

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN23FA359

ON-BOARD RECORDING DEVICE STUDY

Aircraft Performance Study

By

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A. ACCIDENT

Location: Virden, Illinois
Date: August 12, 2023
Time: 08:48 central daylight time (CDT)
Airplane: Vans RV-14A, N6161

B. SUMMARY

On August 12, 2023, about 0848 central daylight time, a Vans RV-14A airplane, N6161, was substantially damaged when it was involved in an accident near Virden, Illinois. The pilot was fatally injured. The flight was operated under the provisions of Title 14 Code of Federal Regulations Part 91 as a personal flight.

C. PERFORMANCE STUDY

1.0 Aircraft

The airplane was a Vans RV-14A, an aerobatic kit aircraft. The A model is a two-seater airplane with a tricycle landing gear. The airplane's maximum speed is reported as 180 kts and its stall speed as 47 kts.



Figure 1. Exemplar Vans RV-14A from vansaircraft.com

2.0 Available Data

This performance study is based on data recorded on the Garmin GX3. The onboard recording device records GPS location, altitude, airspeed, attitude, accelerations, and angle of attack. It additionally records autopilot settings and a variety of engine parameters. It does not record control inputs.

Automatic Dependent Surveillance-Broadcast (ADS-B) data was also provided by the Federal Aviation Administration (FAA). ADS-B broadcasts an airplane's Global Positioning System (GPS) position and other data to the ground where it is recorded. The GPS position has an accuracy of approximately 20 meters (65 ft) in both the horizontal and vertical dimensions.

3.0 Weather

Weather was recorded for 7:52 at Abraham Lincoln Capital Airport (SPI) in Springfield, Illinois, 21 NM northeast of the accident location. The temperature was reported as 84°F (29°C), the dew point was 73°F (23°C), and the barometric setting was 29.88 inHg. Winds were 8 kts from 310°. Visibility was ten statute miles. Few clouds were reported at 2,400 ft above ground level (AGL) and scattered clouds at 3,700 ft AGL.

4.0 Flight Path

The airplane took off at 08:38 from Litchfield Municipal Airport (3LF) in Litchfield, Illinois. The airplane climbed and made a right turn onto a north-northwesterly heading. The initial right turn recorded a roll of 14° right wing down which was the largest roll deviation of the flight until the upset. By 08:42, the airplane was above 3,500 ft above mean seal level (MSL) and on a heading of approximately 345°. After the initial climb, pitch varied between 3.4° nose up and -2.2° nose down.

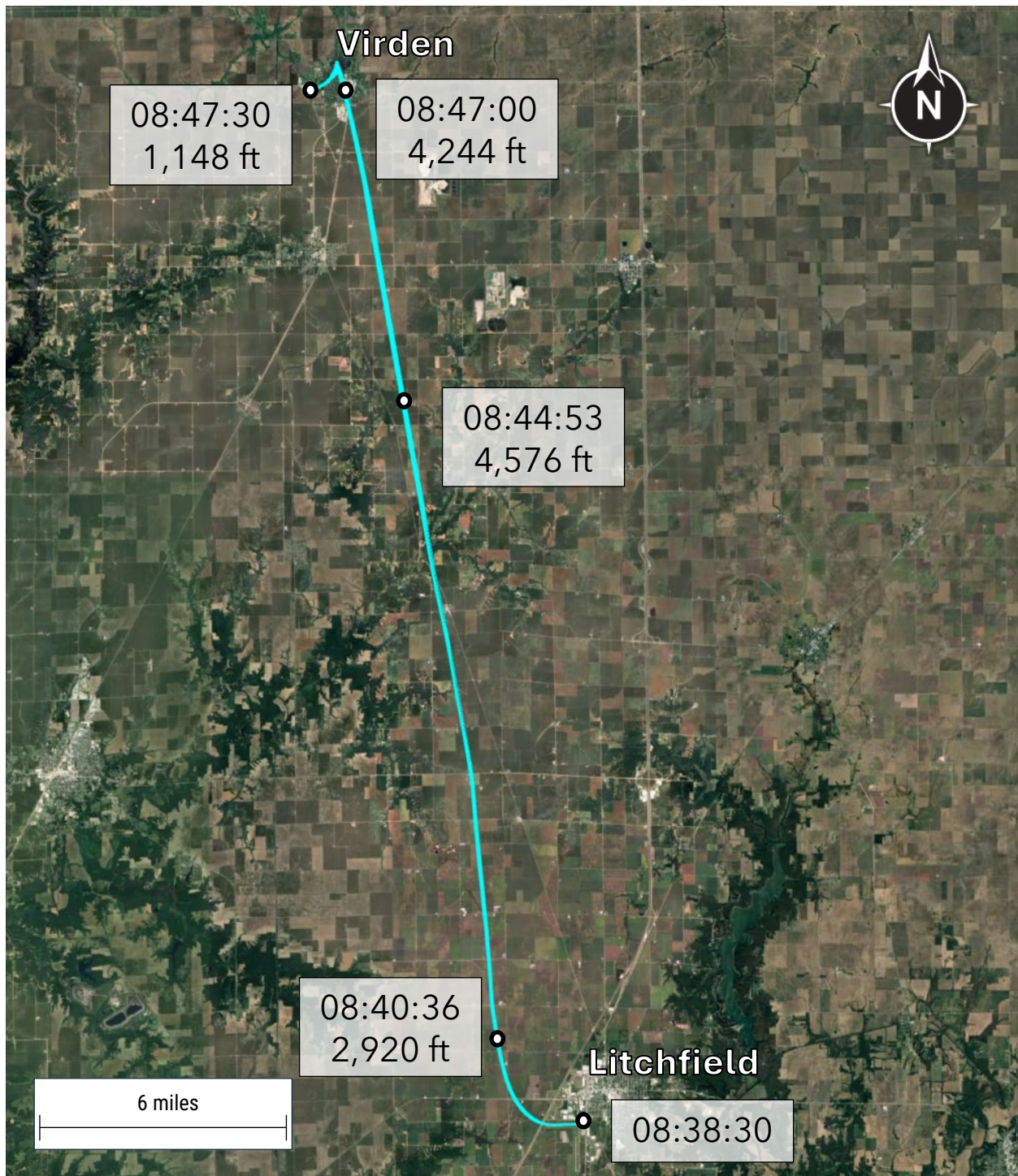


Figure 2. Garmin recorded flight path with times and altitudes noted.

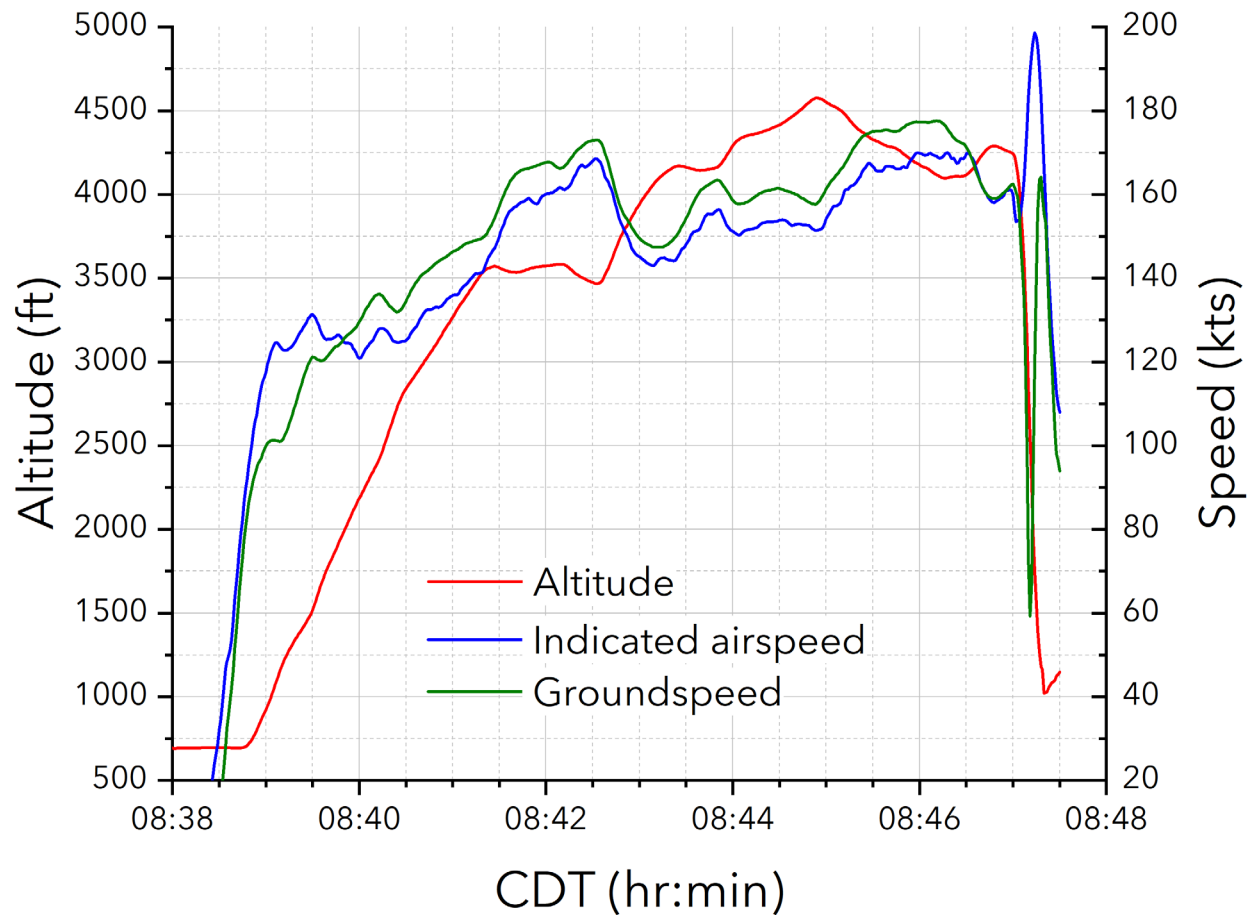


Figure 3. Garmin recorded altitude, indicated airspeed, and groundspeed.

During the flight, the autopilot (AP) setting was recorded. Autopilot was initiated at 08:40:36, after the initial left turn was completed.

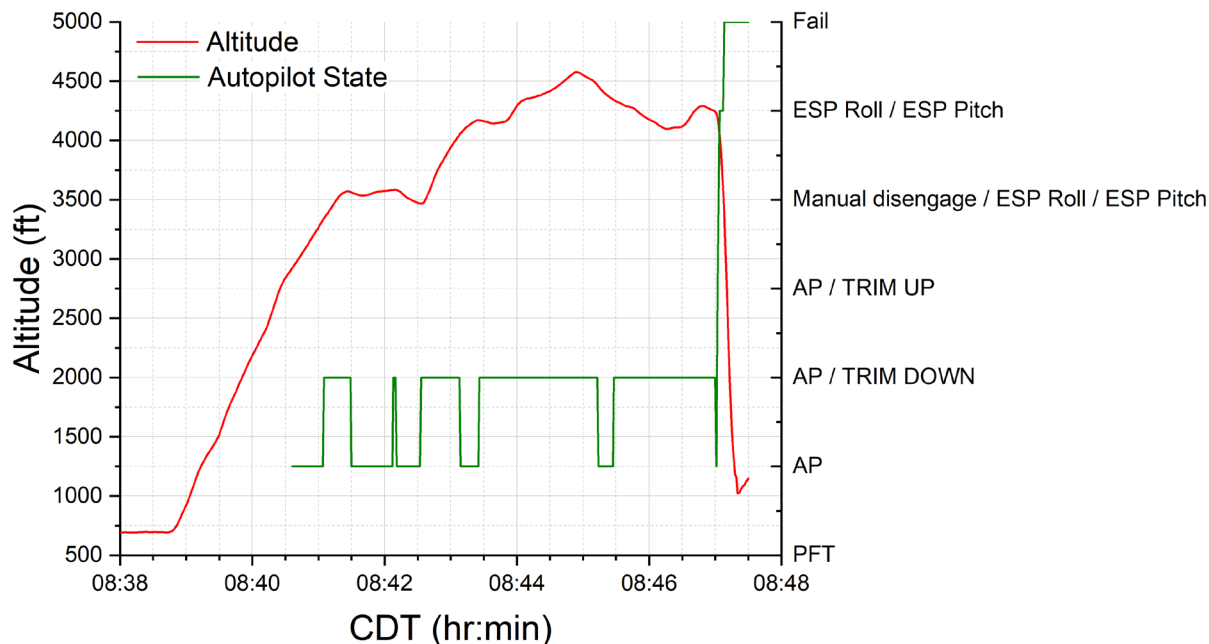


Figure 4. Garmin recorded altitude and autopilot setting.

At 08:46:30, as the airplane approached the town of Virden, Illinois, it climbed from 4,100 ft to 4,200 ft while slowing from 168 kts of indicated airspeed to 160 kts by 08:47. At 08:47:00, the autopilot, which had been in the "AP/TRIM DOWN" setting moved through "AP" then "AP/TRIM UP" to "Manual disengage/ESP Roll/ESP Pitch" then to "ESP Roll/ESP Pitch" where it remained for four seconds before recording "Fail" for the rest of the recording.

Simultaneous with the release from AP/TRIM DOWN the airplane began rolling right while pitching down rapidly. By 08:47:06 the airplane was 35° right wing down and 34° nose down. The airplane had descended 470 ft, but the heading remained straight until 08:47:07 when the recorded heading began to shift left followed by the track angle at 08:47:09.

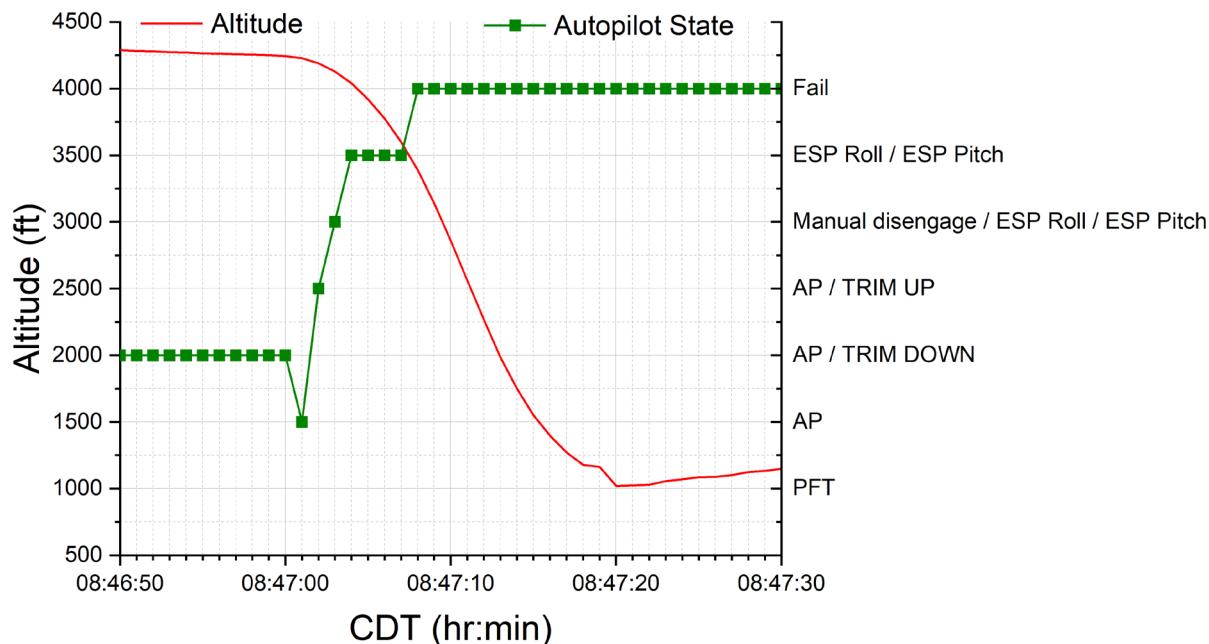


Figure 5. Garmin recorded altitude and autopilot setting for the end of flight.

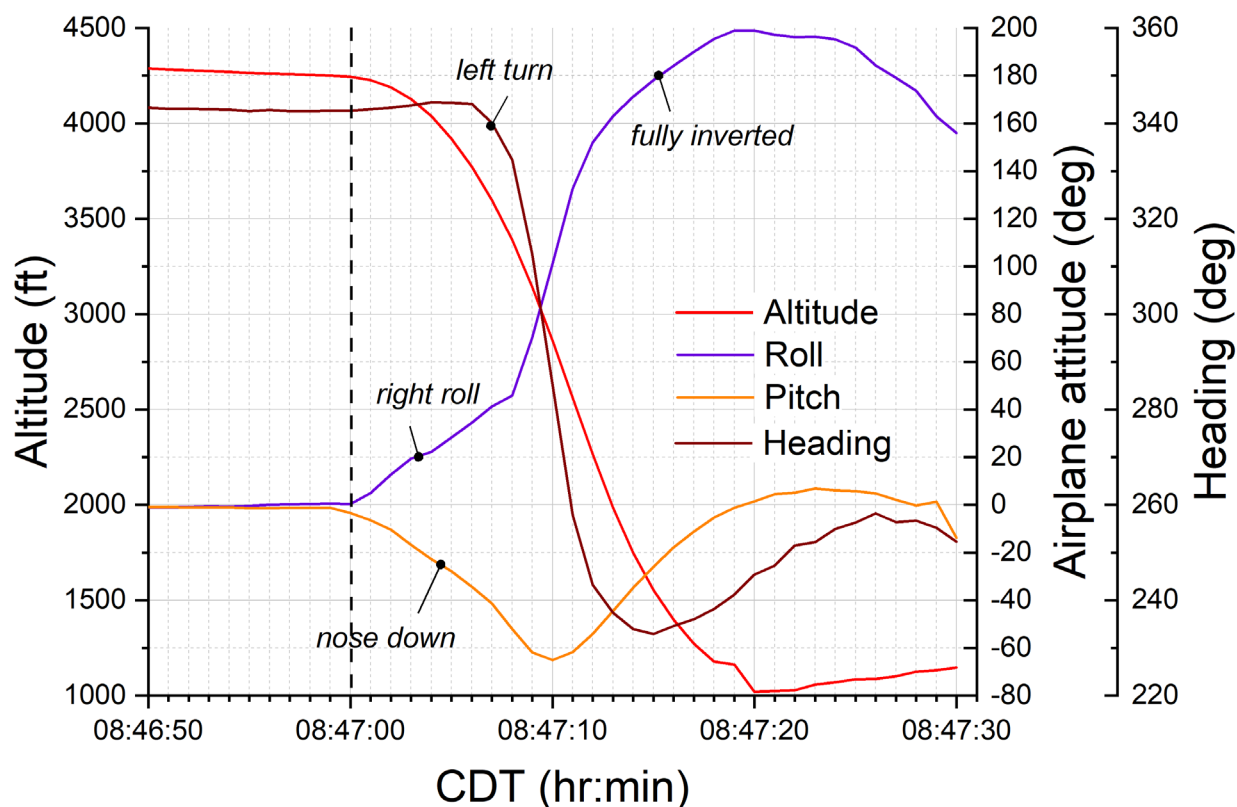


Figure 6. Garmin recorded altitude, roll, pitch, and heading.

By 08:47:16 the airplane had descended to 1,400 ft MSL (~ 700 ft AGL). The airplane by this time was near level, but inverted. The airplane stayed inverted until the

end of data at 08:47:30, 460 ft from the final wreckage location. Witnesses in the town of Virden confirmed that the airplane was inverted as it overflowed homes.

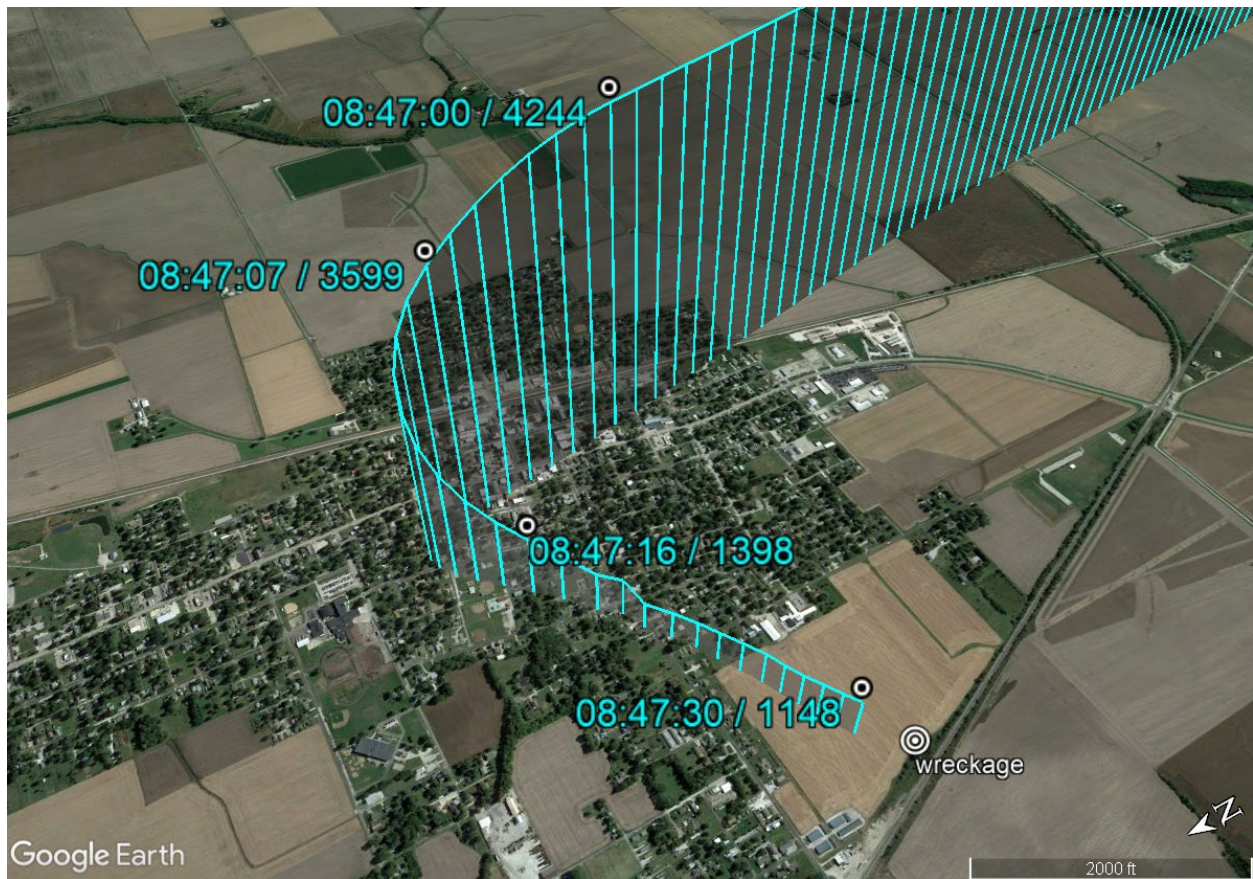


Figure 7. Garmin recorded flight path with times and altitudes noted.

5.0 Prior Flights

Of interest were the pilot's previous flights. The onboard device had records starting in November of 2022. Twenty-nine of these flights were investigated to see if the pilot participated in aerobatic maneuvers. One flight had a single maneuver that resulted in a bank angle of greater than 40°. The banks angles for all other flights rarely exceeded 30°. None of the flights had a nose down pitch greater than 10° or a nose up pitch greater than 10° after takeoff. There was no evidence in the recorded data of the pilot performing any aerobatic maneuvers.

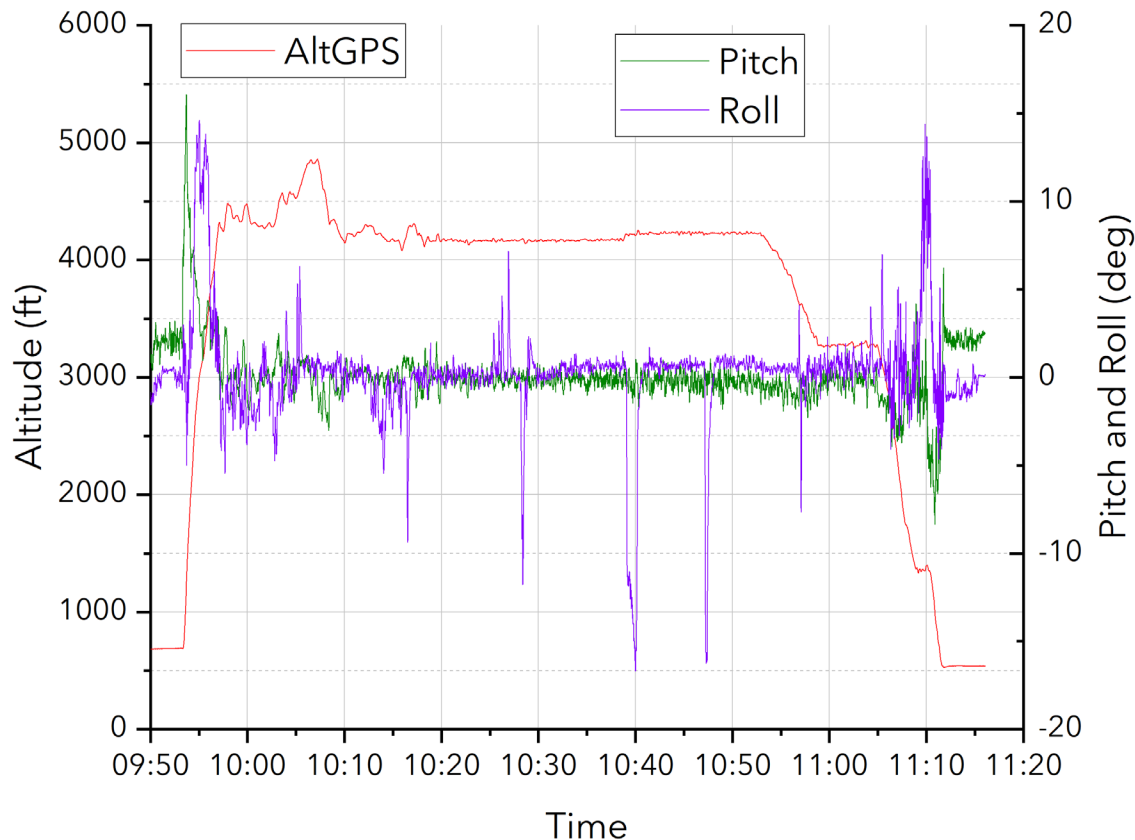


Figure 8. Garmin recorded altitude and airplane pitch and roll for an earlier exemplar flight.

D. SUMMARY

The airplane took off at 08:38:30 and turned north while climbing to 3,500 ft. From 08:42 to 08:47 the airplane's altitude varied between 3,500 and 4,500 ft and calibrated airspeed between 140 and 170 kts. The airplane was level until 08:47:00 when the autopilot setting changed and the airplane began to rapidly pitch down and roll right. The airplane rolled inverted as the flight track turned left and altitude was rapidly lost. Sixteen seconds after the upset began, the airplane arrested its descent while inverted. Fourteen more seconds of inverted flight were recorded before the airplane impacted the ground.

The initial uneventful flight path was not consistent with an aerobatic flight. Additionally, inspection of 29 prior flights of the accident airplane showed no evidence of aerobatic maneuvering by the accident pilot.