National Transportation Safety Board
Office of Research and Engineering
Washington, D.C. 20594

Radar Performance Study

Specialist Report
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A. ACCIDENT

Location: Charleston, West Virginia
Date: May 5, 2017
Time: 1051 GMT (6:51 am EDT)
Airplane: Shorts SD3-30, N334AC
NTSB Number: DCA17FA109

B. GROUP

No vehicle performance group was formed.

C. SUMMARY

On May 5, 2017 at 6:51 am eastern daylight time (EDT), Air Cargo Carriers flight 1260, a Shorts SD3-30, N334AC, crashed during landing on runway 5 at the Charleston Yeager International Airport, Charleston, West Virginia (CRW). The airplane was destroyed, and the two pilots suffered fatal injuries. The flight was a scheduled cargo flight from Louisville, Kentucky, operated under the provisions of 14 CFR 135.

The aircraft was executing a VOR-A approach to runway 5. At the time of the accident, weather was reported as an overcast ceiling at 500 ft with 10 statute miles visibility and light winds.

[Note: Times in the report are quoted in EDT as well as Greenwich Mean Time (GMT or "Z"): EDT = GMT – 4 hr.)]

D. THE AIRPLANE

A picture of the accident airplane, a Shorts SD3-30, is shown in Figure 1. The airplane registration is held by ACC Integrated Services, Inc, of Milwaukee, Wisconsin.

E. WEATHER OBSERVATION

Accident at 1051/0651 EDT

METAR KCRW 051054Z 23003KT 10SM FEW001 OVC005 14/13 A2941 RMK AO2 SLP952 VLY FG

Charleston Yeager Airport weather observation at 0654 EDT, automated, wind from 230° at 3 knots, visibility 10 statute mile, a few clouds at 100 ft above ground level (agl), ceiling overcast at 500 feet agl, temperature 14° Celsius (C), dew point 13° C, altimeter 29.41 inches of mercury (Hg), fog.

The ceiling at CRW was being reported at 1,000 agl when the flight took off in Louisville, KY, but the ceiling came down quickly in Charleston after 6:30 am.

F. RADAR STUDY

Figures 2 and 3 highlight the radar ground track for the accident flight. The 230 NM planned flight took off from Louisville at about 5:40 am and was scheduled to take just over an hour. Note that the radar points in the figures are actually (red) boxes because of the uncertainty associated with radar.

The specific radar data used in the study are secondary returns (transponder code 4510) from the short-range Airport Surveillance Radar (ASR-8) located at CRW. Short-range radar data have approximately a 60 NM range and an inherent uncertainty of ±2 Azimuth Change Pulses (ACP) = ± (2 ACP) x (360º/4096 ACP) = ±0.176° in azimuth, ±50 ft in altitude, and ±1/16 NM in range.

N334AC started its descent from a cruising altitude of 9,000 ft just before 6:38 am. The crew requested and was cleared for the VOR-A circling instrument approach[1] to runway 5 at CRW. Figure 4 shows the approach plate for Charleston's VOR-A approach.

A profile view of the accident approach along with features from the approach plate are shown in Figure 5. As the figure shows, the accident airplane prematurely descended below the 1,720 ft minimum altitude limit to the Minimum Descent Altitude (MDA) of 1,600 ft approximately 2 NM prior to the fix FOGAG[2].

Figures 6 thru 8 show airplane performance parameters that were derived from radar. The data indicate that the airplane approached the airport at an altitude around 1,600 ft which is both the top of the VOR-A approach and also close to the reported 500 ft agl ceiling. At about

[1] Approaches whose final approach segment are more than 30˚ different from the landing runway alignment are always designated as circling approaches and labeled with a letter. Circling-only approaches do not allow a straight in approach so only higher circling minima exist.
[2] N334AC was equipped with Distance Measuring Equipment (DME) and, as a result, could identify the FOGAG fix.

6:50:18, the pilot initiated a 2,500 fpm descent[3] to the runway beginning at a calibrated airspeed of 124 kt. The descent rate and airspeed were reduced to about 600 fpm and 84 kt, respectively, just before impact at 6:50:47. The airplane was in approximately a 22º left bank and pitch was increasing from a 5º nose down attitude just before impact.

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[3] Figure 1-1 of FAA Advisory Circular 91-79A, "Mitigating the Risks of a Runway Overrun Upon Landing", depicts a 1,000 ft agl window for a stabilized approach where the airplane should be on course, on speed, and on a 3º glidepath (between 500-700 fpm). Table 1-2 in AC 91-79A goes on to specifically define a 637 fpm descent rate for a 3º glidepath at N334AC's approximate approach ground speed of 120 kt.

G. FIGURES

Figure 1: Accident Airplane, N334AC, a Shorts SD3-30

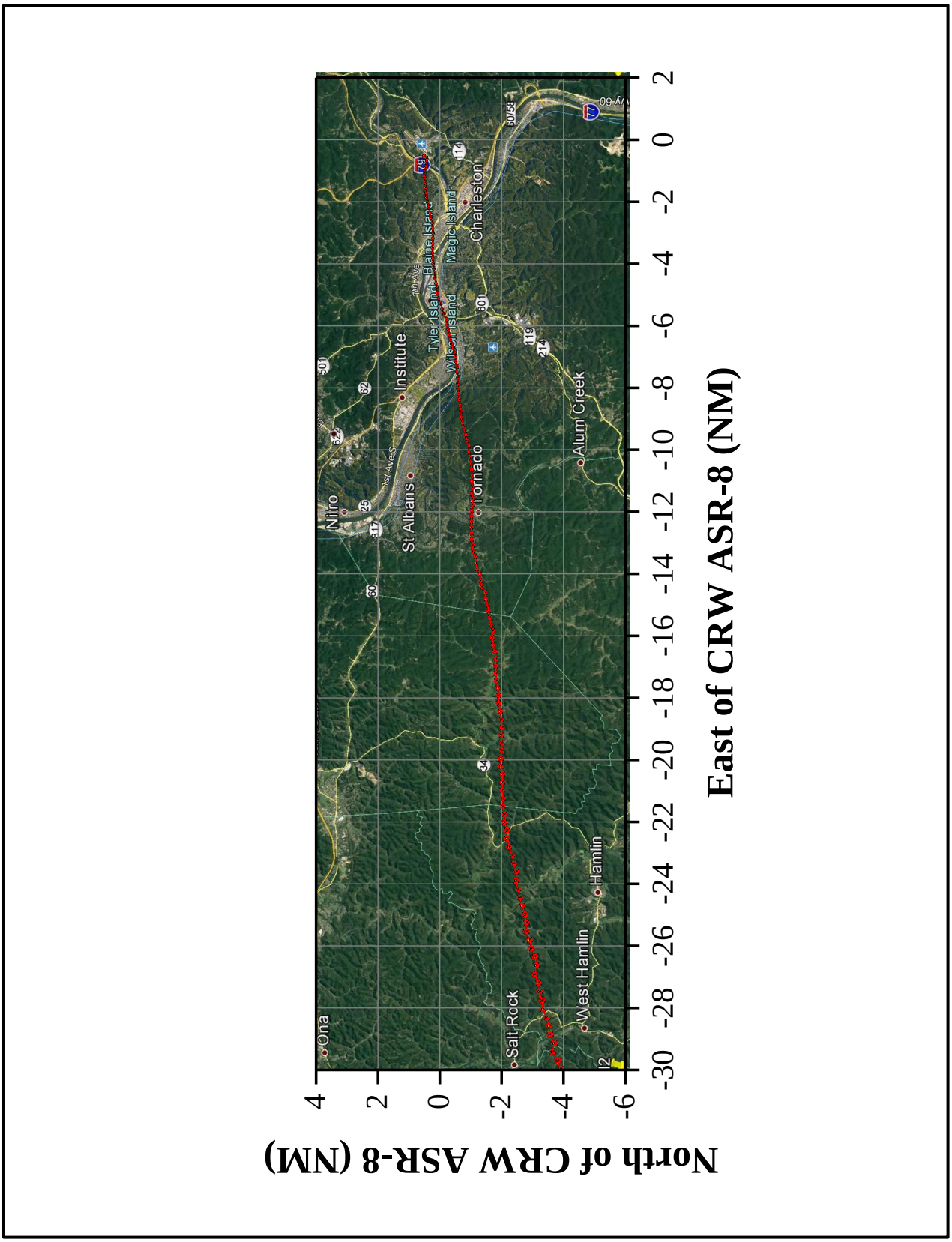

Figure 2: Radar Ground Track

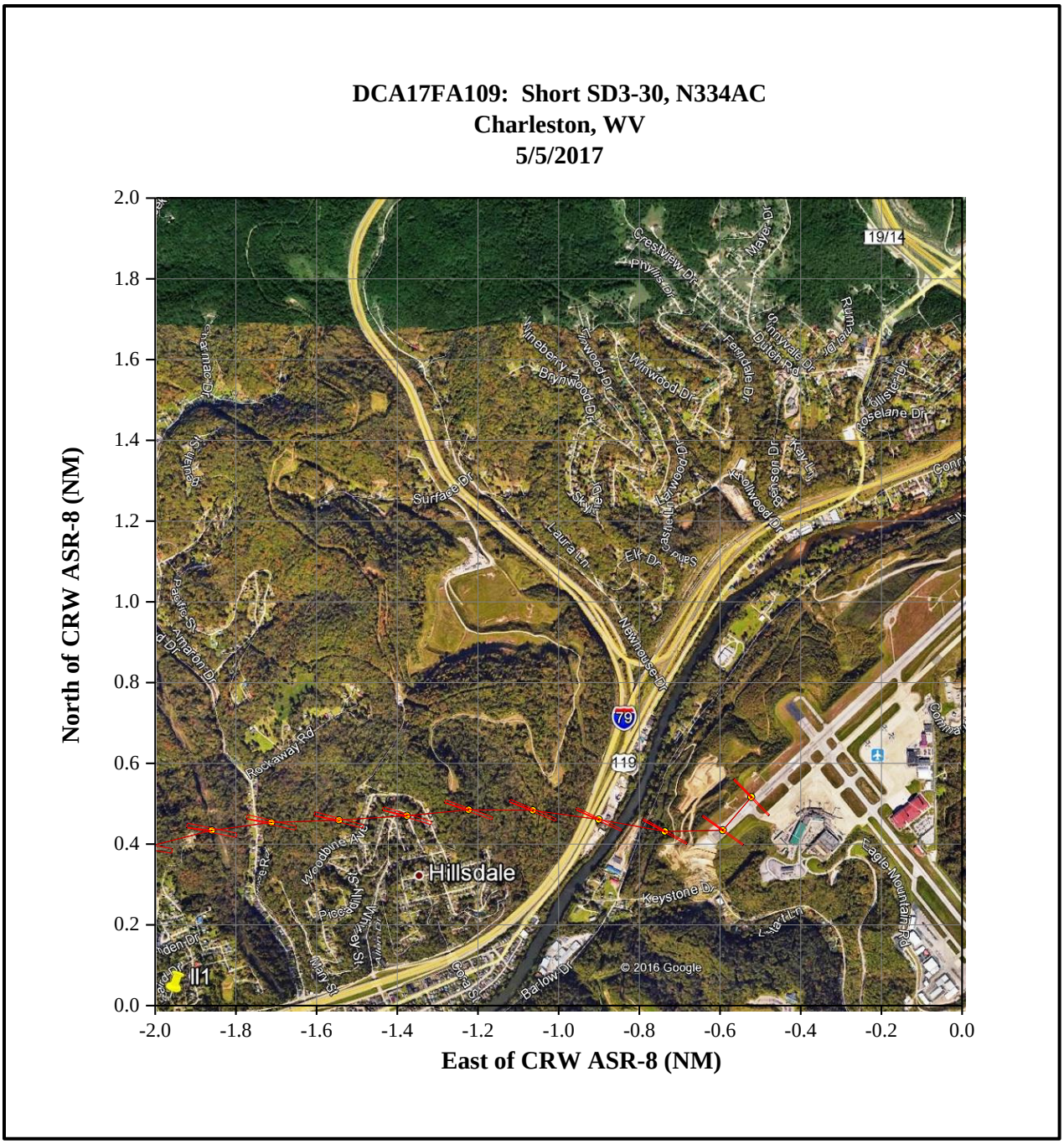

Figure 3: Radar Ground Track During Landing

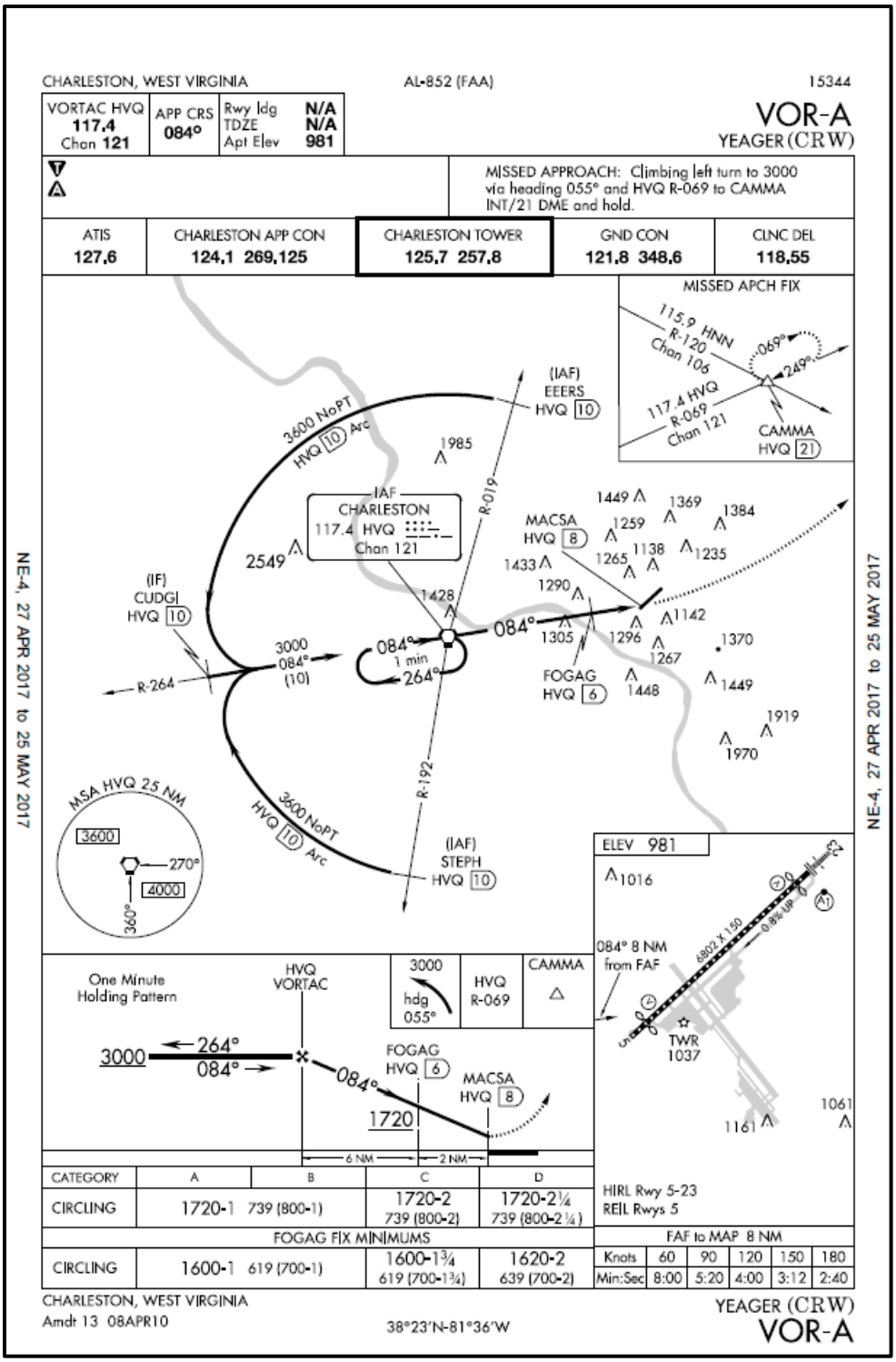

Figure 4: Published Approach for which N334AC had been Cleared

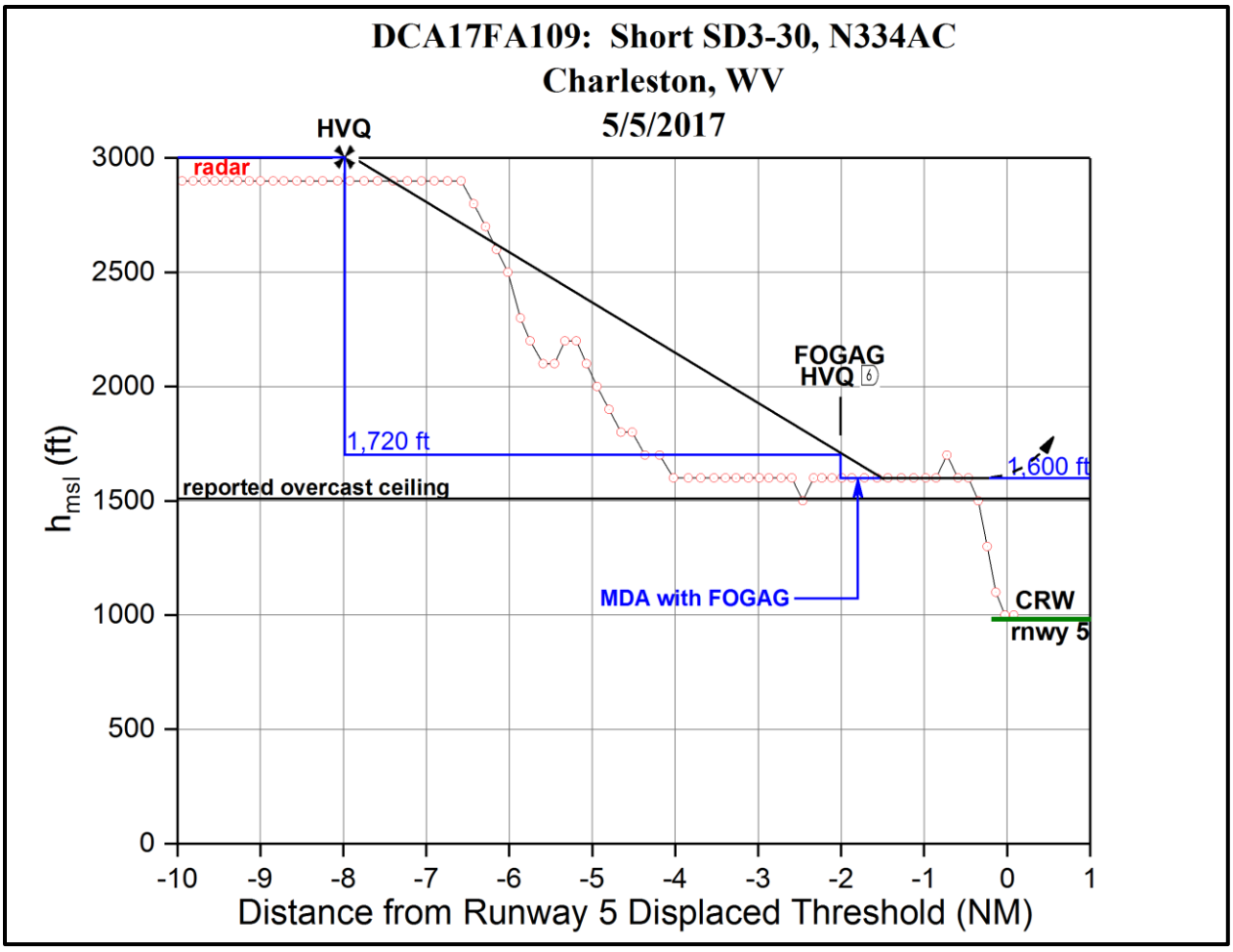

Figure 5: Profile View with Features of the VOR-A Approach

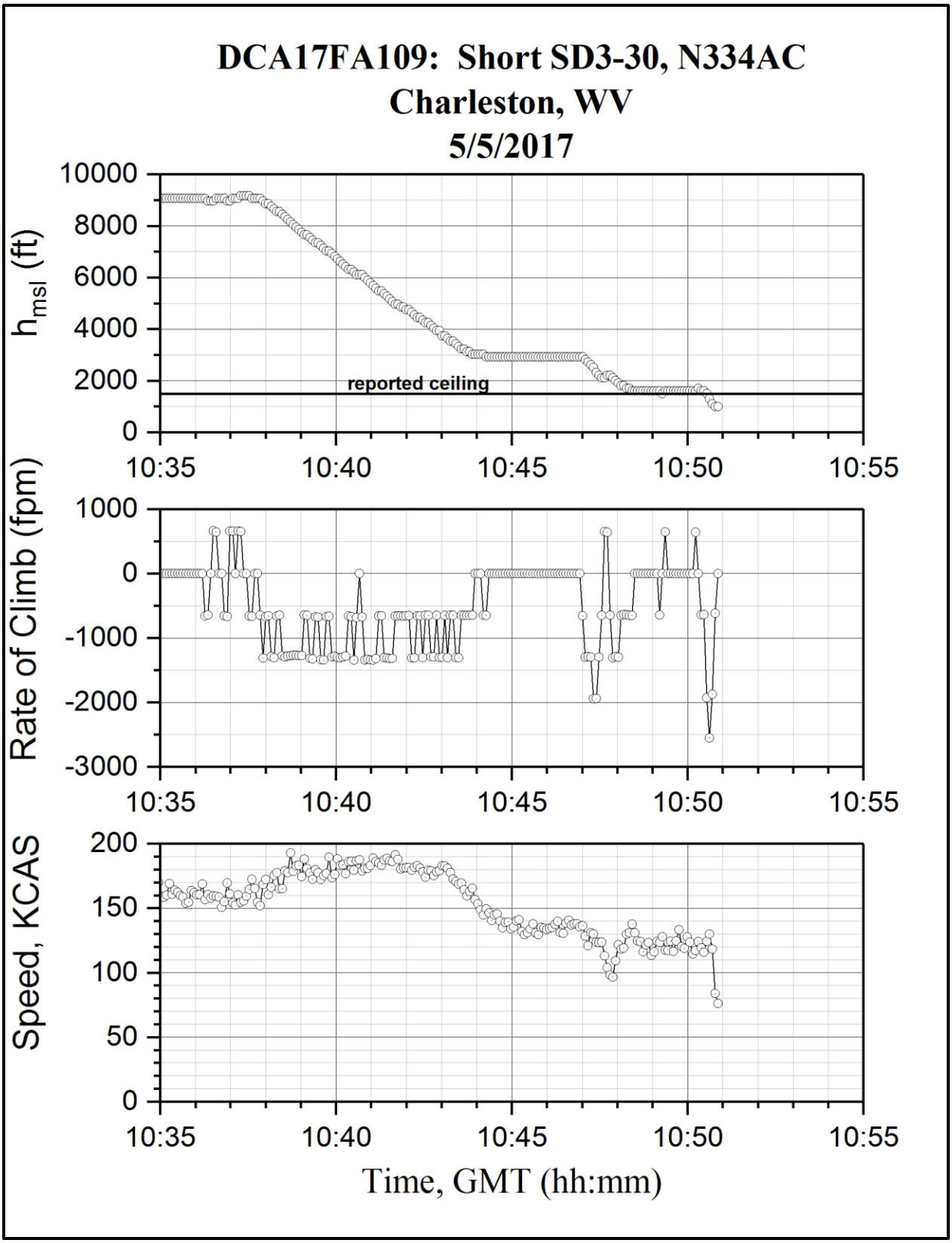

Figure 6: Altitude and Speed Based on Radar

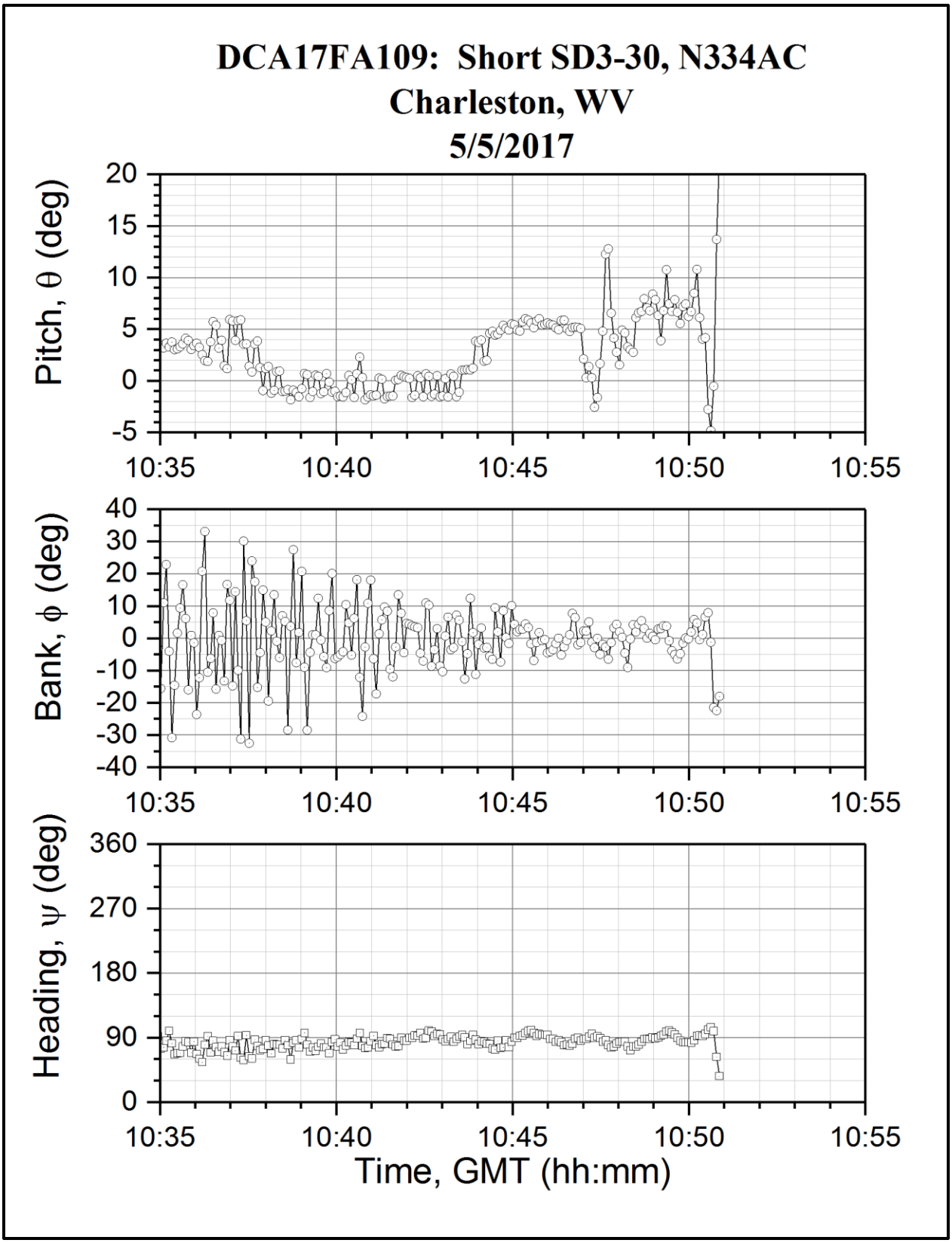

Figure 7: Pitch, Bank, and Heading Based on Radar Data

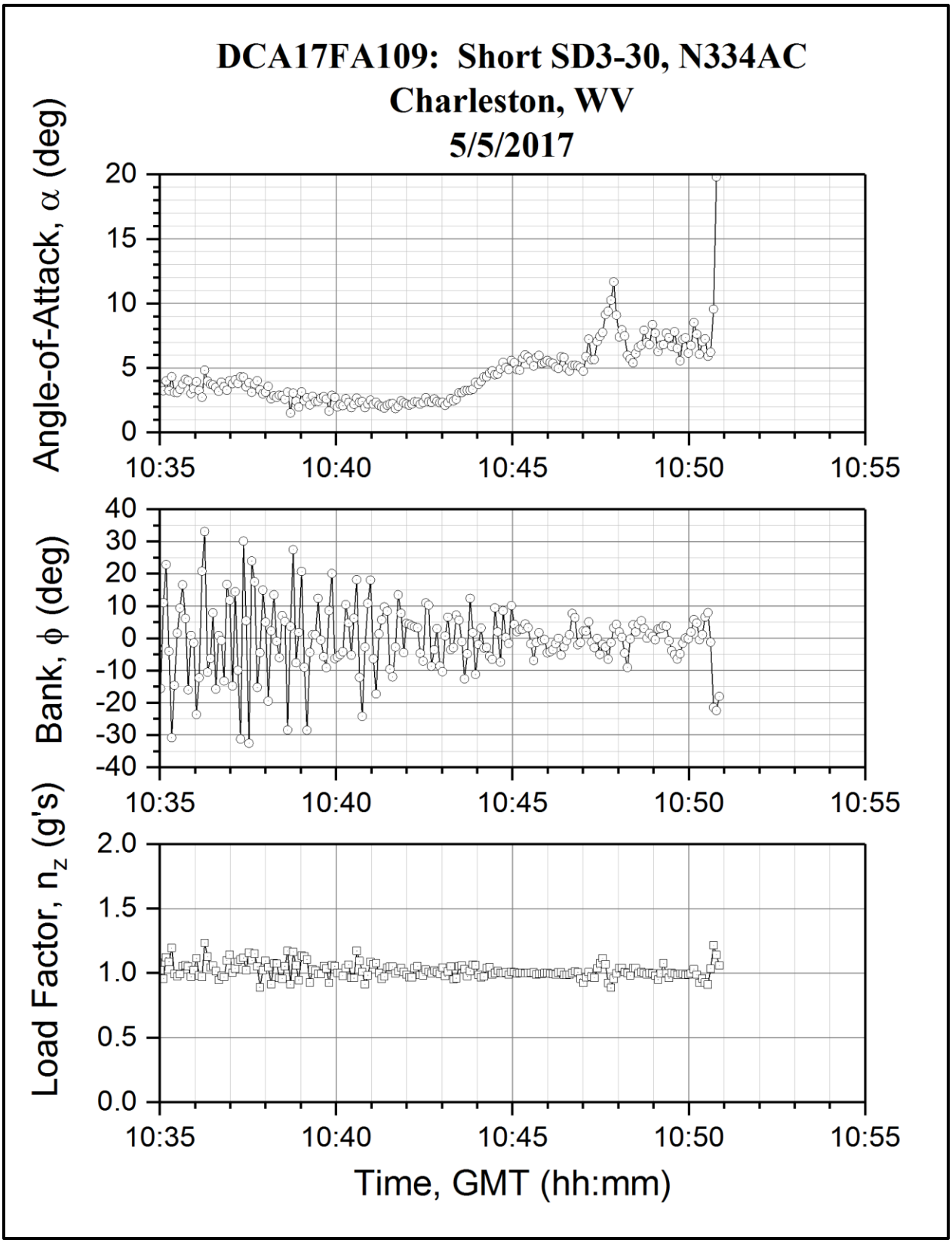

Figure 8: Estimated Angle-of-Attack and Load Factor Based on Radar Data