

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA24FA003

ELECTRONIC DEVICE - RECORDED FLIGHT DATA

Specialist's Factual Report

November 22, 2023

TABLE OF CONTENTS

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

A. ACCIDENT

Location: Croydon, New Hampshire
Date: October 8, 2023
Time: 1932 eastern daylight time (EDT)
2332 coordinated universal time (UTC)
Helicopter: Bell 407, N802JR

B. ELECTRONIC DEVICE - RECORDED FLIGHT DATA SPECIALIST

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

C. DETAILS OF THE INVESTIGATION

An onboard image recorder group was convened at the NTSB Vehicle Recorder Laboratory on November 16, 2023. Description of the image and audio recorded is detailed in the Onboard Image Recorder - Group Chair's Factual Report in the public docket. The NTSB Vehicle Recorder Division received the following electronic device:

Recorder Manufacturer/Model: Appareo Vision 1000
Recorder Serial Number: Unknown

1.0 Device Description

The Appareo Vision 1000 is a self-contained image, audio, and data recorder. The device is typically mounted in the overhead panel of the aircraft's cockpit and records an image at a rate of four times per second with its internal camera. A GPS receiver is included that receives GPS satellite-based aircraft time, position, altitude, and speed. The device has a self-contained real-time inertial measuring unit that records 3-axis acceleration, and derived pitch, roll and yaw data.

Two independent audio tracks can be recorded, depending on installation and configuration. One track is from the internal microphone of the device and the second track can be wired to an external audio source, such as the helicopter's intercom.

The device records image, audio, and parametric data on a removable SD memory card. Depending on card size, removable memory retains approximately the last two hours of image and audio data and the last 100 hours of parametric data. In

addition to the removable memory, the device contains an internal non-volatile flash memory chip whose contents mirror that of the removable SD card.¹

In a typical installation, the device is connected to the aircraft's electrical bus. Any time the battery switch is turned on, the device will start to record audio, images, and data. The device creates a new file for each application of electrical power and may create multiple files for the same power cycle if the recording time exceeds a certain time limit.

1.1 Data Recovery

The device was damaged in the event, as shown in Figure 1. The internally mounted 16GB SD card was undamaged, and data were extracted normally using laboratory tools.

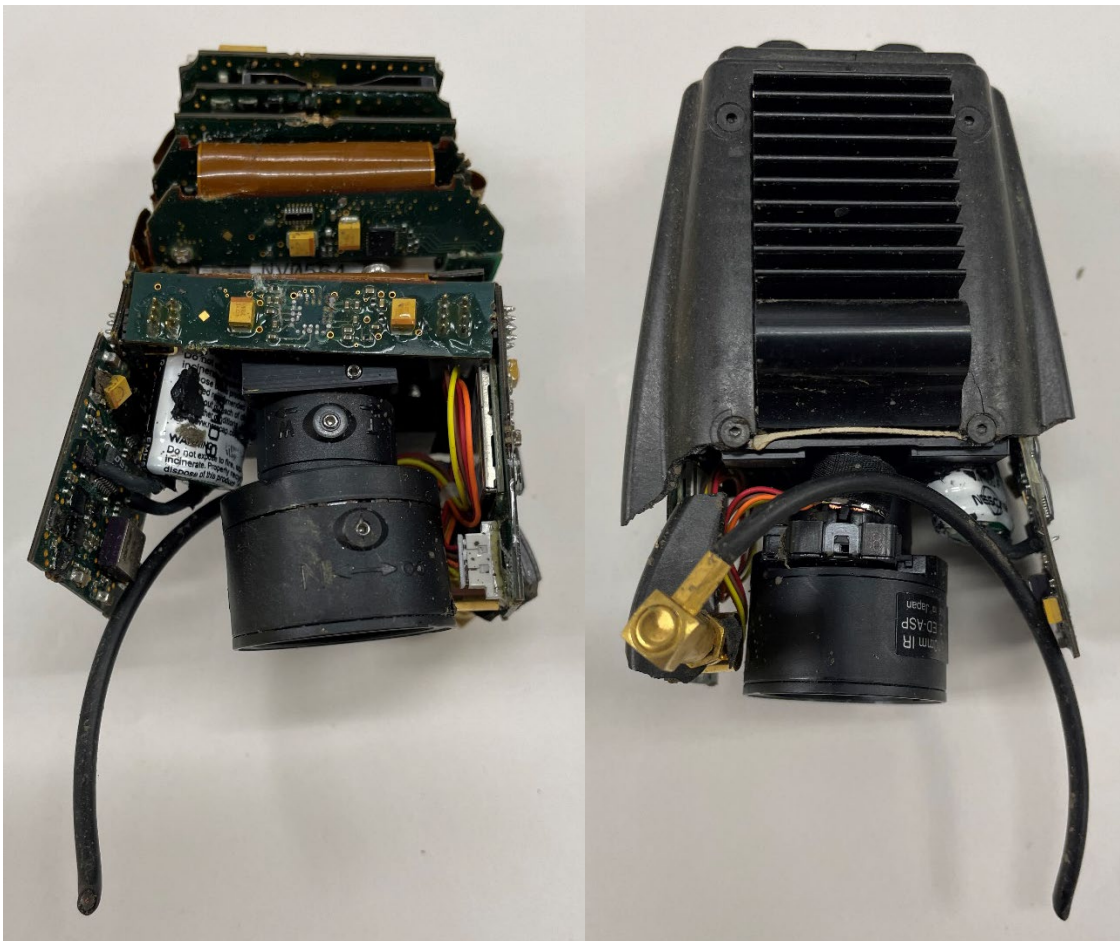


Figure 1. Front and back of the Appareo Vision 1000 as received.

¹ Non-volatile memory (NVM) is semiconductor memory that does not require external power for data retention.

1.2 Recording Description

Files from the SD card included data from May 17, 2023, through October 8, 2023 UTC. Data were parsed out from the card using the manufacturer's procedures. The accident session was the last recording that started at 23:19:35 UTC and ended at 23:32:03 UTC on October 8, 2023. Table 1 describes parameters recorded.

Table 1. Appareo Vision Parameters.

Parameter Name	Parameter Description (units)
Date (mm/dd/yyyy)	Recorded Date (month/day/year)
Time (hh:mm:ss.00)	Recorded UTC Time (hours:minutes:seconds)
Latitude (deg)	Latitude (degrees)
Longitude (deg)	Longitude (degrees)
Elevation (ft)	GPS Altitude (feet)
GroundSpeed (kts)	Average Derived Groundspeed (knots)
Heading (deg)	Heading (degrees)
Course (deg)	Average Derived True Course (degrees)
Roll (deg)	Roll Angle (degrees)
Pitch (deg)	Pitch Angle (degrees)
VerticalSpeed (fpm)	Vertical Speed (feet per minute)

D. FIGURES AND TABULAR DATA

Figures 2 and 3 are graphical overlays generated using Google Earth showing the accident session from the Appareo Vision 1000. Figure 2 is an overview of the entire accident session. Figure 3 shows the final 4 seconds of recorded data in addition to points of impact and location of wreckage. Weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 4 is a plot of parameters for the entire accident session. The time shown is 23:19:30 to 23:32:30 UTC.

Figure 5 is a plot of parameters for the flight portion of the accident recording. The helicopter took off at about 23:30:46 UTC. The time shown is 23:30:40 to 23:32:05 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
Electronics Engineer - Recorder Specialist



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



Figure 3. Google Earth overlay showing the final 4 seconds of recorded data, points of impact, and location of wreckage.

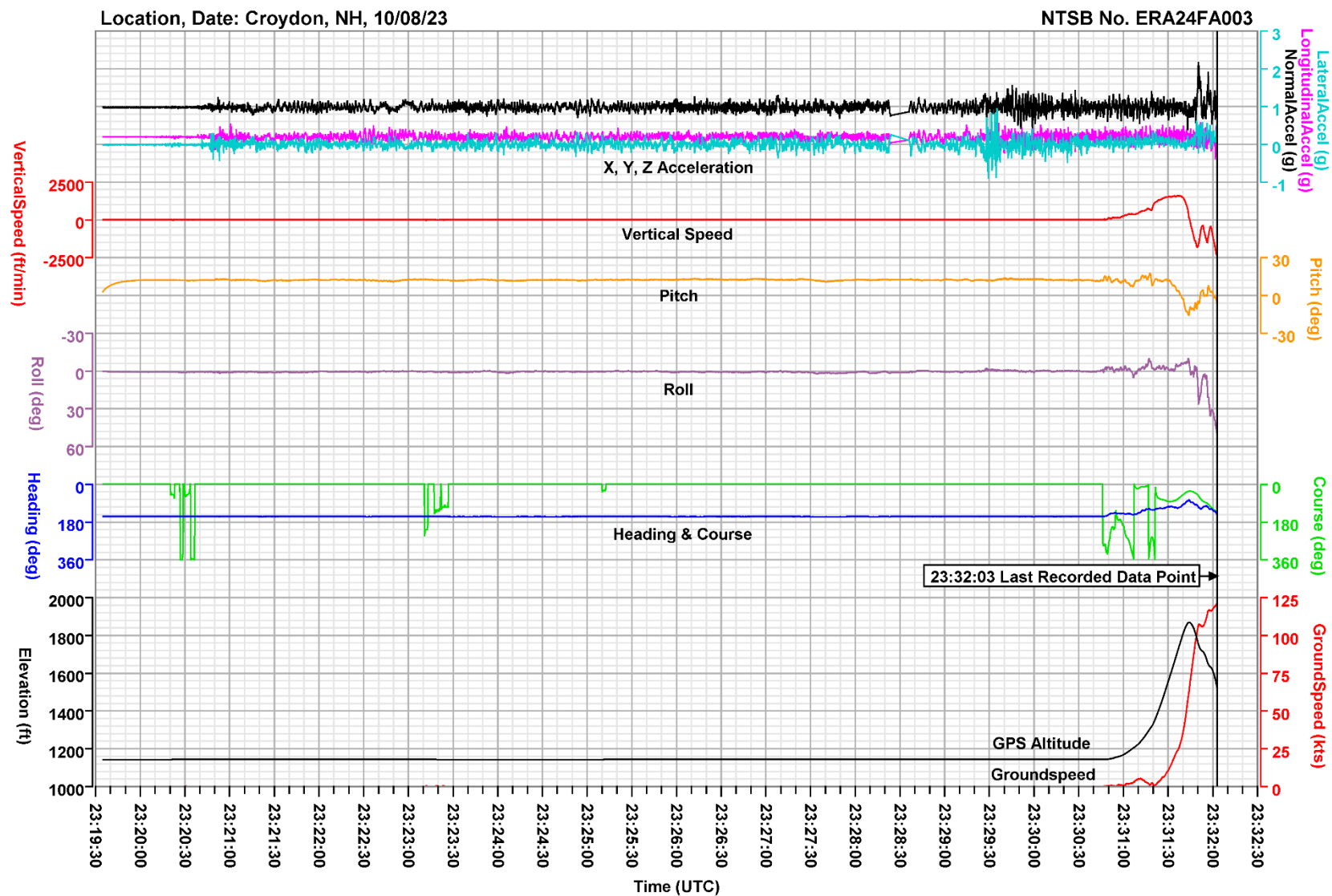


Figure 4. Plot of parameters for the entire accident session.

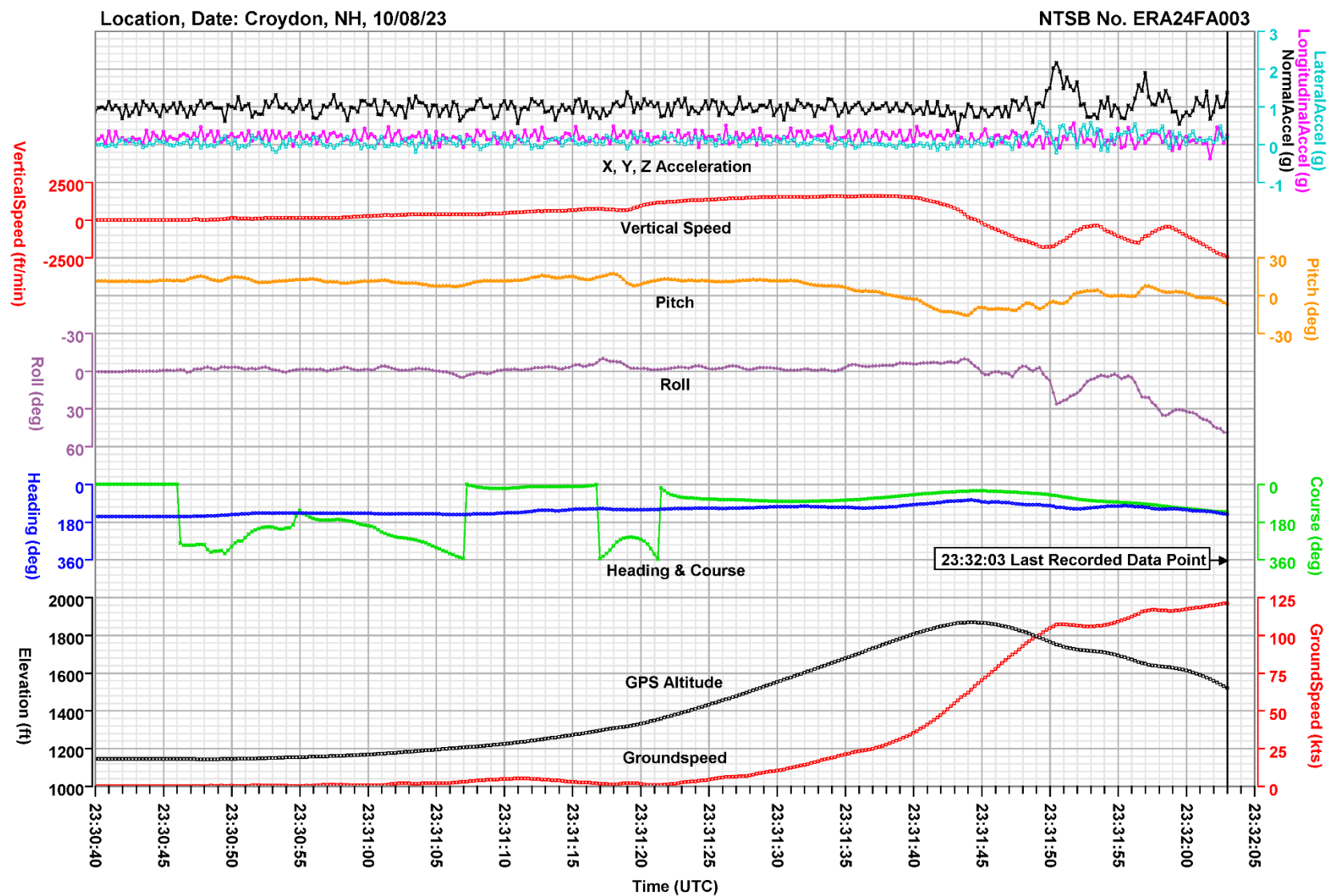


Figure 5. Plot of parameters for the flight portion of the accident session.