

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA23FA219

RADAR STUDY

Aircraft Performance Study

By

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A. ACCIDENT

Location: Reliance, Tennessee
Date: May 7, 2023
Time: 1849 eastern daylight time (EDT)
Airplane: Cessna 182Q, N725AS

B. SUMMARY

On May 7, 2023, about 1849 eastern daylight time, a Cessna 182Q, N725AS, was substantially damaged when it was involved in an accident near Reliance, Tennessee. The private pilot was 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 involved was a Cessna 182Q, a four-seat, single-engine light airplane. At the time of the accident, the airplane's approximate weight was 2,400 lbs.



Figure 1. Cessna 182Q, N725AS.

2.0 Available Data

This performance study is based on a combination of Airport Surveillance Radar (ASR) which has a return rate of 4.5 seconds on average and Air Route Surveillance Radar (ARSR) which has a return rate of about 10 seconds on average. Radar data records an airplane's latitude and longitude and the airplane's broadcasted pressure altitude. During the end of flight, radar returns were every 10 - 20 seconds so data resolution was low.

Automatic Dependent Surveillance-Broadcast (ADS-B) data was not available for this accident flight path.

3.0 Weather

Weather was recorded for 1835 at McMinn County Airport (MMI), 12 nautical miles from the wreckage location. The temperature was reported as 70°F (21°C), the dew point was 59°F (15°C), and the barometric setting was 30.11 inHg. Winds were 10 kts gusting to 29 kts from 360° and there were scattered clouds at 4,200 ft above ground level (AGL) and a broken ceiling at 4,900 ft AGL. Visibility was 10 miles.

Winds aloft were provided by the NTSB Meteorologist and are shown in Table 1.

Table 1. High-Resolution Rapid Refresh (HRRR) sounding for 2300 UTC (1900 EDT).

Altitude, ft MSL	Pressure, millibars	Temperature, C	Dew point, C	Wind direction	Wind speed, kts
1411	966	23.3	18.8	16	8
1441	965	23.1	18.4	15	7
1530	962	22.7	18.5	17	10
1649	958	22.2	18.1	18	11
1919	949	21.3	17.9	21	11
2342	935	20.7	16.9	22	9
2864	918	20.2	15.9	352	3
3520	897	19	15.1	245	5
4220	875	17.3	14.4	237	10
4999	851	15.2	13.5	237	11
5895	824	12.9	11.9	239	12
6916	794	10.3	10	244	13
8038	762	8.1	6	255	14
9311	727	6.8	-0.4	276	18
10713	690	4	-3.8	282	21

4.0 Flight Path

The airplane departed South Bend International Airport about 1559 destined for Jackson County Airport, Jefferson, Georgia. The airplane climbed to over 9,100 ft while on a southeasterly heading.

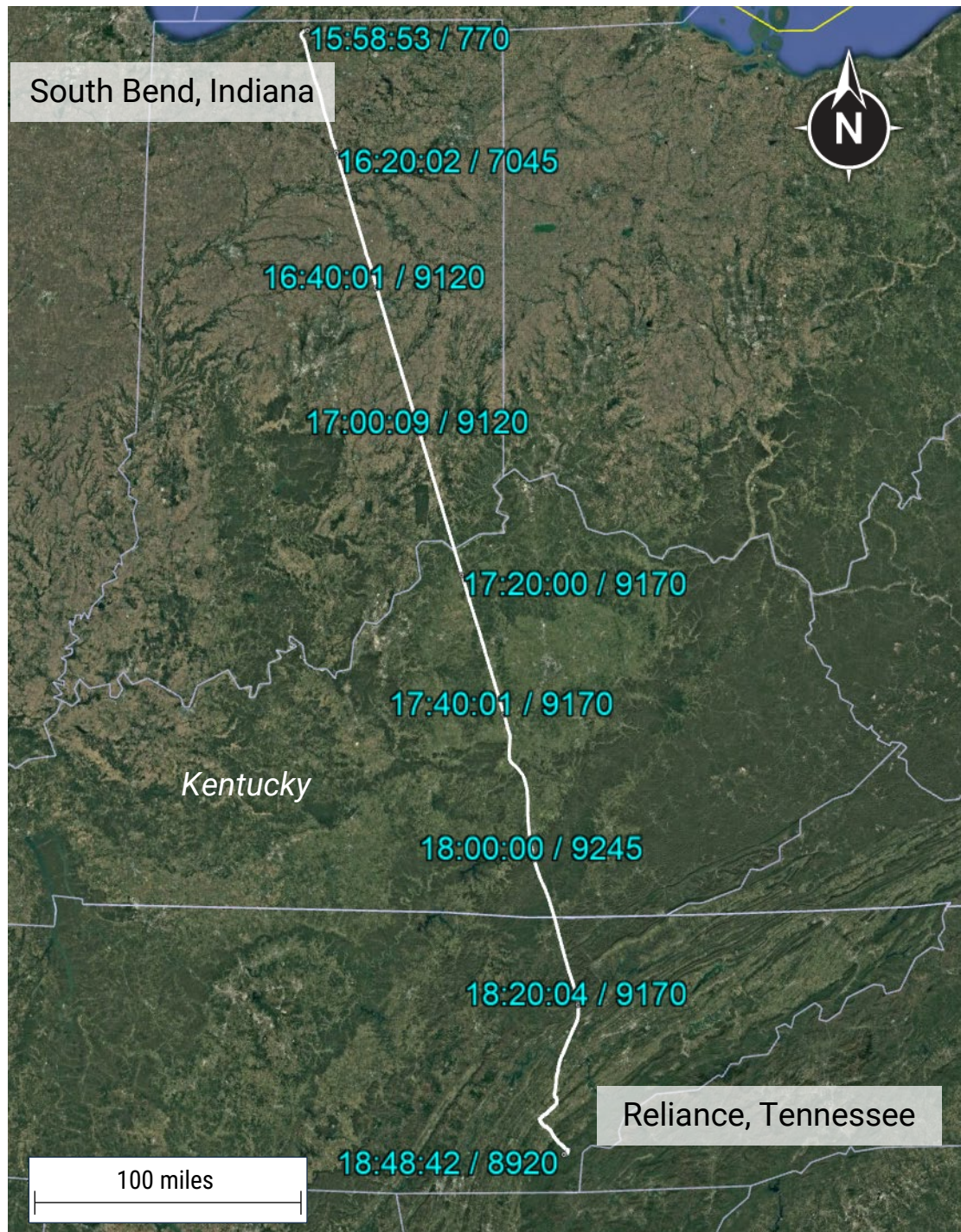


Figure 2. Airplane flight path with selected times and altitudes shown.

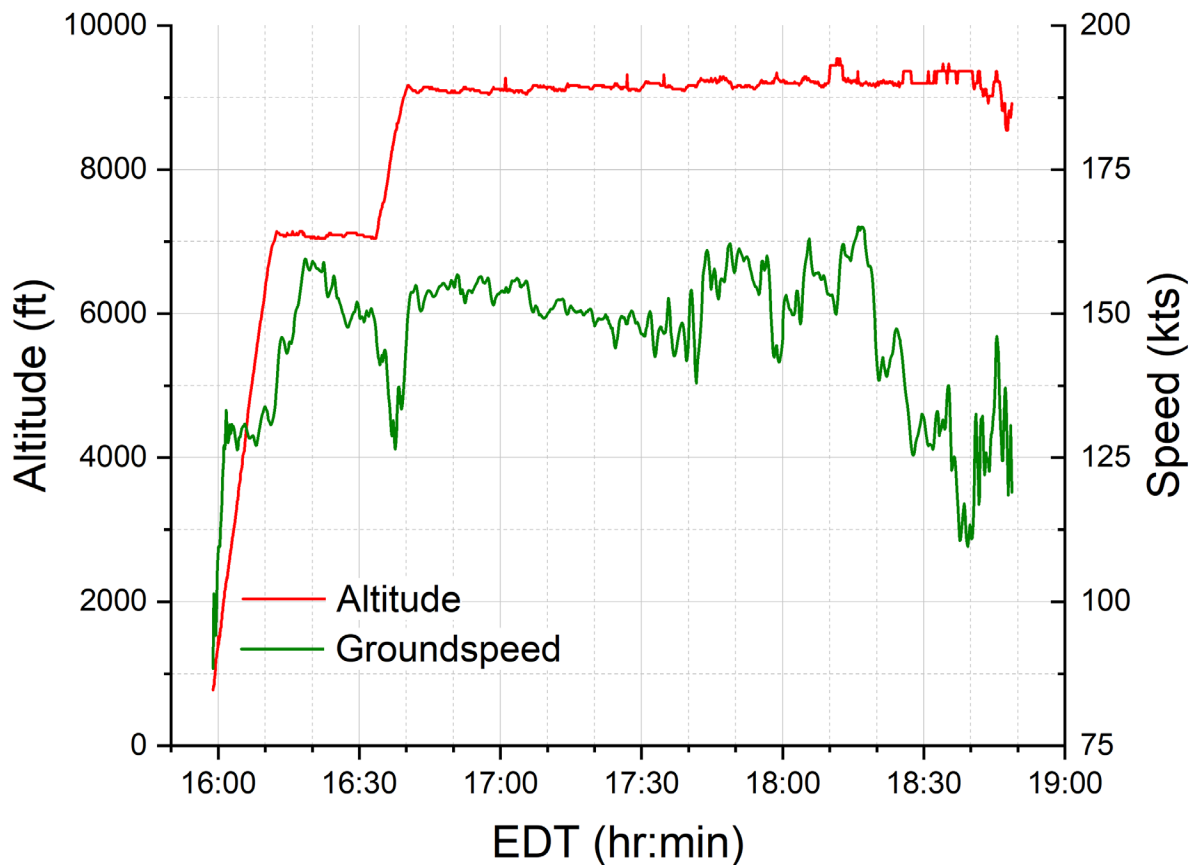


Figure 3. Radar recorded altitude and groundspeed.

After 1830, the flight path track became irregular and the airplane made a series of turns. Local meteorological conditions and winds aloft were used to calculate the airplane's calibrated airspeed. During these turns, the airspeed was above the listed maneuvering speed, V_a , for 2,450 lbs gross weight (99 kts, calibrated airspeed) [1]. As discussed earlier, the airplane's weight at the time of the accident was estimated to be 2,400 lbs.

At about 1845, the pilot contacted the Atlanta Air Route Traffic Control Center and stated that they were getting "bounced around a little bit" and the controller advised that the flight appeared to be clear of any depicted weather returns.

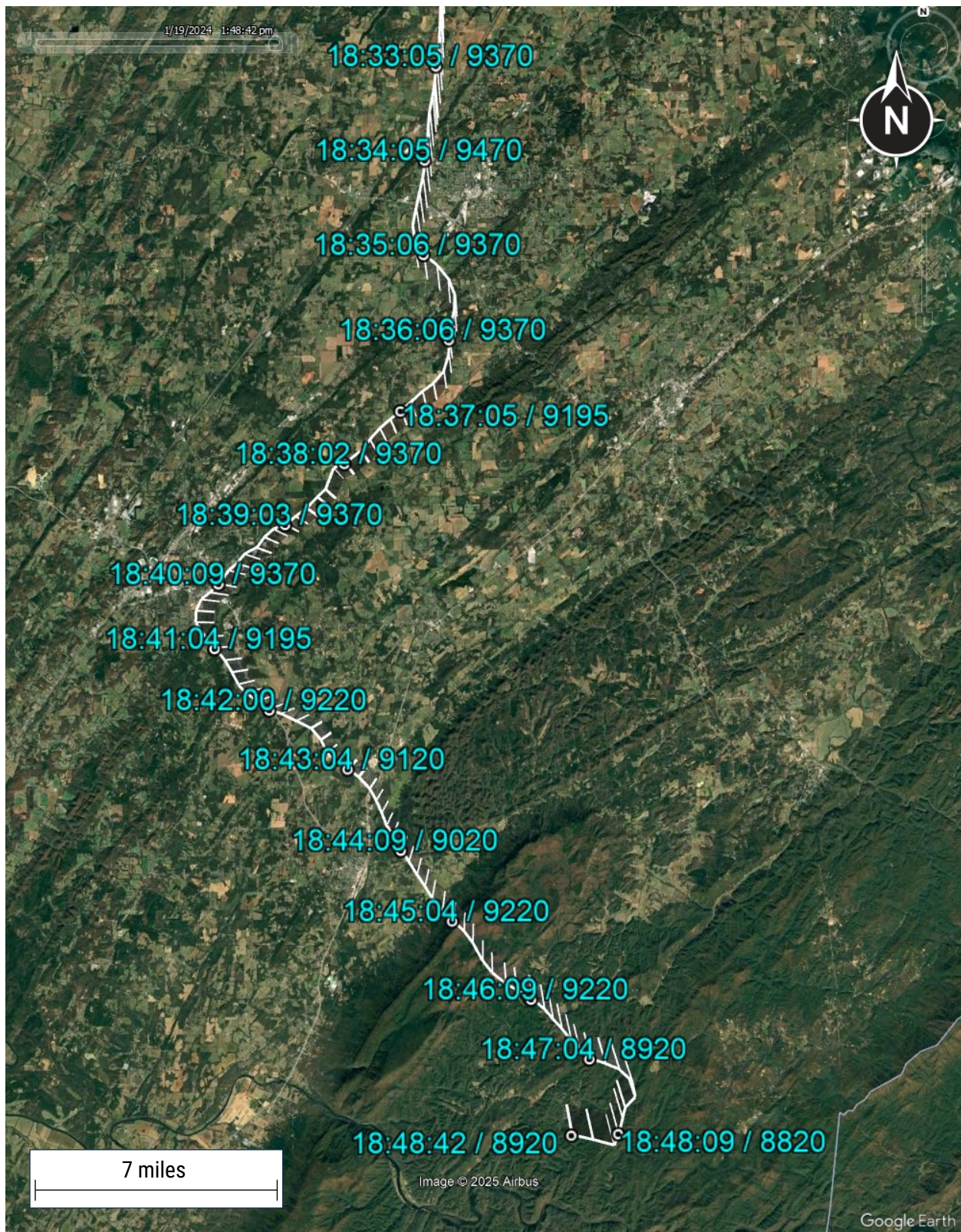


Figure 4. End of airplane flight path with selected times and altitudes shown.

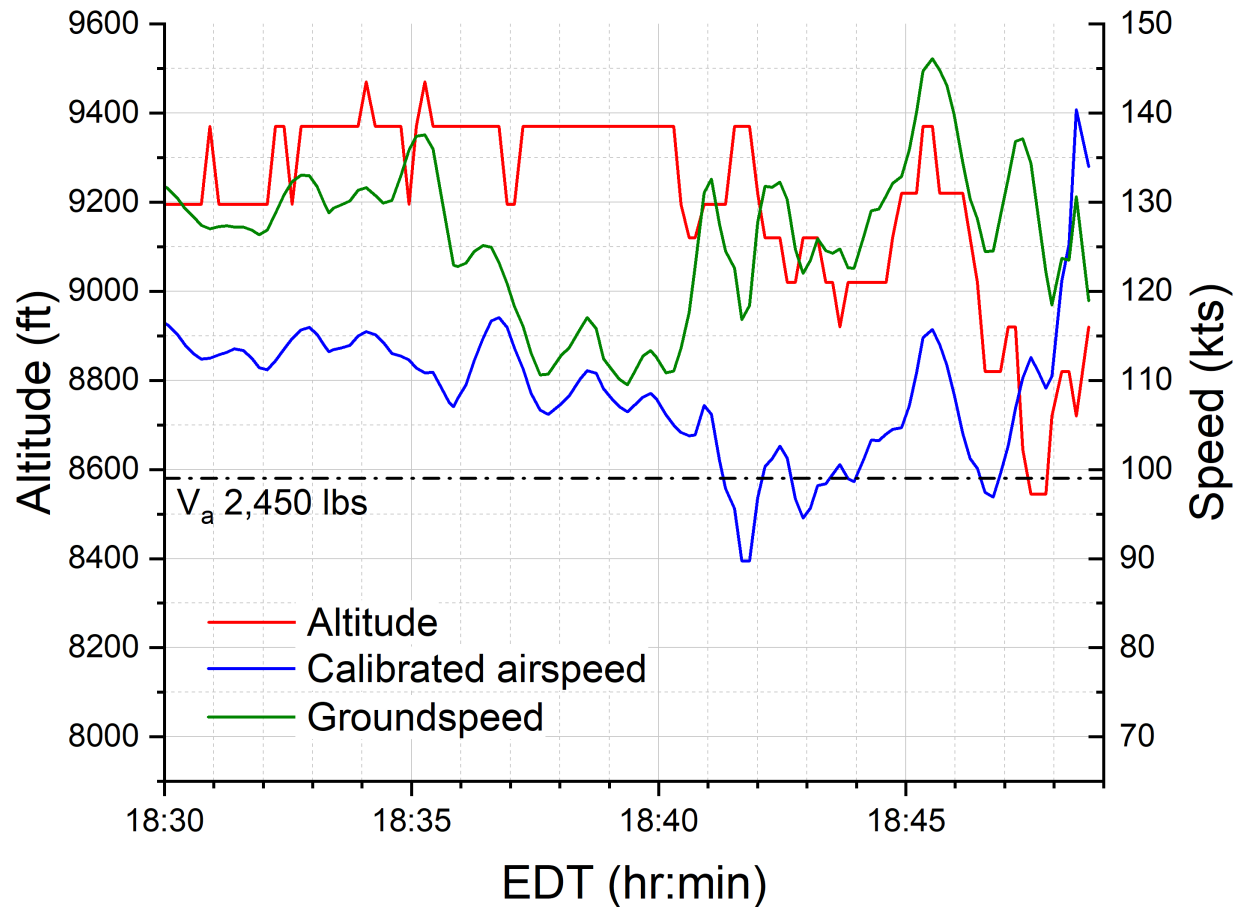


Figure 5. Radar recorded altitude, groundspeed, and calculated airspeed. The Va for 2,450 lbs is shown.

During the final minutes of flight, the airplane remained above the maneuvering speed while in a right turn that, according to aerodynamic calculations, would have required a roll angle of at least 20°. The airplane was generally descending, but the last few data points indicate a climb. However, due to the loss of radar data, the airplane likely again descended below radar coverage.

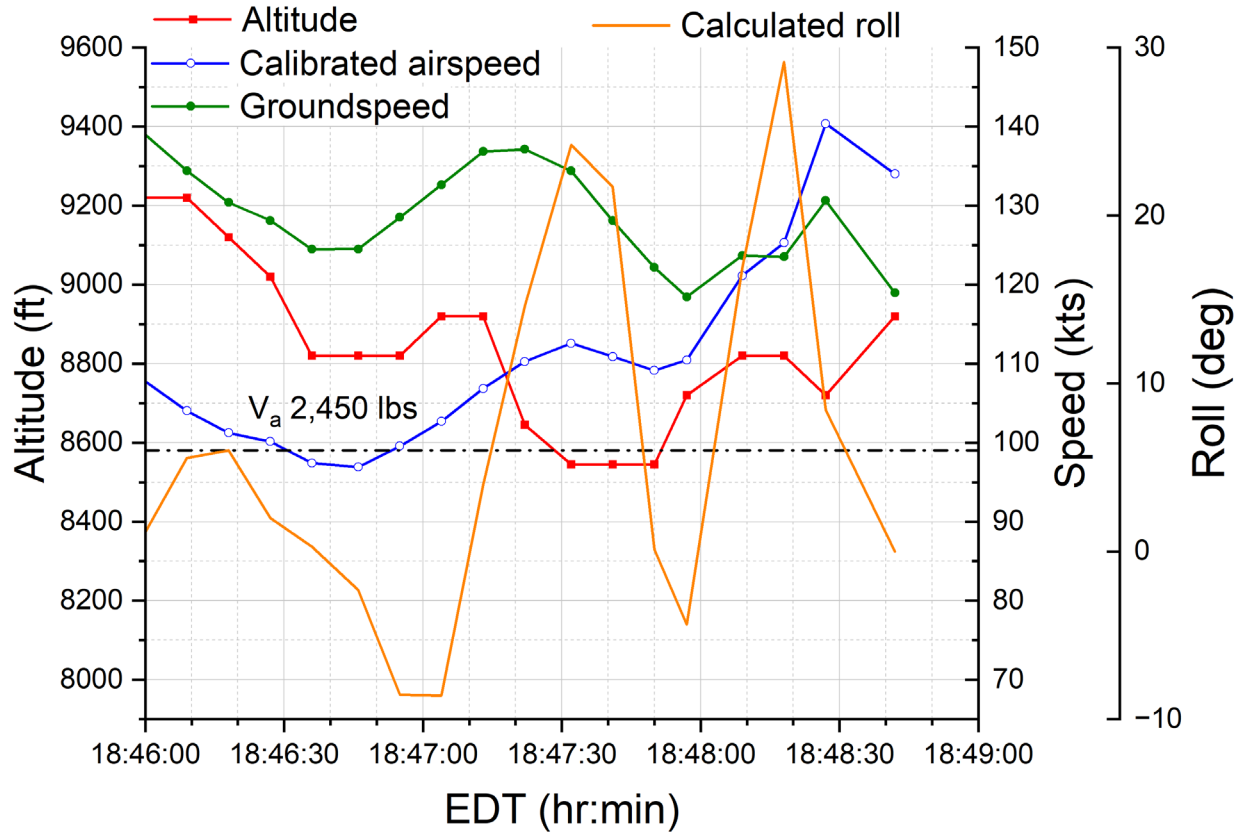


Figure 6. Radar recorded altitude, groundspeed, calculated airspeed, and calculated roll angle. The V_a for 2,450 lbs is shown.

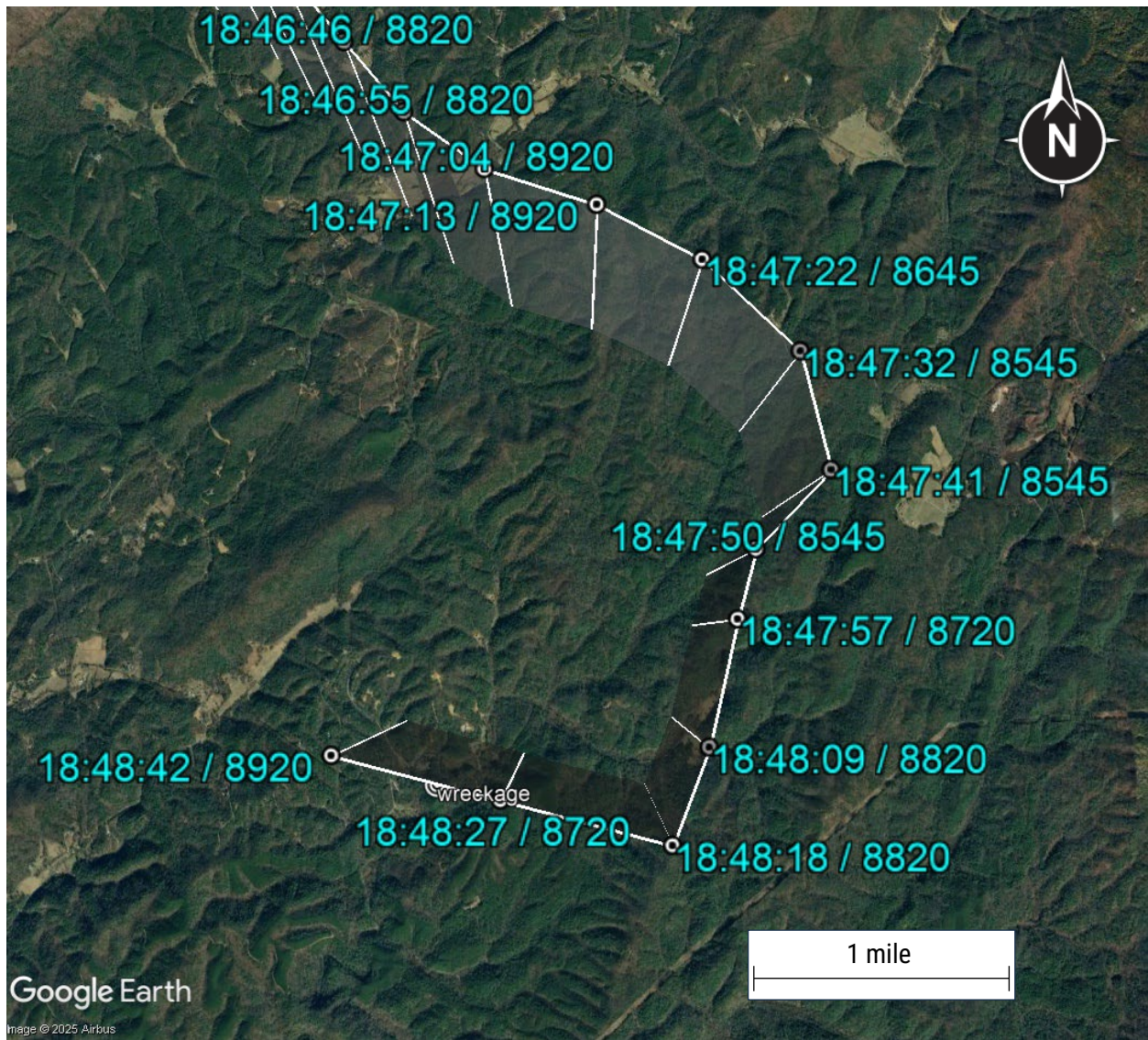


Figure 7. End of airplane flight path with selected times and altitudes shown.

D. SUMMARY

After 1830, the airplane began a series of deviations from its earlier straight path. After 1847 the airplane began a right turn at a speed above its maneuvering speed. The last few data points show the airplane slowing and climbing, but the airplane likely entered a descent and was lost to further radar coverage. The low resolution of the ARSR data and the absence of ADS-B data did not allow for more in-depth investigation of the flight path.

E. REFERENCES

1. Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, 1979 Model 182Q Skylane, Cessna, A Textron Company, 1997.