

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

Airplane Performance Study

Specialist Report
Timothy Burtch

A. ACCIDENT

Location:	Minden, Nevada
Date:	February 19, 2018
Time:	1125 PST (1925 GMT)
Airplane:	Piper PA-34-200T “Seneca II”, Registration N14GQ
NTSB Number:	WPR18FA091

B. GROUP

No vehicle performance group was formed.

C. SUMMARY

On February 19, 2018, about 1125 Pacific Standard Time (PST), a Piper PA-34-200T airplane, N14GQ, collided with the ground about 3.5 nautical miles (NM) northwest of the Minden-Tahoe Airport (MEV), Minden, Nevada (NV). The commercial pilot was fatally injured, and the airplane was destroyed. The airplane was registered to Stunad, LLC, and operated by the pilot under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91 as a personal flight. Visual meteorological conditions prevailed. The one-hour, fifty-one minute flight originated from Meadows Field Airport (BFL), Bakersfield, California, about 0935 PST with an intended destination of MEV. See Figure 1 for a picture of the accident airplane.

Initial examination of the airplane by the National Transportation Safety Board (NTSB) revealed that the airplane impacted the ground in an inverted, wings-level, slightly nose-down attitude. Additional debris was located about a half mile south of the main wreckage and contained separated airplane parts. See Figure 2 for a picture of the main wreckage site.

D. PERFORMANCE STUDY

The airplane performance study describes the accident airplane ground track, altitude, and speed recorded by an Appareo Stratus 2 GPS and dual band receiver¹ that was recovered in the wreckage. Airplane pitch, roll, and heading estimates derived from the Appareo data are also presented.

The Appareo data were also compared to radar data from long-range stations located at Mount Tamalpais, CA, Red Bluff, CA, Sacramento, CA, and Fallon Naval Air Station, NV (transponder code 7741). These data have approximately a 200-250 NM range and an inherent uncertainty of ± 2 Azimuth Change Pulses (ACP) = $\pm (2 \text{ ACP}) \times (360^\circ/4096 \text{ ACP}) = \pm 0.176^\circ$ in azimuth, ± 50 ft in altitude, and $\pm 1/8$ NM in range.

Times in the study are reported in PST as well as Greenwich Mean Time (GMT or “Z”): PST = GMT – 8 hr.

Weather Observation

The certified weather observer at KMEV issued the following report around the time of the accident:

METAR KMEV 191915Z AUTO 35015G29KT 10SM CLR M02/M13 A2982 RMK AO2

KMEV weather on the 19th at 1915 GMT/ 1115 PST, the wind is from 350° (true) at 15 knots (kt) with gusts to 29 kt, visibility 10 statute miles (SM) or greater, clear skies, temperature -2° Celsius (C), dew point -13°C, altimeter 29.82 inches Hg. Remarks: Automated station with precipitation discriminator.

Accident at 1925Z/1125 PST

See the NTSB accident brief for more detailed weather².

Airplane Ground Track, Altitude, Speed, and Attitude

Figure 3 highlights the ground track for the entire flight from BFL to the accident site recovered from the Appareo Stratus receiver. Figure 4 shows approximately the last five minutes of the flight and the main wreckage site in more detail.

¹ The Appareo Stratus 2 receiver is a WAAS GPS that can also be used to view in-flight weather on an iPad, including NEXRAD radar, METARs, TAFs, TFRs, AIRMETs, SIGMETs, and NOTAMs. In addition, the Stratus 2 includes a built-in AHRS for displaying airplane attitude.

² https://www.nts.gov/ layouts/ntsb.aviation/brief.aspx?ev_id=20180220X11813

Airplane Performance Study

WPR18FA091, Piper PA-34-200T, Registration N14GQ, 2/19/2018

Figure 5 shows the GPS altitude³ and groundspeed recorded by the Appareo unit for the flight. The data show that the flight was relatively uneventful until about the last 30 seconds. Figure 6 shows the altitude, the groundspeed, and the estimated airspeed⁴ for the last five minutes.

As shown in Figure 7, the airplane began a right spiral turn beginning at about 11:23:00, with the bank angle reaching 80 degrees at about 11:24:20. The bank angle decreases to about 60 degrees, but then tightens to over 100 degrees bank angle at 11:24:42. The data then indicates a rapid roll to the left. The data in all the Appareo data channels show substantial variability after 11:24:49, and it appears that the data are unreliable beyond that time.

At 11:24:37 the estimated airspeed peaks at 220 kt, well above the never-exceed speed of 195 kt published in the Pilot Operating Handbook (POH). The Appareo data are erratic beyond about 11:24:49. The wide-spread debris field documented during the recovery is evidence of an in-flight break-up.

At approximately 11:24:00, the airplane began a descent with rates between 100-300 feet/minute from a cruising altitude of 14,400 ft mean sea level (msl)

Figure 8 shows that the load factor calculated from the flight path and selected Appareo parameters exceeded 4g's at 11:24:41. The POH lists the maximum positive load factor as 3.8g's. No negative load factors are approved by the manufacturer.

E. SUMMARY AND CONCLUSIONS

The flight parameters recorded by the Appareo receiver and the equivalent values derived from radar compare well for the accident flight. Some of the differences that exist between the two sets of data are likely the result of winds that were assumed in the radar calculations.

The accident flight appeared relatively normal according to the recorded data until the final minutes of the flight as the airplane approached its intended destination. The descent into MEV was erratic with a slow right turn that took approximately two minutes to develop and ultimately exceeded 90 deg of bank. The descent rates during the turn approached 1,500 to 2,000 fpm and were both positive and negative, i.e., both descending and climbing. At about 220 kt airspeed⁵, 25 kt above the never-exceed speed, the airplane appears to begin breaking up in flight.

A witness who was located outside her residence about two miles north of the accident site reported that she heard "a loud noise that sounded like a sonic boom". She said that she looked up and saw an airplane descending while trailing smoke.

CFR 91.211 requires pilots to use supplemental oxygen at cabin pressure altitudes above 12,500 ft msl up to and including 14,000 ft msl for flights lasting more than 30 minutes. The rule also requires pilots to use supplemental oxygen at all times when flying at cabin

³ The recorded GPS altitude matched the field elevation for BFL during the ground roll.

⁴ The estimated airspeed is based on a 1900Z/1100 PST High-Resolution Rapid Refresh sounding from near the accident site.

⁵ The ground speed recorded on the Appareo was 256 kt at this point.

Airplane Performance Study

WPR18FA091, Piper PA-34-200T, Registration N14GQ, 2/19/2018

pressures above 14,000 ft msl. This is to avoid one or more of the many symptoms of hypoxia, including confusion, disorientation, hallucinations, and behavioral changes.

An FAA brochure on hypoxia⁶ states that everyone's response to hypoxia is different and that "... our body doesn't give us reliable signals at the onset of hypoxia — oxygen starvation — unless we have received special training to recognize the symptoms. In fact, it's quite the contrary. The brain is the first part of the body to reflect a diminished oxygen supply, and the evidence of that is usually a loss of judgment."

It is not known if the pilot of N14GQ was using supplemental oxygen. However, the recorded accident flight profile required it. N14GQ climbed above 12,500 ft msl at approximately 10:46; according to the regulations, this required the pilot to use supplemental oxygen starting at 11:16. Before 11:16, however, at approximately 11:08, N14GQ climbed above 14,000 ft msl. According to the regulations, the pilot should have been using oxygen at all times at this point. The accident occurred at about 11:25, leaving 17 minutes before the accident where the pilot of N14GQ was required to use supplemental oxygen according to CFR 91.211.

Timothy Burtch
Specialist – Airplane Performance
National Transportation Safety Board

⁶ <https://www.faa.gov/pilots/safety/pilotsafetybrochures/media/hypoxia.pdf>

F. Figures



Figure 1: Accident Airplane N14GQ, a Piper PA-34-200T “Seneca II”



Figure 2: Main Wreckage Site

Airplane Performance Study
WPR18FA091, Piper PA-34-200T, Registration N14GQ, 2/19/2018

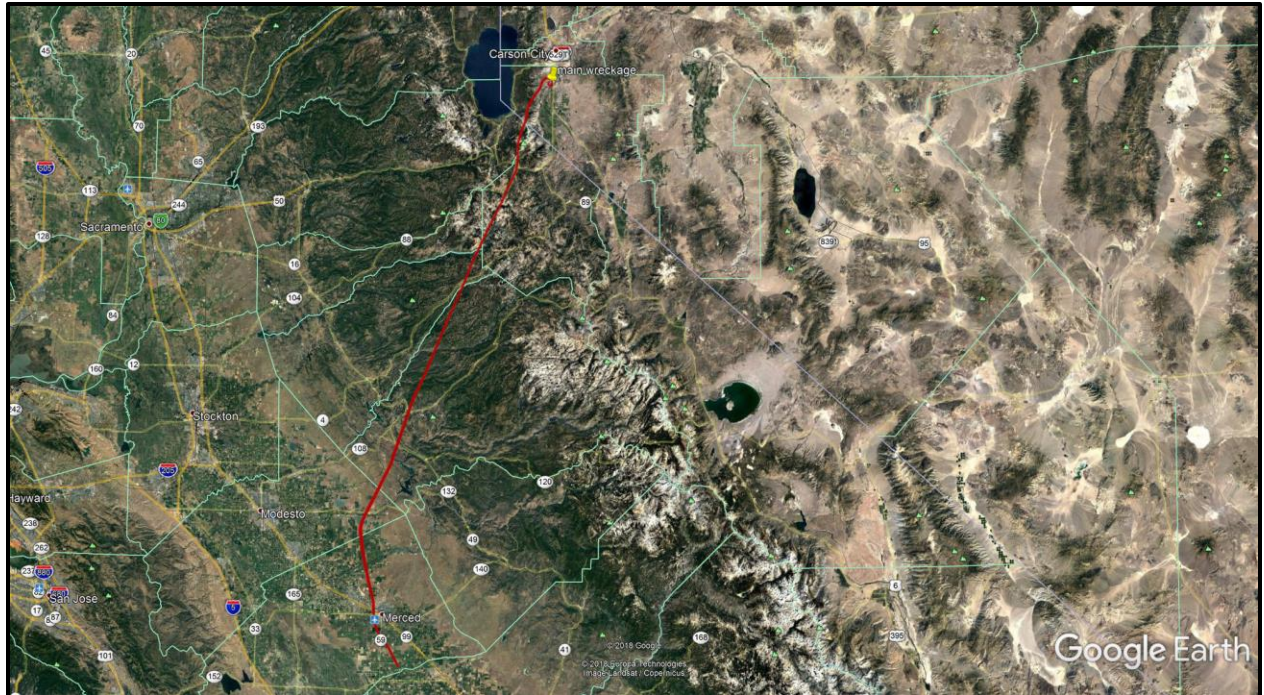


Figure 3: Appareo Stratus Ground Track for the Flight

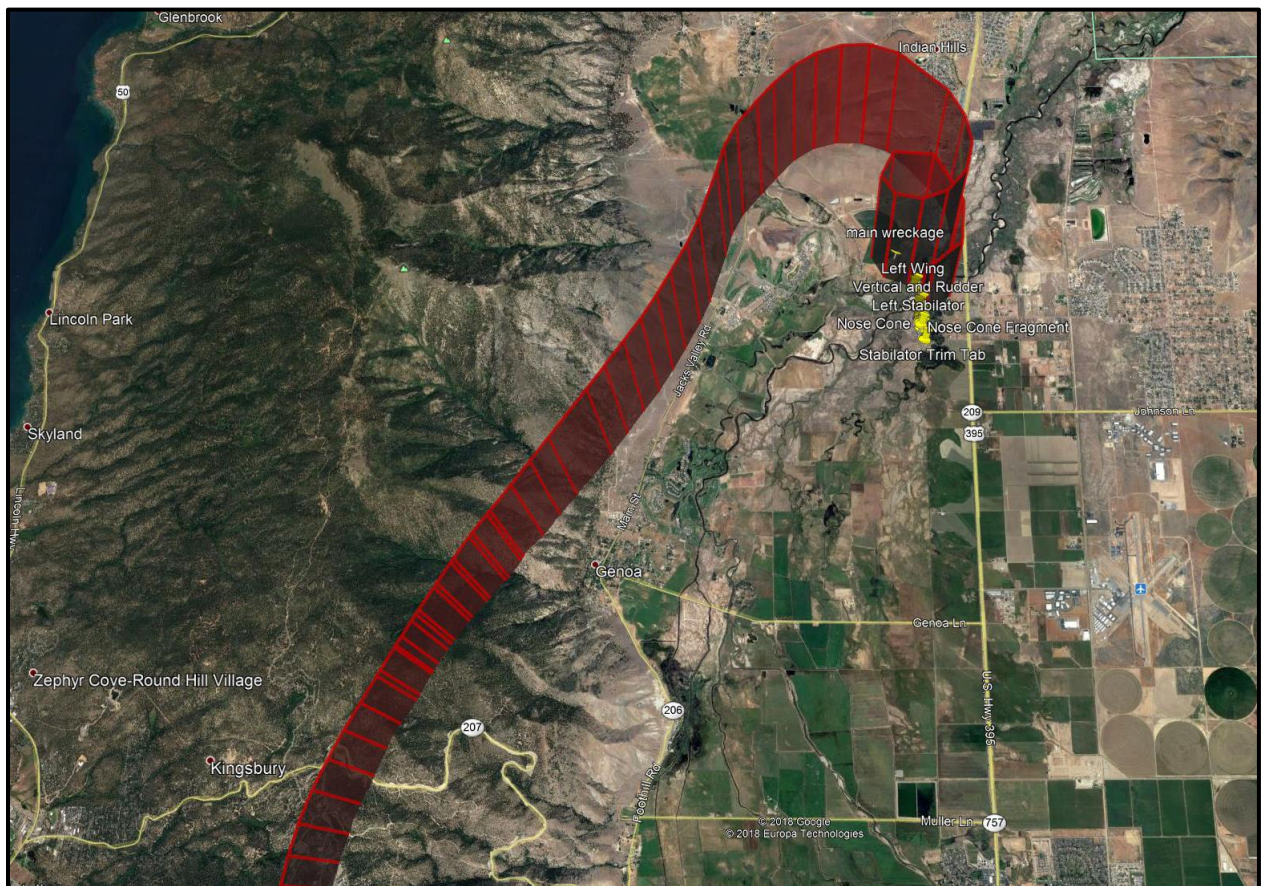


Figure 4: Last Five Minutes of Appareo Stratus Ground Track Near the Accident Site and Wreckage Location

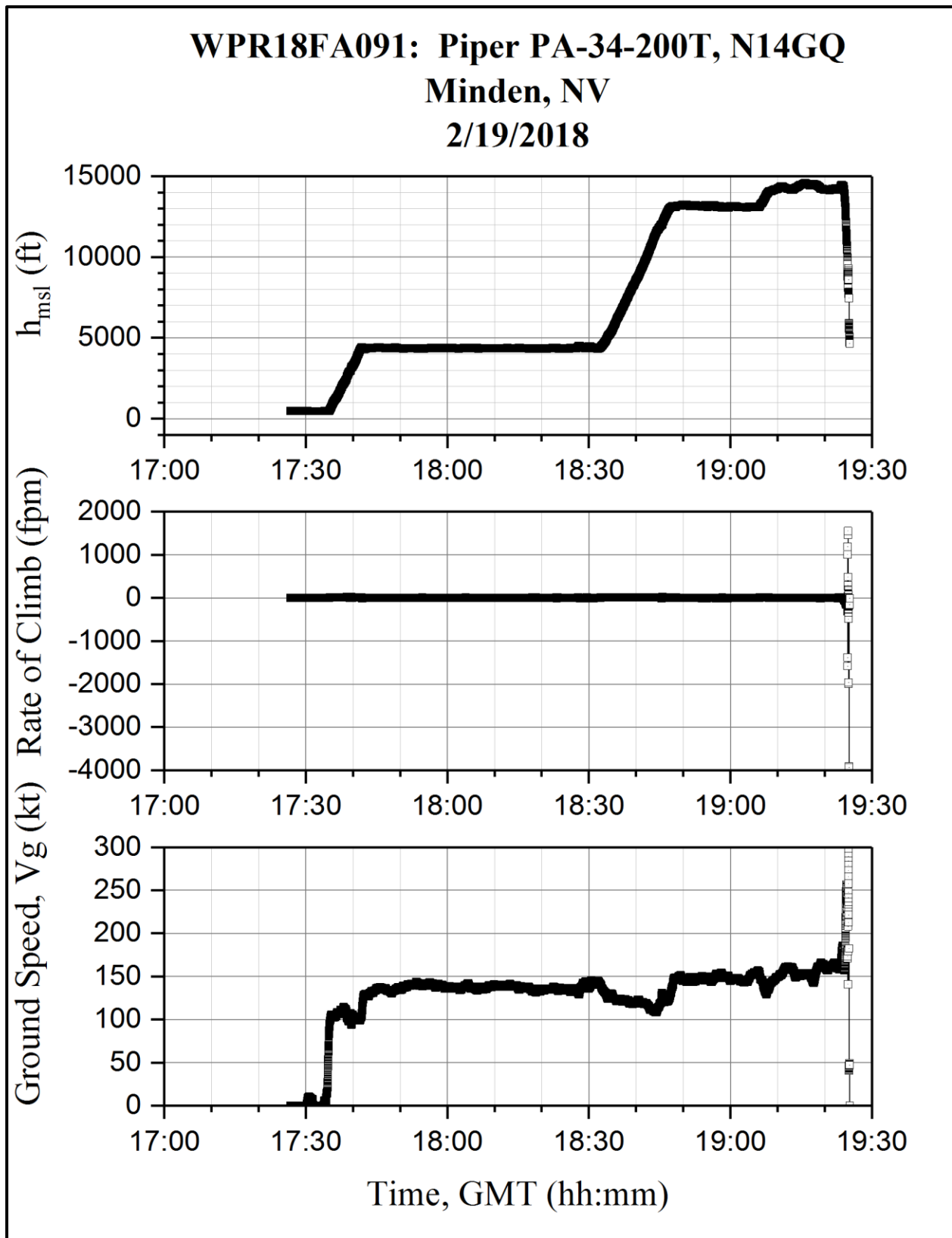


Figure 5: Altitude and Ground Speed Based on Appareo Data

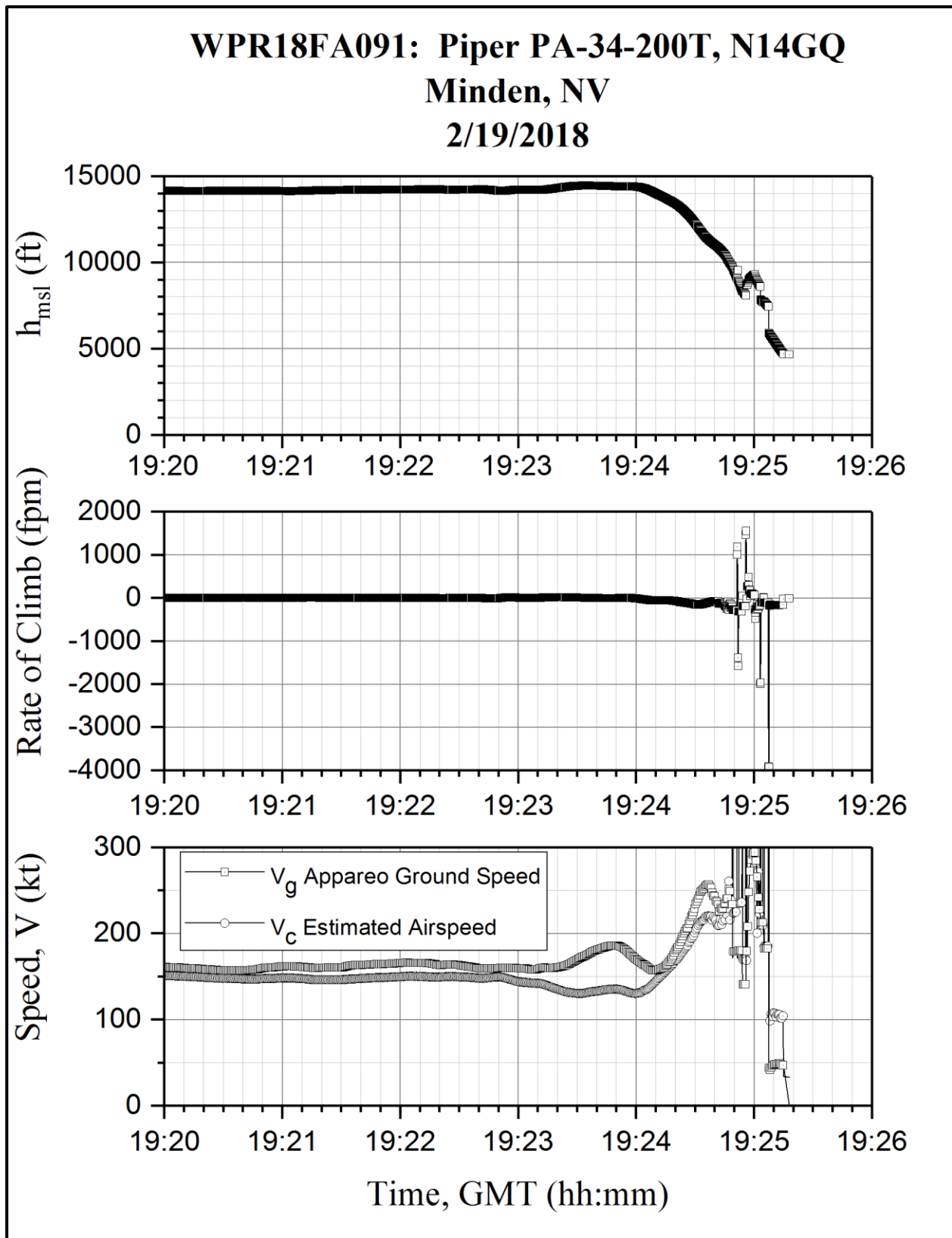


Figure 6: Altitude and Speed for Final Minutes Based on Appareo Data

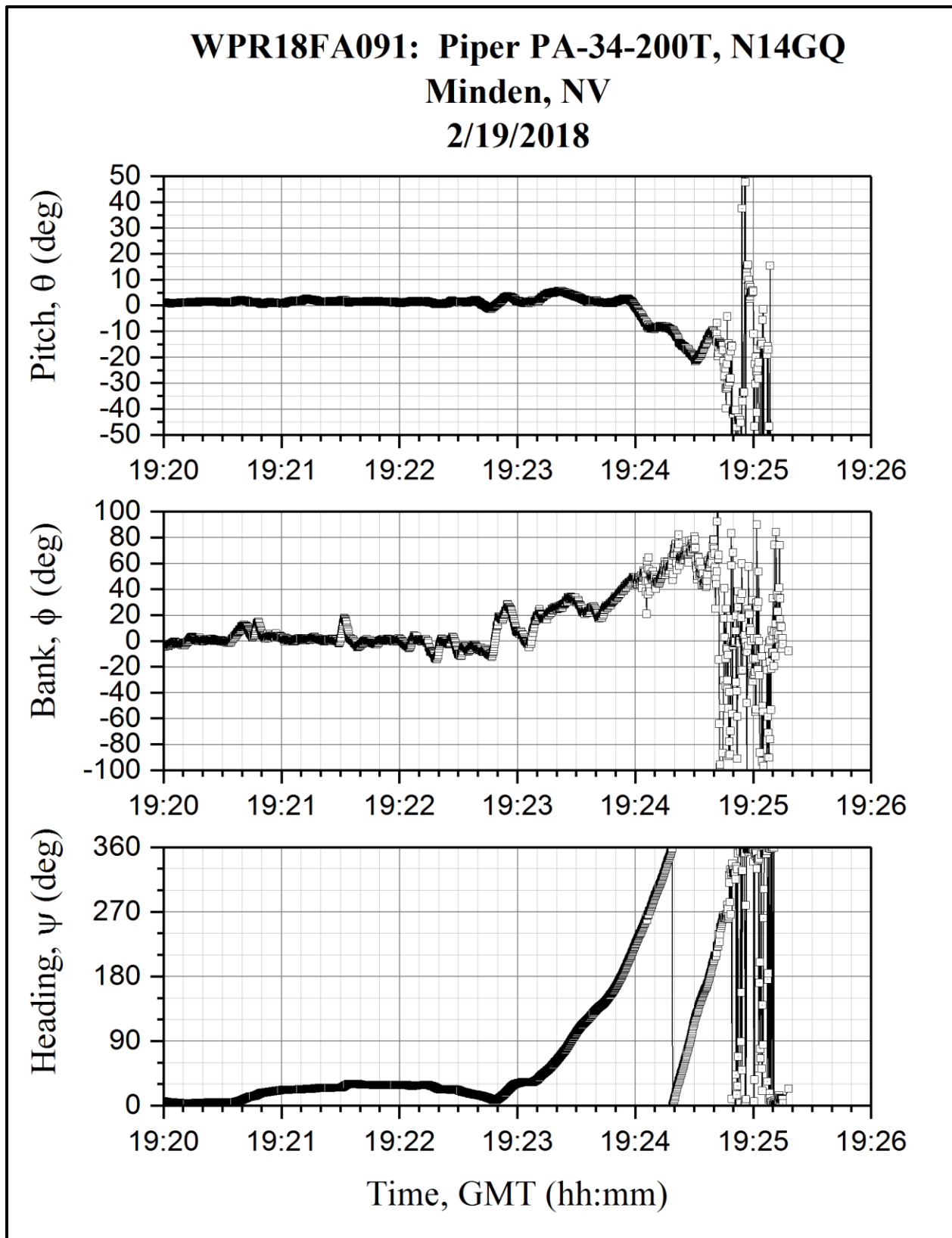


Figure 7: Calculated Pitch, Bank, and Heading for Final Minutes Based on Flight Path and Selected Appareo Data

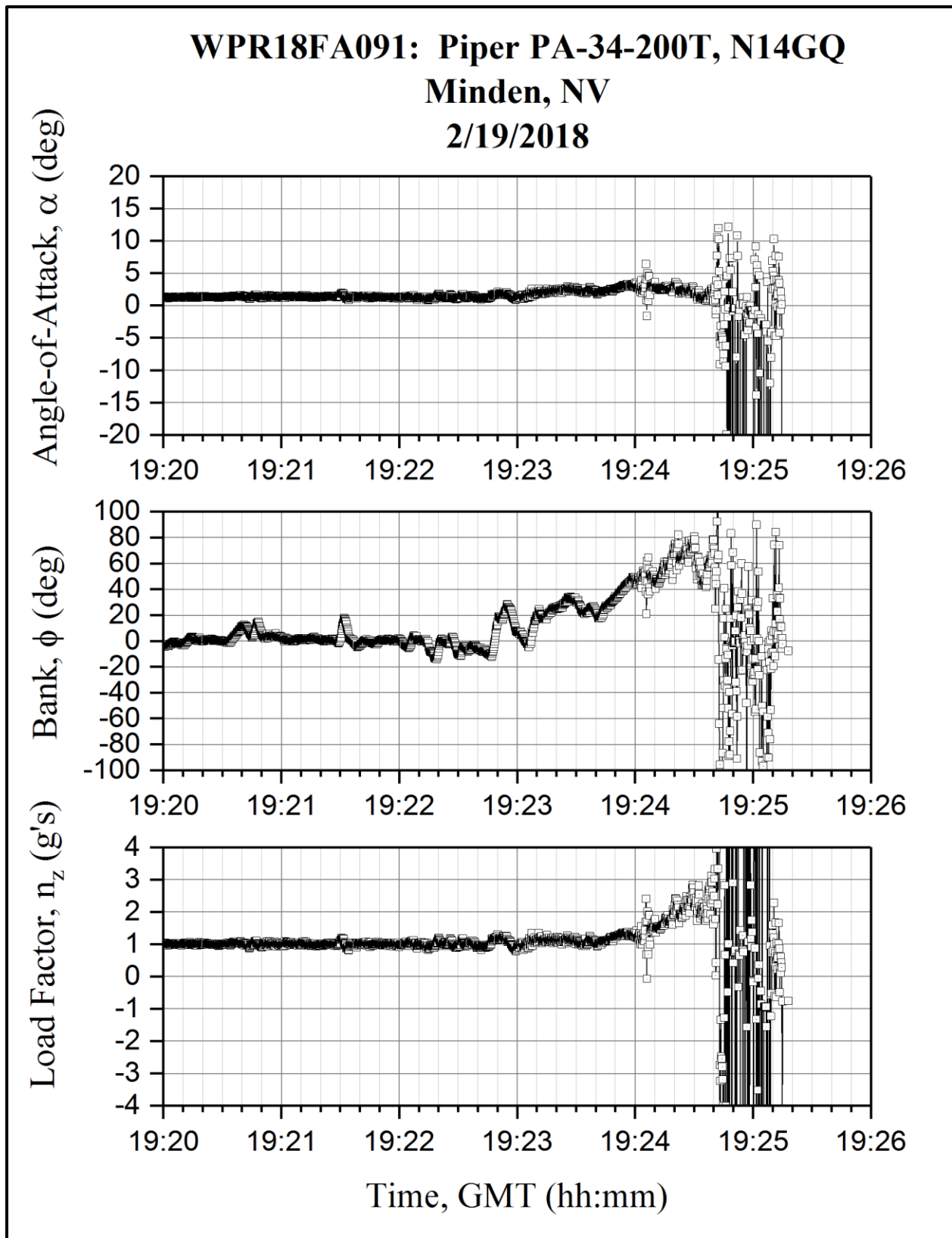


Figure 8: Calculated Angle-of-Attack and Load Factor for Final Minutes Based on Flight Path and Selected Appareo Data