

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN24FA167

ELECTRONIC DEVICES

Specialist's Factual Report

July 25, 2024

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A. ACCIDENT

Location: Spring Branch, Texas
Date: April 29, 2024
Time: 1513 central daylight time (CDT)
2013 coordinated universal time (UTC)
Airplane: Hummingbird 260L, N829SH

B. ELECTRONIC DEVICES SPECIALIST

Specialist: Gerald Kawamoto
Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

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

Device Manufacturer/Model: Appareo Stratus 3
Device Serial Number: 005286

Device Manufacturer/Model: Garmin D2 Smartwatch
Device Serial Number: 5Q8005547

1.0 Appareo Stratus 3 Description

The Appareo Stratus 3 device is a self-contained battery-powered unit that contains an internal AHRS, GPS/WAAS receiver, and ADS-B receiver in one compact unit.^{1, 2, 3} The unit communicates wirelessly with compatible devices to display all the acquired information. In addition to communicating with compatible devices, the

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

² The Wide Area Augmentation System (WAAS) is an air navigation aid to augment the Global Positioning System (GPS), by improving its accuracy, integrity, and availability.

³ Automatic Dependent Surveillance-Broadcast (ADS-B) is a surveillance technology deployed throughout the national airspace system. The ADS-B system is composed of aircraft avionics and a ground infrastructure. Onboard avionics determine the position of the aircraft by using the GPS and transmit its position along with additional information about the aircraft to ground stations for use by air traffic control (ATC) and other ADS-B services. This information is transmitted at a rate of approximately once per second. Operators equipped with ADS-B realize additional benefits from ADS-B broadcast services: Traffic Information Service - Broadcast (TIS-B) (traffic information) and Flight Information Service - Broadcast (FIS-B) (weather information).

Stratus device records GPS position and AHRS information internally on a non-volatile flash memory chip.⁴

1.1 Appareo Stratus 3 Data Recovery

Upon arrival at the Vehicle Recorder Division, an external examination revealed extensive heat damage, as shown in figure 1, rendering it inoperable. The internal NVM chip was undamaged and was removed, read out and converted to engineering units using laboratory tools.



Figure 1. Appareo Stratus 3 as received.

1.2 Appareo Stratus 3 Recording Description

The recorded data included sessions from May 18, 2023, through April 29, 2024. The final session started at 15:08:58.6 CDT and ended at 15:14:27.1 CDT on April 29, 2024. Accuracy of gyroscopic parameters such as pitch angle and bank angle are dependent on the orientation of the device in the aircraft and proper calibration of the device.

⁴ Non-volatile memory (NVM) is semiconductor memory that does not require external power for data retention.

2.0 Garmin D2 Smartwatch

The Garmin D2 Smartwatch sustained heat damage precluding normal data recovery procedures, as shown in figure 2, therefore, no data were recovered.



Figure 2. Front and back of the Garmin D2 as received.

D. FIGURES AND TABULAR DATA

Figures 3 and 4 are graphical overlays generated using Google Earth showing the accident session from the Appareo Stratus. Weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 3 is an overview of the entire session. The beginning of the flight was not captured as the first data point indicated the helicopter was in flight and was approximately 3.7 nautical miles northeast of the reported departure location, Kestrel Airpark (1T7), Spring Branch, Texas.

Figure 4 shows approximately the final 15 seconds of the accident flight and the reported wreckage location. Impact occurred at approximately 15:12:25 CDT.

Figure 5 is a plot of parameters for the entire session. The time shown is 15:08:50 to 15:12:30 CDT.

Figure 6 is a plot of parameters for end of the flight. The time shown is 15:12:14 to 15:12:26 CDT.

The corresponding tabular data used to create figures 3 through 6 are provided in electronic comma-separated value (CSV) format as attachment 1 to this report

Submitted by:

Gerald Kawamoto
Recorder Specialist

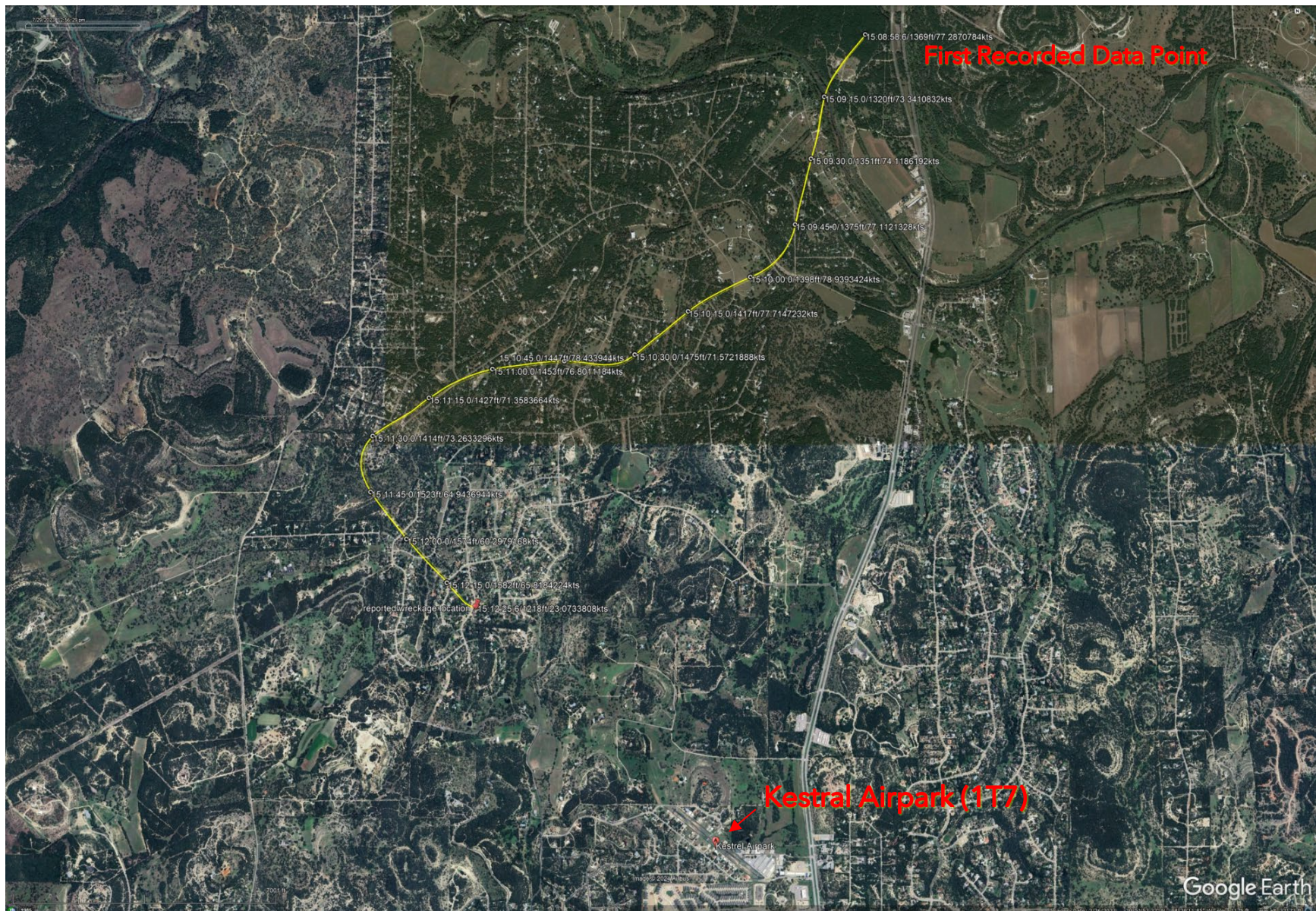


Figure 3. Google Earth overlay of the accident flight recorded on the Appareo Stratus 3.



Figure 4. Google Earth overlay of the end of the accident flight recorded on the Appareo Stratus 3 and the reported wreckage location.

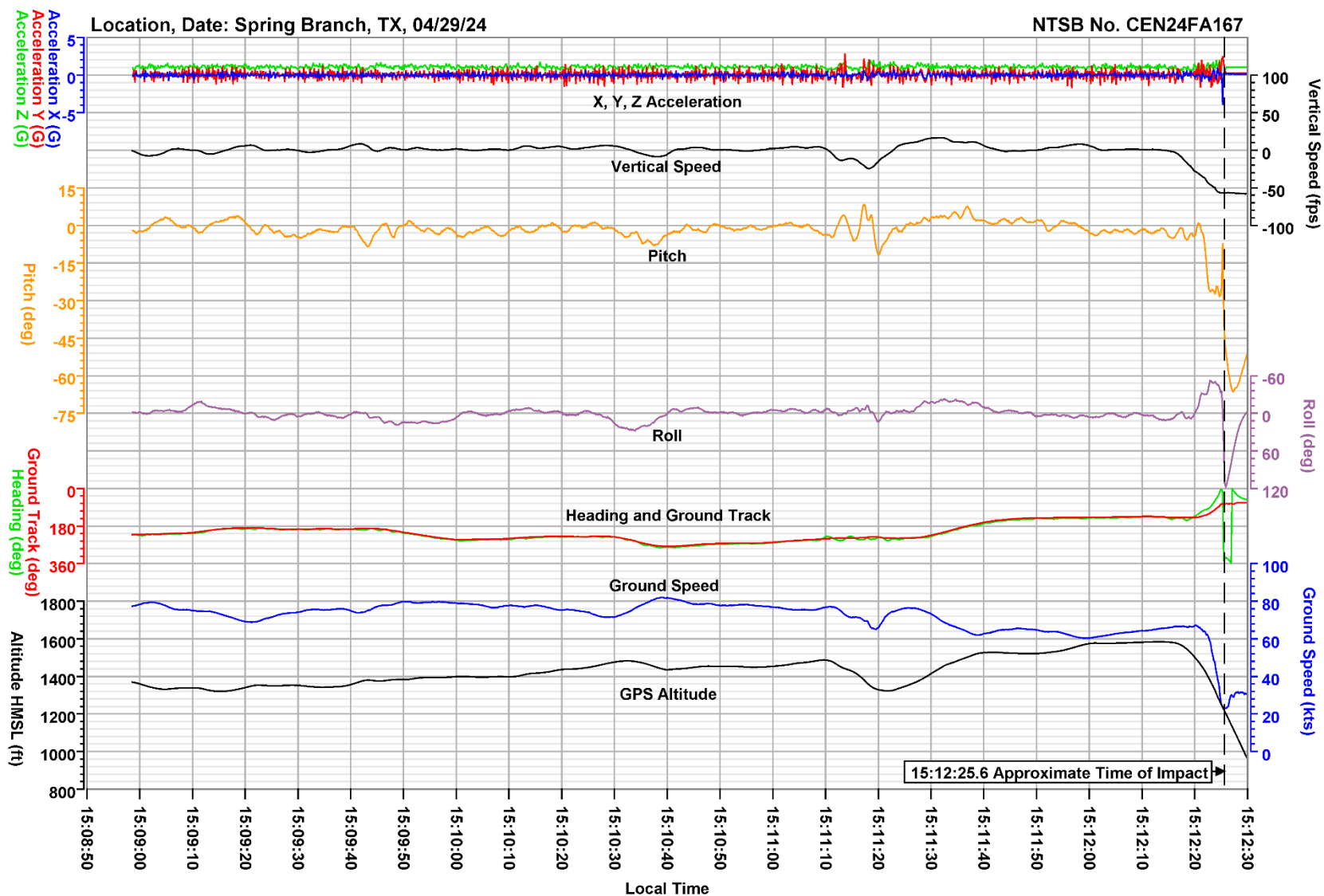


Figure 5. Plot of Appareo Stratus parameters for the entire accident session.

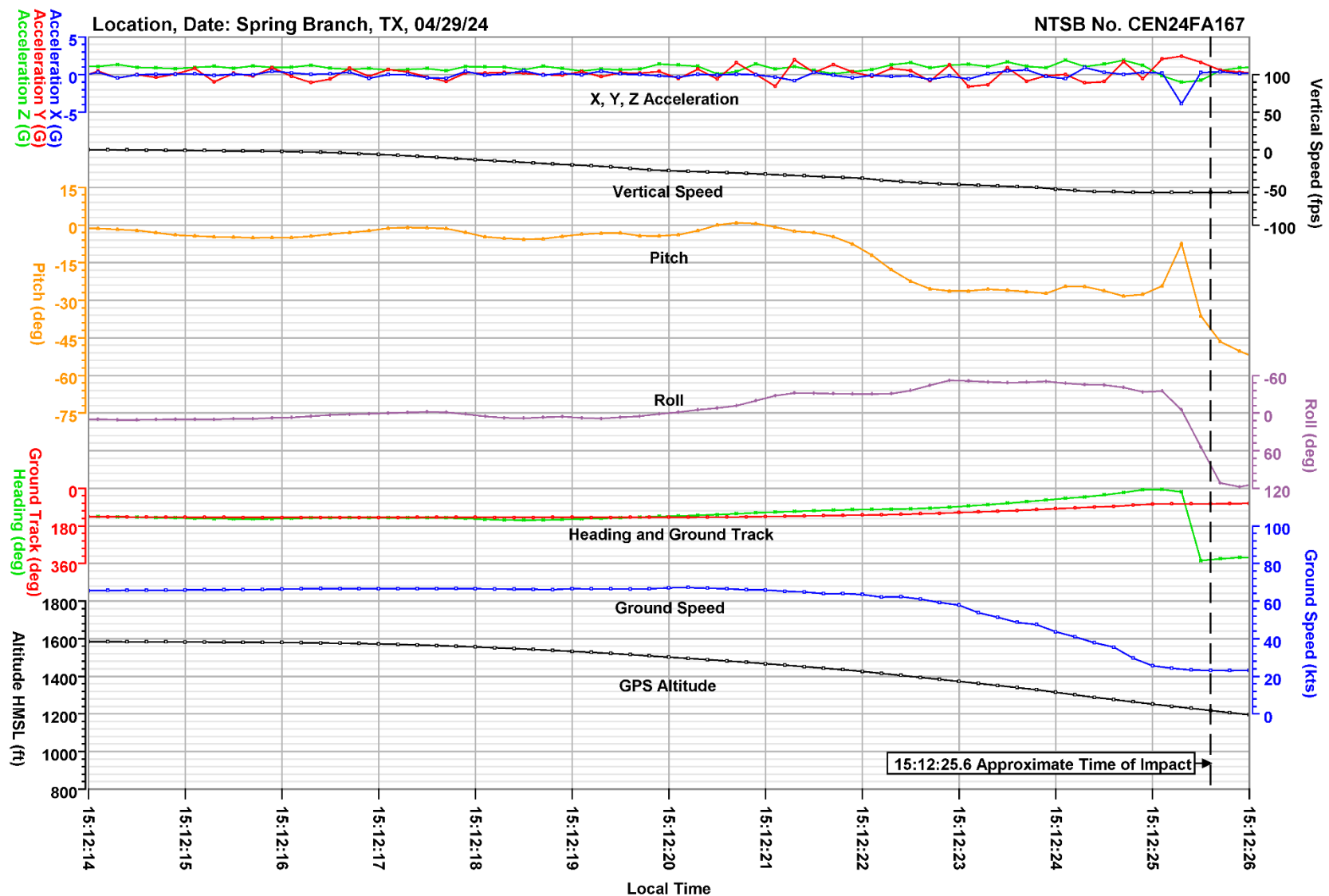


Figure 6. Plot of Appareo Stratus parameters for the end of the accident session.