National Transportation Safety Board
Office of Research and Engineering
Washington, DC 20594

WPR22FA160

GLOBAL POSITIONING SYSTEM DEVICE

Specialist's Factual Report

October 6, 2023

TABLE OF CONTENTS

A. ACCIDENT 3
B. GLOBAL POSITIONING SYSTEM DEVICE SPECIALIST 3
C. DETAILS OF THE INVESTIGATION 3
1.0 GARMIN GPSMAP 396 DESCRIPTION 3
1.1 Garmin GPSMAP 396 Data Recovery 3
1.2 Garmin GPSMAP 396 Recording Description 4
2.0 AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST DESCRIPTION 4
2.1 Automatic Dependent Surveillance-Broadcast File Recovery 4
2.2 Automatic Dependent Surveillance-Broadcast Recording Description 5
2.3 Automatic Dependent Surveillance-Broadcast Parameters Provided 5
D. OVERLAYS AND TABULAR DATA 5

A. ACCIDENT

Location: Sylmar, California
Date: April 20, 2022
Time: 1226 Pacific Daylight Time (PDT)
Airplane: Cessna 337, private operator, N143JB

B. GLOBAL POSITIONING SYSTEM DEVICE SPECIALIST

Specialist: Matthew Yandrick
Electrical Engineer - Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A global positioning system (GPS) device group was not convened. The NTSB Vehicle Recorder Division received the following GPS device and electronic file:

Recorder Manufacturer/Model: Garmin GPSMAP 396
Recorder Serial Number: 28200129

Electronic File #1: ADS-B file for N143JB

1.0 Garmin GPSMAP 396 Description

The Garmin GPSMAP 396 is a hand-portable GPS unit equipped with a detachable antenna, a 256 TFT LCD display, built in base map, and an internal Jeppesen aviation database. The unit employs a parallel 12 channel receiver and can be operated using external power or, alternatively, by using an internal Li-ion rechargeable battery. The GPSMAP 396 is capable of storing date, route of flight, and flight time information for up to 50 individual flights in the form of a flight log. A detailed track log including latitude, longitude, date, time, and groundspeed is stored within the unit whenever the track log as a function of time or distance moved, depending on how the unit has been configured. Once the current track log memory becomes full, new information either overwrites the oldest information or recording stops, depending on how the unit is configured. Track log storage may be activated or deactivated at user discretion.

1.1 Garmin GPSMAP 396 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained damage as shown in figure 1. The front screen was shattered, and the device was unable to be powered on. An internal inspection revealed the memory chip appeared undamaged. Subsequently, the memory chip

was removed from the main internal board, and the memory contents of the chip were read out and track log data points were decoded using laboratory equipment.

Figure 1. Front and back of Garmin GPSMAP 396 as received.

1.2 Garmin GPSMAP 396 Recording Description

The data extracted included 19 sessions from July 22, 2005, through August 15, 2005. [1] The log history showed that the last session recorded was at Zamperini Field Airport (KTOA) on August 15, 2005. The session was about 8 minutes and 23 seconds long. The result confirmed the accident flight was not recorded on the device. Thus, no accident pertinent data were recovered from this device.

2.0 Automatic Dependent Surveillance-Broadcast Description

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 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 get additional benefits from ADS-B broadcast services: Traffic Information Service - Broadcast (TIS-B) (traffic information) and Flight Information Service - Broadcast (FIS-B) (weather information).

2.1 Automatic Dependent Surveillance-Broadcast File Recovery

The NTSB Vehicle Recorder Division received the ADS-B electronic data file for the N143JB aircraft from the FAA.

[1] All dates and times are referenced to coordinated universal time (UTC).

2.2 Automatic Dependent Surveillance-Broadcast Recording Description

The ADS-B file contained the accident flight. The accident flight recording started at 19:20:58.360 UTC and ended at 19:26:19.618 UTC on April 20, 2022. UTC is 7 hours ahead of PDT (local time). The data rate was found to be approximately 1 second per sample.

2.3 Automatic Dependent Surveillance-Broadcast Parameters Provided

Table 1 describes data parameters provided by the ADS-B file. The table also describes the parameter unit abbreviations used in this report.

Table 1. ADS-B Data Parameters.

Parameter Name	Parameter Description
Date (MM/DD/YYYY)	UTC Date (Month/Day/Year)
Time (HH:MM:SS.000)	UTC Time (Hours:Minutes:Seconds)
GeomAlt (ft)	Geometric altitude (feet)
Latitude (deg)	Latitude (degrees)
Longitude (deg)	Longitude (degrees)
Pressure Alt (ft)	Pressure altitude (feet)
VX (kts)	East/West component of velocity (knots)[2]
VY (kts)	North/South component of velocity (knots)[3]
VZ (fpm)	Vertical component of velocity (feet per minute)

D. OVERLAYS AND TABULAR DATA

Data obtained from the ADS-B file was used to produce the following overlays, figures, and tabular data.

Figures 2 and 3 are graphical overlays generated using Google Earth for the accident flight. Figure 2 is a Google Earth overlay of the entire flight. The flight originated at Whiteman Airport (WHP), Pacoima, California. Figure 3 is a Google Earth overlay detailing approximately the last 30 seconds. The last ADS-B data point was near interstate I-210 between Sayre Street and Hubbard Street in Sylmar, California. The weather, landscaping, and lighting conditions in Google Earth are not necessarily the weather, landscaping, and lighting conditions present at the time of the recording.

[2] Negative VX velocities indicate an East to West vector.
[3] Negative VY velocities indicate a North to South vector.

Figure 4 is a plot of parameters of the entire accident flight. The data displayed is from 19:20:58.4 UTC to 19:26:19.6 UTC.

Figure 5 is a plot of parameters of the accident flight's final segment. The data displayed is from 19:25:25 UTC to 19:26:19.6 UTC.

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

Submitted by:

Matthew Yandrick
Electrical Engineer – Recorder Specialist

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

Figure 3. Google Earth overlay showing the accident flight's final segment.

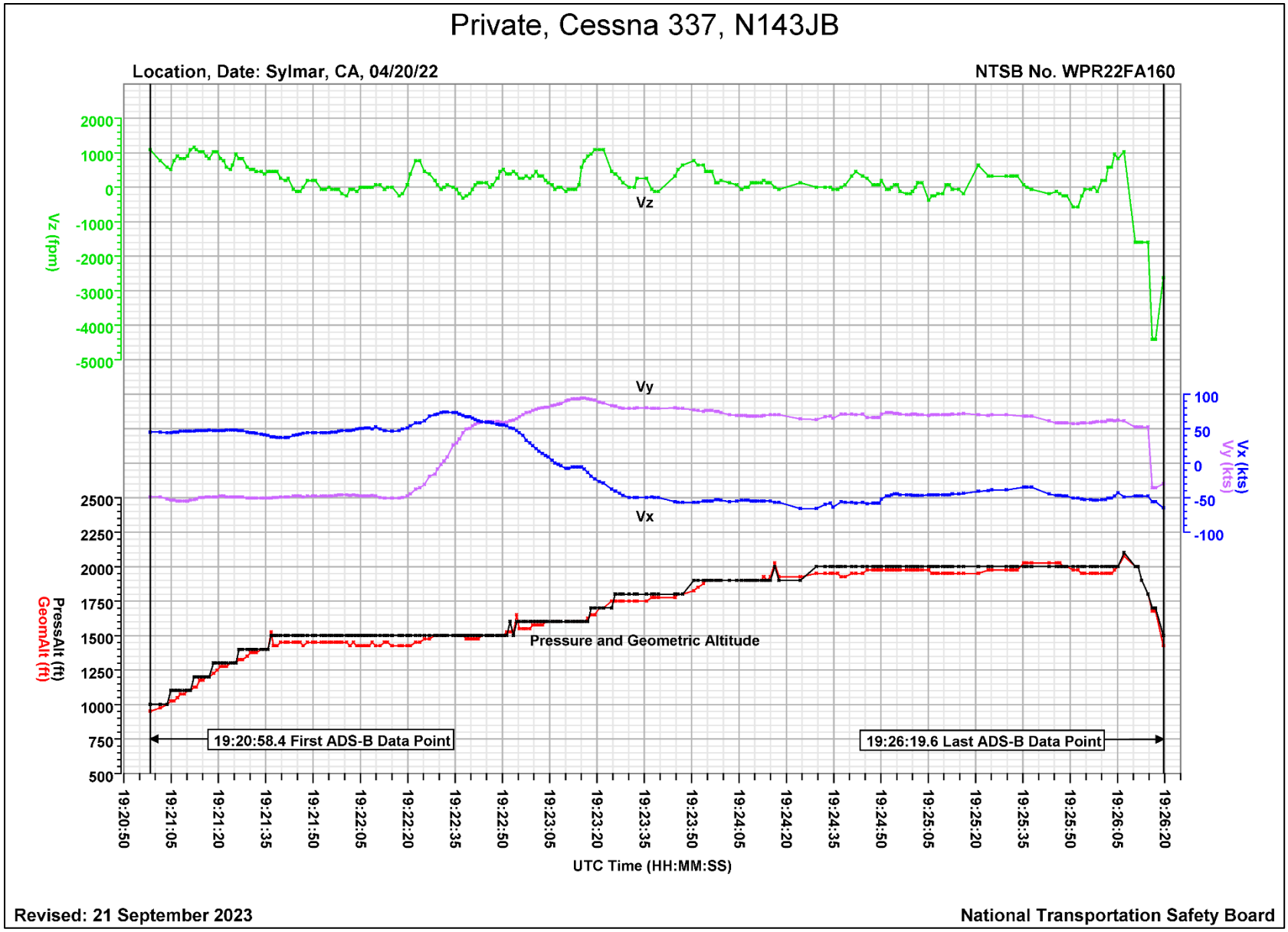

Figure 4. Plot of ADS-B parameters for the accident flight.

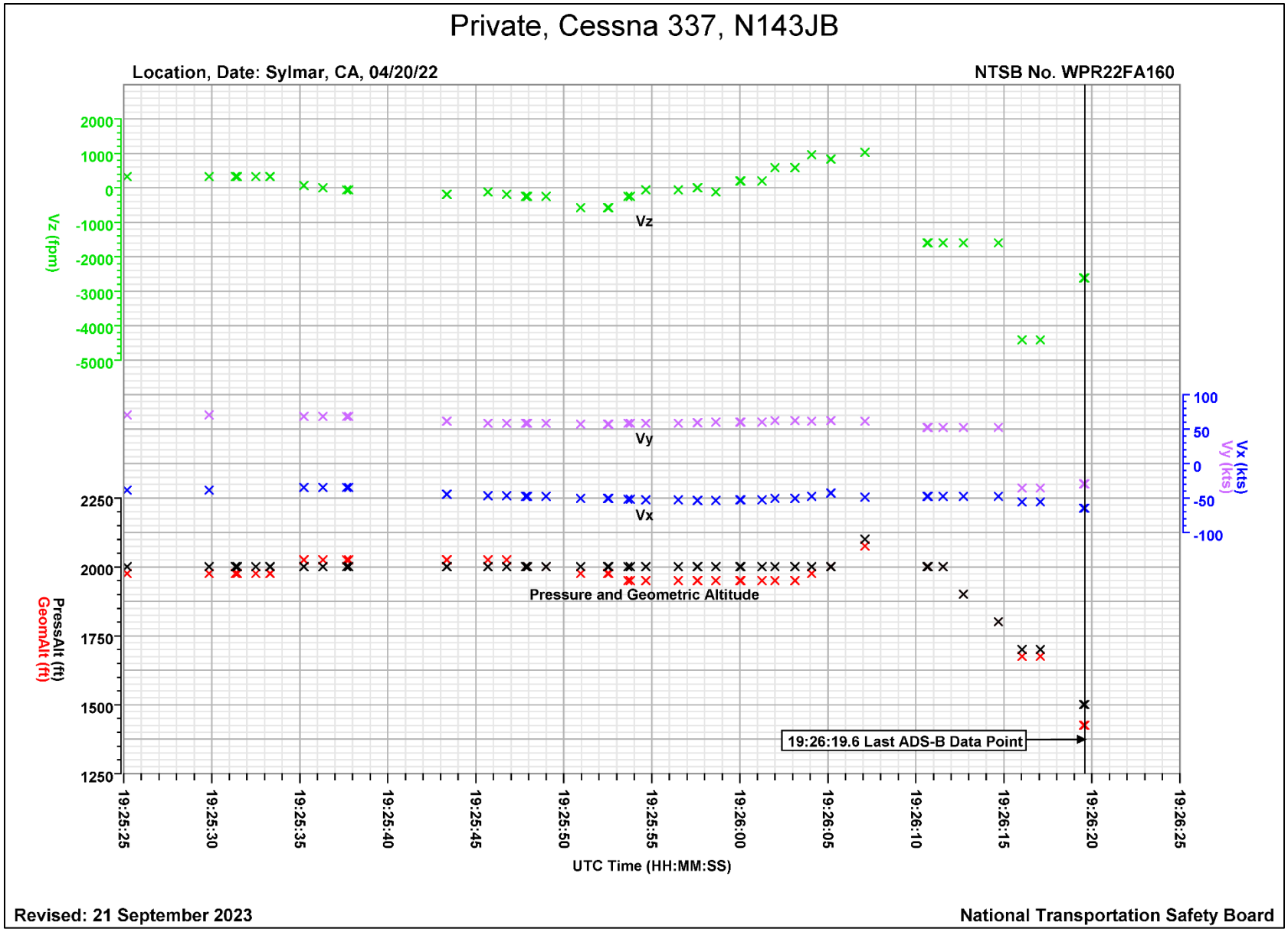

Figure 5. Plot of ADS-B parameters of approximately the final 1 minute of the accident flight.