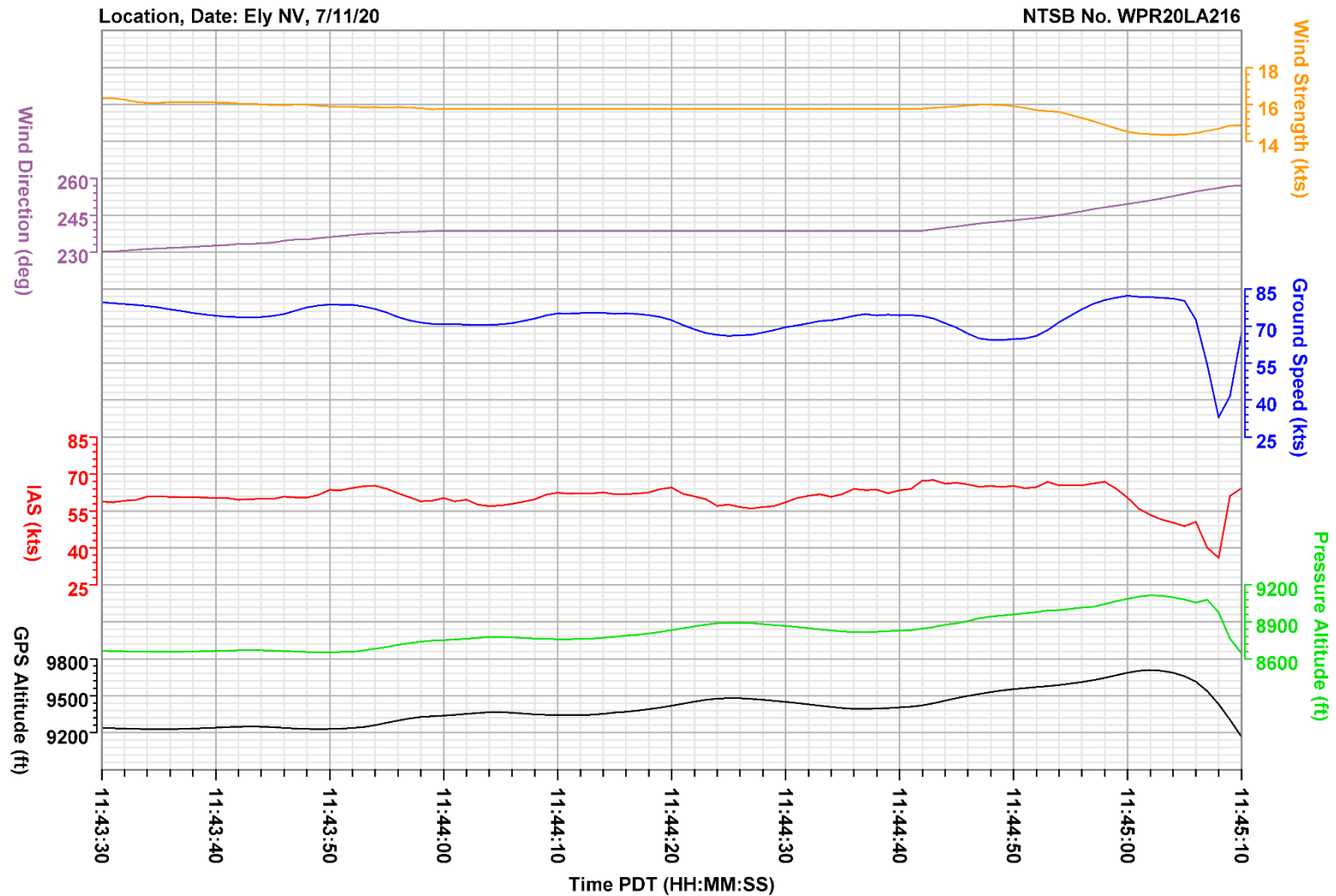


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Figure 5. Plot of the Entire Flight.

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Figure 6. Detailed Plot of Accident.

APPENDIX A - PFD Parameters

This appendix describes the parameters provided and verified in this report. Table A-1 lists the PFD parameters and table A-2 describes the unit abbreviations used in this report for PFD parameters.

Table A-1. Verified and provided parameters.

Parameter Name	Parameter Description	Units
timeUTC	Time in 32 bit Unix timestamp format (seconds since January 1 st , 1970)	seconds
lat	Latitude	decimal degrees
lon	Longitude	decimal degrees
gnssAltitude	GPS Altitude	feet
hAcc	GPS Horizontal Accuracy	millimeters
vAcc	GPS Vertical Accuracy	millimeters
sfrAltitude	Pressure Altitude	feet, at 29.92in Hg
ENL	Engine Noise Level	not calibrated
MOP	Main Oil Pressure	not calibrated
fixStatus	GPS Status Flags	-
flags	Status Flags	-
GSP	Ground Speed	knots
IAS	Indicated Air Speed	knots
TAS	True Airspeed	knots
windStrength	Wind Speed	knots
windDirection	Wind Direction	degrees
mopFlags	MOP Flags	-
mopConnectionState	MOP Flags 2	-

The ADC records pressure altitude, which is based on a standard altimeter setting of 29.92 inches of mercury (in Hg). The pressure altitude information presented in the plots and in the electronic data has not been corrected for the local altimeter setting at the time of the event.