

National Transportation Safety Board

Office of Research and Engineering

Washington, D.C. 20594

Performance Study

Specialist Report

Marie Moler

A. ACCIDENT

Location: Valley Center, California
Date: May 31, 2020
Time: 17:57 Pacific daylight time (PDT)
Airplane: Cub Crafters CCK-1865, N303KP
NTSB Number: WPR20LA157

B. SUMMARY

On May 31, 2020 at 17:57 Pacific daylight time (PDT), an experimental Cub Crafters CCK-1865, N303KP, was substantially damaged when it was involved in an accident near Valley Center, California. The pilot sustained fatal injuries and the passenger was seriously injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

C. PERFORMANCE STUDY

This performance study is 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 and other data to the ground where it is recorded. The GPS position has an accuracy of approximately 20 meters (m) in both the horizontal and vertical dimensions.

The aircraft took off at 17:38 from an airfield near Lake Wohlford, California. The airplane flew for just under 20 minutes before the flight ended north of Valley Center, California. Weather in the area at the time of the accident was winds from the west at 6 kts, 29.54 inHg, 66°F and a dew point of 57°F. Figure 1 shows the full flight with take off at the bottom of the figure and the end of flight at the top.

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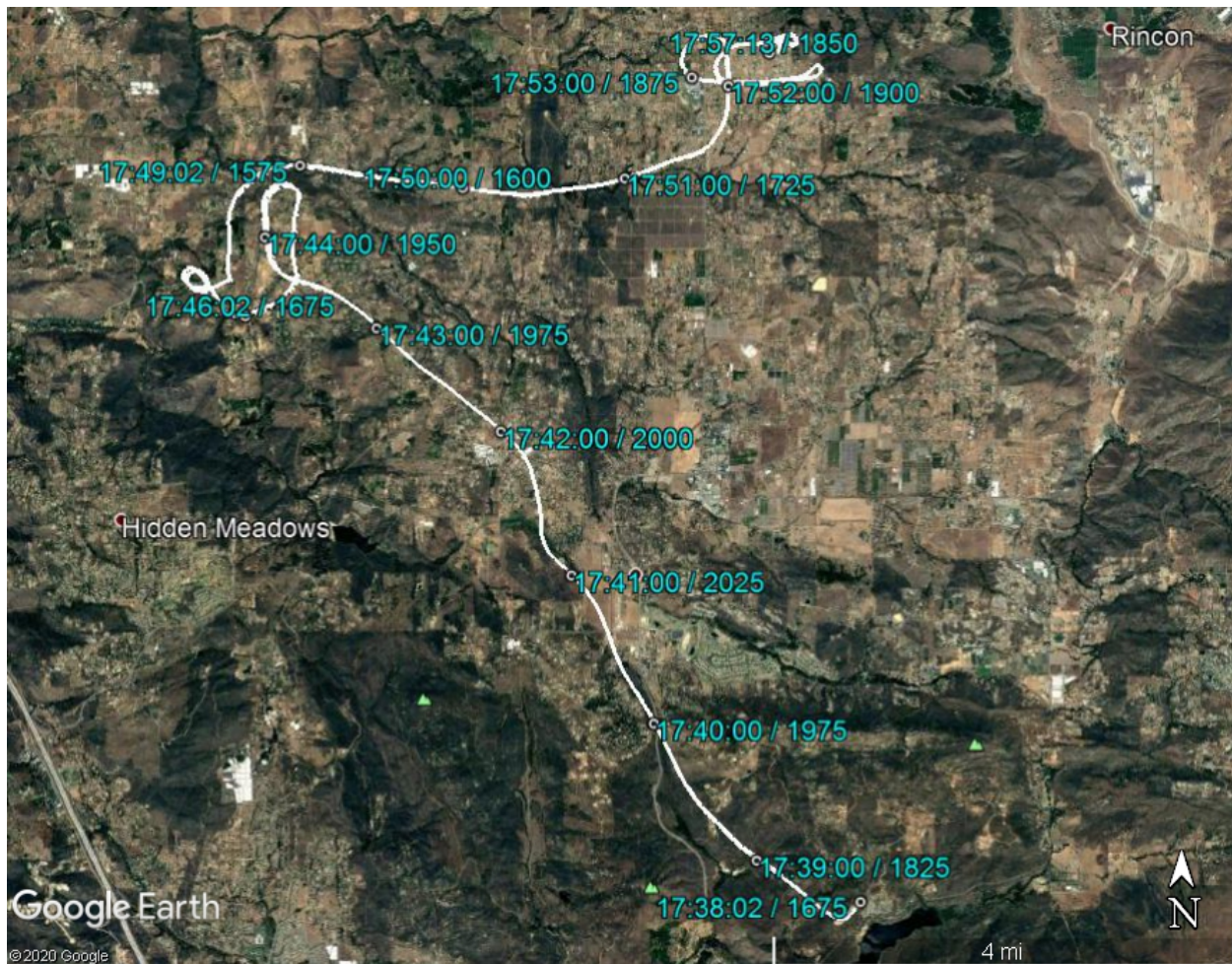


Figure 1. Accident flight in blue with select times and altitudes (msl) annotated in blue.

The airplane's altitude varied between 1,400 and 2,050 ft mean sea level (msl) (Figure 2), but its height above ground was initially between 450 ft and 800 ft before descending to 150 ft to 450 ft above the ground during the second half of the flight (Figure 3). Speed varied between 40 and 100 kts, slowing during maneuvering flight.

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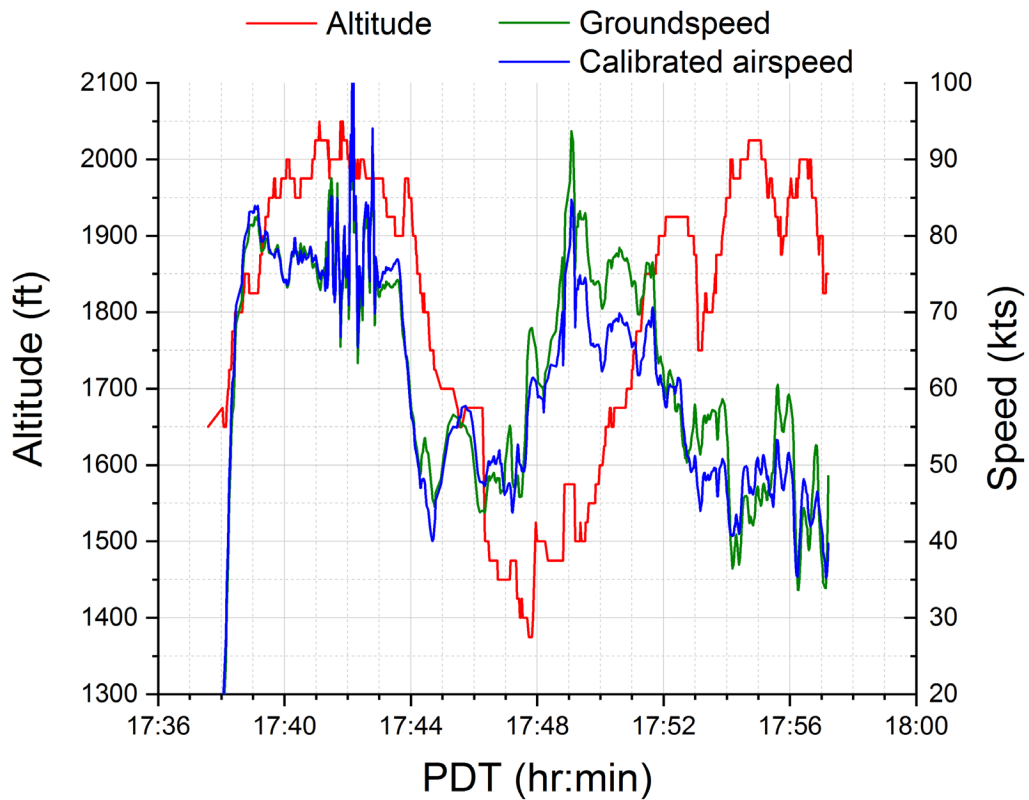


Figure 2. Altitude (msl) and calculated ground and airspeed.

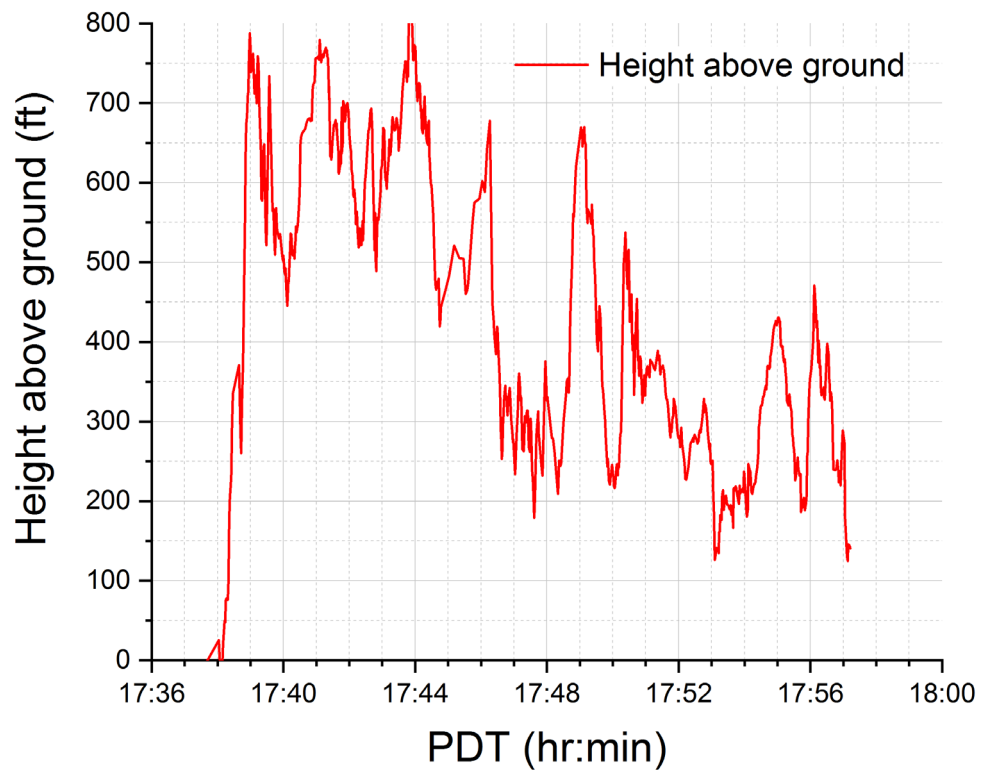


Figure 3. Height above ground.

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At 17:52 the airplane entered the area near the final wreckage location and began to circle over it. Airspeed, altitude, and calculated bank angle are shown in Figure 4. The calculated calibrated airspeed slowed to between 40 and 50 kts as the airplane executed a number of left and right turns. The airplane's height above the terrain varied between 100 ft and 300 ft.

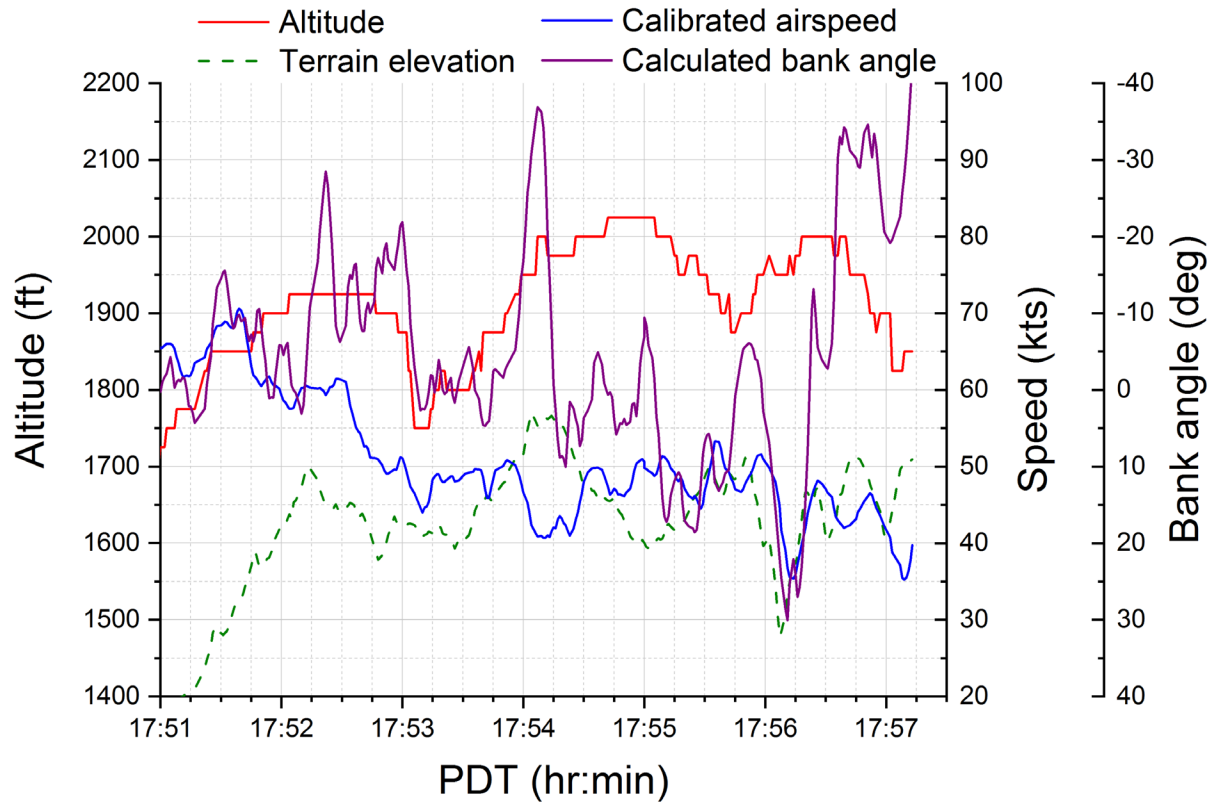


Figure 4. Altitude (msl), terrain elevation, airspeed, and bank angle.

Figure 5 shows the flight path from 17:56 through the end of flight. The airplane executed a 180° right turn starting at 17:56. It climbed 100 ft while the calibrated airspeed dropped to near 35 kts. By 17:56:30 the airspeed was above 45 kts and the airplane began a left turn. By 17:57 the airplane had completed a full 360° turn and was continuing to turn and descend. The bank angle was greater than 40° left wing down. 17:57:13 was the last recorded data point.

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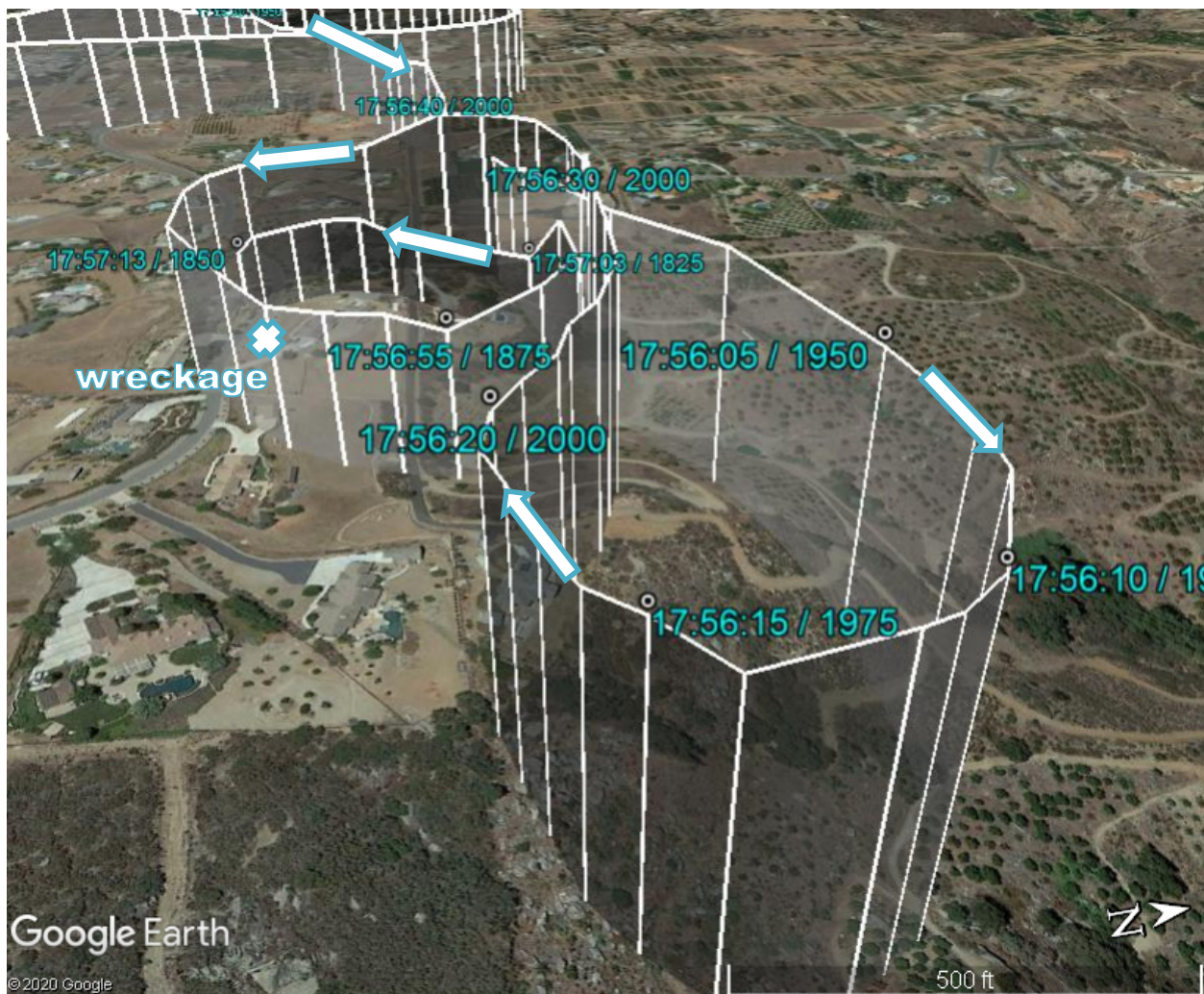
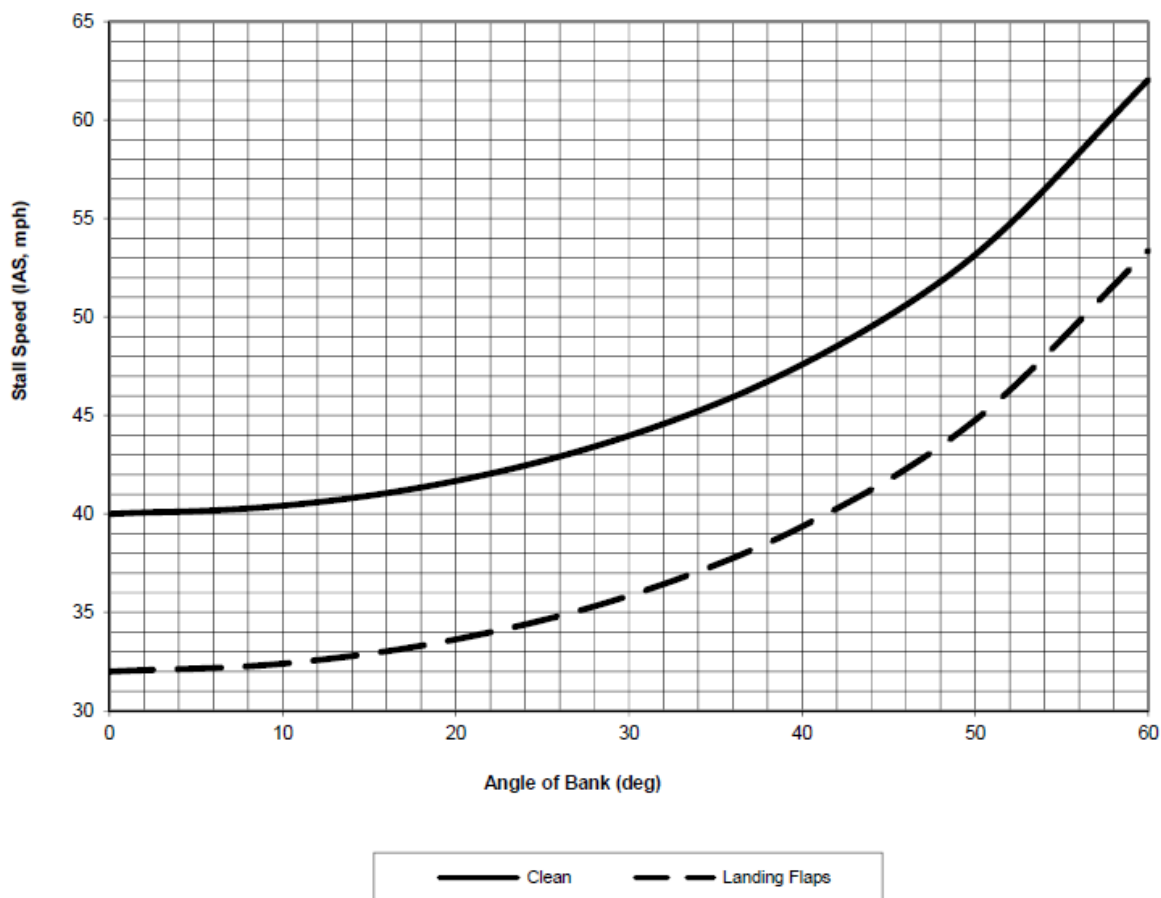


Figure 5. End of flight path. Arrows show direction and wreckage location is marked with an x.

Cub Crafters provided estimated power-off stall speed versus bank angle information shown in Figure 6. Stall speed is shown in indicated airspeed (IAS) and is an estimate, as the airplanes are amateur-built and the pitot static system may not have been installed in the standard configuration. Also provided was an estimate of power-off stall speeds at two weights in calibrated airspeed, which was 7 kts higher than the IAS estimates. The airplane's wings-level, no flaps, power-off stall speed was reported as 40 mph, or 35 kts, indicated airspeed and 42 kts in calibrated airspeed. During the final minutes of the flight, the airplane's calibrated airspeed was between 40 and 50 kts while circling.

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Stall Speed versus Angle of Bank (from POH Template)

Figure 6. Power-off stall speed in mph versus Angle of Bank in degrees.

Using the relationship between bank angle and stall speed for the clean, no flaps configuration, Figure 7 shows the calculated stall speed including the effects of the bank angle for the end of flight. If the airplane was under power, it would have another few knots of stall margin compared to the reported power-off stall speeds. This would explain how the airplane's speed was able to drop below the predicted stall speed before the end of flight. However, after 17:57, the turn tightened, increasing the airplane's bank angle, and the stall speed continued to rise as the airplane's speed continued to drop. The airplane at this point was less than 200 ft above the terrain. It impacted the ground shortly after.

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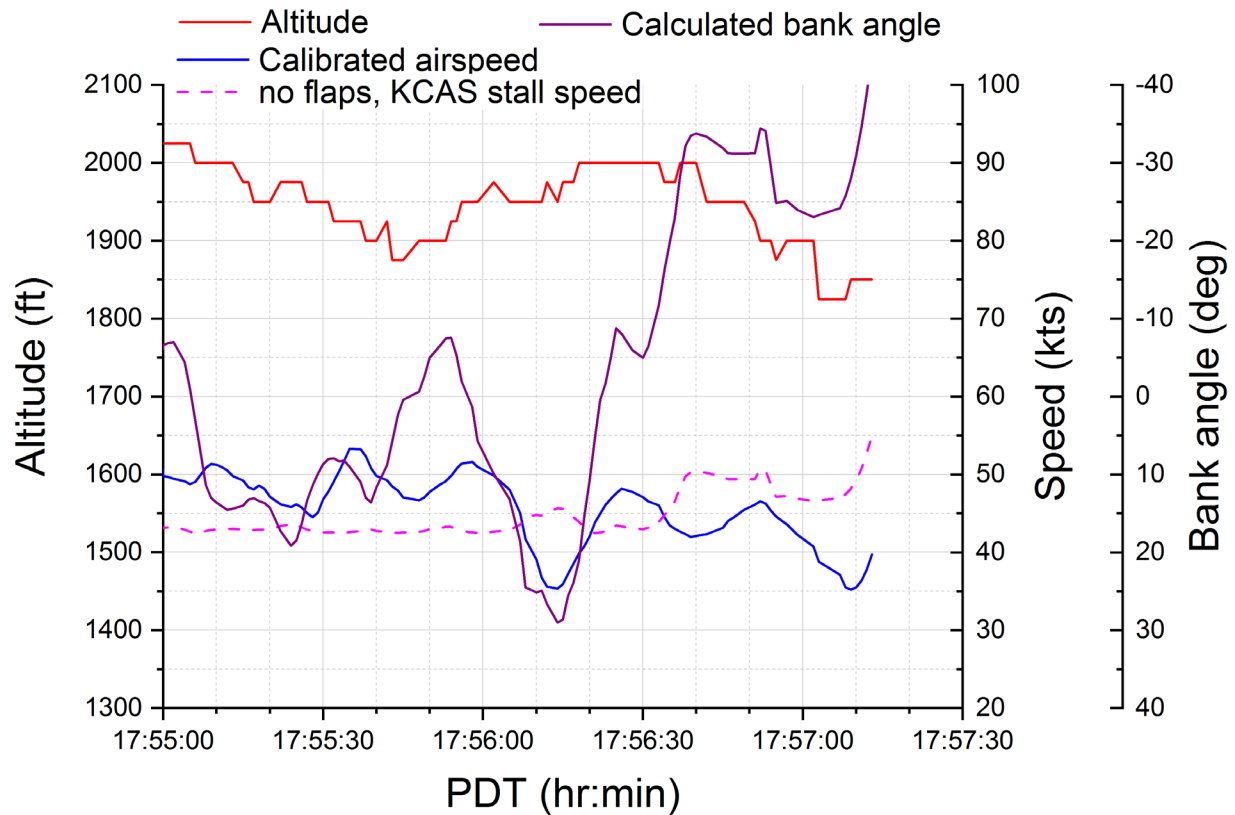


Figure 7. Altitude (msl), calibrated airspeed, and bank angle compared to power-off stall speed.

D. CONCLUSIONS

During the first portion of the 20-minute accident flight, the airplane was between 450 ft and 800 ft above the terrain. Speed varied between 40 and 100 kts, slowing during maneuvering flight. Near the accident location, the airplane descended and its height above the terrain varied between 100 ft and 300 ft. The airplane slowed to between 40 and 50 kts and executed several left and right turns. During the final turn, the airplane's airspeed dropped below the published banking stall speed shortly before impacting the terrain.

Marie Moler
Specialist – Airplane Performance
National Transportation Safety Board