

# National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA23FA024

## **AUTOMATIC DEPENDENT SURVEILLANCE- BROADCAST (ADS-B) STUDY**

Aircraft Performance Study

By

Marie Moler

## **A. ACCIDENT**

Location: Marietta, Ohio  
Date: October 18, 2022  
Time: 0709 eastern daylight time (EDT)  
1109 UTC  
Airplane: Beech E-90, N515GK

## **B. SUMMARY**

On October 18, 2022, at 0709 eastern daylight time, a Beech E-90, N515GK, was substantially damaged when it was involved in an accident in Marietta, Ohio. The two commercial pilots were fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 positioning flight.

## **C. PERFORMANCE STUDY**

### **1.0 Aircraft**

The airplane was a twin-turboprop Beech E-90, also known as a King Air. The airplane's cruise speed is 226 kts, and it has a service ceiling of 30,000 ft. Maximum takeoff weight is over 10,000 lbs.



**Figure 1.** Accident airplane, N515GK.

## **2.0 Available Data**

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 (65 ft) in both the horizontal and vertical dimensions.

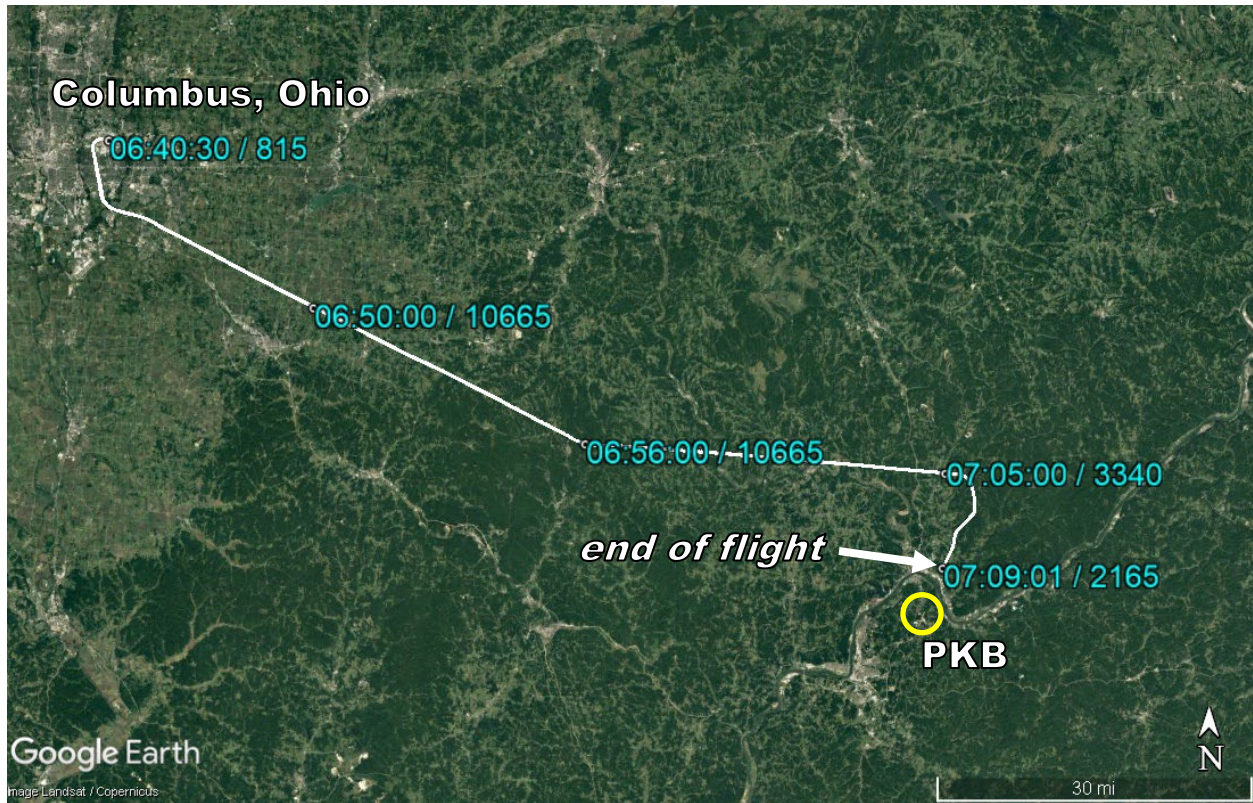
## **3.0 Weather**

Weather was recorded for 0653 at Mid-Ohio Valley Region Airport (PKB), the airplane's intended destination, 3.7 NM south-west of the wreckage location. The temperature was reported as 37.4°F (3°C), the dew point was 33.8°F (1°C), and the barometric setting was 29.80 inHg. Winds were 3 kts from 260°. An overcast ceiling was reported at 1,400 ft AGL. Visibility was ten statute miles.

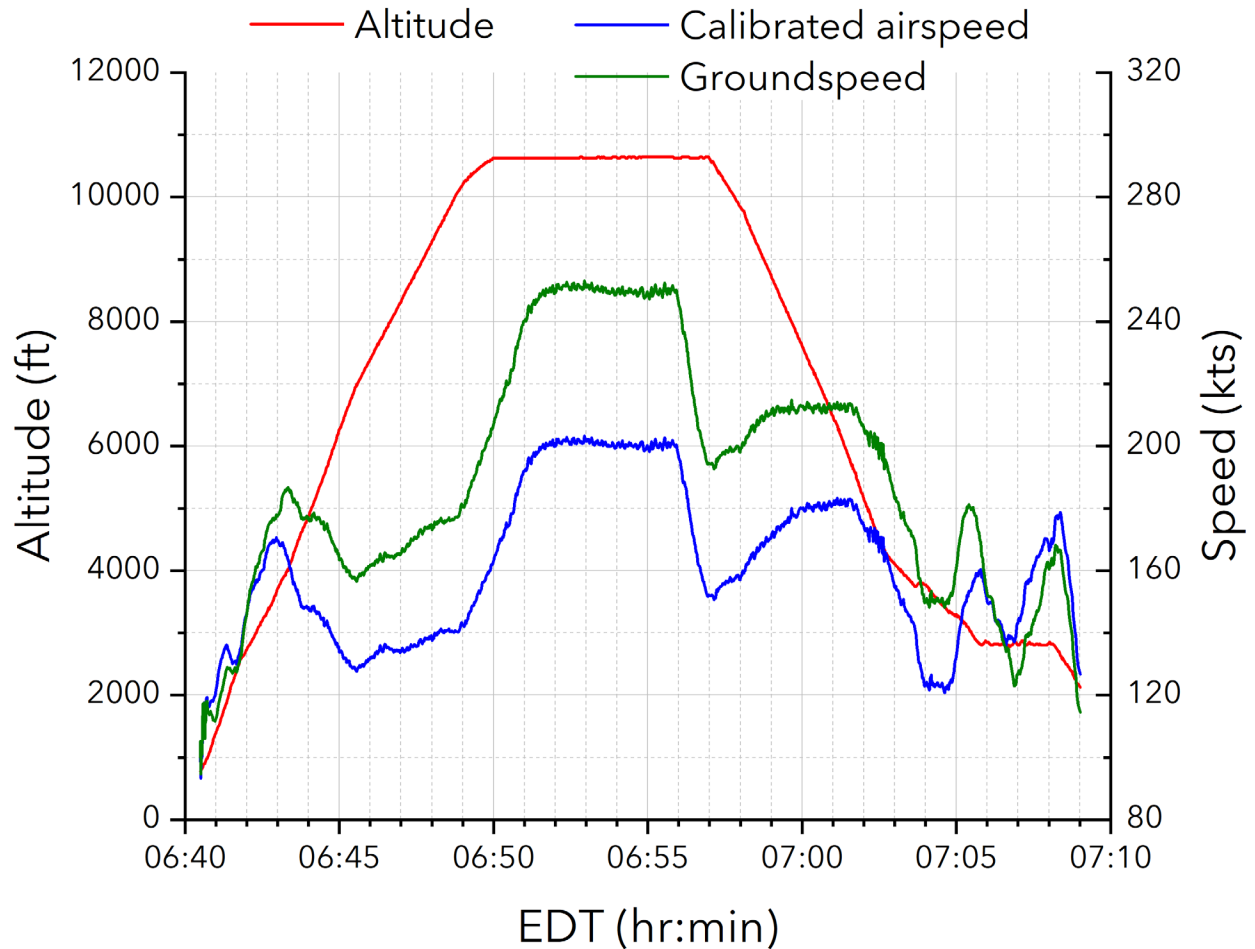
The Meteorology Factual Report [1] stated that the upper air sounding from Pittsburgh, Pennsylvania indicated moderate or greater icing potential (rime, clear, mixed) from 2,600 ft through 9,000 ft msl.

## **4.0 Flight Path**

The flight took off from John Glenn Columbus International Airport (CMH), Columbus, Ohio about 06:40 and was enroute to Mid-Ohio Valley Regional Airport (PKB), Parkersburg, West Virginia (Figure 2). The airplane climbed to 10,600 ft msl (pressure altitude of 11,000 ft) by 06:50 (Figure 3). It continued at this altitude until 06:57 when it began to descend.



**Figure 2.** Airplane flight path with selected times and altitudes annotated. The destination airport is circled in yellow.

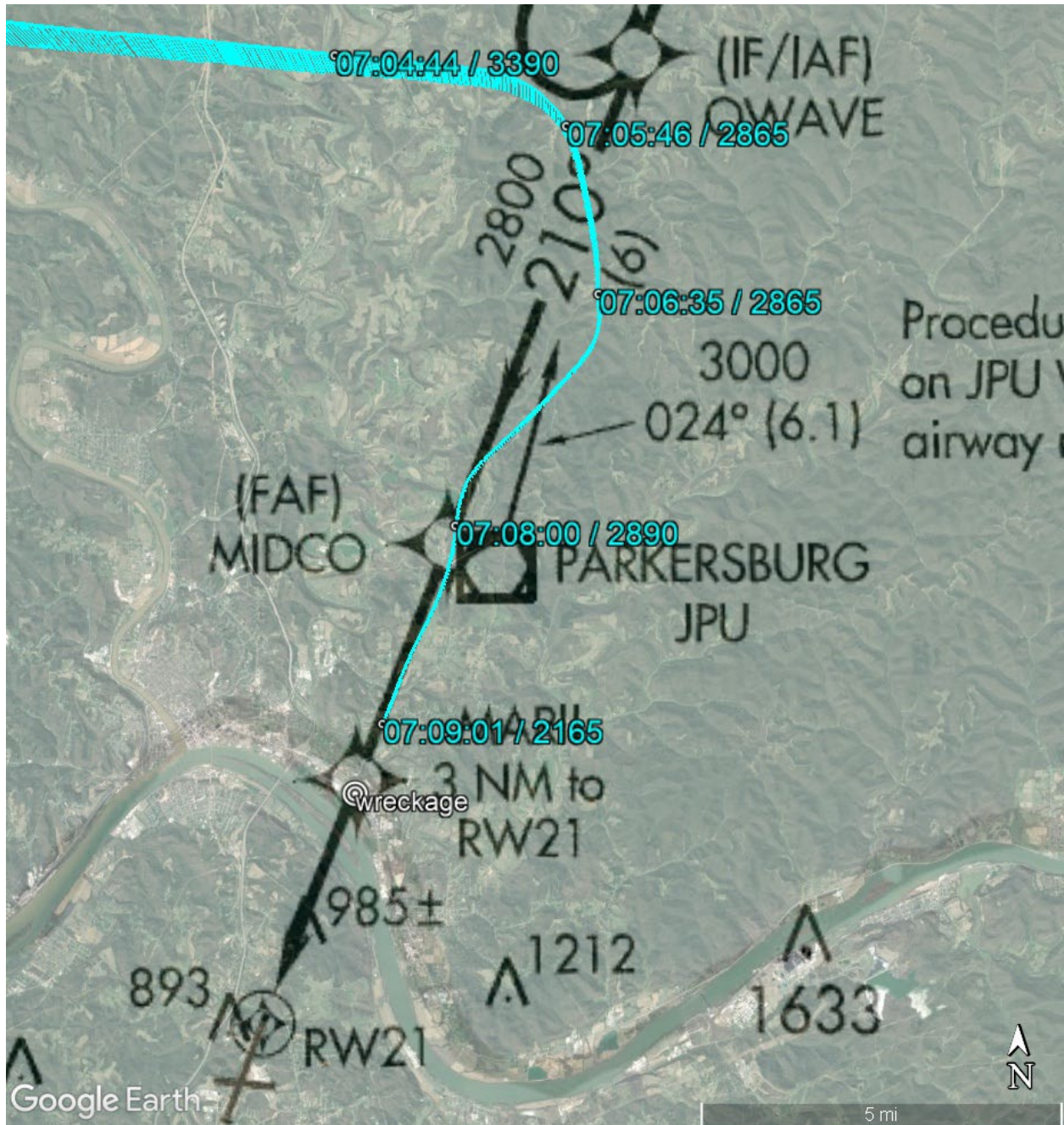


**Figure 3.** Corrected altitude, MSL, and calculated calibrated airspeed and groundspeed for the flight.

The airplane descended steadily between 1,100 and 1,200 ft/min until 07:02:30. The airplane's descent rate decreased and so did its speed, slowing from 170 kts calibrated airspeed to 122 kts by 07:04. The airplane increased its forward speed and began a right turn towards the runway heading just after 07:05.

By 07:06, airspeed was 150 kts and the altitude was leveling out near 2,800 ft. The pilot contacted PKB about the RNAV approach to runway 21 and was instructed to report MIDCO (Figure 4), the Final Approach Fix (FAF) for that runway. MIDCO is 5.9 NM from the runway threshold and has a minimum crossing altitude of 2,800 ft [see References].

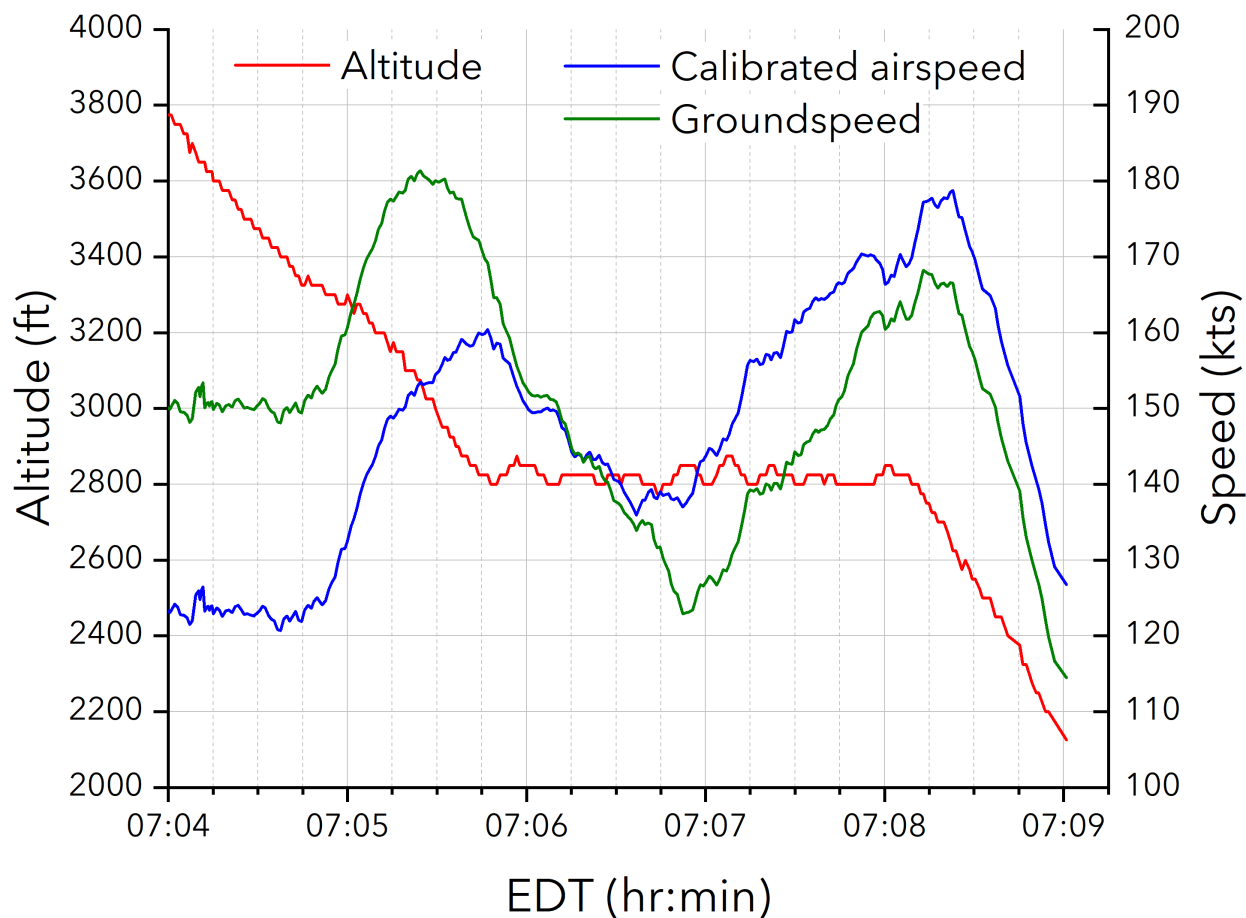




**Figure 4.** Airplane flight path with selected times and altitudes annotated. A portion of the RNAV (GPS) RWY 21 approach plate has been overlaid on the satellite imagery.

Around 07:07 (times recorded to the nearest minute), local control informed the flight crew that there was a vehicle on the runway checking for wildlife that would be clear shortly. A minute later local control observed the lights of the accident airplane as it emerged from the overcast clouds. That would have been at approximately the time that the airplane crossed MIDCO and aligned with the runway. Local control cleared the airplane to land, and the crew repeated back the clearance. Local control reported checking the airfield lighting panel to ensure it was properly set.

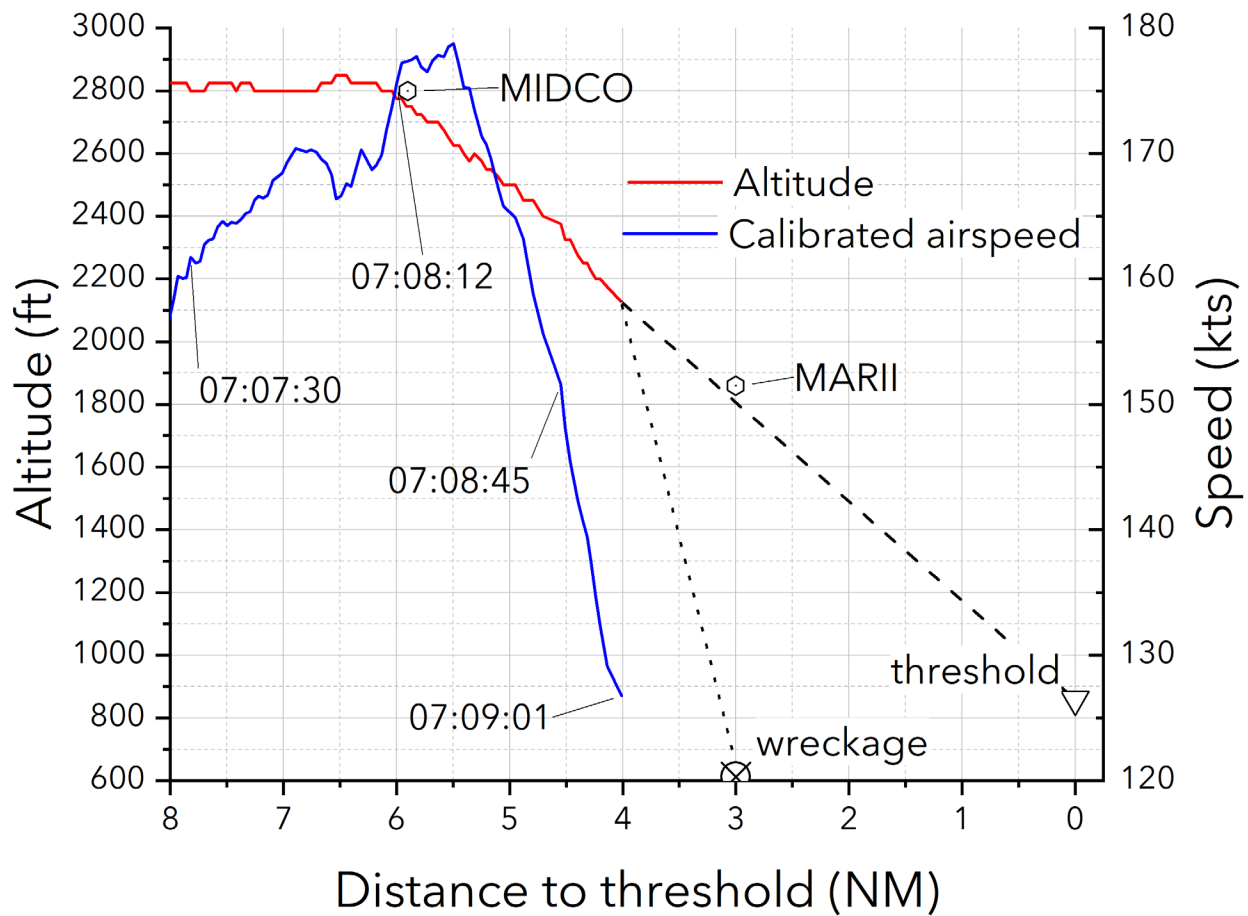
The airplane had slowed to 135 kts at 07:07 and then accelerated. At 07:08 it crossed MIDCO at 170 kts and began to descend at about 700 ft/min. The airplane reached a speed of 178 kts at 07:08:22 before it began to lose speed. The final calculated airspeed, 48 seconds later, was 126 kts. The airplane's approach speed is between 80-100 kts. The airplane's wings-level, power-idle stall speed is between 65 kts (full flaps, light weight) and 88 kts (no flaps, heavy weight) [2].



**Figure 5.** Corrected altitude, MSL, and calculated calibrated airspeed and groundspeed for final five minutes of flight.

The airplane's descent from 2,800 ft was on target for the runway 21 approach (Figure 6). The final ADS-B return was at 07:09:01 at an altitude of 2,125 ft, about 4 NM from the runway threshold. The wreckage was at an elevation of 614 ft, about 1 NM from the last return along the runway heading. The airplane lost 1,500 ft of altitude in 1NM.

Post-accident inspection of the engines found no indications of any pre-impact mechanical anomalies to any of the engine components that would have precluded normal engine operation. The flap actuators indicated a flap position of 15°.

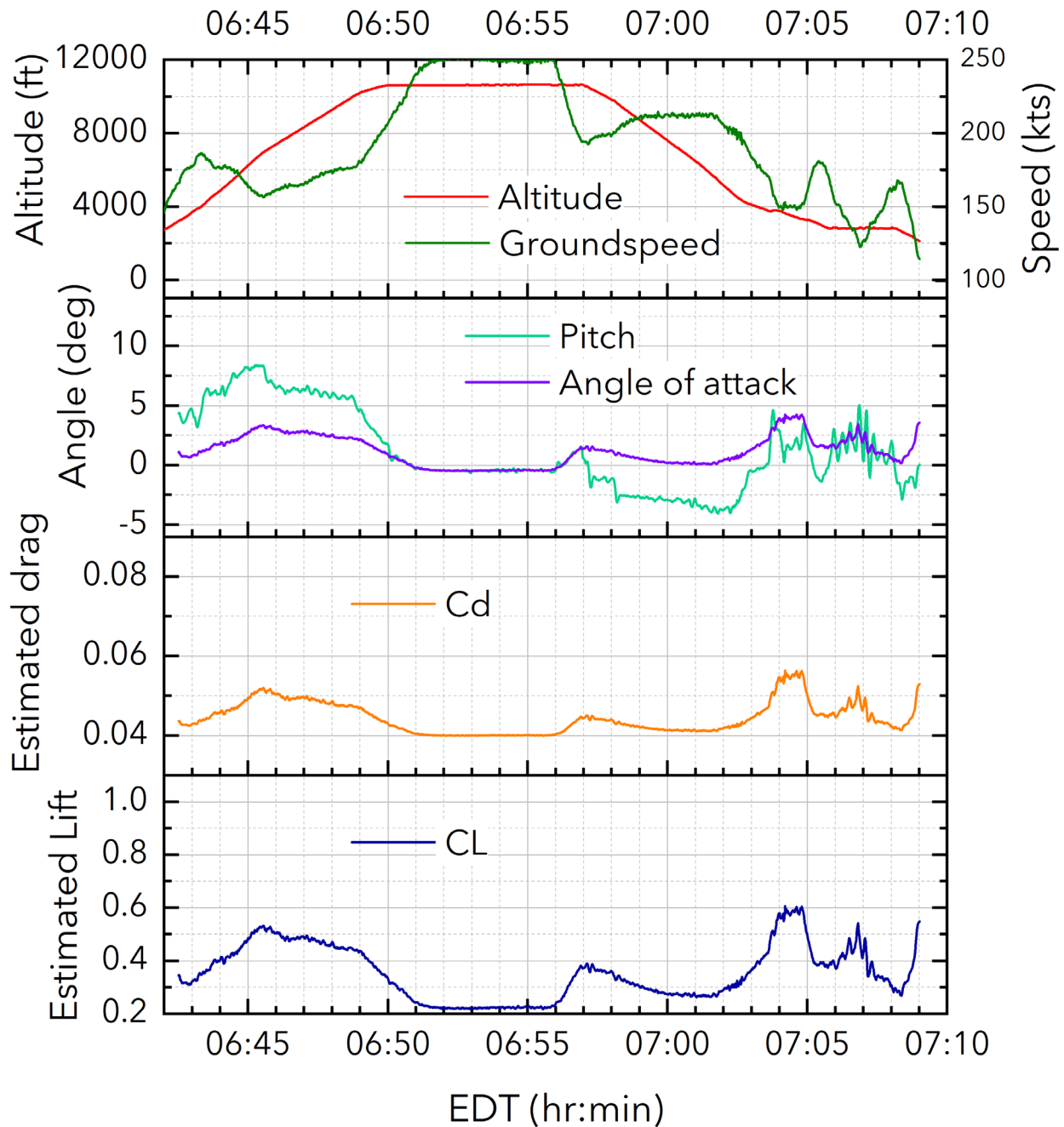


**Figure 6.** Corrected altitude, MSL, and calculated calibrated airspeed versus distance to runway threshold. Wreckage location is also noted.

Pilot reports throughout the area stated trace to moderate icing conditions and AIRMETs based on upper air soundings reported moderate or greater icing potential (rime, clear, mixed) from 2,600 ft through 9,000. The final ten minutes of flight may have been affected by icing.

A simplified aerodynamic model of the airplane was constructed to estimate body attitudes and aerodynamic coefficients during the flight. Absolute values of each parameter should be considered estimates, but the trends are reflective of aerodynamic behavior. Figure 7 shows how lift and drag increased with pitch as the airplane climbed and then leveled during cruise flight. Drag also increased during descents when the airplane maintained or decreased speed. However, drag did not increase enough during the flight to indicate a build up of ice on the airframe. If icing was present, the calculations made from the ADS-B flight path data were not able to capture its effects. Icing effects localized to a control surface would not be discernible from just flight path data.





**Figure 7.** Airplane altitude, speeds, pitch and angle of attack, and estimated drag and lift coefficients for the flight.

#### D. SUMMARY

The airplane aligned with the runway at about 07:08 while crossing the Final Approach Fix at the appropriate altitude and began the final descent to the runway

on the glideslope. The airplane's speed, however, was varying between 120 and 178 kts during the final approach. At the end of the recorded data the airplane was descending and rapidly slowing, but still above the approach speed of 80-100 kts.

## **E. REFERENCES**

1. Meteorology Specialist's Factual Report, ERA23FA024, National Transportation Safety Board, 2023.
2. Beechcraft King Air E90 Pilot's Operating Manual, Beech 1994.

WAAS CH 86727 W21A	APP CRS 210°	Rwy Idg 6780
		TDZE 857
		Apt Elev 859

# RNAV (GPS) RWY 21

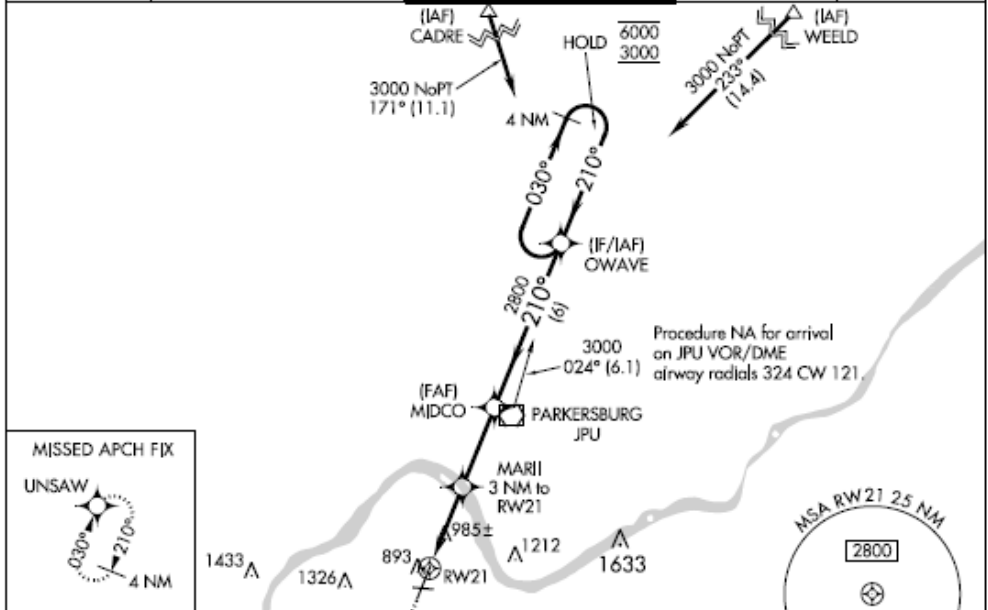
MID-OHIO VALLEY RGNL (PKB)

RNP APCH.

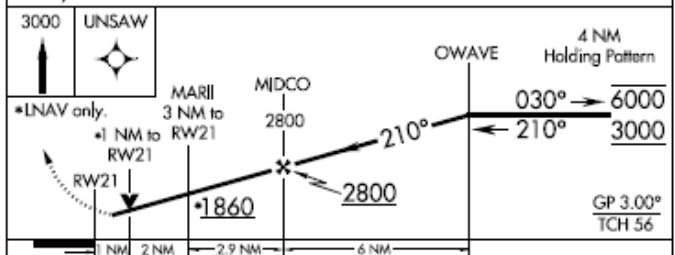
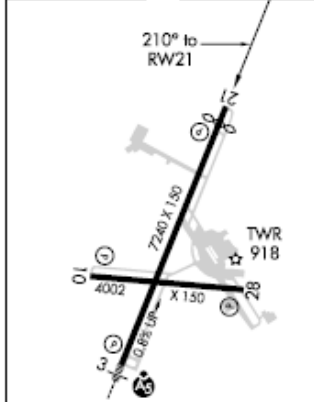
Baro-VNAV and VDP NA when using Athens/Albany altimeter setting. Rwy 21 helicopter visibility reduction below 3/4 SM NA. For uncompensated Baro-VNAV systems, procedure NA below -17°C or above 38°C. When local altimeter setting not received, use Athens/Albany altimeter setting: increase LPV DA to 1249 feet and visibility all Cats 1/4 SM; increase LNAV/VNAV DA to 1237 feet and visibility all Cats 1/2 SM; increase all MDAs 100 feet and visibility Cat C/D 1/2 SM. Circling Rwy 10, 28 NA at night.

MISSED APPROACH: Climb to 3000 direct UNSAW and hold.

ATIS 124.35	INDIANAPOLIS CENTER 125.55 398.9	PARKERSBURG TOWER* 123.7 (CTAF) 257.8	GND CON 121.7	UNICOM 122.95
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ELEV 859	TDZE 857
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CATEGORY	A	B	C	D
LPV DA		1149-7/8	292 (300-7/8)	
LNAV/VNAV DA		1137-7/8	280 (300-7/8)	
LNAV MDA	1240-1	383 (400-1)	1240-1 1/2	383 (400-1 1/2)
CIRCLING	1320-1 461 (500-1)	1380-1 521 (600-1)	1640-2 1/4 781 (800-2 1/4)	1640-2 1/2 781 (800-2 1/2)

PARKERSBURG, WEST VIRGINIA  
Amdt 2E 02DEC21

39°21'N-81°26'W

# RNAV (GPS) RWY 21

MID-OHIO VALLEY RGNL (PKB)

NE-4, 26 JAN 2023 to 23 FEB 2023

NE-4, 26 JAN 2023 to 23 FEB 2023