

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA24FA294

METEOROLOGY

Specialist's Factual Report

June 22, 2024

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A. ACCIDENT

Location: Rutherfordton, North Carolina

Date: 7 July 2024

Time: 2106 eastern daylight time (0106 UTC¹ on 8 July 2024)

Aircraft: Type - Cessna 182; Registration - N2198G

B. METEOROLOGY INVESTIGATOR

Mike Richards

Senior Meteorologist

Office of Aviation Safety

Operational Factors Division (AS-30)

National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in eastern daylight time for 7 July 2024 (based upon the 24-hour clock), directions are referenced to true north, distances are in nautical miles and heights are above mean sea level (msl). The accident site was located at about: 35.5294° north latitude; 81.915802° west longitude; at an elevation of about 1,890 feet.

This report provides information on the weather conditions and forecasts applicable to the accident region at the accident time.

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Weather Observing System (AWOS) was located at Rutherford County Airport (FQD²) in Rutherfordton, North Carolina, which was located about 6 miles south

¹ UTC - abbreviation for Coordinated Universal Time

² This report uses the 3-digit International Air Transport Association format for airport identification, which does not use the geographic designating digit (e.g., "K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the 4-digit International Civil Aviation Organization (ICAO) identifier format. Weather observations from airports in this report are referenced by their reporting station's identifier (using ICAO format that includes the geographic designating digit), not by the airport at which the reporting station is located.

of the accident site at an elevation of 1,075 feet. Automated longline³ reports from the FQD AWOS during the times surrounding the accident time are presented here.

[2025] KFQD 080025Z AUTO 00000KT 5SM RA SCT030 SCT065 BKN120 22/22
A3007 RMK AO2 P0005

[2045] KFQD 080045Z AUTO 00000KT 4SM RA BKN007 BKN027 BKN120 22/22
A3008 RMK AO2 P0008

**[2105] KFQD 080105Z AUTO 00000KT 7SM -RA OVC007 22/22 A3009
RMK AO2 LTG DSNT SE P0001**

[2125] KFQD 080125Z AUTO 00000KT 10SM -RA OVC007 22/22 A3009 RMK
AO2 LTG DSNT SE P0002

[2145] KFQD 080145Z AUTO 00000KT 10SM -DZ OVC007 22/22 A3008 RMK
AO2 LTG DSNT SE P0002

At 2105, the FQD AWOS reported a calm wind, visibility of 7 statute miles, light rain, ceiling overcast at 700 feet above ground level (agl), temperature of 22°C and dew point temperature of 22°C, altimeter setting of 30.09 inches of mercury; Remarks: automated station with a precipitation discriminator, lightning distant⁴ to the southeast, 0.01 inches of hourly liquid equivalent precipitation.

An AWOS was located at Foothills Regional Airport (MRN) in Morganton, North Carolina, which was located about 23 miles northeast of the accident site at an elevation of about 1,270 feet. Automated longline reports from the MRN AWOS during the times surrounding the accident time are presented here.

[2025] KMRN 080025Z AUTO 00000KT 10SM -RA SCT044 SCT055 OVC085
24/24 A3008 RMK AO2 P0001 T02410235

[2045] KMRN 080045Z AUTO 00000KT 7SM -RA SCT046 OVC085 24/24 A3008
RMK AO2 P0001 T02400235

**[2105] KMRN 080105Z AUTO 00000KT 4SM -RA SCT046 OVC095 24/24
A3009 RMK AO2 T02400235**

[2125] KMRN 080125Z AUTO 00000KT 7SM -DZ SCT095 24/23 A3009 RMK AO2
P0001 T02370234

³ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases (effectively, the whole world) 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 general global public has access to surface weather observations, particularly outside of the aviation community.

⁴ "Distant" means beyond 10 statute miles from the point of observation.

[2145] KMRN 080145Z AUTO 00000KT 5SM BR CLR 24/24 A3009 RMK AO2
P0001 T02380235

At 2105, the MRN AWOS reported a calm wind, visibility of 4 statute miles, light rain, scattered clouds at 4,600 feet agl, ceiling overcast at 9,500 feet agl, temperature of 24°C and dew point temperature of 24°C, altimeter setting of 30.06 inches of mercury; Remarks: automated station with a precipitation discriminator, temperature of 24.0°C and dew point temperature of 23.5°C.

2.0 Weather Radar

WSR-88D⁵ Level-II base reflectivity weather radar imagery from Greer, South Carolina, (site KGSP) is presented in Figure 1. KGSP was located approximately 41 miles south-southwest of the accident location with an antenna elevation of about 1,070 feet. Assuming standard refraction and considering the 0.95° beam width⁶ for the WSR-88D radar beam, the KGSP 0.218° tilt would have “seen” altitudes above the accident location of between about 1,100 and 5,200 feet. Figure 1 indicates that the accident aircraft’s flight track terminated in an area characterized by light reflectivity values⁷.

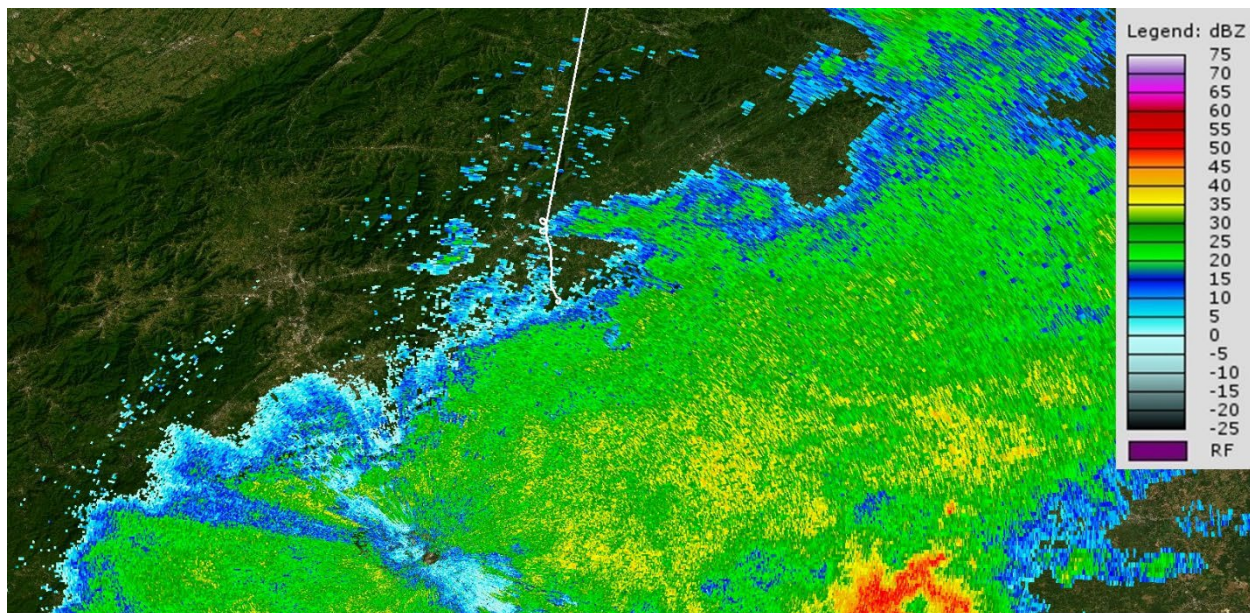


Figure 1 – KGSP WSR-88D 0.218° Level-II base reflectivity product from a sweep initiated at 2106.05. The accident aircraft’s flight track is marked by the white line.

⁵ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁶ Here we define the angular width of the radar beam as the region of transmitted energy that is bounded by one-half the maximum power. The maximum power lies along the beam centerline and decreases outward from the radar antenna.

⁷

https://www.faa.gov/sites/faa.gov/files/other_visit/aviation_industry/airline_operators/airline_safety/in_FO07008.pdf

3.0 CIWS

Archived echo tops data from the Federal Aviation Administration's Corridor Integrated Weather System (CIWS) for the accident region at 2105 are presented in Figure 2. The CIWS data indicate that the accident aircraft was in an area that had echo tops of 25,000 feet.

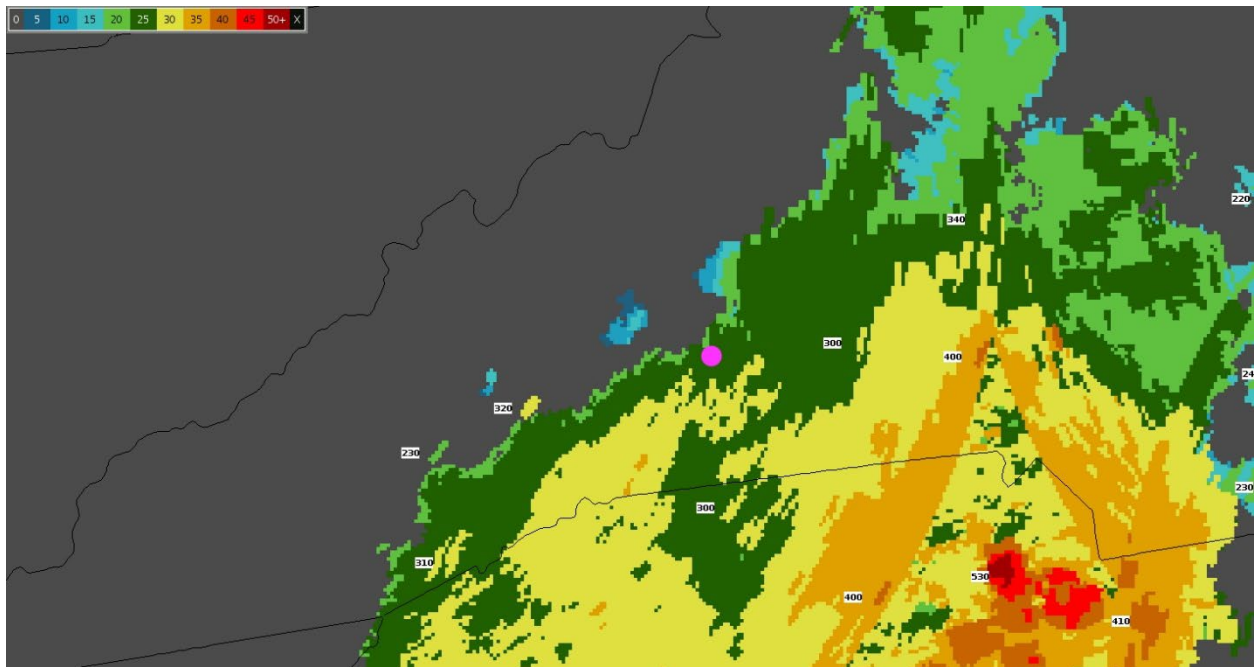


Figure 2 - Archive CIWS echo tops display from 2105. Accident location is denoted by the purple dot.

4.0 Lightning

A review of the Earth Networks Total Lightning Network (ENTLN) lightning database did not yield any flash total lightning activity near the accident location between 2055 and 2110.⁸

⁸ The ENTLN was queried for a geographic area bounded by latitudes 35.7866°N and 35.2972°N, and longitudes 82.4222°W and 81.4499°W.

5.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁹ sounding (Figure 3) for near the accident site¹⁰ at 2100 was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. In the lowest 15,000 feet of the atmosphere broken clouds were identified by RAOB from about 1,800 feet through 10,000 feet. The freezing level was at about 16,400 feet. Light low-level wind shear (LLWS) was identified below 2,000 feet. The wind nearest the surface was from the north-northwest at about 5 knots. Above this level the wind veered¹¹ and increased in magnitude to a north-northeast wind of about 15 knots at 3,000 feet, above which the wind varied between coming from the northeast to coming from the west-northwest at magnitudes up to 12 knots.

⁹ 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.

¹⁰ Coordinates used for the model were latitude: 35.53; longitude: -81.92.

¹¹ A veering wind's wind barbs turn clockwise with increasing height.

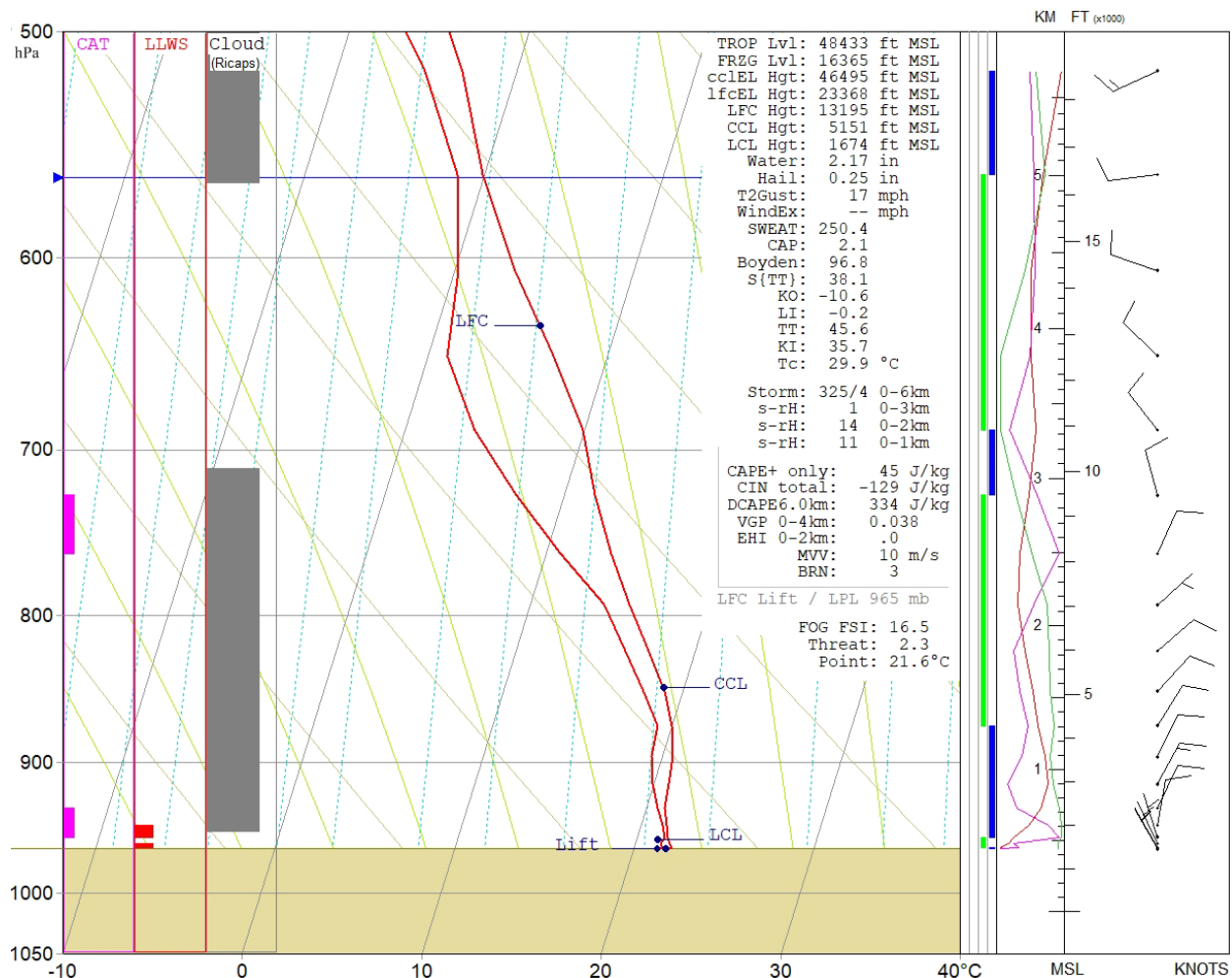


Figure 3 - HRRR model sounding data in SkewT/LogP format for 2100 near the accident site, surface to 500 hPa.

6.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-16 infrared (10.3 μ m) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from these data is presented in Figure 4. The brightness temperature over the accident site was 219 Kelvin (-54°C), which, when considering the 2100 HRRR sounding, corresponded to a cloud top height of about 42,000 feet (not shown in Figure 3).

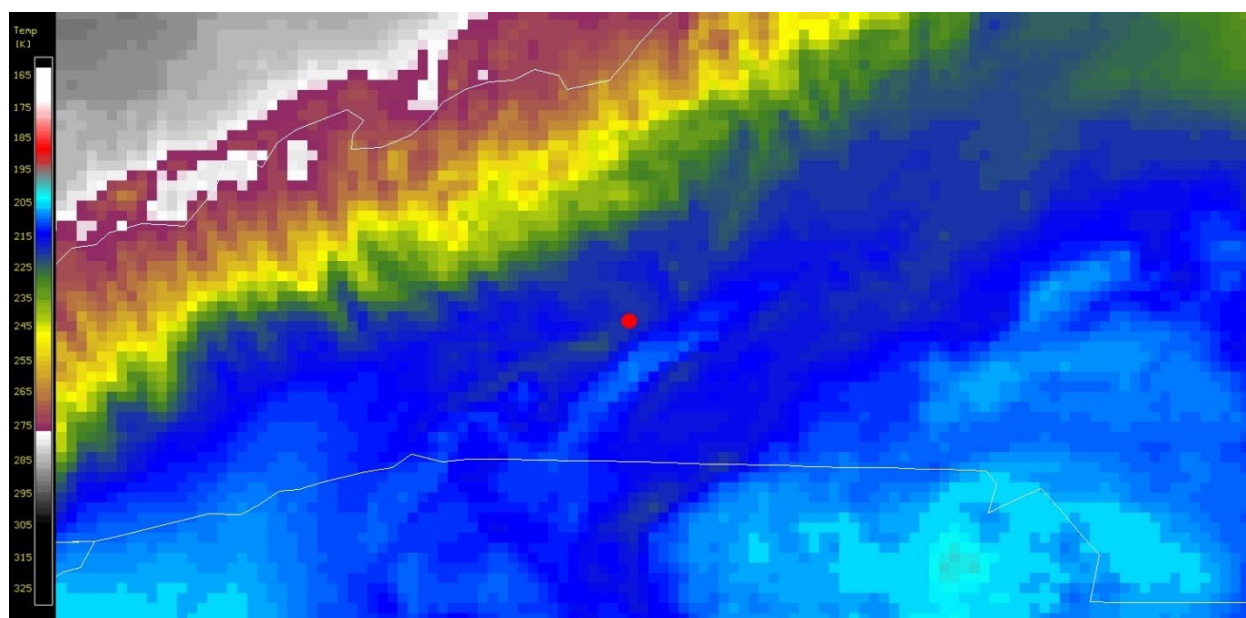


Figure 4 - GOES-16 infrared imagery from 2106. The accident location is denoted by the red dot. Image is not corrected for parallax error.

7.0 Pilot Reports

The only longline-disseminated pilot report¹² (PIREP) reported between 1900 and 2300 below 10,000 feet and within 50 miles of the accident location is presented here.

GSP UA /OV GSP/TM 0008/FL026/TP ACFT/RM BASES GSP 026 MSL

¹² These do not include pilot reports only broadcast via radio.

8.0 Area Forecast Discussion

The National Weather Service's (NWS) Greenville/Spartanburg, South Carolina, Weather Forecast Office issued the following Aviation section of an Area Forecast Discussion at 1935, applicable for a region that included the accident location.

FXUS62 KGSP 072335

AFDGSP

Area Forecast Discussion

National Weather Service Greenville-Spartanburg SC

735 PM EDT Sun Jul 7 2024

.AVIATION /00Z MONDAY THROUGH FRIDAY/...

At KCLT and elsewhere: Ongoing TSRA will start to taper off at all terminals through midnight, with lingering VCSH afterwards. All terminals had rain this evening and this will pose a higher confidence in VSBY/CIG restrictions during the overnight hours. Patchy BR is expected at all sites east of the mountains with FG possible at KAVL, with a TEMPO for 1sm VSBY from 09z-13z. Most other sites also have a TEMPO for a VSBY of 4sm and IFR CIGS during this time. Conditions should improve after daybreak, but will be slow given the deep amount of moisture in the area. Once VCSH/TSRA taper off, winds will become VRB or calm through the overnight hours, enhancing FG/BR potential. Winds should prevail more southerly once speeds start to pick up outside the mountain zones. There is a chance for another round of convection Monday evening, but coverage is not expected to be as widespread. PROB30 for this at all sites except KHKY, where confidence is the lowest.

Outlook: An active summertime pattern continues for most of the upcoming week, leading to showers/thunderstorms and possible restrictions each afternoon/evening. Fog or low stratus may develop each morning, especially over areas that received rain the previous day.

&&

9.0 SIGMETs

There were no non-convective Significant Meteorological Information (SIGMET) advisories active for the accident flight.

At 1955 Convective SIGMET 14E was issued for a region that included the accident location and warned of severe embedded thunderstorms with tops above FL450¹³, hail

¹³ Flight Level (FL) - a standard nominal altitude of an aircraft, in hundreds of feet. This altitude is calculated from the international standard pressure datum of 1013.25 hPa (29.92 inches of mercury), the

to 1 inch and surface wind gusts to 50 knots possible. The Convective SIGMET polygon was moving from 240° at 10 knots.

*WSUS31 KPCI 072355
SIGE
-MKCE WST 072355
CONVECTIVE SIGMET 14E
VALID UNTIL 0155Z
VA NC SC GA TN
FROM 10NE PSK-10N FLO-20ESE ATL-40E GQO-10NE PSK
AREA SEV EMBD TS MOV FROM 24010KT. TOPS ABV FL450.
HAIL TO 1 IN...WIND GUSTS TO 50KT POSS.*

However, at 2055 another Convective SIGMET that was valid for a region close to, but not including, the accident location was issued that superseded Convective SIGMET 14E.

*WSUS31 KPCI 080055
SIGE
-MKCE WST 080055
CONVECTIVE SIGMET 3E
VALID UNTIL 0255Z
VA NC SC GA TN AL AND SC CSTL WTRS
FROM 30SE PSK-40E SAV-60ESE MGM-10SSW GQO-30SE PSK
AREA EMBD TS MOV FROM 26010KT. TOPS ABV FL450.*

10.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the Center Weather Service Unit (CWSU) at the Atlanta Air Route Traffic Control Center that were active for the accident flight.

11.0 G-AIRMETS

A Graphical-Airmen's Meteorological Information (G-AIRMET) is a graphical advisory of weather that may be hazardous to aircraft but are less severe than what would be advised by a SIGMET. G-AIRMETS are only valid at discrete time "snapshots" that are

average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above msl or agl.

three hours apart for a period of up to 12 hours into the future (i.e., 00-, 03-, 06-, 09- and 12-hour forecasts). They are issued at 0300 UTC, 0900 UTC, 1500 UTC and 2100 UTC (with updates issued as necessary).

At about 1700, G-AIRMETs were issued for mountain obscuration in precipitation and mist that were valid at 2000 and 2300 for regions that included the accident location.

12.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) are intended to provide the necessary aviation weather information to give users a complete picture of the weather that might impact flight in the continental United States. The GFAs are available through the Aviation Weather Center's (AWC) website and provide hourly analyses and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS. The following information was retrieved from the AWC's GFA archive. Figures 5-10 present the GFA ceiling, visibility and cloud bases 00-hour and 01-hour forecasts valid at 2100. Figure 11 presents the GFA precipitation 01-hour forecast valid at 2100.

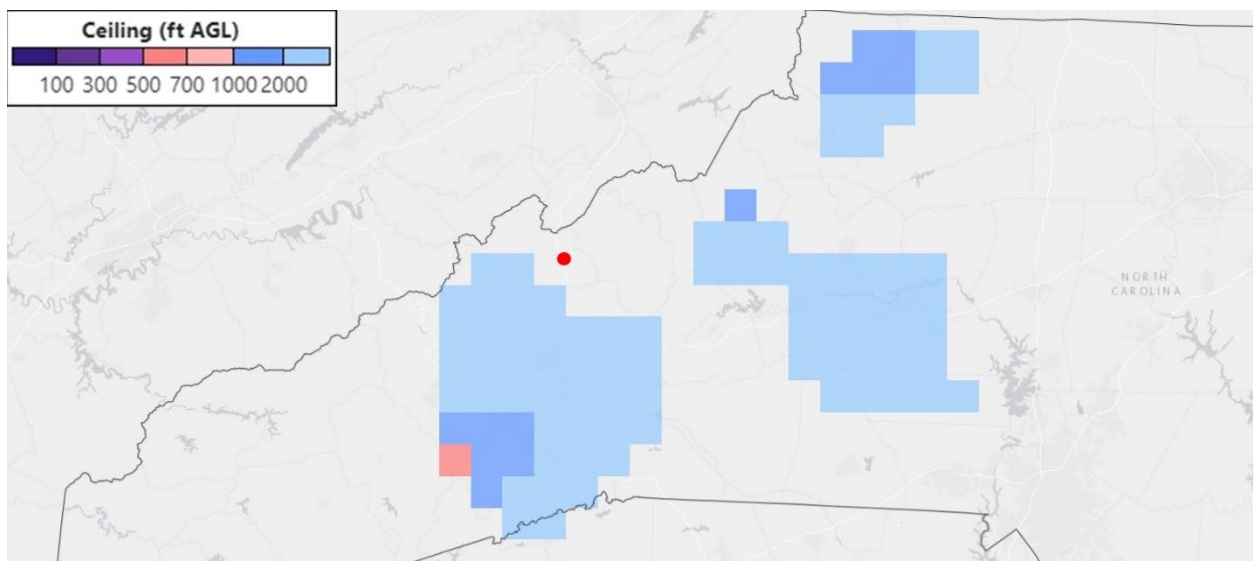


Figure 5 - GFA ceiling 00-hour forecast valid for 2100. The accident location is denoted by the red dot.

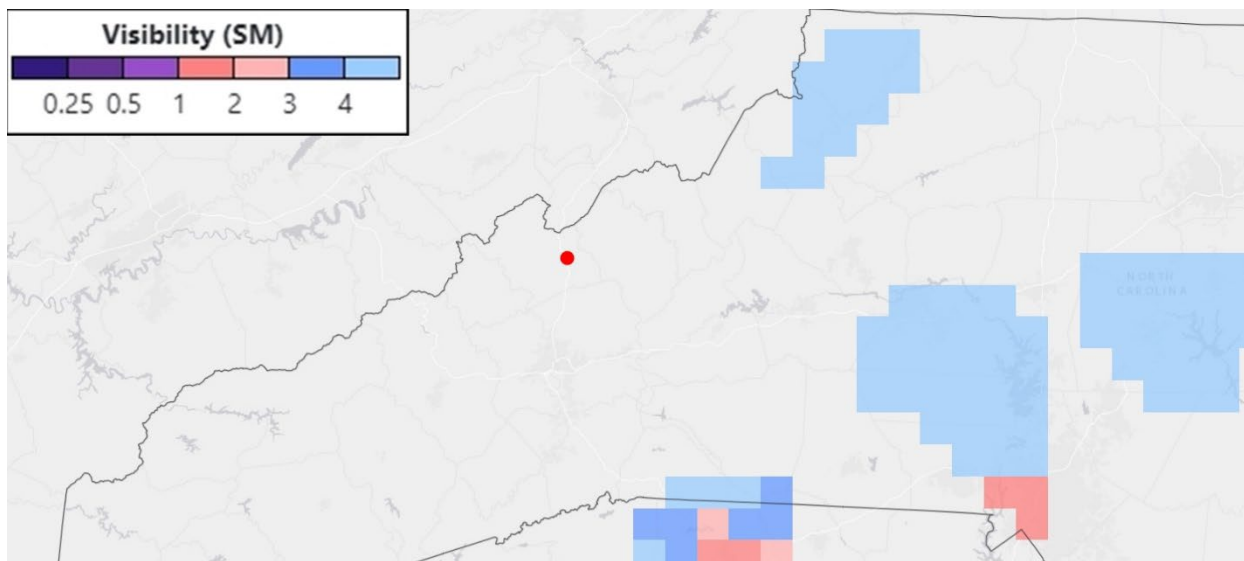


Figure 6 - GFA visibility 00-hour forecast valid for 2100. The accident location is denoted by the red dot.

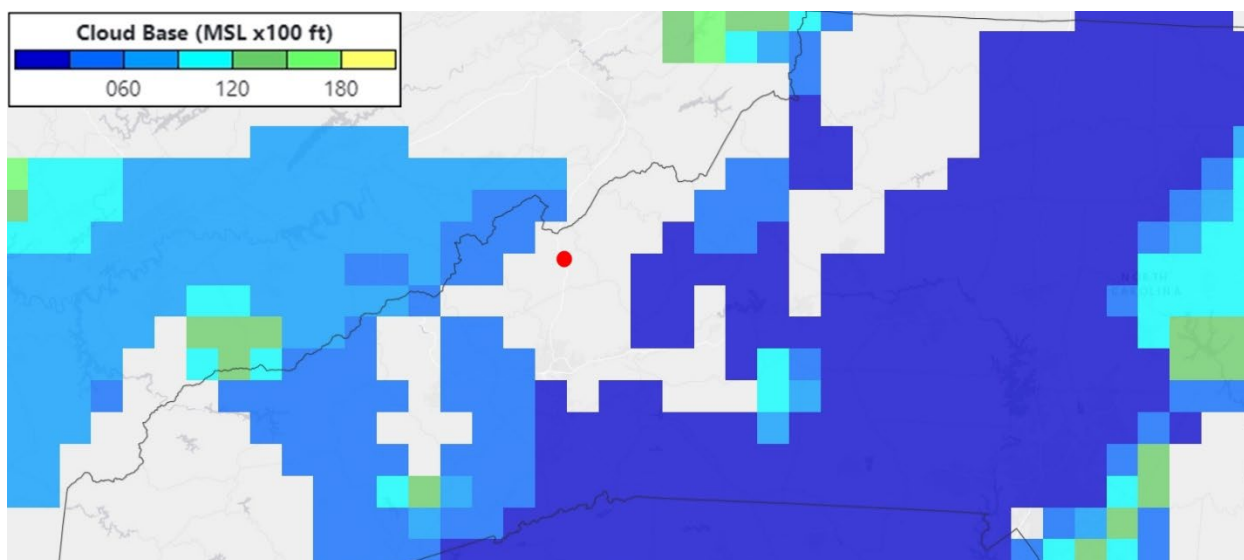


Figure 7 - GFA cloud bases 00-hour forecast valid for 2100. The accident location is denoted by the red dot.

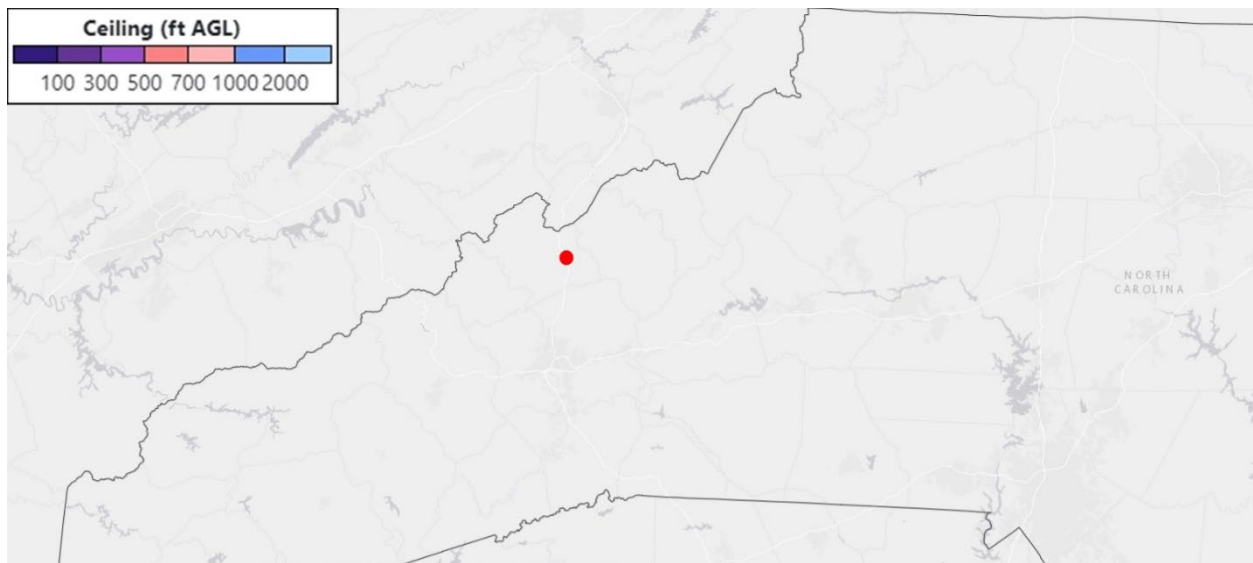


Figure 8 - GFA ceiling 01-hour forecast valid for 2100. The accident location is denoted by the red dot.

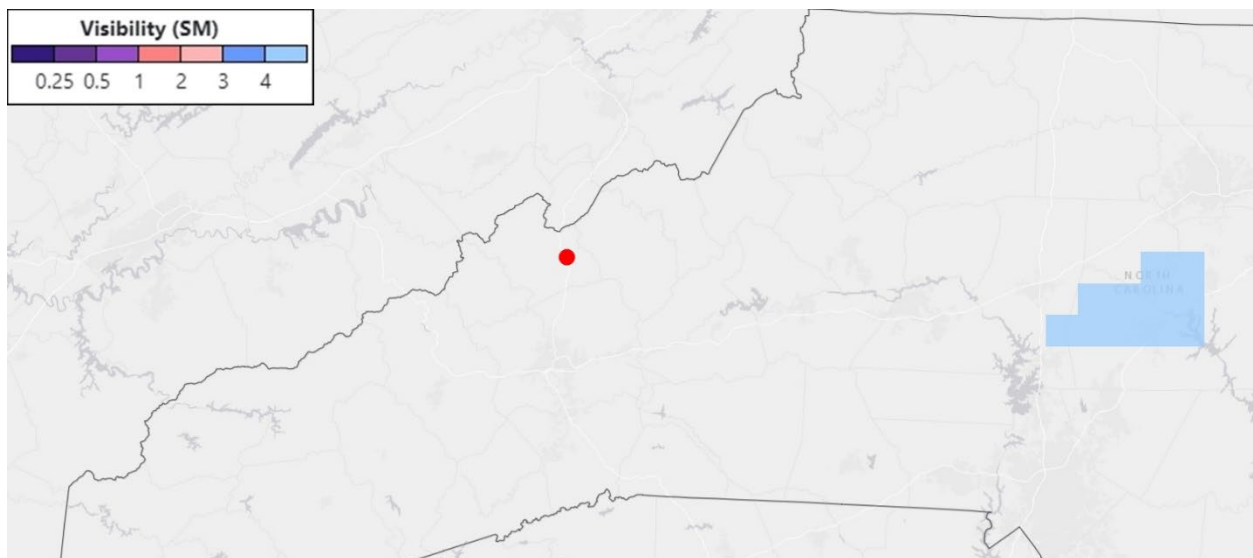


Figure 9 - GFA visibility 01-hour forecast valid for 2100. The accident location is denoted by the red dot.

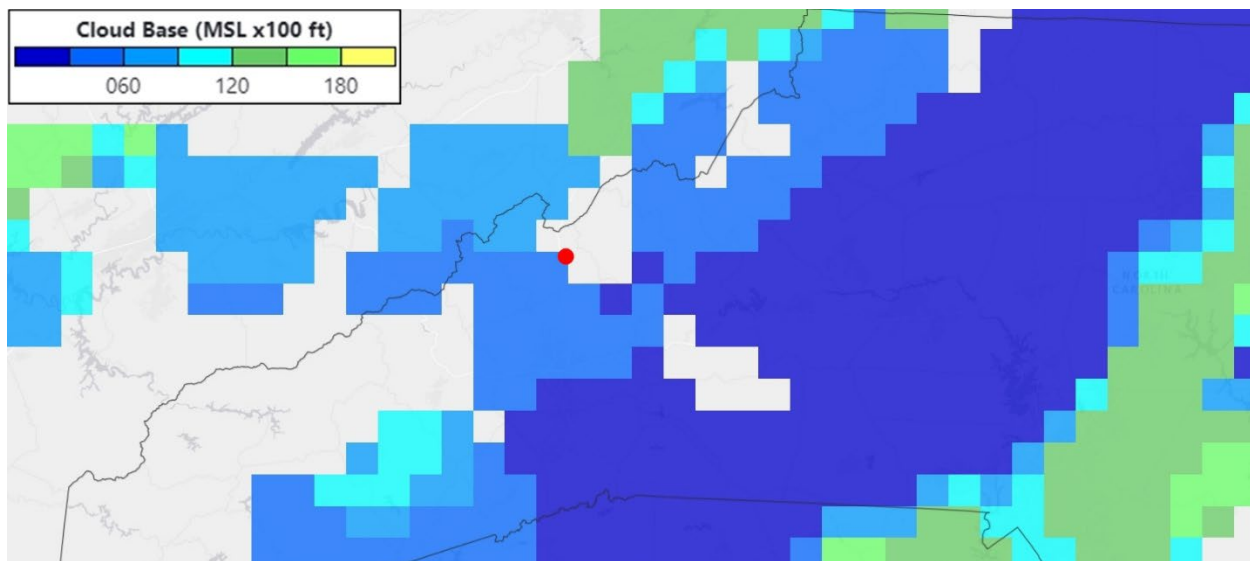


Figure 10 - GFA cloud bases 01-hour forecast valid for 2100. The accident location is denoted by the red dot.

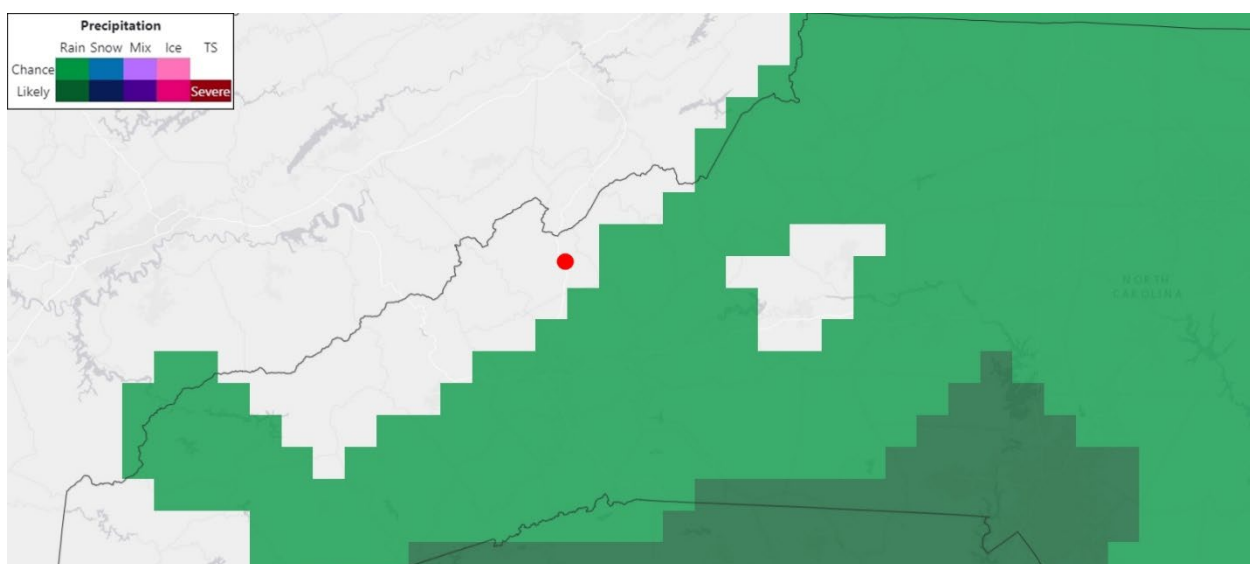


Figure 11 - GFA precipitation 01-hour forecast valid for 2100. The accident location is denoted by the red dot.

Submitted by:

Mike Richards
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