

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN23LA101

ELECTRONIC DEVICE

Specialist's Factual Report

June 21, 2023

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. ELECTRONIC DEVICE SPECIALIST	3
C. DETAILS OF THE INVESTIGATION	3
1.0 DEVICE DESCRIPTION	3
1.1 Data Recovery	4
1.2 Recording Description	4
D. FIGURES AND TABULAR DATA.....	5

A. ACCIDENT

Location: Bayport, Minnesota
Date: February 4, 2023
Time: 1630 central standard time (CST)
Airplane: Bellanca Aircraft 7ACA, N9111L

B. ELECTRONIC DEVICE 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 device:

Recorder Manufacturer/Model: Appareo Stratus 3i
Part Number: 153510-000115
Recorder Serial Number: 002768

1.0 Device Description

The Appareo Stratus 3i 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 Stratus device records GPS position and AHRS information internally on a non-volatile flash memory chip.⁴

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).

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

1.1 Data Recovery

The device was in good condition upon arrival at the Vehicle Recorder Division, as shown in Figure 1. The device powered on normally and data were extracted using the manufacturer's procedures.



Figure 1. Front and back of the Appareo Stratus 3i as received.

1.2 Recording Description

The recorded data included 16 sessions from December 31, 2022, through February 4, 2023, UTC (coordinated universal time). The session containing the accident event started at 19:32:19 UTC and ended at 22:29:55 UTC. 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. A significant offset from 0 degrees can be observed in the bank angle parameter. The bank angle parameter is included in the plots for trending purposes.

D. FIGURES AND TABULAR DATA

Figures 2 and 3 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 2 is an overview of the entire session.

Figure 3 shows approximately the final two minutes of the session and the reported wreckage location.

Figure 4 is a plot of parameters for the entire session. The time shown is 19:30:00 to 22:35:00 UTC.

Figure 5 is a plot of parameters for the final two minutes of the session. The time shown is 22:28:00 to 22:30:00 UTC.

The corresponding tabular data used to create figures 2 through 5 are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

Submitted by:

Gerald Kawamoto
Recorder Specialist

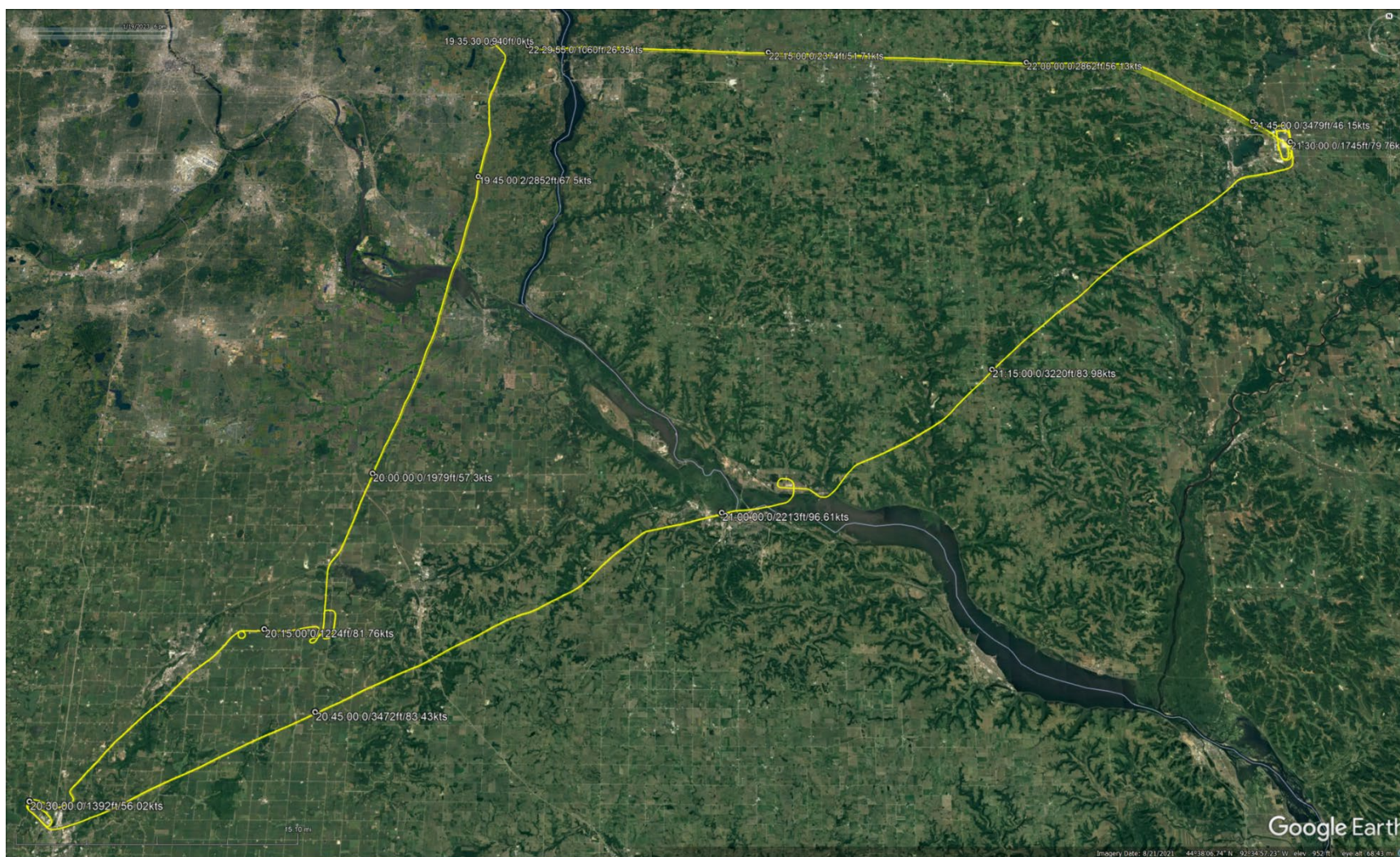


Figure 2. Google Earth overlay of the entire session.



Figure 3. Google Earth overlay showing the end of the accident session.

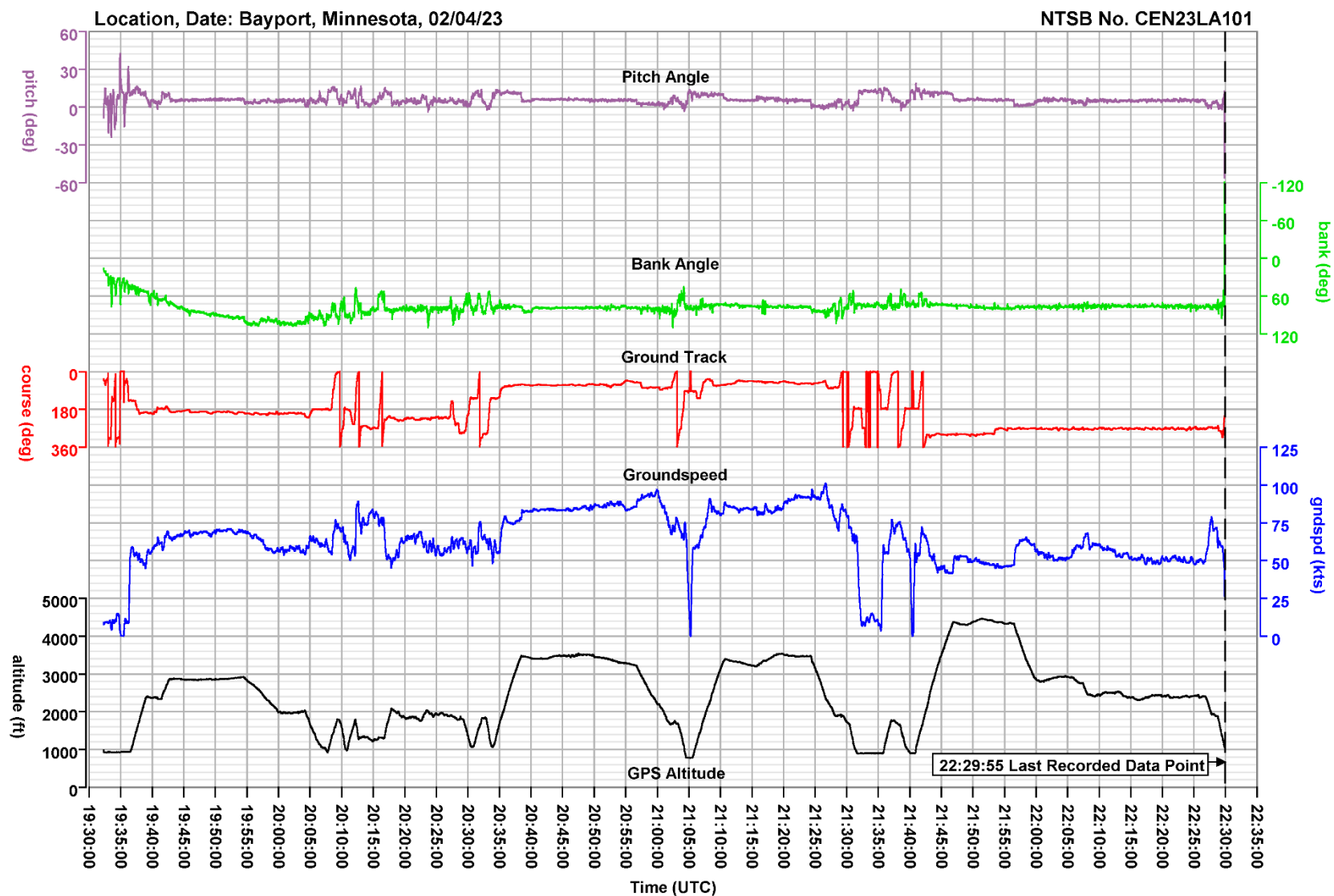


Figure 4. Plot of parameters for the entire session.

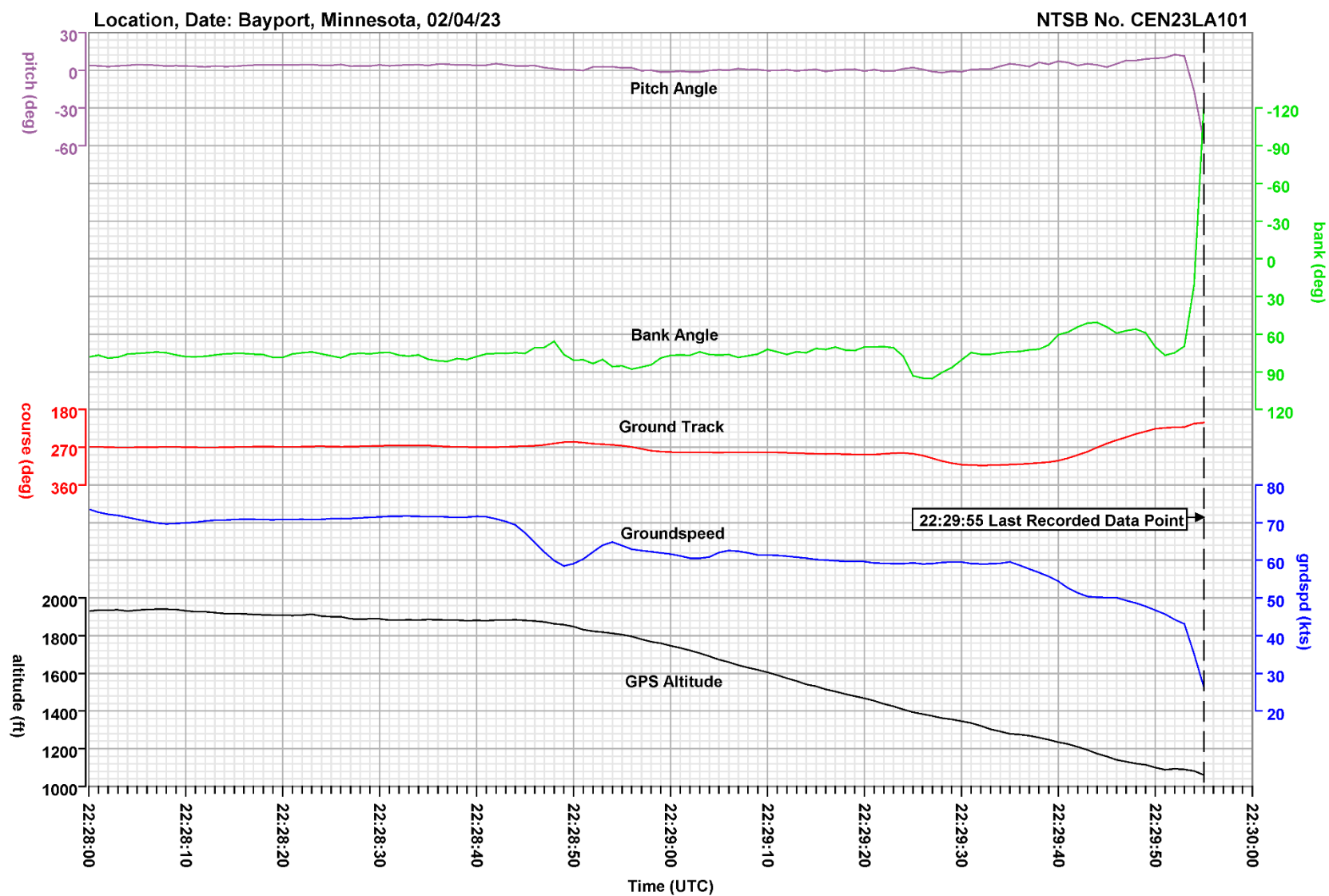


Figure 5. Plot of parameters for the end of the session.