

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

July 11, 2018

Cockpit Display – Recorded Flight Data

Specialist's Factual Report
By Sean Payne

1. EVENT SUMMARY

Location: Paulding, Ohio
Date: December 28, 2017
Aircraft: Pipistrel Virus SW
Registration: N4JW
Operator: Private
NTSB Number: CEN18LA064

On December 28, 2017, about 1630 eastern standard time, a Pipistrel Virus SW airplane, N4JW, impacted terrain during a forced landing on a road following an inflight loss of engine power near Paulding, Ohio. The pilot, who was the sole occupant, was uninjured. The airplane sustained substantial wing damage when it exited the road and impacted vegetation and rough terrain. The airplane was registered to and operated by the pilot as a 14 *Code of Federal Regulations* Part 91 personal flight. Day visual meteorological conditions prevailed in the area about the time of the accident, and the flight was not operated on a flight plan. The local flight originated from a private airport near Paulding, Ohio.

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 devices:

Recorder Manufacturer/Model: **Dynon SV-HDX1100**
Recorder Serial Number: **11917**

Recorder Manufacturer/Model: **Dynon SV-HDX1100**
Recorder Serial Number: **11879**

3.1. Dynon SV-HDX1100

The device has an 11" screen with both a touchscreen and softkey interface. The device can serve as either a Primary Flight Display (PFD) or a Multifunction Display (MFD) depending on installation. The unit has a solid-state Air Data and Attitude Heading Reference System (ADAHRS) and displays aircraft parameter data including altitude, airspeed, attitude, vertical speed, and heading. The unit also has external pitot/static inputs for altitude, airspeed, and

vertical speed information. The device contains an internal flash memory device. The flash memory stores information sampled every 60 milliseconds for the last two hours of flight in a file called a “Black_Box_Log,” detailed alert logs that show both caution, warning and aural alerts generated by the display in a file called “Alert_Data,” as well as a flight history log which is sampled at a lower rate that can record many more hours of operation. The flight history is recorded as a file called “User_Log” and is sampled about every 130 milliseconds.

3.2. Dynon SV-HDX1100 Data Recovery

Both recorders were in good condition and the data were downloaded using the manufacturer’s procedure. Figure 1 is a picture of the “left” display, functioning as the aircraft’s PFD, and the “right” display, functioning as the aircraft’s MFD.

Power was applied to both units and the internal memory was accessed via a maintenance download function.

Figure 1. A photo of both units, the PFD (left) and the MFD (right).



3.2.1. Dynon SV-HDX1100 Data Description

The PFD’s “User_Log” contained records of various flights and power cycles between December 18, 2017, and December 28, 2017. The “Alert_Data” log contained caution and warning as well as aural alert records for the device between the dates of October 10, 2017 and December 28, 2017, on all three data files. The “Black_Box_Log” file contained high rate data between December 27, 2017, and December 28, 2017. The accident flight was associated with the logs created on December 28, 2017,¹ on all three data files. The duration of the accident recording on December 28, 2017, was approximately 18 minutes and 49 seconds.

Log files were reviewed from the MFD and matched those of the PFD described above. There were no additional engine data recorded in any of the MFD’s log files.

3.2.2. Dynon SV-HDX1100 Engineering Units Conversions

Conversion of the data from the raw recorded information to engineering units is performed internally by the device.

¹ During the normal data retrieval process, power is applied to the PFD. Therefore, the accident data is not necessarily the last power cycle recorded.

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=+).²

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

The data files downloaded from the MFD were identical as compared to the PFD and not provided in this report.

3.3. Dynon SV-HDX1100 Time Correlation

Data was recorded in Universal Coordinated Time (UTC). The plotted information was left in UTC and was not converted to local time of the accident.

3.4. Plots and Corresponding Tabular Data

The following four figures contain PFD data recorded during the December 28, 2017 event.

Figure 2 is a plot of basic flight parameters and most significant recorded engine parameters for the entire accident flight. Alert data from the "Alert Data" log is overlaid on the plot. At 21:10:25, the autopilot was shown as engaged in mode "3" (autopilot control in both pitch and roll axis). Between 21:10:48 and 21:14:40, the "Alert Data" log showed multiple aural alerts of the autopilot being connected and disconnected. At 21:14:12, an alert for "AP Mode – Airspeed Low" was issued. At 21:14:41, an aural alert for "Fuel Pressure Low" was issued by the system. The trace for fuel pressure at this time dropped to about 25 psi 7 seconds after the "Fuel Pressure Low" alert was issued. Values for fuel pressure and fuel flow continued to fluctuate and drop for the remainder of the recording. Values for throttle position and manifold pressure continued to fluctuate and drop as well. Altitude first increased after the "Fuel Pressure Low" alert and then decreased for the remainder of the recording. Data ended at 21:18:42.

Figure 3 is a plot showing the details of the final portion of the aircraft's flight. The plotted time interval is between 21:13:00 and 21:19:00.

Figure 4 is a Google Earth overlay of the aircraft's groundtrack during the accident flight.

Figure 5 is a Google Earth overlay of the aircraft's groundtrack during the final portion of flight.

The corresponding tabular data used to create these four plots are provided in electronic (*.csv³) format as Attachment 1 to this report. The "Alert_Data" log is provided in electronic (*.csv) format as Attachment 2 to this report.

² 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 Comma Separated Value format.

Figure 2. Plot of basic parameters during entire flight.

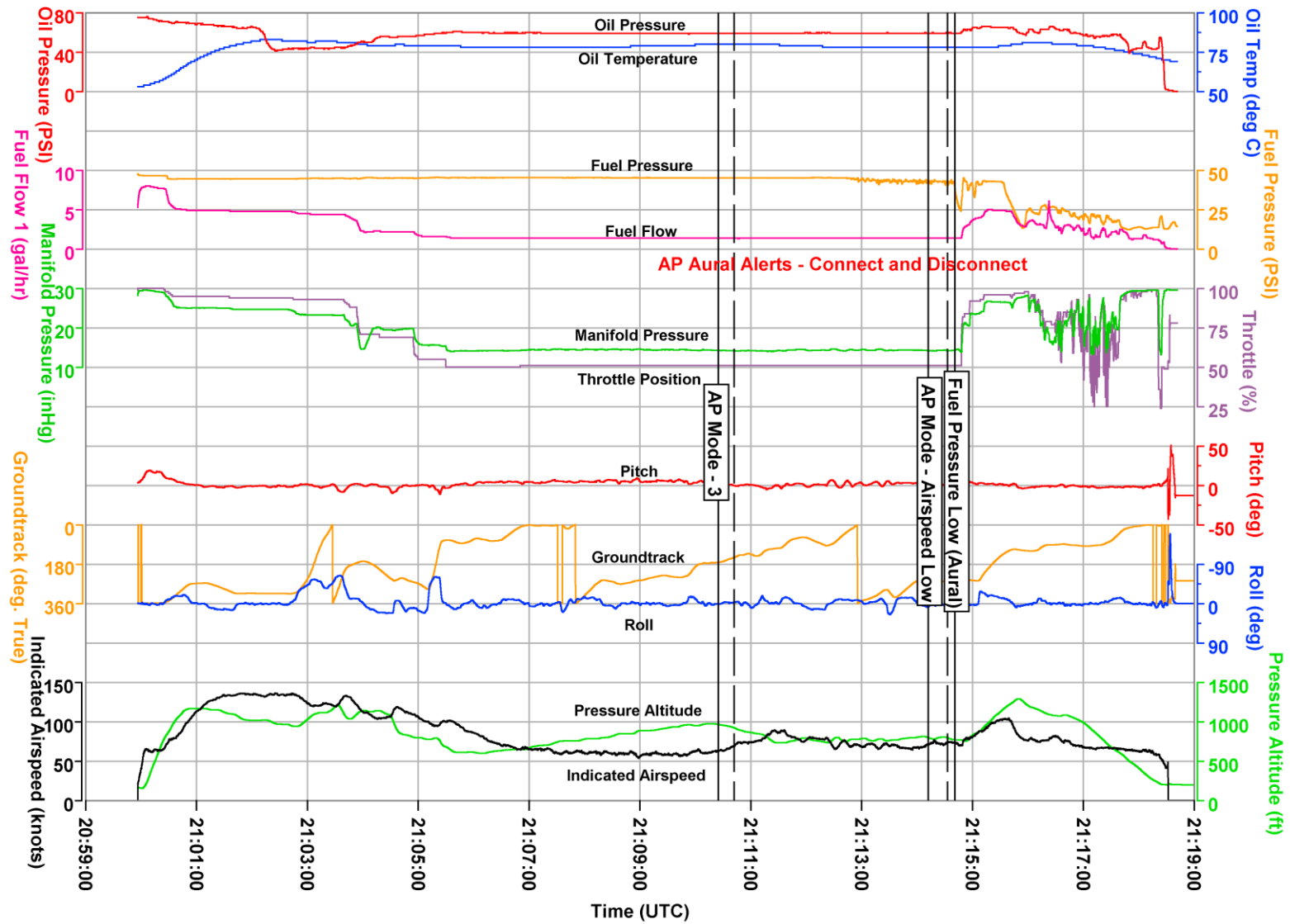


Figure 3. Plot of basic parameters during final portion of flight.

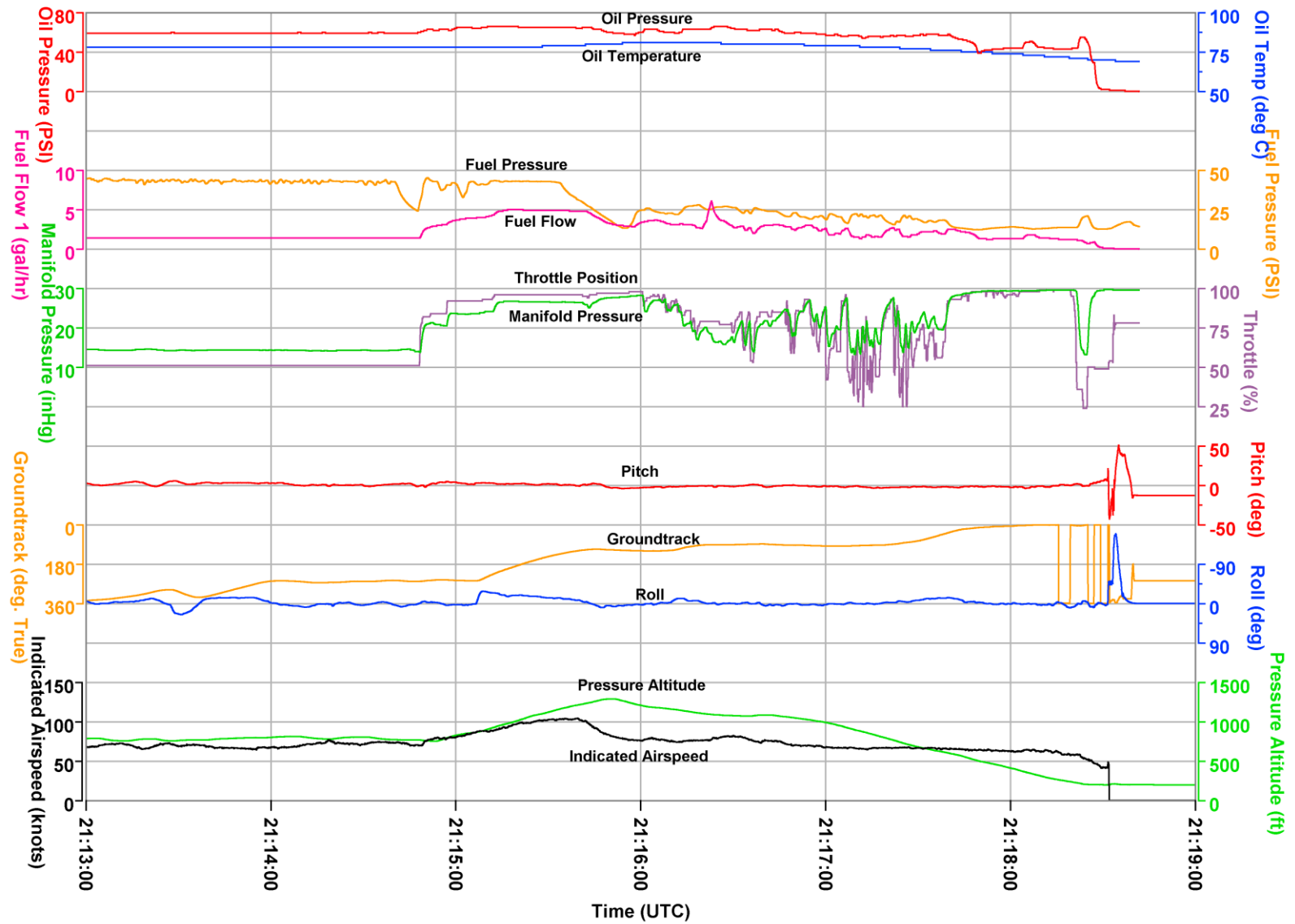


Figure 4. Google Earth overlay of the entire flight.



Figure 5. Google Earth overlay showing the final portion of flight.



APPENDIX A - PFD Parameters

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

Table A-1 - Verified and provided parameters.

Parameter Name	Parameter Description	Source
Fuel Pressure (psi)	Fuel Pressure	PFD
Fuel Flow (gal/hr)	Fuel Flow	PFD
Groundtrack (deg. True)	Groundtrack	PFD
Indicated Airspeed (knots)	Indicated Airspeed	PFD
Manifold Pressure (inHg)	Manifold Pressure	PFD
Oil Pressure (psi)	Oil Pressure	PFD
Oil Temperature (deg. C)	Oil Temperature	PFD
Pitch (deg)	Pitch	PFD
Pressure Altitude (ft)	Pressure Altitude	PFD
Roll (deg)	Roll	PFD
Throttle Position (%)	Throttle Position	PFD

Table A-2 - Unit abbreviations.

Units Abbreviation	Description
%	Percent
deg	degrees
deg C	degrees Celsius
deg True	degrees true
ft	feet
gal/hr	gallons per hour
inHg	inches of mercury
knots	knots
Psi	pounds per square inch

NOTE: For parameters with a unit description of discrete, 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.