

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ANC23FA042

GLOBAL POSITIONING SYSTEM DEVICE

Specialist's Factual Report

July 29, 2024

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A. ACCIDENT

Location: Shaktoolik, Alaska
Date: June 16, 2023
Time: 1135 Alaska daylight time (AKDT)
1935 coordinated universal time (UTC)
Airplane: Cessna 180H, Golden Eagle Outfitters, Inc., N91361

B. GLOBAL POSITIONING SYSTEM DEVICE SPECIALIST

Specialist: Steven Smith
Mechanical Engineer (Recorder Specialist)
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A global positioning system (GPS) device group was not convened. The NTSB Vehicle Recorder Division received the following GPS device:

Recorder Manufacturer/Model: Garmin aera 760
Recorder Serial Number: 6HC002693

1.0 Garmin aera 760 Description

The Garmin aera 760 is a battery-powered portable multi-function display and GPS receiver with a sunlight readable 7-inch diagonal touch screen operation display. The unit includes a built-in Jeppesen database and can receive XM satellite radio for flight information including NEXRAD radar, lightning, METARs, TAFs, and TFRs. The unit can also perform and store weight and balance calculations. A built-in AOPA Airport Directory and Safe Taxi Airport Diagrams are included for selected fields. The unit stores date, route-of-flight, and flight-time information for up to 50 flights. The unit has 23 different map ranges available, from 200 feet to 800 nm. A flight record is triggered when groundspeed exceeds 30 knots and altitude exceeds 250 feet and ends when groundspeed drops below 30 knots for 10 minutes or more. A detailed track log – including latitude, longitude, date, time, and GPS altitude information – is stored within the unit whenever the receiver has a lock on the GPS navigation signal. Position is updated within the track log as a function of time or distance moved, depending on how the unit has been configured. Once the current track log memory becomes full, new information overwrites the oldest information or recording stops, depending on how the unit is configured. The current track log can be saved to long-term memory and 15 saved track logs can be maintained in addition to the current track log. Track log storage may be activated or de-activated at user discretion. All

recorded data is stored in non-volatile memory.¹ The unit contains hardware and software permitting the download of recorded waypoint, route, and track log information to a PC via built-in USB port. An internal button-battery is used to back-up power to the internal memory and real-time clock during those periods when main power is removed.

1.1 Garmin aera 760 Data Recovery

The NTSB Vehicle Recorder Laboratory received a damaged Garmin aera 760, as shown in figure 1. The Garmin aera 760 device was opened and the memory chip was dislodged from the circuit board, as shown in figure 2. The chip was examined under a microscope and significant damage was observed. Examination of the chip revealed damage that precluded normal recovery procedures; thus, no data were recovered (see figure 3). No data were recovered by normal methods.



Figure 1. Garmin area 760 as received at the NTSB Vehicle Recorder Laboratory.

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

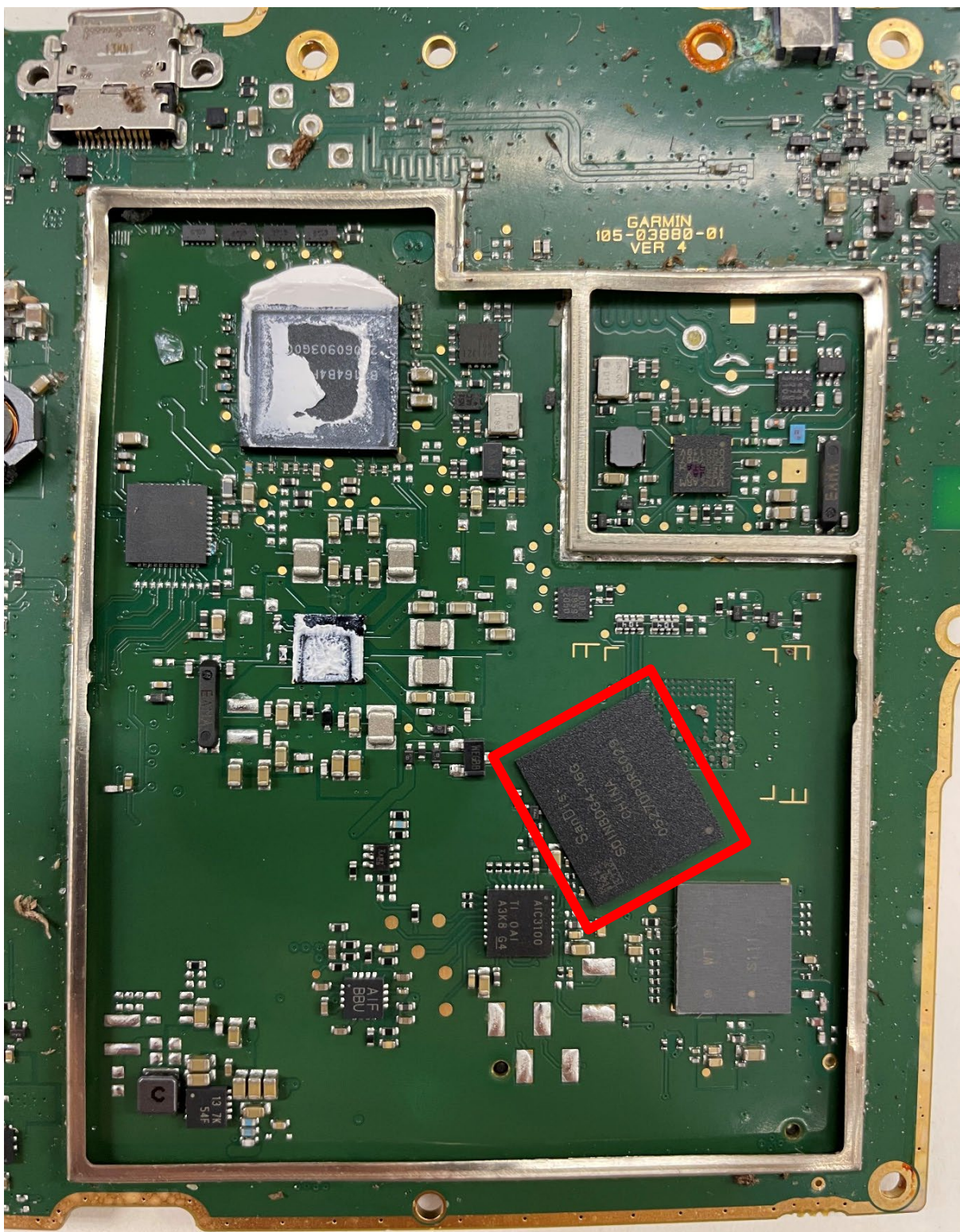


Figure 2. Garmin aera 760 circuit board with memory chip dislodged from the board (red box).

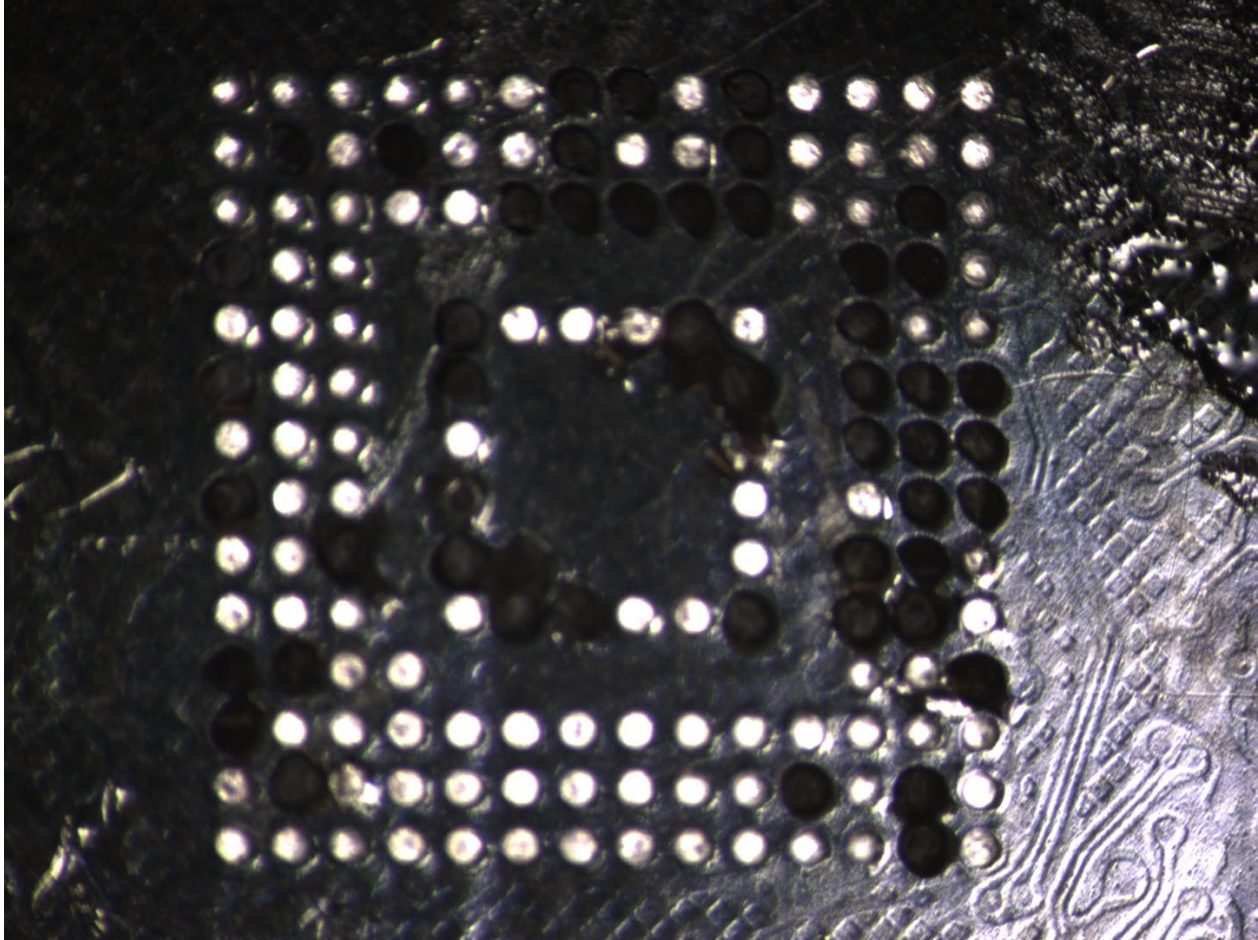


Figure 3. Garmin aera 760 microscopic memory chip image showing damage.

1.2 Advanced Data Recovery Techniques

The NTSB Vehicle Recorder's Laboratory contacted a third-party data recovery service provider. The provider received the damaged chip on January 31, 2024. On February 22, 2024, the provider completed the job and notified the NTSB that the data recovery was successful. The chip, with two thumb drives containing the recovered data and forensic image, was shipped back to the NTSB on March 4, 2024, and arrived at the lab on March 6, 2024. Specialists reviewed the forensic image and the data recovered and were unable to locate any tracked logs stored.

1.3 Advanced Data Recovery Techniques - Surrogate Device

The provided image of the chip was uploaded to a surrogate unit and data were extracted normally. Upon review of the contents, the accident flight was not captured.

D. RESULTS

The surrogate device powered on normally with the image copy memory chip installed (see figure 4). The "Tools" menu was queried and a subset of menus were displayed (see figure 5). The first menu that was checked was the "Flight Logs", which had a total of 29 logs from June 3, 2023, to June 16, 2023 (the day of the accident). There were 4 logs recorded on June 16, 2023 (see figure 6). When selecting on these logs, only the beginning and ending waypoint were displayed, but no parametric data was available (see figures 7 through 9).

The next menu that was examined was the "Track Log," which when queried contained "No Saved Tracks" (see figure 10). The "Menu" button on the bottom left corner of the screen was pressed, which brought up the "Map Setup" menu (see figure 11). The middle row displayed a query for "Track Log Record Mode," which was set to "Off" (see figure 12). The operator may select the "Track Log Record Mode" to either "Off," not recording, "Fill," which will stop recording when the memory is full, or "Wrap," which will continue to record and overwrite older recordings (see figure 13). With the "Track Log Record Mode" set to "Off," no pertinent data was recorded on this device.

Submitted by:

Steven Smith
Mechanical Engineer (Recorder Specialist)

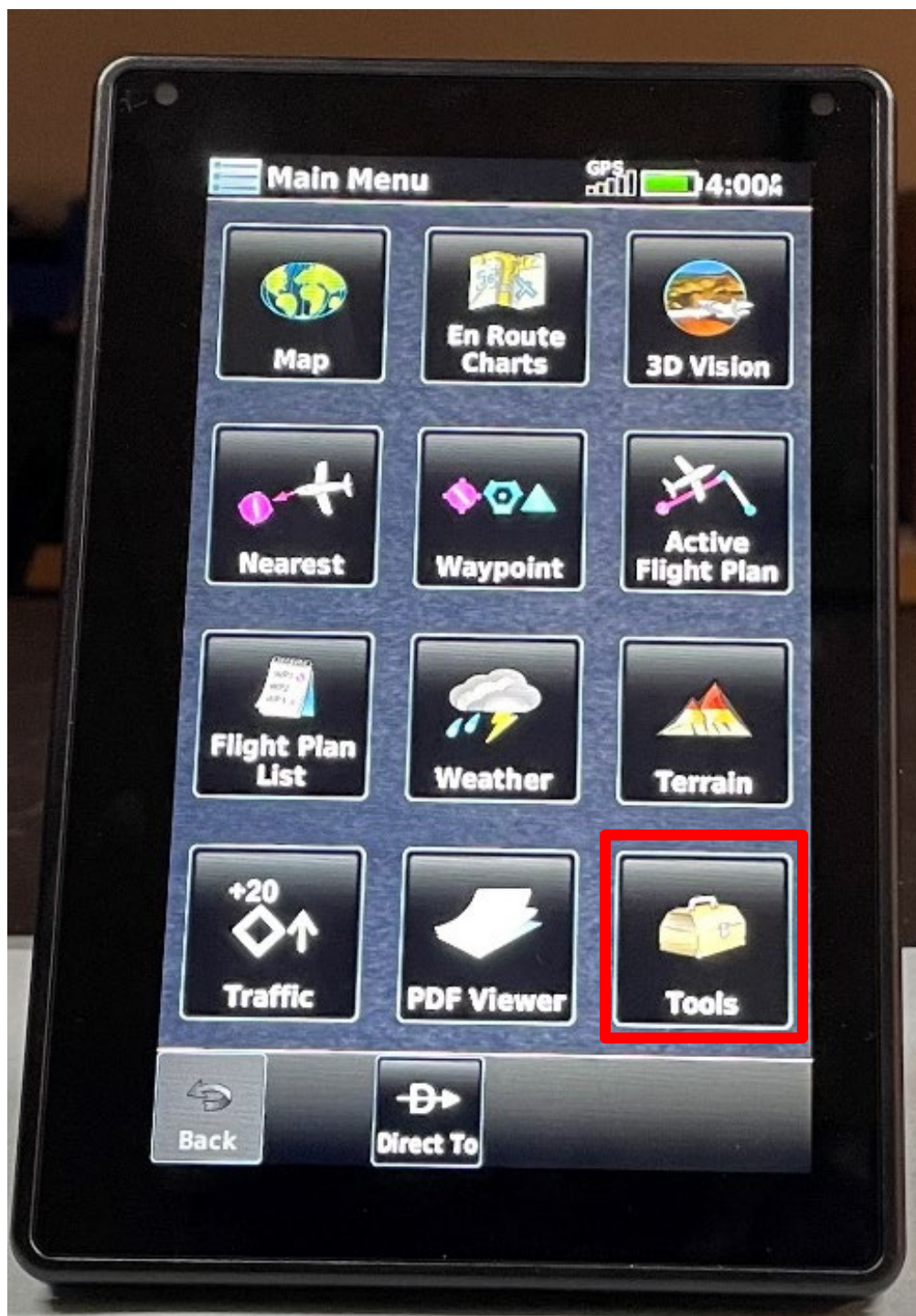


Figure 4. Main menu after the unit was powered on. The “Tools” menu (red box) is where the “Flight Log” and “Track Log” subdirectories are located.

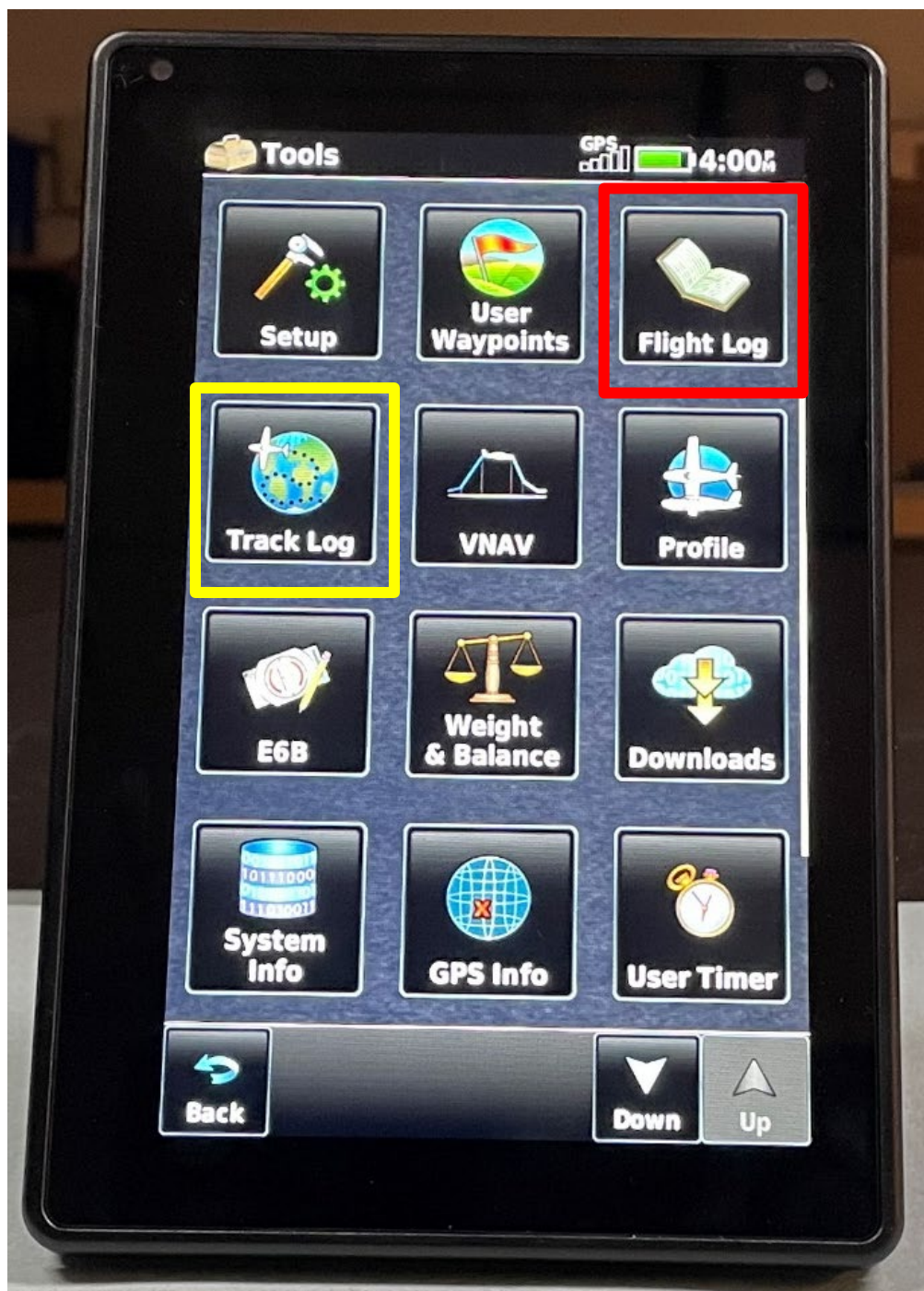


Figure 5. "Flight Log" (red box) and "Track Log" (yellow box) subdirectories after entering from "Tools" menu.

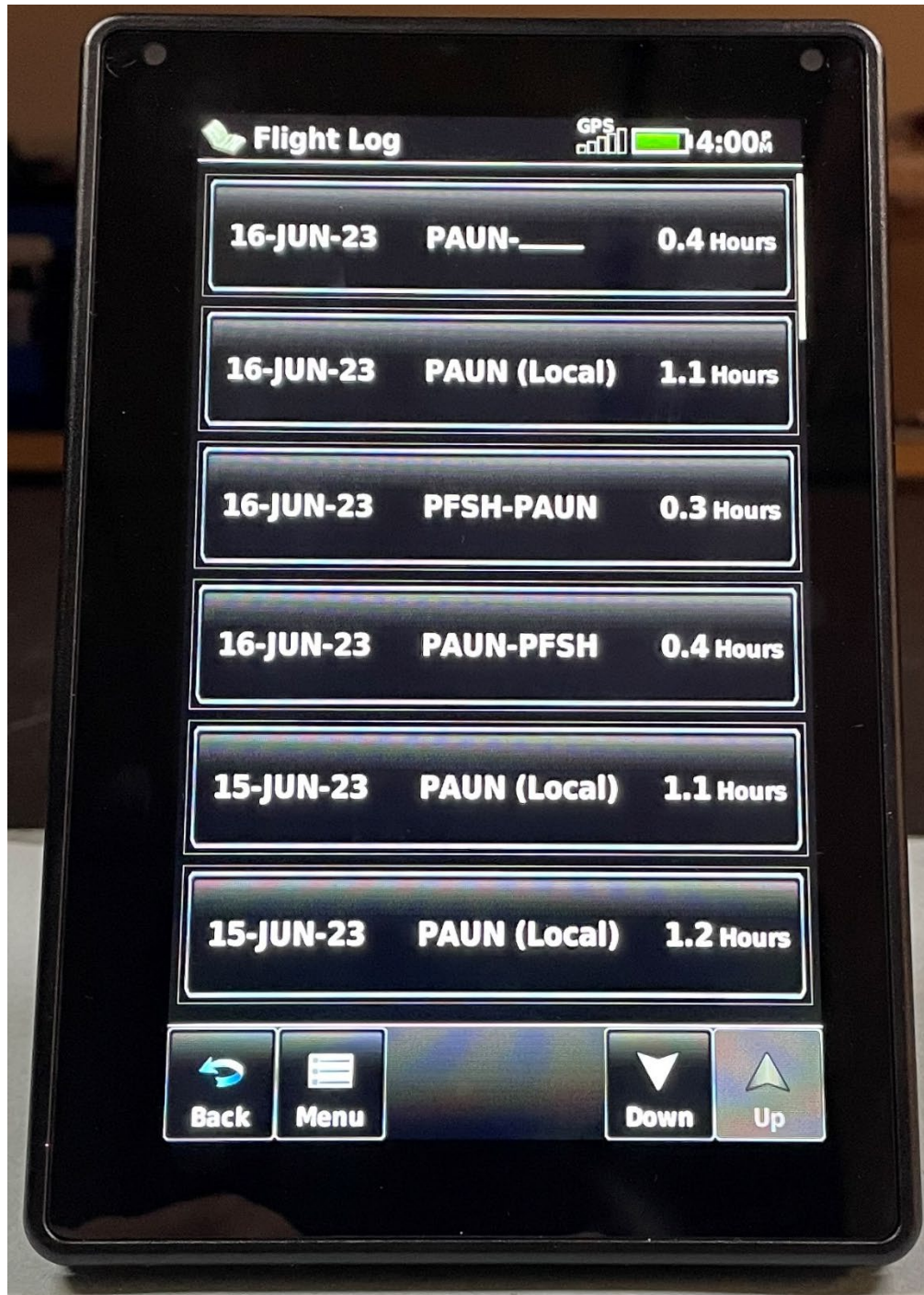


Figure 6. "Flight Log" subdirectory with the route information.

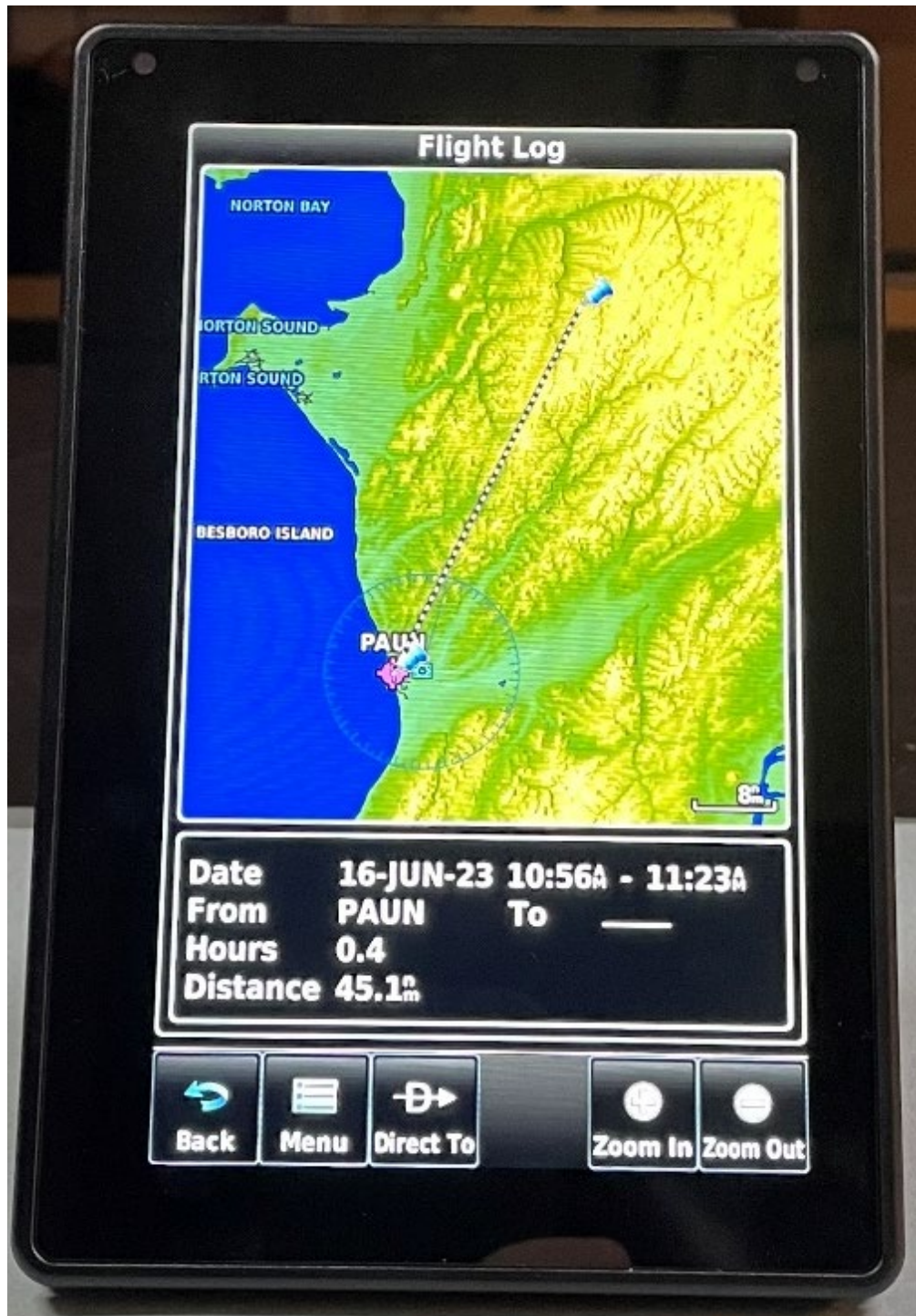


Figure 7. Flight from PAUN to remote terrain on June 16, 2023, (day of accident) from 10:56 AM to 11:23 AM AKDT (flight 3).

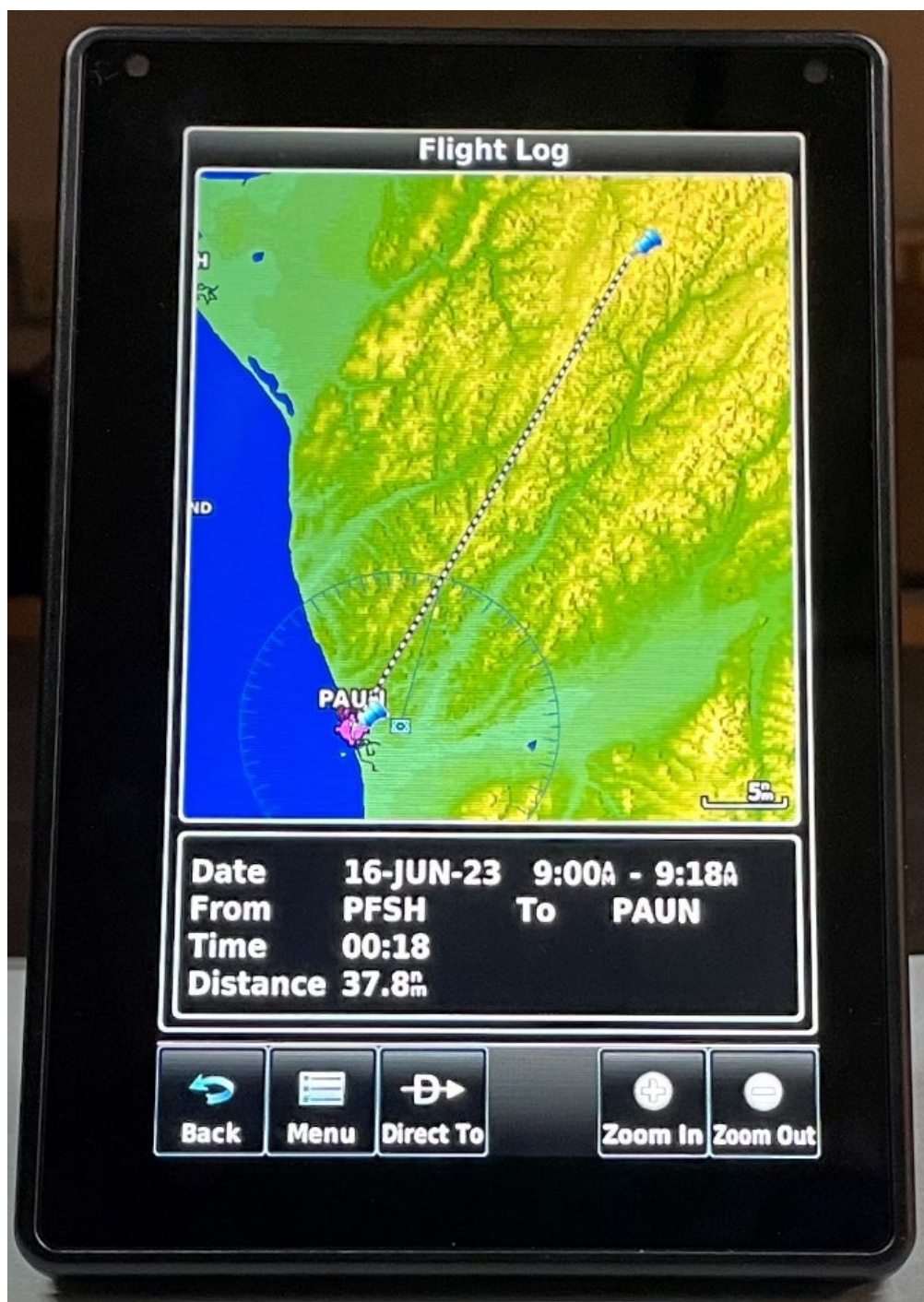


Figure 8. Flight from remote terrain to PAUN on June 16, 2023, (day of accident) from 9:00 AM to 9:18 AM AKDT (flight 2).

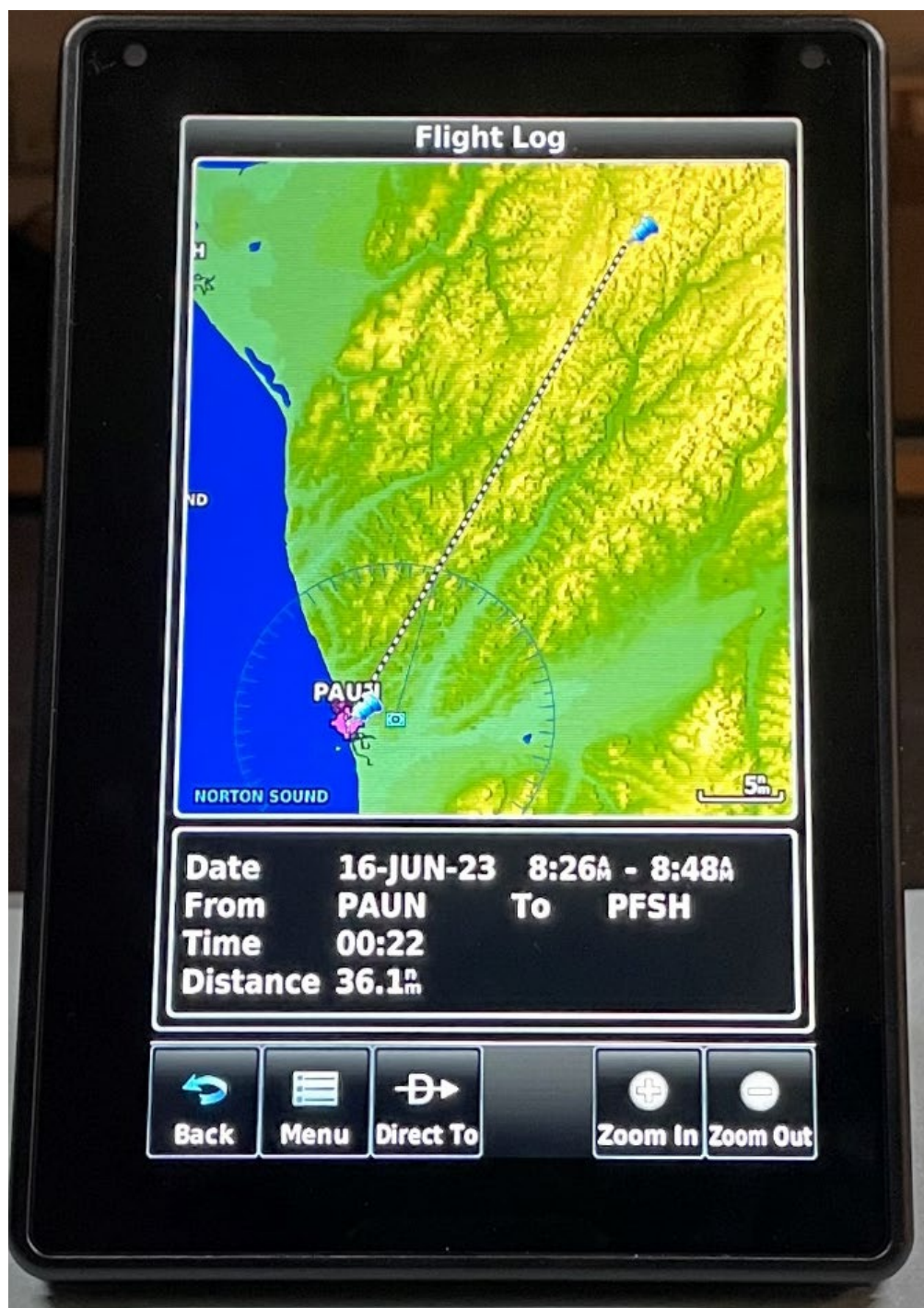


Figure 9. Flight from PAUN to remote terrain on June 16, 2023, (day of accident) from 8:26 AM to 8:48 AM AKDT (flight 1).

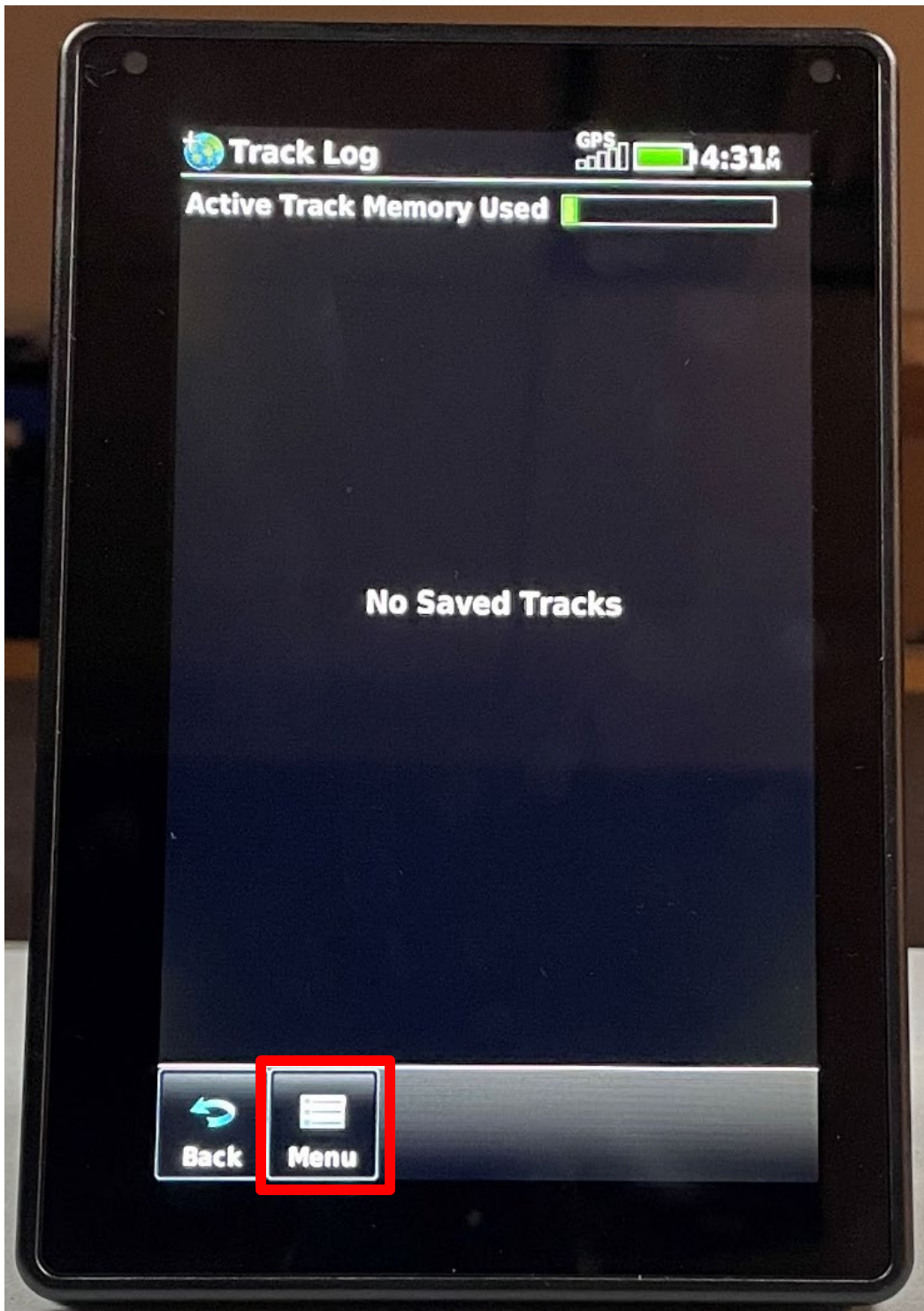


Figure 10. "Tracked Log" subdirectory showing "No Saved Tracks." Select the "Menu" option (red box) to get to the "Setup Page".

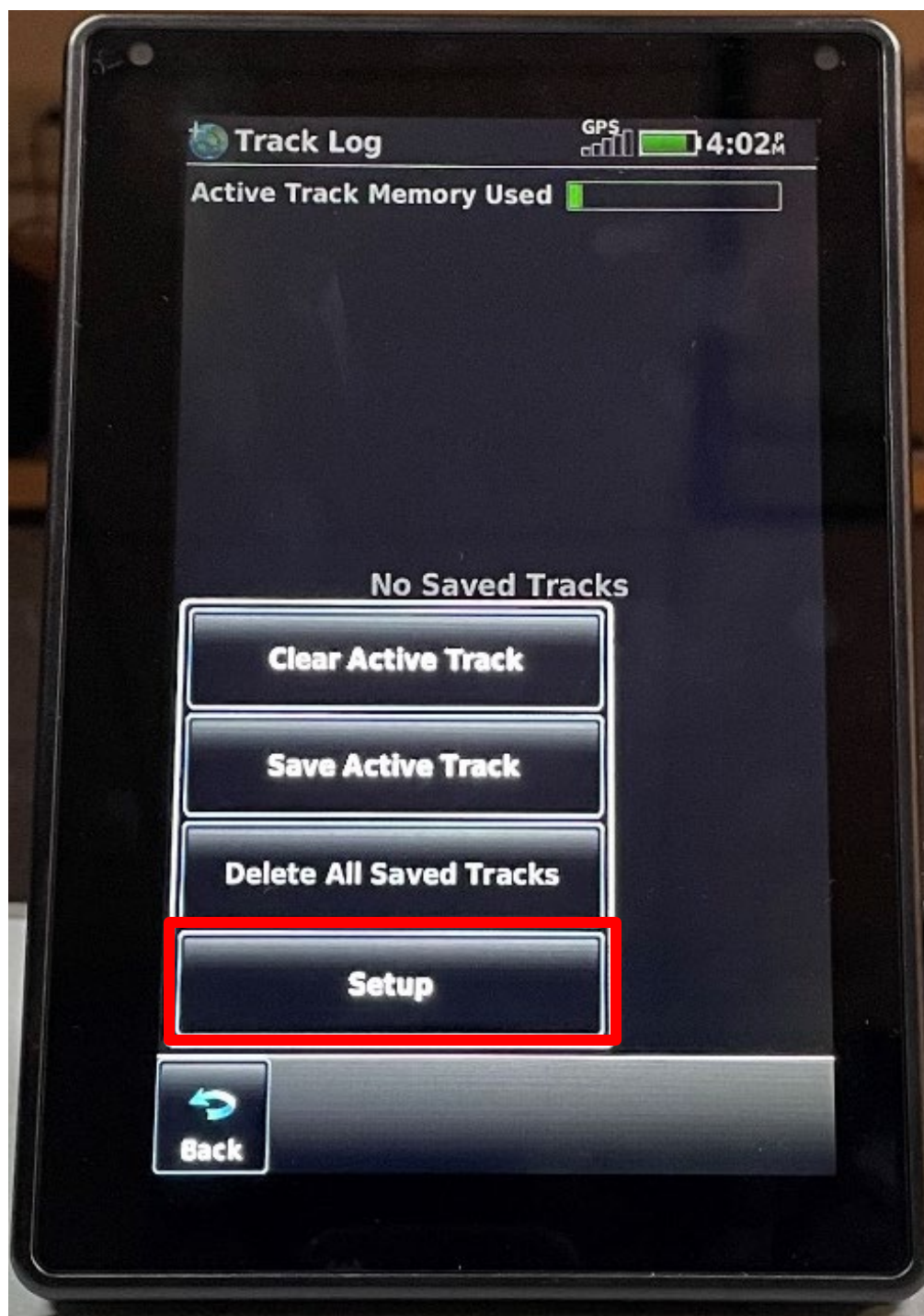


Figure 11. "Track Log" subdirectory "Setup" page option (red box).

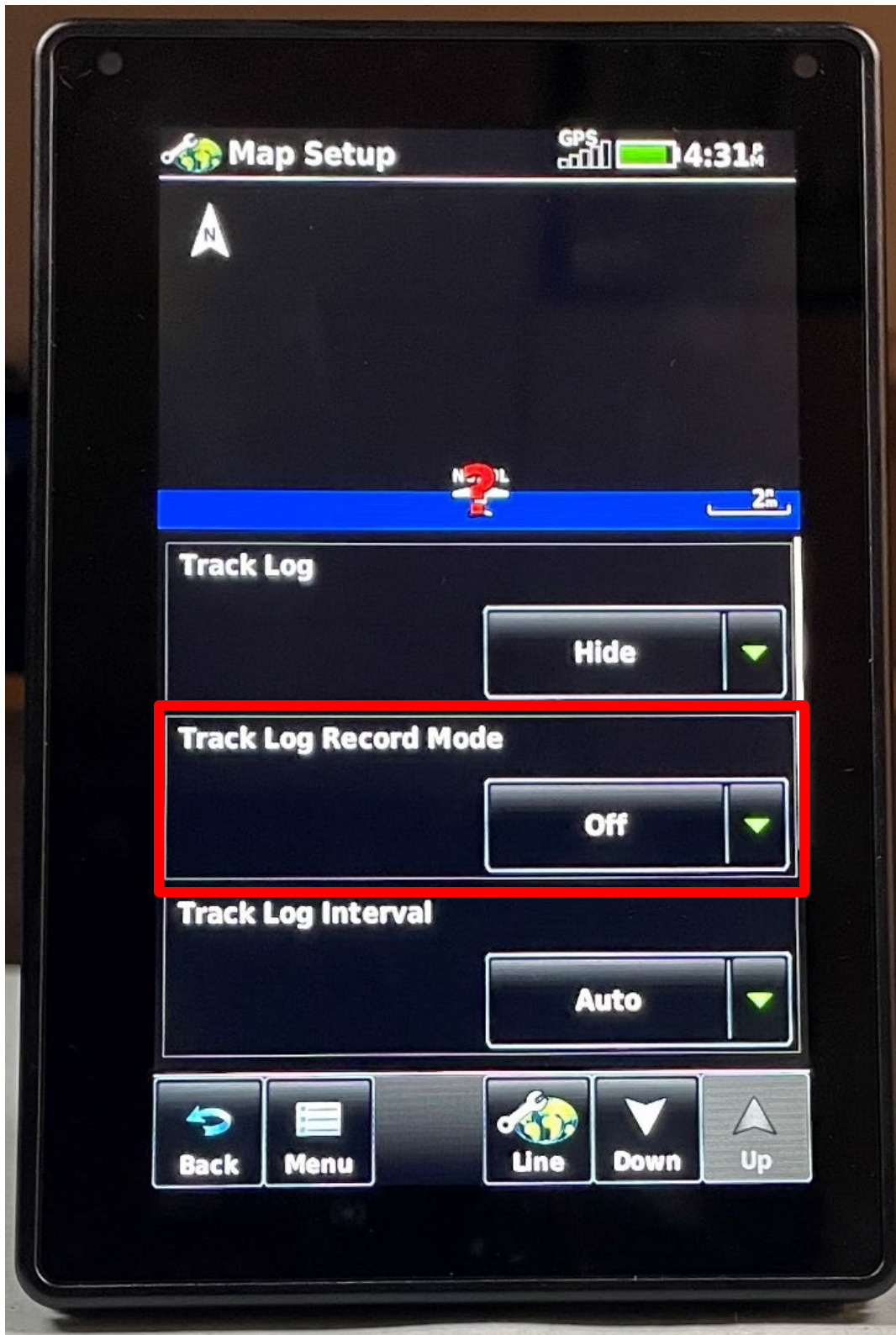


Figure 12. "Map Setup" page showing that the "Track Log Record Mode" was set to "Off" (red box).

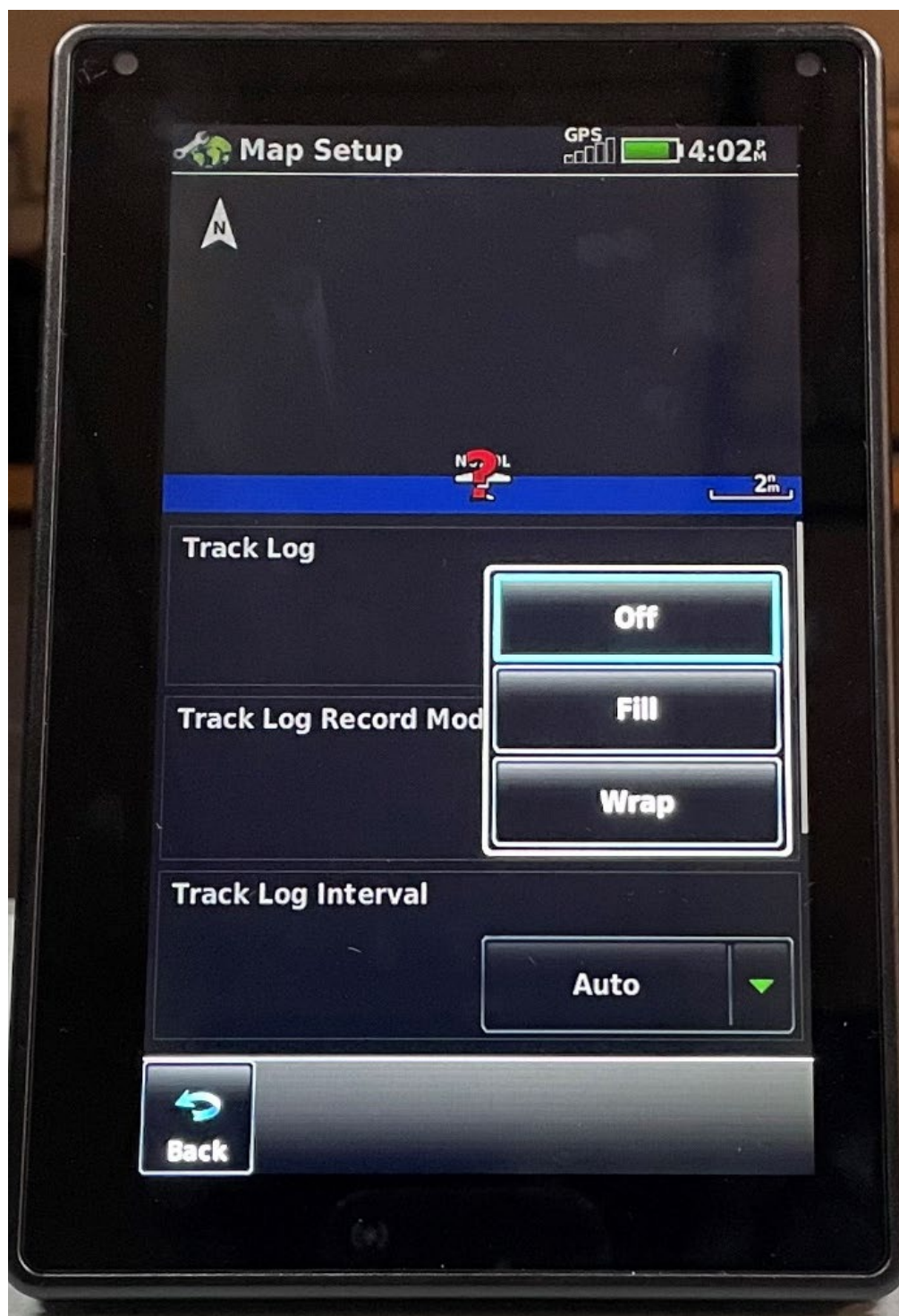


Figure 13. "Track Log Record Mode" options. "Off" was the selected option.