

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

October 6, 2020

Electronic Device

Specialist's Factual Report by Gerald Kawamoto

1. EVENT

Location: Carlinville, Illinois
Date: May 31, 2020
Aircraft: Piper PA-28-235
Registration: N8991W
Operator: Private
NTSB Number: CEN20LA201

On May 31, 2020, at 1546 central daylight time, a Piper PA-28-235 airplane, N8991W, was destroyed when it impacted terrain near Carlinville, Illinois. The pilot and three passengers were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following device:

Device: **Appareo Stratus 3i**
Device Serial Number: **Unknown**

2.1. Device Description

The Appareo Stratus 3i is a wireless non-certified portable receiver capable of providing pilots with Wide Area Augmentation System¹ (WAAS) GPS position, weather and traffic information. The device receives Automatic Dependent Surveillance Broadcast (ADS-B) and records position, speed, attitude, and uncorrected barometric altitude data during flight. The device communicates wirelessly with compatible devices, such as an iPad running compatible applications, such as ForeFlight² to display all acquired information.

2.1.1. Data Recovery

Upon arrival at the Vehicle Recorder Division, an external examination showed the device had sustained impact damage, as shown in Figure 1, rendering it inoperable. The non-

¹ The WAAS is an air navigation aid to augment the GPS, by improving its accuracy, integrity, and availability.

² iOS Device application capable of displaying the aircraft's altitude, navigation, weather, and traffic information. The application can be used for flight planning, charts, airport information, document management, and flight logging.

volatile memory³ chip was removed, read out, and converted to engineering units using laboratory tools.



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

2.1.2. Data Description

The data extracted included sessions from February 22, 2020⁴, through May 31, 2020. The session determined to be relevant to the accident event was parsed out and started at 20:14:46 UTC and ended at 20:46:09 UTC on May 31, 2020.

2.1.3. Parameters Provided

Table 1 describes data parameters recorded and derived by the device.

³Non-volatile memory (NVM) is semiconductor memory that does not require external power for data retention.

⁴All dates and times referenced to Coordinated Universal Time (UTC).

Table 1. Appareo Stratus 3i Parameters.

Parameter Name	Parameter Description and Units
Date	Date for recorded data point (MM/DD/YYYY)
Time	Time (UTC) for recorded data point (HH:MM:SS)
Latitude	Recorded Latitude (degrees)
Longitude	Recorded Longitude (degrees)
Acceleration X	Acceleration in X-Axis (g)
Acceleration Y	Acceleration in Y-Axis (g)
Acceleration Z	Acceleration in Z-Axis (g)
MSL Altitude	Recorded MSL Altitude (feet)
Ground Speed	Averaged derived ground speed (knots)
Heading	Magnetic Heading (degrees)
Pitch	Pitch Angle (degrees)
Roll	Roll Angle (degrees)

3. Plots and Corresponding Tabular Data

Figures 2 through 4 are graphical overlays generated using Google Earth. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 2 shows the entire accident flight.

Figure 3 shows an aerial view of the end of the accident flight and the wreckage location.

Figure 4 shows a side view of the end of the accident flight and the wreckage location.

Figures 5 through 7 are plots of the parameters recorded on the device. These plots are configured such that right turns are indicated by the trace moving toward the bottom of the page, left turns towards the top of the page, and nose up attitudes towards the top of the page.

Figure 5 shows the entire accident flight. The time interval shown is 20:14:00 UTC to 20:47:00 UTC.

Figure 6 shows the last 1 minute and 10 seconds of the accident flight. The time interval shown is 20:45:00 UTC to 20:46:10 UTC.

Figure 7 shows the last 35 seconds of the accident flight. The time interval shown is 20:45:35 UTC to 20:46:10 UTC.

The corresponding tabular data used to create Figures 2 through 7 are provided in electronic comma separated value (.csv) as Attachment 1 to this report.

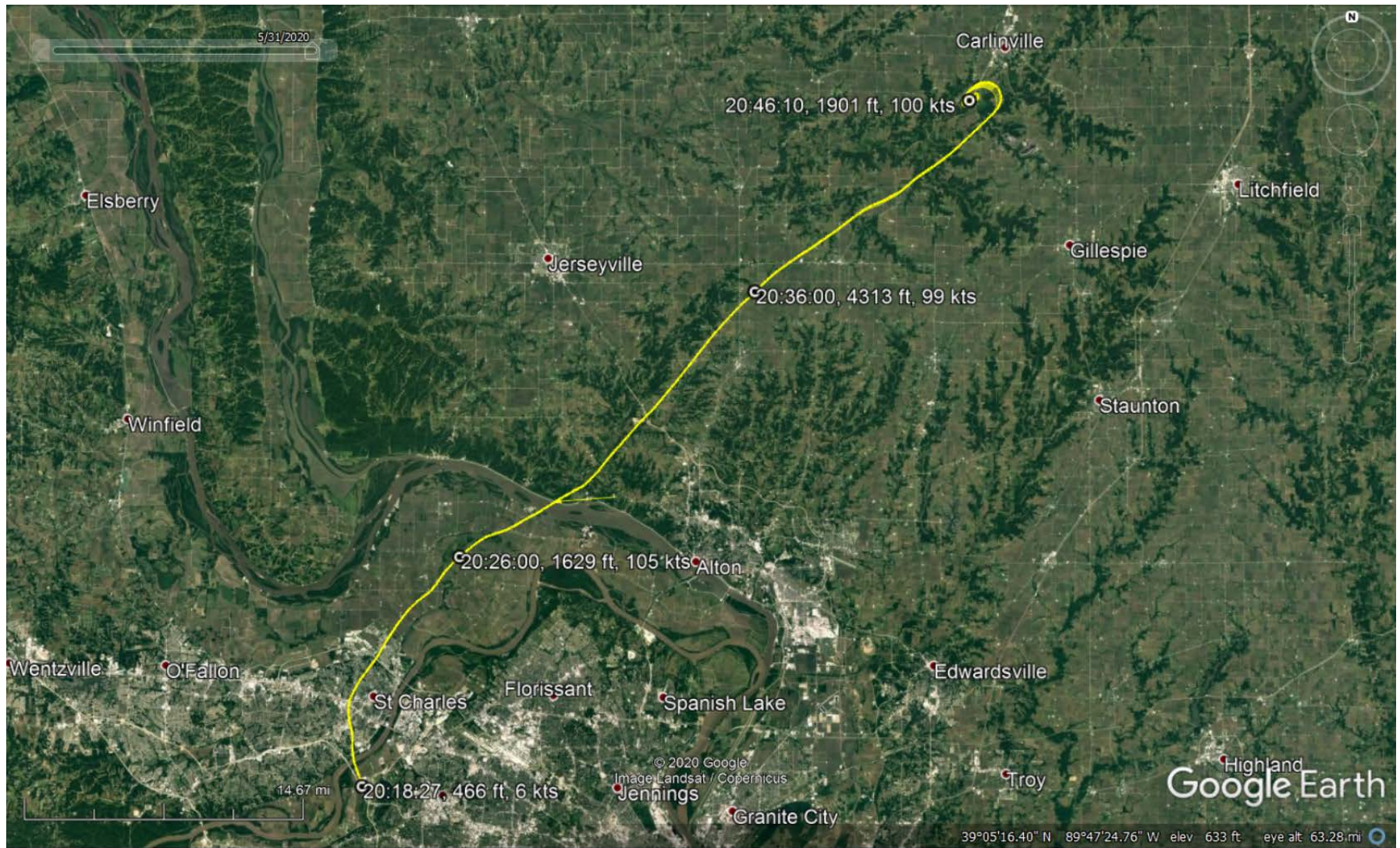


Figure 2. Google Earth overlay of the entire accident flight.

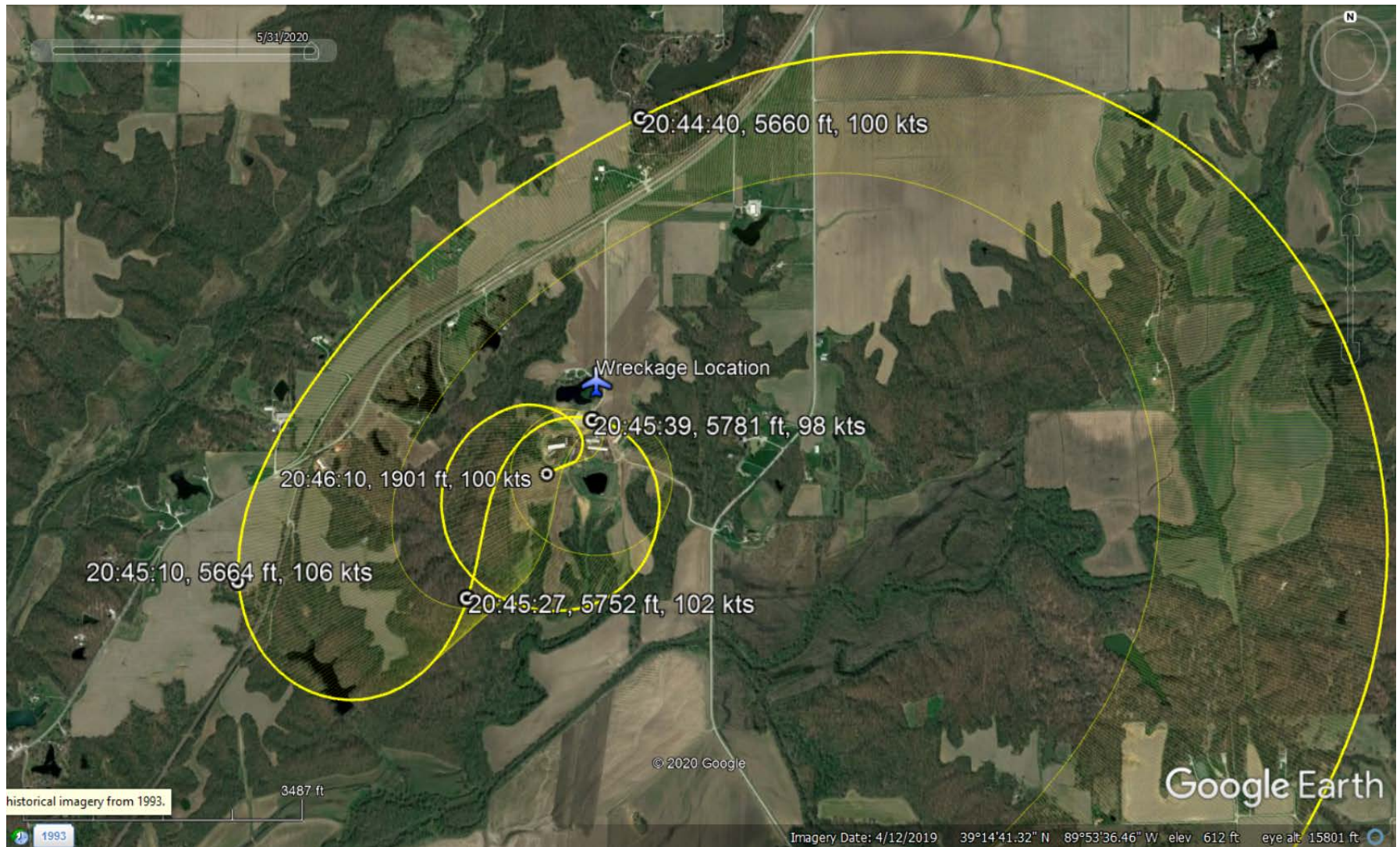


Figure 3. Google Earth overlay showing an aerial view of the end of the accident flight.

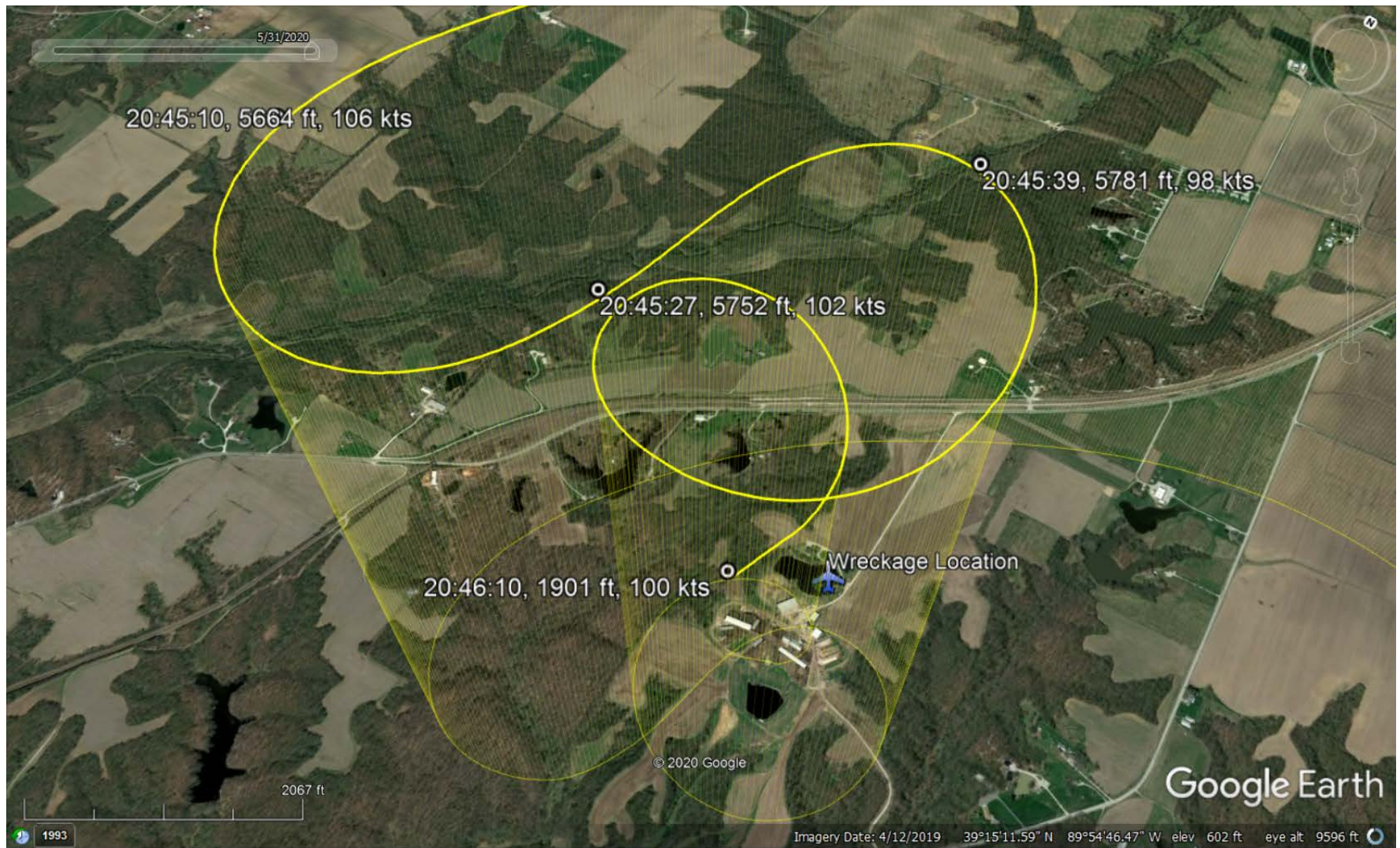


Figure 4. Google Earth overlay showing a side view of the end of the accident flight.

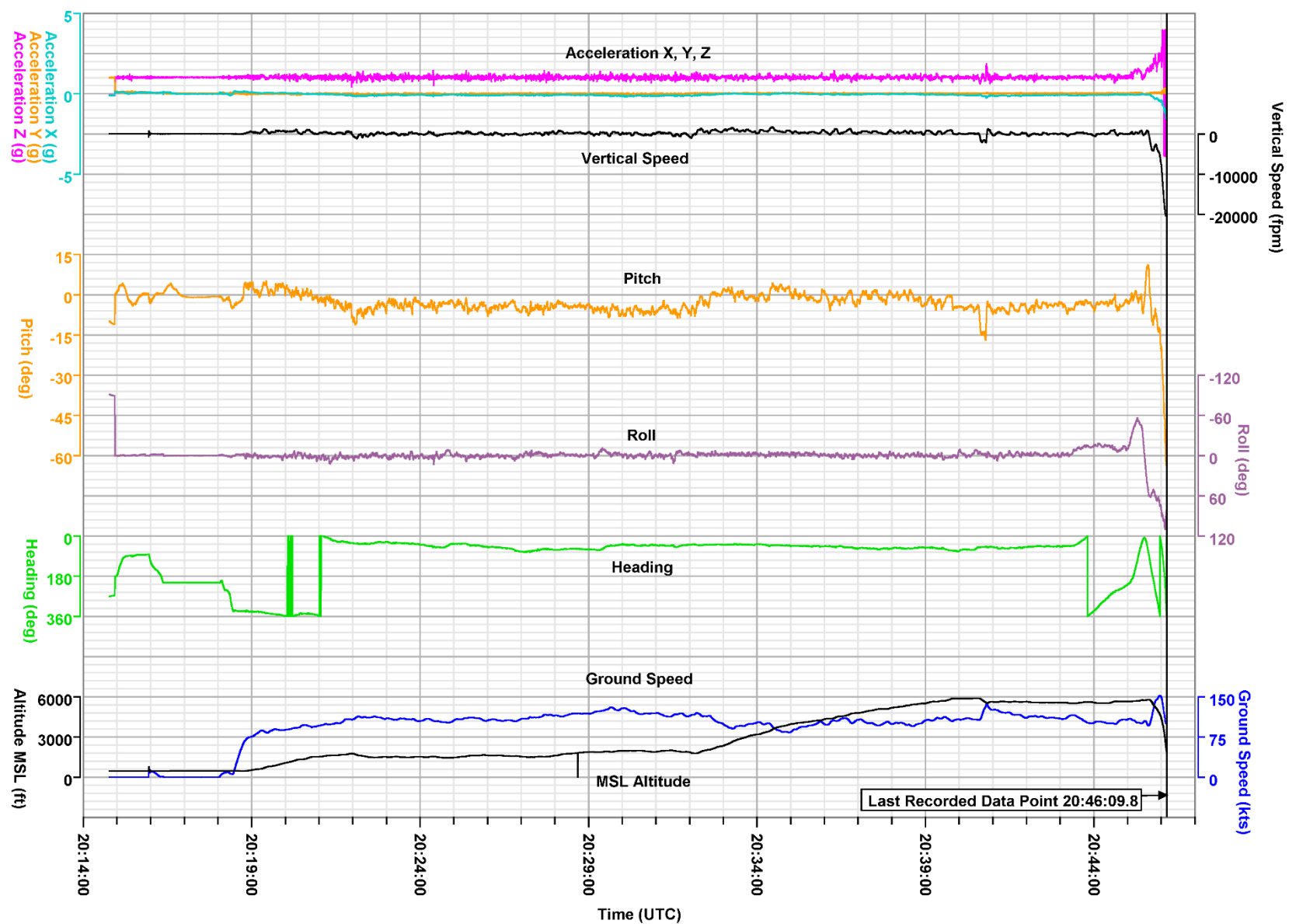


Figure 5. Plot of parameters from the Stratus 3i for the entire accident flight.

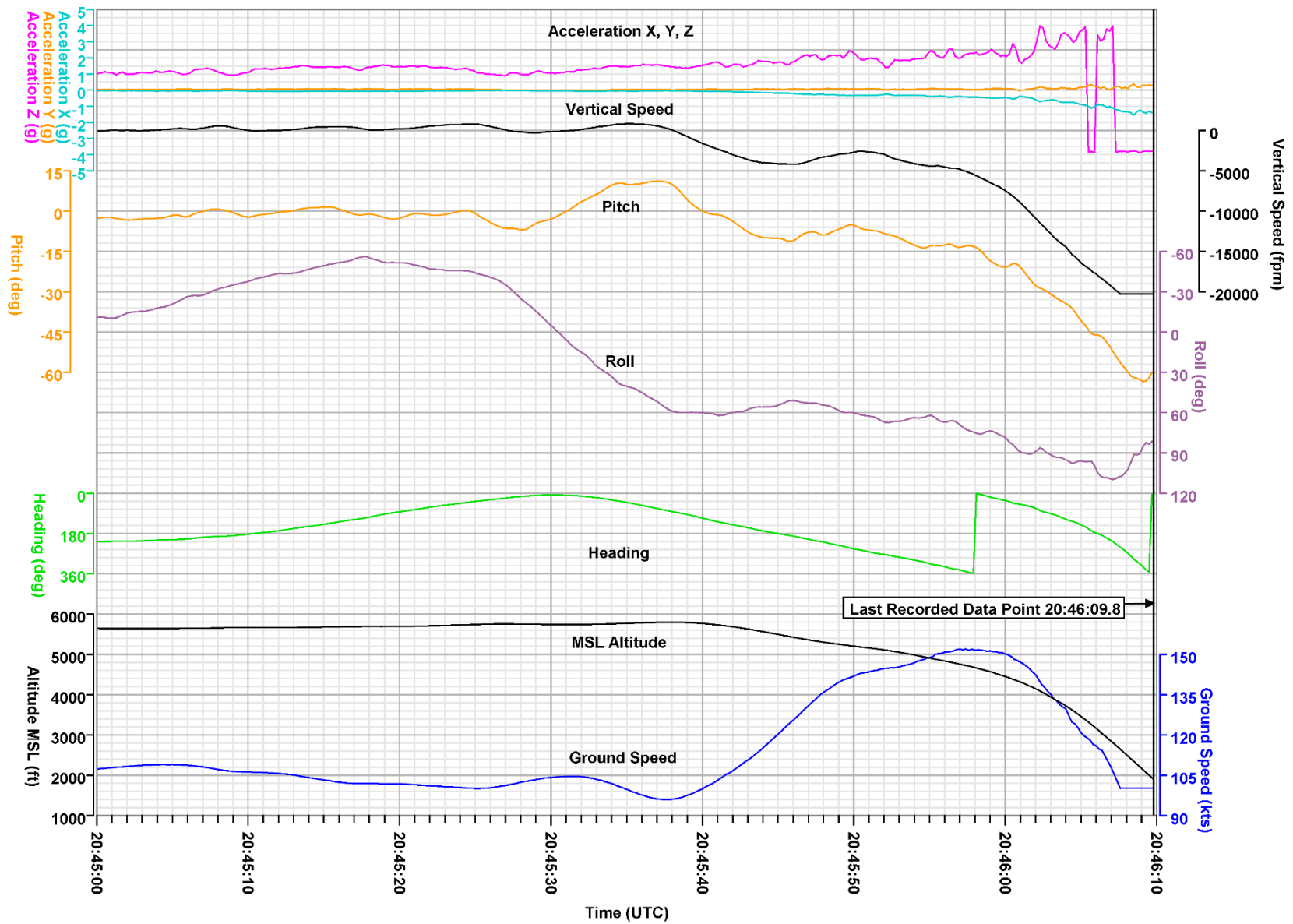


Figure 6. Plot of parameters from the Stratus 3i for the last 1 minute and 10 seconds of the accident flight.

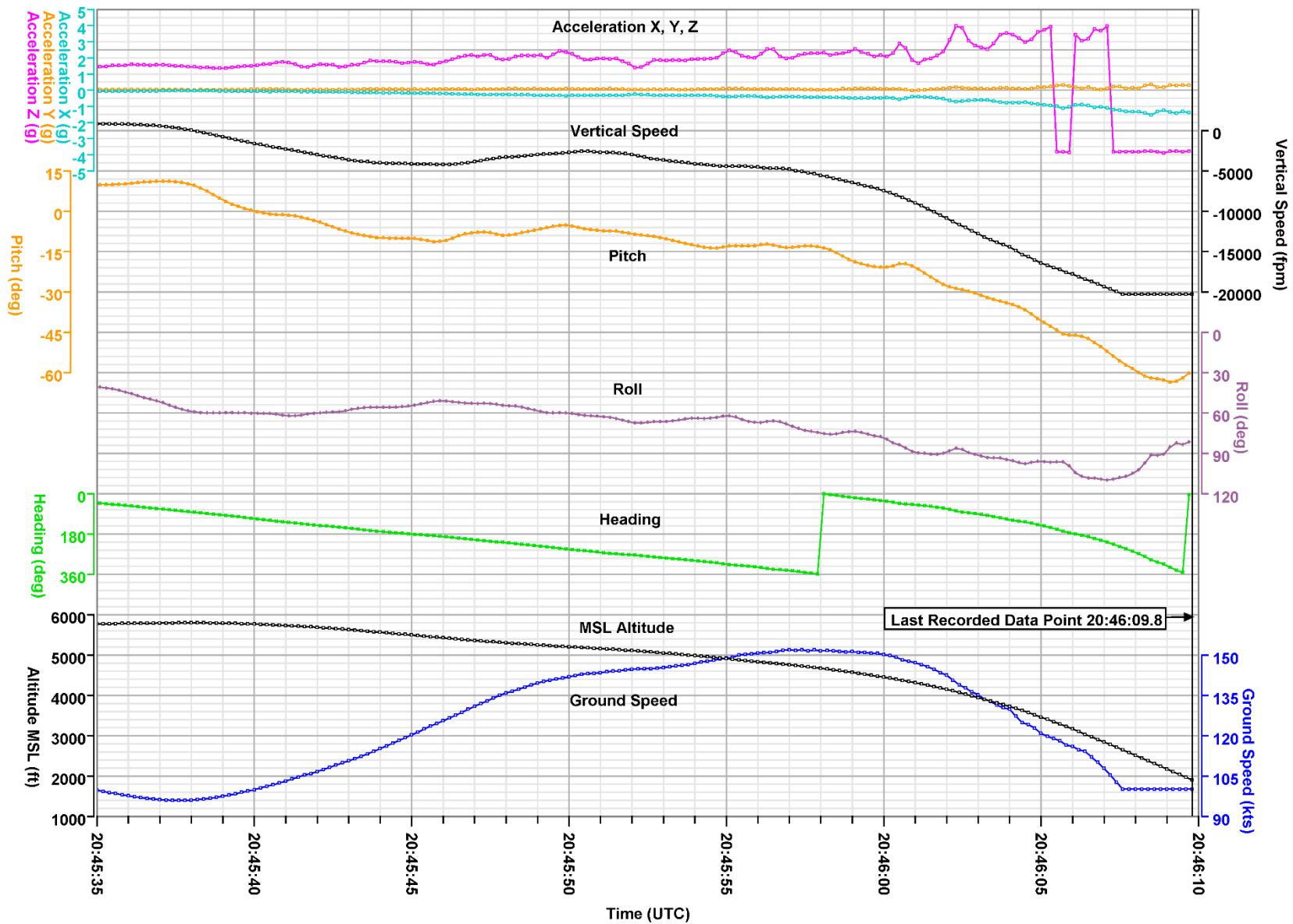


Figure 7. Plot of parameters from the Stratus 3i for the last 35 seconds of the accident flight.