

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

July 23, 2020

Global Positioning System Device

Specialist's Factual Report

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1. EVENT SUMMARY

Location: Goodnews Bay, Alaska
Date: November 10, 2019
Aircraft: Piper PA-32-300
Registration: N7721C
Operator: Paklook Air Inc.
NTSB Number: ANC20LA004

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following global positioning system (GPS) device:

Device Manufacturer/Model:	Garmin Aera 796
Serial Number:	2CY004586

3.1. Device Description

The Garmin aera 796 is a battery-powered multi-function display and GPS receiver with a 7-inch diagonal high-resolution touch screen. The unit includes a built-in Jeppesen database and can receive XM satellite radio for flight information including NEXRAD Radar, lightning, METARs, and TFRs. The unit can also perform and store weight and balance calculations. A built-in AOPA Airport Directory and SafeTaxi airport diagrams are included for selected airfields. With appropriate subscriptions, the unit can store and display geo-referenced VFR and IFR navigation charts, including IFR approach charts. The unit also has a "scratch pad" feature, allowing the user to hand write electronic notes.

The unit stores date, route-of-flight, and flight-time information. 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. The current track log can be saved to long-term memory. Track log

storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile memory.

The unit contains hardware and software permitting the download of recorded waypoint, route, and track log information to a PC via a 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.

3.2. Data Recovery

The device was recovered from salt-water by the operator and delivered to the NTSB regional office. The device was shipped to the Vehicle Recorder Laboratory and was dry upon arrival. An external examination did not reveal any obvious damage, as shown in Figure 1. An internal examination revealed water damage and corrosion to internal components, as shown in Figure 2.



Figure 1. Garmin Aera 796 as received.

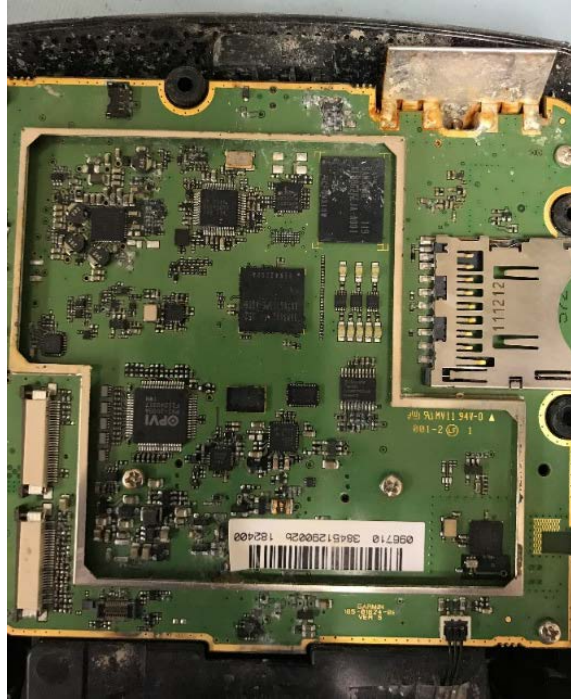


Figure 2. Internal components of Garmin Aera 796.

The non-volatile memory chip was removed using laboratory tools.¹ A chip read out was attempted using multiple chip readers, however it was unresponsive. It was then sent to the Integrated Electronics Engineering Center (IEEC) at Binghamton University for evaluation. Broken wire leads were found on the chip and were subsequently repaired at the IEEC. The repair and recovery report is included as Attachment 1 to this report. The repaired chip read out normally and was converted to engineering units using laboratory tools.

3.3. Data Description

The data extracted included 141 sessions from October 14, 2019, through November 11, 2019.² The last session recorded started at 03:07:25 UTC and ended at 03:58:11 UTC on November 11, 2019. The device recorded a data point once every 30 seconds. Due to data buffering in the device, the end of the session may not have been recorded.

3.4. Parameters Provided

Table 1 describes data parameters provided by the GPS device. Date, Time, Latitude, Longitude, and GPS Altitude are recorded by the device. Groundspeed and Track are derived from the recorded parameters.

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

² All dates and times are referenced to Coordinated Universal Time (UTC). The difference between UTC and Alaska Standard Time (AKST) is 9 hours.

Table 1. GPS Data Parameters.

Parameter Name	Parameter Description (units)
Date	Date for recorded data point (MM/DD/YYYY)
Time	Time (UTC) for recorded data point (HH:MM:SS)
Latitude (deg)	Recorded Latitude (degrees)
Longitude (deg)	Recorded Longitude (degrees)
GPS Alt (ft)	Recorded GPS Altitude (feet)
Groundspeed (kts)	Average derived groundspeed (knots)
Track (deg)	Average derived true course (degrees)

3.5. OVERLAYS AND TABULAR DATA

Figure 3 is a graphical overlay generated using Google Earth for the last session recorded. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording. Due to the GPS Altitude recorded and Google Earth terrain model, the flight track may not appear for all points.

Figure 4 is a graphical overlay generated using Google Earth zoomed in on the final seven minutes recorded during the last session.

The aircraft was shown landing at GNU between 03:51:39 and 03:52:09 UTC. The next data point recorded at 03:52:39 UTC showed the aircraft was no longer on the runway. The next data point was recorded at 03:57:11 UTC, consistent with the recording logic of the device for stops less than 10 minutes. According to the device's Pilot's Guide:

Recording begins when your speed exceeds 30 knots and you gain 250 feet of altitude. If you land and groundspeed drops below 30 knots, the flight entry is saved and a new entry is recorded when you depart the airport. A touch-and-go or brief stop of less than 10 minutes appends to the current flight record, rather than starting a new entry.

The final two data points were recorded at 03:57:41 UTC and 03:58:11 UTC and showed the aircraft on the runway.

Tabular data used to generate Figures 3 and 4 are included as Attachment 2 in electronic comma-delimited (.CSV) format.

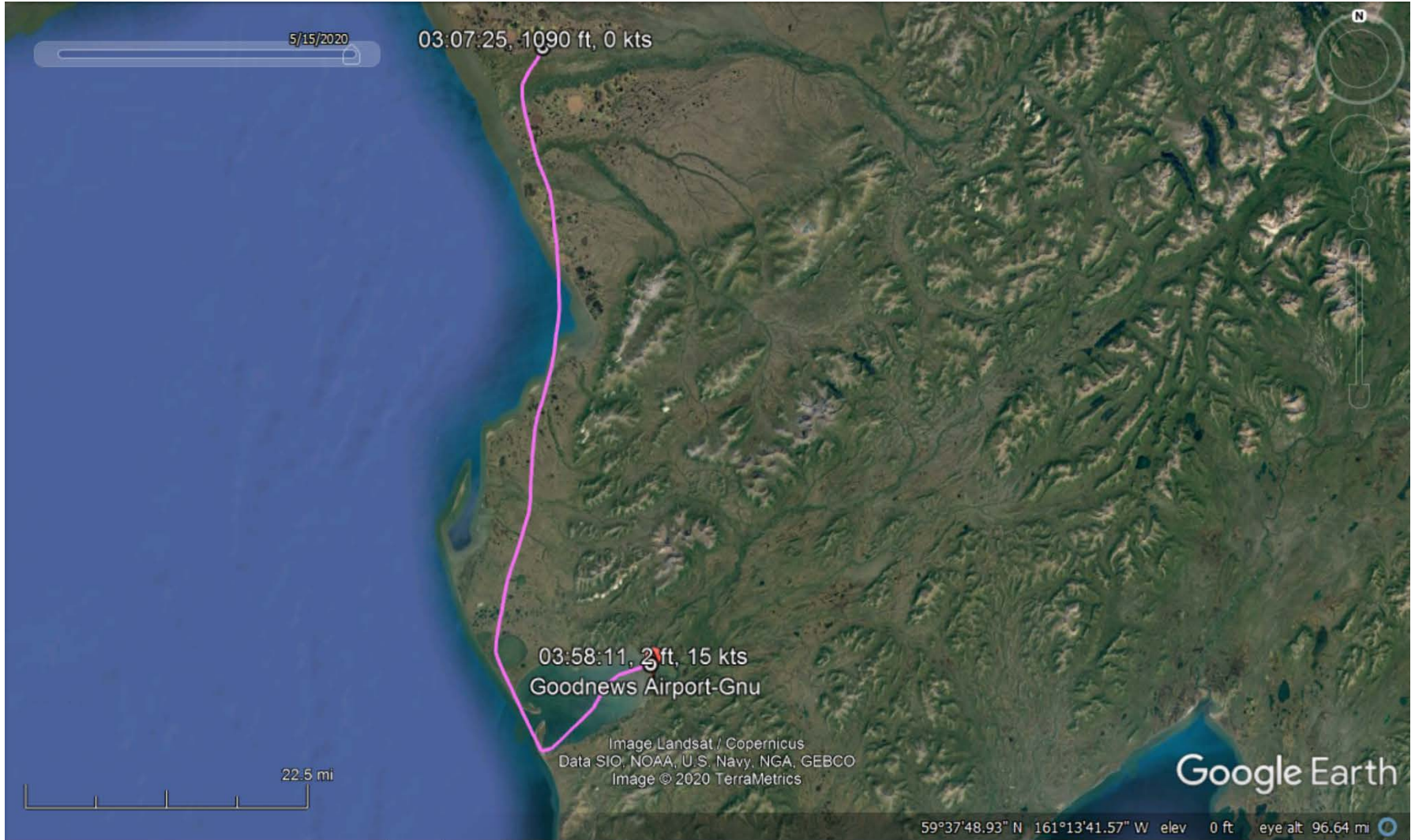


Figure 3. Google Earth overlay of the last session recorded on the Garmin Aera 796.



Figure 4. Google Earth overlay of the end of the last session recorded on the Garmin Aera 796.