

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA23FA330

METEOROLOGY

Specialist's Factual Report

October 19, 2023

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A. ACCIDENT

Location: Junction City, Georgia

Date: 10 August 2023

Time: 1008 eastern daylight time (1408 UTC¹)

Aircraft: Type - Cessna P210N; Registration - N210JT

B. METEOROLOGY SPECIALIST

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 10 August 2023 (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: 32.673632° north latitude; 84.401365° west longitude at an elevation of about 585 feet.

This report provides information on weather conditions and forecasts applicable to the accident flight.

D. WEATHER INFORMATION

1.0 Weather Radar

WSR-88D² Level-II base reflectivity weather radar imagery from the Robbins Air Force Base in Georgia (site KJGX) is presented in Figures 1-3. KJGX was located approximately 53 miles east of the accident location with an antenna elevation of about 620 feet. Assuming standard refraction and considering the 0.95° beam width³ for the

¹ UTC - abbreviation for Coordinated Universal Time

² Weather Surveillance Radar 88 Doppler (WSR-88D)

³ 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.

WSR-88D radar beam, the KJGX 0.835° tilt would have “seen” altitudes above the accident location of between about 4,500 and 9,800 feet. A vertical cross-section of the Level-II base reflectivity weather radar imagery along the final portion of the accident aircraft’s flight track is presented in Figure 3. Light to extreme values of reflectivity were seen along or near the accident aircraft’s flight path.

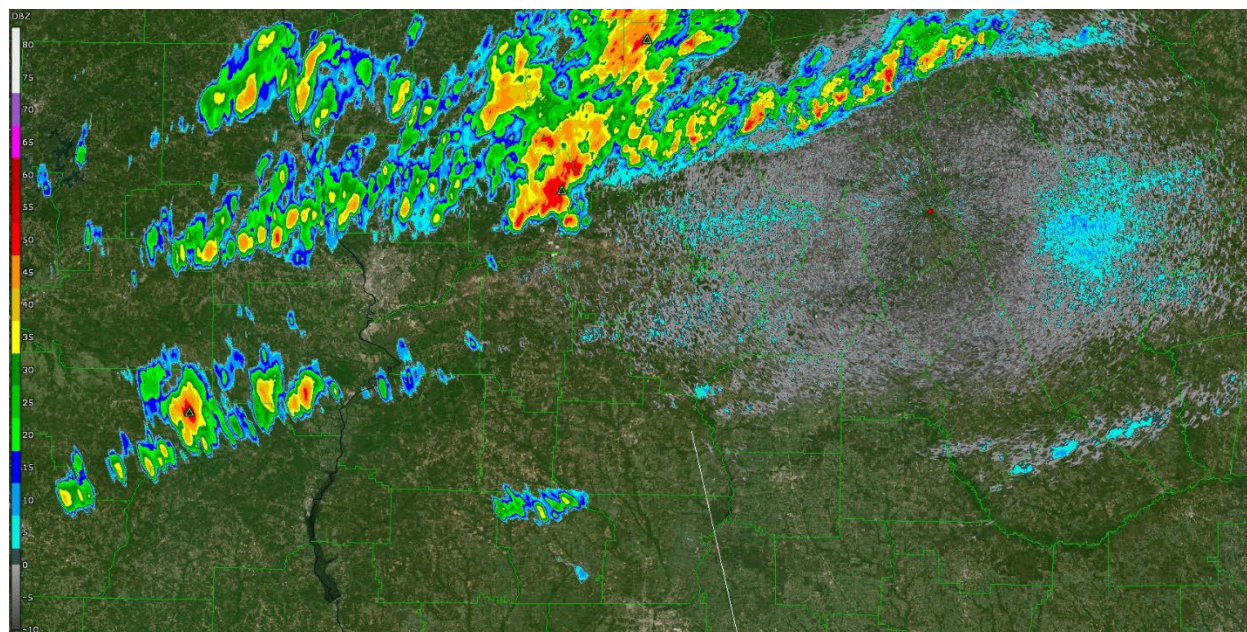


Figure 1 - KJGX 0.835° Level-II base reflectivity product from a sweep initiated at 0952:10. The accident aircraft’s flight path through 0951 is represented by the thin white line.

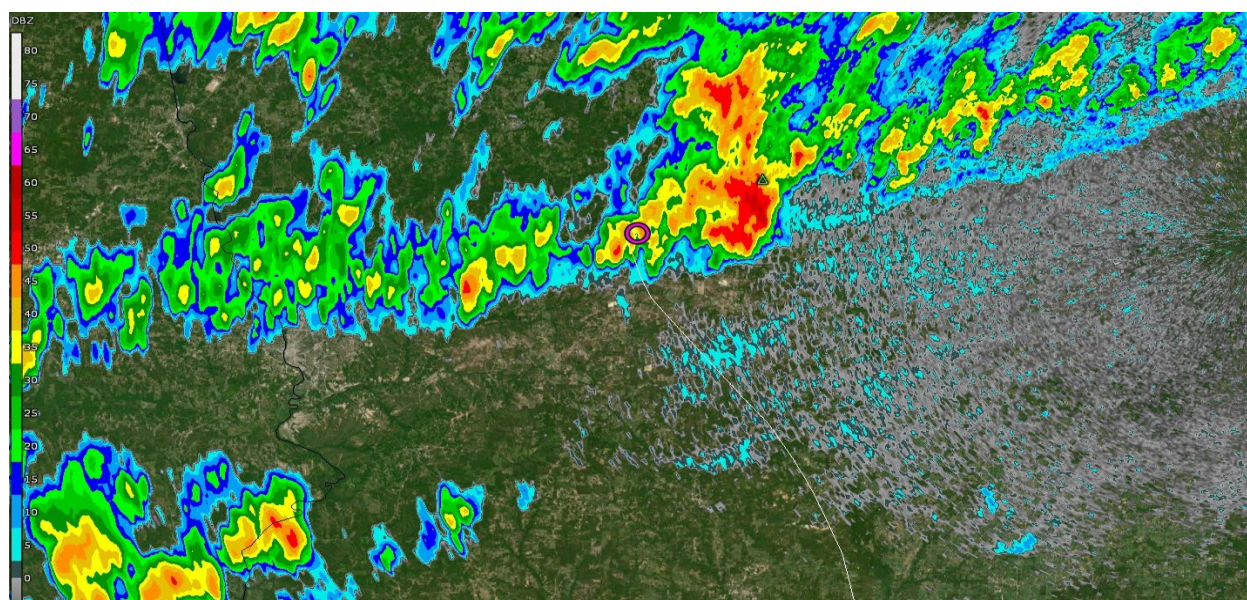


Figure 2 - KJGX 0.835° Level-II base reflectivity product from a sweep initiated at 1008:13. The accident location is denoted by the purple circle. The accident aircraft’s flight path is represented by the thin white line (also see Figure 3).

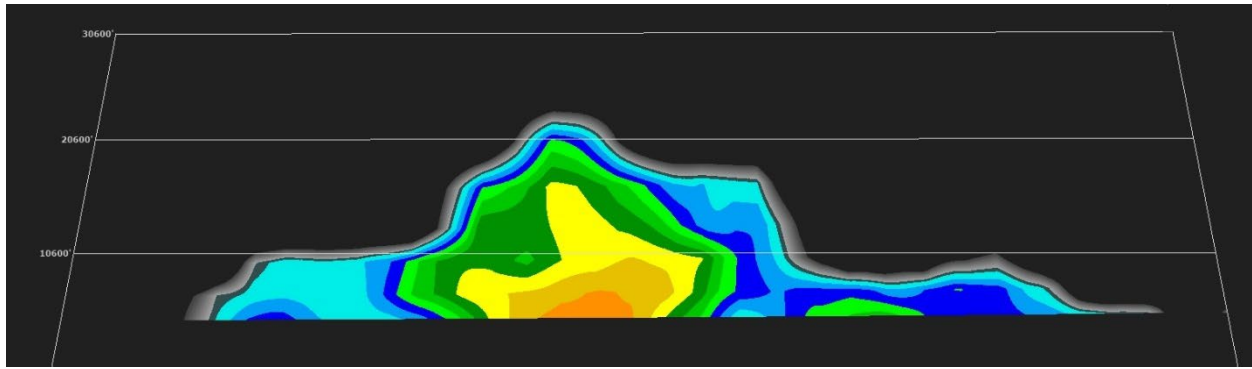


Figure 3 - Vertical cross-section of the KJGX Level-II base reflectivity weather radar imagery for the volume scan initiated at 1008:13 along the final portion of the accident aircraft's flight path. Height scale is approximate to within about 100 feet. Color bar is as presented in Figures 1 and 2. Approximate coordinates used for the cross-section endpoints are [32.557678, -84.378990] (left side) and [32.813908, -84.477943] (right side).

Screenshots of the Standard Terminal Automation Replacement System (STARS) display from the Atlanta Terminal Radar Approach Control Facility (TRACON; A80) during times surrounding the accident time are presented in Figures 4-8. The images, and the times associated with the images, were provided by A80 management. The times of the images could not be verified by the NTSB. Figure 9 describes how different radar levels are presented in the STARS display while presenting a slightly different color shading (a green shading rather than a blue shading) than in Figures 4-8; however, the solid color/dots are consistent between the versions.

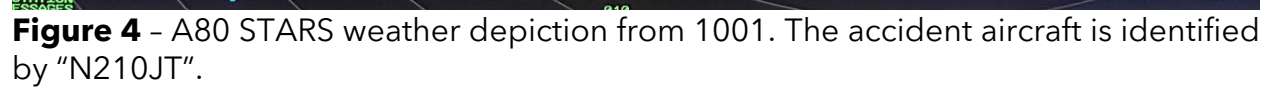




Figure 5 - A80 STARS weather depiction from 1002. The accident aircraft is identified by "N210JT".

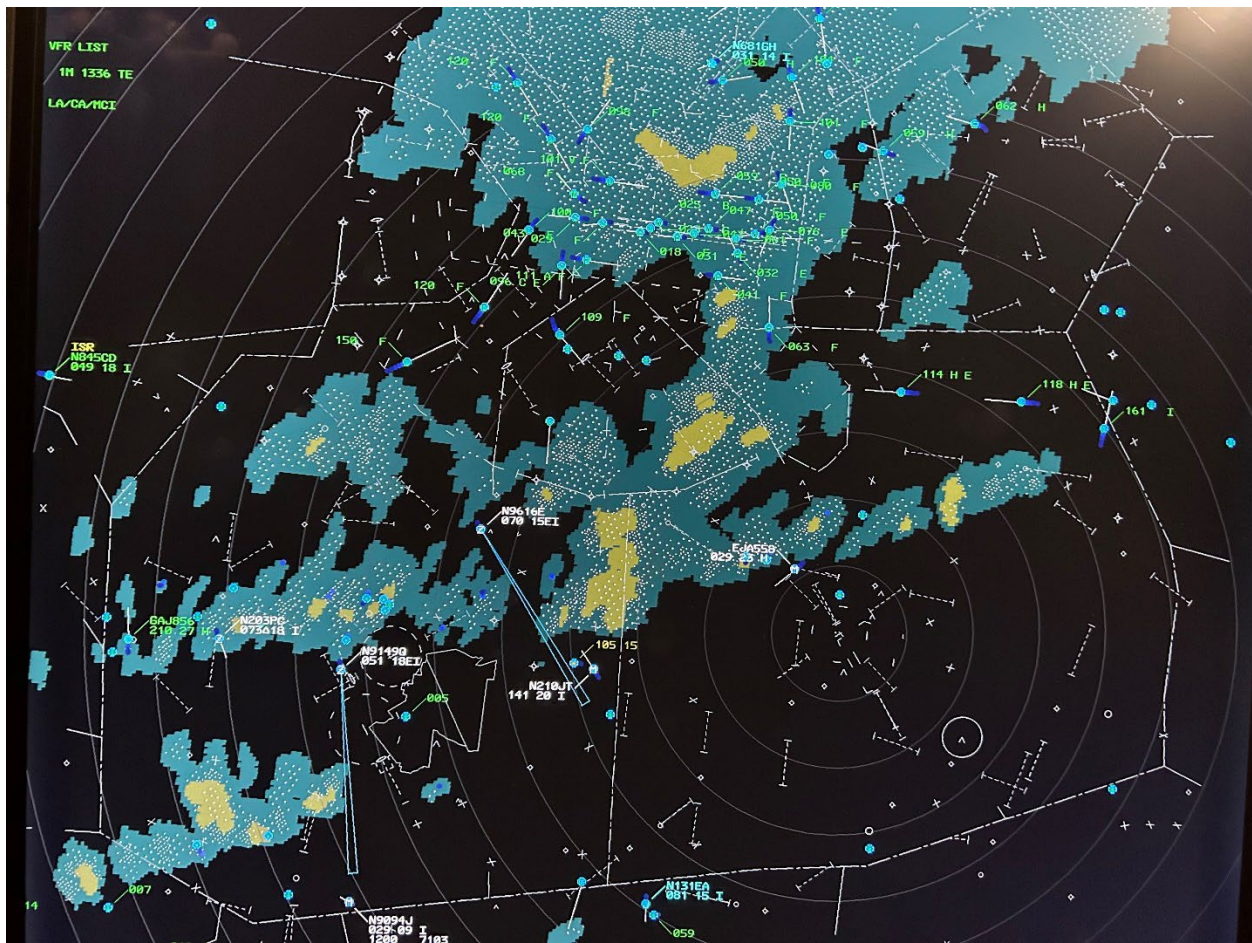


Figure 6 – A80 STARS weather depiction from 1003. The accident aircraft is identified by "N210JT".

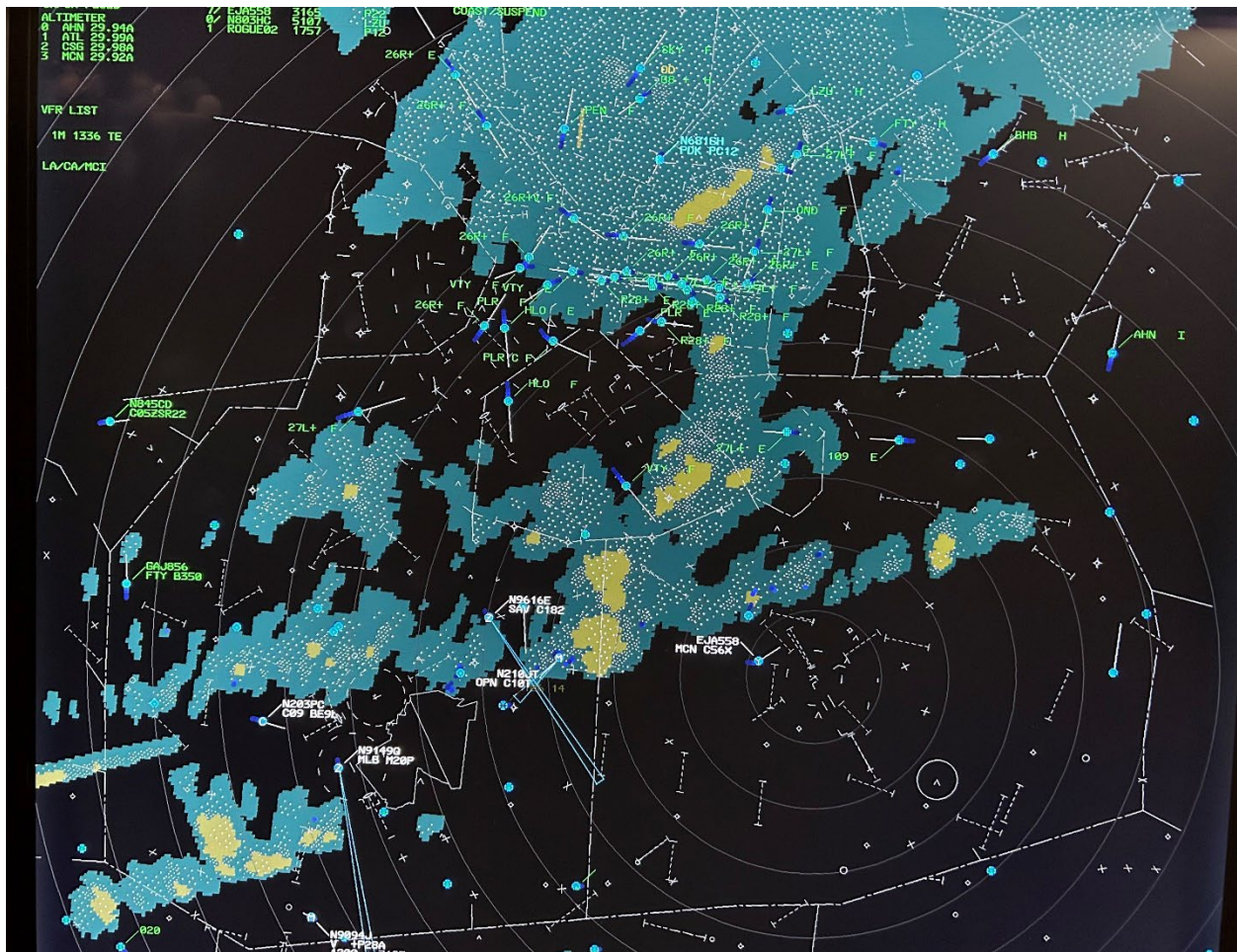


Figure 8 - A80 STARS weather depiction from 1005. The accident aircraft is identified by "N210JT".

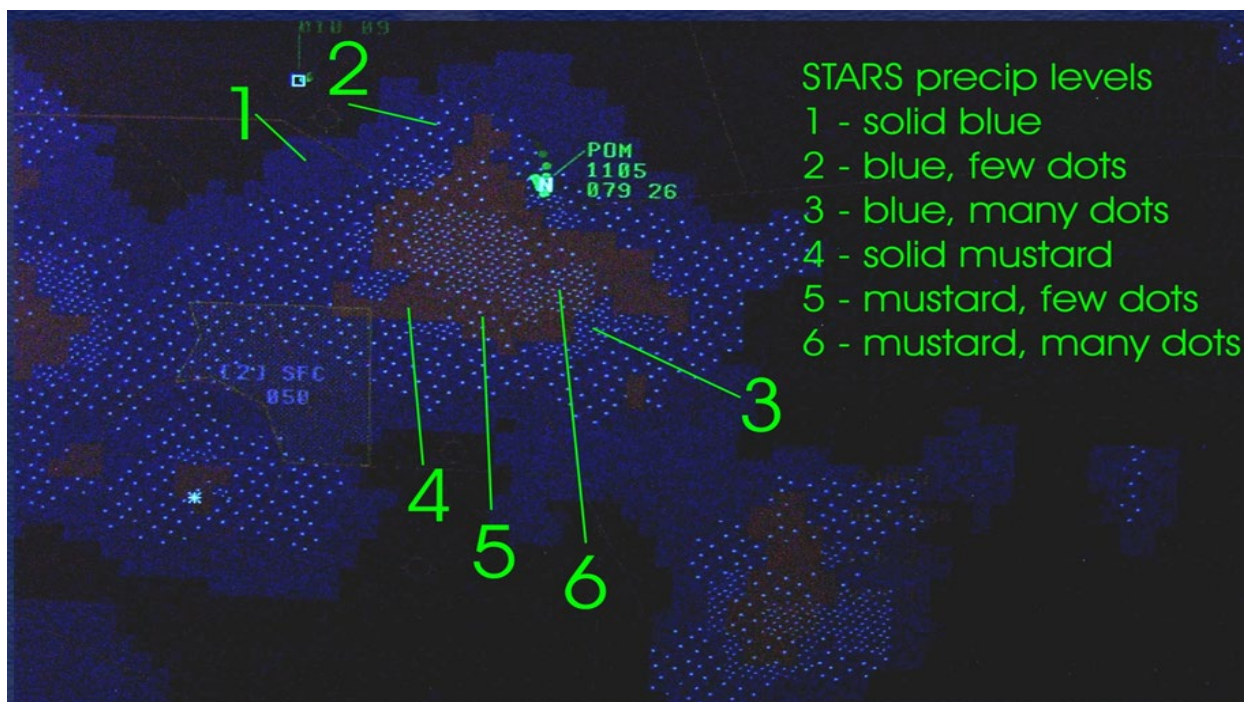


Figure 9 - Example of the weather radar presentation in STARS.

The dBZ thresholds for the color scale (levels) presented in the STARS display are as follows (approximately):

- Level 1: 18 < 30 dBZ
- Level 2: 30 < 41 dBZ
- Level 3: 41 < 46 dBZ
- Level 4: 46 < 50 dBZ
- Level 5: 50 < 57 dBZ
- Level 6: 57+ dBZ

2.0 Lightning

A review of the Earth Networks Total Lightning Network (ENTLN) lightning database for a region surrounding the accident location⁴ revealed flash total lightning activity between 0955 and 1010 as presented in Figure 10.

⁴ The ENTLN was queried for a geographic area bounded by latitudes 32.7769°N and 32.5404°N, and longitudes 84.649°W and 84.1697°W.

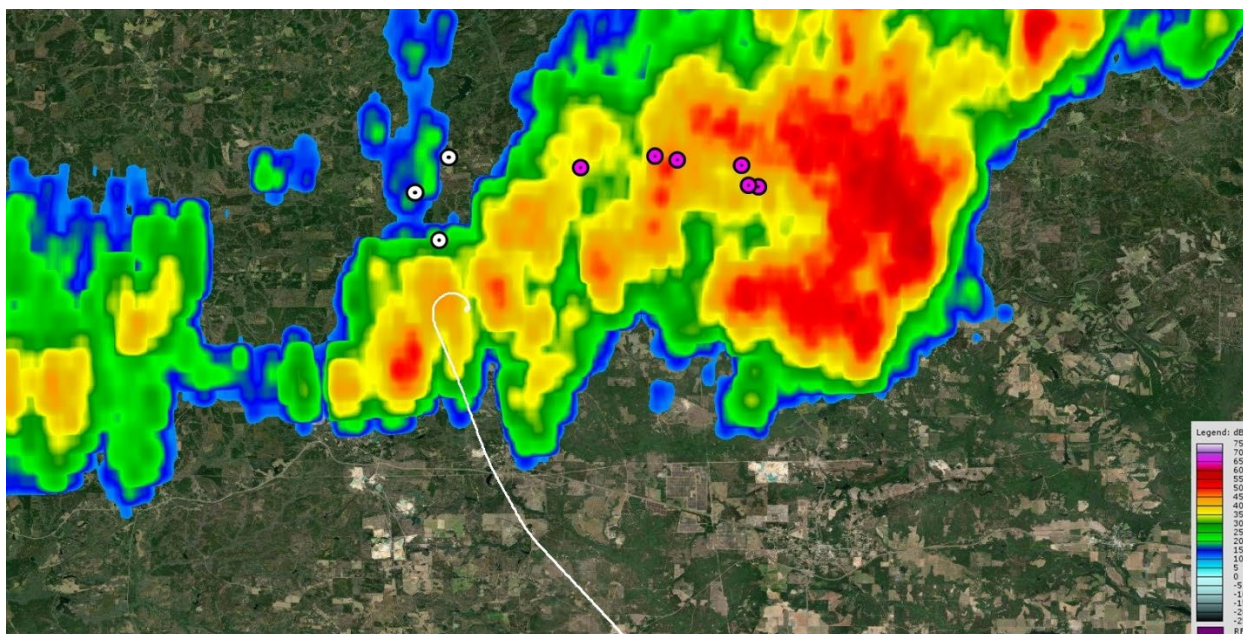


Figure 10 - ENTLN flash total lightning activity (cloud-to-ground light as white dots, intracloud lightning as purple dots) within the queried geographic region and time period. The final portion of the accident aircraft's flight path is represented by the white line. The radar imagery is another representation of the data presented in Figure 2 (it utilizes different smoothing and reflectivities less than 10 dBZ have been masked).

3.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁵ sounding (Figure 11) for near the accident site⁶ at 1000 with an elevation of 590 feet was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAWinsonde OBservation (RAOB) program. Lower-level clouds were identified between about 2,000 and 7,500 feet. The freezing level was at about 15,500 feet. The wind near the surface was from the northwest at about 30 knots and increased in magnitude to a west wind of about 40 knots anear 10,000 feet. Above this level up to 30,000 feet the wind remained generally westerly at magnitudes between 40 and 55 knots. The most-unstable Convective Available Potential Energy (CAPE) parameter was 73 Joules/kilogram (from 847 hPa). The Lifting Condensation Level (LCL) and the Level of Free Convection (LFC) were at 5,093 feet. Downdraft CAPE (DCAPE; 6 kilometers above ground level; coldest wetbulb temperature method) was measured at 1,026 Joules/kilogram.

⁵ 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.

⁶ Coordinates used for the model were latitude: 32.67°N; longitude: 84.40°W.

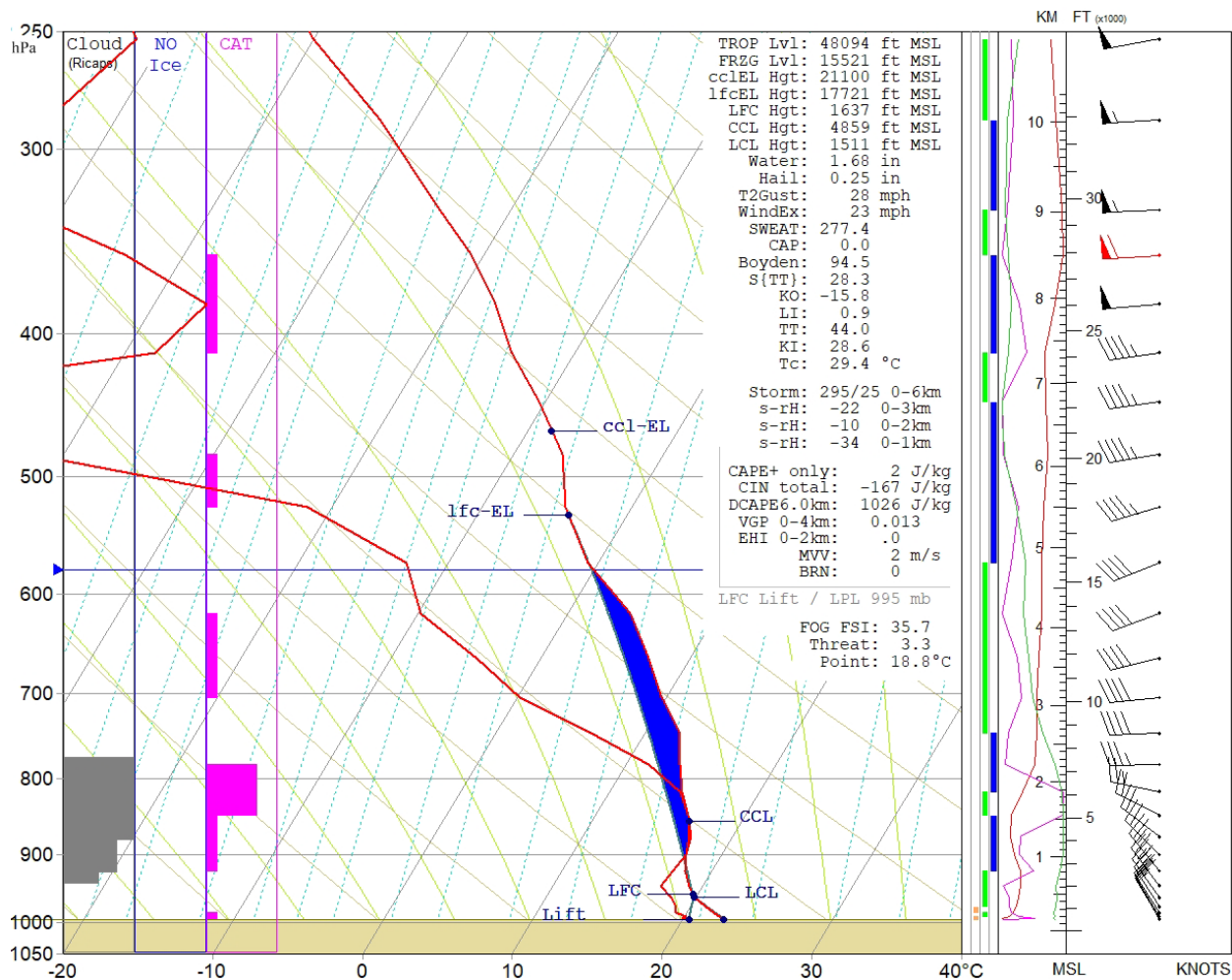


Figure 11 - HRRR model sounding data in SkewT/LogP format for 1000 near the accident site, surface to 250 hectopascals (hPa).

4.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-16 visible ($0.64\mu\text{m}$) and infrared ($10.3\mu\text{m}$) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from these data are presented in Figures 12-14. The visible imagery depicts cloudy conditions over the accident site. Brightness temperatures over the accident location were about -8°C at the accident time (Figure 14), which, when considering the 1000 HRRR sounding, corresponded to cloud top heights of about 21,000 feet.

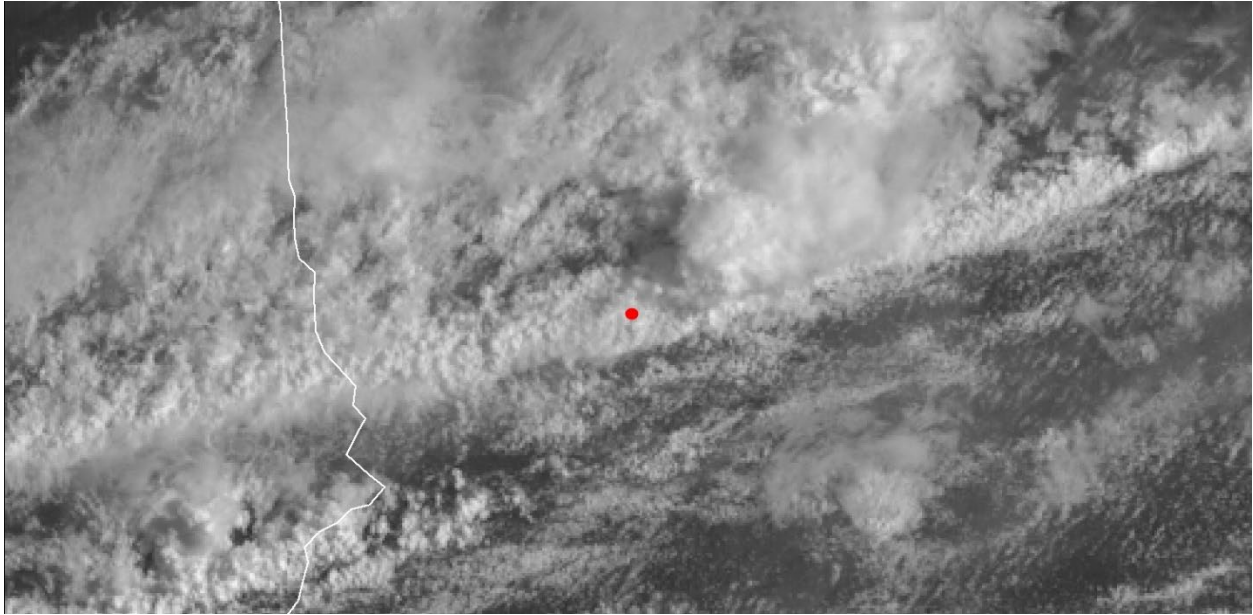


Figure 12 - GOES-16 visible imagery from 1006. Accident location denoted by the red dot. Image is not corrected for parallax error.

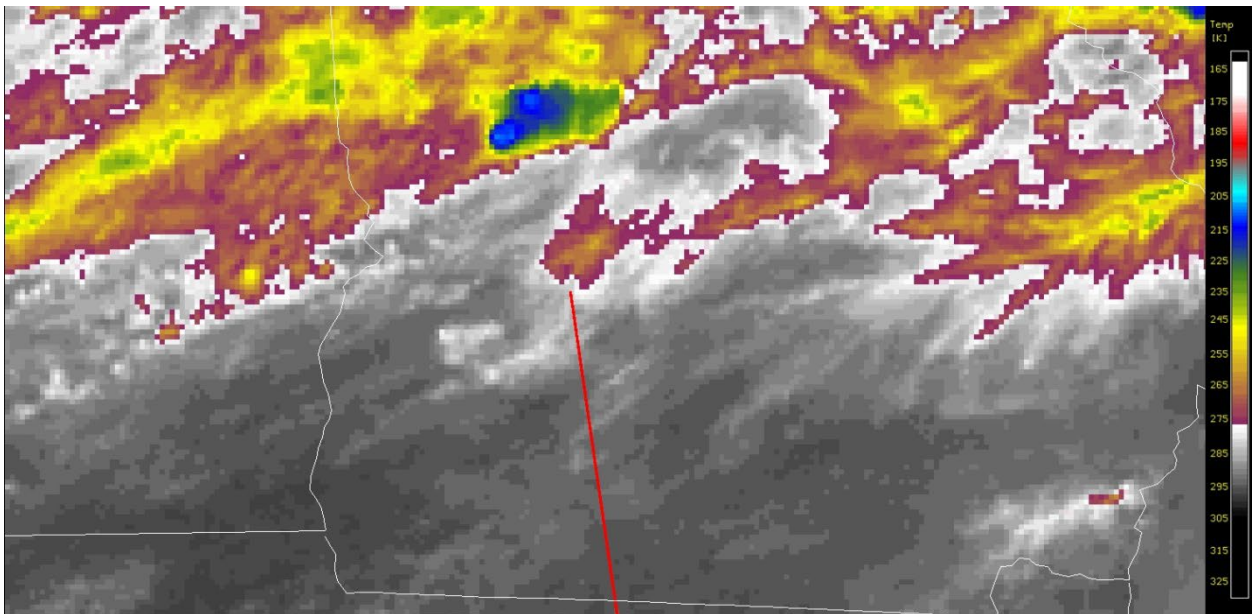


Figure 13 - GOES-16 infrared imagery from 0951. Image is not corrected for parallax error. The accident aircraft's flight path through 0951 is represented by the red line.

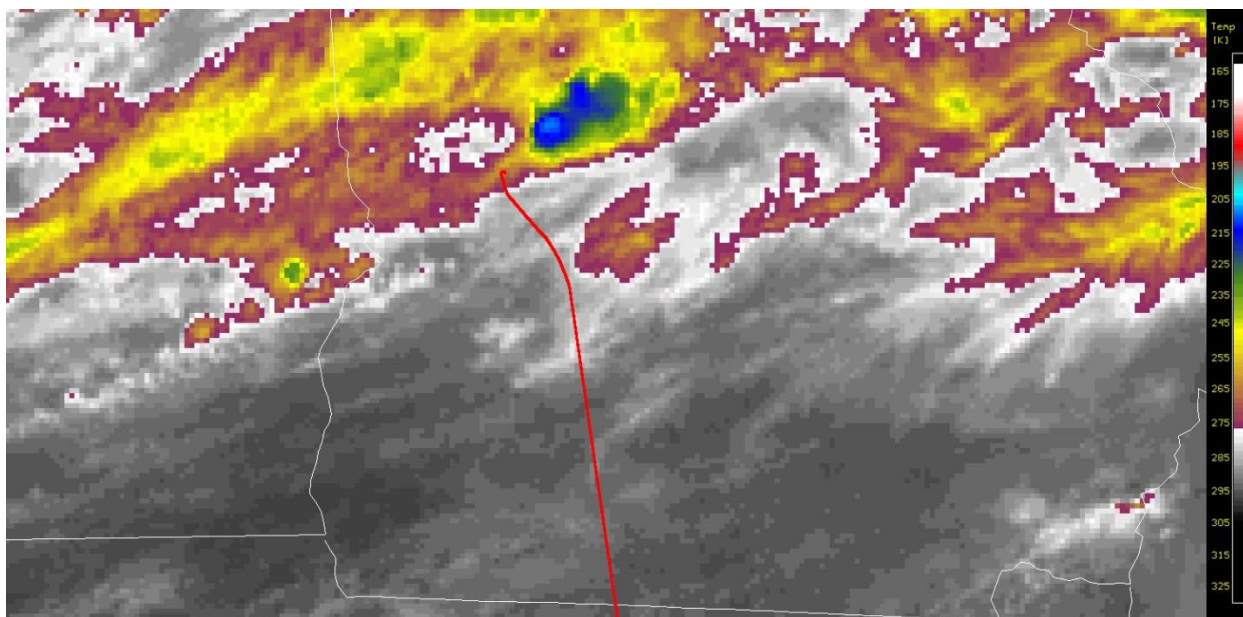


Figure 14 - GOES-16 infrared imagery from 1006. Image is not corrected for parallax error. The accident aircraft's flight path through the accident time is represented by the red line.

5.0 Pilot Reports

The following are the longline-disseminated pilot reports⁷ (PIREPs) reported between 0800 and 1200 within 40 miles of the accident location.

ATL UA /OV CSG/TM 1315/FL030/TP E550/SK BKN018 TOPS 030

ATL UA /OV ATL150035/TM 1332/FL150/TP CRJ9/SK IMC/WX RA/TB CONS
LGT CHOP/RM ZTLFD

WRB UA /OV MCN290018/TM 1442/FL350/TP A320/SK TOP 250/TB NEG
CHOP 350/RM SMOOTH RIDE ZTLFD

MCN UA /OV MCN/TM 1434/FL240/TP B752/TB NEG CHOP 140-240/RM
DURC ZTLFD

WRB UA /OV MCN318031/TM 1517/FL430/TP CL35/TB NEG CHOP 430/RM
MOSTLY SMOOTH ZTLFD

⁷ These do not include pilot reports only broadcast via radio.

6.0 Surface Observations

An Automated Weather Observing Station (AWOS) was located at Butler Municipal Airport (6A1⁸) in Butler, Georgia, which was located about 10 miles southeast of the accident site at an elevation of about 665 feet. It had a magnetic variation of about 5° west. Automated longline⁹ reports from the 6A1 AWOS during the times surrounding the accident time are presented here.

[0935] K6A1 101335Z AUTO 28012G18KT 10SM BKN015 28/25 A2995 RMK AO2 T02840245

[0955] K6A1 101355Z AUTO 28015G22KT 10SM BKN017 BKN021 29/24 A2997 RMK AO2 T02880243

[1015] K6A1 101415Z AUTO 33011G23KT 270V350 10SM OVC019 29/24 A2998 RMK AO2 T02910241

[1035] K6A1 101435Z AUTO 36011G25KT 5SM RA SCT011 BKN021 OVC028 22/20 A3000 RMK AO2 T02210200

At 0955, the 6A1 AWOS reported a wind from 280° at 15 knots with gusts to 22 knots, visibility 10 statute miles or greater, ceiling broken at 1,700 feet above ground level (agl), broken clouds at 2,100 feet agl, temperature of 29°C and dew point temperature of 24°C, altimeter setting of 29.97 inches of mercury; Remarks: automated station with a precipitation discriminator, temperature of 28.8°C and dew point temperature of 24.3°C.

At 1015, the 6A1 AWOS reported a wind from 330° at 11 knots with gusts to 23 knots, wind direction variable between 270° and 350°, visibility 10 statute miles or greater, ceiling overcast at 1,900 feet agl, temperature of 29°C and dew point temperature of 24°C, altimeter setting of 29.98 inches of mercury; Remarks: automated station with a precipitation discriminator, temperature of 29.1°C and dew point temperature of 24.1°C.

⁸ 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.

⁹ "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.

7.0 Terminal Aerodrome Forecasts

The closest National Weather Service (NWS) Terminal Aerodrome Forecast (TAF) site to the accident location was Columbus Airport (CSG) in Columbus, Georgia, which was located about 29 miles west-southwest of the accident location at an elevation of about 400 feet. At 0850, a TAF was issued for CSG that forecasted for the accident time: a wind from 260° at 5 knots, visibility greater than 6 statute miles, rain showers in the vicinity¹⁰ and ceiling overcast at 1,500 feet agl; temporary conditions¹¹ between 0900 and 1100 of a variable wind at 15 knots with gusts to 30 knots, visibility of 4 statute miles, thunderstorm with moderate rain, ceiling overcast at 1,200 feet agl with cumulonimbus clouds. According to NWS Instruction 10-813: "A 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."¹²

KCSG 101250Z 1013/1112 26005KT P6SM VCSH OVC015
TEMPO 1013/1015 VRB15G30KT 4SM TSRA OVC012CB
FM101500 29010G18KT P6SM -SHRA SCT025 BKN040
FM101700 28009KT P6SM BKN040
FM110000 26003KT P6SM SCT180=

8.0 Area Forecast Discussion

The NWS Peachtree City, Georgia, Weather Forecast Office issued the following "Update" and Aviation sections of an Area Forecast Discussion at 0954, applicable for a region that included the accident location.

*FXUS62 KFFC 101354
AFDFFC
Area Forecast Discussion
National Weather Service Peachtree City GA
954 AM EDT Thu Aug 10 2023*

*.UPDATE...
Issued at 943 AM EDT Thu Aug 10 2023*

Outflow boundary from early morning convection has now pushed to near a CSG to MCN line this morning. The outflow boundary continues to have the strongest convection this morning, but for the most part, there are only a few lightning

¹⁰ "In the vicinity" means 5 to 10 statute miles from the point of observation (e.g., in a METAR) or from the center of the airport's runway complex (e.g., in a TAF).

¹¹ Temporary conditions - fluctuations to forecast conditions which are expected to last less than one hour in each instance and, in the aggregate, to cover less than half of the indicated period.

¹² www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

strikes out there. There is some potential for storms to get a little bit more organized in the next hour or so as it moves into some decent instability. However, the outflow is getting further away from the best forcing/dynamics.

The problem of the day is what is going to happen on the back side of the MCS that came through this morning? Regional radar and satellite imagery shows a broad area of light to moderate rainfall stretching back through eastern MS. The overall trends are on the weakening side, and the hi-res models do show this. A weak front remains draped across central portions of the CWA and it will remain nearly stationary throughout the day. With the active NW flow still in place, cannot rule out a weak shortwave moving through and interacting with the boundary this afternoon. Will keep mention of shra/tsra in, but believe coverage to be isold/sct at this time. Coverage could be higher if breaks in the clouds occur.

At this time, much of north GA is in the cold pool left behind by the MCS. Suspect this cold pool will extend into the southern reaches of the CWA by the early afternoon. With quite a bit of cloud cover around, this will impact high temperatures. Have lowered values a bit in response.

&&

.AVIATION...

(12Z TAFS)

Issued at 734 AM EDT Thu Aug 10 2023

Thunderstorms and the mix of MVFR/IFR ceilings (600-2500 ft AGL) will remain the main concerns through 16Z today. These conditions will primarily affect northern and western Georgia. Isolated showers and storms will continue between 16Z and 00Z this evening, but coverage should be less. Winds today will primarily be from the west at 6 to 12 kt, with gusts of 18 to 24 kt. Isolated storms may occur between 00Z and 12Z Friday but confidence remained to low for inclusion in the TAFs.

//ATL Confidence...12Z Update...

Overall confidence in the ATL TAF is moderate.

Confidence in the wind, ceiling, visibility and precipitation forecasts is moderate.

Albright

9.0 SIGMETs

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

At 0955, the NWS' Aviation Weather Center (AWC) issued Convective SIGMET 42E that was active for the accident location and valid until 1155. It warned of an area of thunderstorms with tops to FL450¹³. The Convective SIGMETs polygon was moving from 270° at 40 knots. Convective SIGMETs imply severe or greater turbulence, severe icing, and low-level wind shear.

WSUS31 KPCI 101355

SIGE

-MKCE WST 101355

CONVECTIVE SIGMET 42E

VALID UNTIL 1555Z

GA AL

FROM 40SW ODF-10E MCN-30ESE MGM-40NW LGC-40SW ODF

AREA TS MOV FROM 27040KT. TOPS TO 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 SIGMETs. They are only valid at specific time "snapshots". G-AIRMETS are issued at discrete times 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).

A G-AIRMET for moderate turbulence below 8,000 feet was issued at 0800 and valid at 0800 for a region that included the accident location.

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

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. Hourly model data and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS are available, however only certain imagery are archived by the NWS.

Figures 15 and 16 depict GFA forecast information on sky condition, icing, mountain obscuration, instrument flight rule (IFR) condition¹⁴ and surface wind G-AIRMET advisories, surface visibility, surface wind, precipitation, and other obscurations and hazards, valid for times near the accident time. These GFA forecast imagery depict broken and overcast sky conditions in the immediate accident region with the data point nearest the accident location identifying bases at 1,400 feet and tops at FL220 (Figure 15). The GFA surface forecasts (Figure 16) depicted scattered thunderstorms near the accident location with visibilities greater than 5 statute miles and surface winds gusting up to 20 knots.

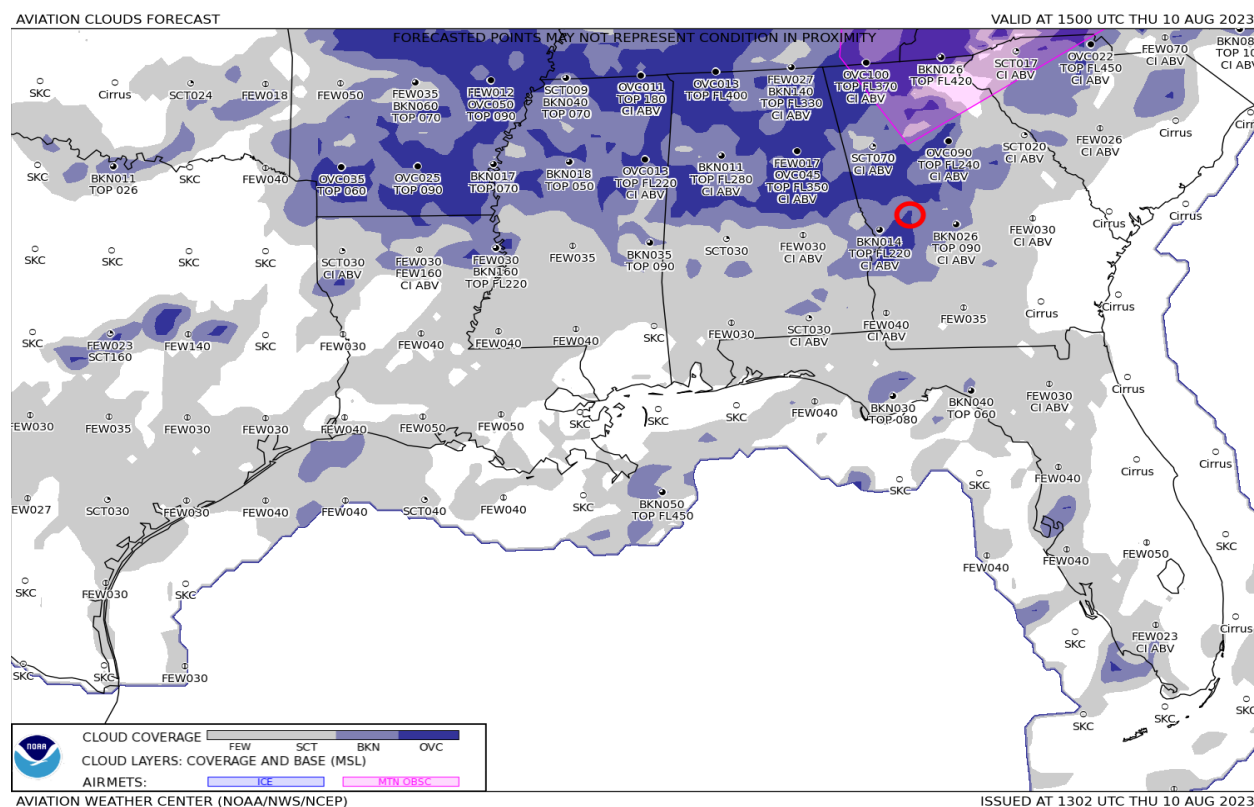


Figure 15 – GFA forecast imagery depicting sky condition and icing and mountain obscuration G-AIRMETS issued about 0900 and valid for 1100. The accident location is located within the red circle.

¹⁴ IFR conditions - Ceilings less than 1,000 feet agl and/or surface visibility less than three statute miles.

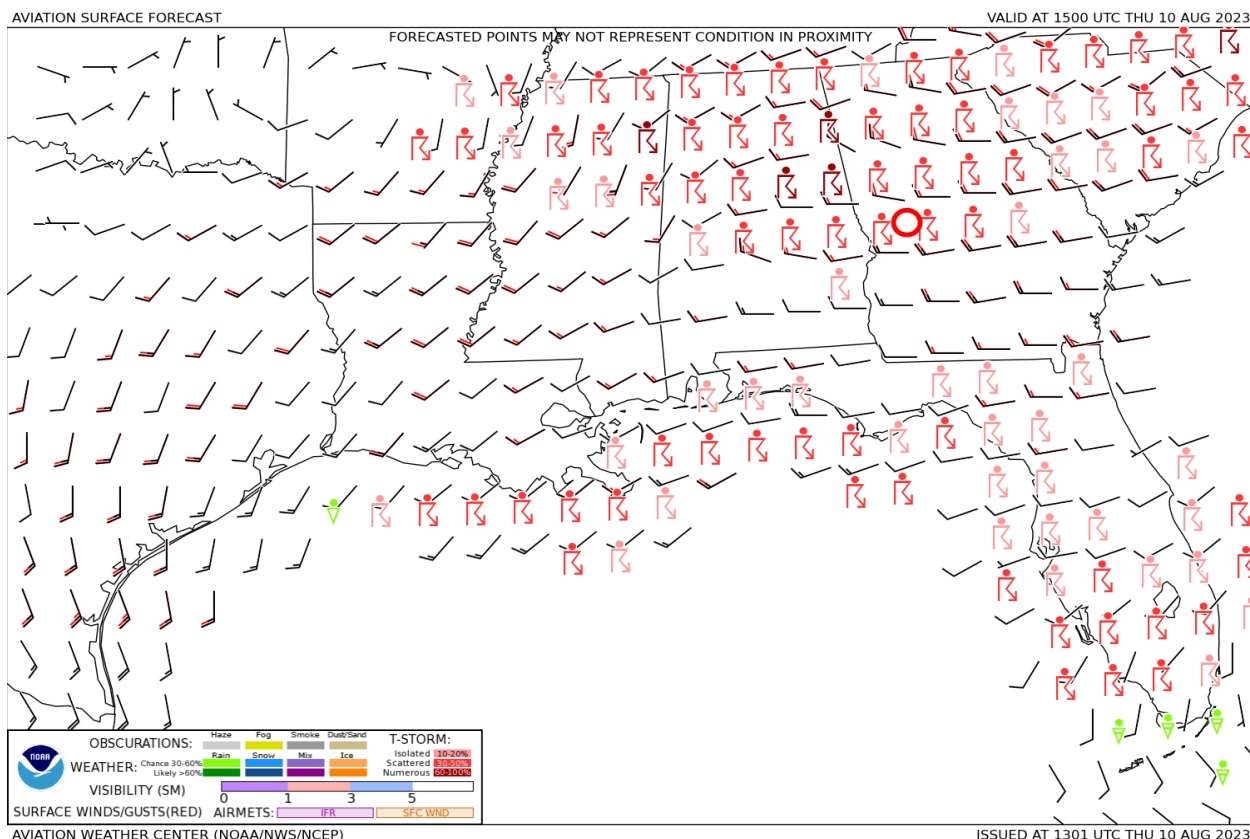


Figure 16 - GFA forecast imagery depicting IFR condition and surface wind G-AIRMETs, surface visibility, surface wind, precipitation, and other obscurations and hazards. Issued about 0900 and valid for 1100. The accident location is located within the red circle.

13.0 Pre-Flight Weather Briefing

According to Leidos Flight Services (LFS), neither LFS nor any third-party vendor utilizing the LFS system had any contact with the accident aircraft on the accident day or the day before the accident day. According to data provided by ForeFlight, the accident pilot did not receive weather information from ForeFlight on the accident day or the day before the accident day.

Submitted by:

Mike Richards
Senior Meteorologist