

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



WPR22FA068

AIRPLANE PERFORMANCE GROUP

April 26, 2023
Timothy Burtch

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A. ACCIDENT

Location: El Cajon, California
Date: December 27, 2021
Time: 1914 PST
0314 GMT (December 28, 2021)
Airplane: LearJet 35A, N880Z

B. AIRPLANE PERFORMANCE GROUP

No airplane performance group was formed.

C. SUMMARY

On December 27, 2021, about 1914 Pacific standard time (PST), a Gates LearJet Corporation 35A, N880Z, was destroyed when it was involved in an accident near El Cajon, California. The 2 pilots and 2 flight nurses were fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 repositioning flight on an instrument flight rules (IFR) flight plan. See Figures 1 and 2.

Times in the study are quoted in PST. Greenwich Mean Time (GMT) = PST + 8 hr.

D. THE AIRPLANE

A picture of the accident airplane, a LearJet 35A, is shown in Figure 3. The airplane was manufactured in 1985 and is registered to Med Jet, LLC.

The airplane was equipped with a cockpit voice recorder (CVR), but it was not equipped with a flight data recorder.

E. WEATHER SUMMARY

The Automated Surface Observing System (ASOS) at Gillespie Field airport (SEE) recorded the following observation 19 minutes before the accident:

METAR KSEE 280255Z VRB05KT 3SM BR BKN020 OVC026 10/08 A2998

The automated surface weather observation at Gillespie Field airport on December 27 at 1855 PST is wind variable at 5 knots (kt); 3 statute miles visibility with light rain; broken ceiling at 2,000 ft above ground level (agl), overcast clouds at 2,600 ft agl; temperature 10° Celsius (C); dew point 8°C; altimeter 29.98" mercury.

KSEE is located approximately 388 ft above mean sea level (msl).

F. AIRPLANE PERFORMANCE STUDY

The airplane performance study is largely based on Automatic Dependent Surveillance-Broadcast (ADS-B) data provided by the Federal Aviation Administration (FAA). ADS-B is a primary technology supporting the FAA's Next Generation Air Traffic Control System, or NextGen, which is shifting airplane separation and air traffic control from ground-based radar to satellite-derived positions. ADS-B broadcasts an airplane's Global Positioning System (GPS) position to the ground where it is displayed to Air Traffic Control (ATC). The GPS position is also transmitted to other airplanes with ADS-B receivers, either directly or relayed through ground stations, to allow self-separation and to increase situational awareness.

GPS has an accuracy of approximately 20 meters in both the horizontal and vertical dimensions. GPS augmented with the Wide Area Augmentation System (WAAS) is accurate to approximately 1.5 – 2 meters.

Figure 4 shows the ADS-B ground track, altitude, and estimated airspeed for the final six minutes of the flight, beginning with N880Z checking in with the Gillespie control tower. N880Z was initially cleared to land on runway 17 at approximately 1908:26 by means of the area navigation, GPS, RNAV17 instrument approach¹; however, N880Z subsequently requested a visual approach to runway 27R about three and a half minutes later at 1912:00². ADS-B data show the airplane at 950 ft msl and approximately 2 NM north of the airport at 1912:00.

After confirming the request, the Gillespie tower told N880Z to overfly the field, to make left traffic, and then cleared N880Z to land on runway 27R. The RNAV 17 instrument approach procedure is shown in Figure 5, including a restriction that circling approaches to runway 27R or runway 35 are not allowed at night. The left circling visual approach to runway 27R that was flown is shown in Figure 6.

Figure 7 also shows the circling approach but on a topographic map of the area surrounding the airport. The airport elevation is approximately 388 ft above mean sea level (msl) with terrain as high as 1,100 ft msl to the east of the airport and close to the accident site. While the terrain would likely have been visible with the reported cloud ceiling of 2,000 ft agl at SEE, the clouds may have been lower than reported³.

¹ Bombardier estimates a wet runway landing distance of 4,004 ft for the LearJet 35A at conditions similar to the accident. Runway 17 at SEE is 4,145 ft long. Runway 27R is 5,342 ft long.

² By requesting a visual approach at 1912:00, N880Z was cancelling their IFR flight plan and was presumably clear of the clouds. However, N880Z never reported having the airport or the runway in sight to ATC.

³ At 1912:28, N880Z was at 810 ft msl and 1 NM from the airport and requested that the tower turn up the runway lights. The tower responded that the lights were already at 100%.

Time histories of ADS-B altitude, ground speed and estimated airspeed for the 18 min flight are shown in Figure 8. Figure 9 shows the same parameters but highlights the final four minutes. N880Z crossed the airport at approximately 785 ft msl (about 400 ft agl) and 138 kt airspeed⁴ before circling to the left to land on runway 27R. The airspeed slowed to 126 kt at 1913:41 and as slow as 119 kt at 1914:04.

Figures 10 and 11 show the estimated bank angle and angle-of-attack during the circling approach in the final minute of the flight. The maximum left bank angle likely exceeded 60° as the estimated angle-of-attack approached 20°.

The wings-level stall speed published in the LearJet 35A FAA Approved Airplane Flight Manual (AFM) at the landing flap⁵ setting and a gross weight of 14,350 lb is approximately 96 kt. The stall speed increases to 119 kt in a level 50° banked turn and to 134 kt in a 60° banked turn. See Figure 12.

SUMMARY AND CONCLUSIONS

Airspeed and airplane attitude information estimated from ADS-B data provided by the FAA show bank angles greater than 60° were used to maneuver the airplane for an attempted visual landing on runway 25R at Gillespie Field. The estimated airspeed, bank angle, and angle-of-attack indicate that the flight crew likely exceeded the wing critical angle-of-attack for the LearJet 35A, and N880Z entered an accelerated aerodynamic stall about 1914:04 while approximately 500 ft above the ground⁶. The flight crew did not recover before the airplane impacted the ground seconds later⁷.

Submitted by:

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⁴ The LearJet 35A FAA AFM specifies a landing approach speed of approximately $V_{REF} + 7$ kt or 132 kt. $V_{REF} = 1.3V_{S0}$ or 125 kt where V_{S0} is the stall speed in the landing configuration or 96 kt.

⁵ The flaps were found in the landing position of 40°; however, it is not known when landing flaps were selected by the crew.

⁶ The stall warning system on the Lear 35 includes a stick shaker and a stick pusher with associated annunciator lights. While the stick shaker does make a sound when activated, there is no aural stall warning tone. No distinguishable stall warning sounds were identified on the CVR recording for this accident. In a similar Lear 35 accident in Teterboro, NJ, where an aerodynamic stall is suspected, no distinguishable stall warning sounds were heard on the CVR recording for that accident either.

⁷ At 1914:3.3, the N880Z was in a 60° left turn at approximately 120 kt airspeed. The left-wing-down aileron that would be required to make the turn to final would increase the angle-of-attack on the right wing and potentially lead to stall on the right wing first. N880Z's last significant turn before impacting the ground was to the right, away from the runway: the wreckage was located to the right of the extended ADS-B ground track.

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G. FIGURES

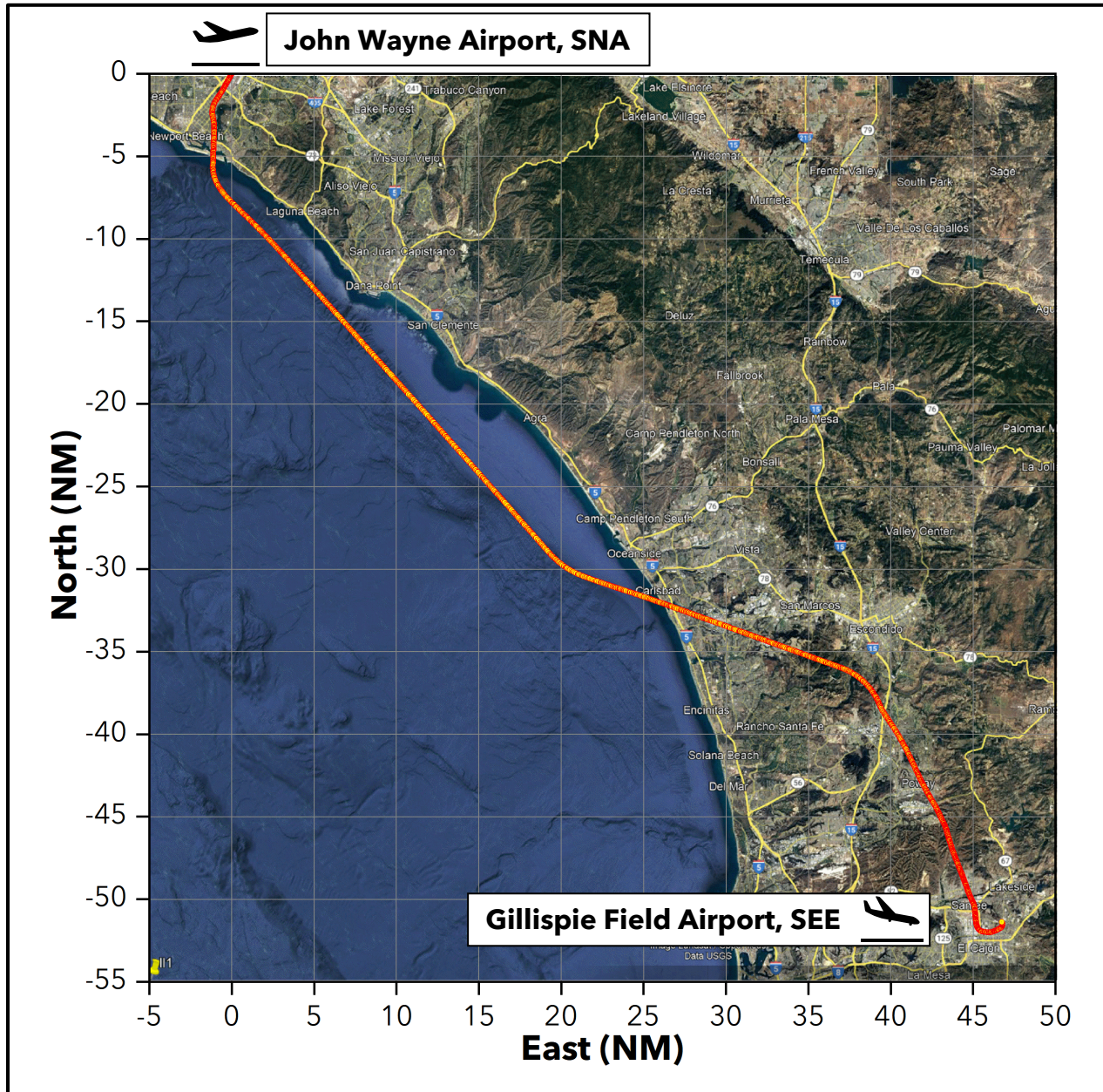


Figure 1: ADS-B Ground Track of Accident Flight from SNA to SEE

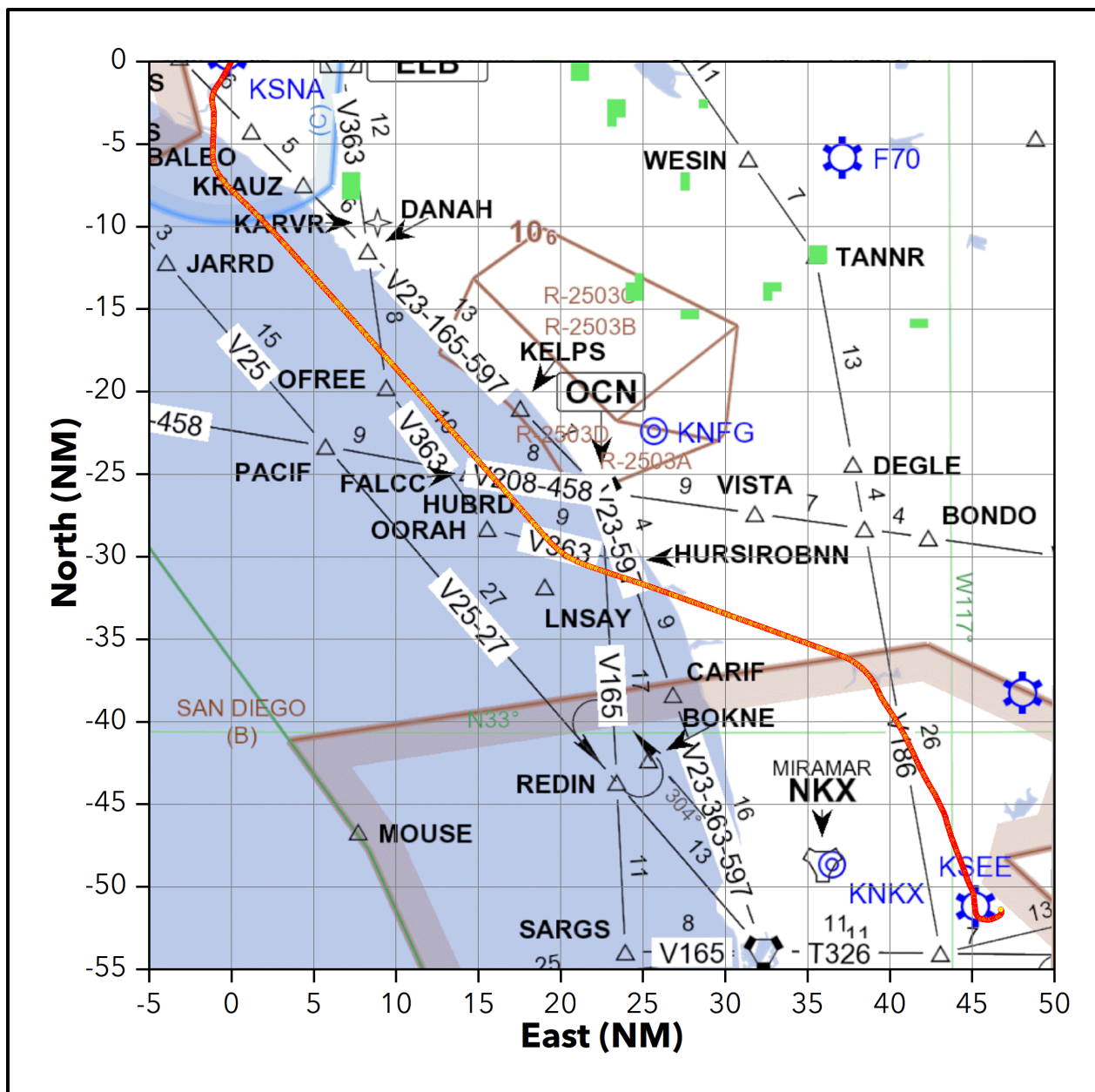


Figure 2: ADS-B Ground Track of Accident Flight from SNA to SEE on Low Altitude Enroute Chart



**Figure 3: Accident Airplane, N880Z, a LearJet 35A,
Manufactured 1985**

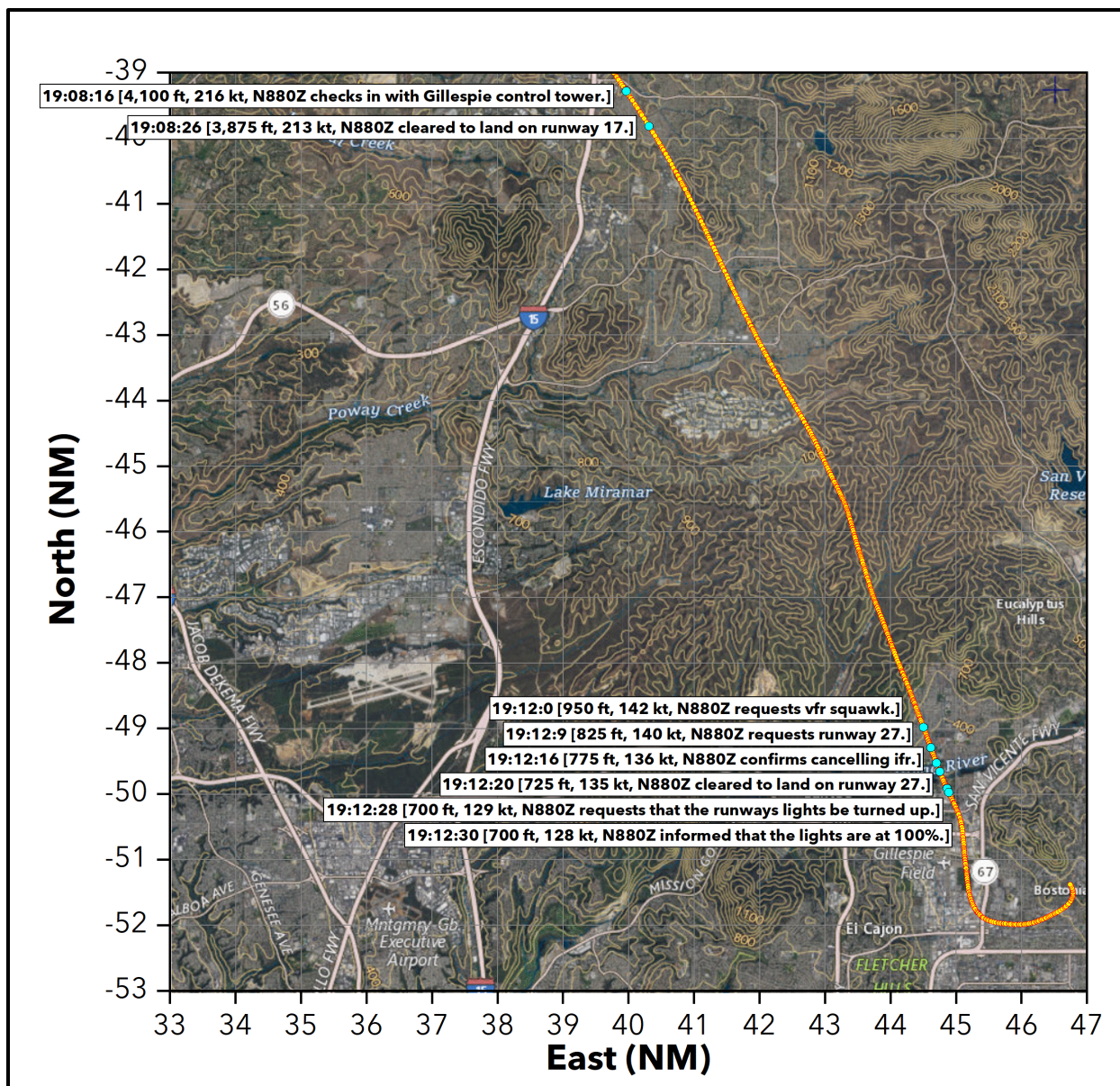


Figure 4: ADS-B Ground Track for Accident Flight with Select Times (PST), Altitudes (ft, msl), and Estimated Airspeeds

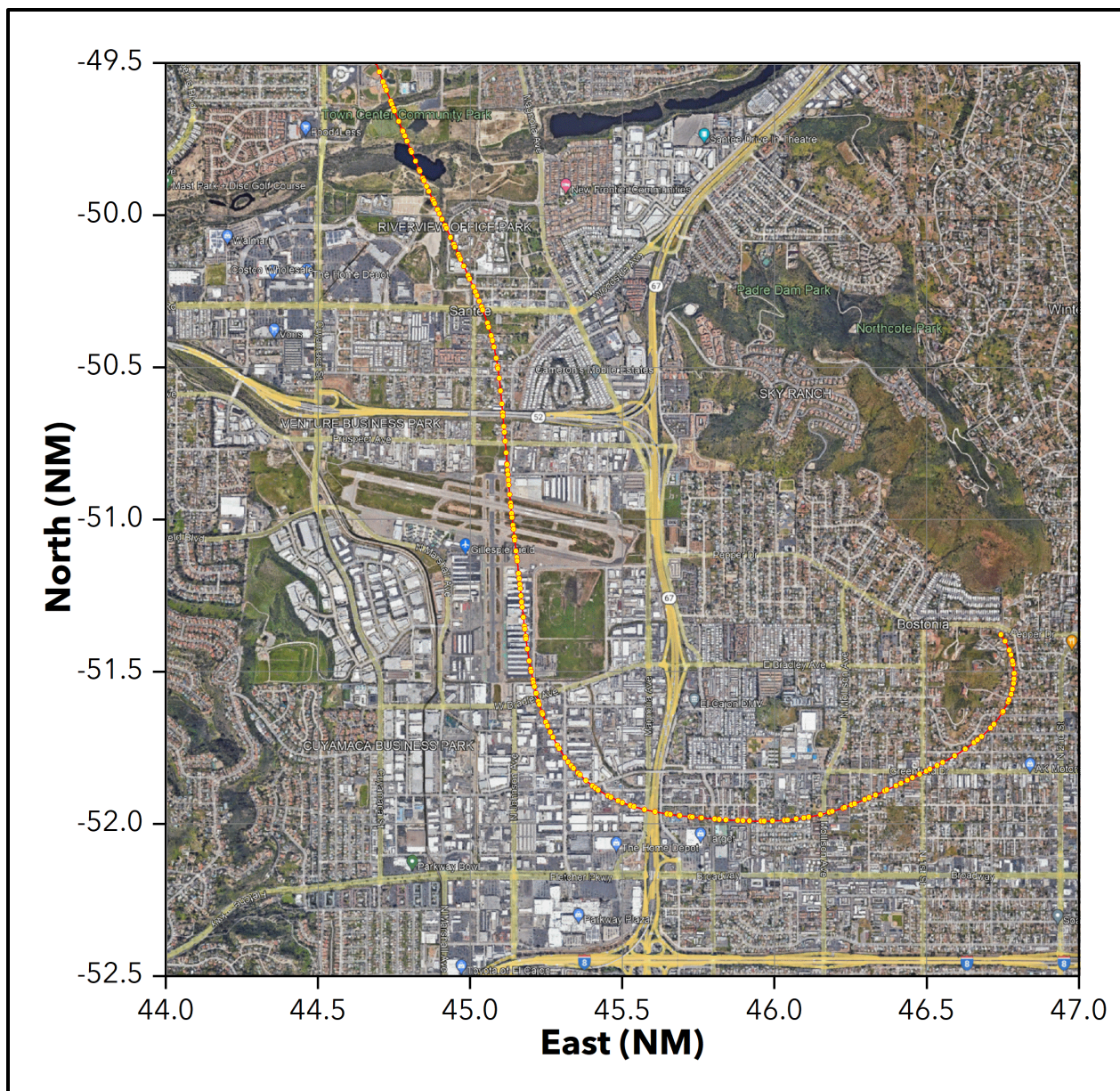


Figure 5: ADS-B Ground Track for Final Two Minutes

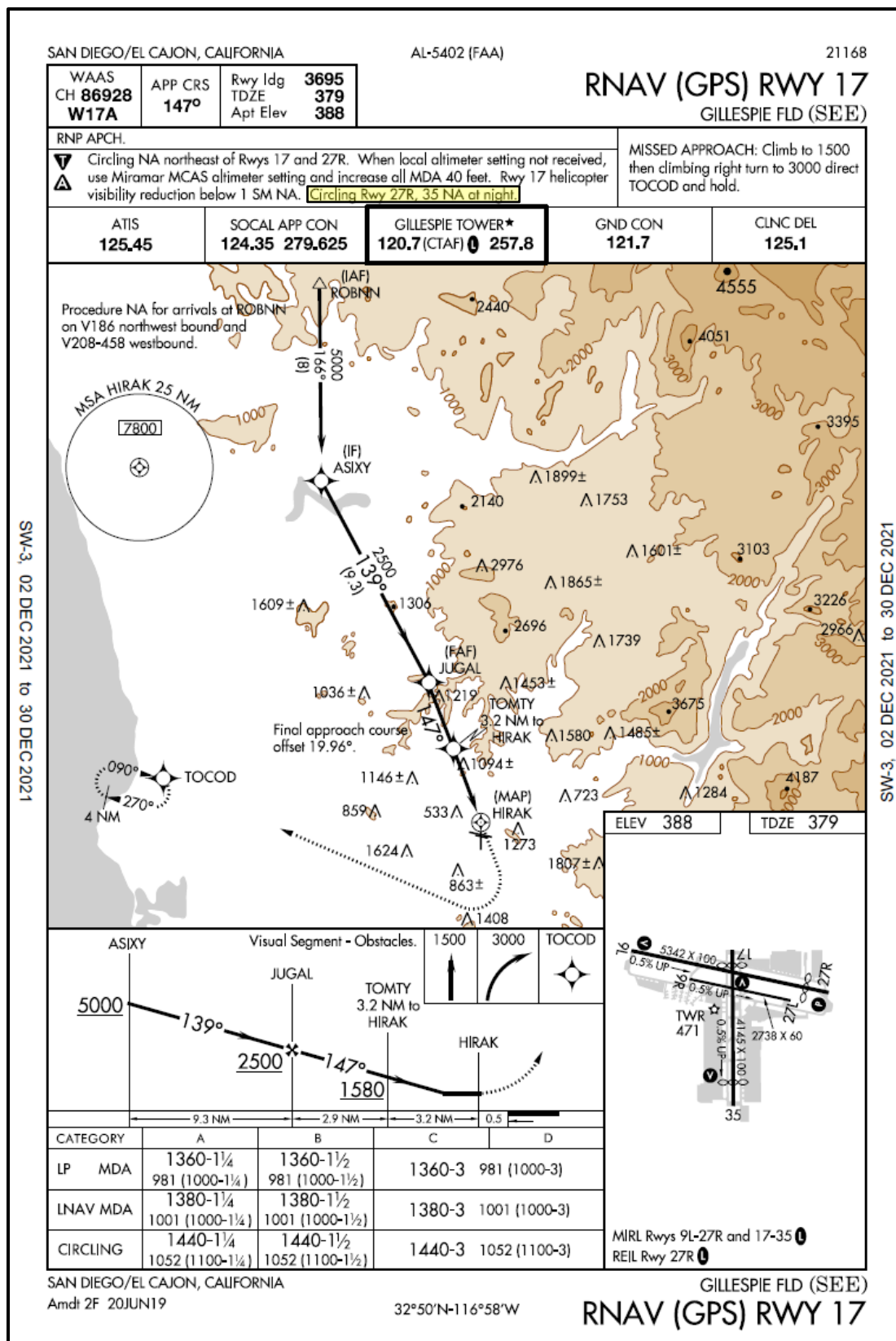


Figure 6: Instrument Approach Plate for KSEE RNAV Runway 17

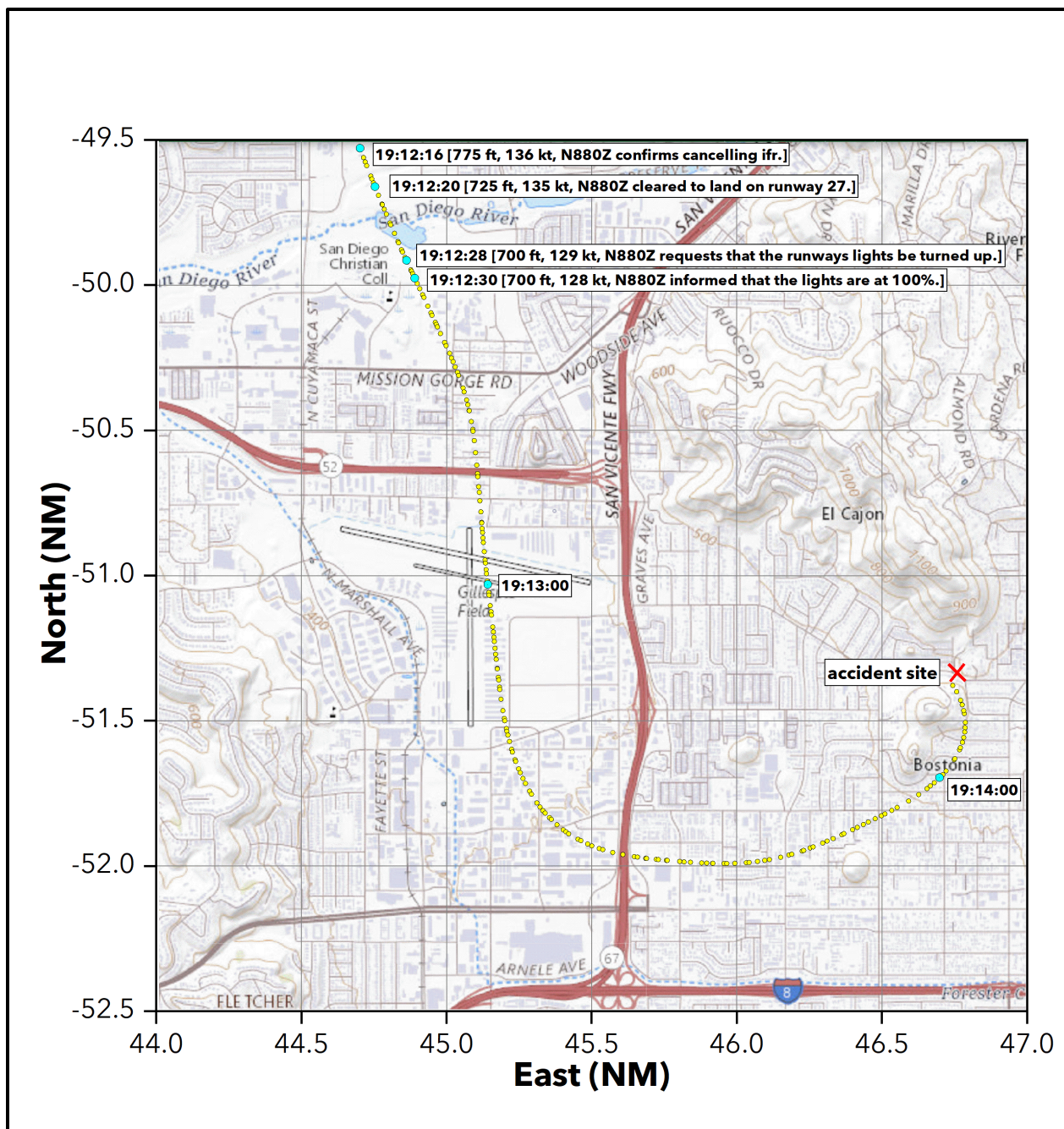


Figure 7: ADS-B Ground Track for Final Two Minutes with Select Times (PST), Altitudes (ft, msl), and Estimated Airspeeds

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El Cajon, CA
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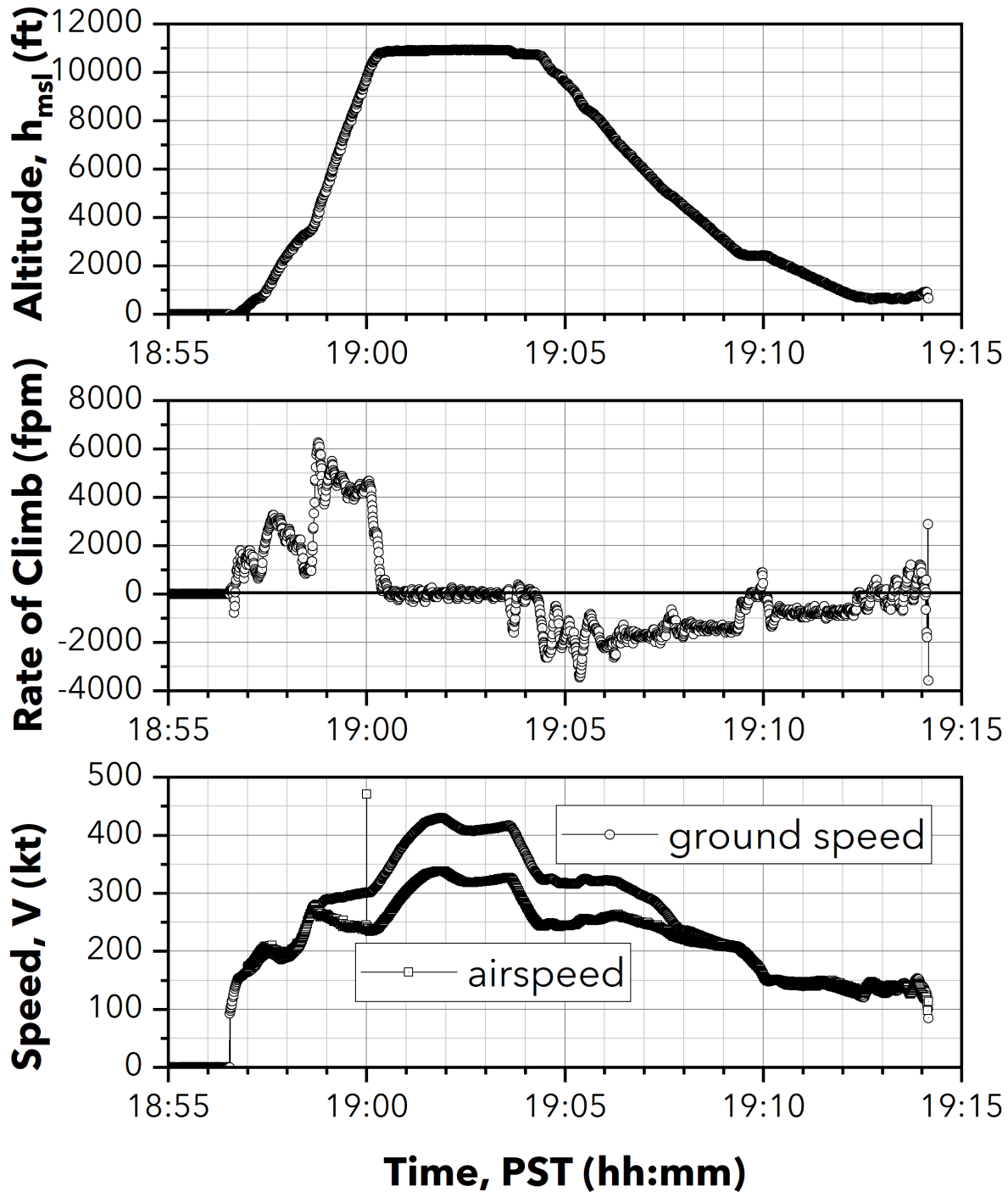
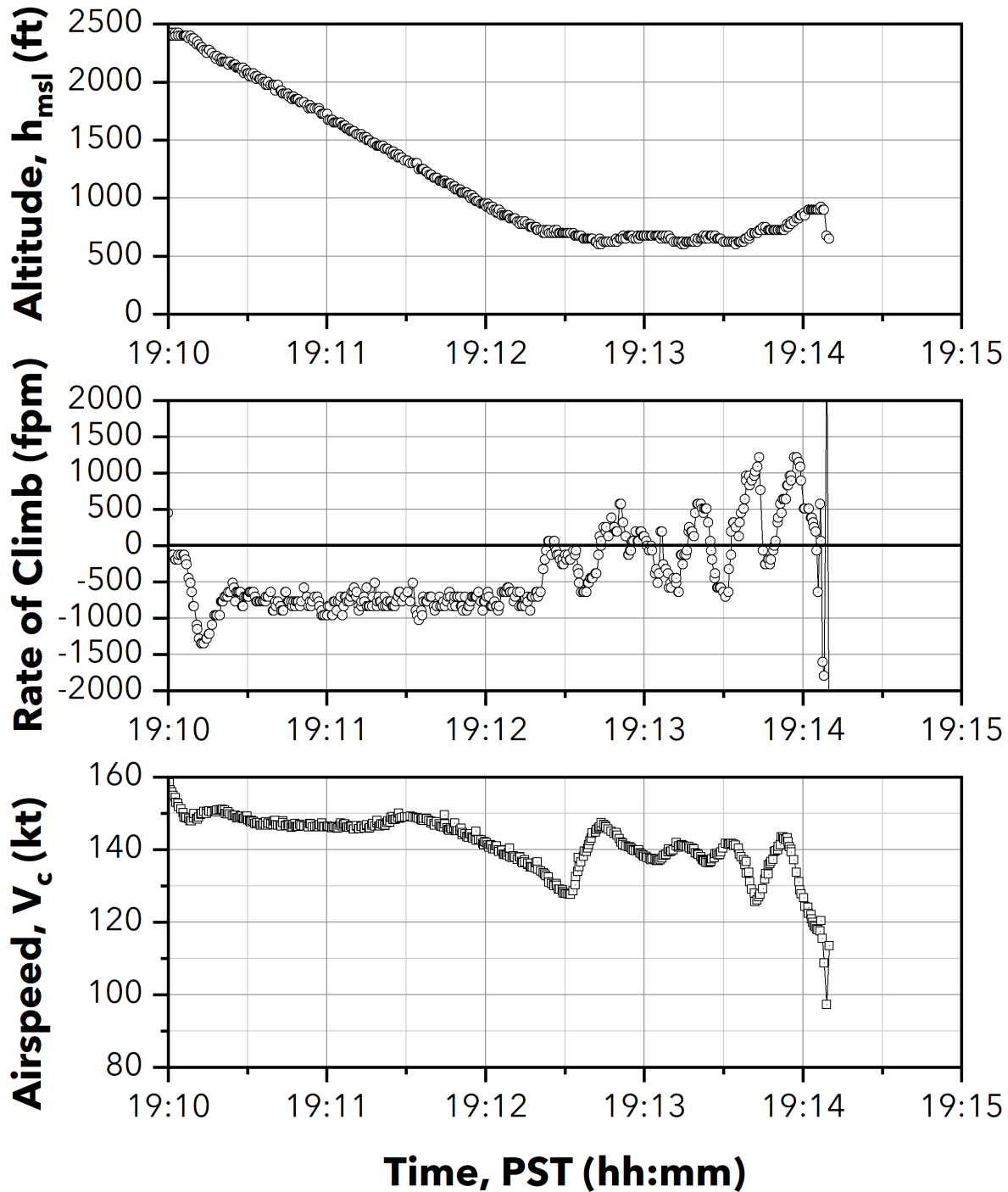


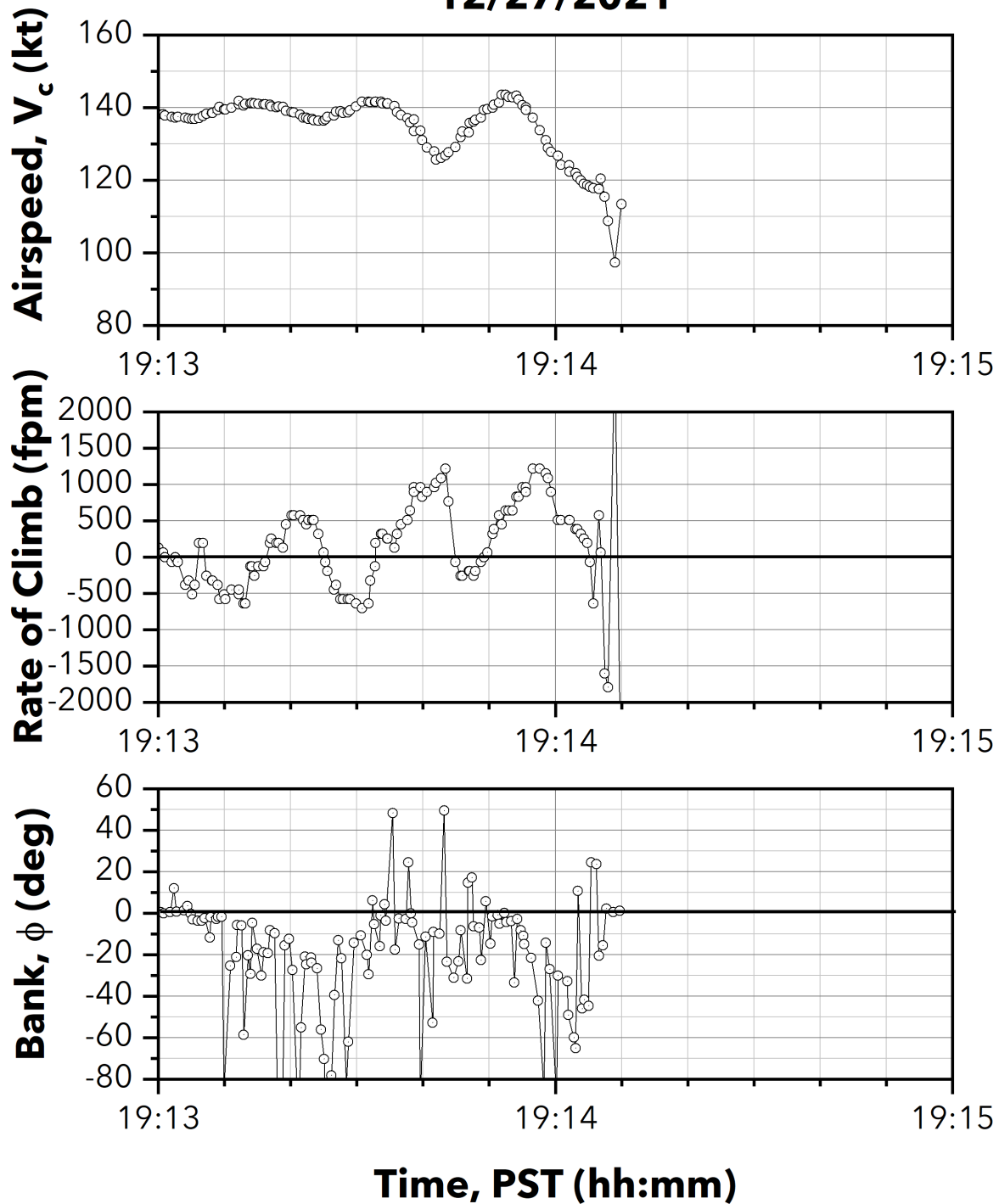
Figure 8: ADS-B Altitude, Ground Speed and Estimated Airspeed for the 18 Minute Flight

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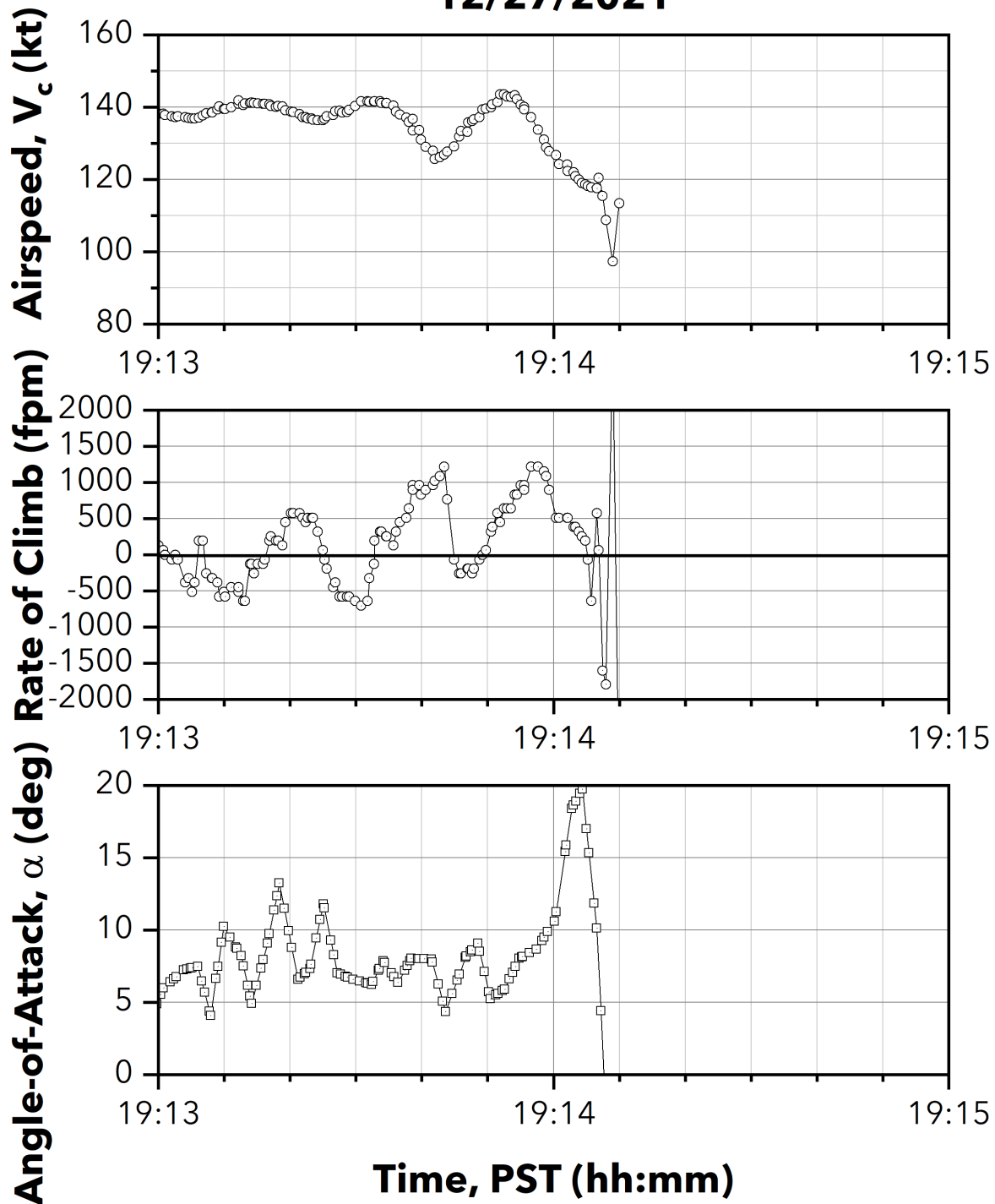
**Figure 9: ADS-B Altitude, Ground Speed and Estimated Airspeed
for the Final Four Minutes**

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**Figure 10: Estimated Airspeed and Bank Angle
During Circling Approach to Runway 27R**

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**Figure 11: Estimated Airspeed and Angle-of-Attack
 During Circling Approach to Runway 27R**

**STALL SPEEDS – TURNING FLIGHT
GEAR UP or DN
LEVEL COORDINATED TURN**

EXAMPLE:
Bank Angle 40°
Weight 15000 LBS
Flaps UP
Stall Speed 136.0 KIAS

*This chart effective for aircraft 35-067 through 35-278
and aircraft 36-018 through 36-044 when not incorporating
AAK 79.10 or AMK 83-5.*

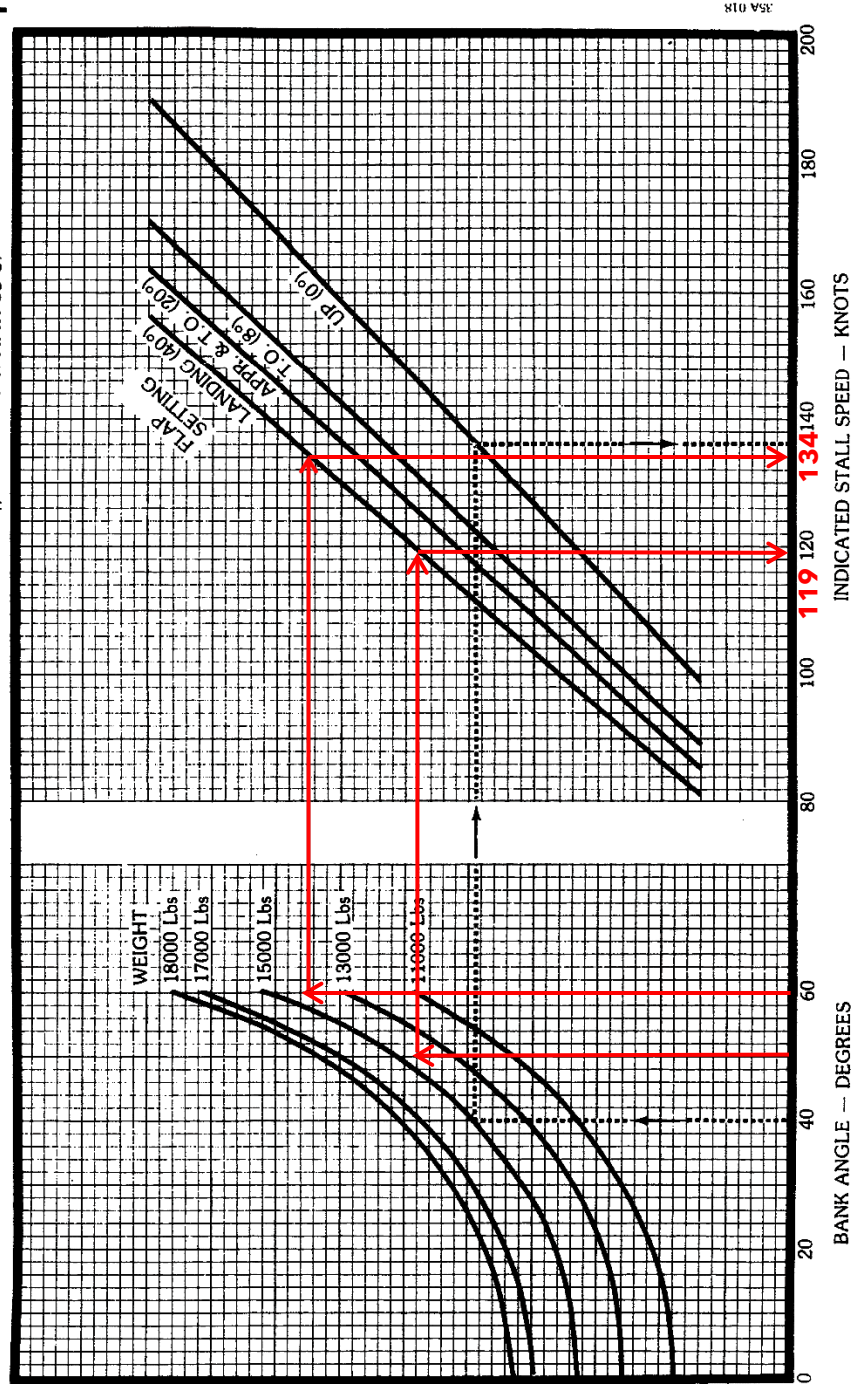


Figure 5-18

FAA APPROVED 4-30-76
REISSUED 2-25-81, CHANGE 5

Figure 12: Estimated Stall Speed from LearJet 35A FAA Approved AFM