

National Transportation Safety Board

Office of Research and Engineering

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AUTOMATIC DEPENDENT SURVEILLANCE- BROADCAST (ADS-B) STUDY

Aircraft Performance Study

By

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A. ACCIDENT

Location: Clinton, Michigan
Date: June 10, 2024
Time: 1311 Eastern daylight time (EDT)
Airplane: Piper PA-28-140, N1039X

B. SUMMARY

On June 10, 2024, about 1311 Eastern daylight time, a Piper PA-28-140, N1039X, was substantially damaged when it was involved in an accident near Clinton, Michigan. The flight instructor was fatally injured, and the student pilot sustained serious injury. The airplane was operated by Solo Aviation Inc. as a Title 14 *Code of Federal Regulations* Part 91 instructional flight.

C. PERFORMANCE STUDY

1.0 Aircraft

The airplane was a Piper PA-28, also known a Cherokee. It was a single-engine propeller airplane.



Figure 1. Piper PA-28-140, N1039X.

2.0 Available Data

This performance study is based on Automatic Dependent Surveillance-Broadcast (ADS-B) data provided by Federal Aviation Administration (FAA). ADS-B broadcasts an airplane's Global Positioning System (GPS) position and other data to

the ground where it is recorded. The GPS position has an accuracy of approximately 20 meters (65 ft) in both the horizontal and vertical dimensions.

3.0 Weather

Weather was recorded for 12:53 at Ann Arbor Municipal Airport (ARB) in Ann Arbor, Michigan. The temperature was reported as 64°F (18°C), the dew point was 45°F (7°C), and the barometric setting was 29.87 inHg. Winds were 11 kts from 360° gusting to 18 kts. There were few clouds at 4,800 ft above ground level (AGL) and visibility was 10 statute miles. Day visual conditions prevailed.

4.0 Flight Path

The airplane had performed various maneuvers at altitudes¹ between 2,600 ft and 2,900 ft mean sea level (MSL) (Figure 2 and Figure 3). Terrain elevation in the area was generally between 800 ft and 900 ft.

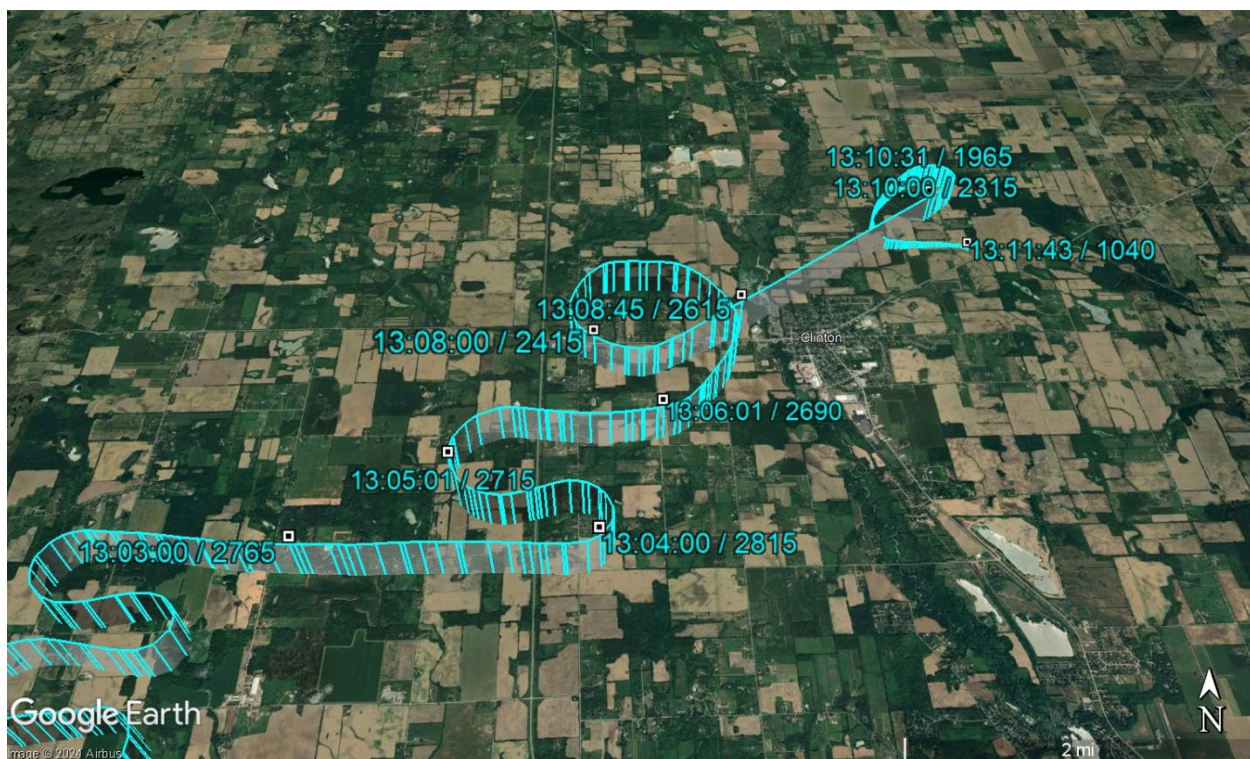


Figure 2. ADS-B end of flight path with selected times and altitudes indicated.

¹ Altitudes shown are ADS-B recorded geometric altitude corrected for the geoid in the area of the accident. Height above ground shown is the corrected geometric altitude minus the ground elevation of the wreckage.

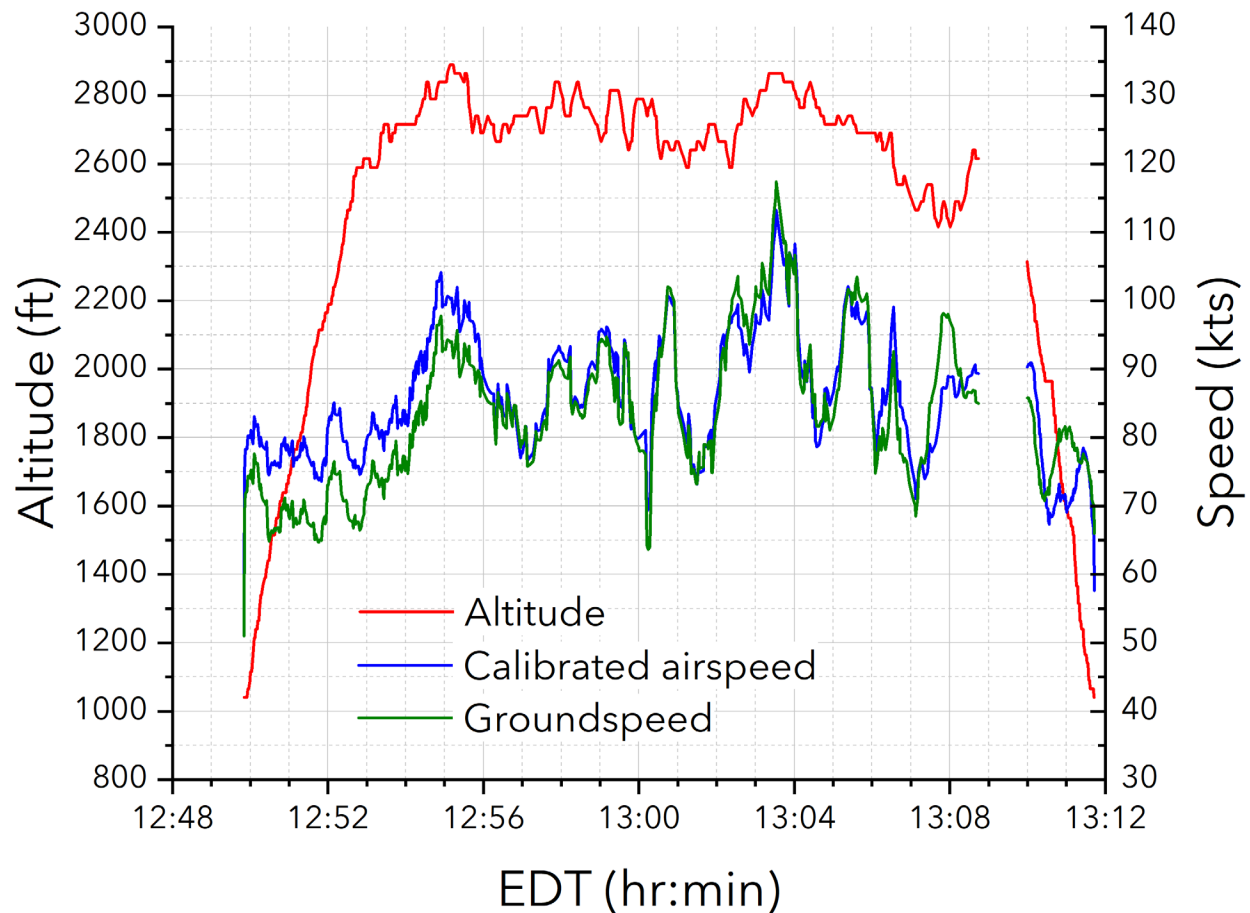


Figure 3. Altitude (MSL) with calculated calibrated airspeed and groundspeed versus time.

Figure 4 shows that from about 13:06:30 to 13:07:00 the airplane descended 200 ft while losing nearly 30 kts of airspeed. This loss of both altitude and airspeed was consistent with a reduction in power. Afterwards, the airplane regained much of the airspeed while maintaining altitude. At about 13:08 the pilot contacted air traffic control (ATC) at Ann Arbor and was told to proceed straight to runway 6. The pilot did not mention any difficulties.

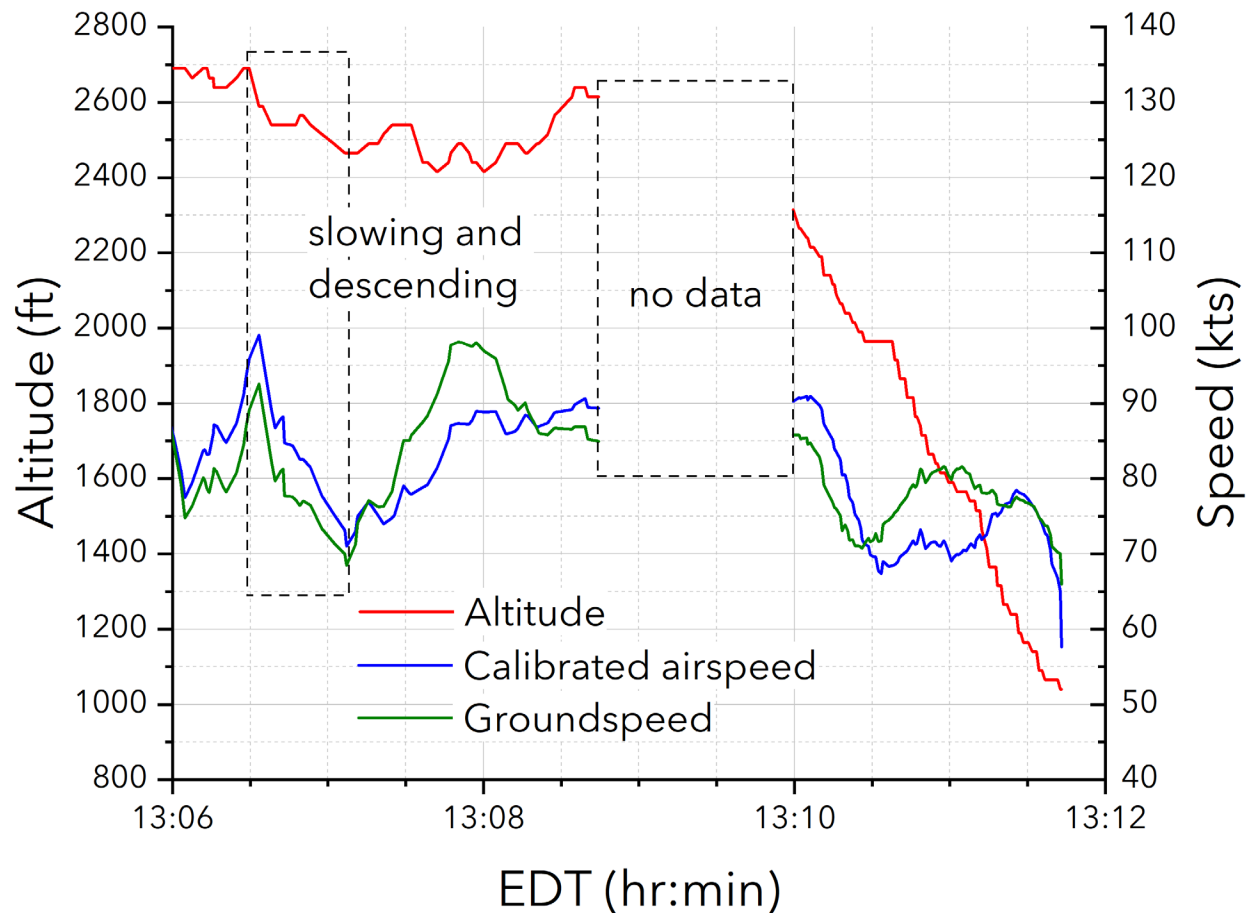


Figure 4. Altitude (MSL) with calculated calibrated airspeed and groundspeed versus time.

After contacting ATC the airplane continued on a track direct to Ann Arbor airport. During this time the airplane generally maintained altitude while increasing speed. ADS-B data was lost from 13:08:45 to 13:10:00. When the ADS-B data returned, the airplane was on the same track at approximately the same speed (90 kts calibrated airspeed), but had descended 300 ft. The airplane descended for the remainder of the flight. Airspeed slowed from 90 kts to 70 kts.

Figure 5 shows altitude as height above ground versus the distance the airplane traveled to the impact point. For the final 2.5 miles of flight, the airplane achieved the glide performance reported in the Pilot's Operating Handbook (POH) [1]. At 13:10, the Ann Arbor airport was 14 miles away, well beyond the airplane's glide distance. The airplane made a left turn (Figure 6) onto a track consistent with a local section of road. After 13:10:30 and 13:11:00 the airplane was able to arrest its deceleration and briefly gain airspeed while continuing to descend, possibly indicating the reduction in power was somewhat intermittent.

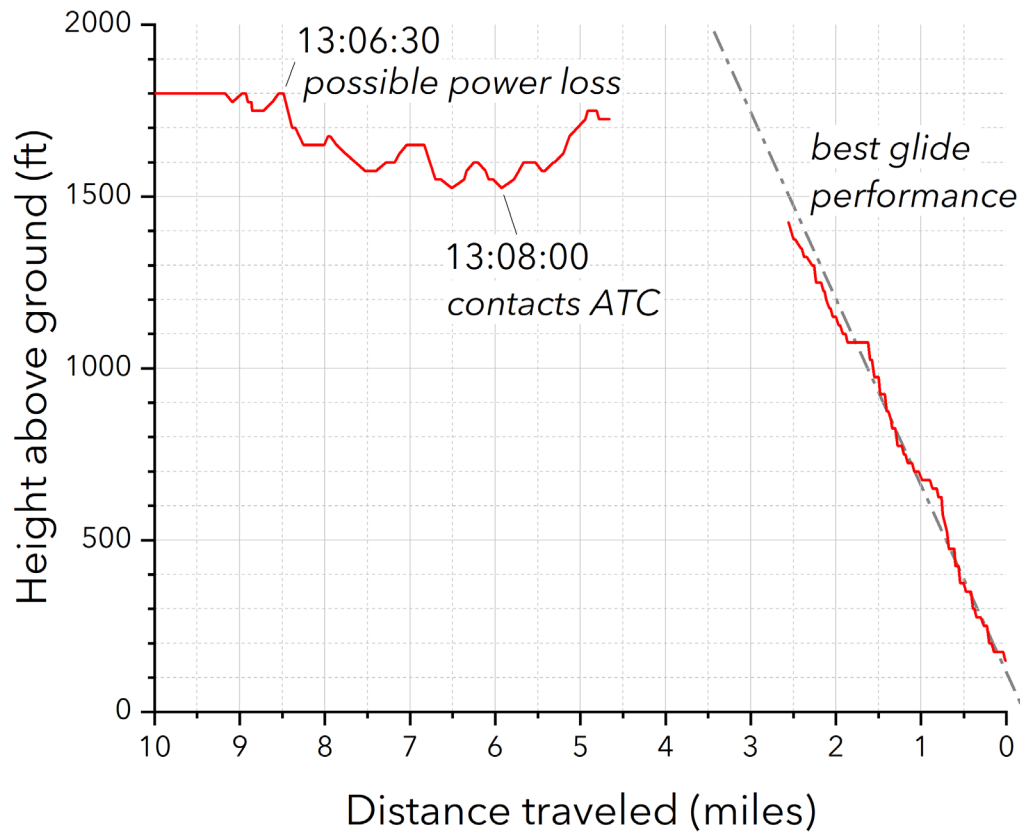


Figure 5. Height above ground versus distance traveled.



Figure 6. End of ADS-B data, selected times and altitudes annotated. The direction of Ann Arbor is noted by a blue and white arrow and a section of road is noted with a white and orange arrow.

However, at 13:11:36 at an airspeed of 74 kts and 200 ft above the ground, the airplane began a right turn away from the road (Figure 7). The airplane's maximum weight, wings level, no flaps calibrated stall speed is 56 kts [1], indicating the turn was not caused by aerodynamic stall. The airplane maintained its altitude for several seconds while continuing to slow. The final ADS-B return was at an altitude of 1,040 ft msl (150 ft above ground level) and had a calculated calibrated airspeed of 57 kts and dropping.

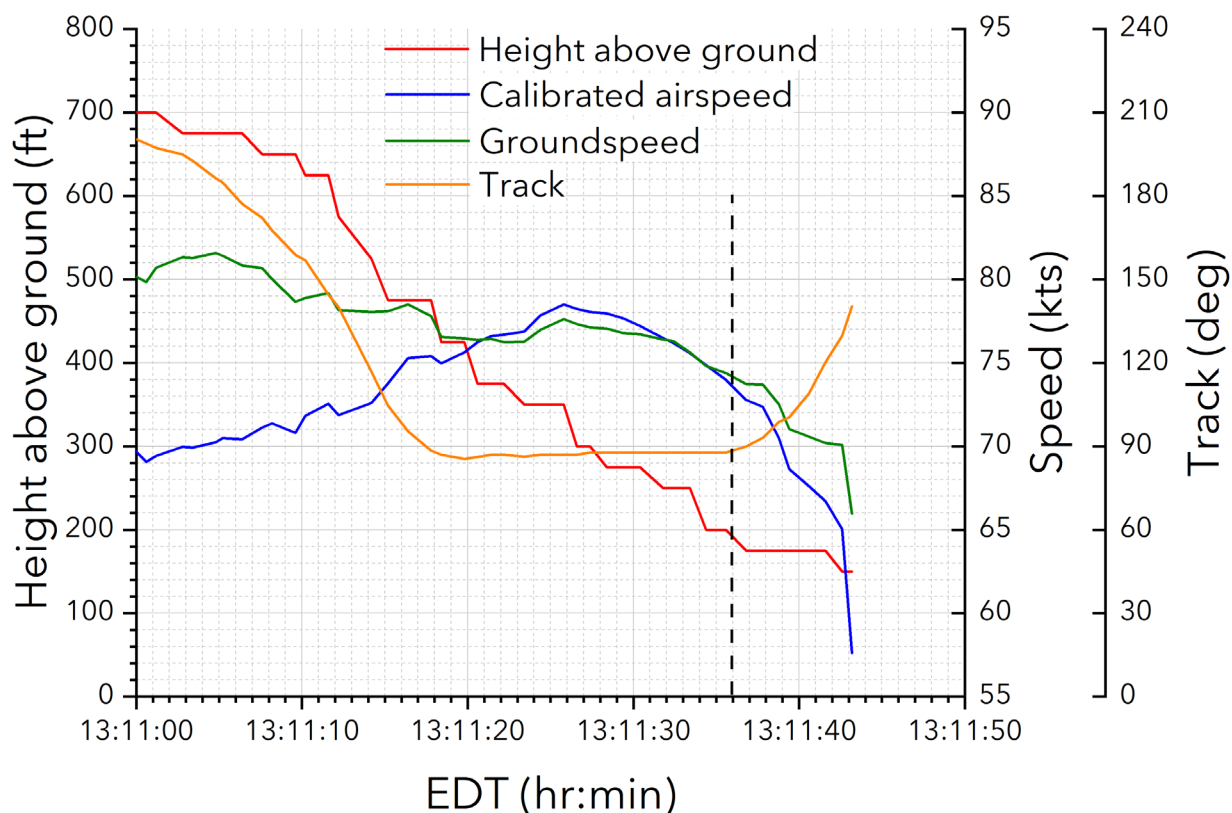


Figure 7. End of ADS-B altitude, speeds, and track versus time. The dotted line marks the beginning of the final right turn at 13:11:36.

D. SUMMARY

The airplane showed signs of a reduction in power before beginning to return to the Ann Arbor airport. After 13:10 the airplane's descent was consistent with the glide performance in the POH, and it made a left turn onto a track consistent with a local section of road. However, when at 200 ft AGL and at a speed well above stall, the airplane made a final right turn. Data ended seven seconds later 150 ft above the local terrain.

E. REFERENCES

1. Warrior II Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, Piper Aircraft Corporation, 1982.