

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA23FA109

METEOROLOGY

Specialist's Factual Report

February 2, 2023

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A. ACCIDENT

Location: Dawsonville, Georgia
Date: January 12, 2023
Time: 2017 eastern standard time (EST)
0117 coordinated universal time (UTC) on January 13, 2023
Airplane: Piper PA28-180; Registration: N2454T

B. METEOROLOGY SPECIALIST

Donald Eick
Senior Meteorologist
National Transportation Safety Board
Washington, DC

C. SUMMARY

On January 12, 2023, about 2017 eastern standard time (EST), a Piper PA-28-180, N4254T, was destroyed when it was involved in an accident near Dawsonville, Georgia. The pilot was fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight. The flight departed from Cherokee County Regional Airport (CNI), Canton, Georgia, at 2005 EST with a planned destination of Stafford Regional Airport (RMN), Stafford, Virginia.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation remotely, collecting data 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 report documents the general weather products and forecasts over the region during the period and the pertinent meteorological parameters related to the accident. All times are reported as eastern standard time (EST) based upon the 24-hour clock, local time is -5 hours from UTC, and UTC=Z. NWS airport and weather 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. Directions are referenced to true north and distances in nautical miles. Heights are in feet (ft) above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 34.361402° N and longitude 84.136949° W at an elevation of approximately 1,200 ft.

E. FACTUAL INFORMATION

1.0 Synoptic Conditions

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 (NCEP) and the WPC located in College Park, Maryland. These are the base products used in describing weather features and in the creation of forecasts and warnings. Reference to these charts can be found in the Federal Aviation Administration (FAA) "Aviation Weather Handbook", FAA-H-8083-28¹.

1.1 Surface Analysis Chart

The east-central section of the NWS Surface Analysis Chart for 1900 EST is included as figure 1 with the approximate accident site marked by a red star. The chart depicted the main low-pressure system at 1001-hectopascals (hPa)² over western Pennsylvania with a cold front extending southward across West Virginia, Kentucky, Tennessee, Alabama and into the Gulf of Mexico. Several low-pressure systems were noted along the cold front over Ohio at 1002-hPa, Tennessee at 1006-hPa, and another low over southern Alabama at 1012-hPa (just off the chart). A warm front extended from the main low-pressure system generally eastward then southward through West Virginia and Virginia and then northward over eastern Virginia, Maryland and into Pennsylvania. It was in the general vicinity of the planned destination. Ahead of the cold front was a squall line³, which was depicted from southern Virginia, across North Carolina, South Carolina, into southern Georgia, and continuing southwestward into the Florida panhandle and the Gulf of Mexico (just off the chart). The accident site was located behind the squall line and east of the cold front. Several north-to-south oriented troughs or outflow boundaries were located parallel to the cold front west of the accident site over Georgia and Tennessee, and another east of the accident site extending from eastern Georgia into western North and South Carolina, Virginia, and West Virginia towards the low over Ohio.

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

² Hectopascals (hPa) is the standard unit for reporting sea-level pressure and is interchangeable with the former term millibar (mb) with the same unit. The standard atmosphere is based on a sea-level pressure is 1013.25-hPa and a temperature of 15° Celsius (C), or 59° Fahrenheit (F).

³ Squall Line is a line of active thunderstorms, either continuous or with breaks, including contiguous precipitation areas resulting from the existence of the thunderstorms.

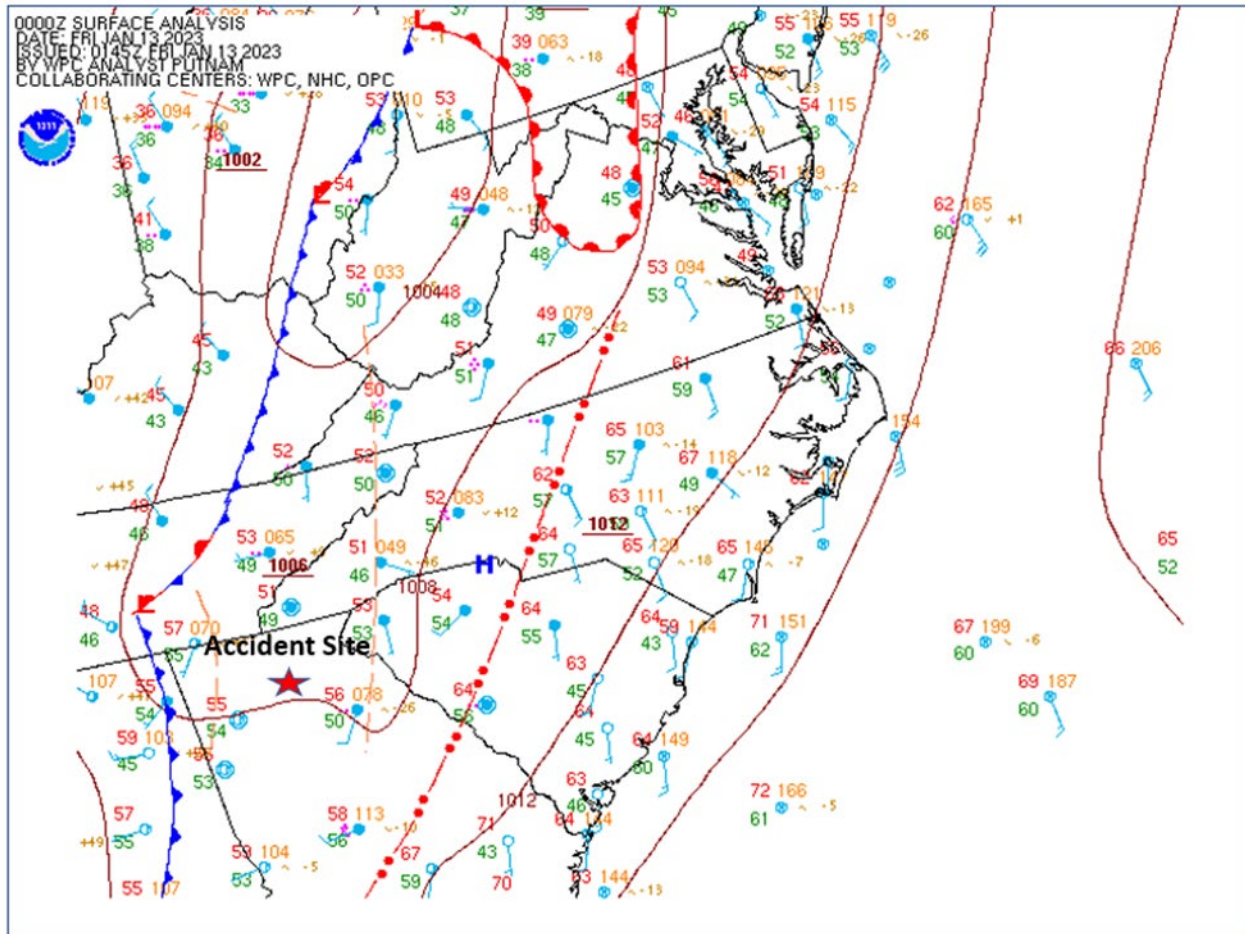


Figure 1 - East-central section of the NWS Surface Analysis Chart for 1900 EST with the approximate accident site marked by the red star.

The station models surrounding the accident site depicted calm to southwesterly winds at 10 knots, scattered clouds west of the accident site and broken to overcast sky cover north, east, and south of the accident site, with temperatures near 56° Fahrenheit, and dew point temperatures between 50° to 54° F, with several stations report rain and thunderstorms north, southeast and south of the accident site.

1.2 Regional Radar Mosaic

A review of the National Composite Radar Mosaic for 2015 EST from NCEI depicted a line of heavy to extreme intensity echoes extending from near the destination airport southwestward across Virginia, North Carolina, South Carolina, eastern and southern Georgia and into the Florida panhandle and is included as figure 2. The line was characterized as having an intense leading edge with an extensive area of trailing echoes and was located east and southeast of the accident site. A second smaller area of echoes were identified behind the main line over northern Georgia and Tennessee, with the accident site located immediately

southeast of an area of echoes. Figure 3 is a closeup of the composite radar for 2020 EST with the accident site marked by a red star and the departure airport in yellow. An area of echoes about 30 miles long extended north of the departure airport, with a smaller area of echoes east and slightly south of the larger area, with the southern portion of those echoes extended along the general route of flight of the accident airplane. The echoes in the vicinity of the accident site were in the range of 20 to 40 dBZ. Based on the identification of echoes in the immediate vicinity of the accident site, the closest NWS weather radar and the aircraft's flight track will be further documented in section 5.0 of this report.

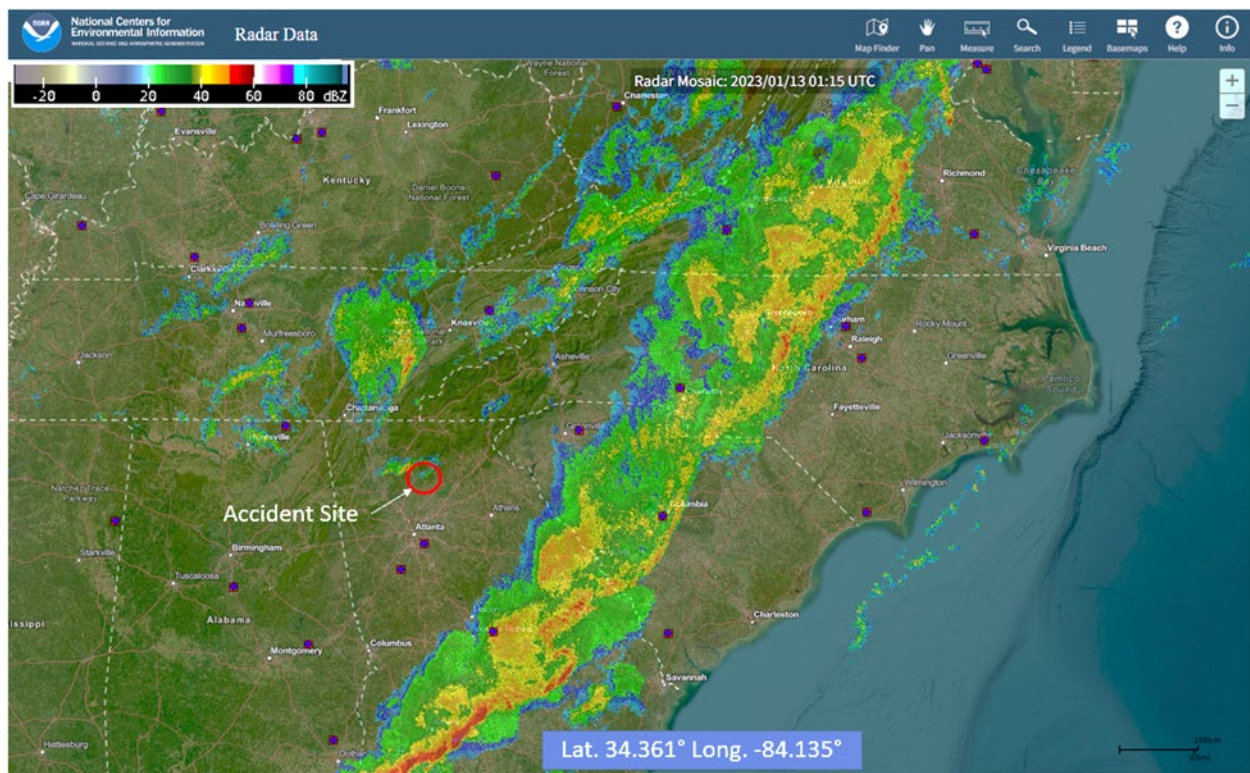


Figure 2 - Eastern section of the National Composite radar mosaic for 2015 EST with the approximate accident site noted within the red circle.

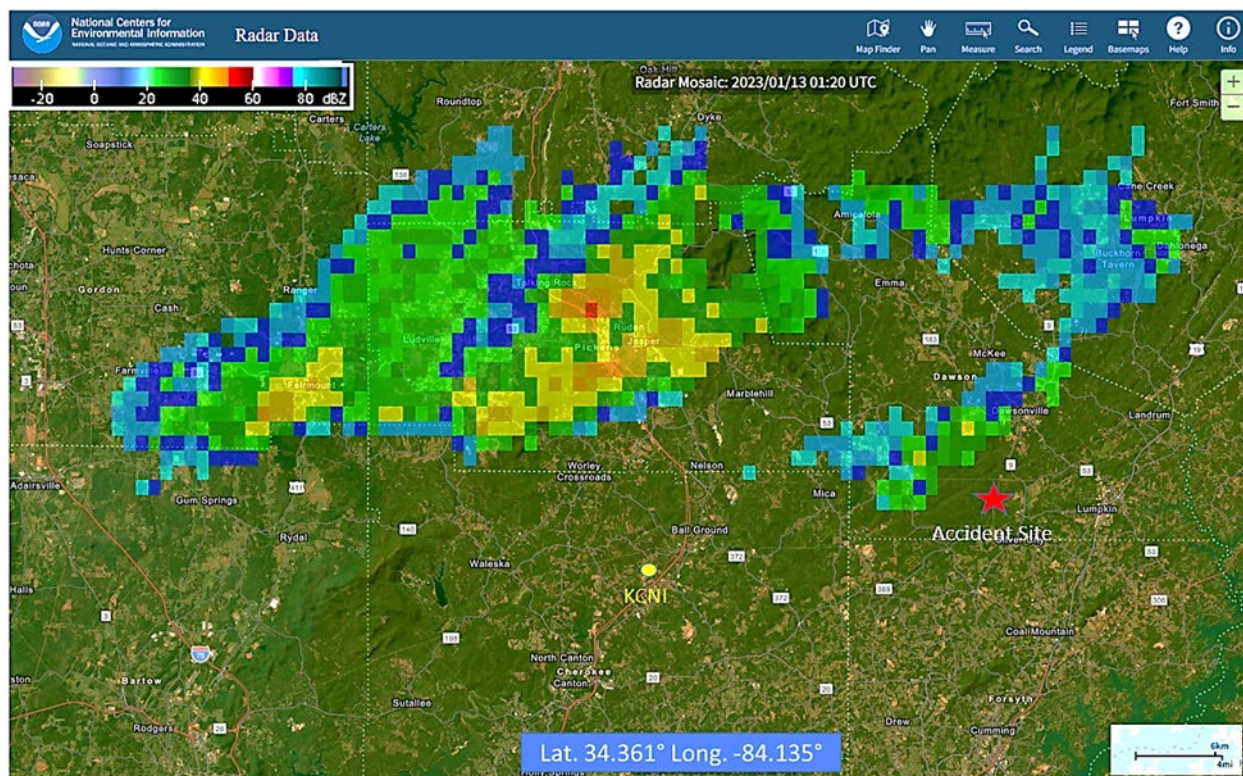


Figure 3 - Closeup of the Composite radar for 2020 EST with the accident site marked by the red star and departure airport KCNI location marked in yellow to the west-southwest.

1.3 Short Term Forecast

The NWS WPC 6-hour Surface Prognostic Chart valid for 0100 EST on January 13, 2023, is included as figure 4. The chart depicted the main low pressure system over eastern Pennsylvania with the warm front extending eastward and the cold front extending southward to the second low pressure system over Tennessee, which was depicted as moving eastward over North Carolina. The cold front continued from the low into South Carolina, southern Georgia, and into northern Florida having moved through the accident site. The chart depicted a large area of rain and thunderstorms along and ahead of the fronts, with a chance of rain trailing behind or west of the fronts and extended immediately north of the accident site and along the general planned route of flight.

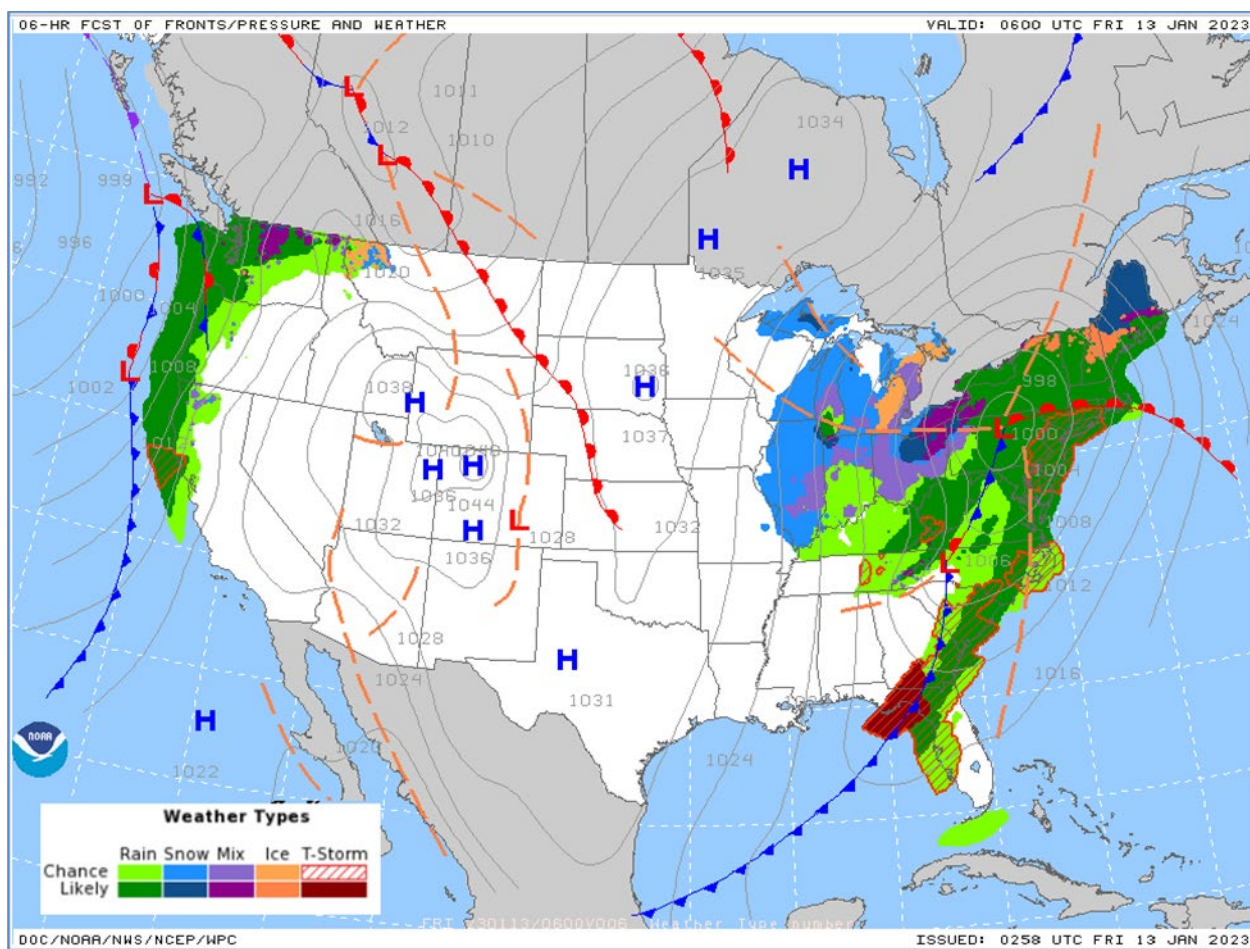


Figure 4 - NWS 6-hour Surface Prognostic Chart current for the period and valid for 0100 EDT.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METAR) and Aviation Selected Special Weather Reports (SPECI). Cloud heights are reported above ground level (agl) in the following section, and the magnetic variation was estimated at 5° west based on the latest sectional chart for the area.

2.1 Canton, Georgia

The closest weather reporting location to the accident site was from the departure site of Cherokee County Regional Airport (KCNH), Canton, Georgia, located about 14 miles west of the accident site at an elevation of 1,219 ft. The airport had an Automated Weather Observation Station (AWOS) which was not augmented by any observers and issued observations every 20-minutes longline. The observations issued

closest to the time of the departure time of 2005 EST and closest to the time of the accident were as follows.

KCNI weather observation at 1955 EST, automated, wind from 260° at 6 knots, visibility 10 statute miles, scattered clouds at 700 ft agl, scattered at 7,500 ft, temperature 12° Celsius (C), dew point temperature of 11° C, altimeter setting 29.79 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator, lightning distant⁴ northeast, temperature 12.0° C, dew point temperature 11.4° C.

KCNI weather observation at 2015 EST, automated, wind from 270° at 3 knots, visibility 1 mile in mist with thunderstorm in the vicinity⁵, ceiling broken at 900 ft agl, overcast at 2,600 ft, temperature 12° C, dew point temperature of 11° C, altimeter setting 29.79 inHg. Remarks: automated station with a precipitation discriminator, lightning distant northeast, temperature 11.6° C, dew point temperature 11.4° C.

The general flight categories⁶ and raw observations reported from 1355 through 2135 EST for KCNI were as follows. The reports transcribed above, and the time of the accident are in bolt type.

MVFR METAR KCNI 121855Z AUTO 19007G16KT 10SM VCTS BKN030 OVC037 19/14 A2983 RMK AO2 LTG DSNT S THRU N P0001 T01860136=

MVFR METAR KCNI 121915Z AUTO 20009G16KT 10SM -VCTSRA OVC030 18/14 A2982 RMK AO2 LTG DSNT ALQDS T01840138=

MVFR METAR KCNI 121935Z AUTO 26010KT 10SM -TSRA OVC028 18/14 A2984 RMK AO2 LTG DSNT ALQDS T01820139=

IFR METAR KCNI 121955Z AUTO 26016G29KT 2 1/2SM +TSRA BR SCT013 BKN028 OVC033 13/11 A2984 RMK AO2 LTG DSNT ALQDS T01320113=

MVFR METAR KCNI 122015Z AUTO 21006G18KT 3SM +TSRA BR SCT015 BKN048 OVC060 12/12 A2987 RMK AO2 LTG DSNT ALQDS T01240115=

⁴ Distant is defined as beyond 10 statute miles of the point of observation.

⁵ Vicinity is defined as between 5 and 10 statute miles of the point of observation.

⁶ As defined by 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 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.

MVFR METAR KCNI 122035Z AUTO 26009KT 4SM TSRA BR SCT011 BKN044 OVC070 13/12 A2985
RMK AO2 LTG DSNT ALQDS T01260117=

MVFR METAR KCNI 122055Z AUTO 24011G20KT 5SM TSRA BR SCT011 BKN060 OVC070 13/12
A2984 RMK AO2 LTG DSNT ALQDS T01320119 60001=

Pilot Arrived at airport for fuel 2100Z and planned initial departure.

MVFR METAR KCNI 122115Z AUTO 18007KT 150V230 4SM +TSRA BR OVC060 13/12 A2981 RMK
AO2 LTG DSNT ALQDS T01300120=

VFR METAR KCNI 122130Z AUTO 16007KT 7SM TSRA BR OVC075 13/12 A2979 RMK AO2 LTG
DSNT NW THRU SE T01260122=

UNK METAR KCNI 122155Z AUTO 18007KT 13/12 A2977 RMK AO2 LTG DSNT N SE AND NW
T01290123=

VFR METAR KCNI 122215Z AUTO 20005KT 10SM BKN110 13/12 A2977 RMK AO2 LTG DSNT N
THRU SE T01290122=

VFR METAR KCNI 122235Z AUTO 20005KT 10SM SCT120 13/12 A2978 RMK AO2 LTG DSNT N
THRU SE T01290120=

VFR METAR KCNI 122255Z AUTO 20006KT 10SM CLR 13/12 A2978 RMK AO2 LTG DSNT N THRU
SE T01290119=

VFR METAR KCNI 122315Z AUTO 22006KT 10SM VCTS SCT013 13/12 A2979 RMK AO2 LTG DSNT
NE AND SE P0001 T01280118=

MVFR METAR KCNI 122335Z AUTO 24008KT 10SM OVC013 13/12 A2979 RMK AO2 LTG DSNT N
AND NE P0001 T01280117=

MVFR METAR KCNI 122355Z AUTO 22007KT 10SM BKN013 BKN019 13/12 A2978 RMK AO2 LTG
DSNT SE AND NW P0001 T01260117 10131 20125 401310125 60001=

VFR METAR KCNI 130015Z AUTO 26005KT 10SM SCT011 12/12 A2979 RMK AO2 LTG DSNT NE
AND NW T01230116=

VFR METAR KCNI 130035Z AUTO 26005KT 10SM SCT007 12/12 A2980 RMK AO2 LTG DSNT NE
SE AND NW T01210116=

Pilot arrives back at airport and fuels aircraft 0054Z.

VFR METAR KCNI 130055Z AUTO 26006KT 10SM SCT007 SCT075 12/11 A2979 RMK AO2
LTG DSNT NE T01200114=

Departure 0105Z

IFR METAR KCNI 130115Z AUTO 27003KT 1SM VCTSBR BKN009 OVC026 12/11 A2979
RMK AO2 LTG DSNT NE T01160114=

Accident 0117Z

VFR METAR KCNI 130135Z AUTO 25010KT 10SM SCT009 SCT024 SCT045 12/11 A2979 RMK AO2 LTG DSNT NE AND NW T01200111=

MVFR METAR KCNI 130155Z AUTO 27016G20KT 10SM SCT021 BKN027 BKN034 13/11 A2979 RMK AO2 T01270107=

MVFR METAR KCNI 130215Z AUTO 28012G26KT 10SM BKN017 BKN024 OVC065 13/10 A2979 RMK AO2 LTG DSNT SW AND NW T01270104=

VFR METAR KCNI 130235Z AUTO 30010G20KT 10SM SCT017 SCT050 SCT065 12/10 A2980 RMK AO2 LTG DSNT NW T01220100=

2.2 Jasper, Georgia

The next closest weather reporting location to the departure airport and the accident site was from Pickens County Airport (KJZP), Jasper, Georgia, located 8 miles north of KCNI and 16.7 miles west-northwest of the accident site at an elevation of 1,535 ft. The airport had an AWOS and reported the following conditions at the approximate time of the accident.

Weather observation for KJZP at 2015 EST, automated, wind calm, visibility 10 miles in moderate rain, scattered clouds at 1,200 ft, ceiling broken at 2,800 ft, overcast at 4,800 ft, temperature 12° C, dew point temperature 12° C, altimeter 29.81 inHg. Remarks: automated station with a precipitation discriminator, temperature 11.6° C, dew point temperature 11.6° C.

The general flight categories and raw observations surrounding the period from 1435 through 2115 EST were as follows.

IFR METAR KJZP 121935Z AUTO 32011G26KT 1 1/2SM +RA SCT012 BKN022 OVC036 13/12 A2986 RMK AO2 VIS 3/4V3 T01270123

IFR METAR KJZP 121955Z AUTO 33018G30KT 2 1/2SM +RA SCT012 BKN020 OVC046 12/12 A2987 RMK AO2 T01230120

MVFR METAR KJZP 122015Z AUTO 31009G28KT 270V340 5SM RA SCT012 BKN055 OVC070 13/12 A2988 RMK AO2 T01250120

MVFR METAR KJZP 122035Z AUTO 29008G20KT 260V320 4SM +RA SCT045 BKN055 OVC070 12/12 A2989 RMK AO2 T01230118

MVFR METAR KJZP 122055Z AUTO 28005KT 3SM +RA SCT042 BKN055 OVC065 12/12 A2988 RMK AO2 T01210121

MVFR METAR KJZP 122115Z AUTO 23004KT 3SM RA SCT042 SCT048 OVC055 13/13 A2983 RMK AO2 T01250125

VFR METAR KJZP 122135Z AUTO 23003KT 10SM -RA SCT055 BKN070 OVC085 12/12 A2981
RMK AO2 T01230123

VFR METAR KJZP 122155Z AUTO 20009KT 10SM SCT043 OVC095 12/12 A2978 RMK AO2
T01220122

MVFR METAR KJZP 122215Z AUTO 22005KT 10SM BKN011 BKN018 OVC110 12/12 A2980 RMK
AO2 T01210121

MVFR METAR KJZP 122235Z AUTO 00000KT 10SM SCT009 BKN014 BKN018 12/12 A2980 RMK
AO2 T01210121

VFR METAR KJZP 122255Z AUTO 00000KT 10SM SCT011 12/12 A2980 RMK AO2 T01200120

IFR METAR KJZP 122315Z AUTO 29003KT 10SM BKN008 BKN011 12/12 A2982 RMK AO2
T01200120

IFR METAR KJZP 122335Z AUTO 00000KT 10SM BKN008 BKN012 12/12 A2982 RMK AO2
T01200120

VFR METAR KJZP 122355Z AUTO 00000KT 10SM SCT008 SCT012 12/12 A2982 RMK AO2
T01180118 10172 20118

VFR METAR KJZP 130015Z AUTO 00000KT 10SM SCT018 SCT032 12/12 A2982 RMK AO2
T01170117

MVFR METAR KJZP 130035Z AUTO 34007KT 10SM BKN014 BKN031 BKN042 12/12 A2983 RMK
AO2 T01200115

MVFR METAR KJZP 130055Z AUTO 34007KT 7SM +DZ BKN012 BKN046 OVC055 12/12 A2983
RMK AO2 T01200120

**MVFR METAR KJZP 130115Z AUTO 00000KT 10SM RA SCT012 BKN028 OVC048 12/12
A2981 RMK AO2 T01160116**

Accident 0117Z

MVFR METAR KJZP 130135Z AUTO 33012G18KT 7SM -RA SCT012 BKN027 OVC065 12/11
A2982 RMK AO2 T01170113

VFR METAR KJZP 130155Z AUTO 33011G19KT 10SM -RA SCT027 BKN050 OVC090 12/11
A2982 RMK AO2 T01180112

VFR METAR KJZP 130215Z AUTO 35010G20KT 10SM SCT023 BKN034 OVC070 12/11 A2983
RMK AO2 T01170106

2.3 Gainesville, Georgia

The next closest station to the accident site was from Lee Gilmer Memorial Airport (KGVN), Gainesville, Georgia located about 16 miles east-southeast of the accident site at an elevation of 1,277ft. The airport had an Automated Surface

Observation System (ASOS) and reported the following conditions at the approximate time of the accident.

Weather observation for KGVL at 2023 EST, automated, wind from 250° at 9 knots, visibility 10 miles, ceiling broken at 1,200 ft agl, temperature 13° C, dew point temperature 11° C, altimeter 29.78 inHg. Remarks: automated station with a precipitation discriminator, temperature 12.8° C, dew point temperature 11.1° C.

The general flight categories and raw observation surrounding the period were as follows.

IFR SPECI KGVL 122115Z AUTO 26020G39KT 1SM +TSRA BR BKN026 OVC033 13/11 A2987 RMK AO2 PK WND 25039/2110 WSHFT 2040 LTG DSNT ALQDS RAB2054 TSB12 P0029 01280111

IFR SPECI KGVL 122121Z AUTO 24012G36KT 1 3/4SM +TSRA BR BKN025 OVC034 13/11 A2986 RMK AO2 PK WND 25039/2110 WSHFT 2040 LTG DSNT ALQDS RAB2054 TSB12 P0037 T01280111

IFR SPECI KGVL 122126Z AUTO 25011G24KT 2SM +TSRA BR FEW022 OVC031 13/11 A2986 RMK AO2 PK WND 25039/2110 WSHFT 2040 LTG DSNT ALQDS RAB2054 TSB12 P0042 01280111

MVFR SPECI KGVL 122130Z AUTO 26010G19KT 3SM TSRA BR FEW022 OVC036 13/12 A2987 RMK AO2 PK WND 25039/2110 WSHFT 2040 LTG DSNT ALQDS RAB2054 TSB12 P0043 T01280117

MVFR SPECI KGVL 122151Z AUTO 20006KT 3SM VCTS RA BR FEW017 SCT041 OVC050 13/12 A2985 RMK AO2 PK WND 25039/2110 WSHFT 2040 LTG DSNT ALQDS RAB2054 TSB12E45 P0054

MVFR METAR KGVL 122153Z AUTO VRB04KT 3SM VCTS RA BR FEW017 SCT036 OVC055 13/12 A2985 RMK AO2 PK WND 25039/2110 WSHFT 2040 LTG DSNT ALQDS RAB2054 TSB12E45 SLP103 P0056 T01280117

MVFR SPECI KGVL 122215Z AUTO 17008KT 4SM TSRA BR OVC065 13/12 A2982 RMK AO2 LTG DSNT ALQDS TSB09 PRESFR P0011 T01280117

MVFR SPECI KGVL 122230Z AUTO 5SM VCTS RA BR BKN060 OVC075 13/12 A2979 RMK AO2 LTG DSNT ALQDS TSB09E24 PRESFR P0016 T01330117

VFR SPECI KGVL 122241Z AUTO 18009G20KT 10SM -RA BKN065 BKN075 OVC090 13/11 A2975 RMK AO2 LTG DSNT E AND SE TSB09E24 P0017 T01330111

VFR METAR KGVL 122253Z AUTO 21009G20KT 10SM SCT065 BKN090 OVC110 13/11 A2979 RMK AO2 LTG DSNT SE RAE45 TSB09E24 PRESRR SLP081 P0017 T01330111

VFR METAR KGVL 122353Z AUTO 23007G15KT 10SM CLR 13/11 A2978 RMK AO2 SLP077 60073 T01330111 10194 20128 58026

Accident 0117Z

MVFR SPECI KGVL 130123Z AUTO 25009KT 10SM BKN012 13/11 A2978 RMK AO2 01280111

MVFR METAR KGVL 130153Z AUTO 26009KT 10SM OVC011 13/11 A2978 RMK AO2 SLP080 T01280111

MVFR SPECI KGVL 130232Z AUTO 26010KT 10SM -RA FEW012 BKN018 OVC025 13/11 A2979 RMK AO2 RAB27 P0000 T01280111

MVFR METAR KGVL 130253Z AUTO 26011KT 10SM FEW012 BKN028 BKN060 13/10 A2979 RMK AO2 RAB27E44 SLP081 P0000 60000 T01280100 51005

2.4 Cornelia, Georgia

The next closest airport which was also along the route of flight was Habersham County Airport (KAJR), Cornelia, Georgia, which was located about 30 miles east-northeast of the accident site at an elevation of 1,448 ft. The airport had an AWOS and reported the following conditions at the approximate time of the accident.

Weather observation for KAJR at 2015 EST, automated, wind from 230° at 4 knots, visibility 7 miles, ceiling overcast at 900 ft agl, temperature 13° C, dew point temperature 13° C, altimeter 29.76 inHg. Remarks: automated station with a precipitation discriminator, lightning distant southwest, temperature 13.1° C, dew point temperature 13.1° C.

The general flight categories and raw observations surrounding the period were as follows.

IFR METAR KAJR 122135Z AUTO 23010G16KT 2 1/2SM +TSRA SCT009 BKN016 OVC026 13/13 A2988 RMK AO2 LTG DSNT ALQDS T01300130

MVFR METAR KAJR 122155Z AUTO 28006KT 5SM +VCTSRA SCT009 BKN048 OVC065 13/13 A2984 RMK AO2 LTG DSNT ALQDS T01290129

MVFR METAR KAJR 122215Z AUTO 21009KT 3SM +TSRA SCT047 SCT055 OVC065 13/13 A2982 RMK AO2 LTG DSNT ALQDS T01300130

MVFR METAR KAJR 122235Z AUTO 18013G17KT 5SM VCTSRA SCT055 OVC065 13/13 A2980 RMK AO2 LTG DSNT ALQDS T01280128

MVFR METAR KAJR 122255Z AUTO 17011G20KT 5SM -RA SCT046 BKN065 OVC090 13/13 A2972 RMK AO2 LTG DSNT NW THRU SE T01280128

VFR METAR KAJR 122315Z AUTO 21009KT 7SM SCT007 SCT042 BKN095 13/13 A2976 RMK AO2 LTG DSNT E T01260126

IFR METAR KAJR 122355Z AUTO 21006KT 7SM OVC009 13/13 A2977 RMK AO2 LTG DSNT NW T01270127 10191 20125

MVFR METAR KAJR 130015Z AUTO 24006KT 7SM OVC013 13/13 A2977 RMK AO2 LTG DSNT NE

T01270127

MVFR METAR KAJR 130035Z AUTO 27005KT 5SM BR BKN013 OVC017 13/13 A2976 RMK AO2
T01280128

MVFR METAR KAJR 130055Z AUTO 24006KT 5SM BR BKN011 OVC016 13/13 A2977 RMK AO2 LTG
DSNT NE T01310131

IFR **METAR KAJR 130115Z AUTO 23004KT 7SM OVC009 13/13 A2976 RMK AO2 LTG DSNT
SW T01310131**

Accident 0117Z

IFR METAR KAJR 130135Z AUTO 23005KT 7SM OVC009 13/13 A2975 RMK AO2 T01300130

IFR METAR KAJR 130155Z AUTO 25008KT 5SM BR OVC009 13/13 A2976 RMK AO2 T01280128

IFR METAR KAJR 130215Z AUTO 24008KT 7SM BKN009 OVC012 13/13 A2976 RMK AO2
T01280128

2.5 NWS METAR Display

A depiction of the observations and the general flight conditions surrounding the approximate time of the accident from the NWS Aviation Weather Center's (AWC) METAR website is included as figure 5 with the approximate accident location marked by a red star. The image depicted the accident site on the southeast side of an area of light intensity echoes with several stations surrounding the accident site reporting IFR to MVFR conditions due to low clouds and visibility restrictions in moderate rain to mist.

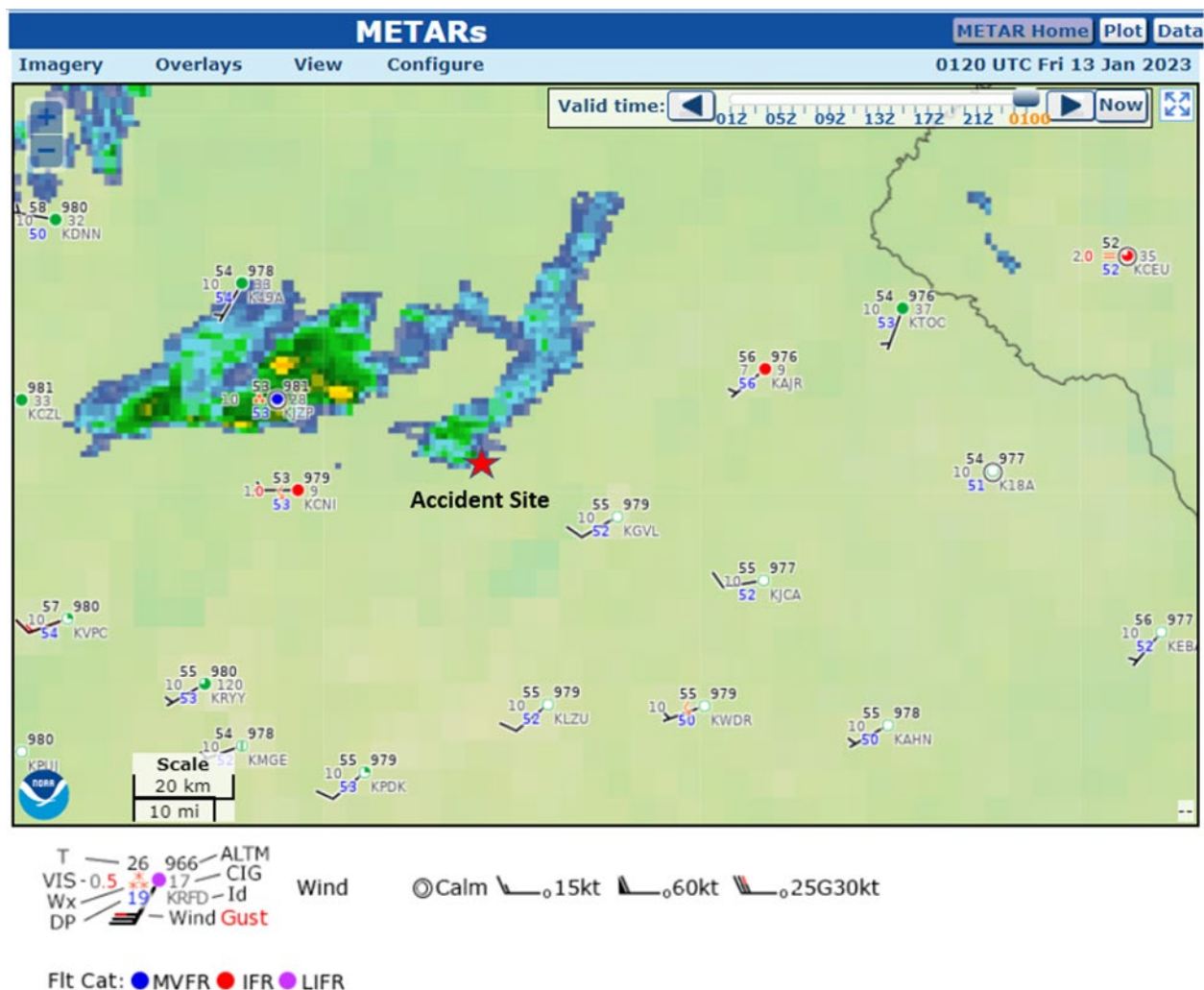


Figure 5 - NWS Aviation Weather Center's METAR display for 2020 EST with radar overlaid with the star marking the approximate accident site.

3.0 Atmospheric Sounding

To determine the vertical structure and state of the atmosphere over the accident site, High-Resolution Rapid Refresh (HRRR)⁷ numerical model data were retrieved from the NOAA Air Resources Laboratory using the model grid point⁸ nearest the accident site for 2000 EST. The data were then plotted on a standard Skew

⁷ 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.

⁸ Grid point coordinates were latitude 34.36° N and longitude 84.14° W.

T log P diagram⁹ using RAOB - The Universal RAwinsonde OBservation program¹⁰ from the surface to 600-hPa or approximately 14,000 ft and is included as figure 6.

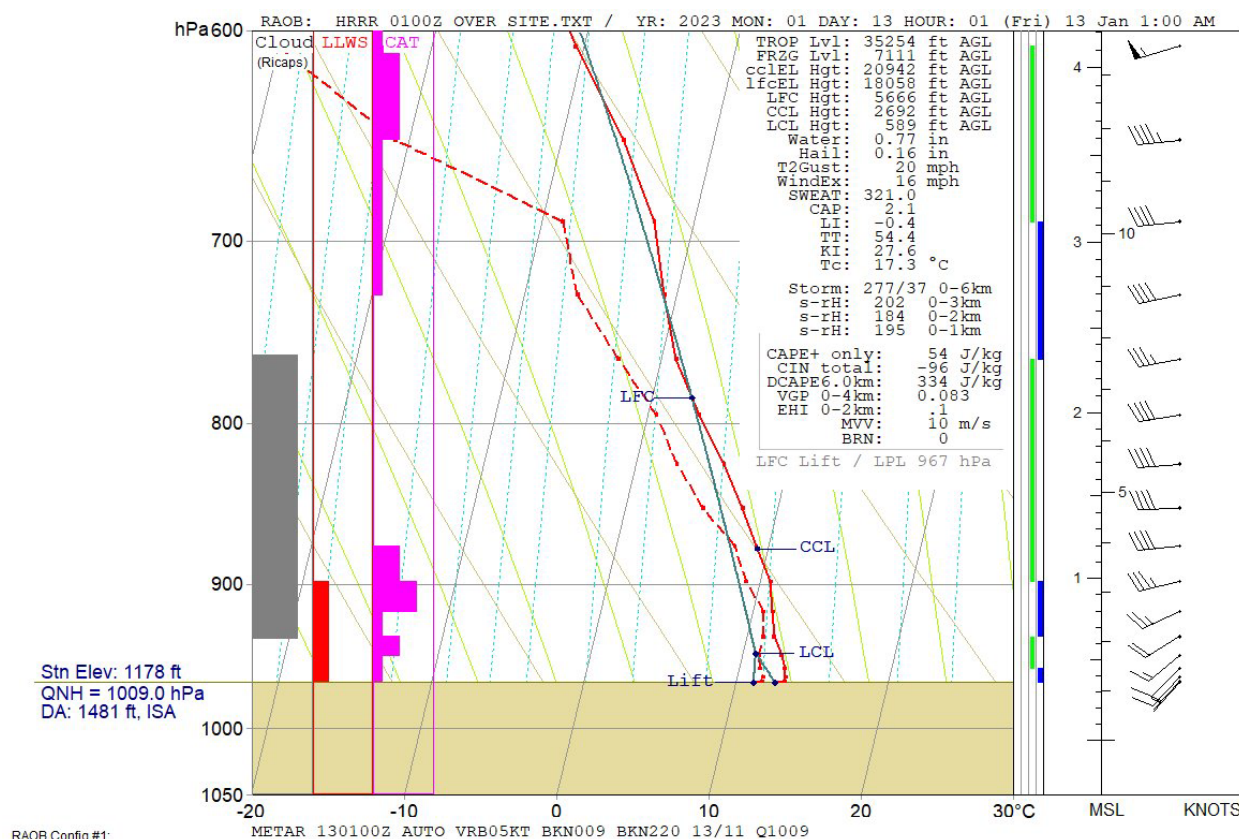


Figure 6 - HRRR numerical model sounding over the closest grip point to the accident site for 2000 EST, depicting the vertical structure of the atmosphere and clouds over the area.

The HRRR sounding for 2000 EST depicted an elevation of 1,178 ft over the grid point, with a near-surface temperature of 12.6° C (54.7° F), a dew point temperature of 11.2° C (52.2° F), a relative humidity of 90%, and a density altitude of 1,481 ft. The sounding indicated the lifted condensation level (LCL)¹¹ was at 589 ft agl, the convective condensation level (CCL)¹² was at 2,692 ft agl, and a level of free convection (LFC)¹³ was at 5,864 ft agl. The RAOB analysis program supported a broken layer of

⁹ Skew T log P diagram - is a standard meteorological plot or thermodynamic diagram 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.

¹⁰ RAOB -The Complete RAwinsonde OBservation program is an interactive sounding analysis program developed by Eosonde Research Services (ERS) previously known as Environmental Research Services, The Villages, Florida.

¹¹ Lifted Condensation Level (LCL) - the level at which a lifted parcel becomes saturated. The LCL height corresponds to cloud base height for forced ascent.

¹² Convective Condensation Level (CCL) - the height at which a parcel of air, when heated sufficiently from below, rises and becomes saturated. It is where newly forming convective clouds should form bases.

¹³ Level of Free Convection (LFC) - the level where a parcel becomes buoyant, or "warmer" than the

clouds at 900 ft agl through 8,000 ft, with a higher broken layer near 22,000 ft. The atmosphere was characterized as conditionally unstable with the Lifted Index¹⁴ of -0.4. The freezing level was identified at 8,285 ft, which was above the accident airplanes obtained altitude of 7,150 ft.

The wind profile indicated southwesterly wind of 5 knots near the surface with the wind veering to the west with height and wind speeds increasing rapidly above the surface. A low-level wind maximum was identified near 3,900 ft with winds from 260° at 40 knots and indicated a high probability of moderate or greater turbulence near that level. The mean 0 to 6 kilometer or 18,000 ft wind was from 250° at 50 knots.

The HRRR parameters of height, pressure (Pres), temperature (T), dew point temperature (Td), relative humidity (RH), wind direction and speed, Clear Air Turbulence (CAT) intensity and Low-Level Wind Shear (LLWS) potential below 10,000 ft were as follows. The wind direction has been rounded to the near 5°.

Height (ft-msl)	Pres (hPa)	T (°C)	Td (°C)	RH (%)	Wind (deg/kts)	CAT (FAA)	LLWS (FAA)	Icing (AFGW)	Wave/x-W-Turb (nm fpm max)
1178	967	12.6	11.2	91	220/ 5				
1207	966	13.2	11.7	91	220/ 5		LGT	LIGHT	
1293	963	13.2	11.7	91	220/ 9		LGT	LIGHT	
1466	957	13.0	11.4	90	225/ 12		LGT	LIGHT	
1727	948	12.6	11.1	91	230/ 15		MDT	LIGHT	
2108	935	11.8	11.1	95	235/ 21		LGT	LIGHT	
2613	918	11.3	10.7	96	245/ 26		SVR	LIGHT	
3218	898	10.7	9.1	90	255/ 36		MDT		
3927	875	9.2	7.8	91	265/ 41				
4683	851	7.7	5.1	84	270/ 40				
5553	824	5.8	2.7	80	265/ 39				
6512	795	3.4	0.6	82	260/ 38				
7602	763	1.0	-2.8	76	260/ 37				
8838	728	-0.8	-6.5	65	260/ 38		LGT		
10239	690	-2.6	-8.6	63	265/ 40		LGT		

4.0 Satellite Imagery

The Geostationary Operational Environmental Satellite number 16 (GOES-16) imagery were obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed

environmental temperature at the same level. The LFC represents the bottom of the layer containing CAPE.

¹⁴ Lifted Index (LI) - A common measure of atmospheric instability. Its value is obtained by computing the temperature that air near the ground would have if it were lifted to 500-hPa or approximately 18,000 feet and comparing that temperature to the actual temperature at that level. Negative values indicate instability - the more negative, the more unstable the air is, and the stronger the updrafts are likely to be with any developing thunderstorms.

using the Man-computer Interactive Data Access System (McIDAS) software. The infrared imagery surrounding the period were reviewed and the closest images to the accident time were documented. The infrared long wave imagery (band 13) at a wavelength of 10.3 microns (μm) provided radiative cloud top temperatures with a nominal spatial resolution of 2 km. Due to the low light conditions at the time of the accident, the higher resolution visible imagery was not useful.

Figure 7 is the GOES-16 infrared image for 2016 EST at 4X magnification and with a standard MB temperature enhancement curve applied to highlight the higher and colder clouds tops associated with deep convection and high cirriform clouds. The image depicted a band of clouds over the accident site with a radiative cloud top of 270 Kelvin or -3.16°C , which corresponded to cloud tops near 10,000 ft based on the HRRR sounding. A clear zone was indicated to the southwest of the accident site over the Atlanta area, with a line of enhanced clouds over eastern Georgia into South Carolina and North Carolina.

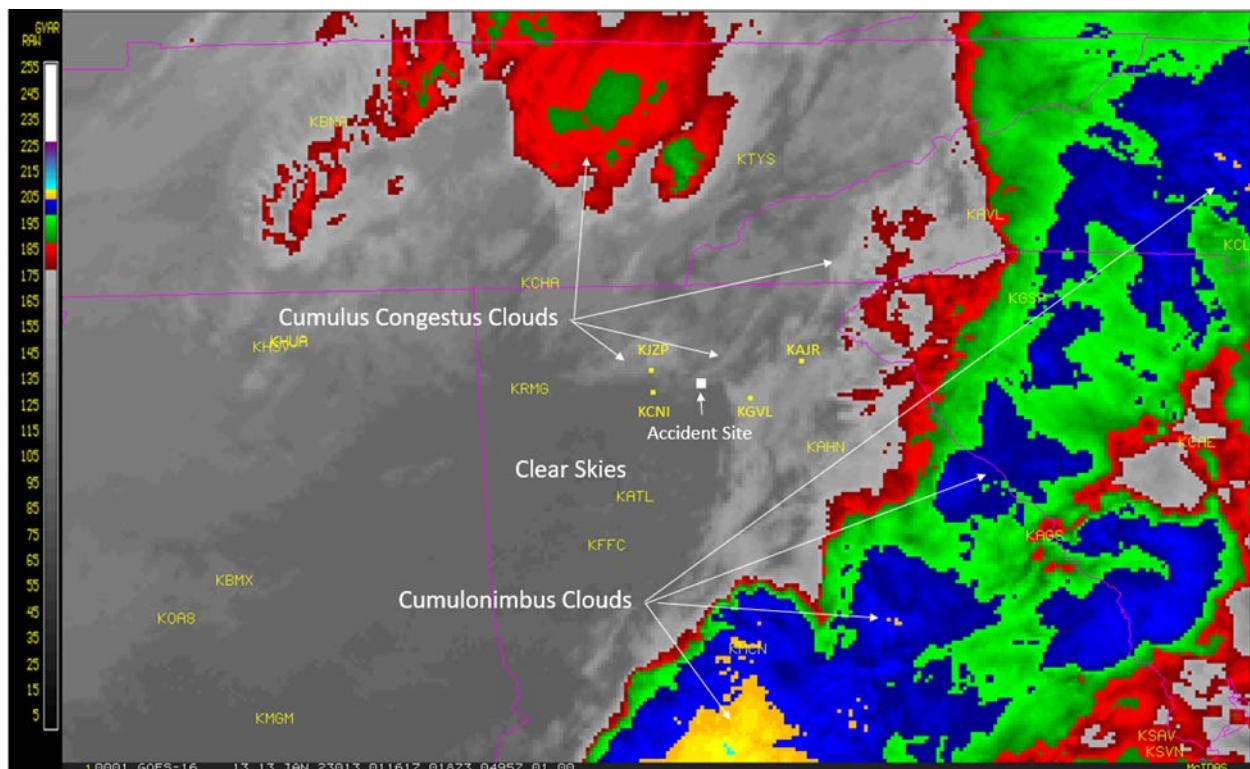


Figure 7 - GOES-16 infrared image for 2016 EST at 4X magnification with accident site and surrounding airports identified.

5.0 Weather Radar Imagery

The closest NWS Weather Surveillance Radar 1988 Doppler (WSR-88D)¹⁵ was from the Atlanta (KFFC) Weather Forecast Office (WFO) located approximately 63.5 miles south of the accident site. The level II archive data were obtained from the NCEI using the Hierarchical Data Storage System and displayed using the NWS NEXRAD Interactive Viewer and Data Exporter software. During the period the KFFC WSR-88D was operating in the standard precipitation mode volume scanning pattern 215 (VCP-215), where the radar makes 15 different elevation scans during a 6 minute scan. Assuming standard refraction¹⁶ of the radar beam with the antenna height of 972 ft, the lowest 0.48° elevation scan was sampling the atmosphere between 3,676 ft and 10,075 ft, with the center of the beam near 6,876 ft over the accident site.

5.1 Reflectivity

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors¹⁷, 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, table 24-8 defines echoes less than 30 dBZ as "light" in intensity, "moderate" echoes 30-40 dBZ, "heavy" with echoes of >40-50 dBZ, and "extreme" intensity with echoes above >50 dBZ. These are the new standard radio phraseology terms used by air traffic controllers to describe weather conditions to pilots as shown in figure 8.

Reflectivity (dBZ) Ranges	Weather Radar Echo Intensity Terminology
< 30 dBZ	Light
30-40 dBZ	Moderate
>40-50 dBZ	Heavy
>50 dBZ	Extreme

Figure 8 - Reflectivity ranges in dBZ and intensity terminology levels.

¹⁵ The WSR-88D is a S-band 10-centimeter wavelength radar with a power output of 750,000 watts, with a 28-foot parabolic antenna concentrating the energy into a 0.95° beam width. The radar produces three basic types of products reflectivity, radial velocity, and spectral width.

¹⁶ Standard refraction implies a standard atmosphere with no ducting or bending of the radar beam due to any inversions or isothermal layers.

¹⁷ Hydrometeors are any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at 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.

5.2 Base Reflectivity Imagery

Figure 9 is the NWS KFFC WSR-88D 0.48° base reflectivity image for 2014 EST and depicts the accident airplane at 7,125 ft approach and enter the area of light intensity echoes of 10 to 24 dBZ. Figure 10 is the KFFC WSR-88D 0.48° base reflectivity image for 2020 EST with the completed flightpath overlaid and the accident site. The image depicts the accident airplane continuing into the light intensity echoes of 7 to 24.5 dBZ with the maximum reflectivity of 43.5 dBZ immediately east of the accident site. Figure 11 is a close-up of the flight track and the KFFX WSR-88D 0.48° base reflectivity image at 2020 EST and shows that shortly after entering the echoes, the flight path of N4254T makes several turns before the accident.

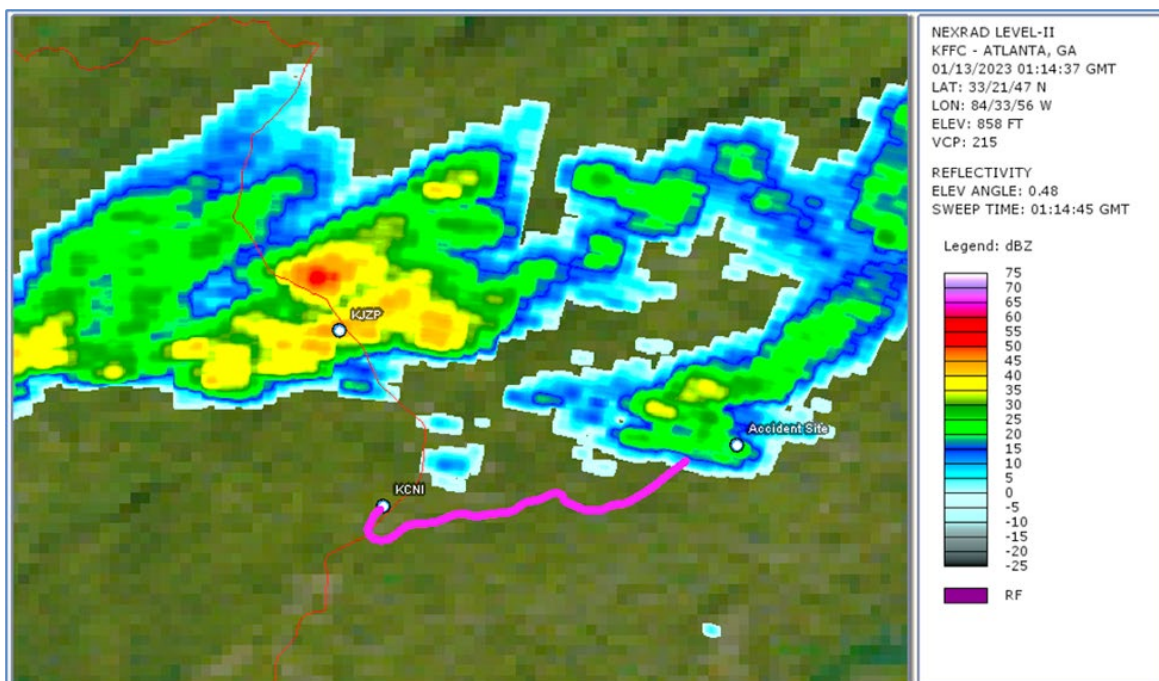


Figure 9 - NWS KFFC WSR-88D 0.48° base reflectivity image for 2014 EST with flight track.

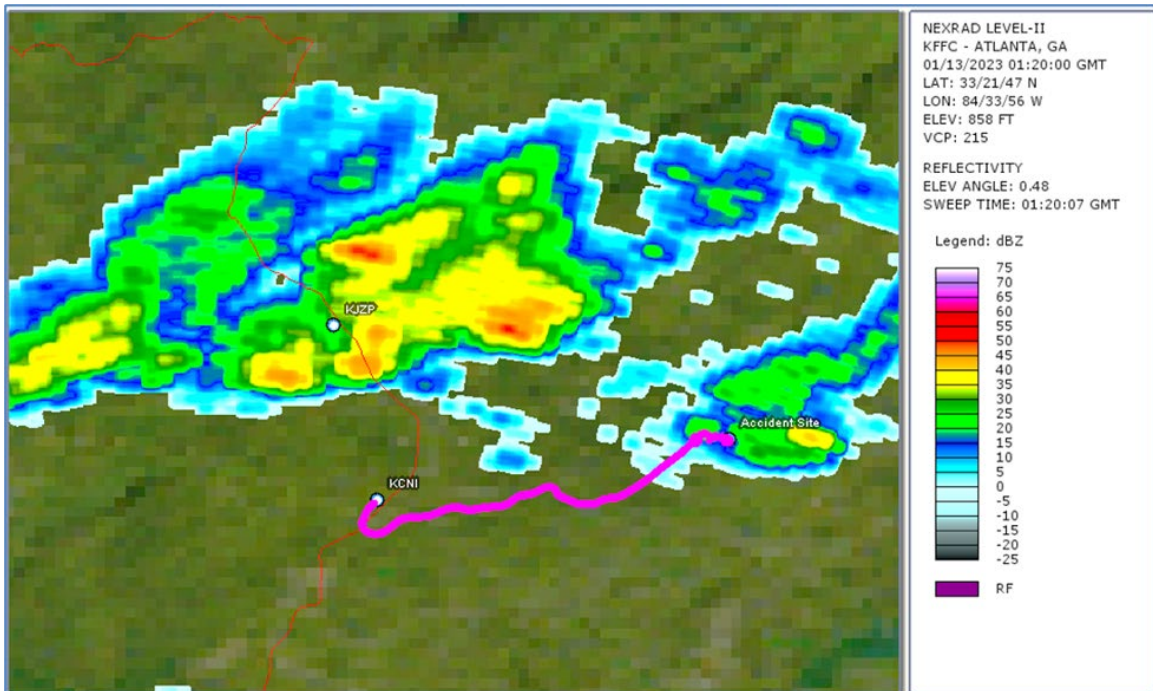


Figure 10 - NWS FFC WSR-88D 0.48° base reflectivity image for 2020 EST with flight track.

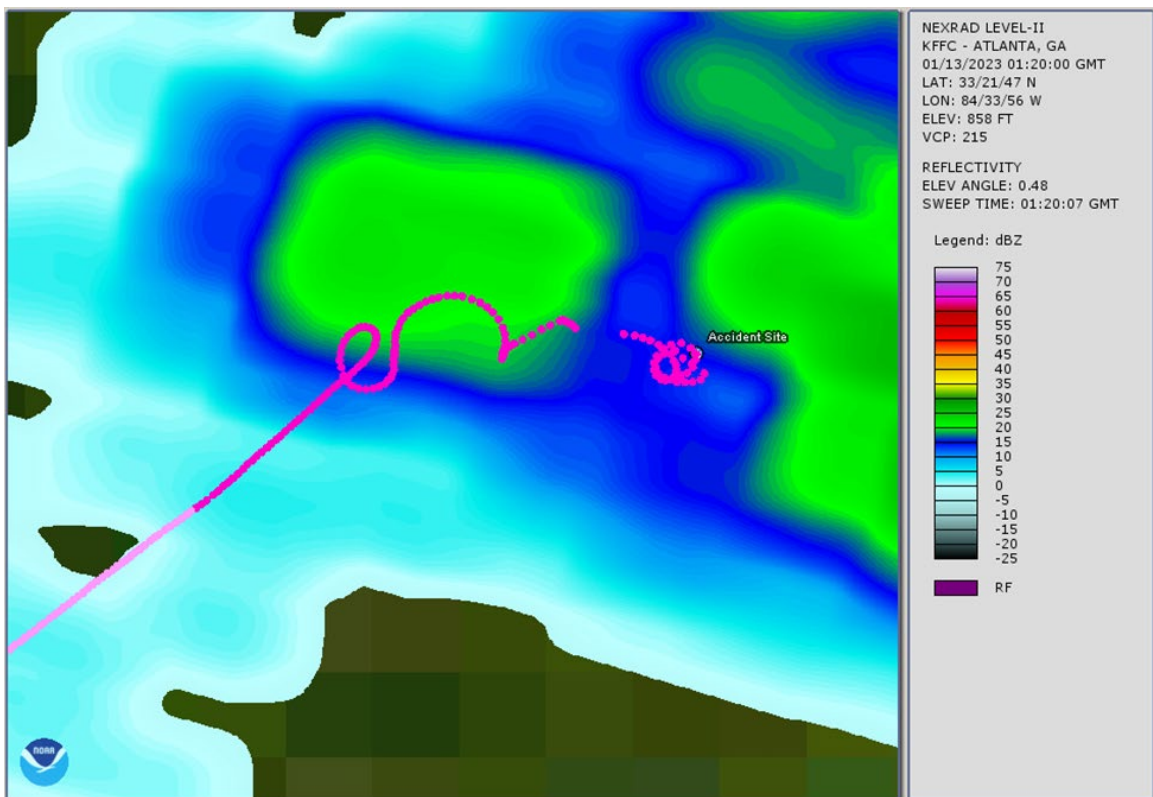


Figure 11 - Close-up of the NWS KFFX WSR-88D 0.48° base reflectivity image for 2020 EST with the flight track overlaid.

5.3 Consolidated Storm Prediction Imagery

A separate review of the FAA Consolidated Storm Prediction for Aviation (CoSPA) images surrounding the period were reviewed. Figure 12 is a depiction of the CoSPA precipitation intensity (left) based on the Vertical Integrated Liquid (VIL) values given in levels 1-6, and the echo tops product (right) with precipitation detected tops in hundreds of feet. The images showed an area of light intensity echoes with echo tops of 21,000 ft over the accident site, with moderate intensity echoes with tops near 25,000 ft to the west of the accident site, which was moving eastward at 30 knots. No cloud-to-ground lightning strikes were noted between the period from 2000 through 2020 EST. A review of Earth Network's lightning archive also indicated no defined in-cloud or ground-to-cloud lightning within 20 miles of the accident site between 1940 and 2020 EST.

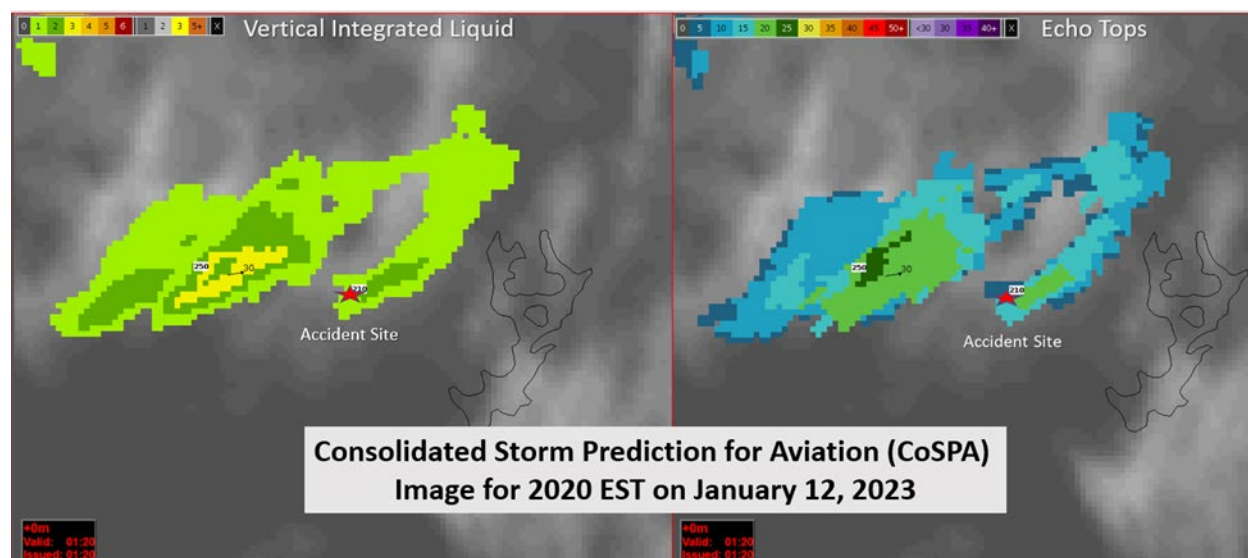


Figure 12 - Consolidated Storm Prediction for Aviation (CoSPA) Precipitation (left) and Echo Tops (right) for 2020 EST with approximate accident site noted by red star.

6.0 Pilot Reports

The following pilot weather reports or PIREPs were available in the national data base within 120 miles of the accident site surrounding the period between 1600 and 2200 EST below 12,000 ft.

MCN UA /OV MCN/TM 2120/FLDURD/TP F2TH/SK CLR/WX -RA

RYY UA /OV RYY/TM 2142/FL30/TP BE40/TB LGT CHOP/RM DURC

ATL UA /OV ATL/TM 2145/FL120/TP A319/SK OVC050/TB LGT 050 MOD 080-120/RM DURC

ATL UA /OV RWY28/TM 2206/FL2600/TP A321/WX MDT RA/RM AIRCRAFT BROKE OUT AT 026 6 MILE FINAL NO WINDSHEAR NO TURB

GSP UA /OV KGSP/TM 2245/FL010/TP P180/SK OVC020/RM DURD

ATL UA /OV ATL110021/TM 2250/FL050/TP A319/TB CONT MOD BORDERLINE SEVERE

ATL UA /OV ATL090020/TM 2300/FL060/TP B767/TB MOD TO SEV

*CHA UA /OV CHAQ045025/TM 2344/FLDURD/TP C550/TA M08/IC LGT MOD RIME 230-080/RM
ZME*

TYS UA /OV TYS/TM 2358/FL040/TP A320/SK BKN041

GSP UA /OV GYH/TM 0000/FLUNKN/TP E110/TB MOD/RM DURD RY23

AHN UA /OV AHN/TM 0007/FL025/TP B350/TB MOD

*AHN UA /OV 5 N 18A/TM 0022/FL060/TP C25A/TB MOD BETWEEN 070-090/RM CLR BELOW
12000*

GSP UA /OV ELW/TM 0031/FL120/TP E175/TB MOD BLO 120/RM DURD 040

CHA UA /OV GQO125020/TM 0111/FL060/TP BE58/IC LGT RIME 060-075/RM ZTLFD

7.0 NWS Forecasts and Advisories

The accident occurred in Dawson County, Georgia which was under the responsibility of the NWS Peachtree City/Atlanta (KFCC) Weather Forecast Office. The local weather bulletins and forecasts issued by the office related to the accident are documented below. The aviation weather products from the NWS AWC were also documented.

7.1 Terminal Aerodrome Forecasts

A Terminal Aerodrome Forecast (TAF) is a concise statement of the expected meteorological conditions significant to aviation for a specified time period within 5 statute miles of the center of the airport's runway complex (terminal). The NWS does not routinely issue a TAF for the departure airport KCNI. The closest TAF to the accident site was issued for Dekalb-Peachtree Airport (KPDK), Atlanta, Georgia, located about 30 miles south of the accident site at an elevation of 998 ft. The forecast current at the time of the accident issued by KFCC was as follows.

TAF KPDK 122340Z 1300/1324 20015G28KT P6SM VCSH FEW050 OVC080

FM130200 28013G24KT P6SM BKN018

FM130800 30012G22KT P6SM SCT015 BKN025

FM131600 32013KT P6SM OVC025=

The forecast issued at 1840 EST expected from 1900 through 2100 EST; wind from 200° at 15 knots gusting to 28 knots, visibility better than 6 miles with rain showers in the vicinity of the airport, a few clouds at 5,000 ft agl, ceiling overcast at 8,000 ft. After 2100 through 0300 EST on January 13th the forecast was for a wind from 280° at 13 knots gusting to 24 knots, visibility 6 miles or more, with a ceiling broken at 1,800 ft agl.

7.2 Aviation Forecast Discussion

The NWS Aviation Forecast Discussions (AFD) are issued by each WFO to describe the short-term weather conditions within their region with an aviation section that includes the general conditions as they relate to the creation of the TAF. These are useful for additional aviation-related issues that cannot be encoded into the TAF and provide some reasoning behind the forecast. The KFFC AFD issued at 1859 EST was as follows.

.AVIATION...
(00Z TAFS)
Issued at 658 PM EST Thu Jan 12 2023

[TSRA has finally moved out of the area. Winds may briefly go SSE between 00-02Z, but will gradually re-establish on the SSW side. Winds at 10-15kts could gust up to 25kts for the rest of the evening. CIGS will be low VFR with sct high MVFR overnight.

*//ATL Confidence...Avi Update...
High on all elements.
Vaughn*

7.3 Graphic Forecast for Aviation

The NWS Graphic Forecast for Aviation (GFA) is a graphical depiction of surface wind, thunderstorms, precipitation, color coded general flight categories, and cloud cover bases and tops, from graphical output from the NWS's National Digital Forecast Data (NDFD) with the Graphic-Airmen's Meteorological Information (G-AIRMET) for IFR conditions, mountain obscuration, icing conditions, and strong surface wind overlaid. The GFA provides a forecast for the enroute phase of flight and for locations without a TAF. The GFA is available at the NWS AWC website and through other weather briefing services. The GFA 3- and 6-hour forecast issued about 1700 EST and valid for 1900 and 2200 EST respectively over the eastern United States are included as figures 13 and 16.

The GFA Surface Forecast (figures 13 and 14) depicted winds from the west-southwest at 20 knots veering to the west during the evening. Visibility restrictions less than 3 miles were expected at 1900 EST over western South Carolina, North Carolina

and over Virginia over the planned route of flight and destination. A chance of rain showers was expected over northern Georgia with the area coverage decreasing in the evening, with thunderstorms over southeastern Georgia, South Carolina, and North Carolina during the period. A G-AIRMET for IFR conditions was depicted immediately east of the accident site over northeastern Georgia into western South Carolina, North Carolina, and Virginia during the period and shifting eastward at 2200 EST. The GFA Cloud Forecasts (figures 15-16) expected overcast clouds with bases at 1,800 ft msl with tops near FL360, with cirrus clouds above at 1900 EST. The GFA Cloud forecast valid for 2200 EST had scattered clouds over the accident site with a clearing trend over Georgia. The GFA Cloud Forecast included a G-AIRMET for mountain obscuration conditions (pink shaded area) over northern Georgia which included the accident site through western portions of South Carolina, North Carolina, and Virginia and eastern Tennessee and West Virginia.

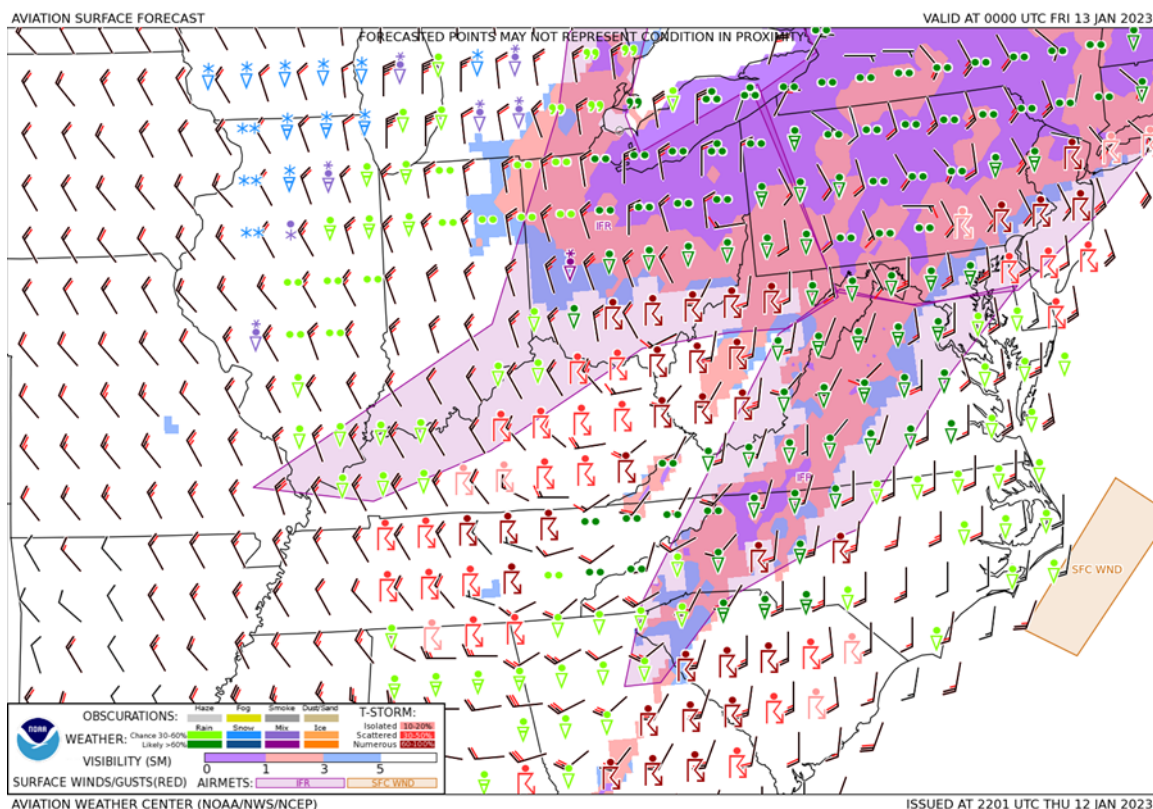


Figure 13 - GFA 3-hour Surface Forecast issued at about 1700 EST and valid for 1900 EST.

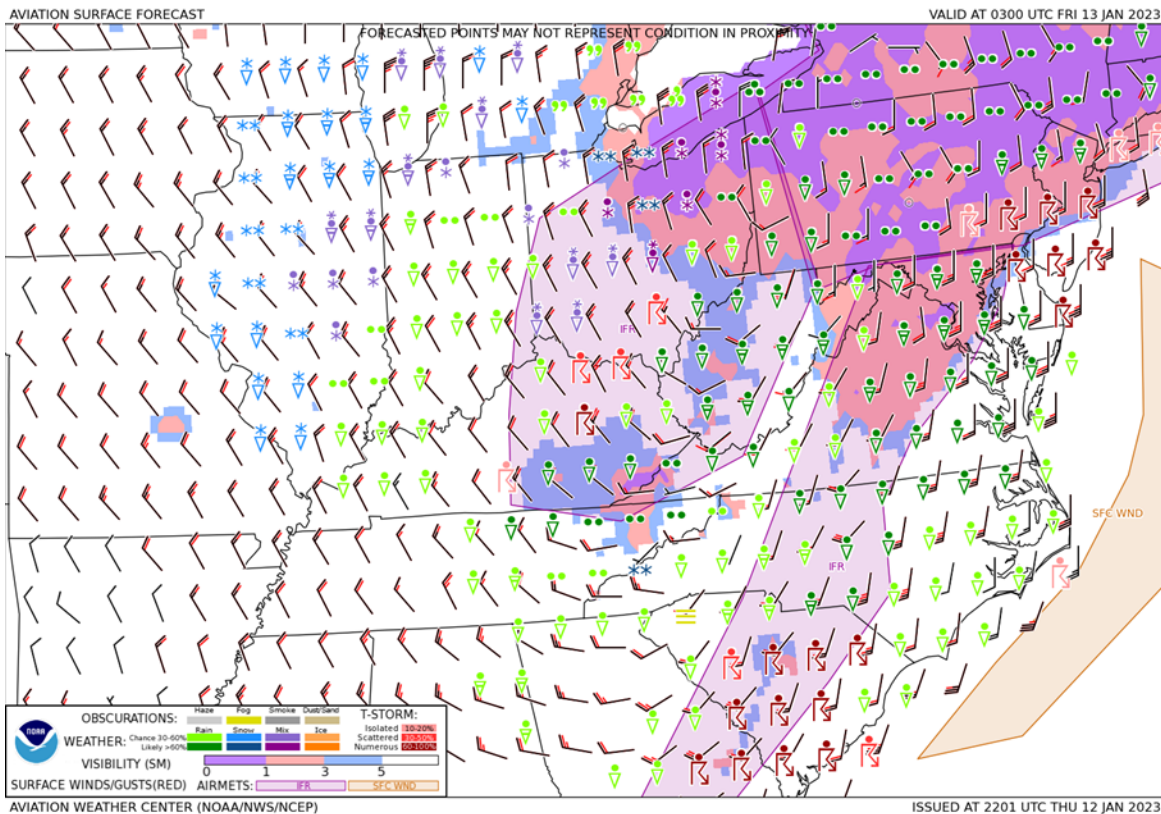


Figure 14 - GFA 6-hour surface forecast issued about 1700 EST and valid for 2200 EST.

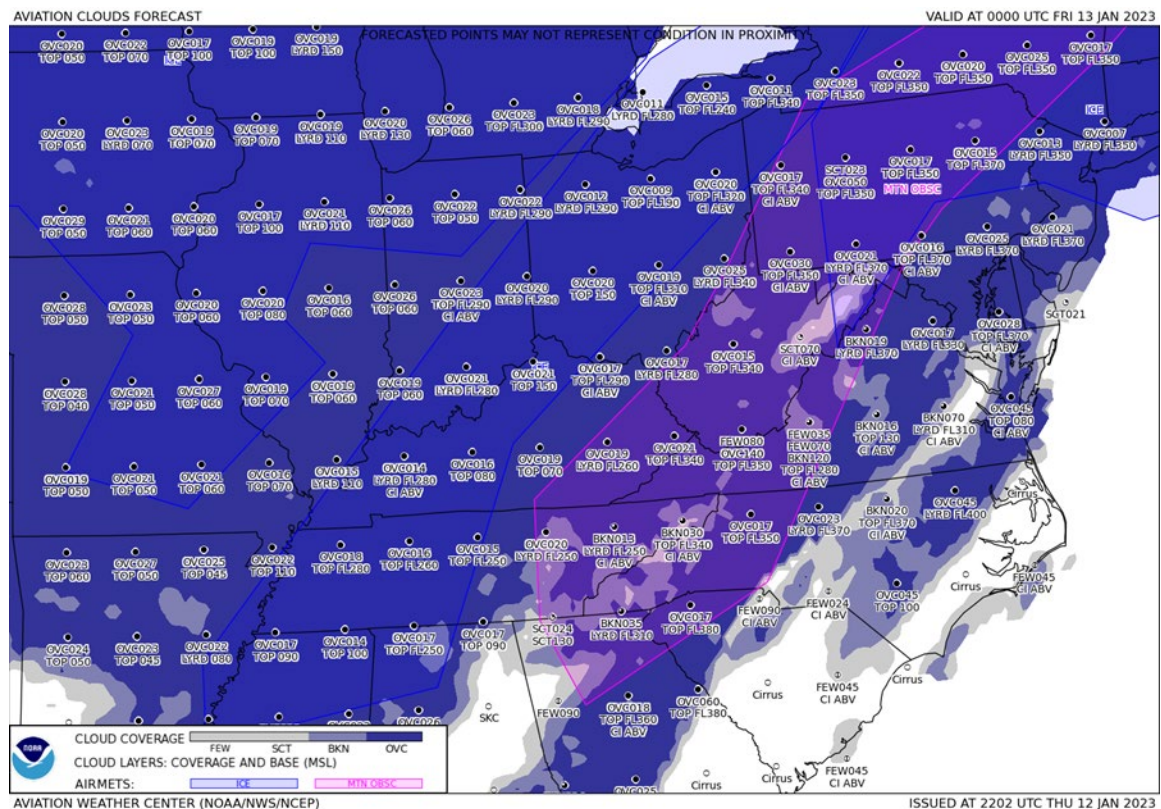


Figure 15 - GFA 3-hour cloud forecast issued about 1700 EST and valid for 1900 EST.

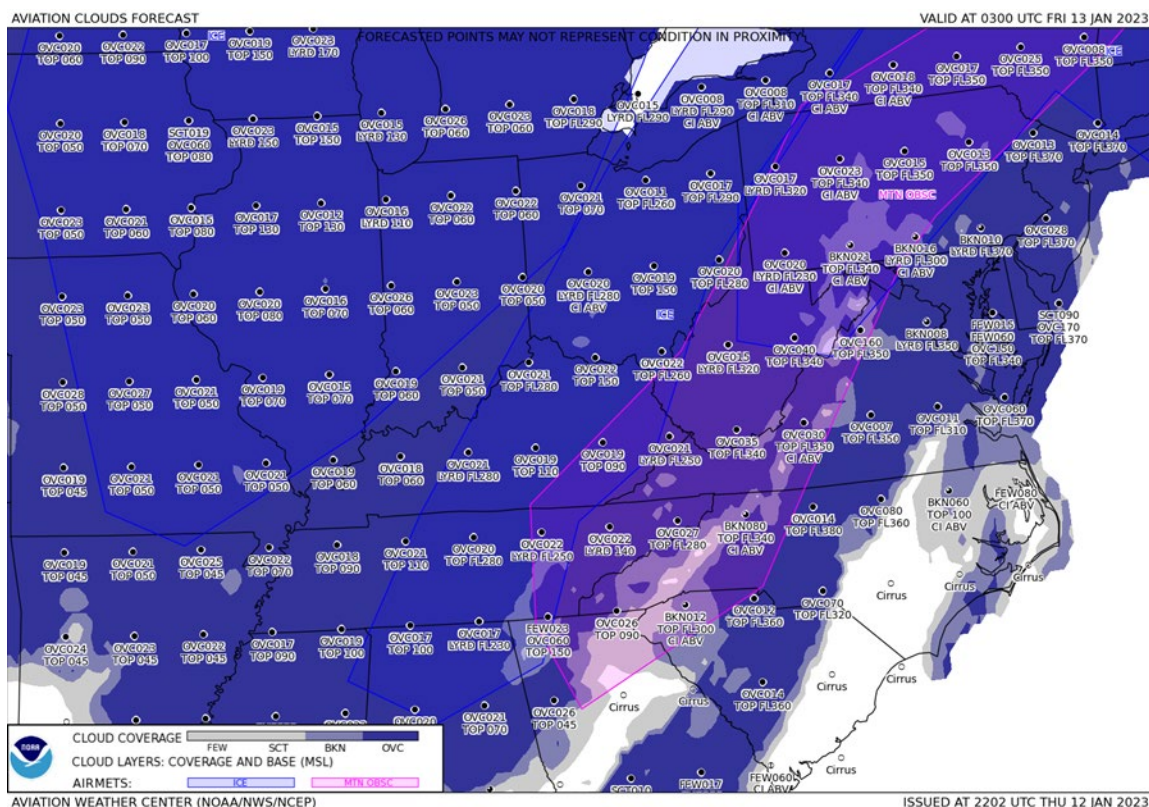


Figure 16 - GFA 6-hour cloud forecast issued about 1700 EST and valid for 2200 EST.

7.4 Inflight Weather Advisories

The NWS issues the primary adverse aviation weather information in the forms of a Significant Meteorological Information (SIGMET), the Convective SIGMET, the Graphic-Airmen's Meteorological Information (G-AIRMET) and Center Weather Advisory (CWA).

During the period of the accident there were no SIGMETs, Convective SIGMETs, or CWA current that extended over the accident site. The NWS had two G-AIRMETs valid from 1900 through 2400 EST over the area for mountain obscuration conditions in clouds and mist, and for low-level wind shear below 2,000 ft agl of air speed loss or gain of 20 knots or more which are graphically depicted in figure 17. A G-AIRMET for IFR conditions was also valid at 1900 through 2400 EST extended from northeast Georgia into Virginia long the general route of flight for ceilings below 1,000 ft agl and/or visibility less than 3 miles in rain and mist.

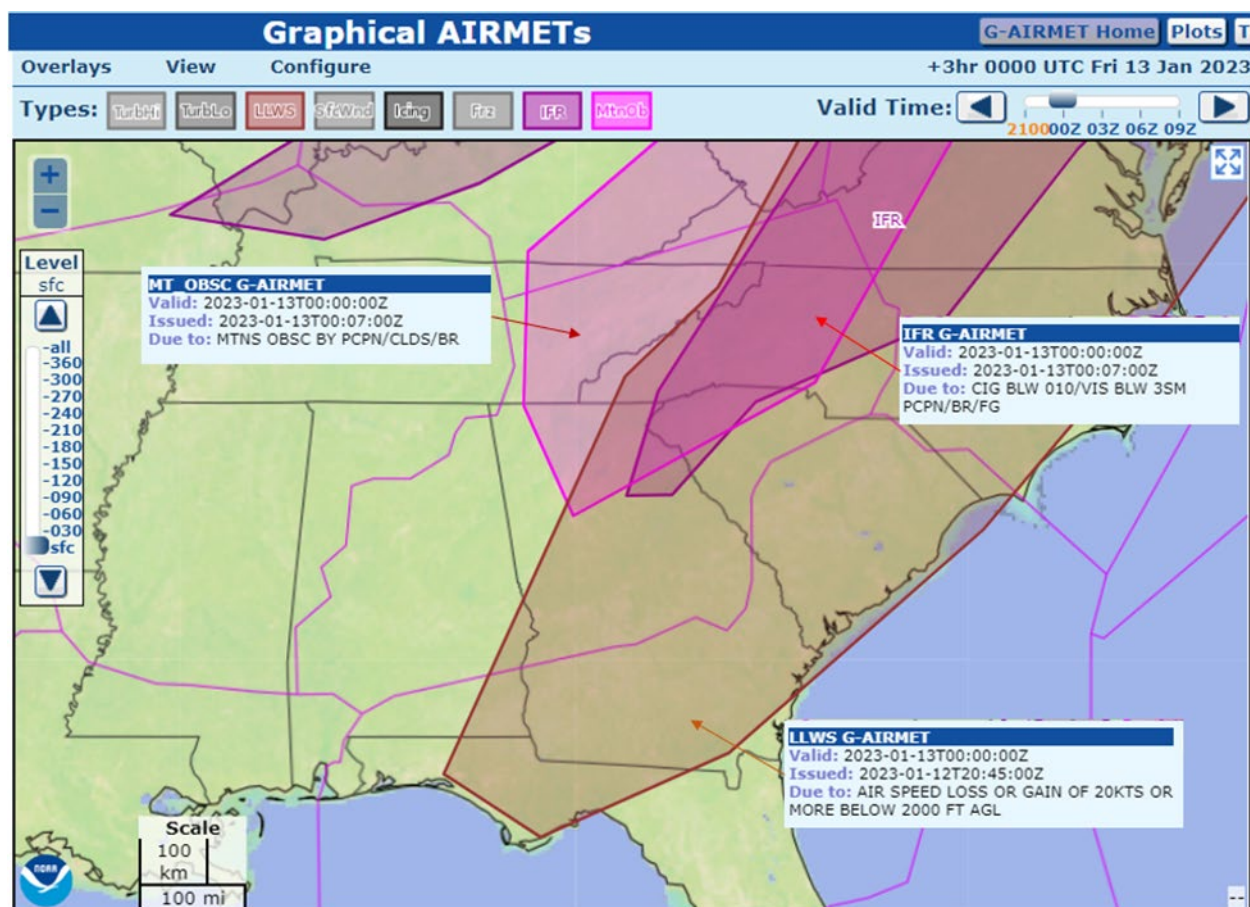


Figure 17 - Graphic-AIRMETs current for 1900 EST over the southeast.

8.0 Weather Briefing Information

A search of the FAA's contract Automated Flight Service Station (AFSS) provider Leidos indicated that neither they nor any of their third party vendors utilizing the Lockheed Flight Service (LFS) system had any contact with the pilot for any weather briefings or flight plans on January 12 or 13, 2023. A separate search of Foreflight indicated the pilot had an account with their company and had created a route briefing for the KCNI to KRMN trip with a proposed departure time of 1700 EST. The ForeFlight route briefing and navigation log generated for the flight is included as Attachment 1. While the pilot had filed flight plans through ForeFlight previously, no flight plan was filed for the accident flight. The briefing did not include the current inflight weather advisories.

9.0 Astronomical Conditions

The astronomical conditions surrounding the period of the accident were obtained from the United States Naval Observatory's website¹⁸ for Canton, Georgia, for January 12, 2023.

<u>SUN</u>	<u>TIME (EST)</u>
Begin Civil Twilight	0717
Sunrise	0744
Upper Transit	1246
Sunset	1748
End Civil Twilight	1815
Accident	2018

<u>MOON</u>	<u>TIME (EST)</u>
Moonset	1110
Accident	2018
Moonrise	2309

F. ATTACHMENTS

Attachment 1 - ForeFlight Weather Briefing obtained at 1700 EST.

Submitted by:

Donald Eick
Senior Meteorologist

¹⁸ <https://aa.usno.navy.mil/data/index>