

# National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN23MA034

## **ELECTRONIC RECORDER DEVICES**

Specialist's Factual Report

December 2, 2022

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## **A. EVENT SUMMARY**

Location: Dallas, Texas  
Date: November 12, 2022  
Time: 13:25 central standard time (CST)  
Airplanes: Boeing B-17G (N7227C), Bell P63-F (N6763)

## **B. ELECTRONIC RECORDER DEVICES SPECIALIST**

Specialist: W. Deven Chen  
National Transportation Safety Board (NTSB)  
Washington, DC

## **C. DETAILS OF THE INVESTIGATION**

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

Recorder Manufacturer/Model:	<b>Garmin GPSMAP 496</b>
Recorder Serial Number:	<b>19725572</b>
Recovered from:	<b>Bell P63-F (N6763)</b>
Recorder Manufacturer/Model:	<b>Avidyne IFD540</b>
Recorder Serial Number:	<b>M204284993</b>
Recovered from:	<b>Boeing B-17G (N7227C)</b>

### **1.0 Garmin GPSMAP 496 (Bell P63-F) - Description**

The Garmin GPSMAP 496 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. 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 GPSMAP 496 (Bell P63-F) - Condition and Data Recovery**

The Garmin GPSMAP 496 had sustained damage upon arrival at the Vehicle Recorder Division, as shown in figure 1. The non-volatile memory chip was removed from its main circuit board, read out, and converted into engineering units using laboratory tools.

The recovered data included 47 sessions of recording, from July 30, 2013, to June 19, 2014. The event was occurred on November 12, 2022. All the track logs were plotted on Google Earth, and there was no track log shown in Texas, which confirmed that the event flight was not recorded on the device. It is likely that the device's track log recording function had been inactive since 2014.



**Figure 1.** The front and back of the Garmin GPSMAP 496 as received.

### **2.0 Avidyne IFD540 (Boeing B-17G) - Description**

The Avidyne IFD540 is a Flight Management System (FMS), GPS, and Navigator. It is capable of monitoring, displaying, and recording navigational information and records parameters including, but not limited to, heading, latitude, and longitude. Additionally, the IFD540 can be connected to external measurement devices to record other parameters such as attitude, attitude rates, body accelerations, pressure altitude, and airspeed. If configured properly, the IFD 540 can also record engine parameters as provided to the unit by external engine monitors. The IFD 540 stores its historical logs on an internal compact flash (CF) card.

## 2.1 Avidyne IFD540 (Boeing B-17G) - Condition and Data Recovery

The Avidyne IFD540's display and body arrived the Vehicle Recorder Division in two separated packages. Upon arrival, it showed the device had sustained impact and fire damage, as shown in figure 2. The internal compact flash card, which stored the flight data and appeared to be in good condition, was recovered from the body of the device. The data were downloaded by inserting the compact flash card into a surrogate device.



**Figure 2.** The display and body of the Avidyne IFD540 as received.

## 2.2 Avidyne IFD540 (Boeing B-17G) - Recording Description

The downloaded data from the Avidyne IFD540 contained five sessions, from November 6 to November 12, 2022. The last session recorded on November 12, 2022, included numerous flights, from 9:13:45 to 13:21:52 CST, the local time of the event, and the last flight was identified to be related to the event. The duration of the event flight was approximately 13 minutes and 4 seconds, from 13:08:48 to 13:21:52 CST. The event data included two data files, named System Data and Flight Data by the manufacturer. The System Data was sampled at 1 Hz, and the Flight Data was sampled at 5 Hz. There were no engine data and AHRS<sup>1</sup> data recorded.

### 2.2.1 Parameters Provided

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

**Table 1.** Avidyne IFD540 data parameters provided.

Parameter Name (unit)	Parameter Description	Sampling Rate (Hz)
GlideSlopeDeviation	Glide slope deviation	1
GPS Lat (deg)	Geographic latitude (degrees)	5
GPS Lon (deg)	Geographic longitude (degrees)	5

<sup>1</sup> The Attitude Heading Reference System consists of a set of 3-axis gyroscope, accelerometers and heading reference sensors that enable the unit to compute pitch, roll, and yaw motions.

Parameter Name (unit)	Parameter Description	Sampling Rate (Hz)
GPS MSL Alt (ft)	Geometric altitude above mean sea level (feet)	1
Ground Spd (kts)	Average groundspeed between current and previous data point (knots)	1
Ground Track (deg)	Path on the surface of the Earth directly below aircraft (degrees)	1
LocalizerDeviation	Localizer deviation	1
Pressure Alt (ft)	Altitude recorded at barometer pressure setting (feet)	5
vD (kts)	Down direction velocity with respect to Earth (knots)	5
vE (kts)	East direction velocity with respect to Earth (knots)	5
vN (kts)	North direction velocity with respect to Earth (knots)	5
Vspd (fpm)	Aircraft vertical speed (feet per minute)	1

### 2.3 Time Correlation

The data was recorded in coordinated universal time (UTC) and converted to CST, the local time of the event, for the report.

### D. FIGURES AND TABULAR DATA

Figures 3 to 7 contain data recorded on the Avidyne IFD540 during the event on November 11, 2022. All the parameters listed in table 1 are plotted, except latitude and longitude.

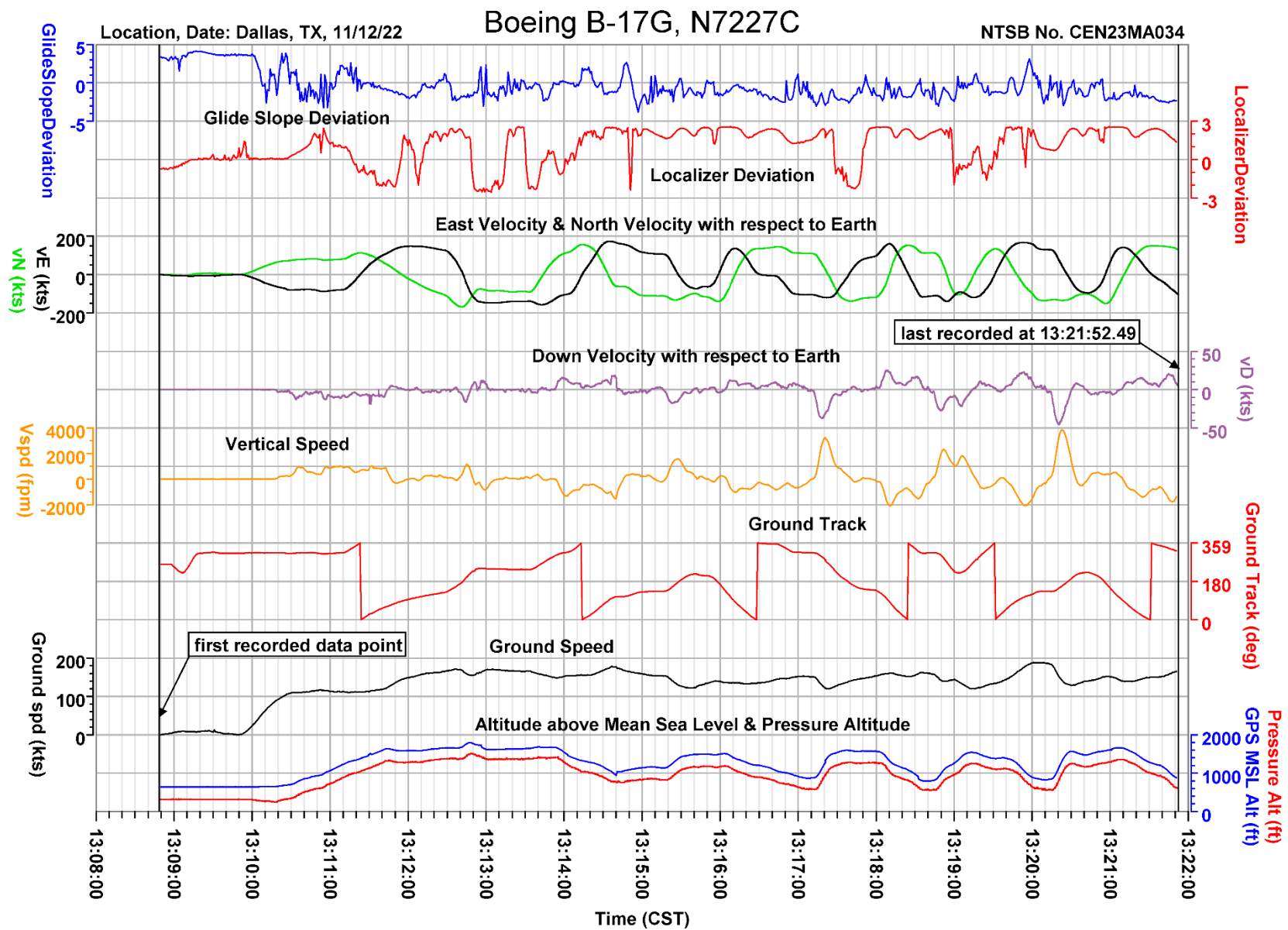
Figure 3 shows a data parameters plot of the entire event flight, and figure 4 shows a data parameters plot of approximately the last two minutes of the event flight.

Figure 5 shows Google Earth overlays of the entire event flight of the Boeing B-17G. Figures 6 and 7 show Google Earth overlays of the last two minutes of the event flight. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

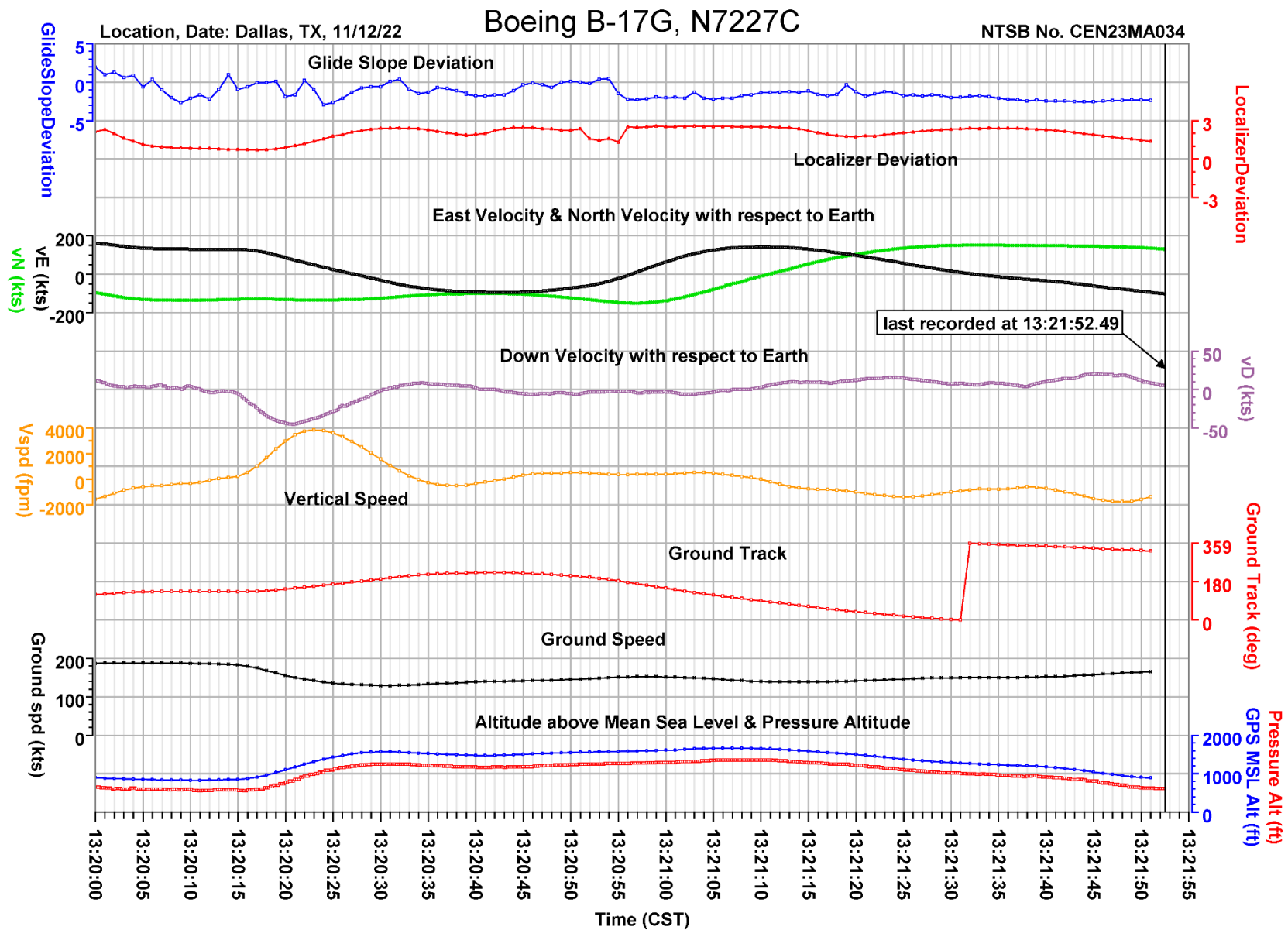
The corresponding tabular data used to create figures 3 to 7 are provided in electronic comma-separated value (CSV) format to this report. Attachment 1 is the Flight Data, and attachment 2 is the System Data.

Submitted by:

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Electrical Engineer - Recorder Specialist



**Figure 3.** Plot of data parameters for the entire event flight recording.



**Figure 4.** Plot of data parameters for approximately the last two minutes of the event flight recording.

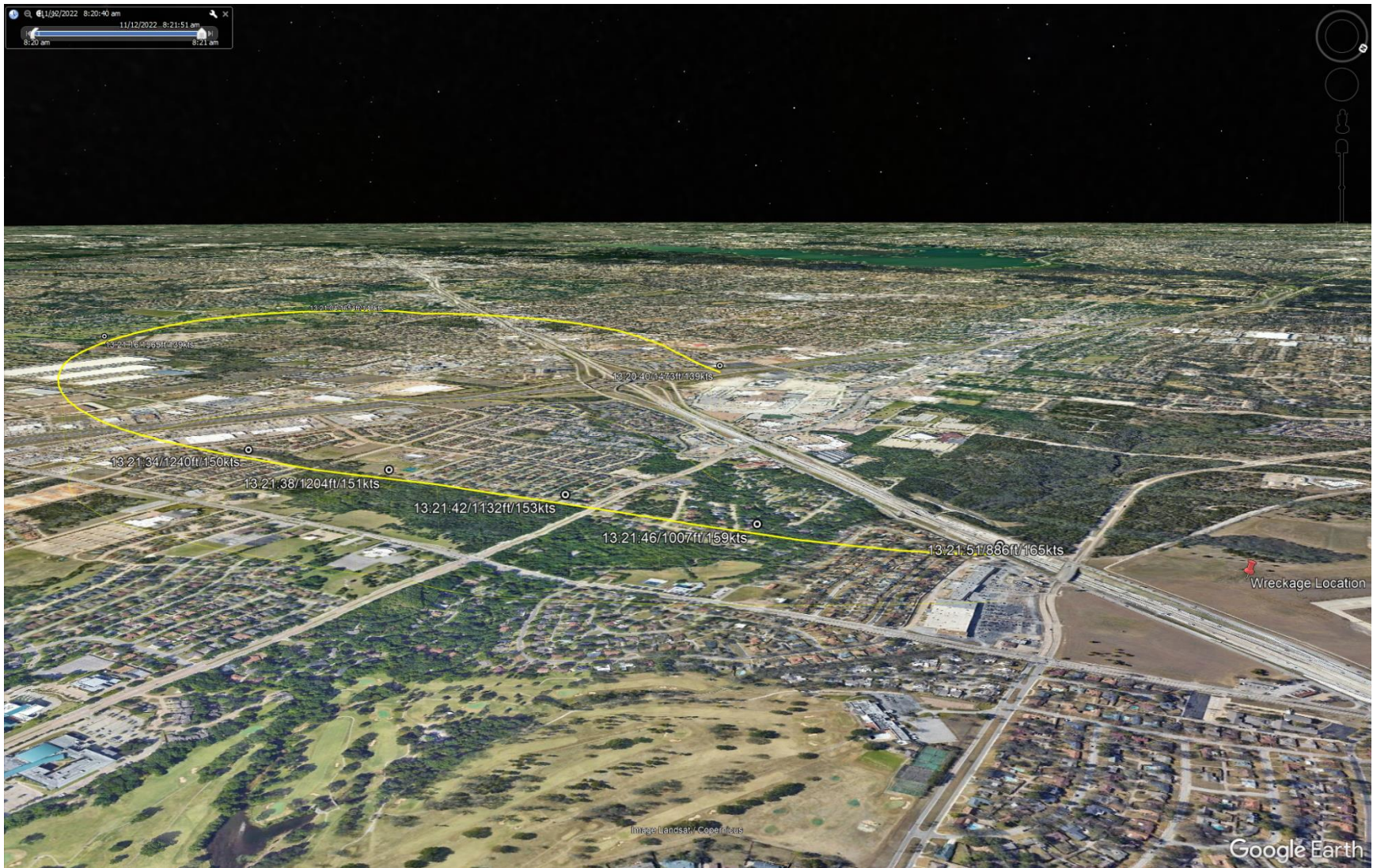




**Figure 5.** Google Earth overfly of the entire event flight of the Boeing B-17G recorded on November 12, 2022.



**Figure 6.** Google Earth overlay of the last two minutes of the event flight of the Boeing B-17G.



**Figure 7.** Google Earth overlay of the last two minutes of the event flight of the Boeing B-17G at a different view angle.