National Transportation Safety Board
Office of Research and Engineering
Washington, DC 20594

CEN21FA459

VEHICLE PERFORMANCE

8/24/2022
Timothy Burtch

TABLE OF CONTENTS

A. ACCIDENT

Location: Hiles, Wisconsin
Date: September 28, 2021
Time: 0901 central daylight time (CDT)
1401 GMT
Airplane: Rockwell International 690B, N690LS

B. VEHICLE PERFORMANCE

No airplane performance group was formed.

C. SUMMARY

On September 28, 2021, about 0901 central daylight time, a Rockwell International 690B "Commander" airplane, N690LS, was destroyed when it was involved in an accident near Hiles, Wisconsin. The pilot and two passengers sustained fatal injuries. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 aerial imagery survey flight.

According to the operator, the flight mission was to obtain aerial imagery of the forest vegetation for the Wisconsin Department of Natural Resources. See Figure 1 for an overview of the flight. The airplane was not under air traffic control (ATC) during the flight or at the time of the accident. However, according to air traffic control, a "mayday, mayday, mayday…we're in a spin" transmission was broadcast.

Times in the study are quoted in CDT. Greenwich Mean Time (GMT) = CDT + 5 hr.

D. THE AIRPLANE

A picture of the accident airplane, a Rockwell International 690B Commander, is shown in Figure 2. The airplane is registered to Surdex Corporation.

E. WEATHER SUMMARY

Eagle River Union Airport (EGV) is located approximately 10 NM west of the accident site. A routine weather observation for EGV about 14 minutes after the accident was reported as:

KEGV 281415Z AUTO 16004KT 10SM CLR 10/10 A3005 RMK AO2

The automated surface weather observation (ASOS) at Eagle River Union Airport on September 28 at 0915 CDT is wind from 160˚ at 4 knots (kt); 10 statute miles visibility; clear skies; temperature 10˚ Celsius (C); dew point 10˚C; altimeter 30.05" of mercury; observation site is automated and has a precipitation sensor.

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 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 3 shows the ADS-B altitude and estimated airspeed for the 11 min accident flight in an overhead view. The point at which the airplane's airspeed was estimated to be at the 80 kt calibrated airspeed (KCAS) stall speed published in the Pilot's Operating Handbook (POH) is marked in red in the figure. The POH stall speed chart is shown in Figure 4.

Figure 5 contains the same parameters as Figure 3 as well as the estimated rate-of-climb (ROC) but in a time history format. Figure 6 highlights the final three minutes of the flight and marks where N690LS reached the published stall speed.

Figures 7 includes the airplane attitude information estimated from ADS-B data for the final three minutes. At 0900:38.7, the airplane pitched down in excess of 30˚ and descended at a rate that ultimately reached 20,000 ft/min.

About the same time the airplane pitched down, the estimated normal load factor, n_z, shown in Figure 8, breaks from about 1.6 g's to less than 1g. Estimated longitudinal acceleration, n_x, is also shown in the figure.

G. SUMMARY AND CONCLUSIONS

FAA ADS-B data for N690LS show the airplane in straight-and-level flight at 16,100 ft before the airplane's pitch attitude began to increase and the estimated airspeed slowed from 167 KCAS to the published stall speed of 80 KCAS[1]. There was a break in normal load factor when the airplane reached 80 KCAS.

A break in normal load factor is indicative of a stall when the wing reaches the critical angle-of-attack, the air flow becomes separated from the wing, and, as a result, the wing can no longer generate the necessary lift. If the airplane is uncoordinated[2] at stall, a spin can result.

Shortly after N690LS's apparent upset, ATC reported hearing a "mayday, mayday, mayday…we're in a spin" radio transmission. In addition, a witness located about one mile from the accident site reported hearing a "loud, strange sounding airplane." He looked up and noticed an airplane "nose down at (a) high rate of speed (and) spinning about its longitudinal axis at about 30 to 60 rpm." The witness lost sight of the airplane behind some trees and then heard the impact.

The POH for the Rockwell International 690B does not include a procedure for inadvertent spin recovery. It states that "Acrobatic maneuvers, including spins, are unauthorized."

Submitted by:

Timothy Burtch
Specialist - Airplane Performance
National Transportation Safety Board

[1] An earlier equipment list for N690LS showed that the airplane was equipped with an autopilot but not an autothrottle. While the autopilot would maintain a straight-and-level attitude, there was no automation installed on the airplane to maintain airspeed.

[2] The FAA Airplane Flying Handbook (FAA-H-8083-3B) states that an airplane is in coordinated flight when the nose is yawed directly into the relative wind and the ball is centered in the slip/skid indicator.

H. FIGURES

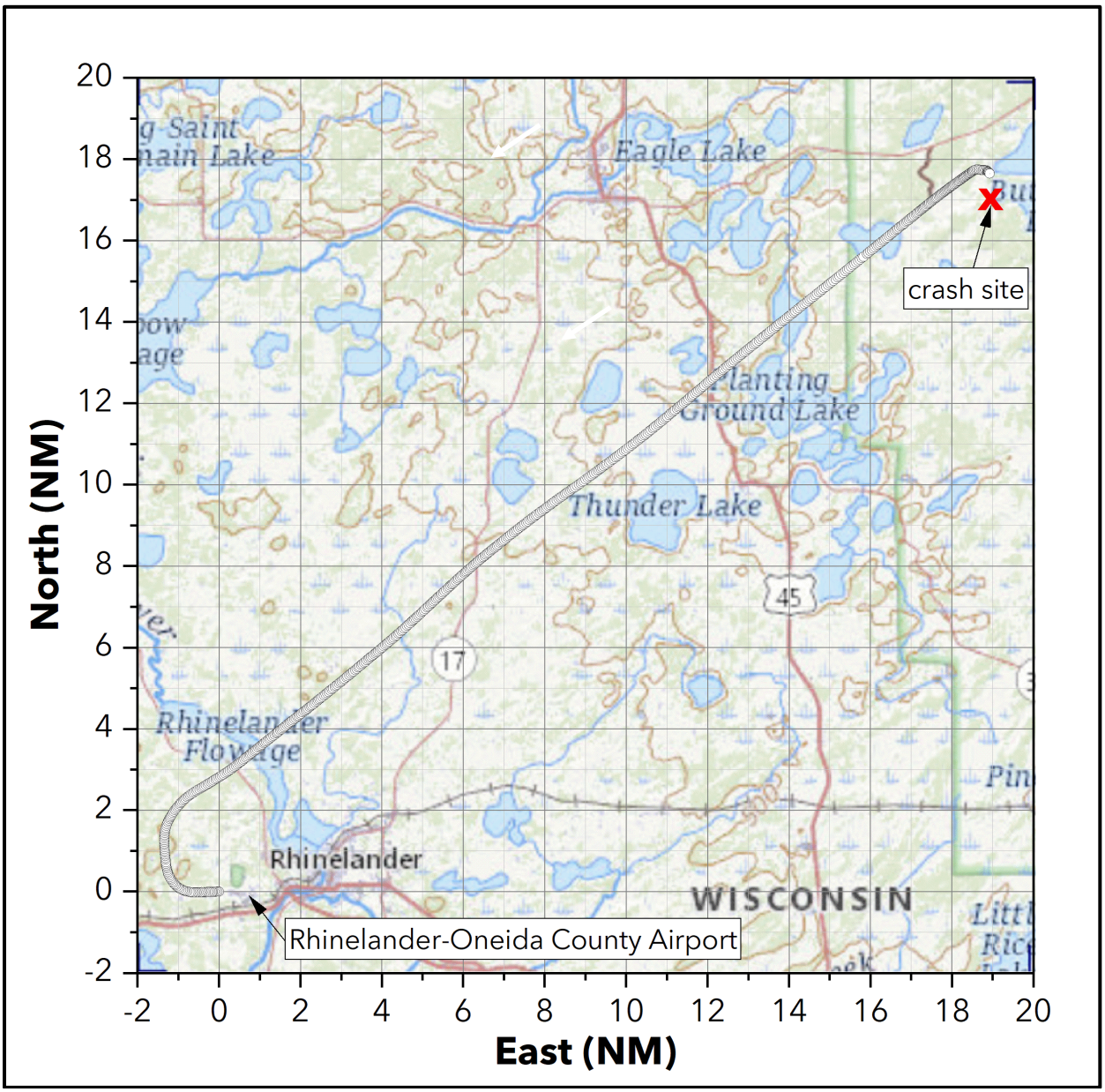

Figure 1: The Flight Departed Rhinelander-Oneida County Airport at 0850 CDT to Obtain Aerial Imagery for the Wisconsin Department of Natural Resources

Figure 2: Accident Airplane, N690LS, a Rockwell International 690B Commander

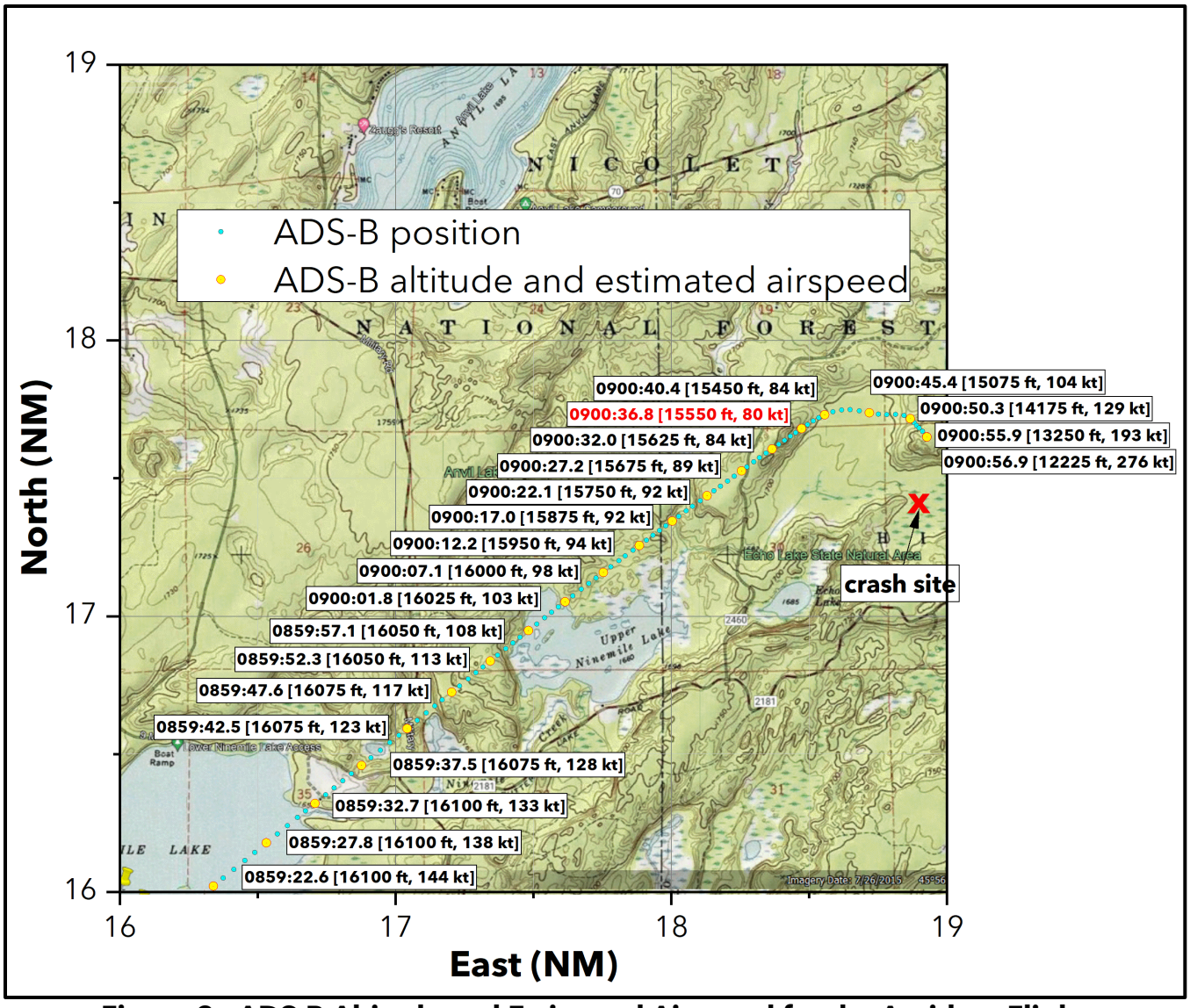

Figure 3: ADS-B Altitude and Estimated Airspeed for the Accident Flight

POH Stall Speed = 80 KCAS

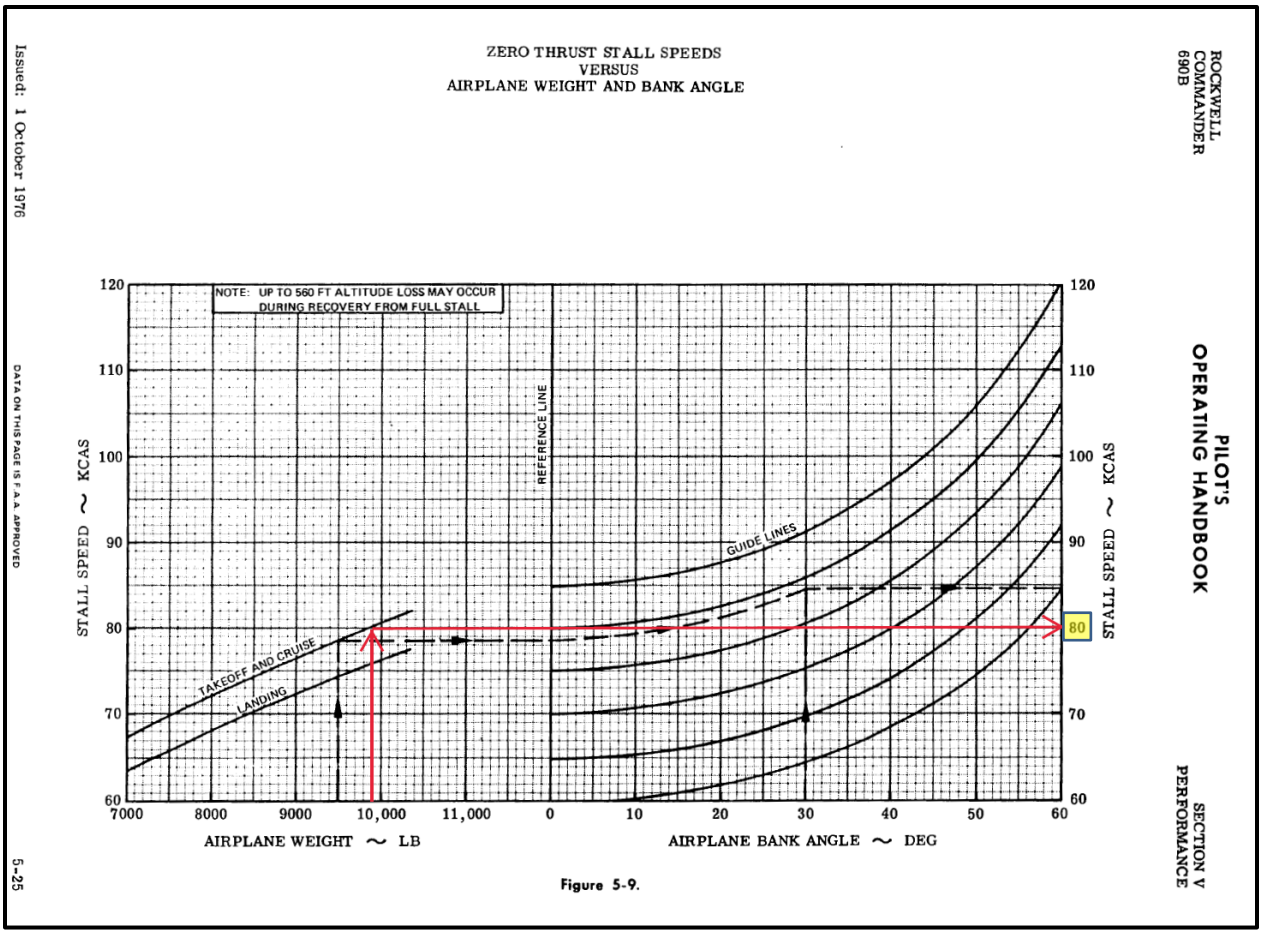

Figure 4: Estimated Stall Speed from Pilot's Operating Handbook

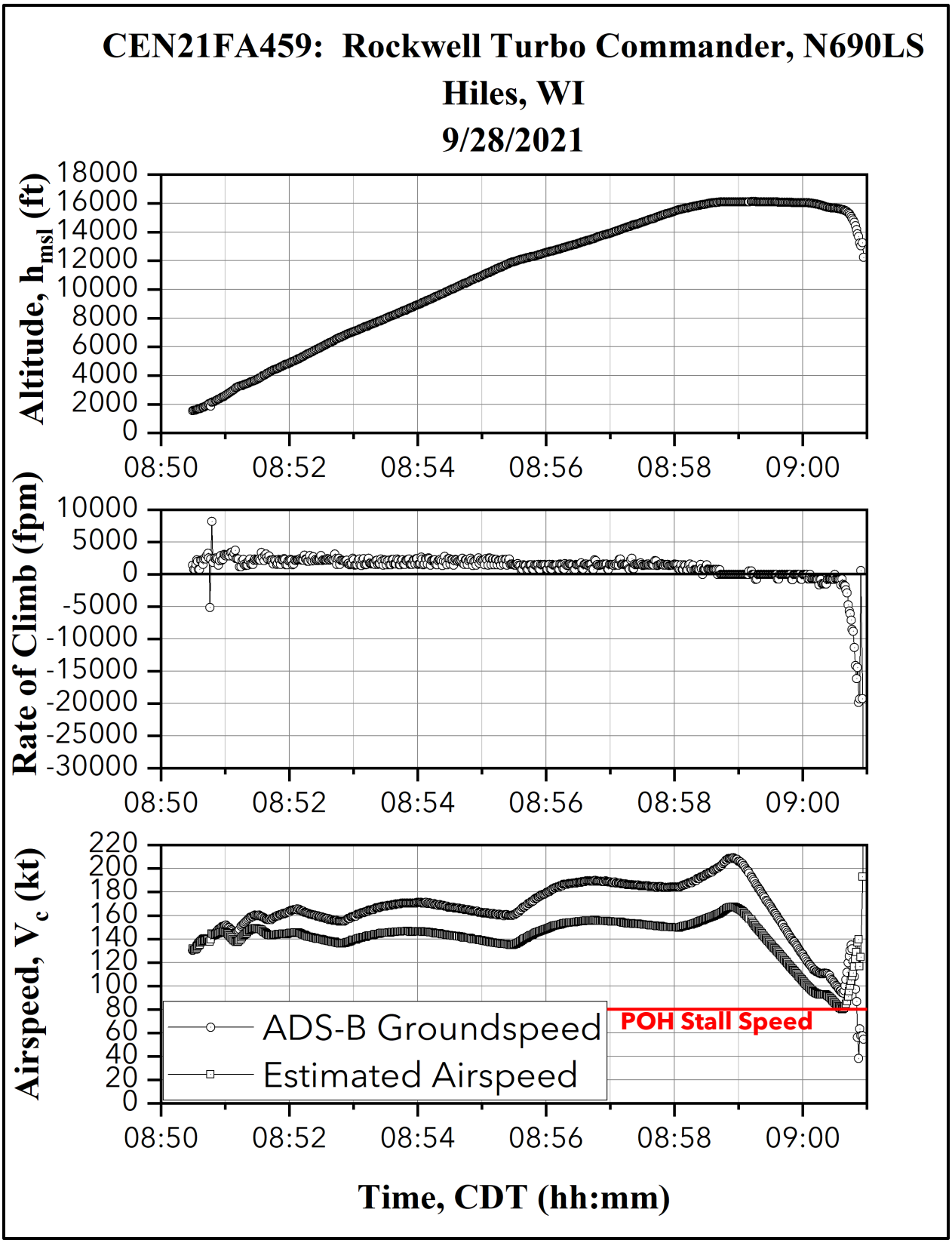

Figure 5: ADS-B Altitude, ROC, and Estimated Airspeed for Accident Flight

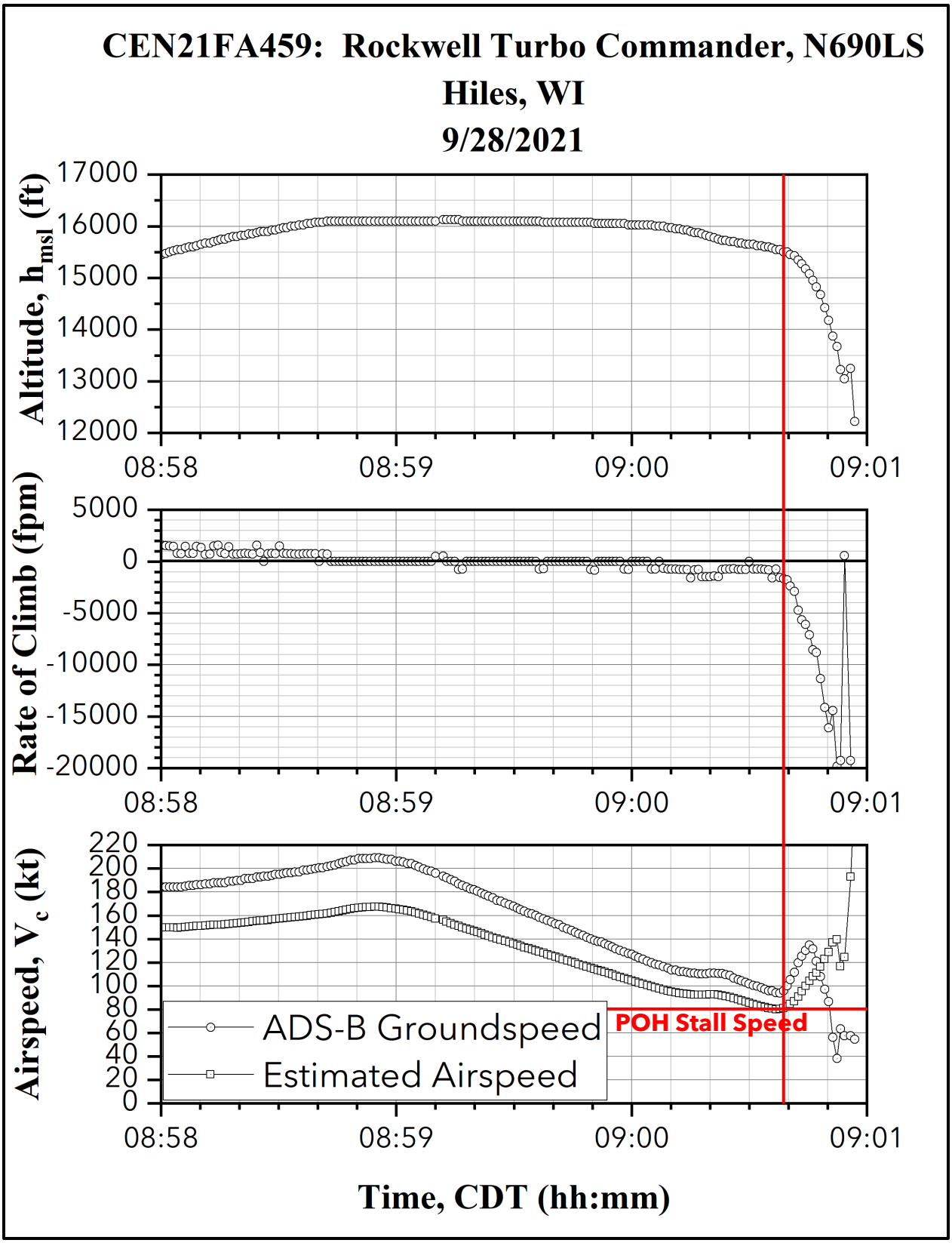

Figure 6: ADS-B Altitude, ROC, and Estimated Calibrated Airspeed for Final Three Minutes

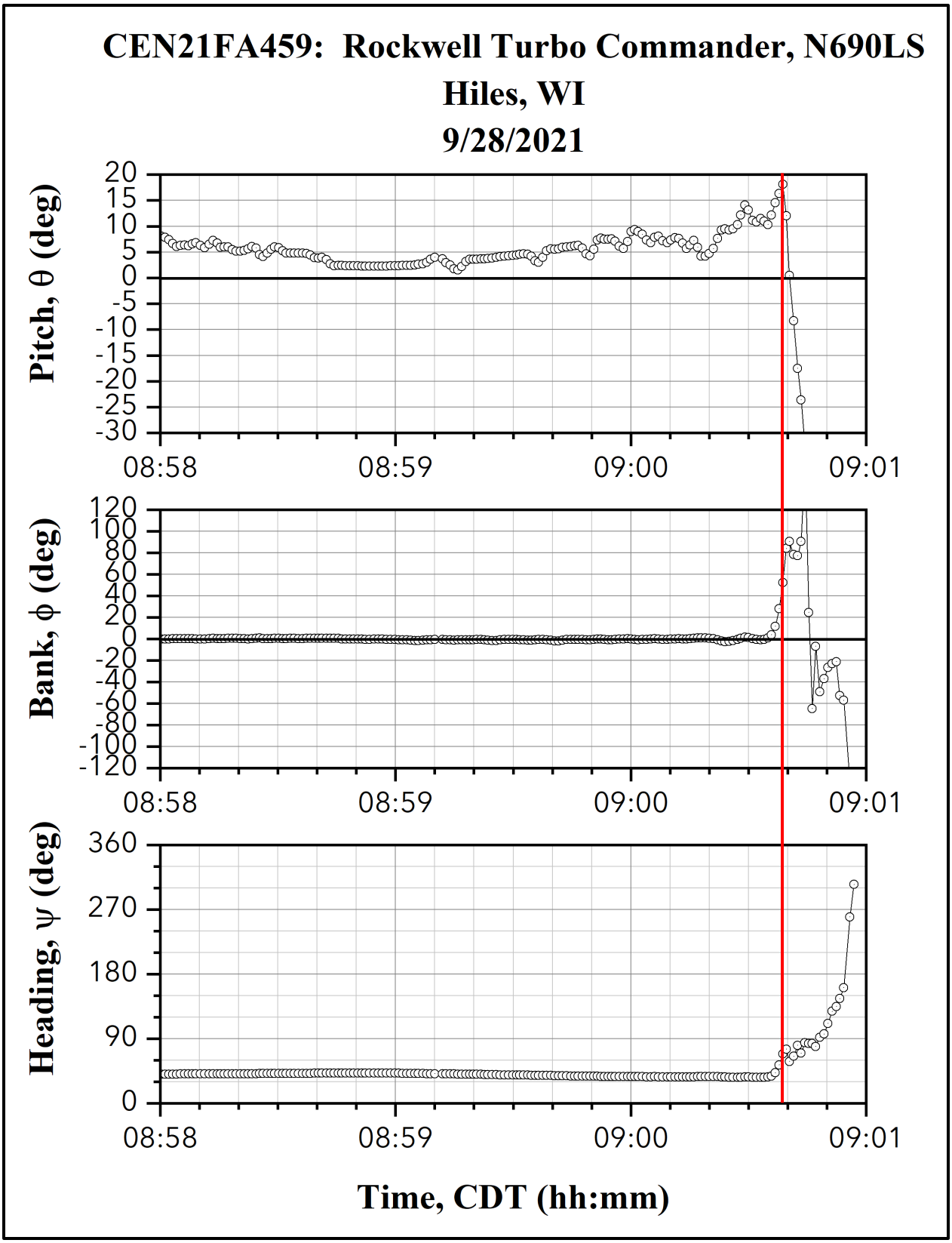

Figure 7: Estimated Pitch, Bank, and Heading Angles for Final Three Minutes

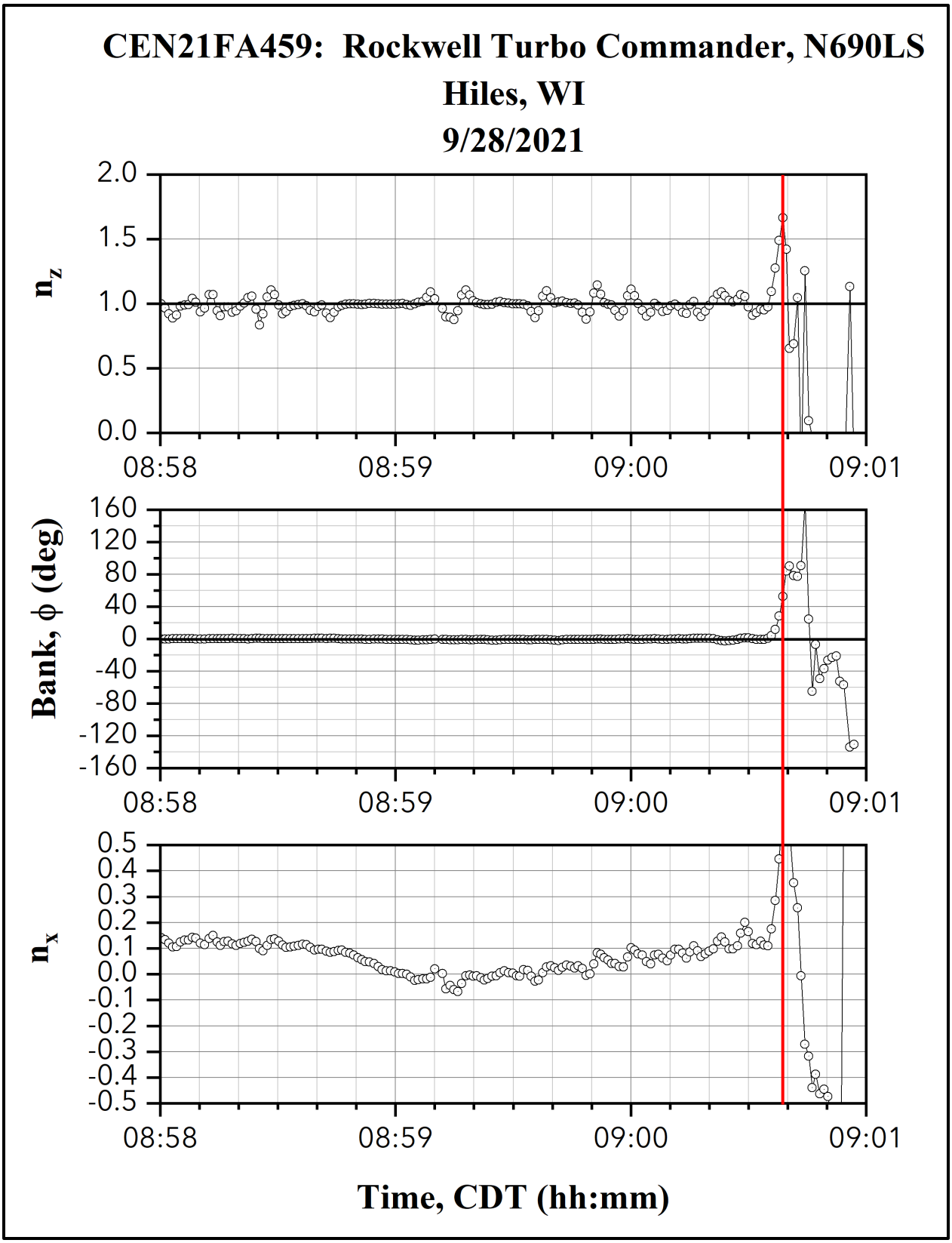

Figure 8: Estimated Normal and Longitudinal Load Factors for Final Three Minutes