

# National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA22FA257

## **COCKPIT DISPLAY - RECORDED FLIGHT DATA**

Specialist's Factual Report

November 3, 2022

## **A. ACCIDENT**

Location: Fairfield, New Jersey  
Date: June 4, 2022  
Time: 1201 eastern daylight time (EST)  
Helicopter: Bell Helicopter Textron Canada 407, Private Operator, N98ZA

## **B. COCKPIT DISPLAY - RECORDED FLIGHT DATA SPECIALIST**

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

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

A cockpit display - recorded flight data group was not convened.

The NTSB Vehicle Recorder Division received the following electronic devices:

Recorder Manufacturer/Model: GDU 1040H  
Part Number: 011-00972-20  
Recorder Serial Number: 1YG005746

Recorder Manufacturer/Model: GDU 1040H  
Part Number: 011-00972-20  
Recorder Serial Number: 1YG005859

### **1.0 Garmin G1000 Description**

The Garmin G1000 Integrated Flight Deck is a collection of multiple avionics units which include flight displays, air data computers, Attitude/Heading Reference System (AHRS), communications and other systems. A typical installation includes a Primary Flight Display (PFD) and a Multi-Function Display (MFD). Each display includes two Secure Digital (SD) card slots, an upper and a lower slot. The lower SD card slot is used by the system for software updates and various databases.<sup>1</sup>

Depending on the display unit software, the aircraft can include a data logging feature. The data logging feature must be enabled by the aircraft operator. If the data logging feature is available and enabled, a SD card has to be installed in the upper slot of the MFD. Depending on the airframe and engine combination as many as 64

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<sup>1</sup> Databases can include terrain data, obstacle data, SafeTaxi charts, flight charts and airport terrain databases

parameters can be stored at a rate of one sample per second (1Hz). According to the manufacturer of the display unit, one flight hour can be stored in approximately 2 megabytes (MB). The SD card typically used is 2 gigabyte (GB) in size and can store over 1,000 flight hours.

### 1.1 Garmin G1000 SD Data Card Data Recovery

The Garmin G1000 SD card was in good condition and the data were downloaded using the manufacturer's procedure. Figure 1 and Figure 2 show the MFD, PFD, and the associated LRU's and the SD cards removed from the MFD, respectively.



**Figure 1.** Two Garmin G1000's and the associated LRU's in good condition.



**Figure 2.** SD memory cards from the MFD.

## **1.2 Garmin G1000 SD Data Card Data Description**

The G1000 SD card stores flight data in individual flight logs. The SD card contained 67 log files. The accident flight recording was identified and was approximately 25 minutes.

### **1.2.1 Garmin G1000 SD Data Card Engineering Unit Conversions**

The flight log data stored in the individual files was converted to engineering units by the display unit.

Appendix A, Table 1 lists the parameters verified and provided in this report.

## **1.3 Garmin G1000 SD Card Time Correlation**

The G1000 SD card records time with the first data sample based on the unit's internal clock. This clock is set and updated by the unit and is based off GPS time.

The data was already provided in the event local time, EDT, and therefore no additional offsets are required. All times in this report are referenced as EDT.

## **D. FIGURES AND TABULAR DATA**

Figure 3 to Figure 8 contain recorded Garmin G1000 parameters during the event on June 4, 2022. All the parameters listed in Table 1 are plotted except Latitude and Longitude.

Figure 3 and Figure 4 are time history plots from the event flight. Figure 3 captures the entire flight, while Figure 4 captures the final three minutes and 30 seconds of the recording. Figure 5 to Figure 8 show Google Earth overlays of the entire accident flight track, approach, approach and impact with terrain, and the location where the pilot returned to Essex County Airport (CDW), respectively. Note that the weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

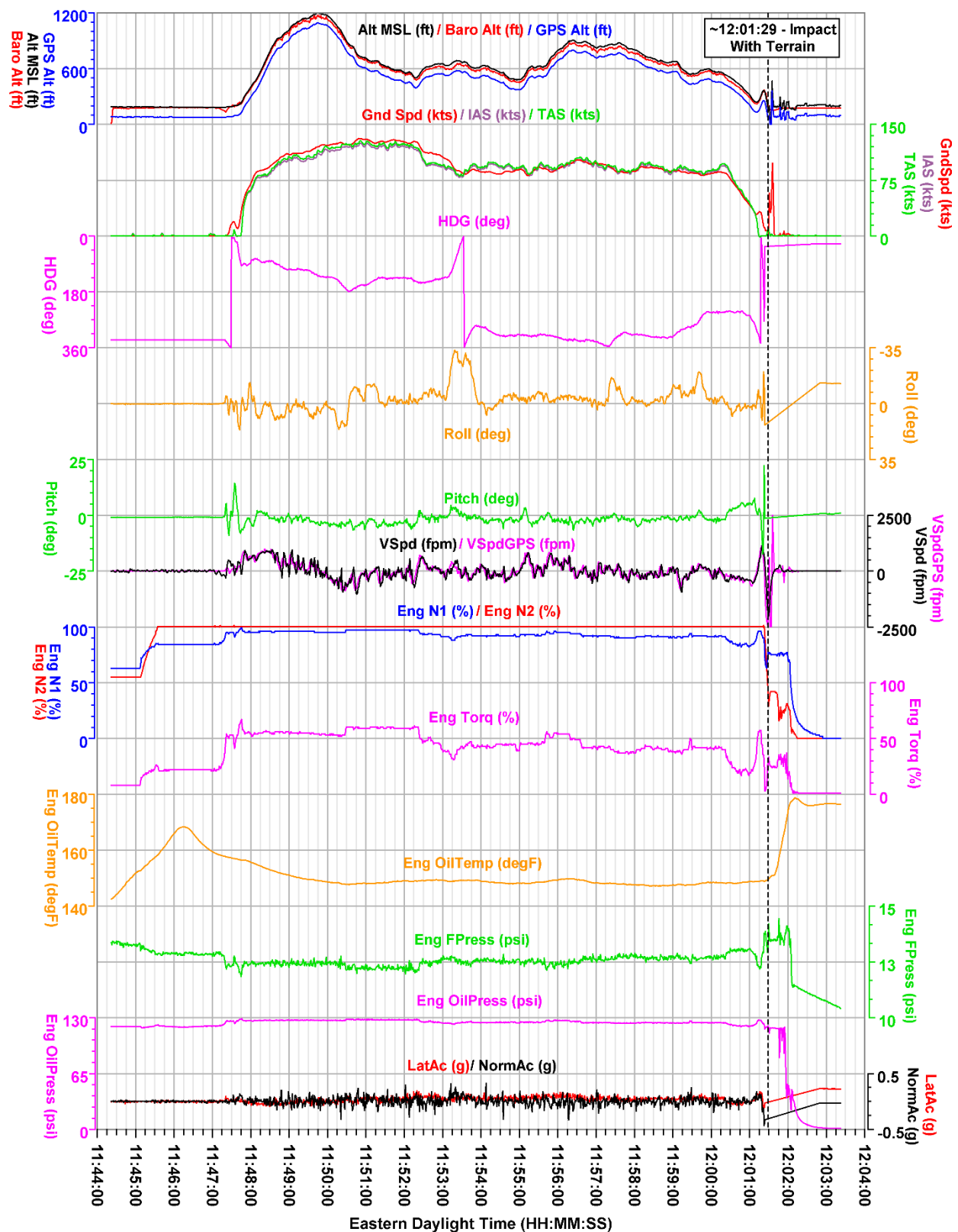
In summary, the pilot departed from Essex County Airport (CDW) at approximately 11:47:25 EDT, turned around in flight to return to CDW at 11:53:05 EDT, and ultimately impacted terrain at approximately 12:01:29 EDT. Before the accident, as the helicopter was approaching CDW, the pilot was tracking a heading of 245 degrees while descending from 600 feet barometric altitude with an indicated airspeed of 86 knots. At 12:00:48 EDT, the helicopters indicated airspeed dropped below 60 knots at a barometric altitude of 372 feet and a magnetic heading of 242 degrees. At 12:01:01 EDT, magnetic heading began increasing from 259 degrees to 344 degrees at 12:01:17 EDT. At 12:01:01 EDT, the indicated airspeed was 41 knots. Magnetic heading data indicated the helicopter had approximately one spin before

impacting terrain at 12:01:29 EDT. The last recorded data point by the Garmin G1000 was at approximately 12:03:22 EDT.

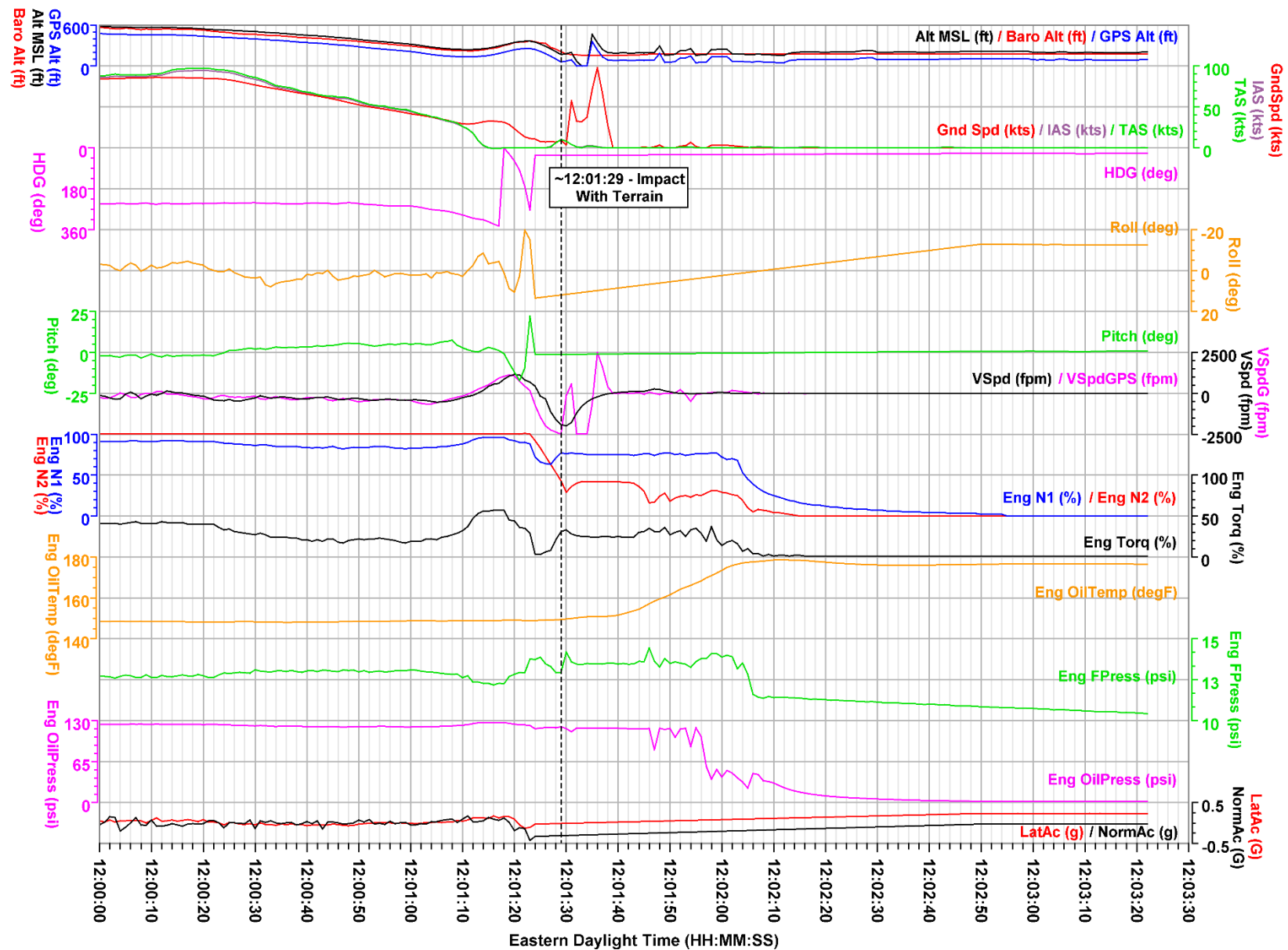
The corresponding tabular data used to create Figure 3 to Figure 8, including Latitude and Longitude, are provided in electronic comma separated value (CSV) format as Attachment 1 to this report.

Submitted by:

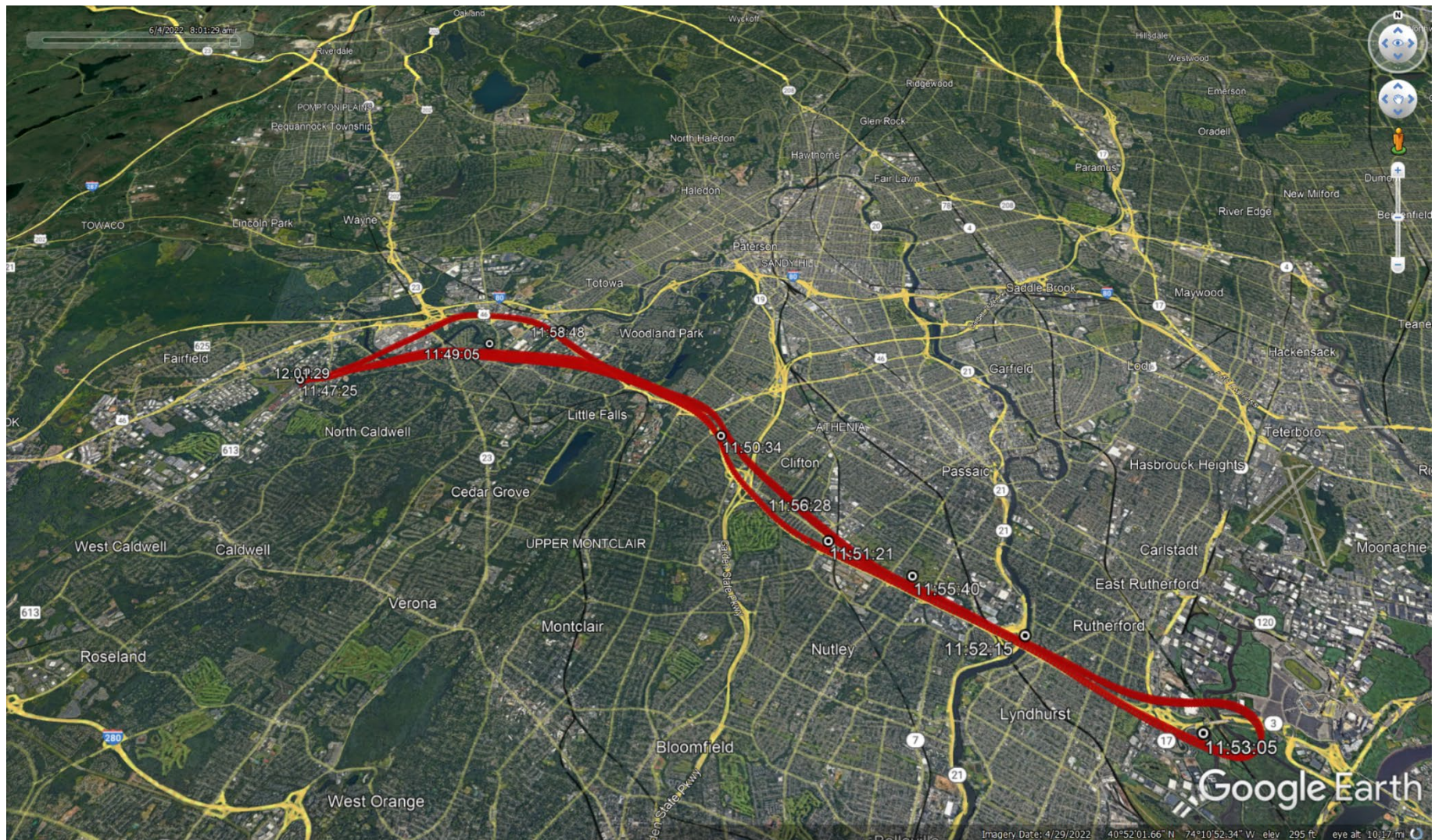
Steven Smith  
Mechanical Engineer (Recorder Specialist)



**Figure 3.** Entire accident flight parameters.



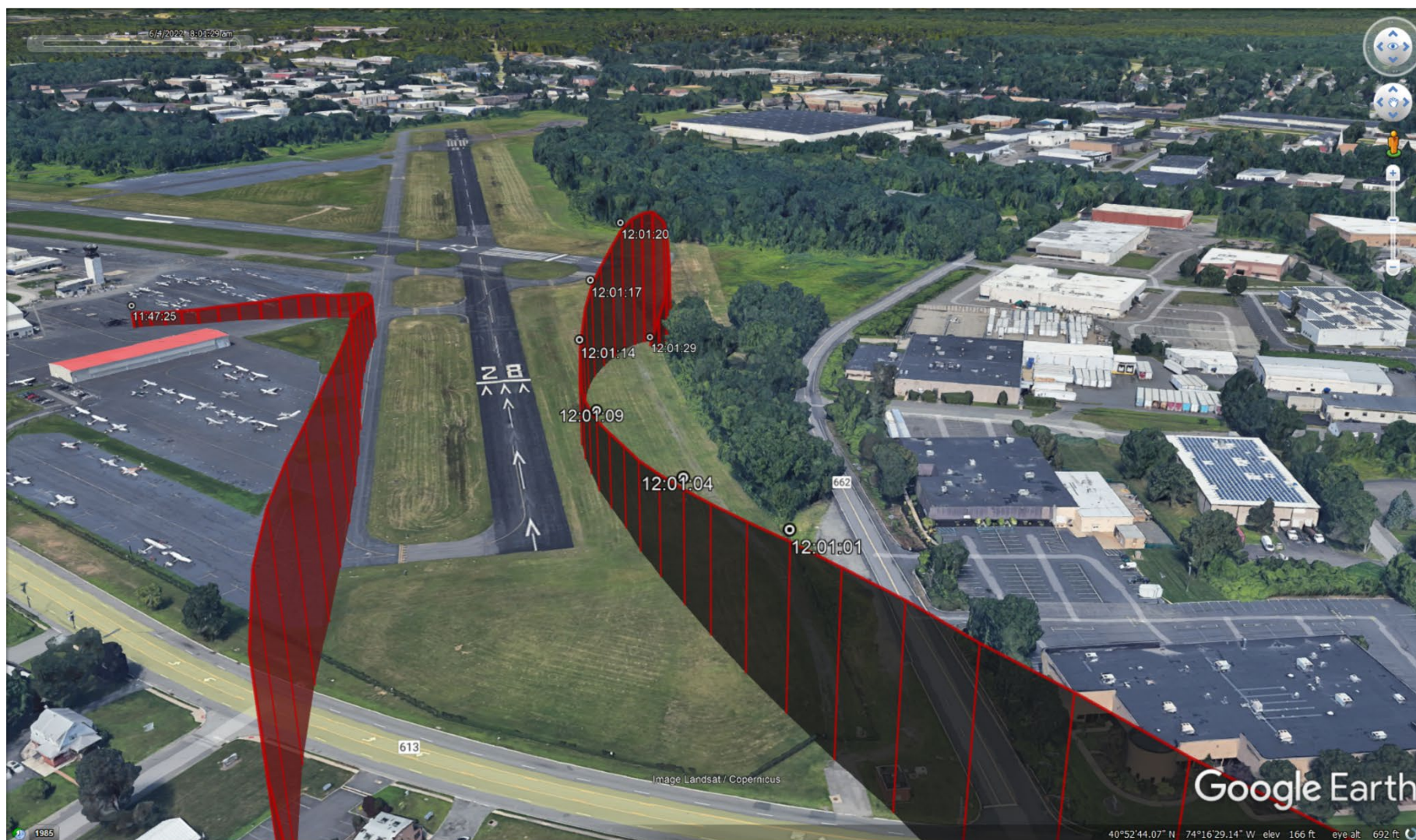
**Figure 4.** Final three minutes and thirty seconds of the recording including the accident impact with terrain.



**Figure 5.** Entire flight path for the accident flight.



**Figure 6.** Approaching Essex County Airport (CDW) moments before impact with terrain.



**Figure 7.** Path taken by the pilot on approach.



**Figure 8.** Location where the pilot returned to CDW. Teterboro (TEB) airport slightly north of this path (yellow pin).

## APPENDIX A. VERIFIED AND PROVIDED PARAMETERS FROM G1000

This appendix describes the parameters provided and verified in this report. Table 1 lists the G1000 parameters and Table 2 describes the unit abbreviations used in this report for G1000 parameters.

**Table 1.** Verified and provided parameters

|                       |                               |
|-----------------------|-------------------------------|
| LatAc (g)             | Lateral Acceleration          |
| NormAc (g)            | Normal Acceleration           |
| IAS (kts)             | Indicated Airspeed            |
| TAS (kts)             | True Airspeed                 |
| Baro Alt (ft)         | Barometric Corrected Altitude |
| GPS Alt (ft)          | GPS Altitude                  |
| Alt MSL (ft)          | Altitude Mean Sea Level       |
| Eng FPress (psi)      | Engine Fuel Pressure          |
| Eng N1 (%)            | Engine Turboshift Speed-1     |
| Eng N2 (%)            | Engine Turboshift Speed-2     |
| Eng OilPress (psi)    | Engine Oil Pressure           |
| Eng OilTemp (deg)     | Engine Oil Temperature        |
| Eng Torq (%)          | Engine Torque                 |
| Gnd Spd (kts)         | Ground Speed                  |
| HDG (deg)             | Magnetic Heading              |
| Latitude (deg)        | Latitude                      |
| Longitude (deg)       | Longitude                     |
| Pitch (deg)           | Pitch Angle                   |
| Roll (deg)            | Roll Angle                    |
| VSpd (fpm)            | Vertical Speed                |
| VSpdGPS (fpm)         | GPS Vertical Speed            |
| Time Local (HH:MM:SS) | Recorded Time                 |

Note: The G1000 records pressure altitude, which is based on a standard altimeter setting of 29.92 inches of mercury (inHg). The pressure altitude information presented in the plots and in the electronic data has not been corrected for the local altimeter setting at the time of the event.

**Table 2.** Unit abbreviations

| Unit Abbreviations | Descriptions           |
|--------------------|------------------------|
| %                  | percent                |
| deg                | degrees                |
| degF               | degrees Fahrenheit     |
| fpm                | feet per minute        |
| ft                 | feet                   |
| g                  | gravity                |
| kts                | knots                  |
| psi                | pounds per square inch |