

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA23LA071

METEOROLOGY

Specialist's Factual Report

December 21, 2022

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A. ACCIDENT

Location: Gaithersburg, Maryland

Date: November 27, 2022

Time: 1729 eastern standard time (2229 UTC¹)

Aircraft: Type - Mooney M20J; Registration - N201RF

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 standard time for November 27, 2022 (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: 39.18441° north latitude; 77.188553° west longitude at an elevation of about 470 feet.

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

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Weather Observing System (AWOS) was located at Montgomery County Airpark (GAI²) in Gaithersburg, Maryland, which was located about 1.5 miles

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.

southeast of the accident location and was at an elevation of about 540 feet. It had a magnetic variation of about 11° west. Automated longline³ reports from the GAI AWOS during the times surrounding the accident time are presented here, and the observation closest in time to the accident time is highlighted by bold text.

[1621] SPECI KGAI 272121Z AUTO 14006KT 3/4SM BR OVC002 10/10 A2945
RMK AO2=

[1628] SPECI KGAI 272128Z AUTO 18003KT 1 1/4SM BR OVC002 11/11 A2945
RMK AO2=

**[1656] METAR KGAI 272156Z AUTO VRB04KT 1 1/4SM BR OVC002 11/11
A2945 RMK AO2 SLP987 T01060106=**

[2308] SPECI KGAI 280408Z AUTO 29003KT 1/4SM FG 10/10 A2955 RMK AO2=

At 1656, the GAI AWOS reported a variable wind at 4 knots, visibility 1 1/4 statute miles, mist, ceiling overcast at 200 feet above ground level (agl), temperature of 11° Celsius (C) and dew point temperature of 11°C, altimeter setting of 29.45 inches of mercury; Remarks included: automated station with a precipitation discriminator, sea-level pressure of 998.7 hectopascals (hPa), temperature of 10.6°C and dew point temperature of 10.6°C.

Automated one-minute observations (OMO) were retrieved from the GAI AWOS for the times surrounding the accident time and are presented below. These observations were not delivered longline and were only available in real time via telephone and the AWOS's very high frequency broadcast. The observation highlighted in bold text is the last OMO prior to certain parameters being reported as "missing" (M).

[1726] 1-MIN KGAI 272226Z AUTO 20006KT 2 1/2SM BR OVC002 12/12 A2945
980 100 900 220/06 RMK AO2

**[1727] 1-MIN KGAI 272227Z AUTO 21005KT 2 1/2SM BR OVC002 12/12
A2945 980 100 900 230/05 RMK AO2**

[1728] 1-MIN KGAI 272228Z AUTO 23006KT 2 1/2SM BR OVC002 12/12 M 100
M 240/06 RMK AO2 \$

[1729] 1-MIN KGAI 272229Z AUTO 2 1/2SM BR OVC002 12/12 M 100 M M /M
RMK AO2 \$

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.

[1730] 1-MIN KGAI 272230Z AUTO 3SM BR 12/12 M 100 M M /M RMK AO2 \$
[1731] 1-MIN KGAI 272231Z AUTO 12/12 M 100 M M /M RMK AO2 PWINO \$
[1732] 1-MIN KGAI 272232Z AUTO 12/12 M 100 M M /M RMK AO2 PWINO \$

At 1727, the GAI AWOS reported a wind from 210° at 5 knots, visibility of 2 1/2 statute miles, ceiling overcast at 200 feet agl, temperature 12°C and dew point temperature of 12°C, altimeter setting of 29.45 inches of mercury, pressure altitude of 980 feet, relative humidity of 100 percent, density altitude of 900 feet, wind from 230° magnetic at 5 knots; Remarks: station with a precipitation discriminator.

2.0 Weather Radar

WSR-88D⁴ Level-II base reflectivity weather radar imagery from the Sterling, Virginia, site (KLWX) is presented in Figure 1. KLWX was located approximately 18 miles southwest of the accident location with an antenna elevation of about 405 feet. Assuming standard refraction and considering the 0.95° beam width⁵ for the WSR-88D radar beam, the KLWX 0.529° tilt would have “seen” altitudes above the accident location of between about 1,800 and 2,500 feet.

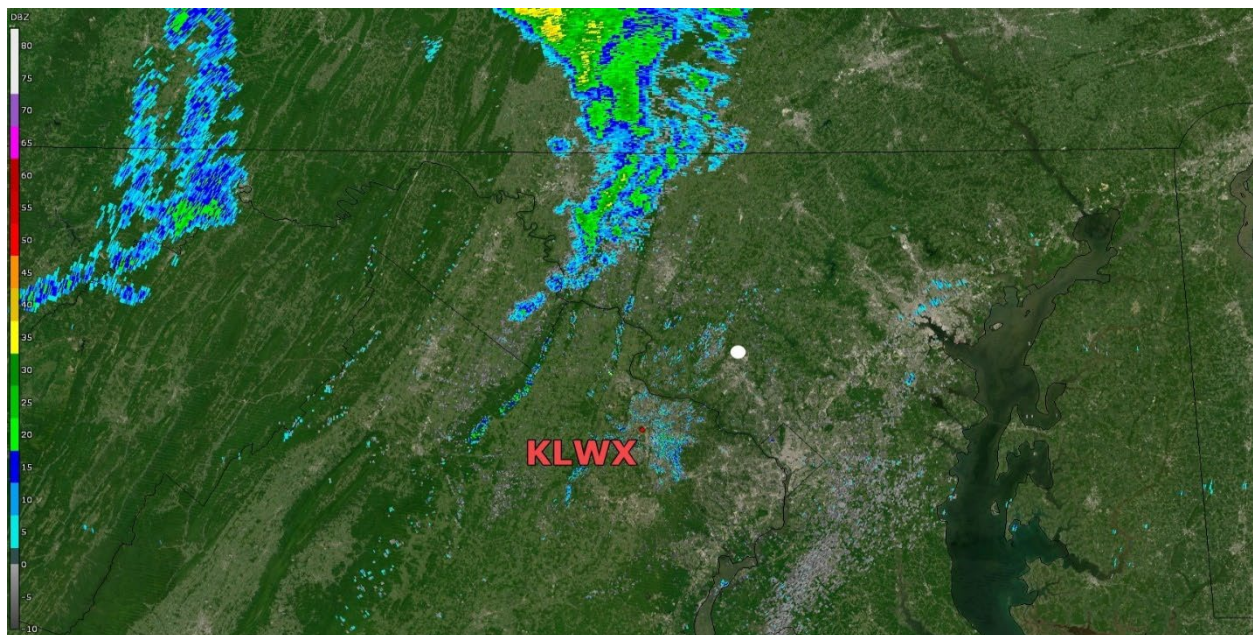


Figure 1 - KLWX 0.529° Level-II base reflectivity product from a sweep initiated at 1728:22. The accident location is identified by the white dot.

⁴ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁵ 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.

3.0 Pilot Reports

The following are the longline-disseminated pilot reports⁶ (PIREPs) reported between 1600 and 1900 that were applicable within about 30 miles of the accident location.

IAD UA /OV RWY 19L/TM 2103/FLDURD/TP B739/SK OVC003/RM BASES 350

BWI UA /OV BAL20003/TM 2114/FLDURC/TP B737/SK BASES 004 TOPS050

DCA UA /OV DCA185R 1DME/TM 2146/FL006/TP CRJ9/SK BASES006

DCA UA /OV DCA328010/TM 2201/FL070/TP B737/SK 006 OVC 020

BWI UA /OV BAL150005/TM 2225/FL041/TP GLF5/SK OVC002 TOPS041

IAD UA /OV RWY 30 DEP/TM 2229/FLDURC/TP BE40/SK OVC018/RM BASES 1800

BWI UA /OV BAL/TM 2327/FL040/TP B737/SK BASES 011 TOPS 024

4.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁷ sounding (Figure 2) for near the accident site⁸ at 1700 using an elevation of 469 feet was retrieved from the National Oceanic and Atmospheric Administration's Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Cloudy conditions were identified by RAOB in the lower atmosphere from about 750 feet through 3,650 feet. The freezing level was noted at about 10,700 feet. The wind nearest the surface was from the southwest at a magnitude of less than 5 knots, but the wind increased in magnitude to a south-southwest wind of about 35 knots near 1,900 feet. RAOB identified low-level wind shear and light to moderate turbulence in this layer. Severe turbulence was noted at the top of this layer above 1,900 feet. Temperature inversions were noted between about 750 and 1,900 feet and between about 4,000 and 4,850 feet. RAOB identified wet fog between the surface and 571 feet.

⁶ These do not include pilot reports only broadcast via radio.

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 Coordinates used for the model were 39.18, -77.19.

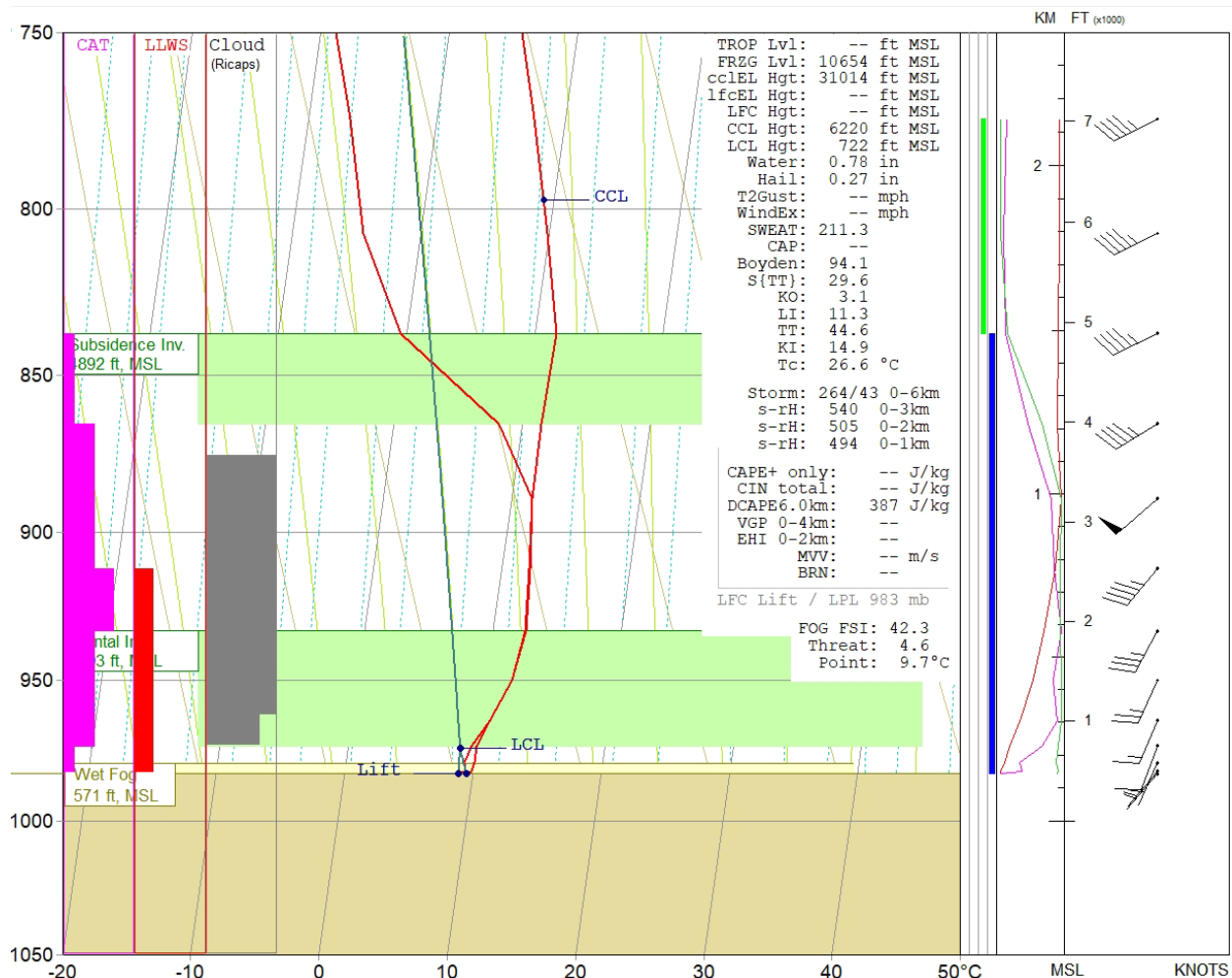


Figure 2 - HRRR model sounding data in SkewT/LogP format for 1700 near the accident site, surface to 750 hPa.

5.0 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 1729 is presented in Figure 3. Infrared cloud-top temperatures over the accident site were about 9°C, which, when considering the 1700 HRRR sounding, corresponded to cloud top heights of either about 6,300 feet or very near the surface.

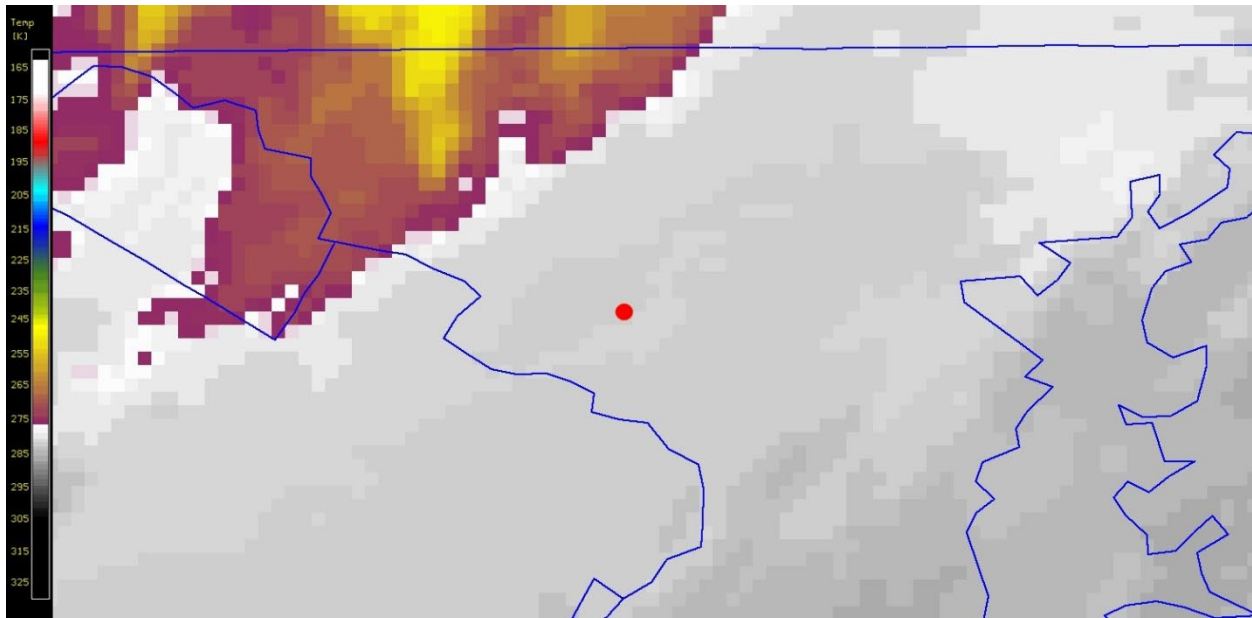


Figure 3 - GOES-16 infrared imagery from 1729. Accident location denoted by the red dot. Image is not corrected for parallax error.

6.0 Terminal Aerodrome Forecasts

The closest airport to the accident site for which a National Weather Service (NWS) Terminal Aerodrome Forecasts (TAF) was produced was Washington Dulles International Airport (IAD), which was located about 19 miles southwest of the accident location at an elevation of about 315 feet. According to NWS Instruction 10-813: "NWS TAFs consist 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."⁹

At 1601 a TAF was issued for IAD that forecasted for the accident time: a wind from 160° at 5 knots, visibility of 6 statute miles or greater, light drizzle, mist and ceiling overcast at 300 feet agl.

*KIAD 272101Z 2721/2824 **16005KT 6SM -DZ BR OVC003**
 FM272300 22008G16KT P6SM BKN008
 FM280200 25009KT P6SM SCT050
 FM281000 27009KT P6SM SCT040
 FM281700 32010G20KT P6SM SCT130
 FM282200 31008G16KT P6SM BKN150=*

⁹ www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

7.0 Area Forecast Discussion

The NWS Washington D.C. Weather Forecast Office issued the following Aviation section of an Area Forecast Discussion at 1437, applicable for a region that included the accident location.

FXUS61 KLWX 271937

AFDLWX

Area Forecast Discussion

National Weather Service Baltimore MD/Washington DC

237 PM EST Sun Nov 27 2022

.AVIATION /20Z SUNDAY THROUGH FRIDAY/...

IFR to sub-IFR conditions will continue through at least 21z for the eastern terminals. Latest satellite shows clearing out west that will likely move further east over the next several hours and improve to MVFR/VFR CIGs/VISs. If winds are able to calm across the eastern terminals tonight, then some fog/low clouds may reform this evening and into tonight.

Low-level wind shear is also in the forecast through this afternoon as the low-level jet strengthens.

A cold front will pass through the terminals late tonight into early Monday. A stratocumulus deck is expected behind the cold front, but cigs should be just above 3kft for most areas. High pressure will build overhead Monday night into Tuesday. SubVFR conditions and precipitation chances may return late Tuesday night ahead of the next cold front, which will be a strong cold front.

Sub-VFR conditions are likely and LLWS is possible as a strong frontal system impacts the area Wednesday into Thursday. This system may also bring strong wind gusts in excess of 30 knots with a wind shift to the W/NW as it passes.

8.0 SIGMETs

There were no non-convective or Convective Significant Meteorological Information (SIGMET) advisories active for the accident location at the accident time.

9.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the NWS Center Weather Service Unit at the Washington Air Route Traffic Control Center that were active for the accident location at the accident time.

10.0 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 include forecasts for discrete times that are three hours apart for a period of up to 12 hours into the future (i.e., when G-AIRMETs are issued, they include 00-, 03-, 06-, 09- and 12-hour forecasts). This suite of forecasts is issued about 0300 UTC, 0900 UTC, 1500 UTC and 2100 UTC (the G-AIRMET issuance times), with updates issued as necessary.

A search was conducted to identify G-AIRMETs that were issued about 1600 and were applicable for the accident location for altitudes below 10,000 feet. The search identified G-AIRMETs for instrument meteorological conditions¹⁰, low-level wind shear and moderate turbulence, all valid at both 1600 and 1900.

11.0 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 4-7 depict GFA forecast information on sky condition, icing, mountain obscuration, IFR condition and surface wind G-AIRMET advisories, surface visibility, surface wind, precipitation, and other obscurations and hazards, valid for a times near the accident time.

The GFA forecast imagery valid at 1600 (Figure 4) depicted overcast sky conditions over the accident site with a point to the southwest of the accident site identifying overcast clouds at 600 feet with cloud tops to 10,000 feet. The GFA surface forecast valid at 1600 (Figure 5) depicted a southerly surface wind of 10-15 knots with gusts to 20 knots in the accident region, a surface visibility of 0 to 1 statute mile at the accident

¹⁰ IFR conditions - Ceilings less than 1,000 feet agl and/or visibility less than three statute miles.

location and a chance (30 to 60 percent) of light rain showers to the south and east of the accident location. A G-AIRMET for IFR conditions was active over the accident site.

The GFA forecast imagery valid at 1900 (Figure 6) depicted scattered/few clouds and clear sky conditions near the accident site. The GFA surface forecast valid at 1900 (Figure 7) depicted a southwesterly surface wind of 10-15 knots with gusts to 25 knots in the accident region and a surface visibility of greater than 5 statute miles at the accident location and a chance (30 to 60 percent) of light rain showers to the south and east of the accident location.

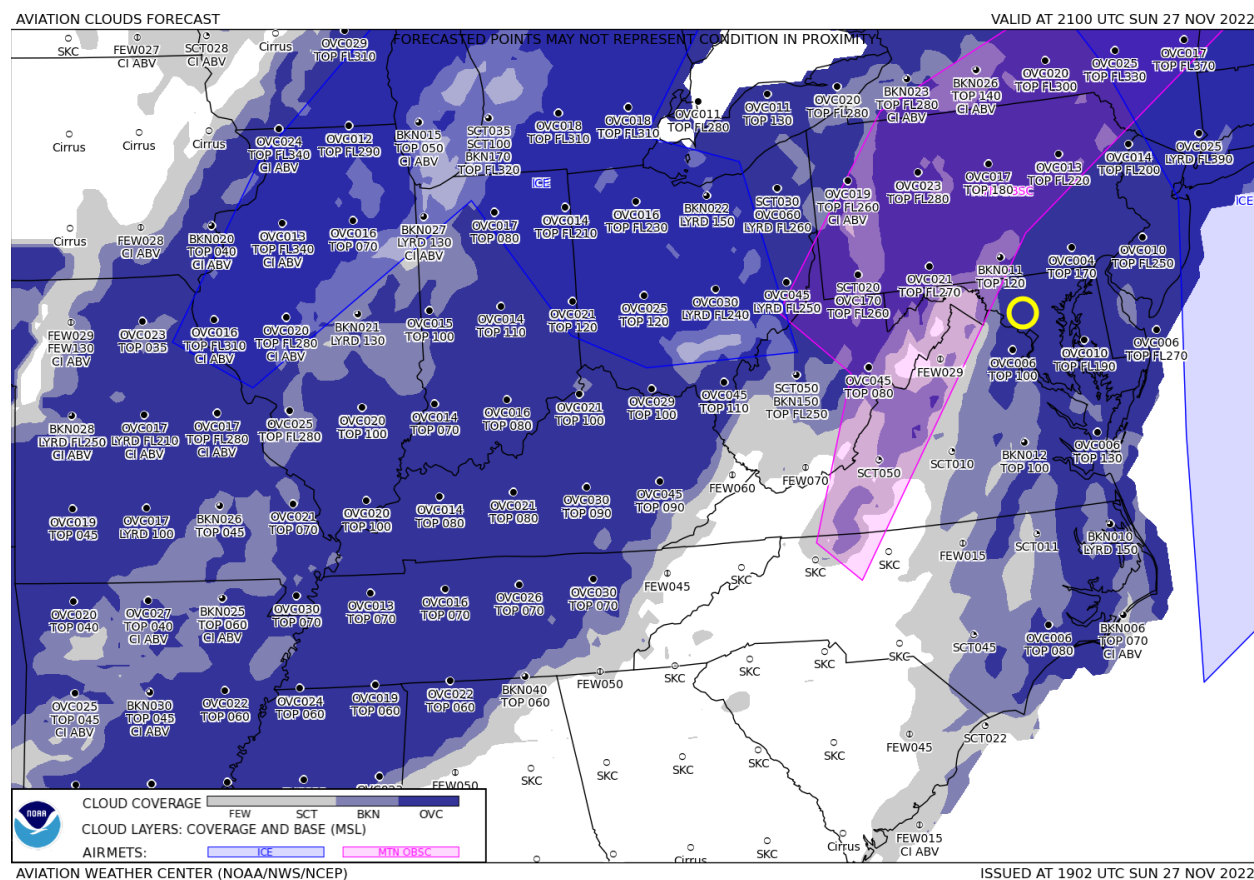


Figure 4 - GFA forecast imagery depicting sky condition and icing and mountain obscuration G-AIRMETs issued about 1400 and valid for 1600. The accident location is located within the yellow circle.

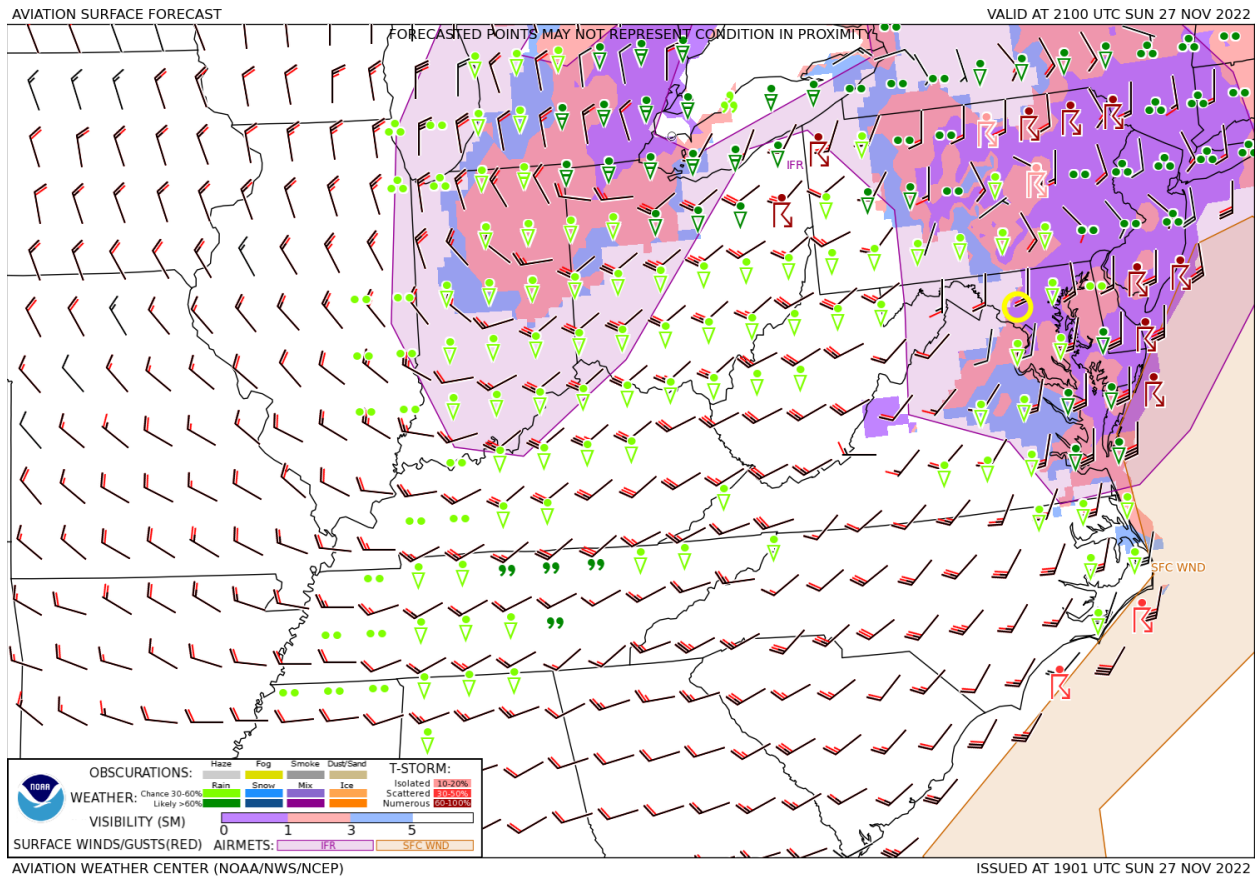


Figure 5 - GFA forecast imagery depicting IFR conditions and surface wind G-AIRMETs, surface visibility, surface wind, precipitation, and other obscurations and hazards. Issued about 1400 and valid for 1600. The accident location is located within the yellow circle.

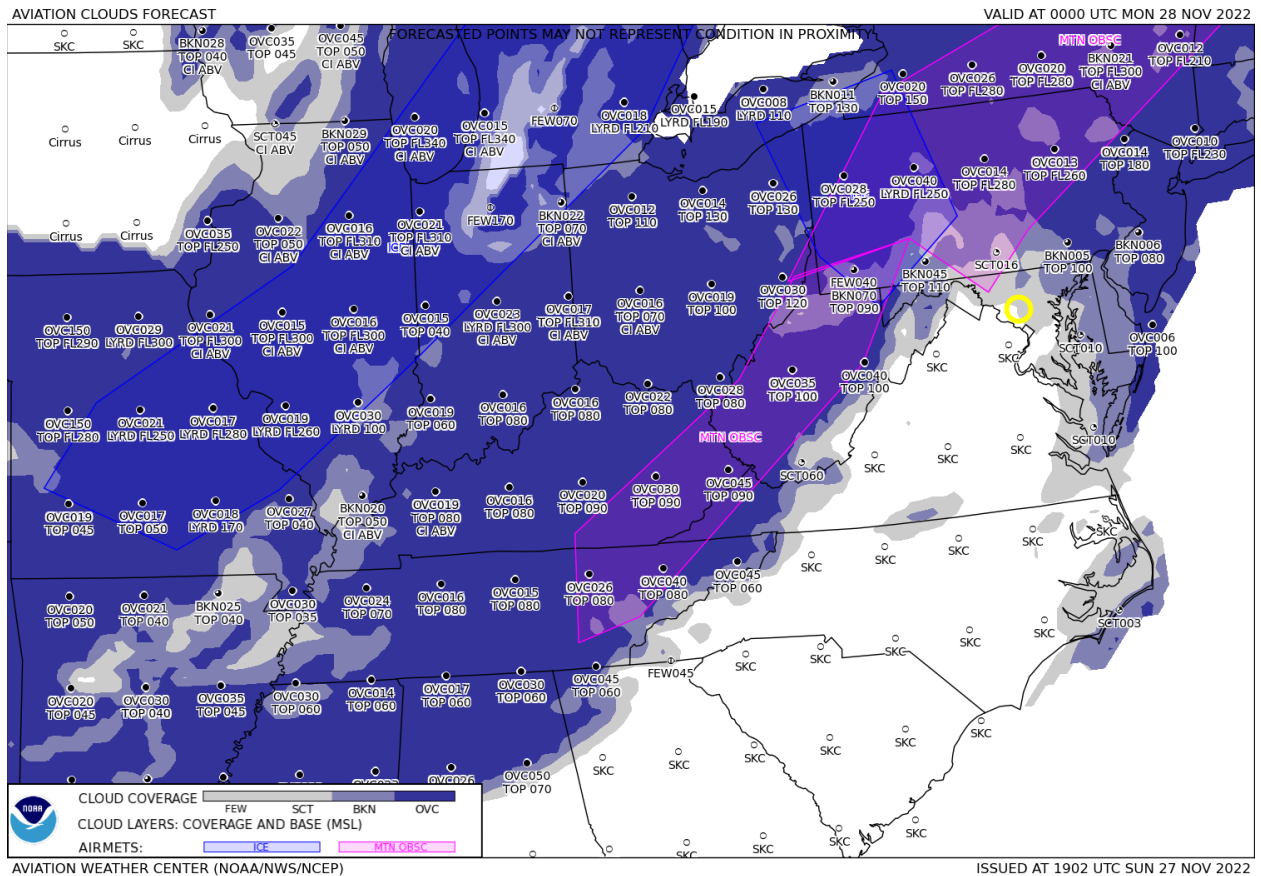


Figure 6 - GFA forecast imagery depicting sky condition and icing and mountain obscuration G-AIRMETs issued about 1400 and valid for 1900. The accident location is located within the yellow circle.

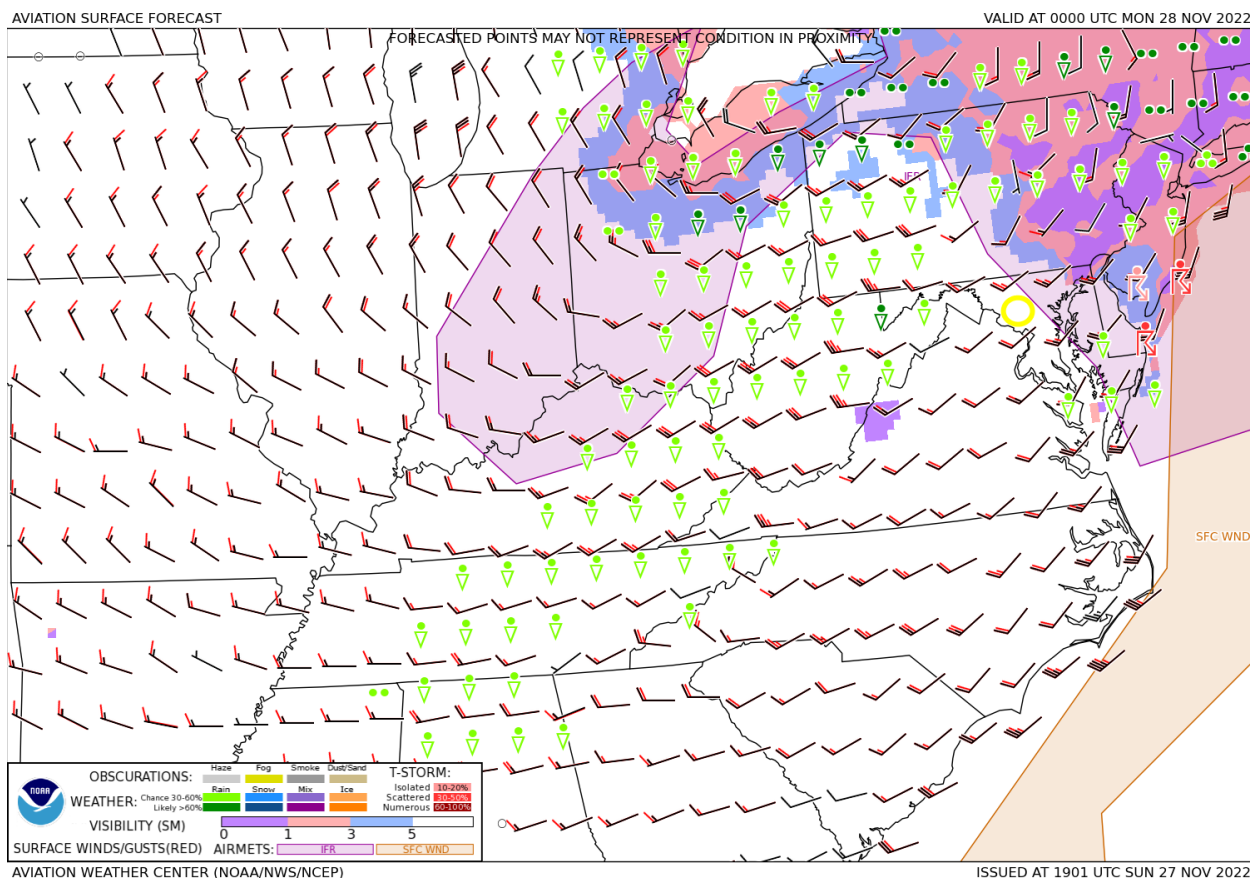


Figure 7 - GFA forecast imagery depicting IFR conditions and surface wind G-AIRMETs, surface visibility, surface wind, precipitation, and other obscurations and hazards. Issued about 1400 and valid for 1900. The accident location is located within the yellow circle.

12.0 Pre-Flight Weather Briefing

According to Leidos Flight Services (LFS), LFS provided the accident pilot two telephone weather briefings on the accident day (at 0719 and 1351). A flight plan had also been filed at 2051 on 26 November 2022. Documentation from LFS relevant to these activities, as well audio recordings of the two telephone weather briefings, may be found in the docket for this accident.

Submitted by:

Mike Richards
Senior Meteorologist