

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA25FA037

METEOROLOGY

Specialist's Factual Report

February 4, 2025

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A. ACCIDENT

Location: Wilder, Tennessee
Date: October 31, 2024
Time: 1837 central daylight time (CDT)
2337 coordinated universal time (UTC)
Airplane: Cessna 150F; Registration: N8110S

B. METEOROLOGY SPECIALIST

Paul Suffern
Senior Meteorologist
National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

The NTSB's Senior Meteorologist did not travel for this investigation but gathered all data remotely. Data for this investigation were collected from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). This Specialist's Factual Report contains the meteorological factors pertinent to the weather surrounding the accident time. All times are central daylight time (CDT) and are based upon the 24-hour clock, where local time is -5 hours from UTC. Directions are referenced to true north and distances are in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles. NWS station identifiers use the standard International Civil Aviation Organization 4-letter station identifiers versus the International Air Transport Association 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports.

The accident site was located at approximate latitude 36.317286° N, longitude 85.092206° W, at an altitude of 1,490 feet (ft).

D. FACTUAL INFORMATION

1.0 Synoptic Situation

The synoptic or large-scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction and the WPC, located in College Park, Maryland. These are the base products used in describing synoptic weather features and in the creation of forecasts and warnings for the NWS. Reference to these charts can be found in the Federal Aviation Administration (FAA) "Aviation Weather Handbook", FAA-H-8083-28.¹

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart centered over the Tennessee Valley of the United States for 1900 CDT is provided as figure 1 with the location of the accident site within the black circle. The chart depicted a high-pressure system at 1021-hectopascals (hPa) located west of the accident site in central Tennessee. An outflow boundary² was located in the immediate vicinity of the accident site stretching north to south through eastern Tennessee. Further west, a cold front stretched southwest to northeast from Louisiana to Indiana with a 1018-hPa low-pressure system in southern Arkansas. Outflow boundaries, troughs, and fronts can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present.

The station model closest to the accident site depicted an air temperature of 61°F, dew point temperature 59°F, cloudy skies, and calm winds.

¹ <https://www.faa.gov/regulationspolicies/handbooksmanuals/aviation/faa-h-8083-28a-aviation-weather-handbook>

² Outflow boundary - A surface boundary formed by the horizontal spreading of thunderstorm-cooled air.

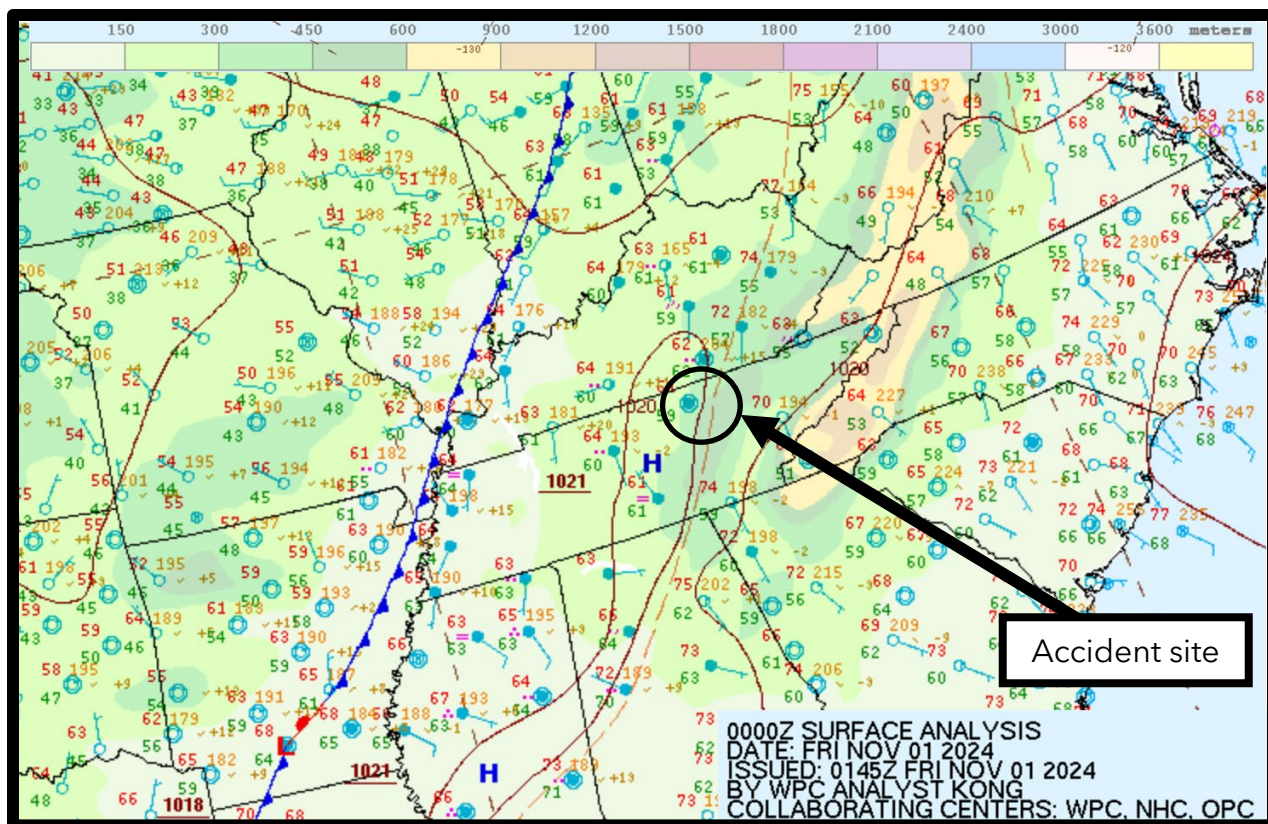


Figure 1. NWS Surface Analysis Chart for 1900 CDT.

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) issued Constant Pressure Charts for 1900 CDT at 925-, 850-, and 700-hPa, which are presented in figures 2 through 4. The charts indicated a low- and mid-level trough³ at 925- through 700-hPa west of the accident site from Illinois southward into Arkansas and central Tennessee. The 925-hPa constant pressure chart depicted a southwest wind around 15 knots (figure 2) becoming a west-southwest 30-knot wind by 700-hPa (figure 4).

³ Trough - An elongated area of relatively low atmospheric pressure or heights.

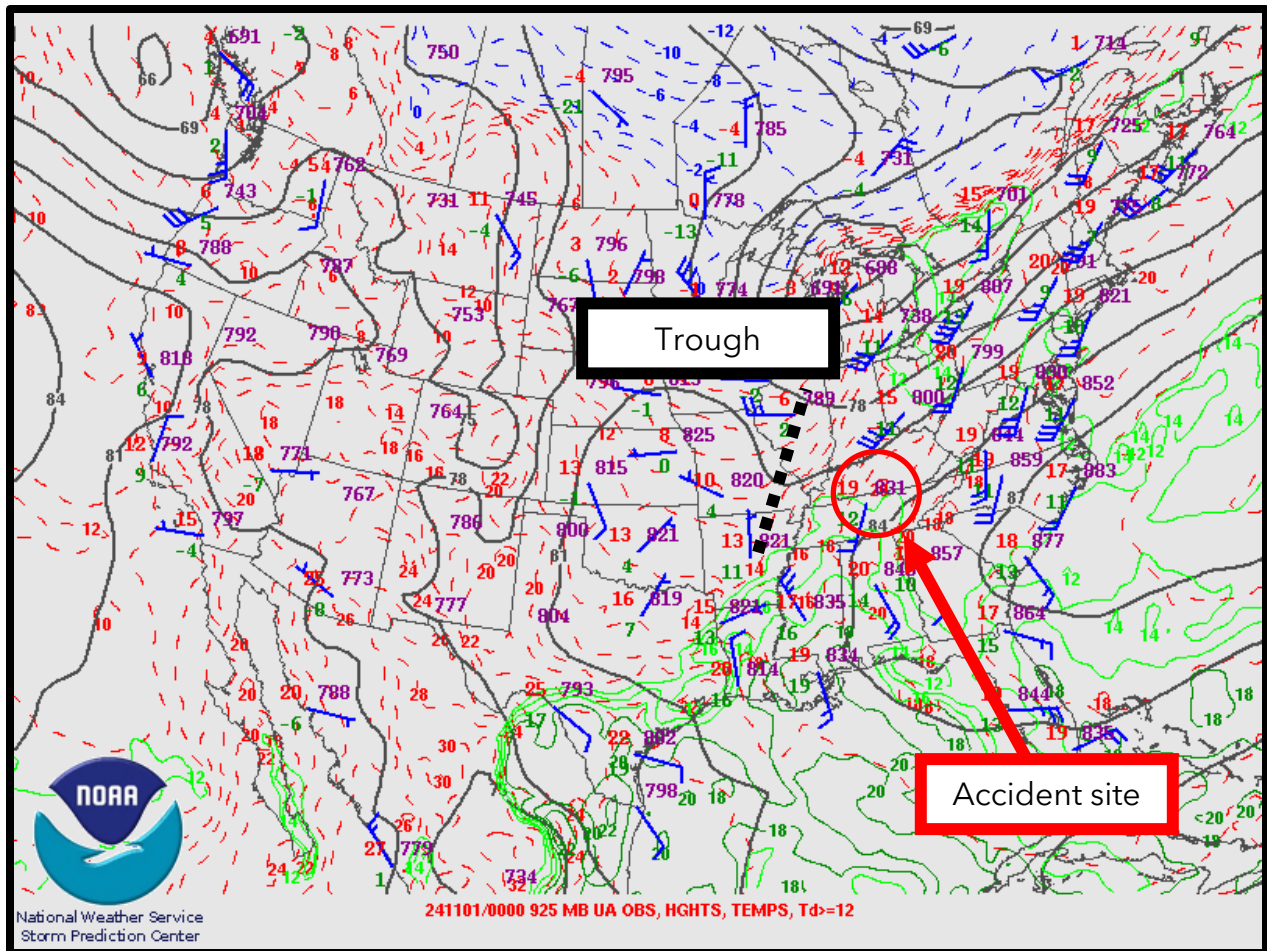


Figure 2. 925-hPa Constant Pressure Chart for 1900 CDT.

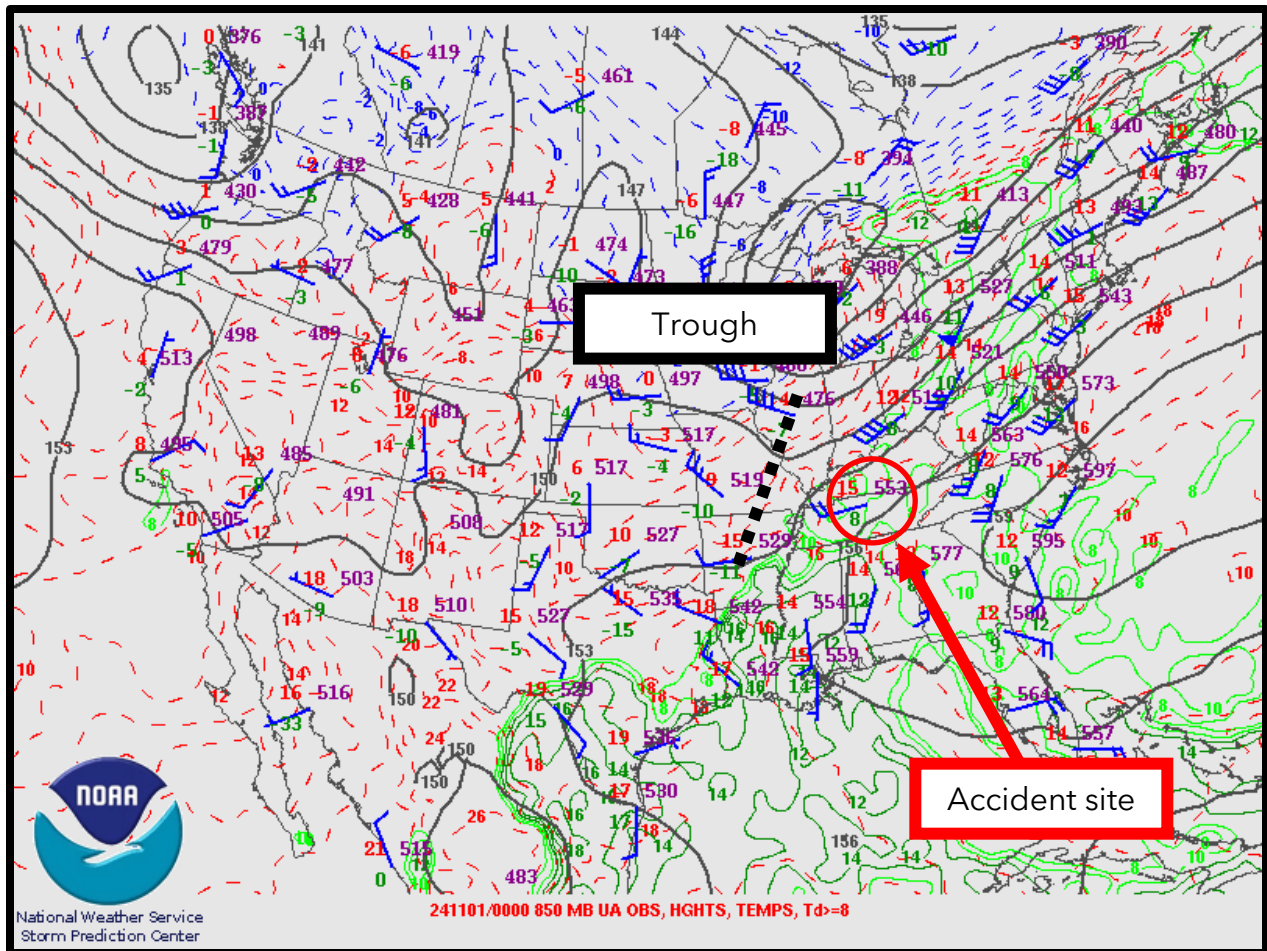


Figure 3. 850-hPa Constant Pressure Chart for 1900 CDT.

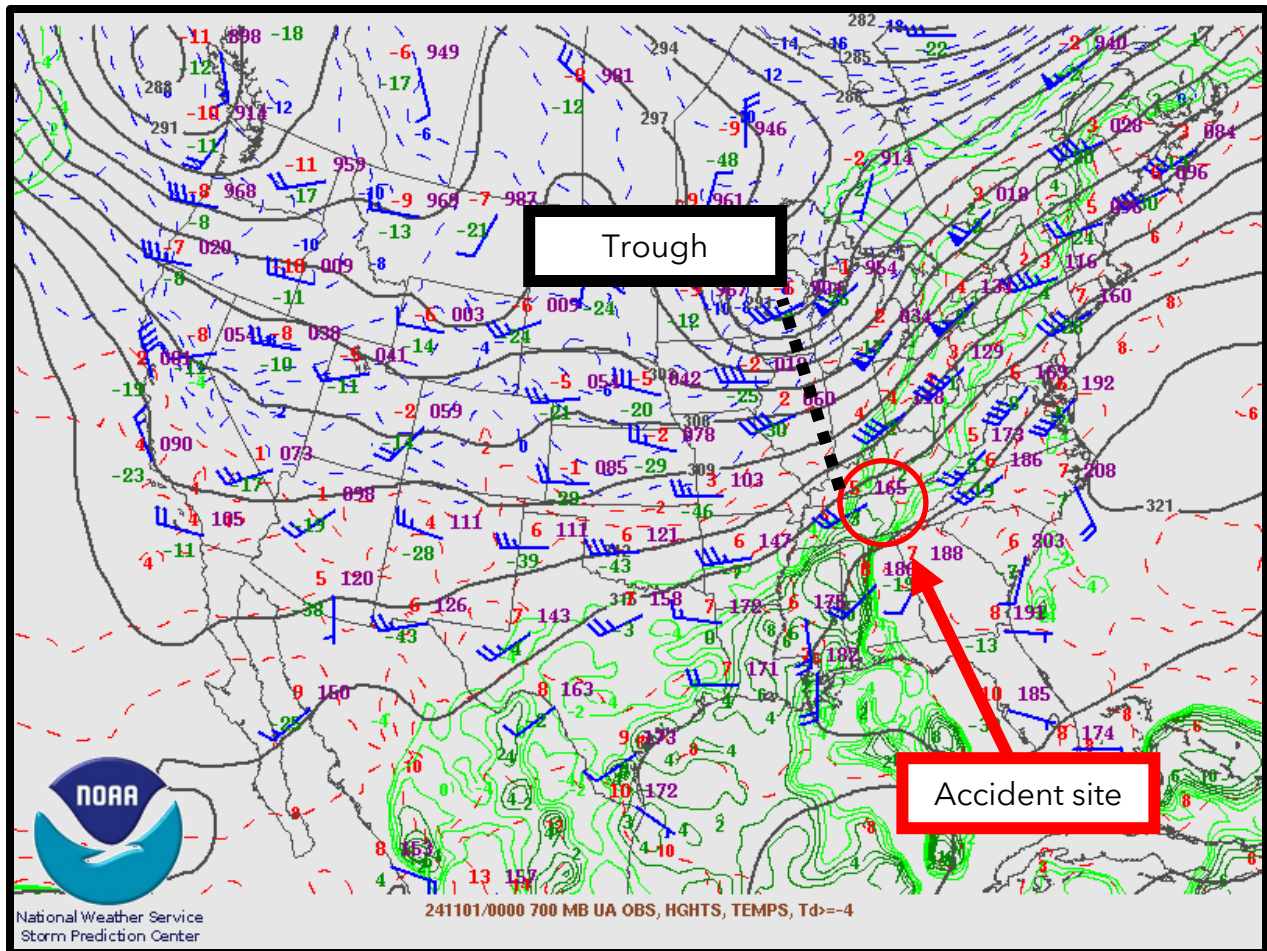


Figure 4. 700-hPa Constant Pressure Chart for 1900 CDT.

2.0 Storm Prediction Center Convective Outlook

SPC issued a Day 1 Convective Outlook at 1454 CDT (figure 5) with the accident site located in an area where a chance of thunderstorms was predicted. The SPC defines the “TSTM” area as an area where a 10% or higher probability of thunderstorms is forecast during the valid period.

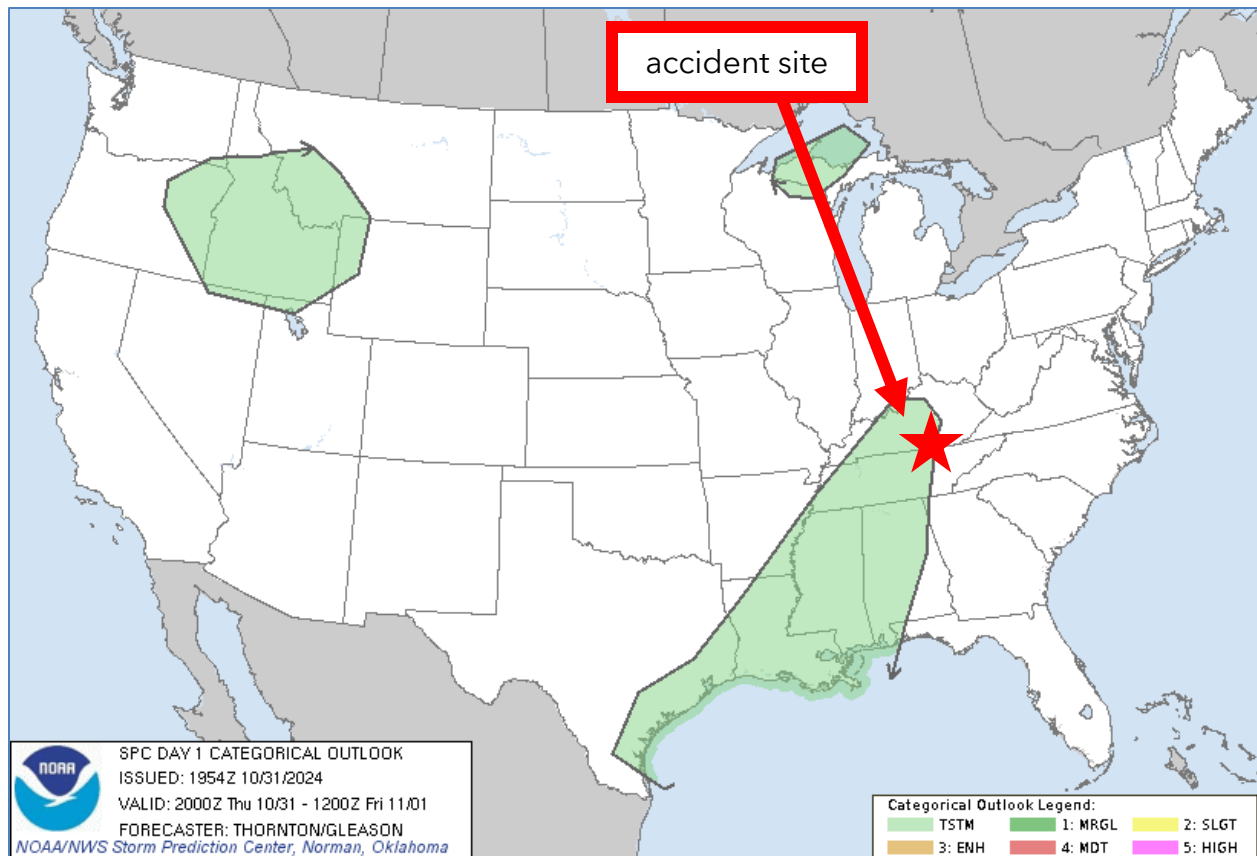


Figure 5. SPC day 1 Convective Outlook valid at the time of the accident.

3.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METARs) and Aviation Selected Special Reports (SPECIs)⁴. The following observations were taken from standard code and are provided in plain language. A magnetic variation⁵ of 5° west was indicated over the area (figure 6).

⁴ Latest criteria for SPECIs can be found in the Federal Meteorological Handbook: [Federal Meteorological Handbook Number 1, Surface Weather Observations and Reports \(icams-portal.gov\)](https://www.federalmeteorologicalhandbook.com/)

⁵ Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>



Figure 6. FAA sectional aeronautical chart of the accident area with the locations of the accident site and surface observation site noted.

Livingston Municipal Airport (K8A3) had the closest official weather station to the accident site. K8A3 had an Automated Weather Observing System (AWOS⁶) and its longline⁷ reports every 20 minutes were not augmented. The K8A3 AWOS was located 12 miles west-northwest of the accident site (figure 6), at an elevation of 1,372 ft, and issued the following observations surrounding the accident time:⁸

⁶ AWOS - Automated Weather Observing System is equipped with meteorological instruments to typically observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to 12,000 feet, and altimeter setting. AWOS are maintained by the FAA. Certain AWOS may have different reporting or observational equipment.

⁷ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline dissemination of weather observations is the primary vehicle through which the weather observations are distributed.

⁸ The bold sections of products in this report are intended to highlight the text that directly reference the weather conditions that affected the accident region around the accident time. The local times in this section next to the METARs are provided for quick reference.

[1715 CDT] METAR K8A3 312215Z AUTO 23007KT 190V260 10SM
BKN044 BKN050 OVC070 23/15 A3010 RMK A01=

[1735 CDT] METAR K8A3 312235Z AUTO 32011G22KT 3/4SM BR
BKN006 BKN024 OVC031 17/15 A3012 RMK A01=

[1755 CDT] METAR K8A3 312255Z AUTO 33006G13KT 8SM SCT031
OVC040 16/15 A3012 RMK A01 P0004=

[1815 CDT] METAR K8A3 312315Z AUTO 00000G10KT 9SM FEW024
BKN028 OVC041 16/15 A3013 RMK A01=

**[1835 CDT] METAR K8A3 312335Z AUTO 00000KT 10SM OVC029
16/15 A3013 RMK A01=**

ACCIDENT TIME 1837 CDT

**[1855 CDT] METAR K8A3 312355Z AUTO 00000KT 10SM OVC031
16/15 A3014 RMK A01 P0001=**

[1910 CDT] METAR K8A3 010010Z AUTO 00000KT 8SM OVC030 16/15
A3015 RMK A01=

The bold type observations decoded in plain language were as follows:

K8A3 weather at 1835 CDT, automated, wind calm, visibility 10 miles or greater, overcast ceiling at 2,900 ft above ground level (agl), temperature of 16°C, dew point temperature of 15°C, and an altimeter setting of 30.13 inches of mercury (inHg). Remarks, automated station without a precipitation discriminator.

K8A3 weather at 1855 CDT, automated, wind calm, visibility 10 miles or greater, overcast ceiling at 3,100 ft agl, temperature of 16°C, dew point temperature of 15°C, and an altimeter setting of 30.14 inHg. Remarks, automated station without a precipitation discriminator, 0.01 inches of precipitation since 1755 CDT.

The observations from the K8A3 AWOS around the accident time identified MVFR to VFR⁹ conditions.

⁹ The NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories:

- Low Instrument Flight Rules (LIFR*) - ceiling below 500 ft above ground level (agl) and/or visibility less than 1 statute mile.
- Instrument Flight Rules (IFR) - ceiling between 500 to below 1,000 feet agl and/or visibility 1 to less than 3 miles.
- Marginal Visual Flight Rules (MVFR**) - ceiling from 1,000 to 3,000 ft agl and/or visibility 3 to 5

4.0 Upper Air Sounding

A High-Resolution Rapid Refresh (HRRR)¹⁰ model sounding was created¹¹ for the approximate accident site coordinates for 1900 CDT. The HRRR sounding was plotted on a standard Skew-T Log P diagram¹² from the surface to 600-hPa (or approximately 14,000 ft) using the RAOB¹³ software package and is included as figure 7. The sounding depicted an elevation of 1,683 ft over the grid point. The sounding depicted the lifted condensation level (LCL)¹⁴ at 2,063 ft, the level of free convection (LFC)¹⁵ at 2,119 ft, and the convective condensation level (CCL)¹⁶ at 4,682 ft. The freezing level was located at 13,347 ft. The precipitable water value was 1.43 inches.

miles.

- Visual Flight Rules (VFR) - ceiling greater 3,000 ft agl and visibility greater than 5 miles.

* By definition, IFR is a ceiling less than 1,000 ft agl and/or visibility less than 3 miles while LIFR is a sub-category of IFR.

**By definition, VFR is a ceiling greater than or equal to 3,000 ft agl and visibility greater than 5 miles while MVFR is a sub-category of VFR.

¹⁰ The HRRR is a NOAA real-time three-kilometer resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by three-kilometer grids with three-kilometer radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a one-hour period.

¹¹ HRRR sounding was created using NOAA Air Resource Laboratory: [READY Archived Meteorology \(noaa.gov\)](https://ready.noaa.gov/).

¹² Skew T log P diagram - is a standard meteorological plot using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

¹³ RAOB - (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Esonde Research Services, The Villages, Florida.

¹⁴ LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹⁵ LFC - The level at which a parcel of saturated air becomes warmer than the surrounding air and begins to rise freely. This occurs most readily in a conditionally unstable atmosphere.

¹⁶ CCL - The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.

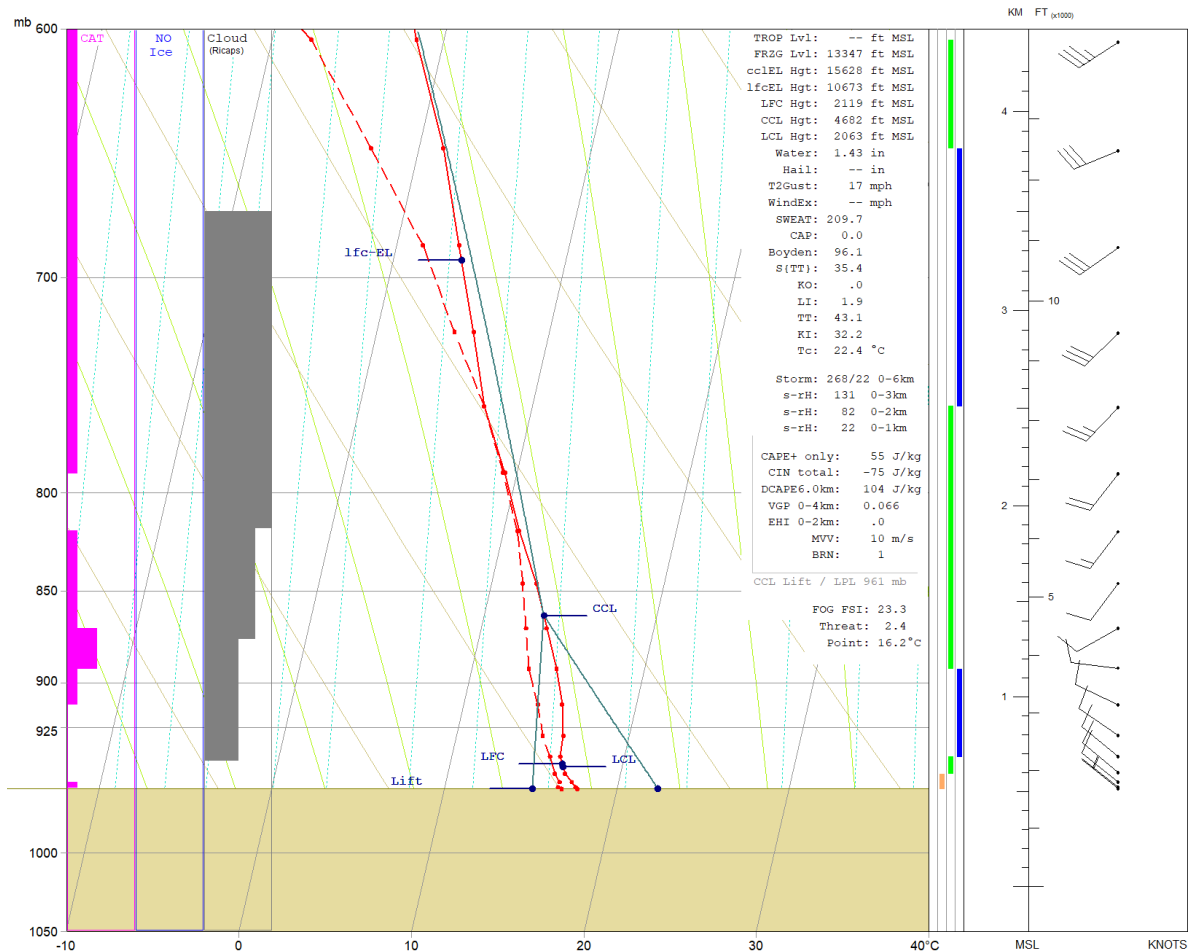


Figure 7. 1900 CDT HRRR sounding.

The 1900 CDT HRRR sounding indicated an unstable to conditionally unstable atmosphere from the surface through 2,250 ft, then a stable atmosphere from 2,250 ft through 3,750 ft, then another conditionally unstable layer between 3,750 ft and 8,200 ft. There was a Convective Available Potential Energy (CAPE)¹⁷ of 55 Joules/kilogram (J/kg), and the maximum vertical velocity (MVV) for this atmosphere was calculated as 10 meters/second (about 1,970 ft per minute).¹⁸ RAOB indicated cloud cover between 2,000 ft and 10,500 ft. No icing was indicated below 13,000 ft.

¹⁷ Convective Available Potential Energy (CAPE) - CAPE is a measure of the amount of energy available for convection and is directly related to the maximum potential vertical speed within an updraft.

¹⁸ MVV is not usually considered a realistic estimate for maximum vertical velocity in a storm. Anecdotes suggest considering a value of MVV/2, however it is not well understood when or where such a half-value should be applied.

The 1900 CDT HRRR sounding wind profile indicated a near-surface wind from 310° at 6 knots with the wind remaining northwesterly through 3,500 ft. The wind veered¹⁹ to the southwest above 3,500 ft. The wind speed increased to 10 knots by 2,000 ft, with a wind speed above 25 knots by 8,000 ft. RAOB indicated very light clear air turbulence in two layers between 3,000 ft and 14,000 ft.

5.0 Satellite Data

Geostationary Operational Environmental Satellite number 16 (GOES-16) visible and infrared data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. Visible and infrared imagery (GOES-16 bands 2 and 13, respectively) at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period from 1500 CDT through 2200 CDT and reviewed, and the closest images to the time of the accident were documented. Due to the sun angle the visible imagery was not useful around the accident time.

Figure 8 presents the GOES-16 infrared image at 1836 CDT at 6X magnification with the accident site highlighted with a red square. Cloud cover was indicated above the accident site with lower brightness temperatures (yellow and green colors; higher cloud tops) located west of the accident site. The brightness temperature of 274 Kelvin²⁰ would have been near 13,000 ft based on the vertical temperature profile provided by the 1900 CDT HRRR sounding. It should be noted these figures have not been corrected for any parallax error.

¹⁹ Veered - Wind turning clockwise with height.

²⁰ around 1°C

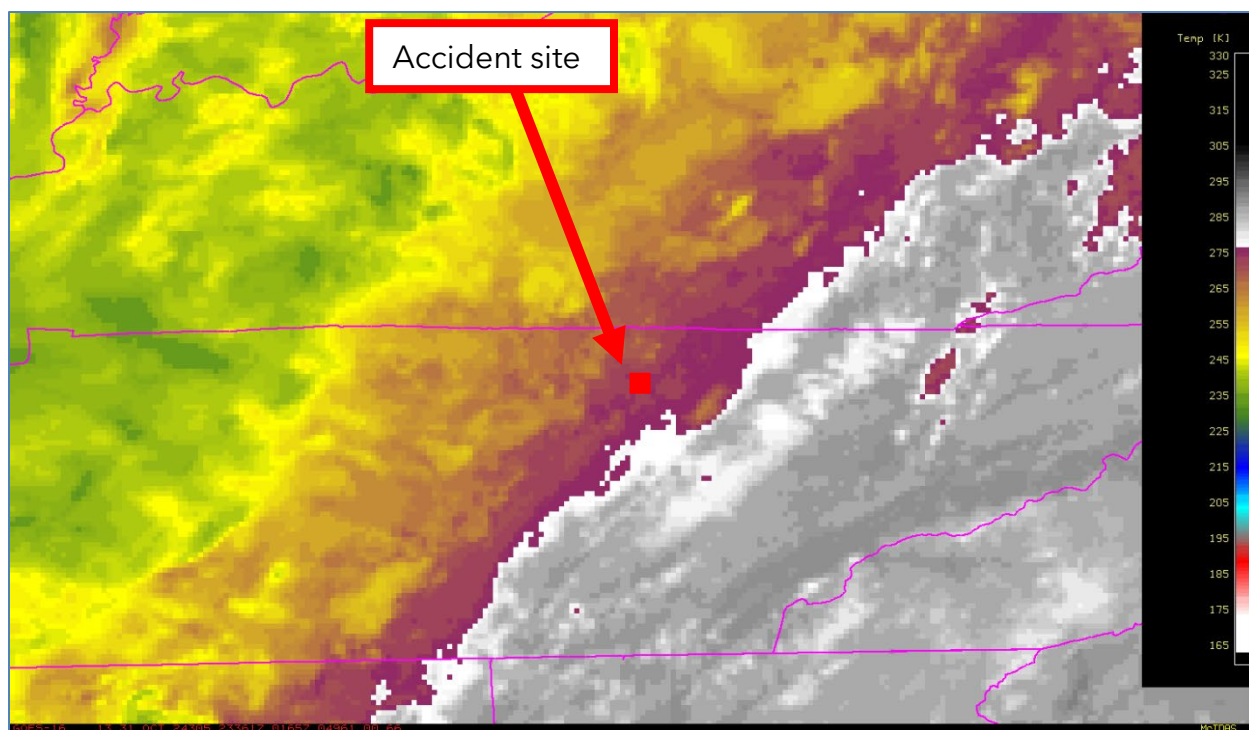


Figure 8. GOES-16 infrared image at 1836 CDT.

6.0 National Radar Imagery

A regional view of the NWS National Reflectivity Mosaic is included as figure 9 for 1840 CDT with the approximate location of the accident site marked by a white and red circle. The mosaic imagery depicted echoes of 10 to 30 dBZ²¹ above the accident site.

²¹ dBZ - A non-dimensional "unit" of radar reflectivity which represents a logarithmic power ratio (in decibels or dB) with respect to radar reflectivity factor, Z.

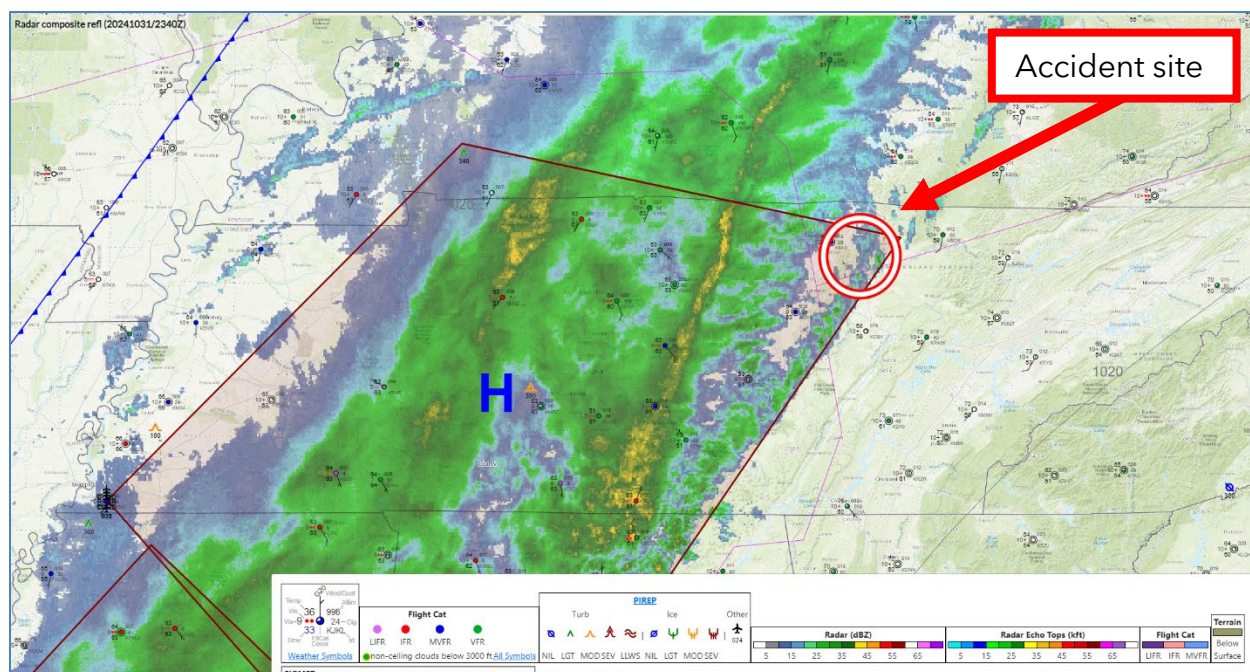


Figure 9. National Reflectivity Mosaic for 1840 CDT.

7.0 Weather Surveillance Radar Imagery

The closest NWS Weather Surveillance Radar-1988 Doppler (WSR-88D)²² to the accident site was from Nashville (KOHX), Tennessee, located 71 miles west of the accident site. The Level II archive radar data were obtained from the NCEI utilizing the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software.

²² The WSR-88D is an S-band 10-centimeter wavelength radar with a power output of 750,000 watts, and with a 28-foot parabolic antenna that concentrates the energy between a 0.87° and 0.96° beam width. The radar produces three basic types of products: base reflectivity, base radial velocity, and base spectral width.

7.1 Volume Scan Strategy

During the period surrounding the accident, the KOHX WSR-88D radar was operating in the precipitation mode VCP-215²³ (figure 10). The following figure provides an indication of the different elevation angles in this VCP, and the approximate height and width of the radar beam with distance from the radar site.

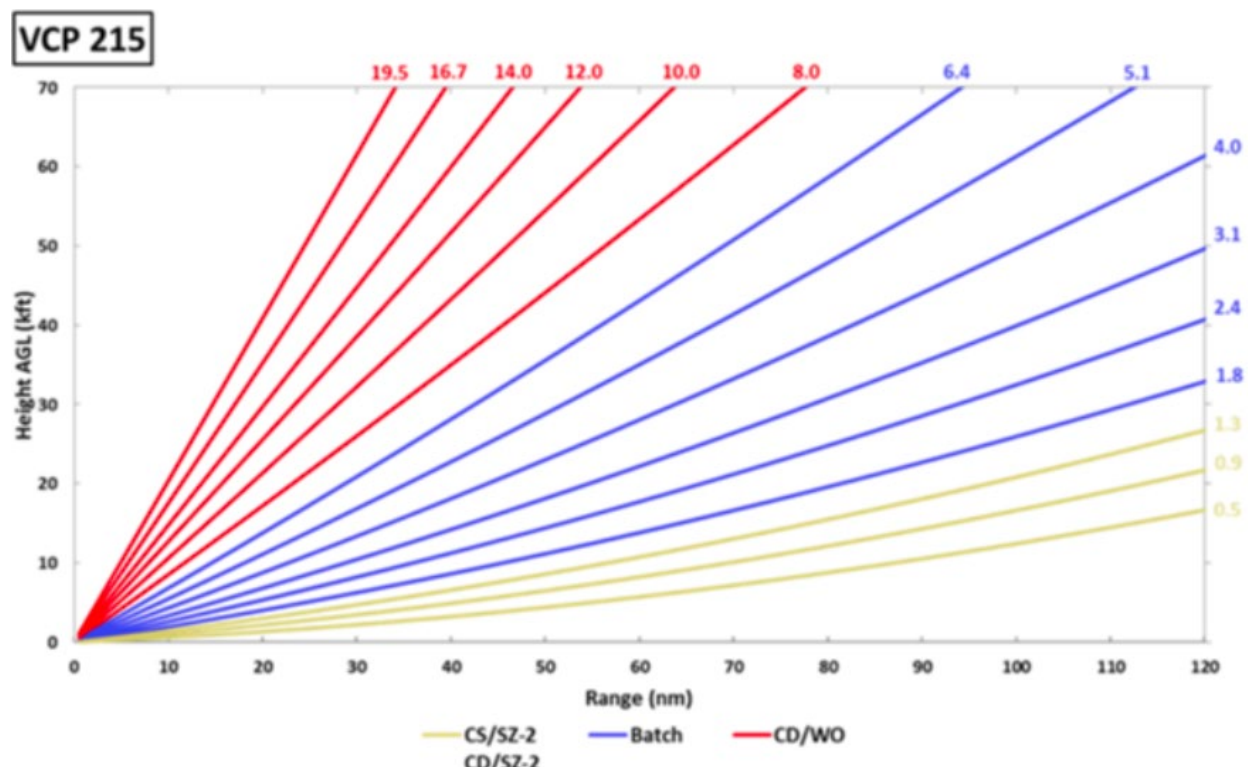


Figure 10. VCP-215 precipitation Mode Scan Strategy.

²³ Contiguous Surveillance (CS)--The low Pulse Repetition Frequency (PRF) scan of the split cut. Gives a high R_{max} value to determine proper target location and intensity, but a low V_{max} value limits the velocities that can be measured.

Contiguous Doppler (CD)--The high PRF scan of the split cut. Gives a low R_{max} value causing more range folded (multiple trip) echoes, but a high V_{max} value to get higher, more accurate velocity values. Batch Mode - Uses alternating low and high PRFs on each radial for one full rotation at each elevation angle. The two resulting data sets (low PRF and high PRF) are combined to resolve range ambiguity.

Used in the middle elevation angles.

W - With range unfolding (W)

WO - Without range unfolding (WO)

7.2 Beam Height Calculation

Assuming standard refraction²⁴ of the KOHX WSR-88D radar beam with the antenna elevation at 676 ft, and considering a beamwidth²⁵ of 0.95°, the following table shows the approximate heights for the 0.5° radar beam's center, top and base over the accident site. These heights have been rounded to the nearest 10 ft.

ANTENNA ELEVATION	BEAM CENTER	BEAM BASE	BEAM TOP
KOHX 0.5°	8,010 ft	4,430 ft	11,580 ft

Based on the radar height calculations, the elevation scans reviewed from KOHX listed in the above table combined to depict conditions between 4,430 ft and 11,580 ft over the accident site.

7.3 Reflectivity

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors²⁶ it is a function of the drop size distribution, number of particles per unit volume, physical state (ice or water), shape, and aspect. Reflectivity is normally displayed in dBZ and is a general measure of echo intensity. The FAA Aviation Weather Handbook also defines the echo intensity levels and weather radar echo intensity terminology associated with those levels. For dBZ values less than 30 the weather radar echo intensity terminology should be "light." For dBZ values between 30 and 40, the terminology should be "moderate." "Heavy" terminology is used for dBZ values greater than 40 dBZ to 50 dBZ, inclusive. Finally, any dBZ values above 50 dBZ shall be described as "extreme."

²⁴ Standard Refraction in the atmosphere is when the temperature and humidity distributions are approximately average, and values set at the standard atmosphere.

²⁵ Beamwidth - the angular separation between the half power points on the antenna radiation pattern, where the gain is one half the maximum value.

²⁶ Hydrometeors are any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at the earth's surface; also, any water particles blown by the wind from the earth's surface. Hydrometeors are classified as; (a) Liquid or solid water particles suspended in the air: cloud, water droplets, mist, or fog. (b) Liquid precipitation: drizzle and rain. (c) Freezing precipitation: freezing drizzle and freezing rain. (d) Solid (frozen) precipitation: ice pellets, hail, snow, snow pellets, and ice crystals. (e) Falling particles that evaporate before reaching the ground: virga. (f) Liquid or solid water particles lifted by the wind from the earth's surface: drifting snow, blowing snow, blowing spray. (g) Liquid or solid deposits on exposed objects: dew, frost, rime, and glazed ice.

7.4 Base Reflectivity Data and Lightning Data

Figures 11 and 12 present the KOHX WSR-88D base reflectivity images for the 0.53° elevation scans initiated at times of 1833:05 and 1839:07 CDT with resolutions of 0.5° X 250 m. These images depicted portions of reflectivity values between 5 and 30 dBZ or light intensity echoes along the accident flight track in the last 5 minutes of flight. The reflectivity values were moving from west to east (attachment 1).

There were no lightning flashes²⁷ reported within 25 miles of the accident site within 10 minutes prior to and following the accident time.²⁸

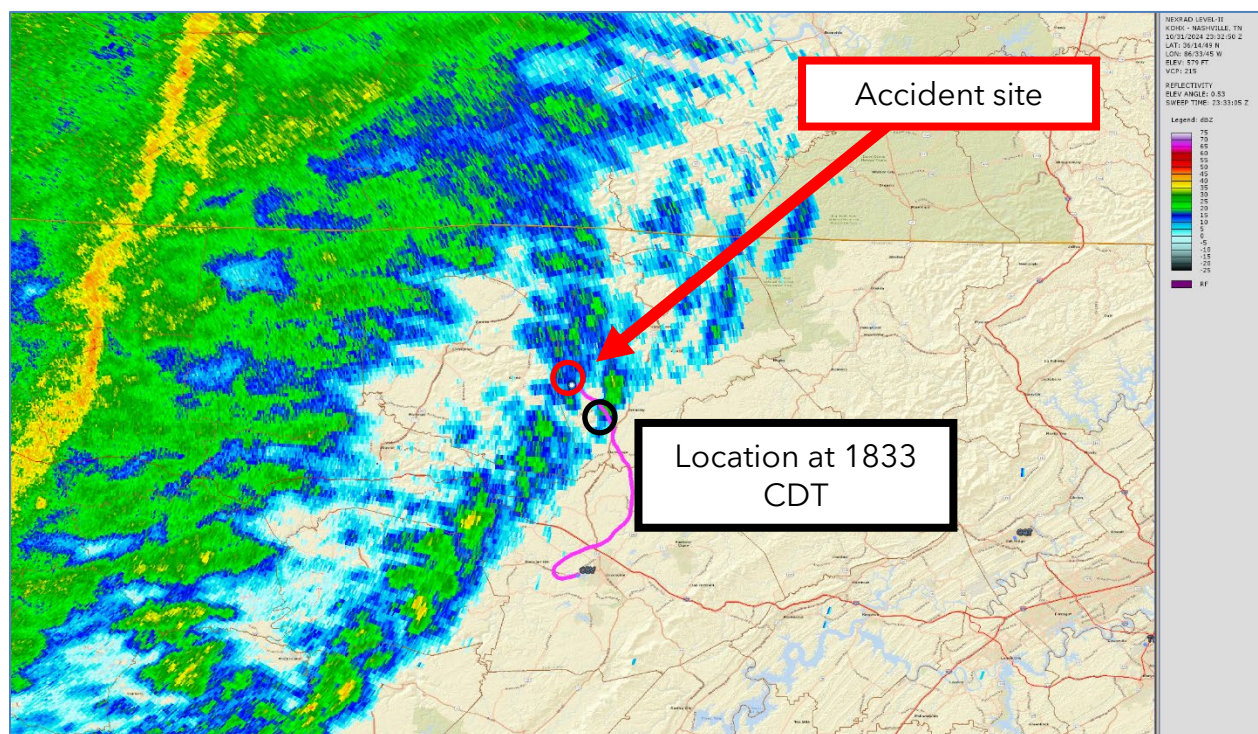


Figure 11. KOHX WSR-88D reflectivity for the 0.53° elevation scan initiated at 1833:05 CDT with the accident site marked with the red circle and the location of the accident aircraft in the black circle. The pink dots are the airplane flight track points.

²⁷ Lightning Flash – This is one contiguous conducting channel and all the current strokes/pulses that flow through it. There are two types of flashes: ground flashes and cloud flashes.

²⁸ A review of Earth Networks Total Lightning network and GOES-16 Geostationary Lightning Mapper (GLM) was done.

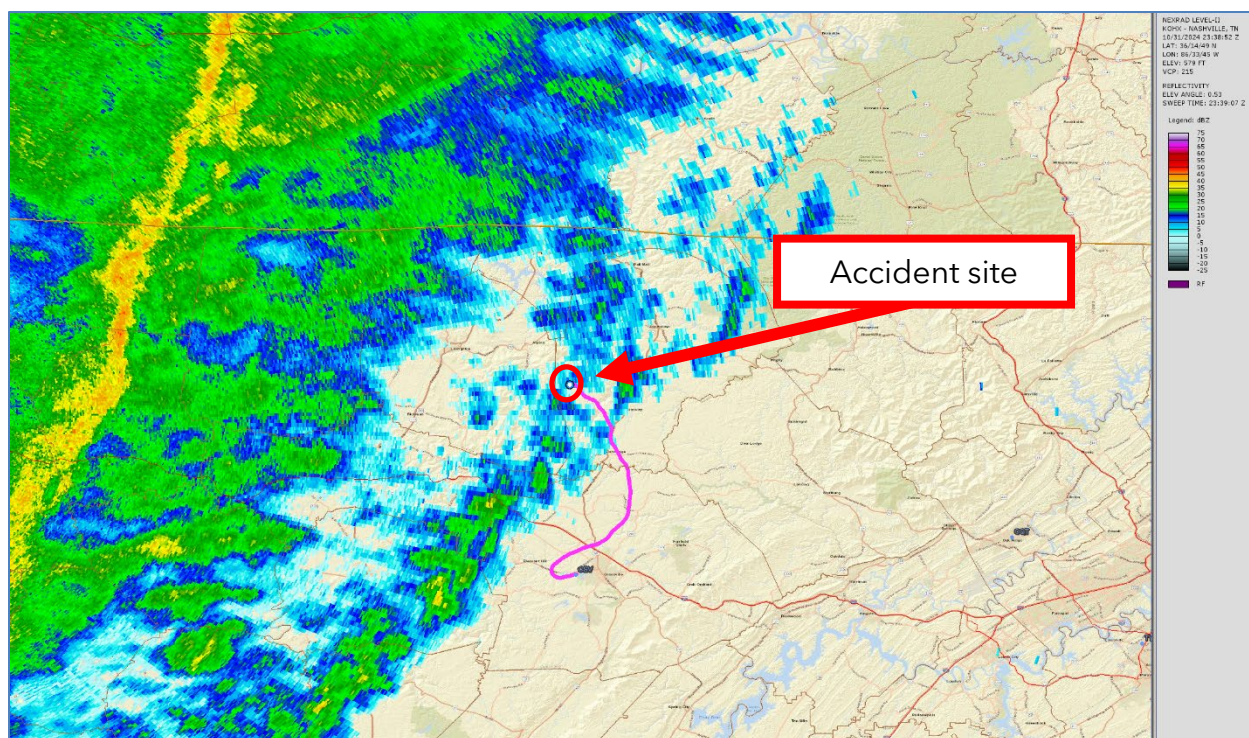


Figure 12. KOHX WSR-88D reflectivity for the 0.53° elevation scan initiated at 1839:07 CDT with the accident site marked with the red circle. The pink dots are the airplane flight track points.

8.0 Pilot Reports

There were no longline-disseminated pilot reports²⁹ (PIREPs) distributed into the national airspace system (NAS) within 2 hours of the accident time and within 60 miles of the accident site for below 18,000 ft.

²⁹ Only PIREPs with the World Meteorological Organization headers UBTN**, UBKY**, UBVA**, and UBNC** were considered. These do not include pilot reports only broadcast via radio.

9.0 Significant Meteorological Information

There were no non-convective Significant Meteorological Information (SIGMET) advisories valid for the accident site at the accident time. There was a Convective SIGMET³⁰ valid for the accident site at the accident time. SIGMET 79C issued at 1755 CDT, valid through 1955 CDT, forecast an area of embedded thunderstorms with tops to FL230³¹ with the SIGMET box area moving from 250° at 35 knots:

WSUS32 KPCI 312255
SIGC
-MKCC WST 312255
CONVECTIVE SIGMET 79C
VALID UNTIL 0055Z
TN KY AL MS
FROM 60W BWG-50SW LOZ-60SW VUZ-MEM-60W BWG
AREA EMBD TS MOV FROM 25035KT. TOPS TO FL230.

10.0 Center Weather Service Advisories and Information

The Indianapolis (ZID) Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU) was responsible for the accident region. There was no Center Weather Advisory (CWA) valid for the accident site at the accident time.

³⁰ US Convective SIGMETs - Convective SIGMETs are issued in the conterminous U.S. if these conditions are occurring or expected to occur:

- Line of thunderstorms at least 60 miles long with thunderstorms affecting 40% of its length
- Area of thunderstorms covering at least 40% of the area concerned and exhibiting a very strong radar reflectivity or a significant satellite or lightning signature
- Embedded or severe thunderstorms expected to occur for more than 30 minutes

Special issuance criteria occur with tornado, hail greater than 3/4 inch in diameter, and wind gusts greater than or equal to 50 knots. Any convective SIGMET implies severe or greater turbulence, severe icing, and low level wind shear. A convective SIGMET may be issued for any convective situation which the forecaster feels is hazardous to all categories of aircraft. Bulletins are issued hourly at Hour+55. The text of the bulletin consists of either an observation and a forecast or just a forecast. The forecast is valid for up to 2 hours or until superseded by the next hourly issuance.

³¹ Flight Level - A Flight Level (FL) is a standard nominal altitude of an aircraft, in hundreds of ft. This altitude is calculated from the International standard pressure datum of 1013.25 hPa (29.92 inHg), the standard sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above mean sea level or above ground level.

11.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products issued by the AWC before the accident flight and valid at 1600 and 1900 CDT and issued around 1100 and 1700 CDT are shown in figures 13 through 16. The GFA surface forecasts applicable at 1600 and 1900 CDT for the accident site indicated VFR visibilities with a chance (between 30 and 60 percent) of rain showers with a south wind of 10 knots and gusts to 20 knots. The GFA cloud forecast applicable to the accident site for 1600 CDT indicated cirrus clouds at the accident site. The GFA cloud forecast applicable to the accident site for 1900 CDT indicated scattered to overcast cloud cover at the accident site with scattered clouds at 2,700 ft, overcast clouds at 7,000 ft, clouds tops at FL340. The Graphical AIRMETs³² (G-AIRMET) valid at 1600 and 1900 CDT are located on figures 13 through 16 and no G-AIRMETs were valid for the accident site for below 14,000 ft. The only human-generated information reflected in the two GFA products were the G-AIRMETs.

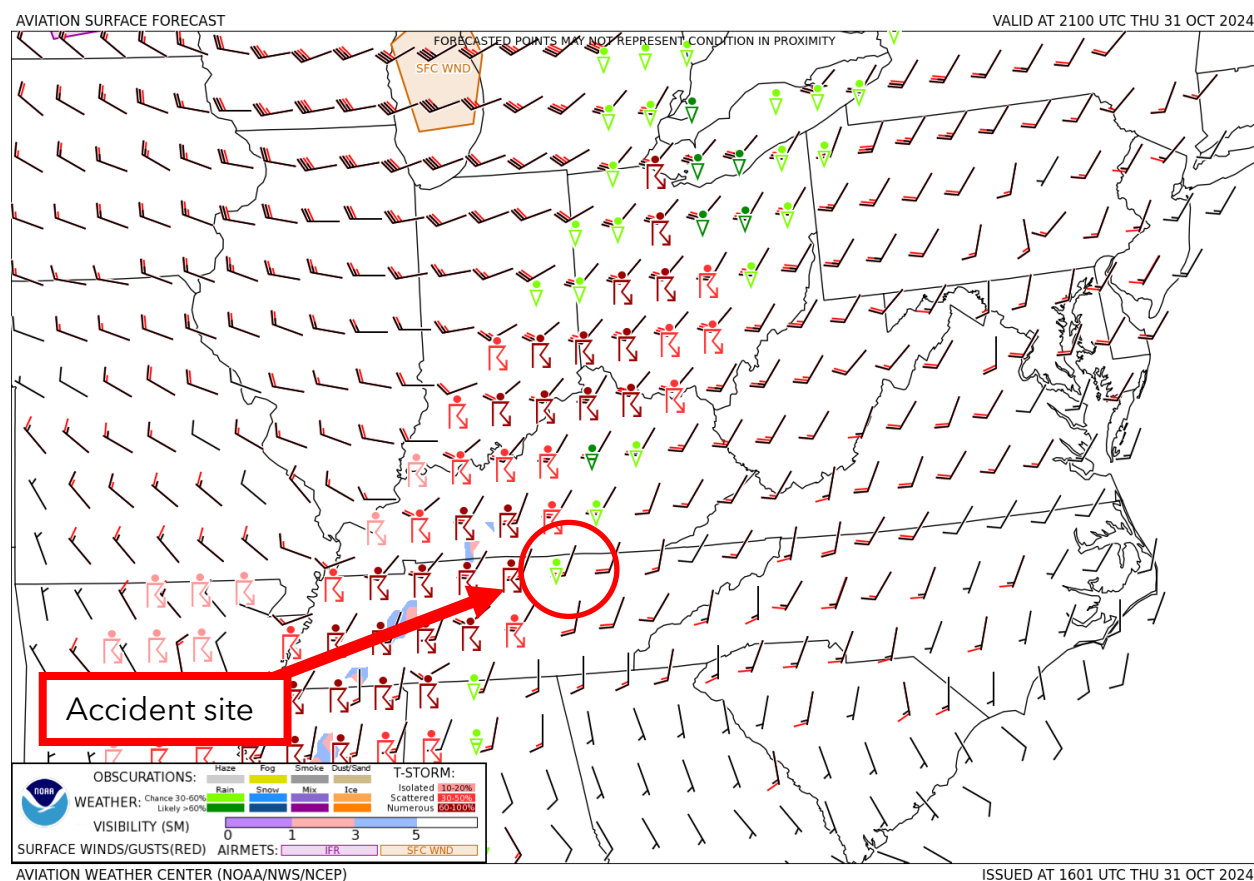
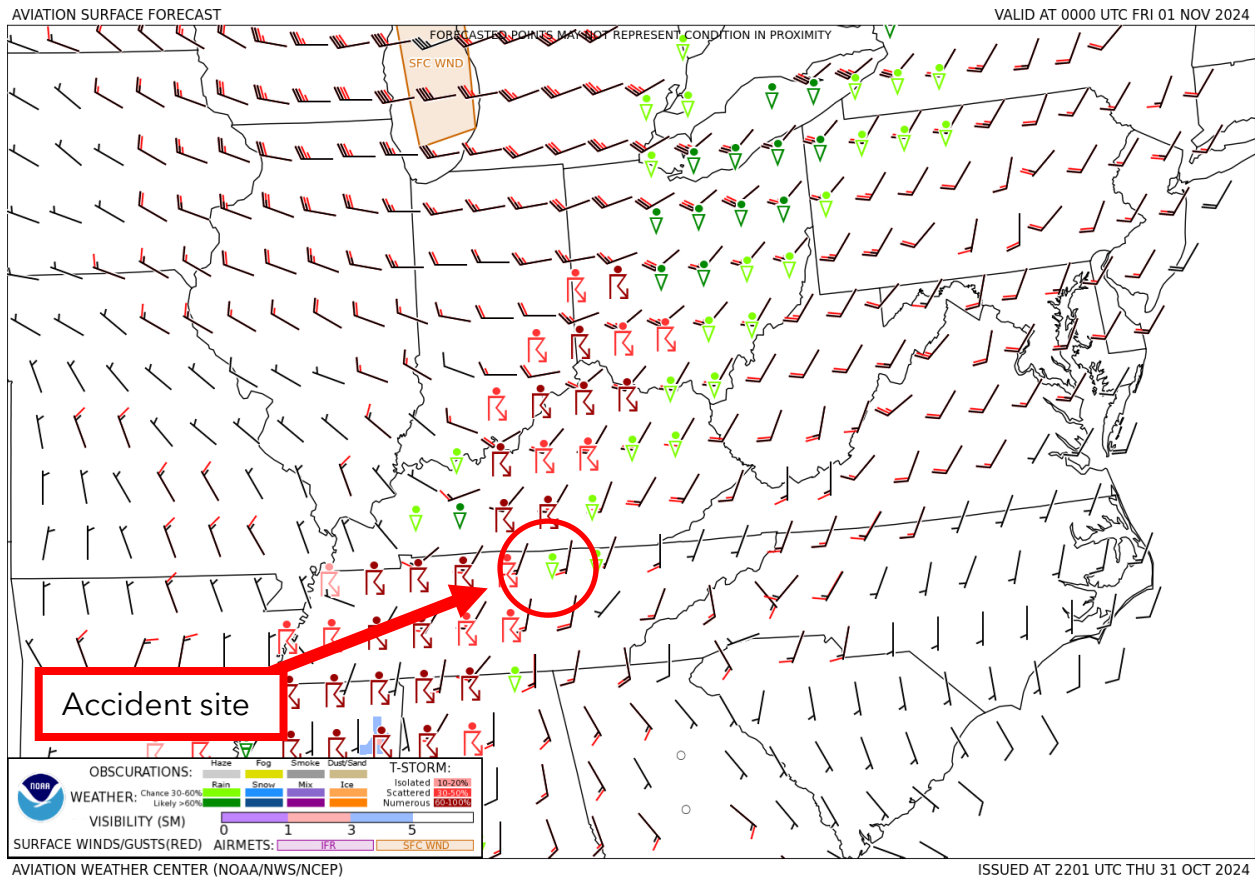


Figure 13. GFA Surface Forecast valid at 1600 CDT with forecast issued at 1101 CDT.

³² Graphical AIRMETs found on the Aviation Weather Center webpage at <http://aviationweather.gov>, are graphical forecasts of en-route weather hazards valid at discrete times no more than 3 hours apart for a period of up to 12 hours into the future (for example, 00, 03, 06, 09, and 12 hours). G-AIRMETs are snap shots at discrete time intervals as defined above. The text AIRMET is the result of the production of the G-AIRMET but provided in a time smear for a 6hr valid period.



AVIATION WEATHER CENTER (NOAA/NWS/NCEP)

ISSUED AT 2201 UTC THU 31 OCT 2024

Figure 14. GFA Surface Forecast valid at 1900 CDT with forecast issued at 1701 CDT.

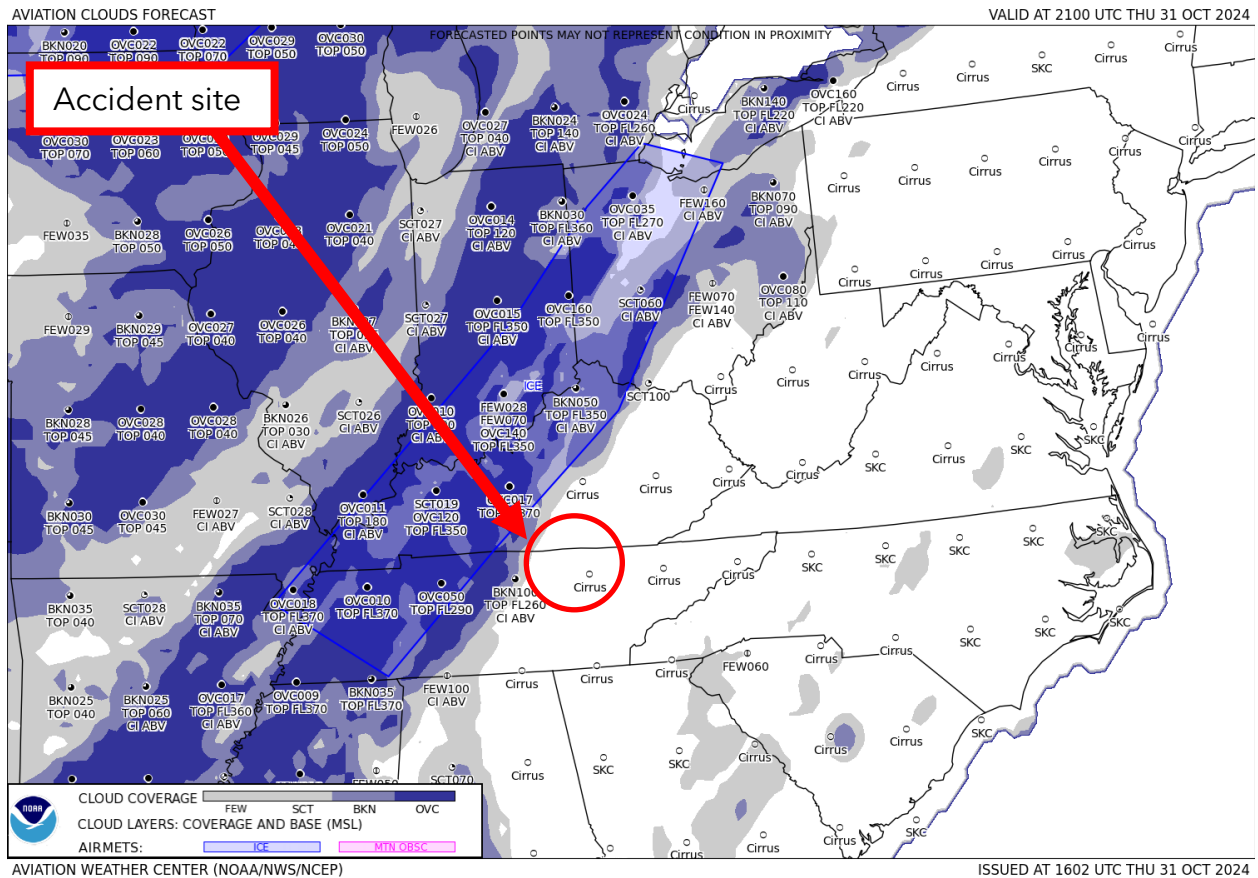


Figure 15. GFA Aviation Clouds Forecast valid at 1600 CDT with forecast issued at 1102 CDT.

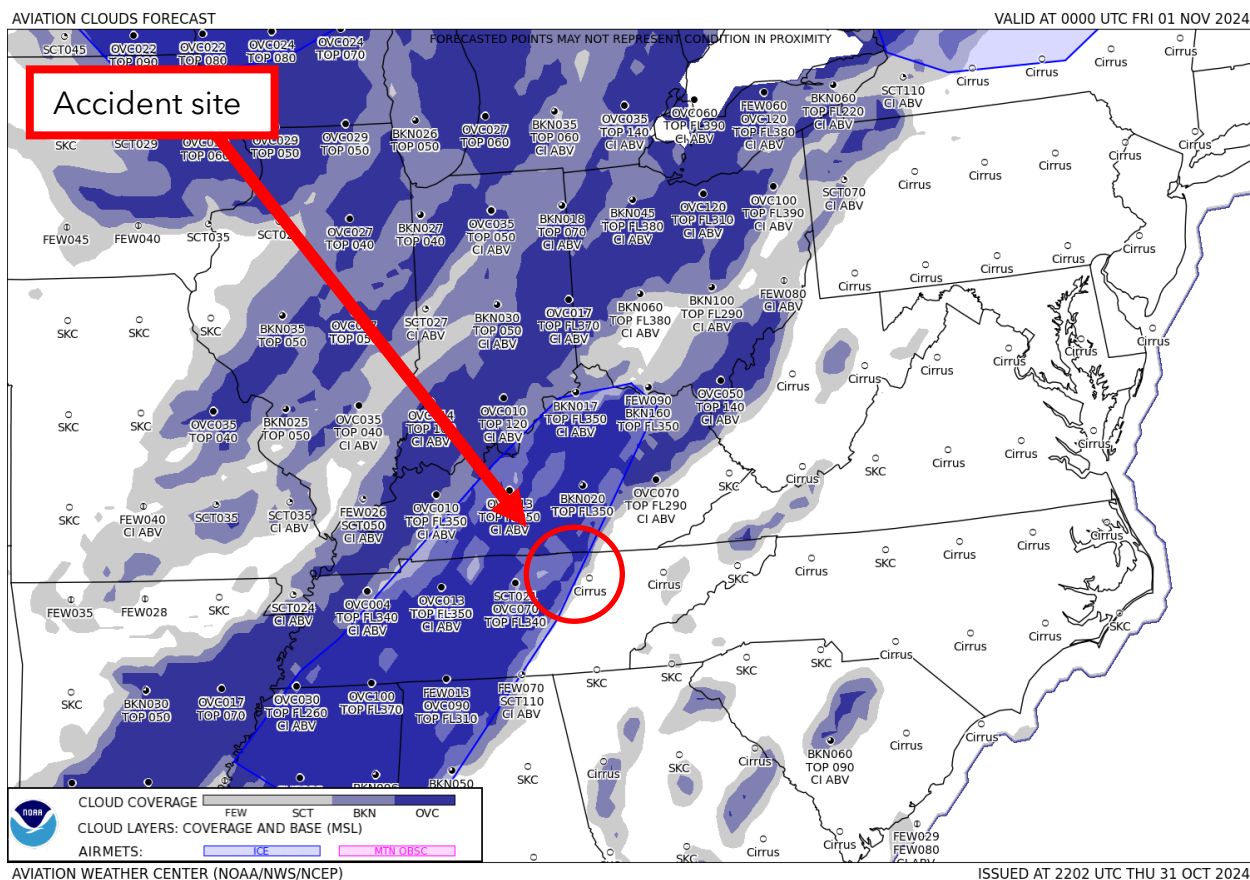


Figure 16. GFA Aviation Clouds Forecast valid at 1900 CDT with forecast issued at 1702 CDT.

12.0 Airmen's Meteorological Information

The AWC had text Airmen's Meteorological Information (AIRMET) advisory Tango valid for the accident site at the accident time. The text AIRMET was issued at 1545 CDT and forecast moderate turbulence conditions below 14,000 ft:

457
WAUS43 KKKCI 312045
WA3T
-CHIT WA 312045
AIRMET TANGO UPDT 5 FOR TURB AND STG SFC WINDS VALID UNTIL 010300

AIRMET TURB...ND SD NE MN IA WI LM LS MI
FROM YQT TO SSM TO 20SSE DSM TO 40NNW ANW TO 50NW RAP TO 60SSW
ISN TO 60SSW BJI TO 60W YQT TO YQT
MOD TURB BTN FL180 AND FL380. CONDS CONTG BYD 03Z THRU 09Z.

AIRMET TURB...IA MO WI LM MI LH IL IN KY
FROM SSM TO YVW TO 30SE ECK TO FWA TO CVG TO 30W HNN TO 80SE CVG
TO 50SE BWG TO 40E RZC TO 20NE SGF TO 20SSE DSM TO SSM
MOD TURB BTN FL180 AND FL380. CONDS CONTG BYD 03Z THRU 09Z.

AIRMET TURB...SD NE KS OK TX
FROM 50W RAP TO 70SSE RAP TO 20SW LBF TO 20SSE MCK TO 20SSE GCK
TO 30NNE TXO TO 30ESE TBE TO 50W LBL TO GLD TO BFF TO 70SW RAP
TO 50W RAP
MOD TURB BTN FL180 AND FL360. CONDS CONTG BYD 03Z THRU 09Z.

**AIRMET TURB...MN IA WI LM LS MI LH IL IN KY TN
FROM 20WNW SSM TO YVV TO 30SE ECK TO FWA TO CVG TO HNN TO HNV TO
GGO TO 20W JOT TO 30W DBQ TO 20N ODI TO 20WSW SAW TO 20WNW SSM
MOD TURB BLW 140. CONDS CONTG BYD 03Z THRU 09Z.**

AIRMET STG SFC WND...WI LM MI
FROM 40W TVC TO 30SSW PMM TO 20ENE ORD TO 30NNE BAE TO 40W TVC
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS CONTG BYD 03Z
ENDG 03-06Z.

OTLK VALID 0300-0900Z
AREA 1...TURB ND SD MN IA MO WI LM LS MI LH IL IN KY TN AL
BOUNDED BY 20ESE YQT-SSM-YVV-30SE ECK-FWA-CVG-HNN-HMV-40SSW VXV-
30ENE MSL-40SE PMM-60S ODI-70SW BRD-50SW BIS-20NE BIS-40WNW BRD-
40NE DLH-20ESE YQT
MOD TURB BTN FL180 AND FL380. CONDS CONTG THRU 09Z.

AREA 2...TURB ND SD NE KS MN IA
BOUNDED BY 40S BIS-70SW BRD-60S ODI-OBH-30W LBL-40NNE TCC-30ESE
TBE-50W LBL-GLD-BFF-70SW RAP-50ESE MLS-40S BIS
MOD TURB BTN FL180 AND FL360. CONDS CONTG THRU 09Z.

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13.0 Terminal Aerodrome Forecast

There were no airports within 20 miles of the accident site with an NWS Terminal Aerodrome Forecast³³ (TAF).

14.0 National Weather Service Area Forecast Discussion

The NWS weather forecast office in Nashville, Tennessee, (WFO OHX) was responsible for the public surface forecast in the region of the accident site. WFO OHX issued the following Area Forecast Discussion (AFD) at 1215 CDT, which was the AFD issued closest to the accident time with an aviation section.

FXUS64 KOHX 311715

³³ According to NWS Instruction 10-813: "An NWS TAF consists of the expected meteorological conditions significant to aviation at an airport for a specified time period. For the U.S., this is the area within five (5) statute miles (SM) of the center of an airport's runway complex."
www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

AFDOHX

Area Forecast Discussion
National Weather Service Nashville TN
1215 PM CDT Thu Oct 31 2024

...New AVIATION...

.SHORT TERM...
(Rest of today through Friday)
Issued at 1115 AM CDT Thu Oct 31 2024

Some of you are going to call me crazy, but I think I see something on the radar. Wait. Yep. It's there...it's rain! A weak line of showers and thunderstorms has leapt onto our doorstep at forecast time and whether you want to believe it or not, we're all going to see some rain by this time tomorrow. Cloud cover over Middle TN has been pretty extensive this morning and this is acting to hamper destabilization across the area. ACARS soundings continue to show low double digit surface based CAPEs. Lapse rates are still sub-5.0 deg/km. Shear values are still under 20 kts. This is all good news when it comes to any severe weather potential with this line of storms. A few pokes of sunshine over our far western counties may allow for some more instability over there so I can't completely rule out some gusty conditions with any of these storms as they cross the TN River, but if it happens, it'll be very isolated and relegated to counties west of I-65 and close to the TN River. Rainfall totals should be nice through this time tomorrow with everyone seeing between 0.25" and an inch. No drought buster, but we'll take it even though it's unfortunate for Halloween activities. Fropa will occur after midnight and while some showers will linger into the daylight hours across the south and east through about 10 am tomorrow morning, we should clear out during the afternoon and by tomorrow night, probably be looking at dense fog developing.

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.LONG TERM...
(Friday Night through next Thursday)
Issued at 1115 AM CDT Thu Oct 31 2024

Here's the real stinky part of all of this: November arrives tomorrow and it sure won't feel like it. Even with the passage of the cold front tonight, any cooler temperatures we get from it are going to be very short lived. Several places will be back into the low 80s as early as Sunday as high pressure takes over the region and we remain in southeast to southerly boundary layer flow. Why is this? Well, other than Mother Nature having it out for us, our next weather system is due in here on Tuesday. Here's the more odd part: even with multiple days of southerly flow ahead of this system, forecast soundings are still unimpressive. Yes, we'll have dew points in the low to mid-60s, but with the parent low all the way up

into Canada, the dynamics required for severe weather currently just aren't there. In fact, Tuesday could be very similar to what we're seeing today. Poor lapse rates, pretty saturated soundings and very little surface based instability. Lots of time between now and then, but for now, showers and thunderstorms look likely with the chance for some sub-severe gusty winds. Maybe we can at least get some cooler air by the end of next week.

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.AVIATION...

(18Z TAFS)

Issued at 1211 PM CDT Thu Oct 31 2024

A line of showers and thunderstorms is moving into western Middle TN at the start of this TAF period. This line will gradually weaken as it moving eastward through the evening, but for western terminals, periods of lightning will be possible before 00Z. Otherwise, gusty winds of 20 to 30 knots and MVFR visibility from heavy rain will be possible. MVFR to IFR cigs will develop behind the line tonight and will persist through Friday morning.

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.PRELIMINARY POINT TEMPS/POPS...

Nashville	58	71	56	76	/	100	30	10	10
Clarksville	53	70	49	75	/	60	0	0	10
Crossville	57	67	54	73	/	80	80	10	10
Columbia	58	70	56	78	/	80	40	10	10
Cookeville	58	67	56	74	/	90	60	10	10
Jamestown	58	66	54	73	/	90	70	0	10
Lawrenceburg	58	70	57	78	/	80	50	10	0
Murfreesboro	58	70	56	78	/	100	40	10	10
Waverly	53	70	52	76	/	70	10	10	10

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.OHX WATCHES/WARNINGS/ADVISORIES...

None.

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15.0 Astronomical Data

The astronomical data obtained for the accident site on October 31, 2024, indicated the following:

SUN

Begin civil twilight	0636 CDT
Sunrise	0703 CDT
Sun transit	1224 CDT
Sunset	1745 CDT
End civil twilight	1811 CDT
Accident time	1837 CDT³⁴

At the time of the accident the Sun was below the horizon. At the time of the accident the Moon was below the horizon and did not rise until 1941 CDT.

16.0 Pilot Weather Information

Title 14 CFR 91.103 states that “Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight.” FAA AC 91-92 “Pilot’s Guide to a Preflight Planning” (dated March 15, 2021) provided pilot guidance on preflight self-briefings, including planning, weather interpretation, and risk identification/mitigation skills. The AC further stated in part:

Pilots adopting these guidelines will be better prepared to interpret and utilize real-time weather information before departure and en route, in the cockpit, via technology like Automatic Dependent Surveillance-Broadcast (ADS-B) and via third-party providers.³⁵

A search of archived information indicated that the accident pilot did not request weather information from Leidos Flight Service. The accident pilot did have an account with ForeFlight, but did not file a flight plan through ForeFlight. The accident pilot did view and update route strings (attachments 2 and 3). When the accident pilot viewed airport information from 5 airports, text weather information would have been available for the pilot to view, but it is unknown if the accident pilot viewed any text weather information. No weather imagery information was viewed on the ForeFlight account.

³⁴ Inserted accident time for reference and context.

³⁵ https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-92.pdf. The AC also listed multiple online FAA resources for aviation flight planning services for adverse weather.

E. LIST OF ATTACHMENTS

Attachment 1 - KOHX WSR-88D base reflectivity animation from 1814 to 1851 CDT

Attachment 2 - ForeFlight correspondence part 1

Attachment 3 - ForeFlight correspondence part 2

Submitted by:

Paul Suffern
Senior Meteorologist