

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN24FA179

FLIGHT PATH DATA STUDY

Aircraft Performance Study

By

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A. ACCIDENT

Location: Marianna, Arkansas
Date: May 12, 2024
Time: 19:56 central daylight time (CDT)
Airplane: Piper PA46-500TP, N241PM

B. SUMMARY

On May 12, 2024, about 19:56 central daylight time, a Piper PA46-500TP airplane, N241PM, was substantially damaged when it was involved in an accident near Marianna, Arkansas. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

C. PERFORMANCE STUDY

1.0 Aircraft

The airplane was a Piper PA46-500TP, also referred to as a Piper Malibu Meridian. It has a single turboprop engine and six seats.



Figure 1. Piper PA46-500TP, N241PM.

2.0 Available Data

This report used data from the Federal Aviation Administration (FAA) Automatic Dependent Surveillance-Broadcast (ADS-B) system. ADS-B equipped airplanes broadcast the airplane's Global Positioning System (GPS) latitude, longitude, and altitude along with other data approximately once per second. This data is received by FAA ground stations, private ground stations, and other aircraft. The position data is expected to have an uncertainty of approximately 20 m (65 ft) in horizontal and vertical dimensions.

Also included in this report are communications with a number of air traffic control (ATC) centers.

3.0 Weather

Weather was recorded for 19:55 at Tunica Municipal Airport (KUTA), in Tunica, Mississippi, 12 NM south of the accident site. The temperature was reported as 73°F (23°C), the dew point was 66°F (19°C), and the barometric setting was 29.89 inHg. Winds were 8 kts from 160°. Visibility was reported as 9 miles. Few clouds were at 10,000 ft agl and scattered clouds were at 12,000 ft.

Winds aloft were provided by the NTSB Meteorological group for 20:00 CDT near the accident site and are shown below. The High-Resolution Rapid Refresh (HRRR) model sounding showed light and variable surface winds. Above 16,000 ft the winds shifted to the west-southwest and speeds rapidly increased to 45 kts or more. These atmospheric conditions are used to determine airspeeds for the end of accident flight.

Table 1. Winds aloft from the HRRR sounding for 20:00 CDT near the accident site.

<i>Altitude, ft</i>	<i>Pressure Pa</i>	<i>Temperature °C</i>	<i>Dewpoint °C</i>	<i>Wind direction</i>	<i>Wind speed, kts</i>
161	1005	22	16.8	178	5
189	1004	22.7	17.1	180	5
275	1001	23.1	17.4	183	10
419	996	23	15.5	186	13
679	987	23.1	13.6	192	19
1117	972	22.3	12.2	195	22
1649	954	20.7	11.5	195	23
2279	933	18.8	10.8	193	23
2981	910	17	9.6	191	21
3790	884	15	8.9	186	17
4682	856	12.8	8.2	171	15
5696	825	10.4	7.2	157	16
6877	790	7.9	4.8	148	15
8171	753	5.2	2.6	142	12

9630	713	2.8	1.8	141	11
11278	670	0.5	0	146	9
13190	623	-1.2	-6.5	189	1
15281	575	-3.3	-11.4	304	16
17481	528	-7.1	-8.2	251	47
19645	485	-10.2	-11.7	249	54
21639	448	-14.1	-15.7	257	52
23649	413	-18.5	-19.8	262	52
25481	383	-22.6	-24.1	258	53
27295	355	-26.7	-28.3	254	62
29011	330	-30.8	-32.5	258	70
32134	288	-38.2	-40.2	254	74
35013	253	-45.8	-48.5	259	83

In the area of the accident, two layers of clouds were recorded; one from 4,000 ft to 12,000 ft and a second layer from 17,000 ft to 43,000 ft. The sounding also showed a risk of structural icing conditions between 18,000 ft and 24,000 ft with rime to mixed type icing indicated [1].

4.0 Flight Path

The airplane took off from Pensacola International Airport (PNS), Florida at 18:21CDT with the intended destination of Batesville, Arkansas (Figure 2). The airplane turned onto a northwesterly track towards Batesville by 18:31. The pilot requested flight level 280 (28,000 ft) at 18:33. The airplane climbed steadily (Figure 3) at a rate between 1,000 and 1,500 fpm and reached a cruising altitude of 28,000 ft pressure altitude (corrected geometric altitude was just over 29,000 ft) by 18:48 which it maintained until 19:44 when it began to descend. The calculated calibrated airspeed was consistently above 150 kts.

An airplane's ADS-B transponder can be configured to broadcast certain avionics settings. The ADS-B data included Selected Heading (SelHdg) and Selected Altitude (SelAlt) from the onboard autopilot settings, though no other autopilot settings recorded changing data. Selected altitude was set to 18,000 ft (18016) at 18:26 and remained there for the rest of the flight. Selected heading changed multiple times with the groundtrack following the changes in selected heading. Selected heading remained unchanged after 18:36, consistent with the constant track. The majority of the flight shows steady climb rates, altitudes, and tracks, consistent with the use of autopilot.

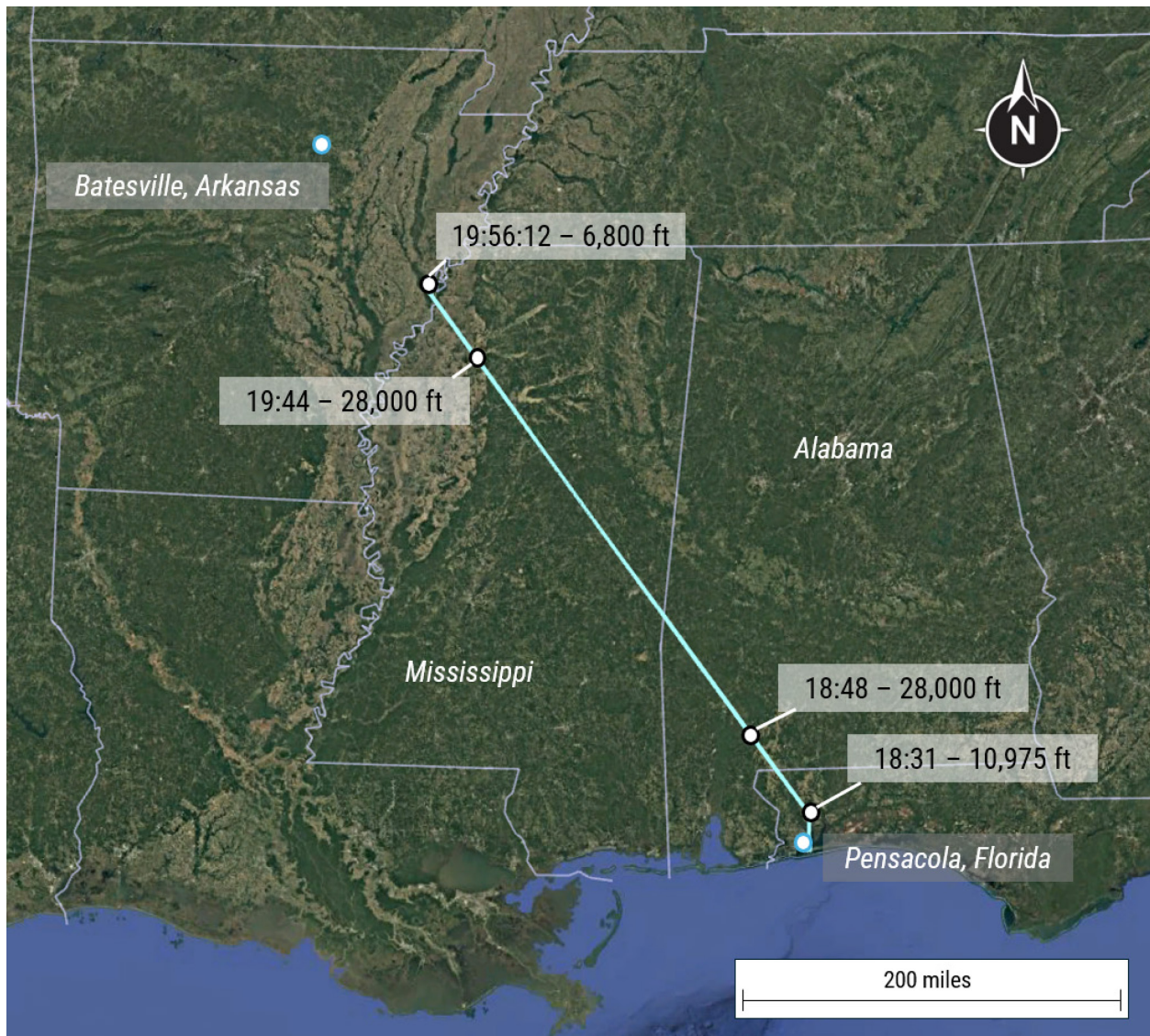


Figure 2. ADS-B flight path with selected times and pressures altitudes (uncorrected) shown.

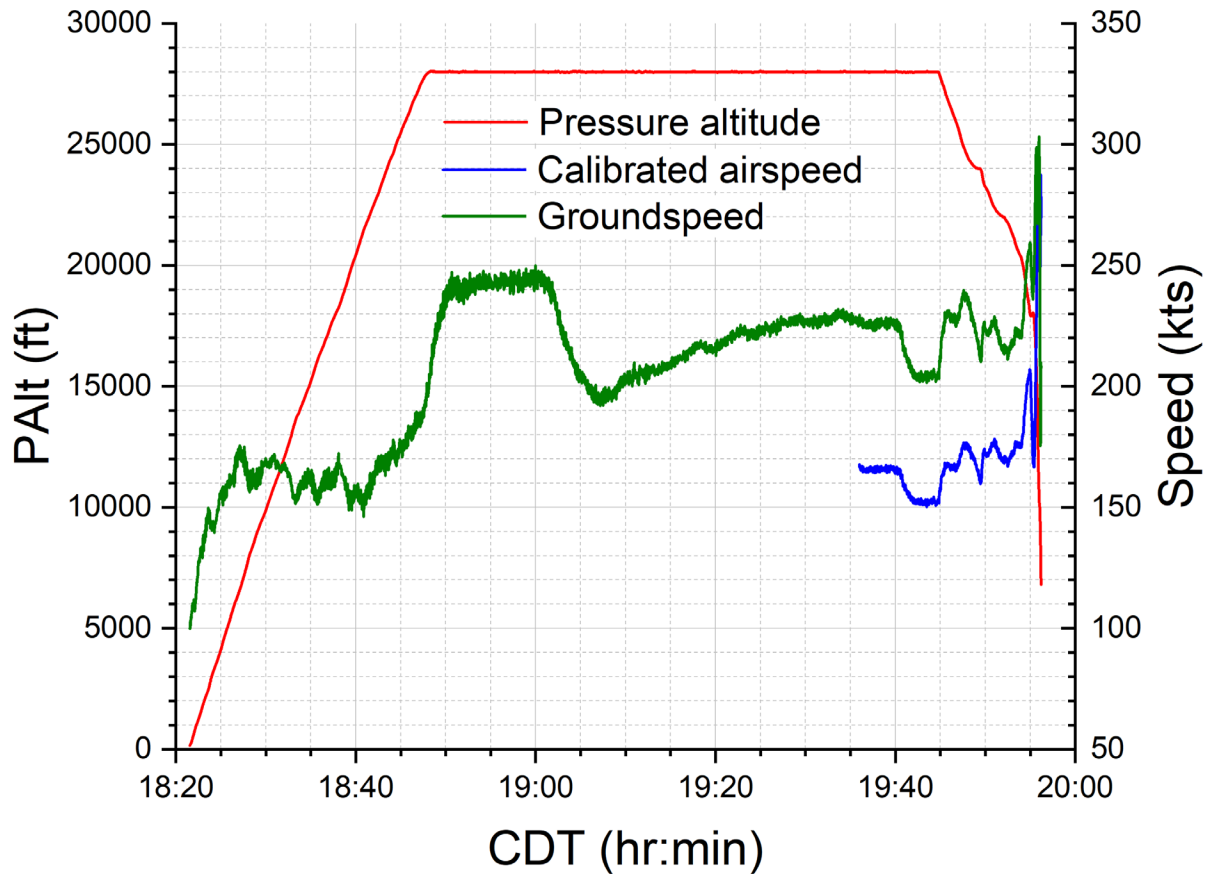


Figure 3. ADS-B pressure altitude (uncorrected for barometric setting), recorded groundspeed, and calculated airspeed. Airspeed is calculated using the HRRR sounding data and is more accurate as it approaches the end of flight.

The pilot reported to ATC that his satellite weather radar was not functioning at 18:41 and later asked for assistance navigating through weather. At 19:08 he reported light chop over the prior 40 miles but that it was currently smooth. At 19:44, ATC instructed the pilot to descend to flight level 240 and to expect moderate chop. The airplane began to descend at a rate between 1,000 and 1,500 ft/min (Figure 5). At 19:47 the pilot checked in with a new ATC center on his route and reported descending with moderate chop. ATC responded by instructing the pilot to descend at his discretion to 17,000 ft. The airplane reached 24,000 ft (the previously instructed altitude) at 19:49 where it stayed for less than a minute before continuing its descent. The first portion of this descent was at a rate of -2,000 ft/min before slowing to near -1,000 ft/min.

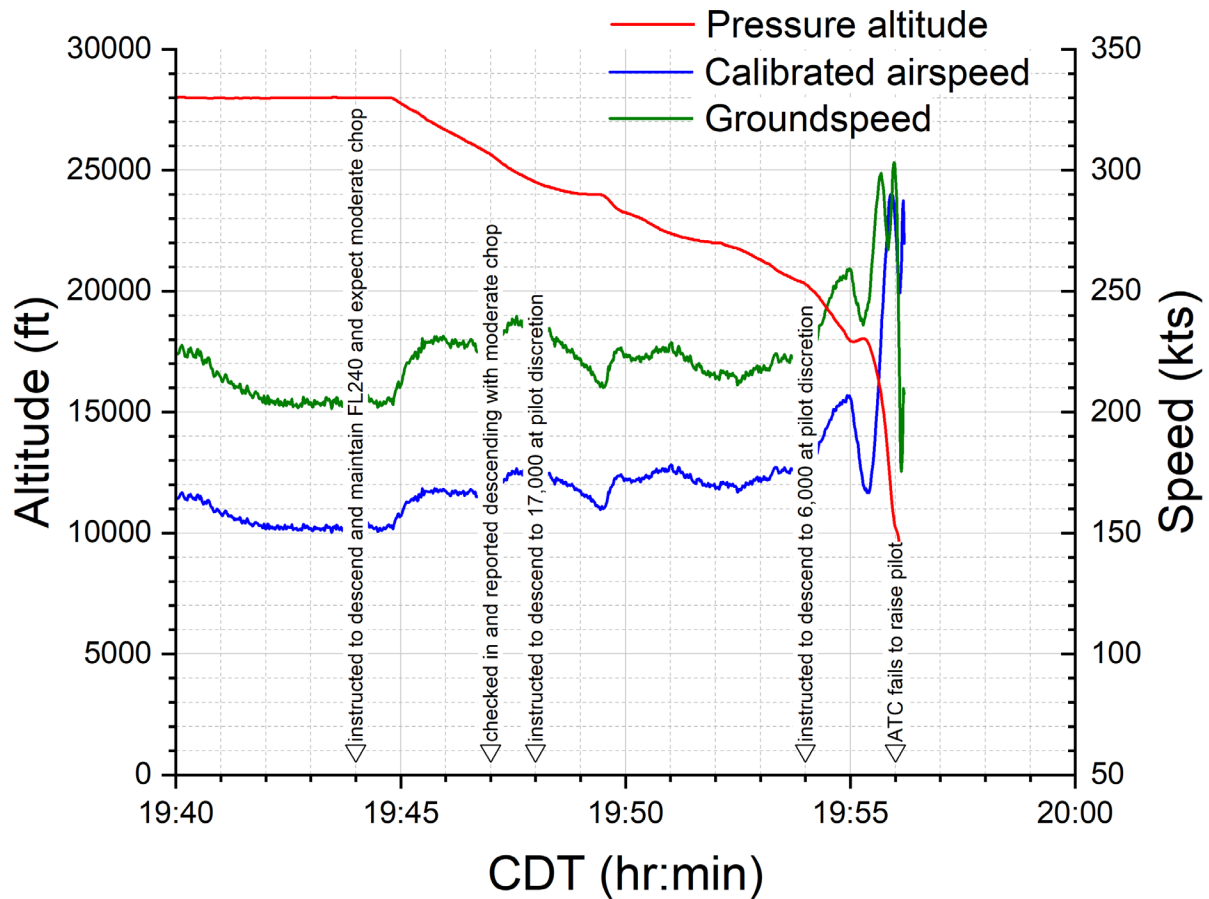


Figure 4. ADS-B pressure altitude (uncorrected for barometric setting), recorded groundspeed, and calculated calibrated airspeed. Airspeed is calculated using the HRRR sounding data and is more accurate as it approaches the end of flight. Also included are select ATC communications.

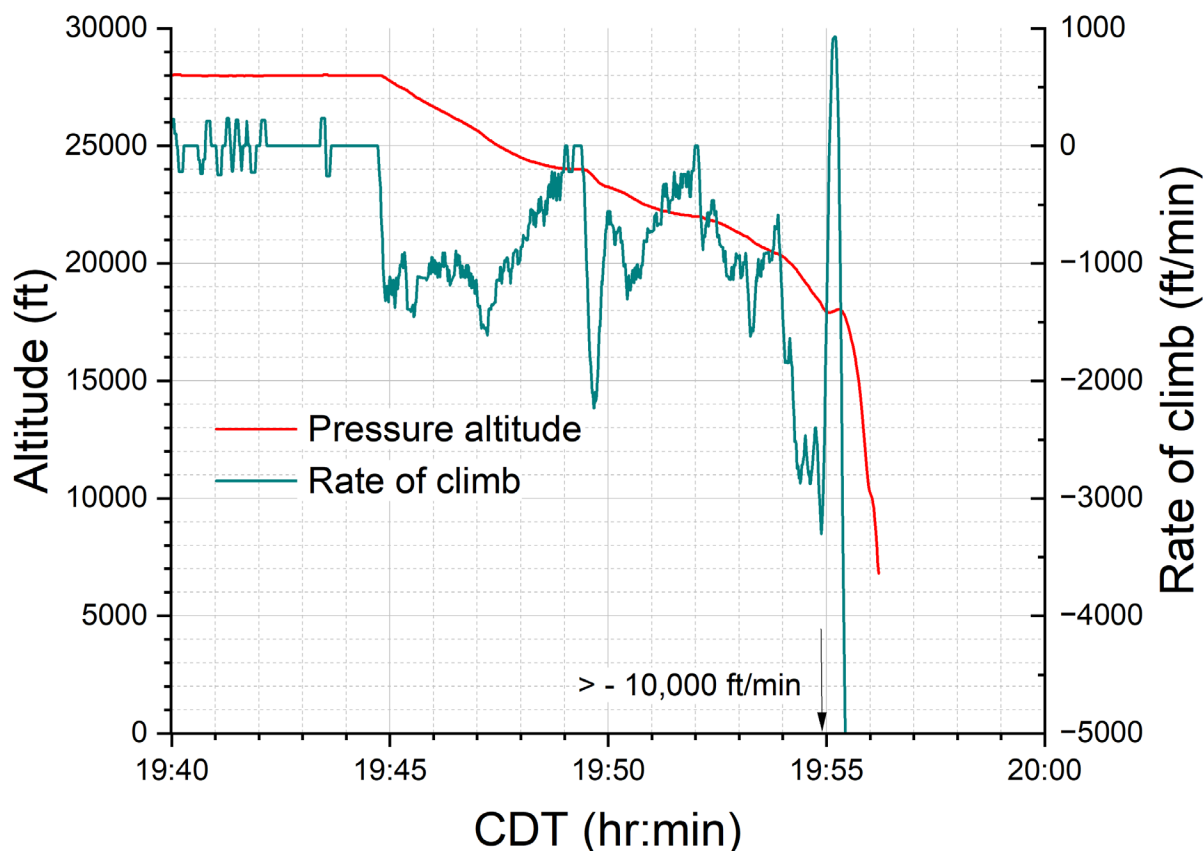


Figure 5. ADS-B pressure altitude (uncorrected for barometric setting) and calculated rate of climb for the end of flight.

The airplane continued to descend with a slight pause at 19:52 at 22,000 ft. At 19:54, while descending through 20,000 ft, ATC instructed the pilot to descend at his discretion to 6,000 ft. The rate of descent increased to near -3,000 ft/min and the airspeed markedly increased from 170 kts to over 200 kts, exceeding the Flight Information Manual's listed maximum operation limit of 187 kts calibrated airspeed [2]. The airplane was at risk of structural damage when exceeding this limitation.

At 19:55, the airplane arrested its descent at 18,000 ft and began a small climb as it began to slow its airspeed. It also began an initially shallow right turn (Figure 6 and Figure 7). The airplane had been within 2° of the same northwesterly track for the previous 1 hour and 20 minutes. As noted earlier, the steady track, altitude and climb rates indicated that the autopilot was in use. At 19:55, the airplane's altitude passed through the ADS-B recorded selected altitude value of 18016, after which the airplane began a brief climb and the ground track began to deviate to the right, no longer consistent with autopilot control.

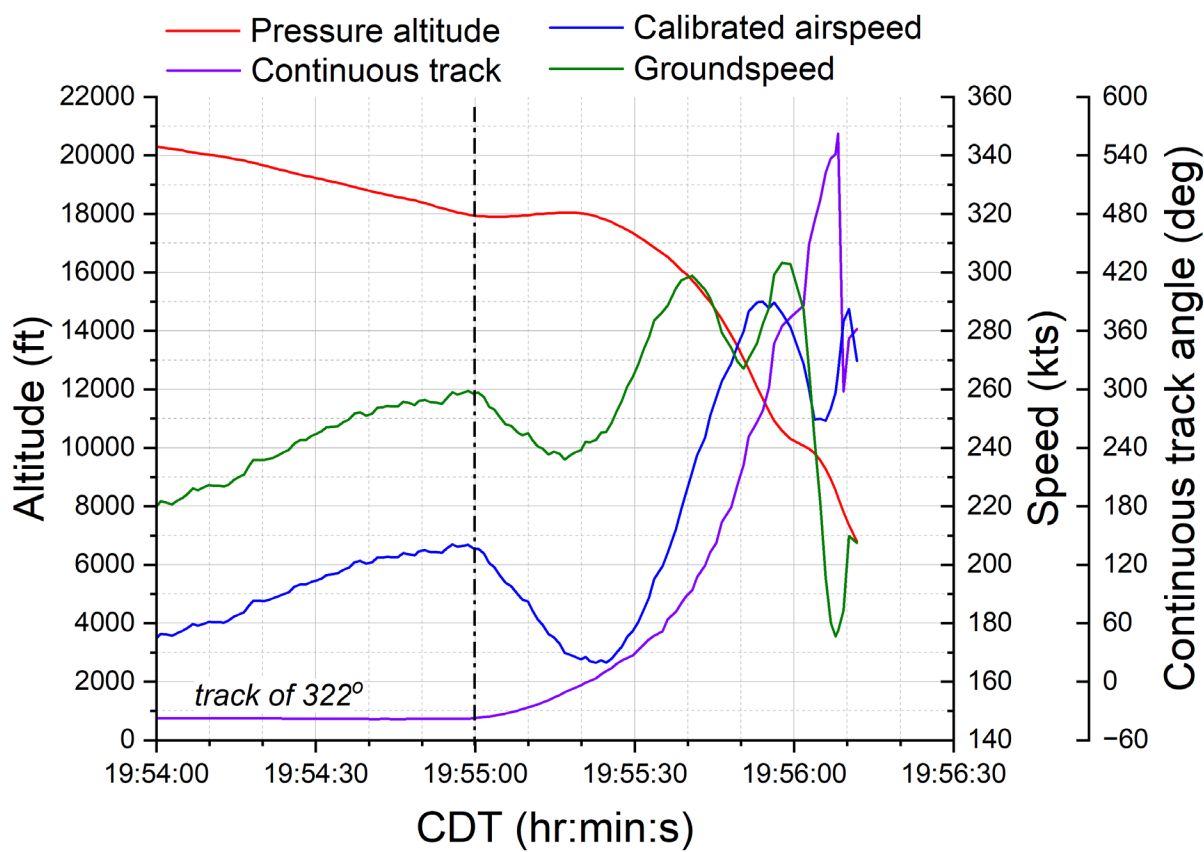


Figure 6. ADS-B pressure altitude (uncorrected for barometric setting), calibrated airspeed, groundspeed, and track angle as a continuous angle.

At 19:55:20, the airplane began rapidly descending and after 19:55:24, the airplane's speed rapidly increased from 160 kts to 290 kts while in a tightening right turn. The airplane experienced an in-flight breakup consistent with the increasing speed in a descending tight turn, which exceeded the airplane's structural limitations.

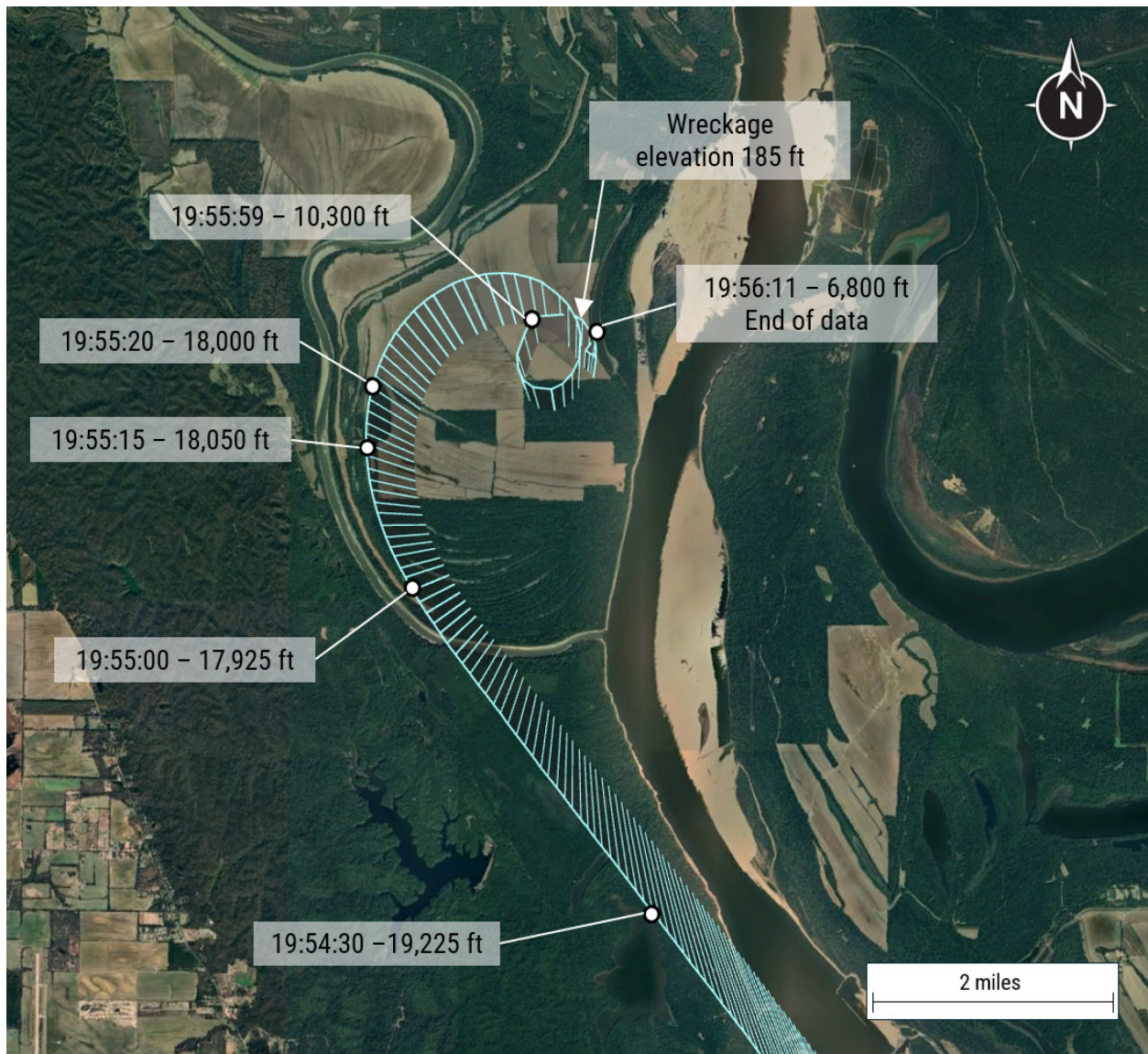


Figure 7. ADS-B flight path for the end of flight with selected times and pressure altitudes (uncorrected) annotated.

As discussed earlier, two thick layers of clouds were reported. The upper layer was from 17,000 ft to 43,000 ft and the airplane would have been in this cloud layer for most of the end of the flight including the initiation of the final descent and right turn. The airplane descended through 17,000 ft at 19:55:32 and then through 12,000 ft into the lower cloud layer at 19:55:53, 21 seconds later. The final ADS-B point was at an altitude of 6,800 ft, still in the clouds. The pilot would not have had out-of-cockpit visual cues for the majority of the end of flight.

Also discussed in the weather section, the possibility of icing conditions was noted. With the data available, no increase in the airplane's drag, which would be indicative of ice accumulation, was seen prior to the departure from straight flight at 19:55.

D. SUMMARY

While descending through 20,000 ft, ATC instructed the pilot to descend at his discretion to 6,000 ft. The rate of descent increased to near -3,000 ft/min and the airspeed increased from 170 kts to over 200 kts, exceeding the Flight Information Manual's listed maximum operation limit of 187 kts calibrated airspeed [2]. The airplane arrested its descent at 18,000 ft and it began a small climb as it began to slow its airspeed to below 170 kts. However, at the same time the airplane began an initially slight right turn off of its original course. Twenty seconds later, the airplane began to rapidly descend and the turn tightened while the calibrated airspeed rapidly increased, again surpassing the maximum operation limit. The airplane was at risk of structural damage during both exceedances and eventually suffered an in-flight breakup. Additionally, the pilot would not have had out-of-cockpit visual cues for the majority of the end of flight.

E. REFERENCES

1. Meteorology Specialist's Factual Report, CEN24FA179, National Transportation Safety Board, 2025.
2. Piper Meridian Information Manual, PA-46-500TP, The New Piper Aircraft, INC, 2005.