

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA23LA121

COCKPIT DISPLAYS

Specialist's Factual Report

August 4, 2023

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A. ACCIDENT

Location: Hartford, Connecticut
Date: January 28, 2023
Time: 1542 eastern standard time (EST)
2042 coordinated universal time (UTC)
Airplane: Lancair 4P, private operator, N550LX

B. COCKPIT DISPLAYS SPECIALIST

Specialist: Gerald Kawamoto
Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A group was not convened. The NTSB Vehicle Recorder Division received the following devices:

Recorder Manufacturer/Model: Garmin GTN 750
Recorder Serial Number: Unknown

Recorder Manufacturer/Model: Garmin GDU 460 (PFD)
Recorder Serial Number: Unknown

Recorder Manufacturer/Model: Garmin GDU 460 (MFD)
Recorder Serial Number: Unknown

1.0 Device Description

The Garmin G3X is a series of displays that comes in a 10.6-inch (GDU 460) or a 7-inch (GDU 470) version. The unit employs a touch-screen user interface and can be utilized as a Primary Flight Display (PFD), Multi-Function Display (MFD), Engine Monitoring Device, or a combination of all, depending on how the unit is integrated with other compatible avionics products. Each unit is capable of recording data via an externally mounted SD card under the center of the screen, or internally on a series of non-volatile memory chips.¹

The Garmin GTN 750 is a panel-mounted navigator featuring an 800 x 600 pixel, 6.9-inch color liquid crystal (LCD) display. It has a GPS/SBAS engine and is TSO-c146c certified for primary domestic, oceanic, and remote navigation including

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

enroute, terminal, and non-precision approaches, and approaches with vertical guidance, such as LPV and LNA/VNAV. The unit can simultaneously give aviators vital approach information and weather and traffic data in relation to their position on a large, color moving map display. Its color moving map features a built-in database that shows cities, highways, railroads, rivers, lakes, and coastlines. The unit has a slot on the front for a Jeppesen database containing all airports, VORs, NDBs, Intersections, FSSs, Approaches, DPs/STARs and SUA information. A flight plan composed of multiple waypoints, including user-defined waypoints, can be programmed in the unit. The GTN 750 also includes a TSO approved airborne VHF communications transceiver and TSO approved airborne VOR/Localizer and Glideslope receivers. The unit contains an internal SD card storing flight log data, which can be accessed through the slot in the right side of the unit. If the unit is equipped with a firmware v6.50 or later, the internal SD card will store a limited set of flight data information.

1.1 Data Recovery

All devices had sustained extensive fire damage rendering them inoperable. Figure 1, Figure 2, and Figure 3 show the GTN, PFD, and MFD, respectively, as received. The GTN 750 sustained damage to its internal electronics, thus no data were recovered. The NVM chips from the PFD and MFD were in good condition and were removed, installed on a functioning lab surrogate board, and data were exported normally using the manufacturer's procedures.

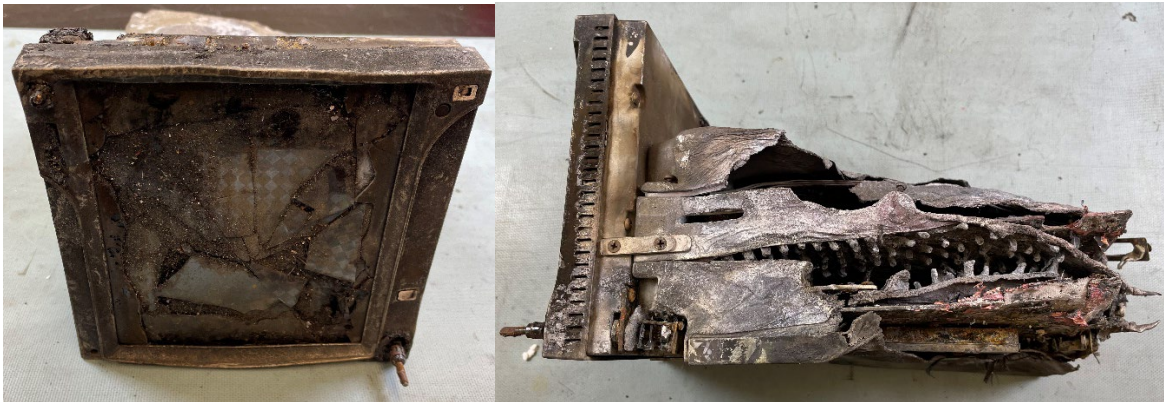


Figure 1. Front and side of the Garmin GTN 750 as received.



Figure 2. Front and back of the Garmin GDU 460 PFD as received.



Figure 3. Front and back of the Garmin GDU 460 MFD as received.

1.2 Recording Description

Data from the PFD and MFD were compared and found to be redundant, thus only PFD data are included in this report. Data extracted from the PFD included sessions from October 20, 2022, through January 28, 2023.² The accident session started at 20:22:58.00 UTC and ended 20:41:21.61 UTC on January 28, 2023. The accident session included an aborted takeoff (about 20:32 to 20:33), and subsequently showed the aircraft taxiing back on the ramp before proceeding back to runway 20. Data concluded with the aircraft at runway 20, however the takeoff and accident event were not captured.

² All dates and times are referenced to coordinated universal time (UTC).

1.3 Parameters Provided

Table 1 describes data parameters provided by the Garmin GDU 460 PFD.

Table 1. Garmin GDU 460 PFD Parameters.

Parameter Name (units)	Parameter Description (units)
Date	Date for recorded data point (MM/DD/YYYY)
Time	Time (UTC) for recorded data point (HH:MM:SS)
Latitude	Recorded Latitude (degrees)
Longitude	Recorded Longitude (degrees)
GPS Altitude	Recorded GPS Altitude (feet)
Groundspeed (kt)	Average derived groundspeed (knots)
True Airspeed (kt)	True Airspeed (knots)
Indicated Airspeed (kt)	Indicated Airspeed (knots)
Fuel L Qty (gal)	Left Fuel Indicator (gallons)
Fuel R Qty (gal)	Right Fuel Indicator (gallons)
Fuel Press (PSI)	Fuel Pressure (pounds per square inch)
Fuel Flow (gal/hr)	Fuel Flow (gallons per hour)
NP RPM	Propeller Revolutions Per Minute
NG RPM (%)	Gas Generator Speed (percent)
Torque	Torque
Oil Temp (deg F)	Oil Temperature (degrees Fahrenheit)
Oil Press (PSI)	Oil Pressure (pounds per square inch)

D. OVERLAYS AND TABULAR DATA

Data obtained from the PFD were used to produce the plots and tabular data. Figure 4 is a graphical overlay generated using Google Earth for the accident session. Green arrows indicate the direction of travel. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 5 is a plot of Garmin GDU 460 PFD parameters for the accident session. The time displayed is 20:22:00 UTC to 20:42:00 UTC.

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. Not all parameters recorded were validated by the recorder specialist.

Submitted by:

Gerald Kawamoto
Recorder Specialist



Figure 4. Google Earth overlay of the accident session recorded on the Garmin GDU 460 PFD.

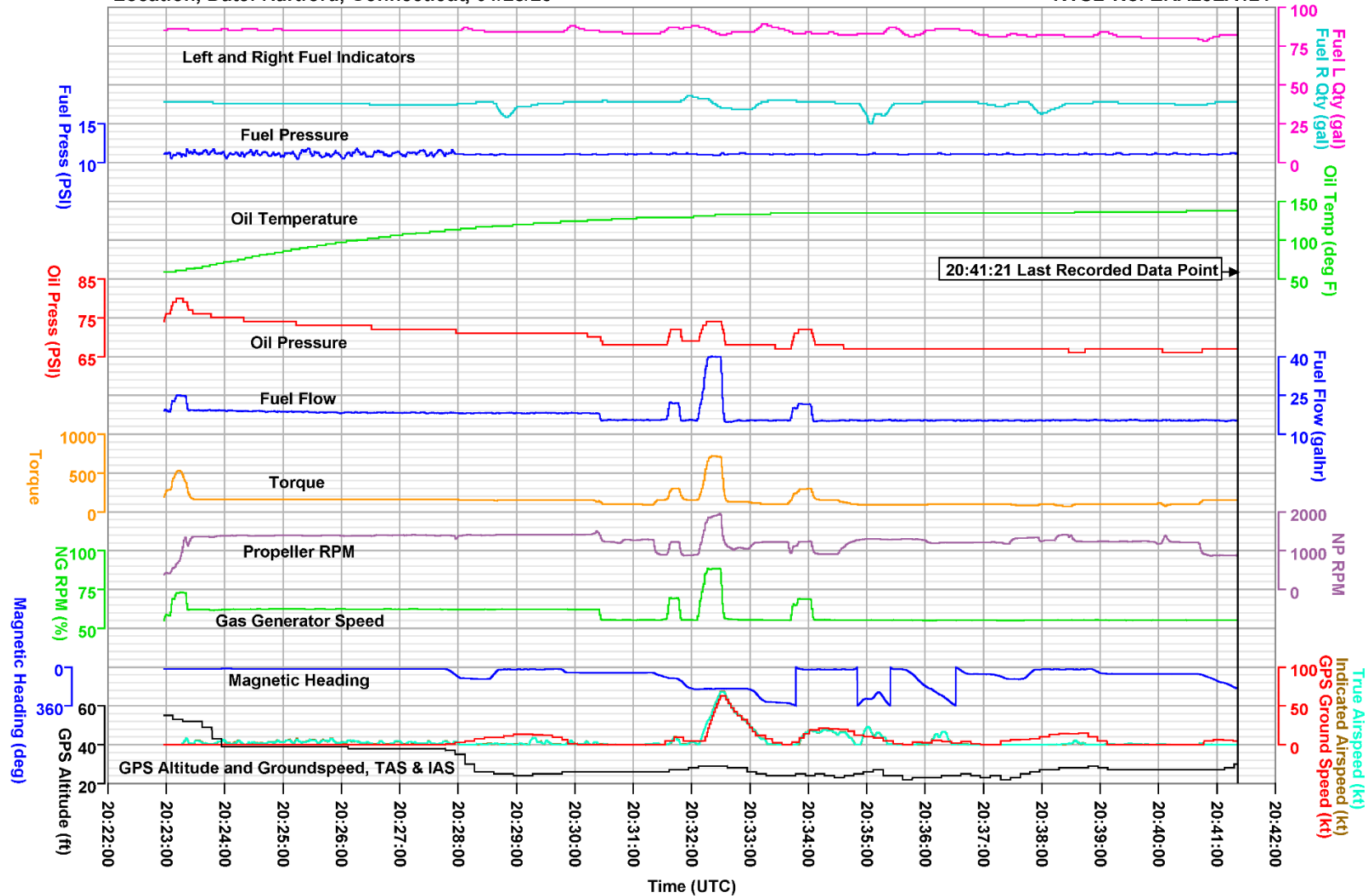


Figure 5. Plot of Garmin GDU 460 PFD parameters for the accident session.