

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

June 22, 2022

Cockpit Displays

Specialist's Factual Report by Gerald Kawamoto

1. EVENT

Location: Hana, Hawaii
Date: January 15, 2022
Aircraft: Flight Design CTLS
Registration: N992SA
Operator: Private
NTSB Number: ANC22LA012

2. DETAILS OF INVESTIGATION

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

Device:	Dynon EMS-D120
Device Serial Number:	002095
Device:	Dynon EFIS-D100
Device Serial Number:	003548

2.1. Dynon EMS-D120 Description

The Dynon EMS-D120 is a panel-mounted Engine Monitoring System (EMS) capable of displaying EMS data on a 7-inch LCD display. Data are stored on non-volatile memory.¹

2.1.1. Dynon EMS-D120 Data Recovery

Upon arrival at the Vehicle Recorder Division, an external examination revealed minor damage to the display, as shown in Figure 1. The display was nonfunctional upon powering, however, the device interfaced normally with laboratory equipment and data were extracted using the manufacturer's software.

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



Figure 1. Dynon EMS-D120 as received.

2.1.2. Dynon EMS-D120 Data Description

The date recorded on the device was not valid. Device data were correlated to the event by comparing known information, such as previous legs of the flight leading up to the event and the reported wreckage location. Time on the device is referred to as Device Time. Data were sampled once every 10 seconds.

The event recording started at 19:37:07 Device Time and ended at 19:44:47 Device Time. After 19:44:47 Device Time, data appears to become invalid.

2.1.3. Parameters Provided

Data were downloaded in engineering units and no conversions were performed. Table 1 describes data parameters provided by the device and validated by the recorder specialist.

Table 1. Dynon EMS-D120 Data Parameters.

Parameter Name (units)	Parameter Description (units)
Time	Device Time
grnd spd (kts)	Ground Speed (knots)
grnd trk (deg)	Ground Track (degrees)
man pres (inHg)	Manifold Pressure (inches of Mercury)
rpm	Engine RPM (revolutions per minute)
oil pres (psi)	Oil Pressure (pounds per square inch)
oil temp (degF)	Oil Temperature (degrees Fahrenheit)
fuel flow (gph)	Fuel Flow (gallons per hour)
fuel pres (psi)	Fuel Pressure (pounds per square inch)
gals rem (gal)	Fuel Remaining (gallons)
egt # (degF)	Exhaust Gas Temperature # (degrees Fahrenheit)
cht # (degF)	Cylinder Head Temperature # (degrees Fahrenheit)
volts (V)	Voltage (volts)

2.2. Dynon EFIS-D100 Description

The Dynon Electronic Flight Information System (EFIS) D100 is a 7" wide screen display mounted in the cockpit of non-type certificated aircraft. The instrument integrates multiple flight instruments including airspeed, altitude, gyro-stabilized magnetic compass, turn rate, slip/skid ball, bank angle, pitch angle and vertical speed. The unit contains an Air Data, Attitude and Heading Reference System (ADAHRS) to provide air data, attitude, and heading information to the display.

Depending on the firmware version on the unit, the ability to log data to internal memory exists. According to the manufacturer, firmware versions 5.0 and later contain the ability to log certain EFIS and GPS parameters. The data logging must be configured by the operator to enable logging and set the data log interval.

2.2.1. Dynon EFIS-D100 Data Recovery

The device was in good condition upon arrival at the Vehicle Recorder Division, as shown in Figure 2. The device powered on normally, however, the "RECORDING" function was set to "OFF", as shown in Figure 3. Therefore, no data were recovered from this device.

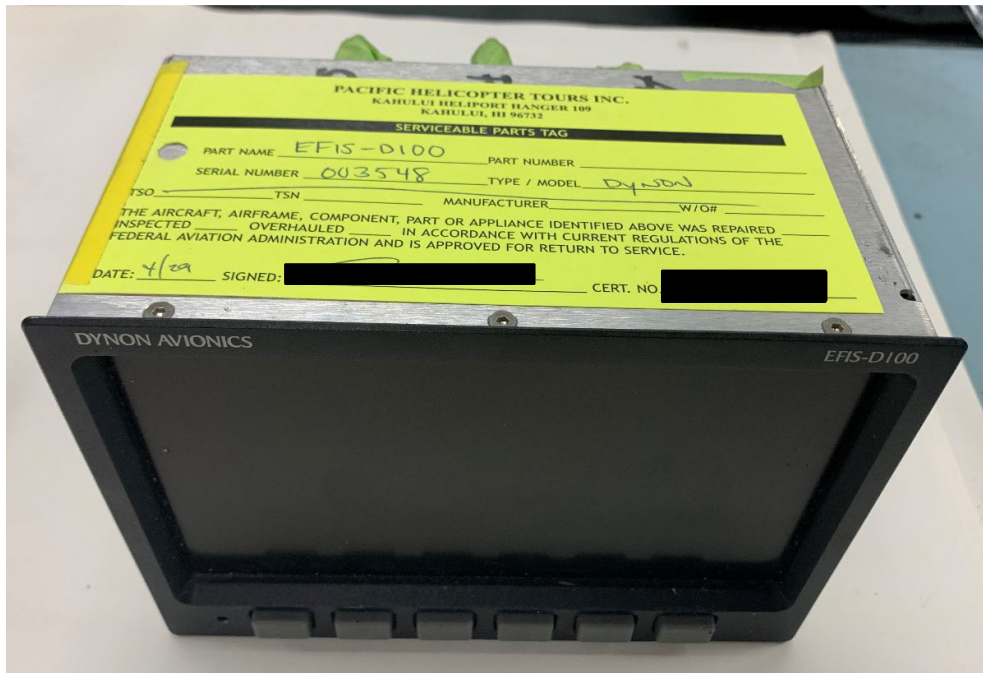


Figure 2. Dynon EFIS-D100 as received.

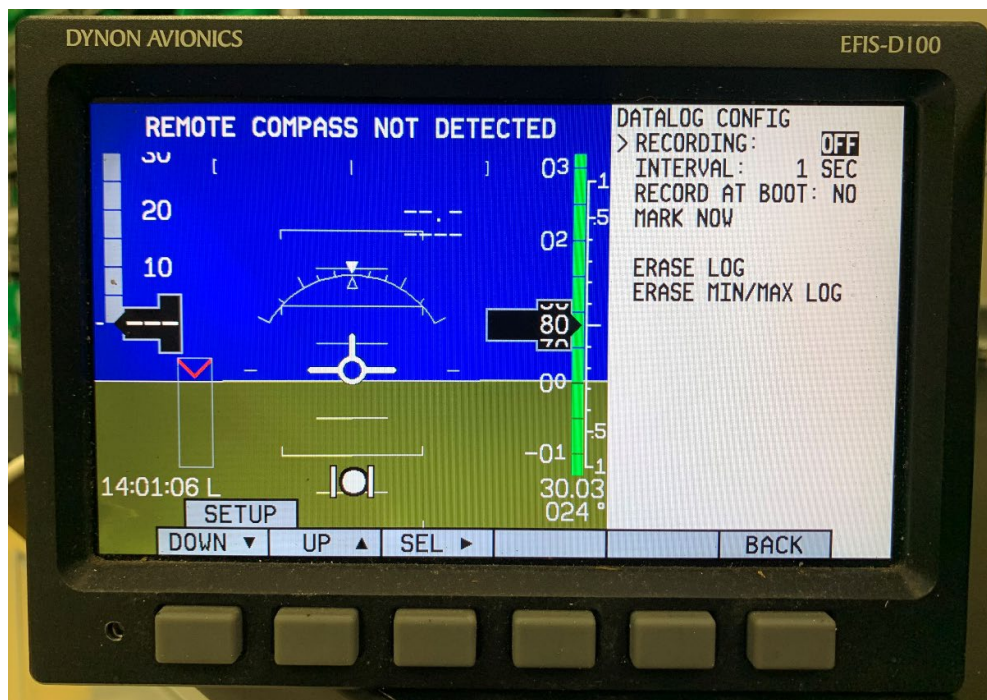


Figure 3. Screen showing recording function set to "OFF" on Dynon EFIS-D100.

3. Plots and Corresponding Tabular Data

Figure 4 is a graphical overlay generated in Google Earth for the event flight. Weather and lighting conditions shown in Google Earth may not be representative of the conditions at the time of the event flight.

Figure 5 is a plot of parameters for the entire event session. The time interval displayed is 19:36:00 to 19:45:00 Device Time. 19:44:47 Device Time appears to be the final valid data point.

The corresponding tabular data used to create Figures 4 and 5 are provided in electronic comma-separated value (csv) format as Attachment 1 to this report. Attachment 1 contains additional parameters, however, not all parameters were validated by the specialist.

Submitted by:
Gerald Kawamoto
Electrical Engineer (Recorder Specialist)



Figure 4. Google Earth overlay of the entire event session.

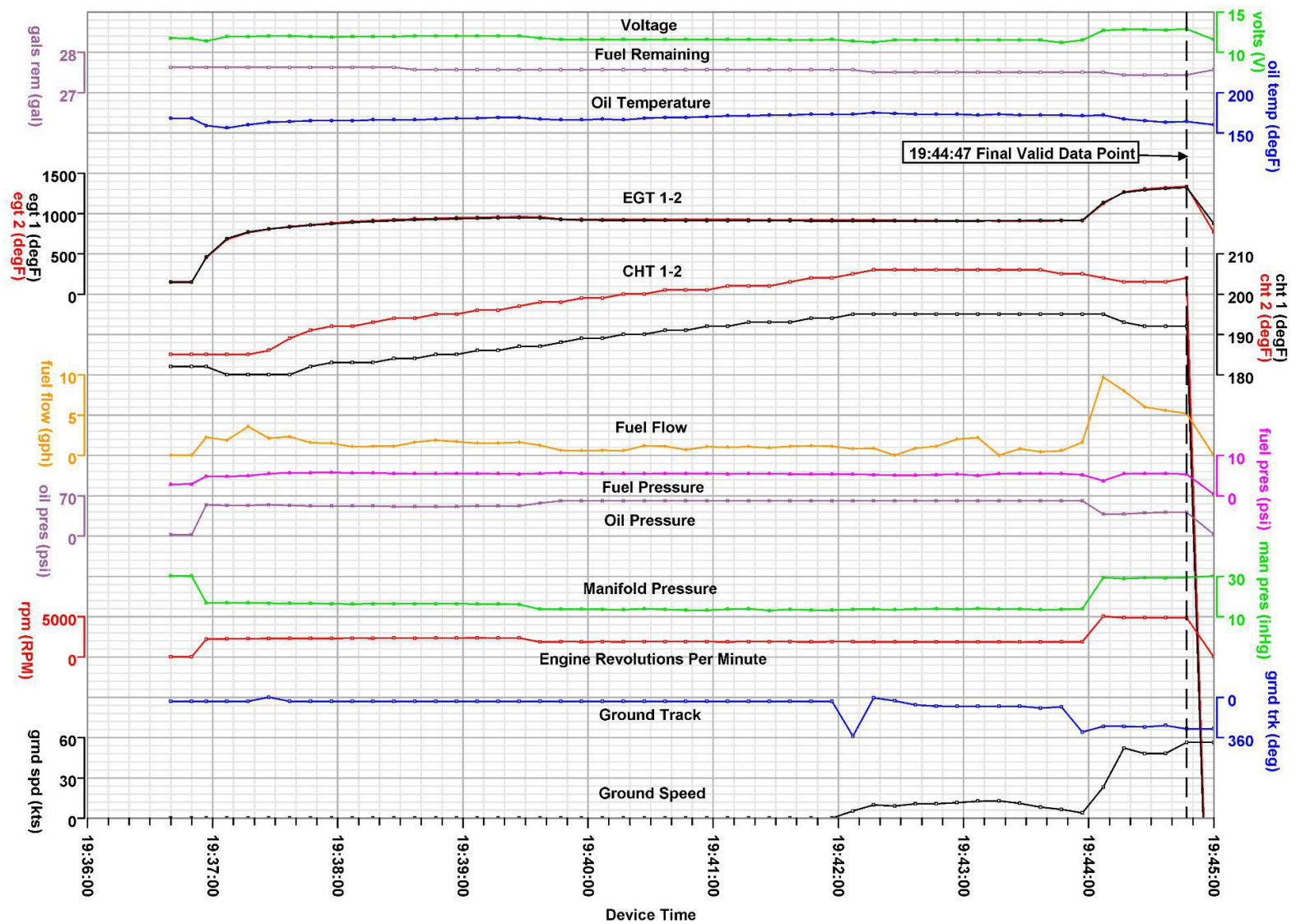


Figure 5. Plot of parameters recorded on the Dynon EMS-D120 for the entire event session.