

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA24FA001

GLOBAL POSITIONING SYSTEM (GPS) DEVICE

Specialist's Factual Report

March 14, 2024

A. ACCIDENT SUMMARY

Location: Lake Placid, New York
Date: October 01, 2023
Time: 1608 eastern daylight time (EDT)
Airplane: Cessna 177RG, N545PZ, Lake Placid Air Service

B. GLOBAL POSITIONING SYSTEM (GPS) DEVICE SPECIALIST

Specialist: W. Deven Chen
Electrical Engineer – Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A recorder group was not convened. The NTSB Vehicle Recorder Division received the following GPS device:

Recorder Manufacturer/Model:	Garmin GPSMAP 396
Recorder Serial Number:	28205569

1.0 Device Description

The Garmin GPSMAP 396 is a battery-powered portable 12-channel GPS receiver with a 256-color thin-film transistor (TFT) liquid-crystal display (LCD) display screen. The unit includes a built-in Jeppesen database and is capable of receiving XM satellite radio for flight information including NEXRAD radar, lightning, METARs, TAFs, and TFRs. A built-in AOPA Airport Directory and SafeTaxi Airport Diagrams are included for selected fields. The unit stores date, route-of-flight, and flight-time information for up to 50 flights. A flight record is triggered when groundspeed exceeds 30 knots and altitude exceeds 250 feet, and it 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 when 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 either 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. The unit contains hardware and software permitting the download of recorded waypoint, route, and track log information to a PC via a built-in

serial port. The unit can also communicate with external devices such as a computer using 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.

1.1 Device Condition and Data Recovery

The Garmin GPSMAP 396 as received did not show obvious physical damage, as shown in Figure 1. The device powered up normally when being supplied power. The internally stored track logs were downloaded using laboratory tools.



Figure 1. The front and back of the Garmin GPSMAP 396 as received.

1.2 Recording Description

The downloaded data contained 44 sessions, from May 26 to October 1, 2023. The last session, recorded on October 1, 2023, was identified to be associated to the accident event. The duration of this recording was approximately 4 minutes and 15 seconds, from 16:04:32 to 16:08:47 EDT. The recording rate ranged from 2-23 seconds per sample.

A review of all the recorded information discovered a session recorded on September 17, 2023, which contained a flight with similar turnback maneuver shortly after the takeoff from the same airport as the accident event. This session is also included in this report.

1.2.1 Parameters Provided

Table 1 lists the recorder parameters verified and provided in this report.

Table 1. Garmin GPSMAP 396 data parameters provided.

Parameter Name (unit)	Parameter Description
GPS Alt (Ft)	Geometric altitude above mean sea level (feet)
Groundspeed (Kt)	Average groundspeed between current and previous data point (knots)

Parameter Name (unit)	Parameter Description
Latitude (Deg)	Geographic latitude (degrees)
Longitude (Deg)	Geographic longitude (degrees)
Track (Deg)	Path on the surface of the Earth directly below aircraft (degrees)

1.3 Time Correlation

The data was recorded in coordinated universal time (UTC), and it was converted to EDT, the local time of the event. EDT is behind UTC by 4 hours.

D. FIGURES AND TABULAR DATA

Figure 2 to Figure 8 contain data downloaded from the Garmin GPSMAP 396. All the parameters listed in table 1 are plotted.

Figure 2 is a data parameter plot of the entire accident flight. The time shown is 16:04:30 to 16:09:00 EDT.

Figure 3 and Figure 4 are Google Earth overlays of the accident flight. Figure 3 shows the entire accident flight, and Figure 4 shows the final portion of the accident flight.

Figure 5 and Figure 6 are data parameter plots of a previous flight recorded on September 17, 2023. Figure 5 shows the entire dataset from this session. Figure 6 focuses on the portion of this tracklog that contained the turnback to the airport.

Figure 7 and Figure 8 are Google Earth overlays of the same previous flight recorded on September 17, 2023. Figure 7 shows the entire flight, and Figure 8 focuses on the portion of the recording that contained the turnback to the airport.

The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

The corresponding tabular data used to create figures 2 to 8 are provided as attachments in electronic comma-separated value (CSV) format to this report. Attachment 1 is the accident flight recording, and attachment 2 is of a previous flight recorded on September 17, 2023.

Submitted by:

W. Deven Chen
Electrical Engineer – Recorder Specialist

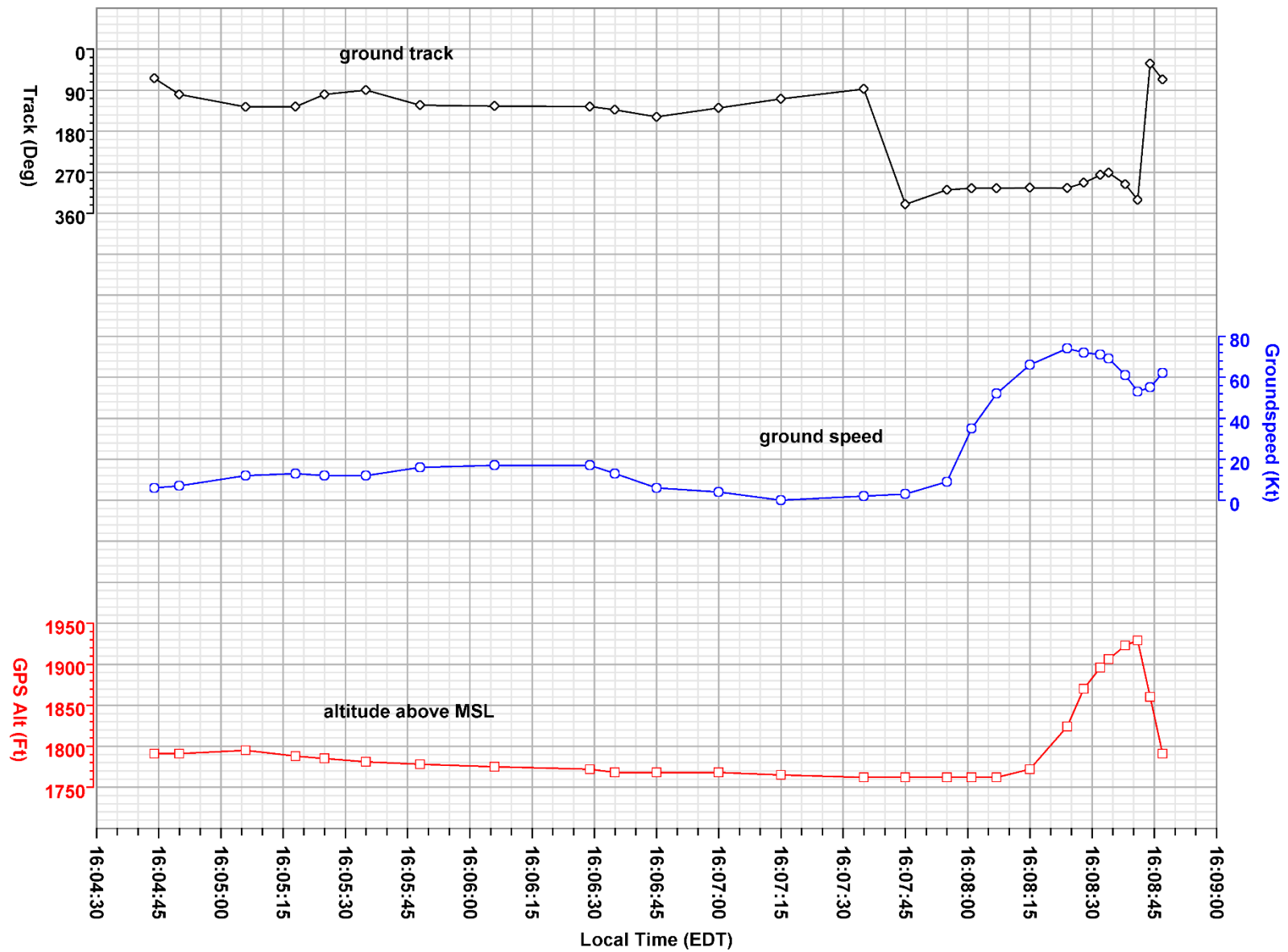


Figure 2. Plot of data parameters of the entire event flight recording.



Figure 3. Google Earth overlay of the entire event flight on October 1, 2023.



Figure 4. Google Earth overlay of the final portion of the event flight.

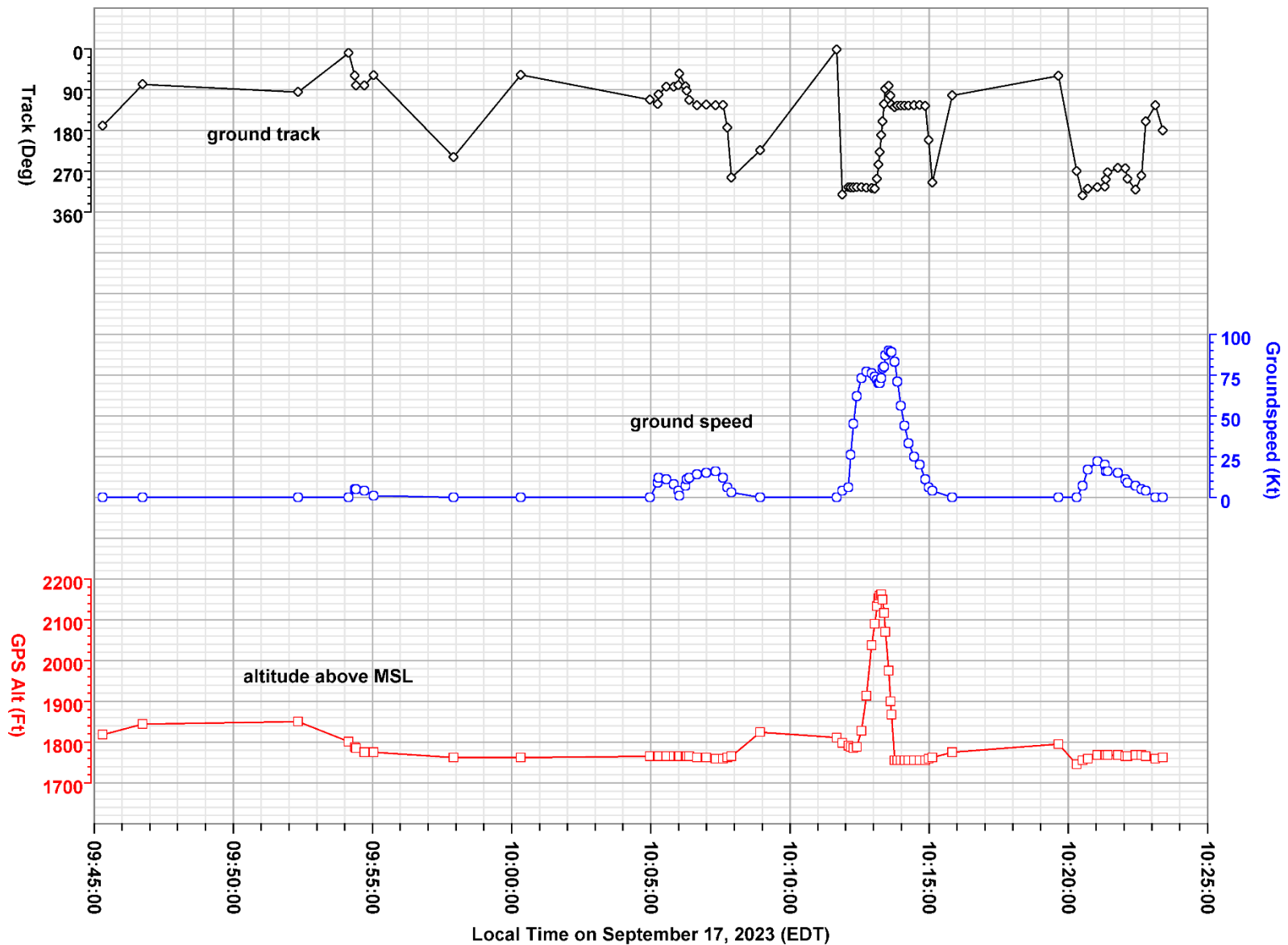


Figure 5. Plot of data parameters of a previous flight recorded on September 17, 2023.

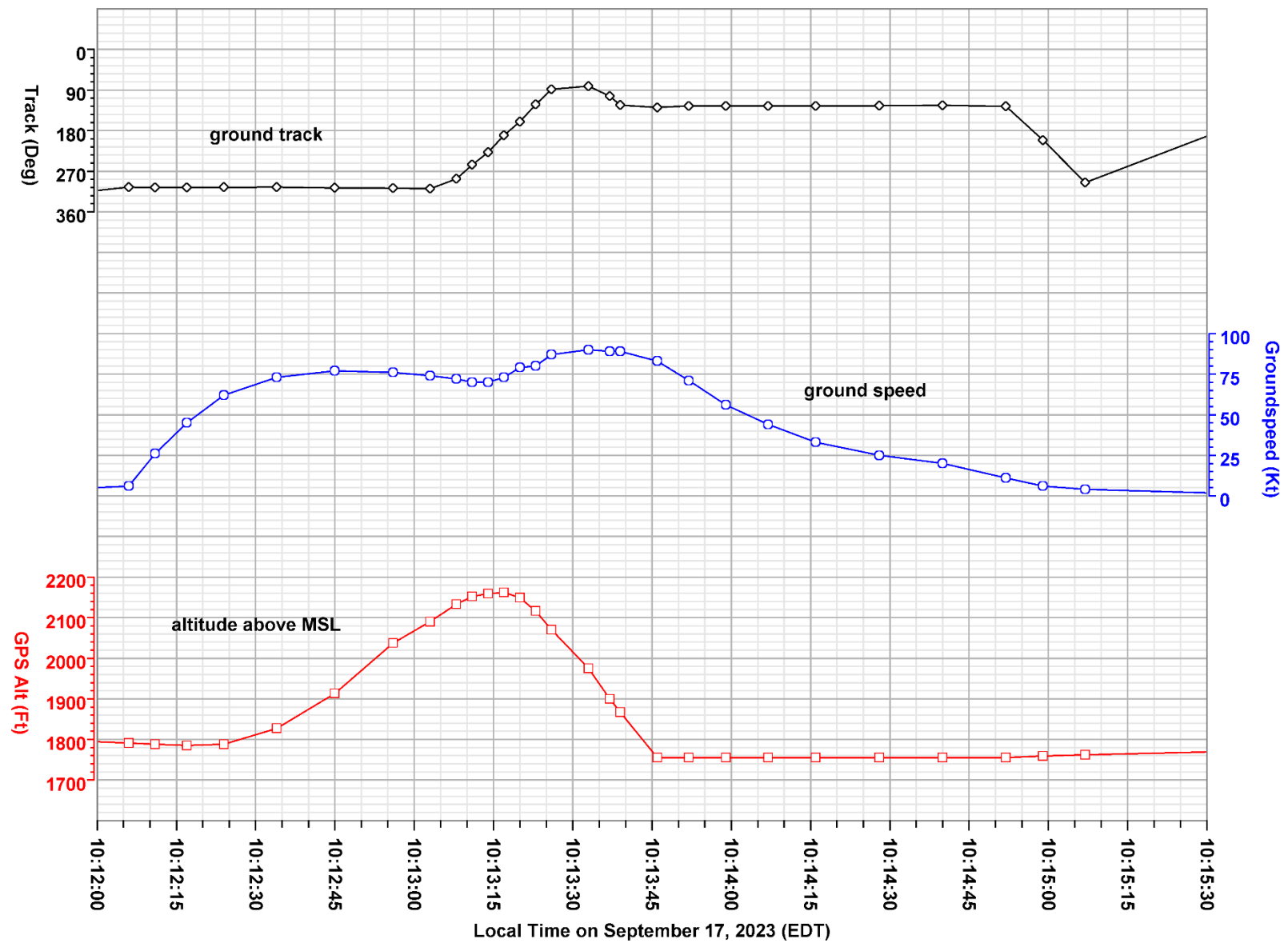


Figure 6. Plot of data parameters of a previous flight recorded on September 17, 2023, with a focus on the turnback to the airport portion.



Figure 7. Google Earth overlay of a previous flight recorded on September 17, 2023.



Figure 8. Google Earth overlay of a previous flight recorded on September 17, 2023, with a focus on the turnback to the airport portion.