

National Transportation Safety Board

Office of Research and Engineering

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AIRCRAFT PERFORMANCE

Specialist's Study

May 19, 2025

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A ACCIDENT

Location: Augusta, Georgia
Date: May 2, 2024
Time: 07:13 Eastern Daylight Time
11:13 UTC
Airplane: Raytheon Aircraft Company (Beechcraft) A36, N629BE

B AIRCRAFT PERFORMANCE SPECIALIST

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C SUMMARY

On May 2, 2024, about 07:13 Eastern Daylight Time (EDT), a Raytheon Aircraft Company A36 airplane, N629BE, was destroyed when it was involved in an accident near Augusta, Georgia. The flight departed runway 5 at Daniel Field Airport (DNL), Augusta, Georgia, at 07:12, destined for Tweed/New Haven Airport (HVN), New Haven, Connecticut. The private pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

D DETAILS OF THE INVESTIGATION

1.0 Airplane

The airplane was a Raytheon Aircraft Company A36, a low-wing, single-engine airplane with retractable gear that seats six. The A36 is a variant of the Beechcraft Bonanza produced from 1970 to 2005. N629BE was serial number E-3287, manufactured in 1999, equipped with a Continental IO-550 motor and registered to WBME LLC¹. A photograph of the airplane is shown in Figure 1.

The airplane was consumed by a post-crash fire. The investigator in charge reported that there were no records regarding weight and balance or the basic empty weight of the airplane. The fuel tanks were filled before flight with 80 gallons of fuel (480 lbs), and the pilot weighed 228 lbs at last medical in 2023. The cargo weight was estimated to be 100 lbs. The Pilot's Operating Handbook (POH) [1] lists a maximum takeoff weight of 3650 lbs, and provides a chart with power-idle stall speeds for weights from 2800 to 3650 lbs.

¹ [Aircraft Inquiry](#)



Figure 1. The accident airplane, N629BE. Photograph from AIRCRAFT.COM.

At 3650 lb, the POH indicates a power-idle, flaps-up, wings-level stall speed of 68 knots calibrated airspeed, corresponding to a maximum lift coefficient $C_{L_{max}}$ of 1.29. At 2800 lb, the POH indicates a power-idle, flaps-up, wings-level stall speed of 61.5 knots calibrated airspeed, corresponding to a maximum lift coefficient $C_{L_{max}}$ of 1.21. The stall speeds in the POH were determined at the forward center of gravity limit for each weight.

All structural components of the airplane were accounted for at the accident site. The landing gear were found in the extended (down) position and the wing flaps were retracted (up).

Calculations were performed assuming an airplane weight of 3200 lb. In some cases, the calculations were repeated assuming an airplane weight of 3650 lb.

2.0 Weather

Weather was recorded at DNL at 06:53 EDT, with calm winds, clear skies, 10 statute miles visibility, temperature 18 °C (64 °F), dewpoint 16 °C (61 °F), and barometric setting of 30.00 inches of mercury.

3.0 Data

The Federal Aviation Administration (FAA) provided Automatic Dependent Surveillance-Broadcast (ADS-B) data, which broadcasts an aircraft's Global Navigation Satellite System (GNSS) position and other data to ground stations, where it is recorded approximately once per second. The GNSS position data is expected to

have an uncertainty of approximately 20 m (65 ft) in horizontal and vertical dimensions. The ADS-B data extended from 07:12:28 to 07:13:42. The GNSS-based altitude above the reference ellipsoid was corrected to the mean sea level (MSL) altitude above the geoid by adding 101.7 ft.

Winds aloft, temperature, and pressure as functions of altitude were taken from a High-Resolution Rapid Refresh (HRRR) model sounding from the National Oceanic and Atmospheric Administration². The data were downloaded for coordinates 33.47° North, 82.03° West, at 07:00 EDT.

4.0 Flight Path

An overall view of the flightpath is shown in Figure 2. The ADS-B data recorded 73.6 seconds of ground roll and flight. The crash site was located at 33.47759° North, 82.03308° West.

² [READY Archived Meteorology](#)



Figure 2. Overall view of the flight path with selected points annotated with time EDT (hh:mm:ss), MSL altitude in ft, and calibrated airspeed in kt. The crash site is indicated with a red symbol.

No calls of distress from the pilot were noted. The departure airport used a common traffic advisory frequency (CTAF) that was not recorded. Several local residents provided home surveillance video to investigators. Although the airplane could not be seen within the fields of view of the cameras, the engine could be heard, running at high rpm until the sounds of tree and ground impact were heard. The investigator in charge reported that the engine examination found no evidence of a malfunction, and the propeller signatures supported power at impact. The propeller manufacturer examined the audio from the home surveillance videos and determined that the engine was operating at maximum rpm.

An overhead view of the flightpath is shown in Figure 3. About 0.46 NM past the departure end of runway 05, the airplane began turning left. The direction of the wreckage path was about 235°, nearly opposite the 46° true alignment of runway 05.

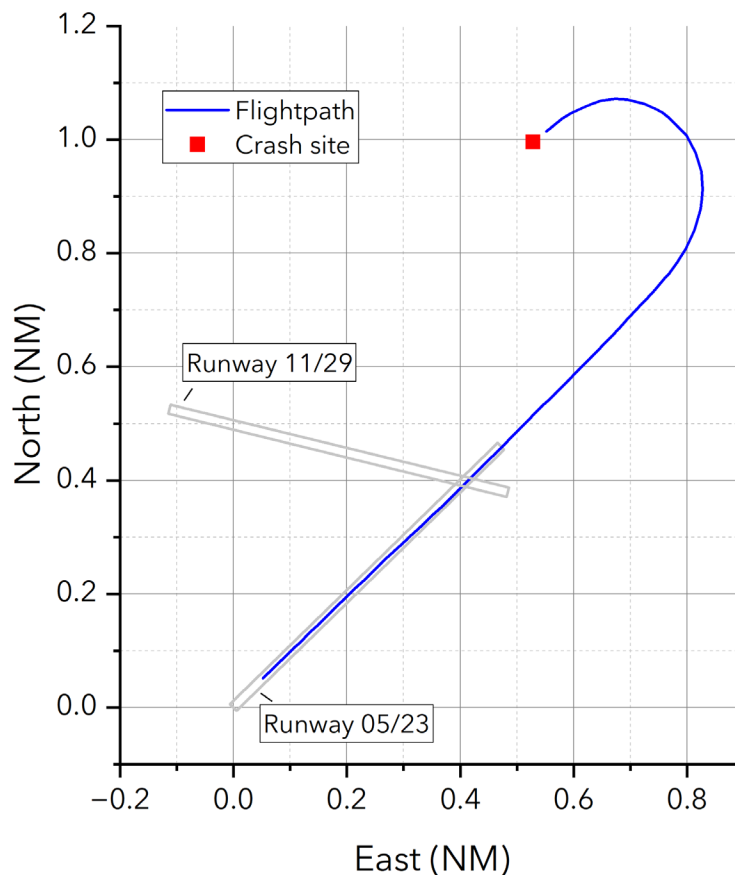


Figure 3. The airplane flightpath with north and east positions in NM relative to the threshold of runway 05. The crash site is indicated by the red square. The outlines of runway 05/23 and runway 11/29 are also shown.

The GNSS-based MSL altitude and the pressure altitude during the flight are shown in Figure 4; also shown is a smooth curve from integrating the rate of change of pressure altitude recorded in the ADS-B data and shifted to align with the recorded pressure altitude. The pressure altitude and GNSS-based MSL altitude are reported to the nearest 25 ft. The pressure altitude indicated a slight climb after 07:13:35 before the final descent, but the GNSS-based MSL altitude only showed a pause in the descent before the final rapid descent at 07:13:40. The slight climb indicated by the pressure altitude data might be an artifact of the resolution of the data or might reflect some change in the airplane attitude that reduced the pressure at the static port, rather than an actual altitude increase.

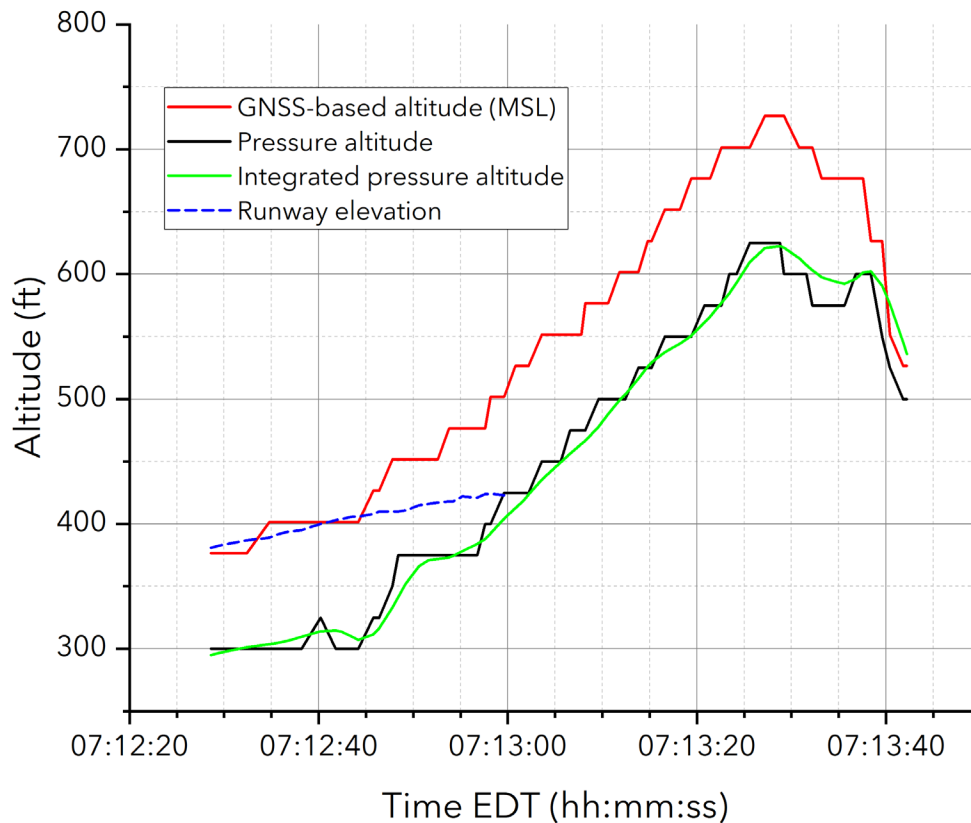


Figure 4. GNSS-based MSL altitude, pressure altitude and integrated rate of change of pressure altitude during the flight. Also shown is the runway elevation corresponding to each recorded airplane position.

The airplane lifted off at 07:12:44, and it reached a maximum altitude of 725 ft MSL at 07:13:28. Runway 05 slopes up at 1.2 %, and the elevation at the departure end is 422 ft, so the airplane only reached an altitude of about 300 ft above the departure end of the runway. Between 07:13:00 and 07:13:28, the airplane climbed at about 500 ft per minute. The final descent rate was about 1500 ft per minute.

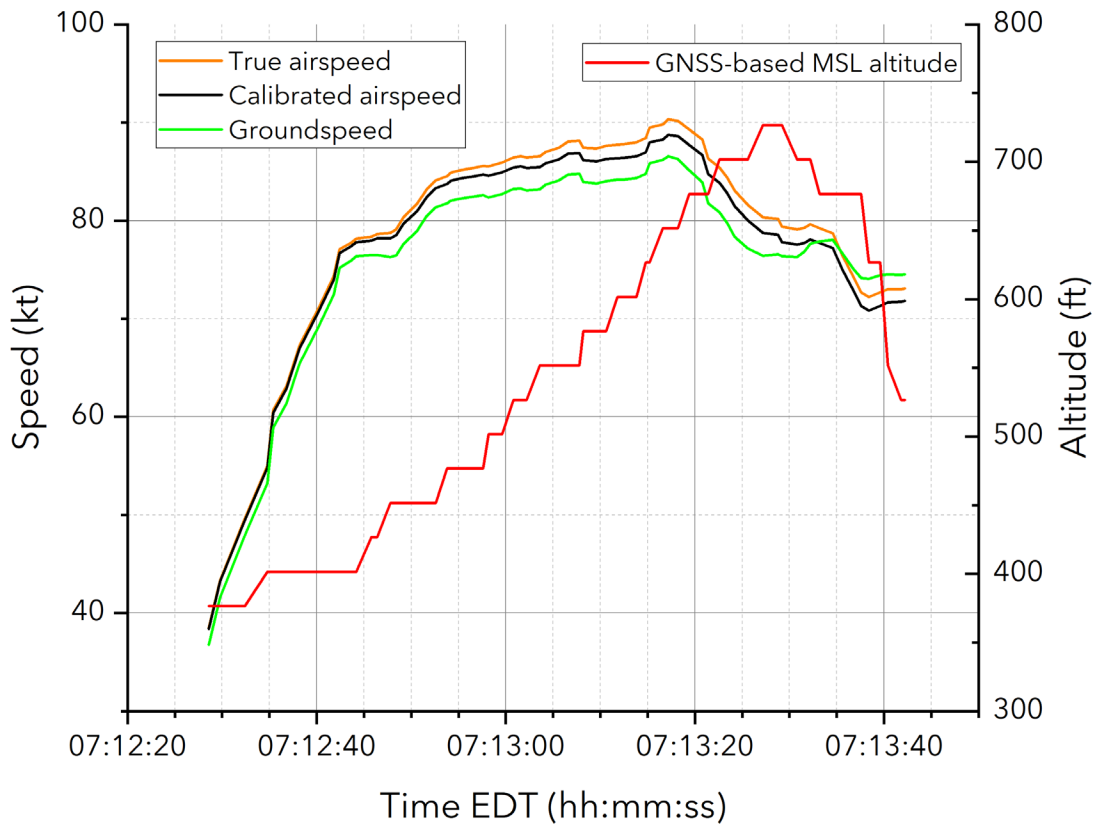


Figure 5. Groundspeed, true airspeed and calibrated airspeed during the flight. Also shown is the GNSS-based MSL altitude.

Figure 5 shows the groundspeed, true airspeed and calibrated airspeed along with the GNSS-based MSL altitude. The true airspeed and calibrated airspeed were calculated from the HRRR model sounding winds aloft, pressure, and temperature data. The calibrated airspeed increased from about 78 kt at liftoff (07:12:44) to a maximum of about 89 kt at 07:13:17, and then slowed to 72 kt at the end of the data.

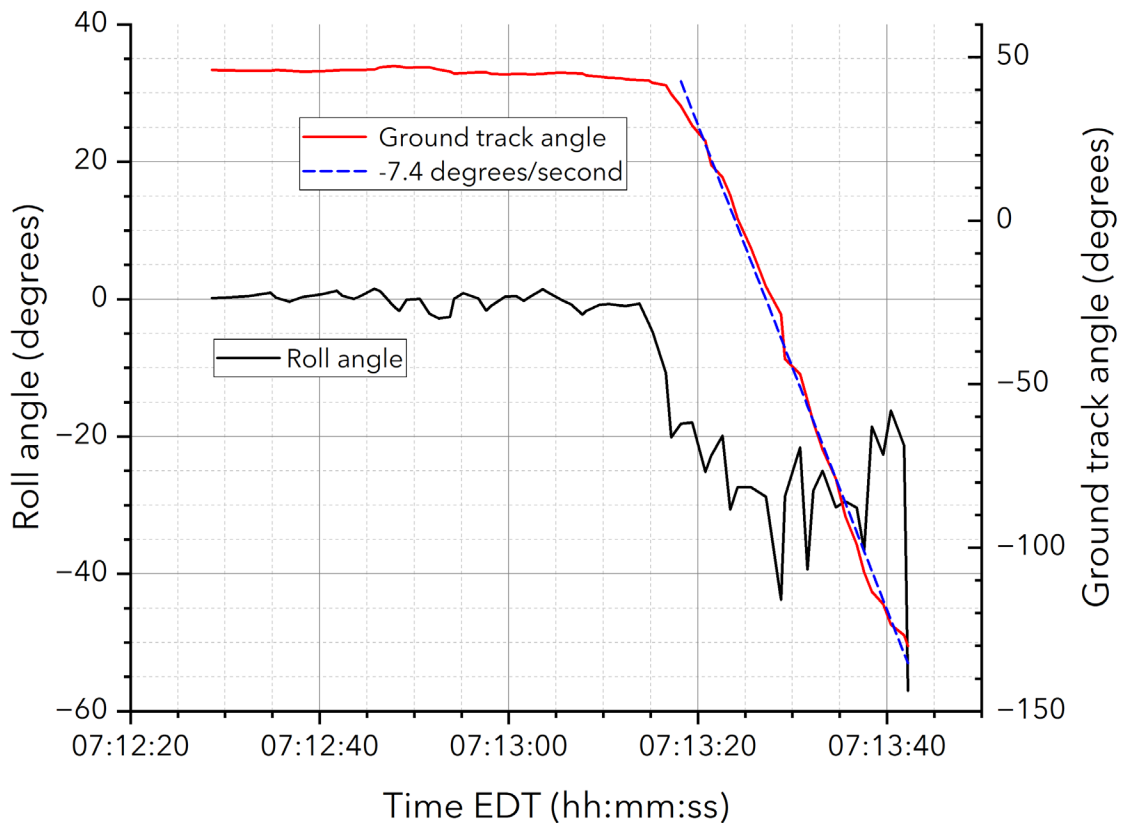


Figure 6. Roll angle and ground track angle for the flight. Also shown is a constant change in ground track angle of -7.4 degrees/second.

A simplified aerodynamic model of the airplane was used to calculate airplane attitudes and load factors during the flight. The aerodynamic model uses an assumption that the airplane is flying with zero sideslip, so the lateral load factor is zero. Figure 6 shows the calculated roll angle and the ground track angle. This calculation assumed an airplane weight of 3200 lb, but the roll angle is insensitive to airplane weight, so the roll angle calculated for an airplane weight of 3650 lb is nearly identical. The airplane began turning to the left about 07:13:15, about 2 seconds before the airplane began to slow and about 13 seconds before the airplane began to descend. The calculated roll angle was about -30 degrees after 07:13:23, and the turn rate was about -7.4 degrees per second, or a little more than twice as fast as a standard rate turn of 3 degrees per second.

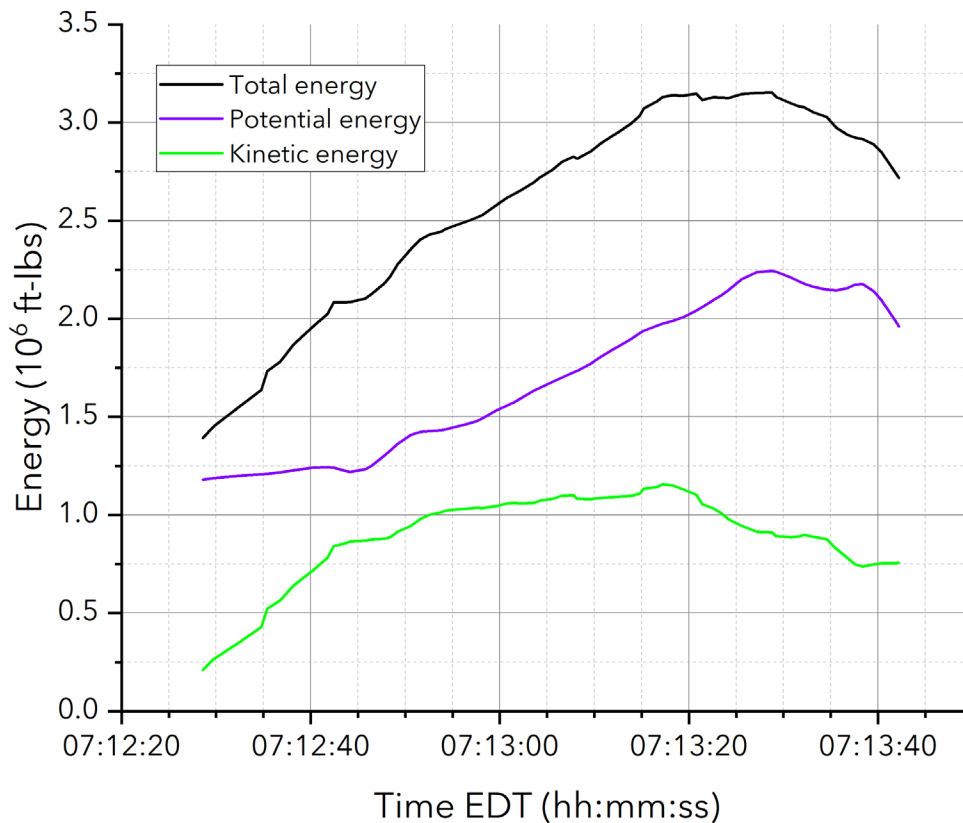


Figure 7. Kinetic energy, potential energy and total energy for the flight.

Figure 7 shows the kinetic energy, potential energy and total energy (the sum of kinetic and potential) during the flight. The kinetic energy reached a maximum at 07:13:17, and the total energy reached a plateau at that time, suggesting some reduction in engine power. The plateau in total energy reflects the fact that the decreasing kinetic energy (speed) was offset by the increasing potential energy (altitude), until 07:13:29, when the potential energy reached a peak and began to decrease as the airplane slowed and descended. The curves in Figure 7 were calculated assuming an airplane weight of 3200 lb; both kinetic and potential energy are linear functions of airplane weight, so a different assumed weight would translate the curves up or down.

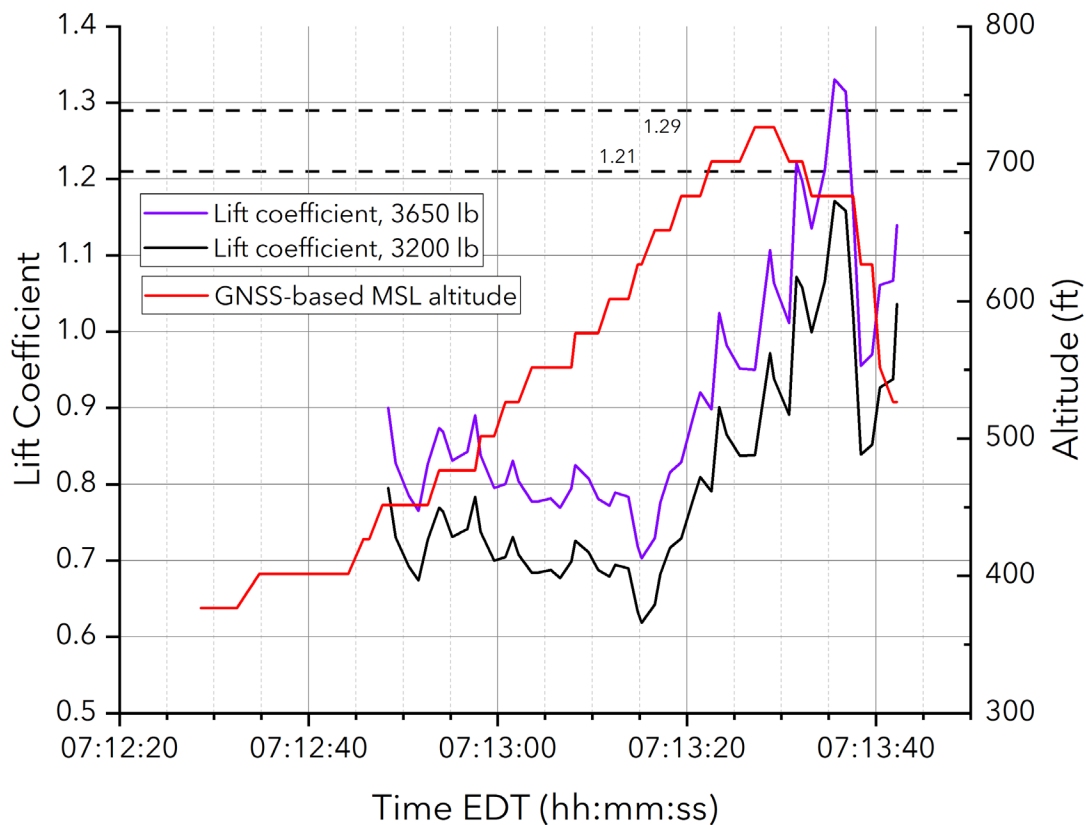


Figure 8. Lift coefficient calculated assuming airplane weights of 3650 lb and 3200 lb, along with the GNSS-based MSL altitude for the flight. Also shown are the maximum lift coefficients calculated from the stall speeds in the POH.

Figure 8 shows the lift coefficient calculated assuming airplane weights of 3650 lb and 3200 lb, which peak at 07:13:36. The maximum lift coefficients calculated from the stall speeds in the POH are also shown for comparison; $C_{L_{max}} = 1.29$ corresponds to an airplane weight of 3650 lb, while $C_{L_{max}} = 1.21$ corresponds to an airplane weight of 2800 lb.

At the lighter weight of 3200 lb, the lift coefficient approaches but does not exceed a $C_{L_{max}}$ that would be consistent with aerodynamic stall. At the airplane's maximum weight of 3650 lb, the lift coefficient exceeds $C_{L_{max}}$, indicating an aerodynamic stall.

E DISCUSSION

The airplane lifted off about 07:12:44, and it initially climbed at 500 ft/min at a calibrated airspeed between 80 and 90 kt. At 07:13:17, the calibrated airspeed reached a maximum of 90 kt and began to decrease. The decrease in speed corresponded to the total energy reaching a plateau, suggesting some reduction in engine power. Also at 07:13:17, the airplane began a roll to the left, with the ground track changing at 7.4 degrees/s, a little more than twice as fast as a normal rate turn of 3 degrees/s. The roll angle reached 44° left wing down at 07:13:29. At 07:13:28, the altitude reached a maximum of 725 ft MSL (300 ft above ground level) and began to decrease; the total energy also began to decrease at that time.

At 07:13:36, the calculated lift coefficient reached a maximum; it is possible that the lift coefficient exceeded $C_{L_{max}}$ (calculated from the stall speeds in the POH), leading to an accelerated aerodynamic stall arising from the steep roll angle and decreasing airspeed. The sharp drop in altitude and slight increase in speed after 07:13:38 are consistent with an aerodynamic stall, but the initiating event in the sequence likely occurred about 07:13:17, when the airspeed began to decrease and the airplane began to turn.

Submitted by:

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F REFERENCES

1. Beechcraft Bonanza A36 Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, Raytheon Aircraft Company, January, 2006.