

**National Transportation Safety Board**  
Office of Research and Engineering  
Washington, D.C. 20594

## Airplane Performance Study

### Specialist Report Timothy Burtch

#### A. ACCIDENT

**Location:** Eatonton, Georgia  
**Date:** June 5, 2020  
**Time:** 1920 GMT (1520 EDT)  
**Airplane:** Piper PA-31T, N135VE  
**NTSB Number:** ERA20LA206

#### B. GROUP

No vehicle performance group was formed.

#### C. SUMMARY

On June 5, 2020, about 1520 eastern daylight time (EDT), a Piper PA-31T, N135VE, was destroyed when it was involved in an accident near Eatonton, Georgia. The accident airplane had departed Williston Municipal Airport (X60), Williston, Florida, about 1413 EDT and was on a northerly heading enroute to New Castle Henry Marlatt Field (UWL), New Castle, Indiana, at an altitude of approximately 26,000 ft. The two pilots and the three passengers were fatally injured. The airplane was operating as a Title 14 Code of Federal Regulations Part 91 personal flight.

An overview of the 1 hour and 7-minute flight is shown in Figure 1. According to the air traffic control (ATC) transcript, when the airplane was about 50 miles south of Eatonton, Georgia, N135VE told ATC that they were deviating "to the right a little" to avoid weather. About 1518 EDT, as the airplane approached Eatonton, N135VE advised ATC that they wanted to proceed direct to their destination on a 353° heading, and ATC approved. This was the last communication between ATC and the airplane. About a minute later, the airplane was observed on radar entering a right turn, followed by a rapid descent. Radar contact was lost about 1520. There were no distress calls from N135VE.

The main wreckage of the airplane impacted densely wooded terrain inverted. The airplane continued to burn, and the cockpit, fuselage, empennage, inboard sections of both wings, and the right engine sustained extensive fire damage. The outboard sections of both wings and the tail section separated from the airplane as it descended and were located within three miles of the main wreckage. The left engine also separated and has not yet been located.

Times in the study are quoted in EDT. Greenwich Mean Time (GMT) = EDT + 4 hr.

#### **D. THE AIRPLANE**

A picture of the accident airplane, N135VE, a Piper PA-31T Cheyenne, is shown in Figure 2. The airplane was manufactured by Piper in 1975 and registered to the accident pilot.

#### **E. WEATHER SUMMARY**

The closest weather reporting station to the accident site is Baldwin County Regional Airport (MLJ), Milledgeville, Georgia, located about 17 miles south-southeast of the site at an elevation of 385 ft. The airport has an Automated Weather Observation System (AWOS) which issues observations every 20-minutes. The MLJ AWOS reported the following approximately 5 minutes before the accident:

***METAR KMLJ 051915Z AUTO 00000KT 10SM TS SCT007 SCT044 25/22 A2998 RMK AO2 LTG DSNT E THRU W=***

The automated surface weather observation at Baldwin County Regional Airport on June 5 at 1515 EDT is wind calm; 10 statute miles visibility with thunderstorms; scattered clouds at 700 ft above the ground (agl), scattered clouds at 4,400 ft agl; temperature 25° Celsius (C); dew point 22°C; altimeter 29.98" mercury. Remarks: automated observation system with a precipitation discriminator, distant lightning east through west.

See the NTSB Meteorology Specialist's Factual Report for additional weather information.

#### **F. PERFORMANCE STUDY**

The airplane performance study is largely based on Automatic Dependent Surveillance-Broadcast (ADS-B) data provided by the Federal Aviation Administration (FAA). ADS-B broadcasts an airplane's Global Positioning System (GPS) position to the ground where it is displayed to ATC. The GPS position is also transmitted to other airplanes with ADS-B receivers, either directly or relayed through FAA ground stations to allow self-separation and to increase situational awareness.

GPS has an accuracy of approximately 20 meters in both the horizontal and vertical dimensions. GPS augmented with the Wide Area Augmentation System (WAAS)<sup>1</sup> is accurate to approximately 1.5 – 2 meters.

In addition to the ADS-B data, an Appareo Stratus 2S device was recovered from N135VE that recorded GPS position and Attitude Heading Reference System (AHRS) information internally on a non-volatile flash memory chip. The internal memory has the space to store over 13 hours of flight data sampled at approximately 5 data records per second. See the NTSB Recorder Specialist's Factual Report for additional details.

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<sup>1</sup> WAAS collects, processes, and corrects GPS information to ensure that the data the pilot receives can be trusted:  
[https://www.faa.gov/news/fact\\_sheets/news\\_story.cfm?newsId=14974&omniRss=fact\\_sheetsAoc&cid=103\\_F\\_S](https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=14974&omniRss=fact_sheetsAoc&cid=103_F_S)

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Figure 3 shows the ADS-B ground track in the vicinity of the accident site. After approximately 15 minutes of straight and level flight at 26,000 ft, the pilot or front-seat passenger<sup>2</sup> reported to ATC at 1518:02 that they were going to head direct to their destination on a heading of 350° (which was slightly left of their heading at that time). The last ADS-B return was recorded at 1519:07, and the last radio transmission, although unintelligible, was received 12 sec later at 1519:19. The recorded descent rate was about 7,000 feet per minute (fpm) at 1519:19 according to the recovered GPS data.

The Pilot Operating Manual indicates that the maximum operating speed, V<sub>mo</sub>, is 246 kts up to 12,000 feet altitude and then decreases linearly to 182 kts at 26,000 ft. The airplane did not exceed the published V<sub>mo</sub> during the course of the flight. Figure 4 shows the airplane was below V<sub>mo</sub> at 26,000 feet up to the point where the airplane deviated from straight and level flight.

Figures 4, 5, and 6 show the ADS-B altitude and GPS ground speed recorded for the entire flight, the last five minutes, and the last two minutes, respectively. Figures 5 and 6 contain ATC communications and highlight that the airplane was in straight and level flight until about 30 sec after indicating they were turning direct to their destination; at about 1518:30, a pitch oscillation and a right roll that ultimately reached 115° bank angle ensued. After 1519, the large pitch and bank angles affect the calculation of airspeed, making the calculation unreliable.

Figures 7 and 8 include airplane attitude information recorded by the AHRS for the last two minutes. Like the altitude parameters shown in Figures 5 and 6, Figures 7 and 8 include ATC communications and highlight a pitch oscillation and a right roll about 30 sec after reporting a turn direct to their destination. In addition, Figures 7 and 8 show an approximate 10° left heading change about 10 sec after N135VE's "direct destination" radio call and before the right roll.

Figure 9 contains the AHRS accelerations for the last two minutes. The accelerations highlight the change in airplane dynamics about 1518:20, especially the vertical acceleration, *a<sub>z</sub>*.

Several witnesses observed the airplane as it was descending and recorded cellphone video. A still image from one video is shown in Figure 10. A review of the video revealed the airplane was spinning and trailing smoke as it descended.

## **G. SUMMARY AND CONCLUSIONS**

The accident flight of N135VE lasted one hour and seven minutes. The flight appeared normal according to ADS-B, GPS, AHRS, and ATC data until the final 90 sec. After deviating around weather at flight level 260, at 1518:02, the flight reported to ATC that they were turning direct to their destination. Data show the airplane banking 10° left over the next 20 seconds, which would be appropriate based on their radio communication.

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<sup>2</sup> The passenger in the right seat had just recently obtained his private pilot license. It is not clear who made the radio call.

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After reaching 10° of left bank, the airplane began to roll back right as if returning to wings-level but instead continued to roll right to almost a 120° bank angle over the next 70 seconds with about a 1-2 deg/sec roll rate. At the same time, the airplane entered a pitch oscillation with a period of oscillation<sup>3</sup> of approximately 60-65 sec.

The ADS-B data suggest that the airplane was largely on autopilot until shortly after N135VE reported turning direct to their destination: the recorded altitude, ground speed, and heading were relatively constant<sup>4</sup>. However, after the turn, the airplane dynamics could be consistent with an open-loop situation, i.e., the result of the pilot being “hands-off” and with the autopilot disengaged. The ADS-B data capture dynamics that are similar to the airplane’s inherent phugoid<sup>5</sup> and spiral modes<sup>6</sup>.

The NTSB Meteorology Specialist’s Factual Report indicates that N135VE was operating in instrument meteorological conditions near convective weather<sup>7</sup>. Besides making the manipulation of the flight controls by means of outside visual cues impossible, the turbulent weather in the area could have also provided the initial disturbance for the airplane dynamics recorded in the final 90 sec.

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<sup>3</sup> The period of oscillation is the time it takes the airplane to complete one full pitch oscillation.

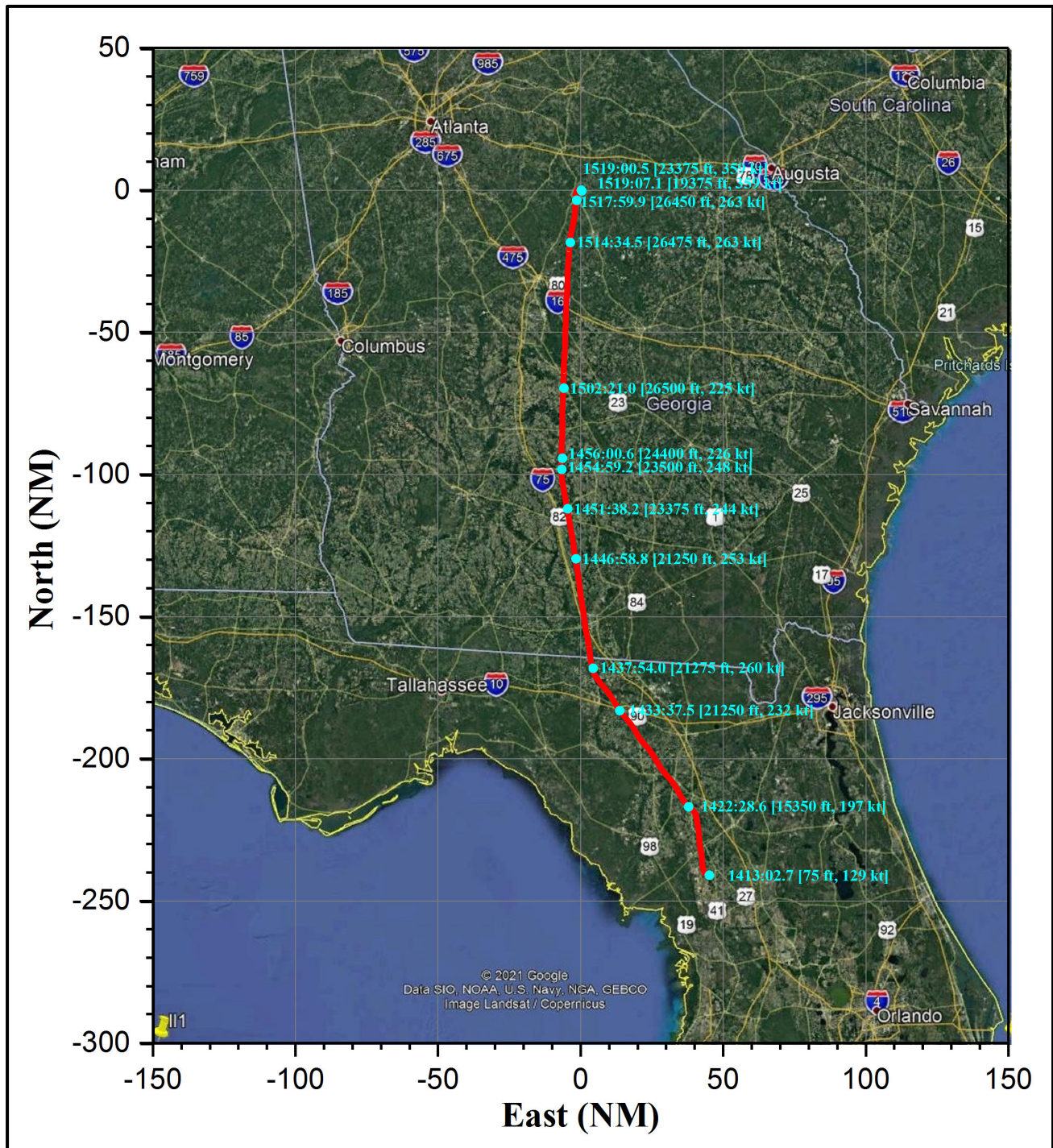
<sup>4</sup> While the airplane was not equipped with an auto-throttle to hold speed, the airplane’s speed would remain relatively constant without throttle inputs from the pilot and without appreciable changes in the atmosphere or airplane configuration, like ice.

<sup>5</sup> As per FAA Advisory Circular 23-8C, Flight Test Guide for Certification of Part 23 Airplanes, the short period oscillation is the first oscillation the pilot sees after a pitch disturbance. The long period or phugoid follows and is characterized by a nearly constant angle of attack but varying pitch caused by a repeated exchange of airspeed and altitude. Flight test data obtained for the Piper Cheyenne IIIA, the successor to the PA-31T with had a 3 ft longer fuselage and a “T” tail, indicate a long period of 60-65 sec at conditions similar to the accident flight. See Figure 5.

<sup>6</sup> FAA Advisory Circular 23-8C describes the spiral mode as a slow-acting mode that may be stable but is often neutrally stable or even mildly divergent in roll. Flight test data obtained for the Piper Cheyenne IIIA indicate a spiral mode that is mildly divergent at roll rate of approximately 1-2 deg/sec at conditions similar to the accident flight. See Figure 8.

<sup>7</sup> There were some pilot reports or PIREPS for light to moderate turbulence from aircraft operating in the vicinity of the accident.

## H. FIGURES

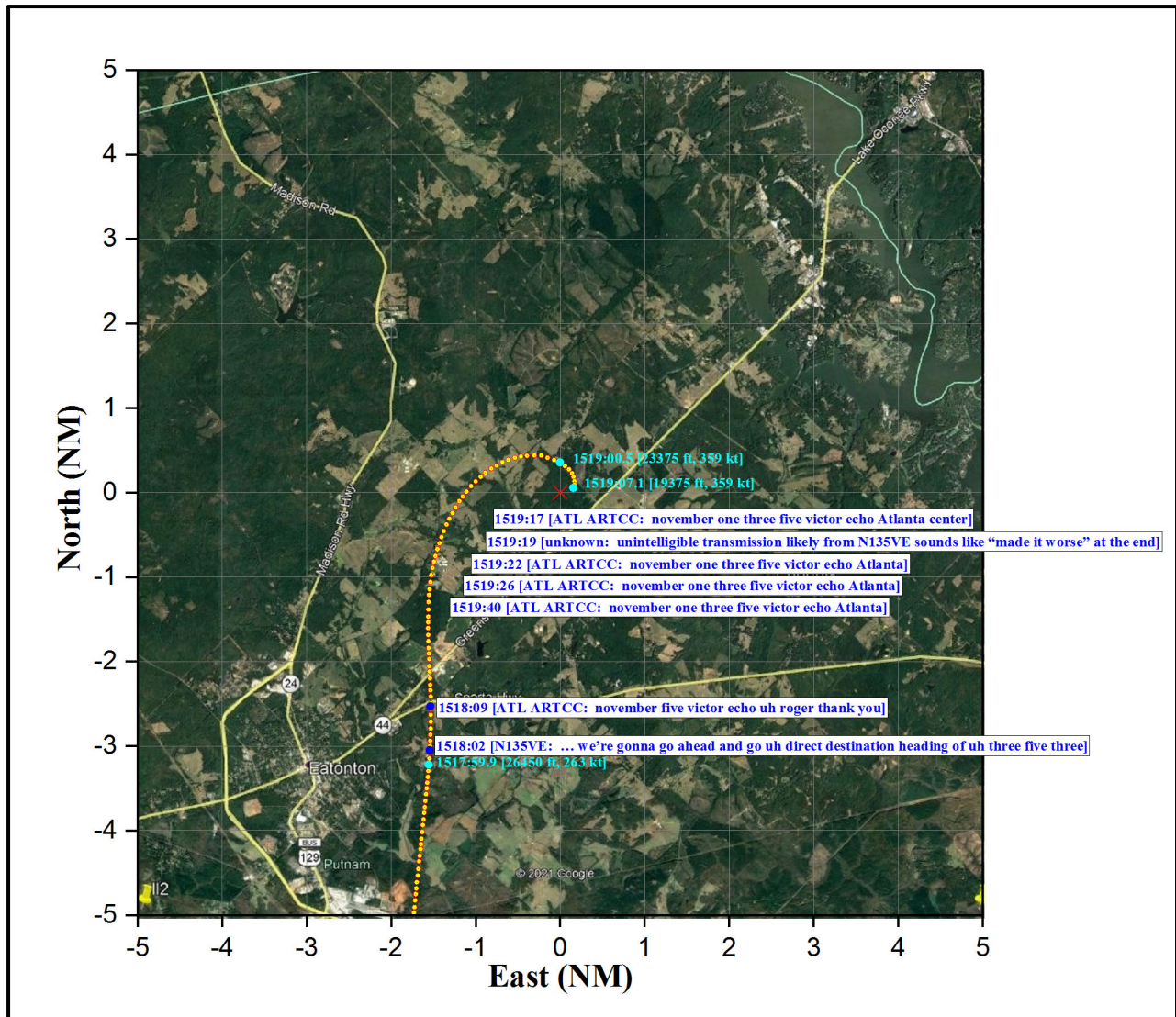


**Figure 1: The Accident Flight Departed Williston Municipal Airport Around 1413 EDT  
 Select Local Times, GPS Geometric Altitudes and Ground Speeds are Shown in Cyan (●)**



**Figure 2: Accident Airplane, N135VE, a Piper PA-31T Cheyenne**

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**Figure 3: ADS-B Ground Track (●●●) and Impact Site (X)**  
 Select Local Times, GPS Geometric Altitudes and Ground Speeds are Shown in Cyan (●),  
 ATC Communications are Shown in Blue (●)

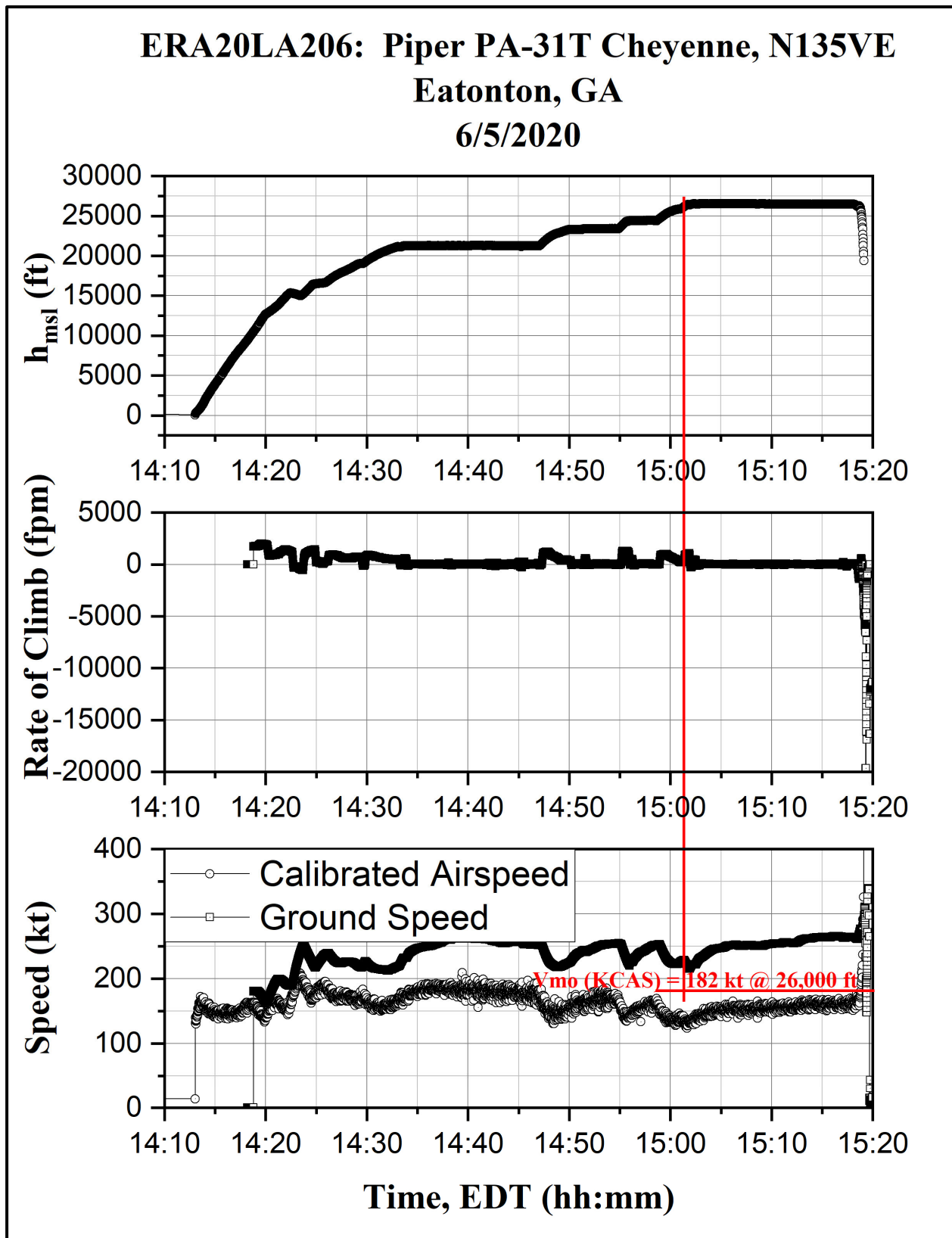


Figure 4: ADS-B Altitude and GPS Ground Speed for Entire Flight

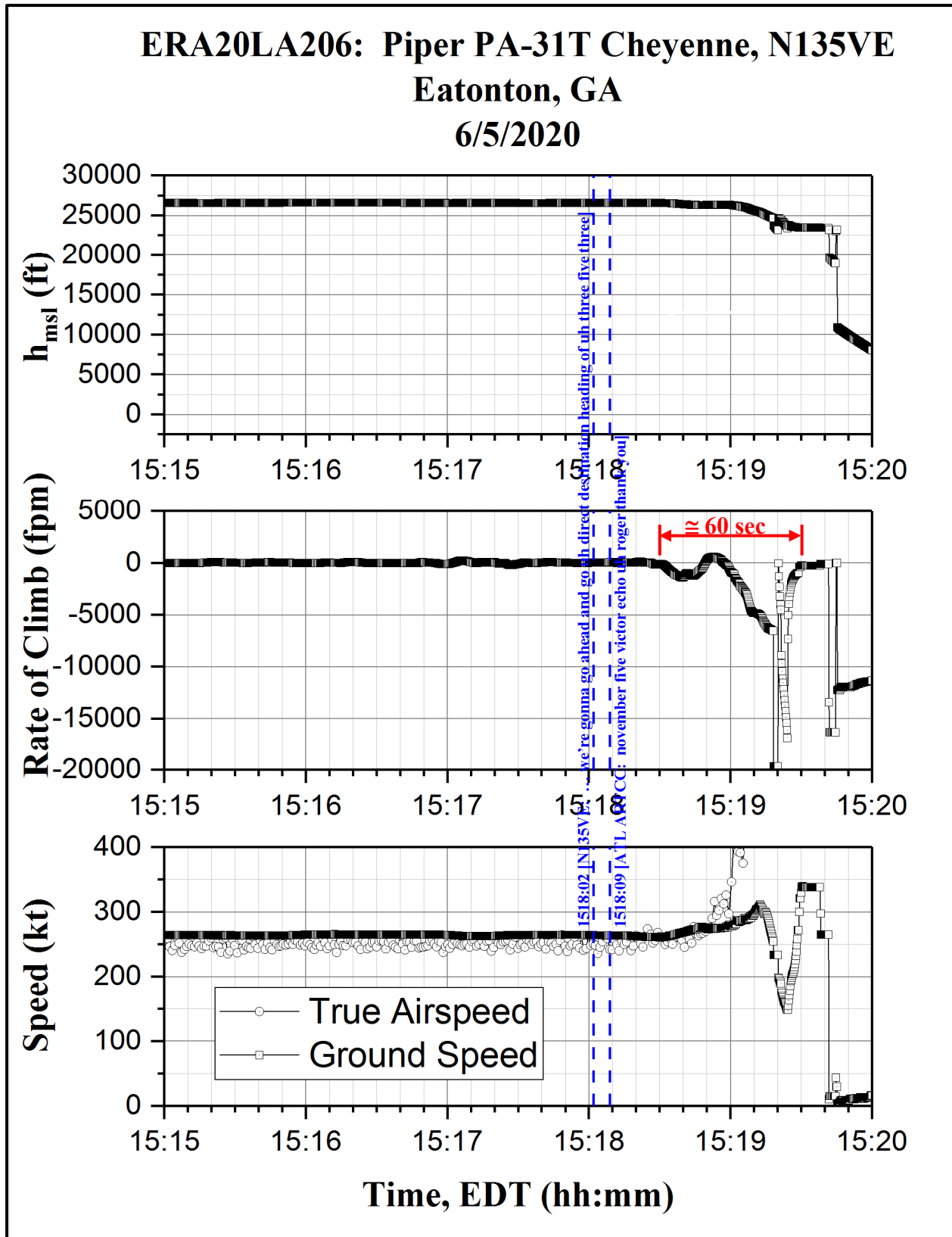


Figure 5: ADS-B Altitude and GPS Ground Speed for Last Five Minutes

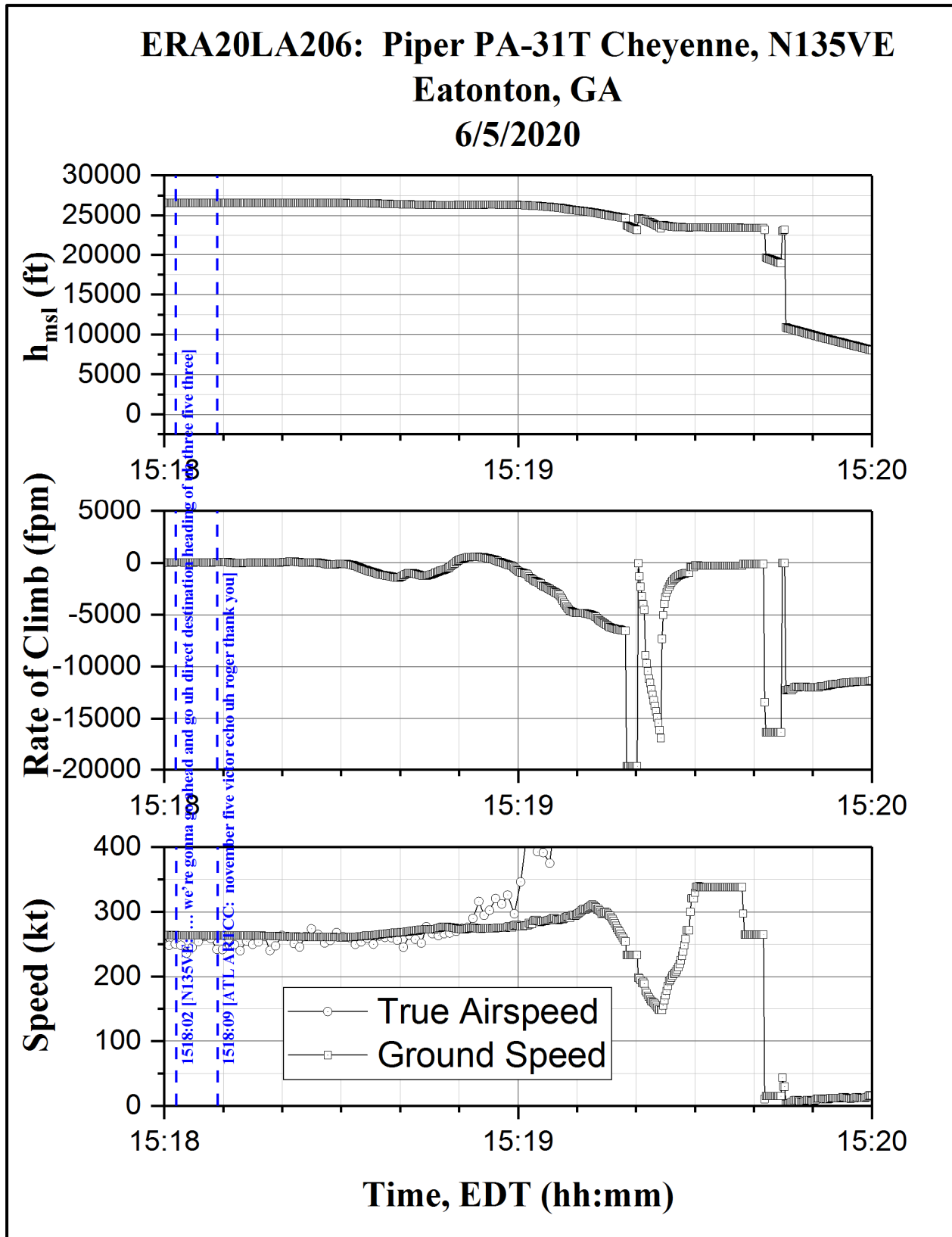


Figure 6: ADS-B Altitude and GPS Ground Speed for Last Two Minutes

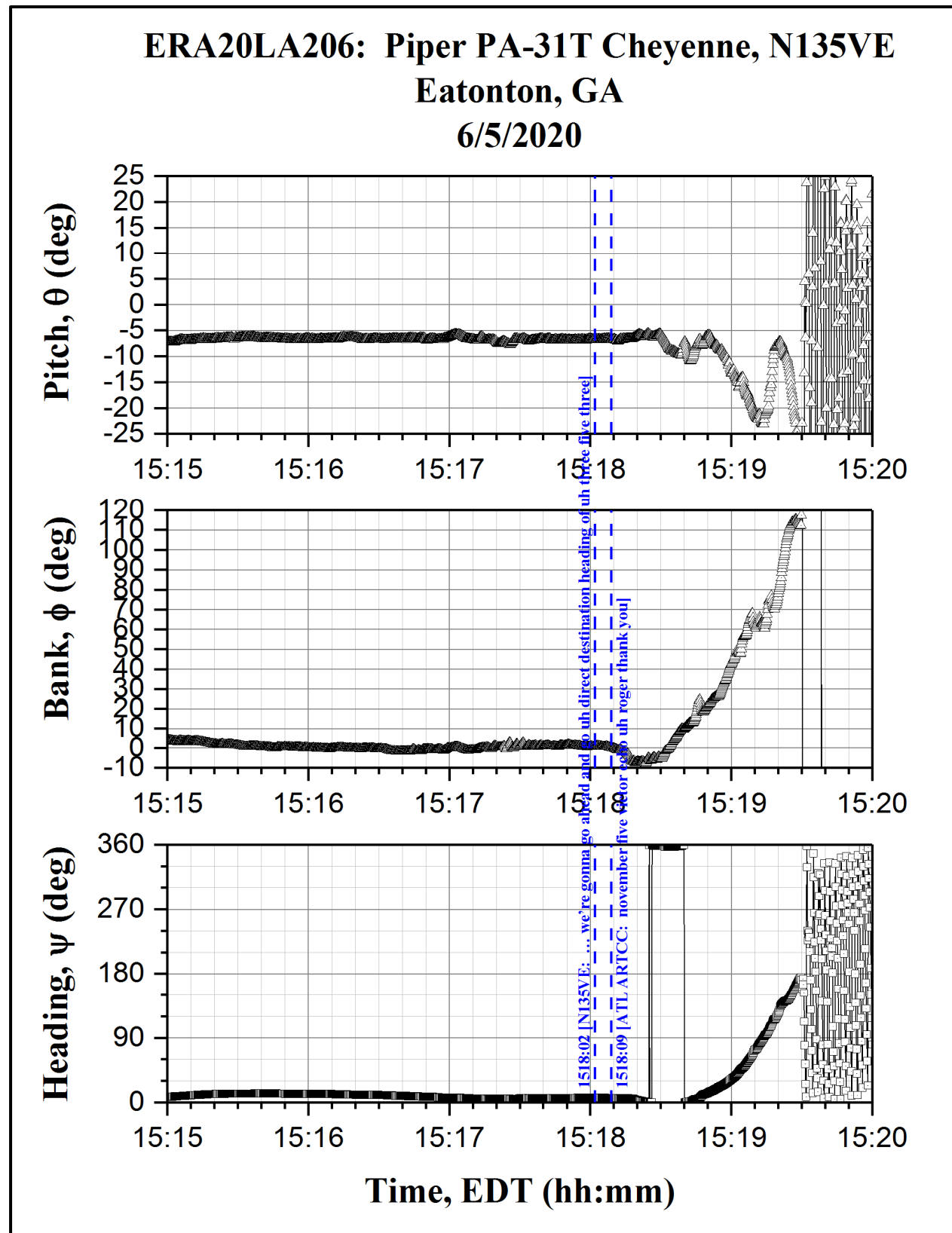


Figure 7: AHRS Pitch, Bank, and Heading for Last Five Minutes

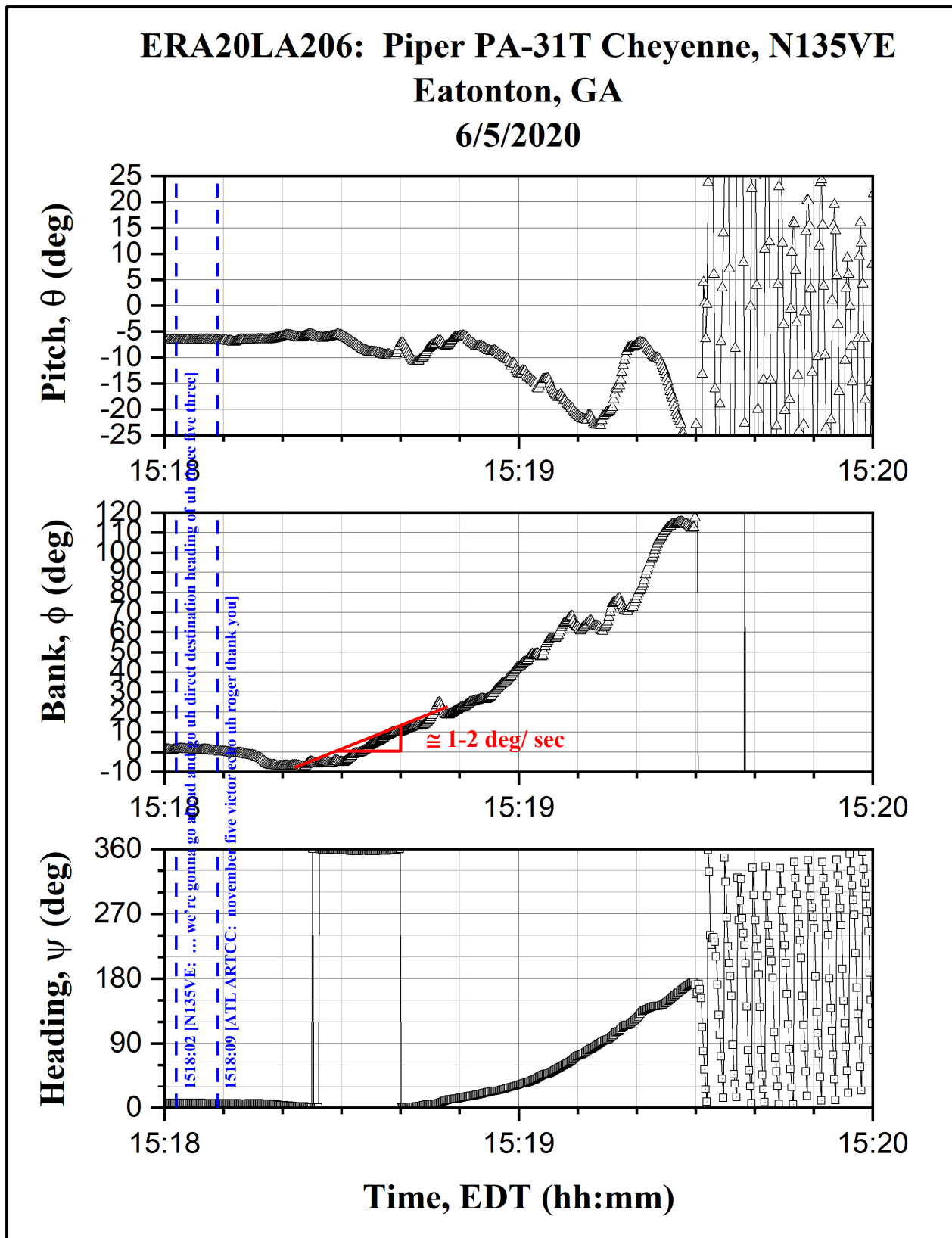


Figure 8: AHRS Pitch, Bank, and Heading for Last Two Minutes

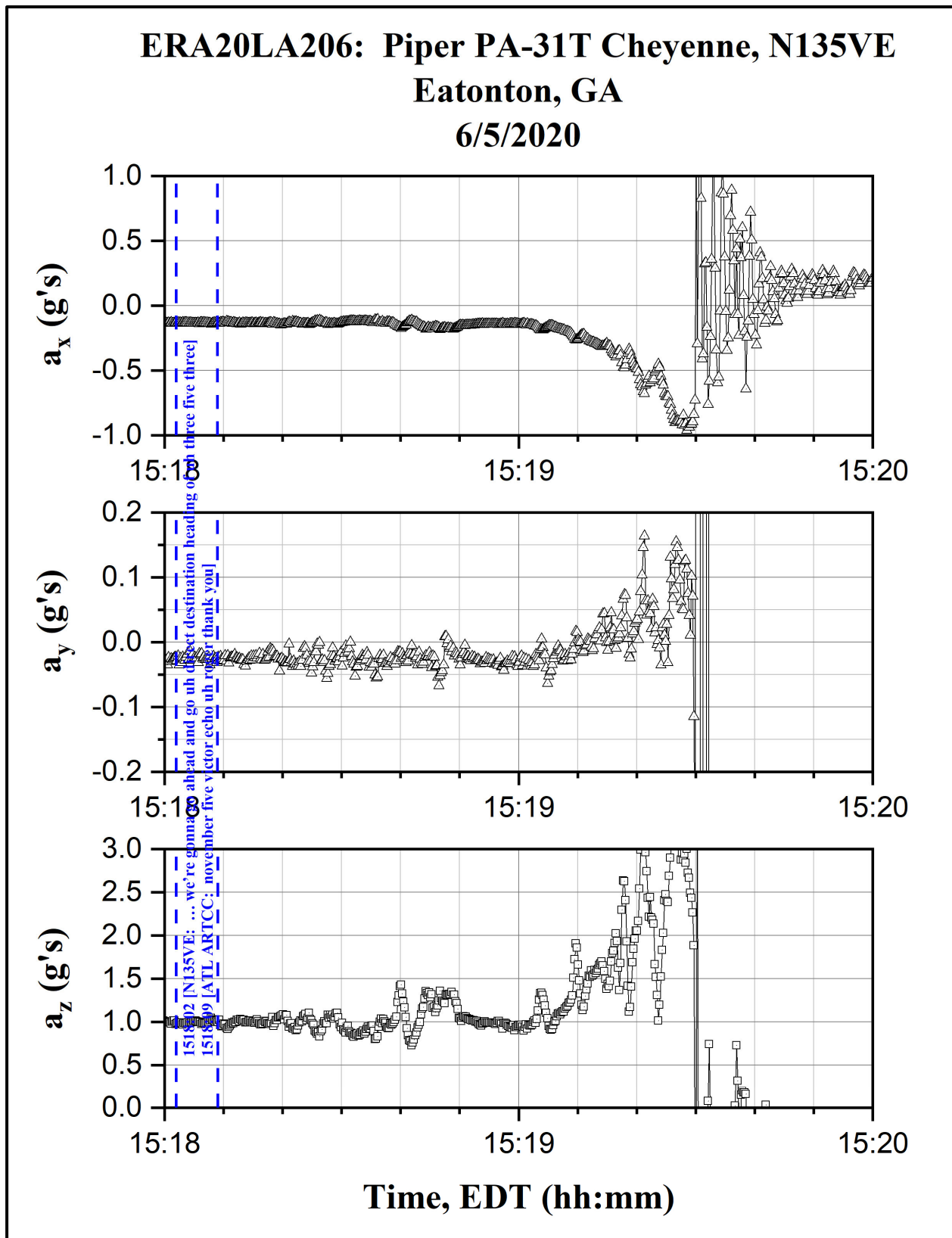


Figure 9: AHRS Accelerations for Last Two Minutes

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**Figure 10: Still Image from Video Showing Airplane Trailing Black Smoke as it Descended**  
(Video available at <https://www.fox5atlanta.com/news/pilot-florida-family-of-4-headed-to-funeral-in-indiana-die-in-georgia-plane-crash>, accessed June 3, 2022)