



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

July 22, 2021

Specialist's Factual Report

METEOROLOGY

ERA21LA122

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A. ACCIDENT

Location: Leicester, Massachusetts
Date: February 2, 2021
Time: 1656 eastern standard time
2156 Coordinated Universal Time (UTC)
Airplane: Piper PA-46-350P; Registration: N221ST

B. METEOROLOGIST

Paul Suffern
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Meteorologist did not travel for this investigation and gathered the weather data for this investigation from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources and also from the National Centers for Environmental Information (NCEI). This specialist factual contains the meteorological factors pertinent to the weather surrounding the accident time. All times are eastern standard time (EST) on February 2, 2021, and are based upon the 24-hour clock, where local time is -5 hours from UTC, and UTC=Z. Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles. NWS station identifiers use the standard International Civil Aviation Organization 4-letter station identifiers versus the International Air Transport Association 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports.

The accident site was located at latitude 42.2767° N, Longitude 71.9594° W, with an approximate elevation of 950 feet (ft).

D. FACTUAL INFORMATION

1.0 Synoptic Situation

The synoptic or large-scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction and the Weather Prediction Center, located in College Park, Maryland. These are the base products used in describing synoptic weather features and in the creation of forecasts and warnings for the NWS. Reference to these charts can be found in the joint NWS and Federal Aviation Administration (FAA) Advisory Circular “Aviation Weather Services”, AC 00-45H.¹

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart centered over the northeastern United States for 1600 EST is provided as figure 1 with the approximate location of the accident site within the red circle. The chart shows two low pressure centers off the New Jersey and Maine coast with central pressures of 988-hectopascals (hPa) associated with a dissipating occluded frontal system. The accident site was located to the north of the low-pressure center off New Jersey and west of the frontal boundaries on the cold side of the front.

The station models around the accident site depicted air temperatures in the low 30’s degrees Fahrenheit (°F), dew point temperatures in the upper 20’s °F with temperature-dew point spreads of 6°F or less, a north to northwest wind at 10 to 15 knots, and overcast sky cover.

¹

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1030235

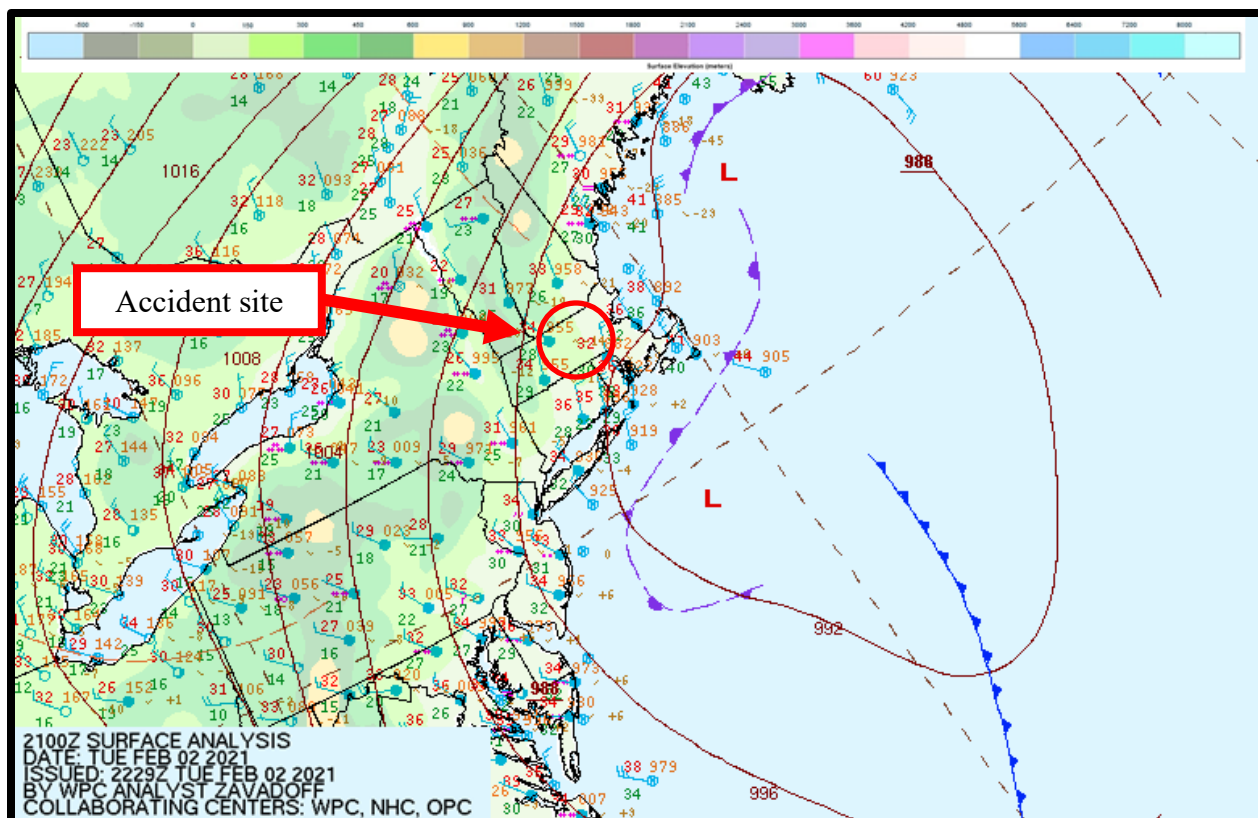


Figure 1 – NWS Surface Analysis Chart for 1600 EST.

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 1900 EST at 925-, 850- and 700-hPa are presented in figures 2 through 4. A low-pressure center was located to the east of the accident site at 925- through 700-hPa. Low pressure centers can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present. There was a north wind at 30 knots at 925-hPa with the wind becoming northeasterly at 15 knots by 700-hPa.

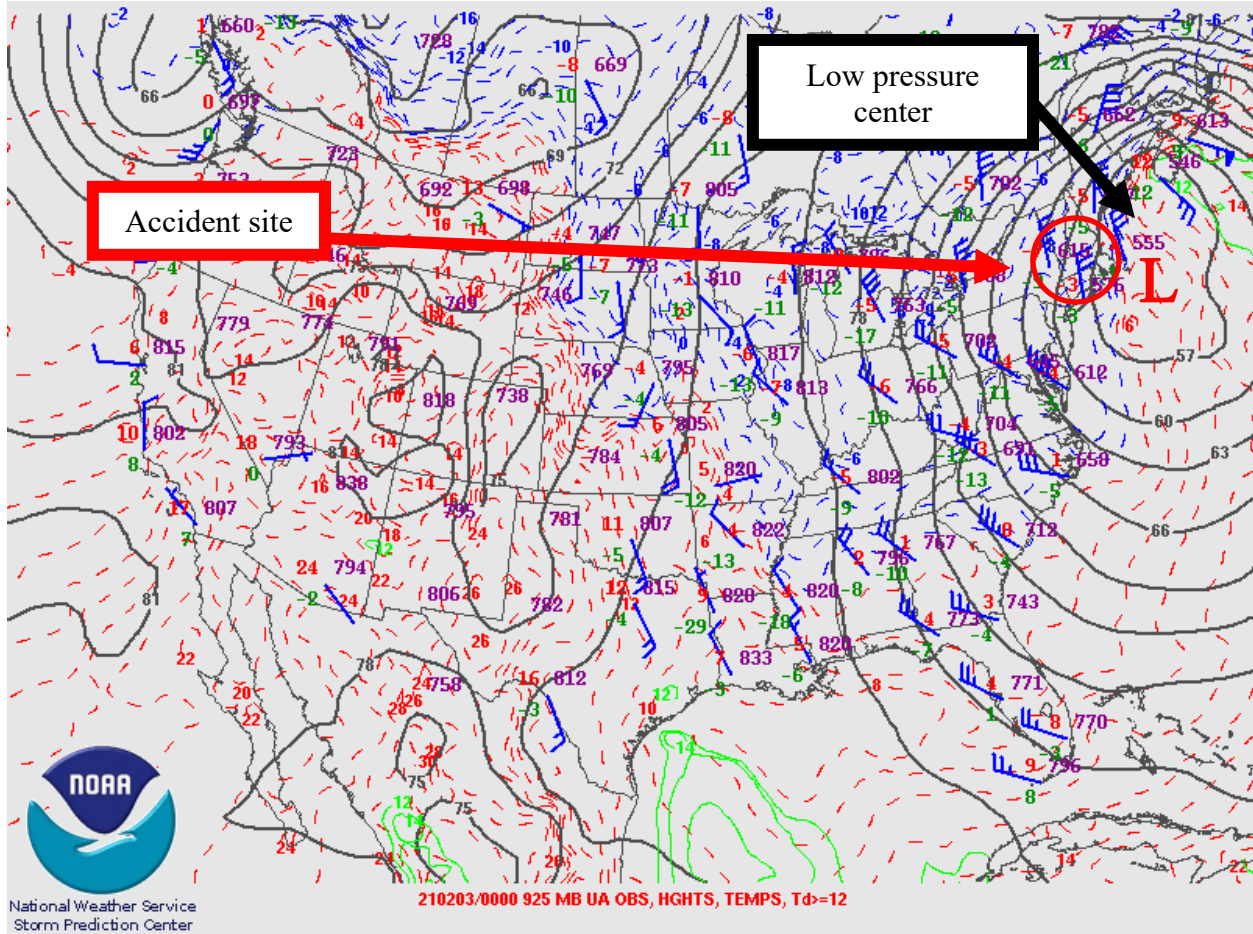


Figure 2 – 925-hPa Constant Pressure Chart for 1900 EST.

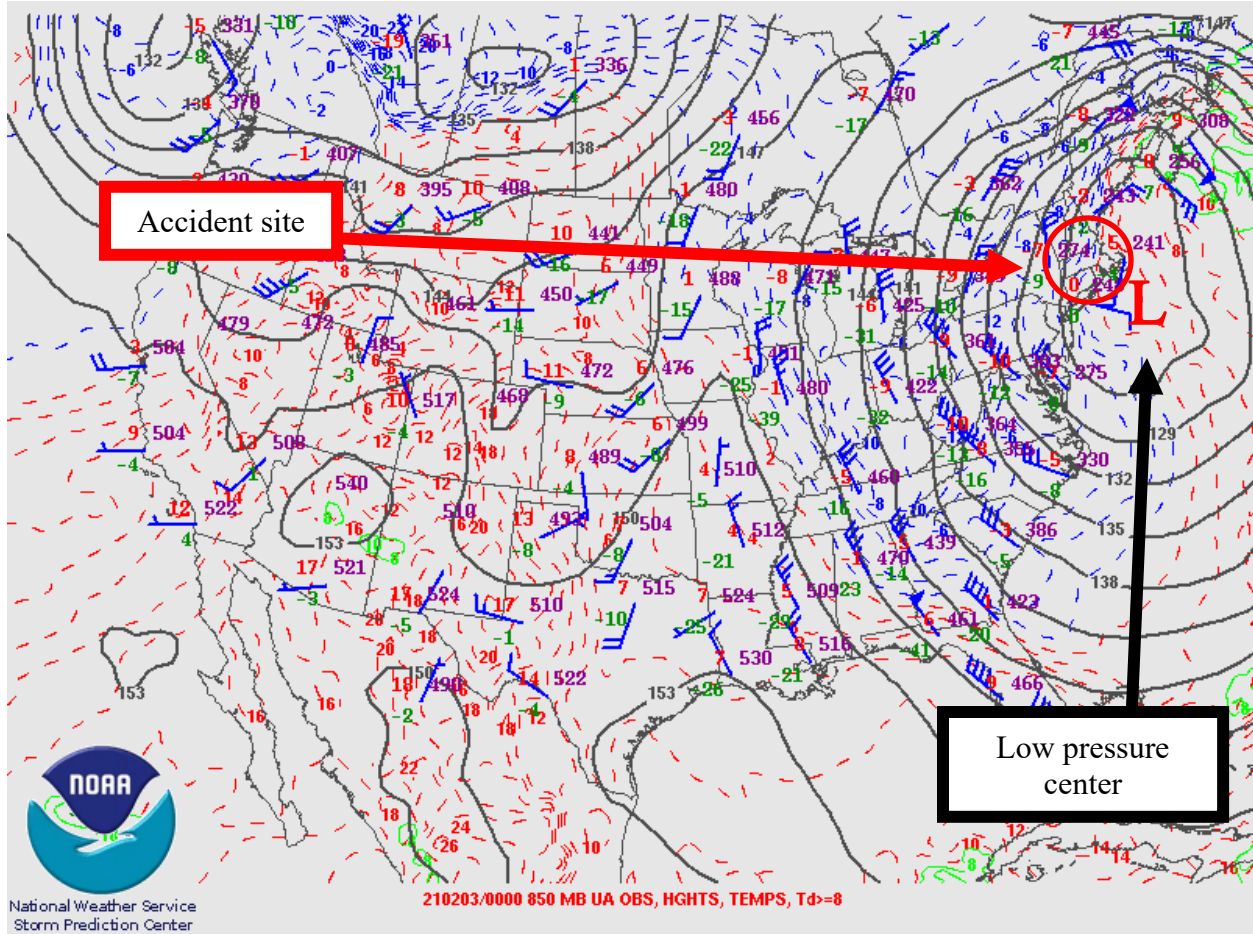


Figure 3 – 850-hPa Constant Pressure Chart for 1900 EST.

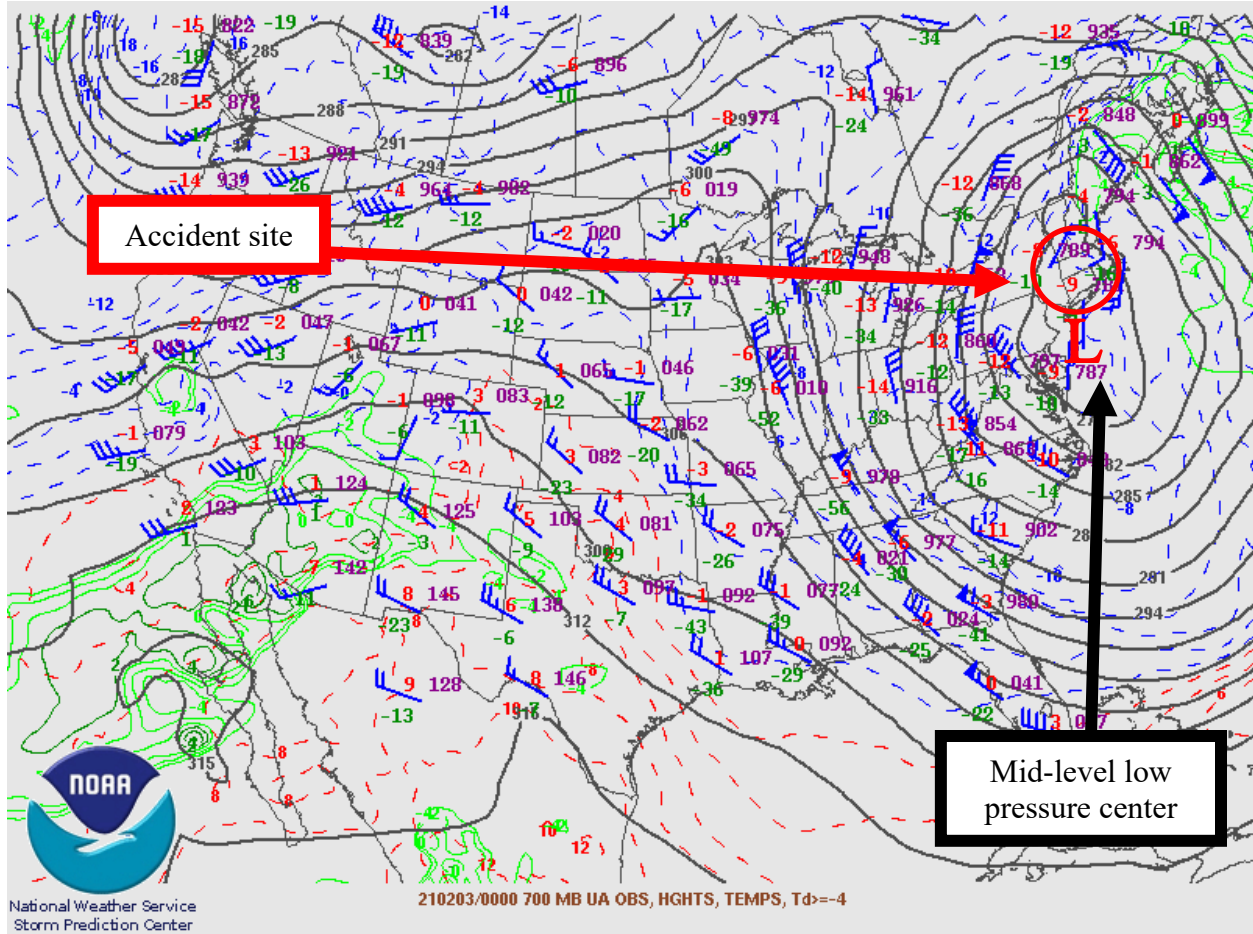


Figure 4 – 700-hPa Constant Pressure Chart for 1900 EST.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METARs) and Specials (SPECIs). The following observations were taken from standard code and are provided in plain language. Figure 5 is a local sectional chart with the accident site and the closest weather reporting location marked.

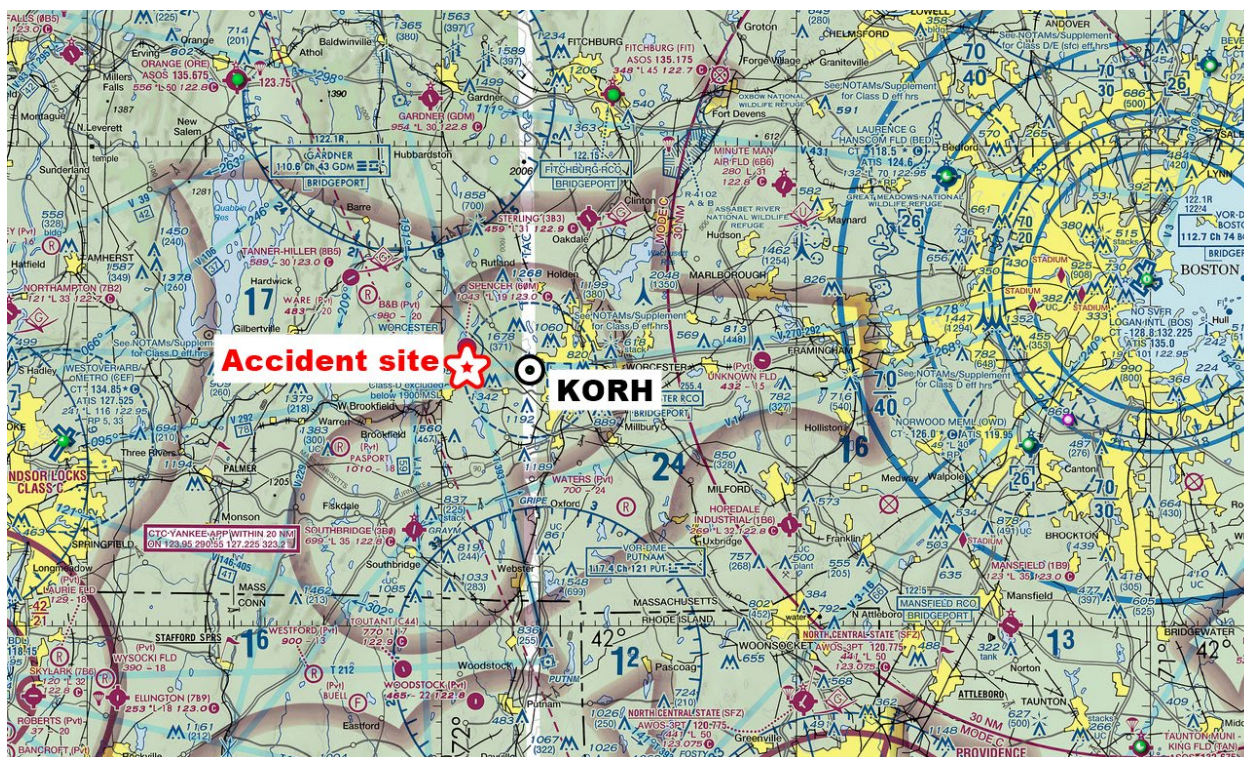


Figure 5 – Sectional map of the accident area with the location of the accident site and surface observation site.

Worcester Regional Airport (KORH) the planned destination had the closest official weather station to the accident site. KORH had an Automated Surface Observing System (ASOS²) whose longline³ reports were supplemented by air traffic control (ATC) when the tower was in operation⁴. KORH ASOS was located 4 miles east of the accident site, at an elevation of 1,009 ft, and had a 14° westerly magnetic variation⁵. The following automated longline observations were disseminated during the times surrounding the accident:⁶

[1454 EST] METAR KORH 021954Z 03010G23KT 10SM UP M01/M03 A2933 RMK AO2 SLP944 P0000 T10061033 \$=

² ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, weather phenomena, ceiling, temperature, dewpoint, altimeter, and barometric pressure.

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 ATC hours of operation between 0630 and 2100 local.

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

⁶ The bold sections in this NWS product and the rest of the products in this report are intended to highlight the text that directly reference the weather conditions that affected the accident location around the accident time. The local times in this section next to the METARs are provided for quick reference between UTC and local times around the accident time.

[1504 EST] SPECI KORH 022004Z 02012G22KT 9SM UP OVC008 M01/M03 A2932
RMK AO2 P0000 T10061033 \$=

[1554 EST] METAR KORH 022054Z 01012G22KT 8SM UP OVC008 M01/M03 A2933
RMK AO2 SLP943 P0000 60000 T10061033 56009=

[1601 EST] SPECI KORH 022101Z 01017G22KT 7SM UP OVC010 M01/M03 A2933
RMK AO2 CIG 009V013 P0000 T10061033=

**[1642 EST] SPECI KORH 022142Z 02013G21KT 5SM -FZRA OVC011 M01/M03 A2932
RMK AO2 UPE36FZRAB36 CIG 008V013 P0000 I1001 T10061033=**

**[1654 EST] METAR KORH 022154Z 03013G20KT 5SM -FZRA OVC010 M01/M03 A2932
RMK AO2 UPE36FZRAB36 CIG 008V013 SLP942 P0000 I1001 T10061033=**

ACCIDENT TIME 1656 EST

**[1721 EST] SPECI KORH 022221Z 01014G21KT 4SM -SN BR OVC010 M01/M03 A2932
RMK AO2 FZRAE15SNB15 CIG 006V013 P0000 I1000 T10061028=**

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

KORH weather at 1642 EST, wind from 020° at 13 knots with gusts to 21 knots, visibility 5 miles, light freezing rain, overcast ceiling at 1,100 ft above ground level (agl), temperature of -1°Celsius (C), dew point temperature of -3°C, and an altimeter setting of 29.32 inHg. Remarks: automated station with a precipitation discriminator, unknown precipitation ended at 1636 EST, freezing rain began at 1636 EST, ceiling varying between 800 and 1,300 ft agl, a trace of precipitation since 1554 EST, 0.01 inches of ice accumulation since 1554 EST, temperature -0.6°C, dew point temperature -3.3°C.

KORH weather at 1654 EST, wind from 030° at 13 knots with gusts to 20 knots, visibility 5 miles, light freezing rain, overcast ceiling at 1,000 ft agl, temperature of -1°C, dew point temperature of -3°C, and an altimeter setting of 29.32 inHg. Remarks: automated station with a precipitation discriminator, unknown precipitation ended at 1636 EST, freezing rain began at 1636 EST, ceiling varying between 800 and 1,300 ft agl, sea level pressure 994.2 hPa, a trace of precipitation since 1554 EST, 0.01 inches of ice accumulation since 1554 EST, temperature -0.6°C, dew point temperature -3.3°C.

KORH weather at 1721 EST, wind from 010° at 14 knots with gusts to 21 knots, visibility 4 miles, light snow, mist, overcast ceiling at 1,000 ft agl, temperature of -1°C, dew point temperature of -3°C, and an altimeter setting of 29.32 inHg. Remarks: automated station with a precipitation discriminator, freezing rain ended at 1715 EST, snow began at 1715 EST, ceiling varying between 600 and 1,300 ft agl, a trace of precipitation since 1654 EST, a trace of ice accumulation since 1654 EST, temperature -0.6°C, dew point temperature -2.8°C.

The observations from KORH surrounding the accident time indicated MVFR⁷ to IFR (ceiling varying down to 800 ft agl) conditions prevailing with light freezing rain. The KORH icing sensor frequency data was obtained for February 2 and 3 (figure 6) and several periods of freezing rain are noted on February 2 and 3, including the accident timeframe. For more information, please see attachment 1.

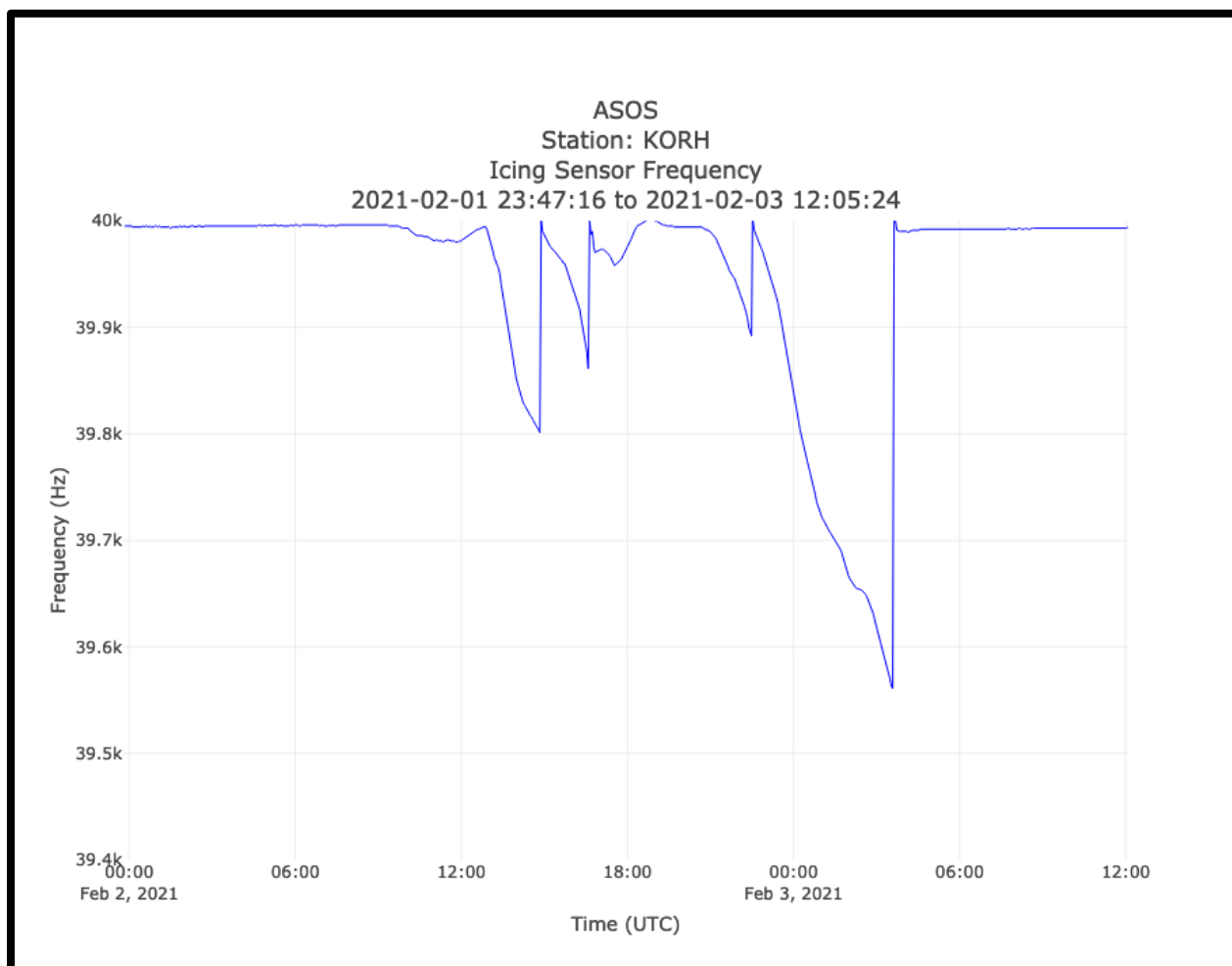


Figure 6 – KORH icing sensor frequency from February 2 and 3.

⁷ 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.

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

3.0 Upper Air Sounding

A High-Resolution Rapid Refresh (HRRR)⁸ model sounding was created for the accident site for 1700 EST using a surface elevation of 1,017 ft.⁹ The 1700 EST HRRR sounding was plotted on a standard Skew-T Log P diagram¹⁰ with the derived stability parameters included in figure 7 with data from the surface to 600-hPa (or approximately 14,000 ft msl). These data were analyzed using the RAOB¹¹ software package. The sounding depicted the lifted condensation level (LCL)¹² at 900 ft agl (1,917 ft msl) and the convective condensation level (CCL)¹³ at 1,374 ft agl (2,391 ft msl). The freezing level was identified at the surface with the entire sounding below freezing. An isothermal layer was identified from 3,000 through 7,000 ft where temperatures remained relatively constant with height. The precipitable water value was 0.44 inches.

⁸ 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.

⁹ HRRR sounding was created using NOAA Air Resource Laboratory: <https://ready.arl.noaa.gov/READYamet.php>

¹⁰ Skew T log P diagram – is a standard meteorological plot using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

¹¹ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Eosonde Research Services, The Villages, Florida.

¹² LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹³ CCL – The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.

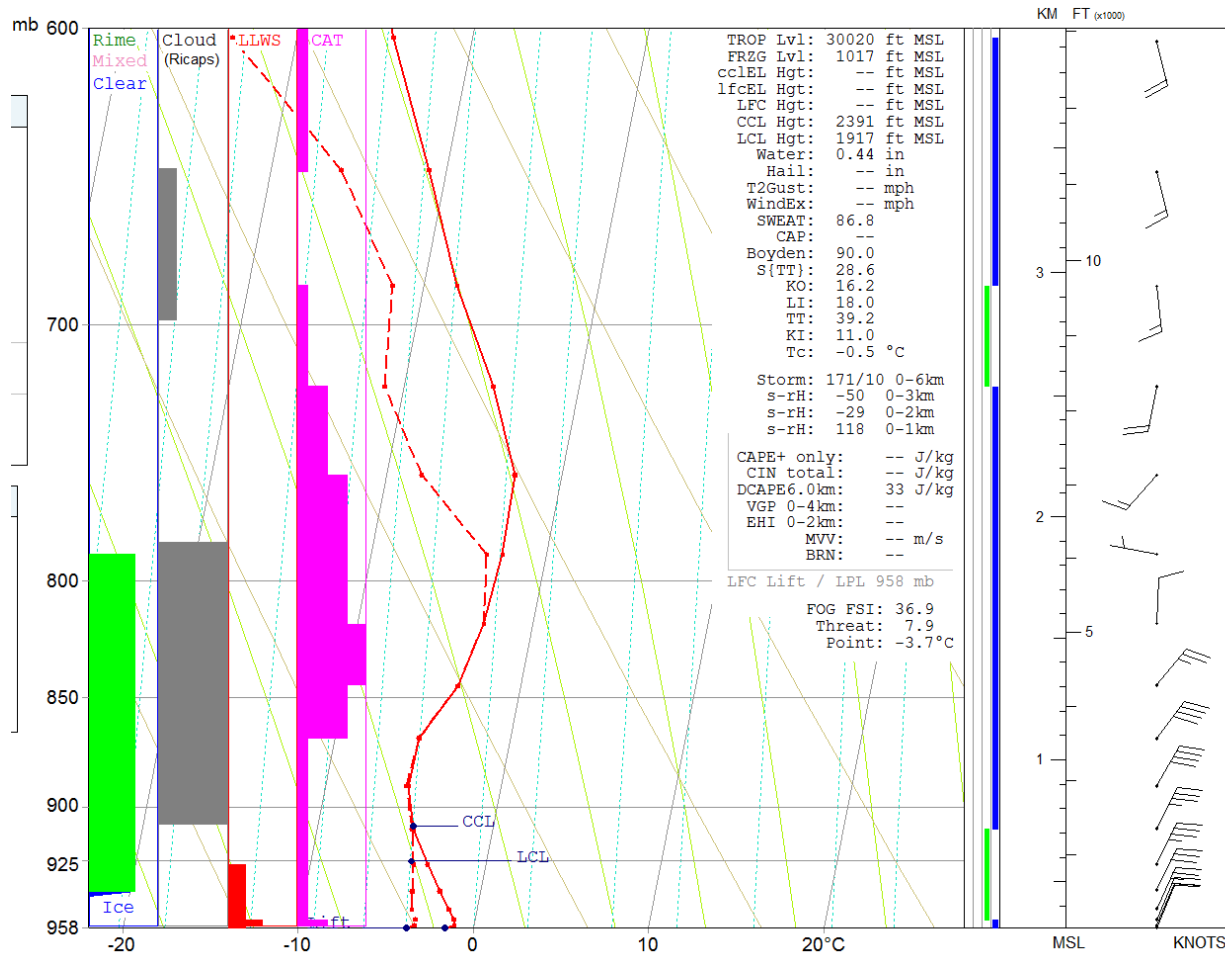


Figure 7 – 1700 EST HRRR sounding.

The 1700 EST HRRR sounding indicated a mainly stable environment from the surface through 14,000 ft msl. RAOB indicated cloud cover between 2,500 and 6,500 ft msl, with the potential for moderate rime icing between 500 ft agl (~1,500 ft msl) and 6,000 ft msl.

The 1700 EST HRRR sounding wind profile indicated a near surface wind from 021° at 12 knots with little variation in direction through 4,500 ft. Above the isothermal layer the winds shifted to the south. The wind speed increased to 40 knots by 3,000 ft msl and then the wind decreased back to 20 knots by 14,000 ft. RAOB indicated the possibility of light to moderate low-level wind shear (LLWS) between the surface and 500 ft agl. RAOB indicated the possibility of light to moderate clear-air turbulence between the surface and 10,000 ft msl.

4.0 Satellite Data

The Geostationary Operational Environmental Satellite number 16 (GOES-16) visible and infrared data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. Visible and infrared imagery (GOES-16 bands 2 and 13) at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period from 1400 EST through 1900 EST and reviewed, and the closest images to the time of the accident were documented.

Figure 8 presents the GOES-16 visible imagery from 1650 EST at 2X magnification with the accident site highlighted with a red square. There was cloud cover above the accident site and the lower cloud cover was stationary above the accident site (attachment 2). Figure 9 presents the GOES-16 infrared imagery from 1700 EST at 6X magnification with the accident site highlighted with a red square. The lower brightness temperatures (green colors; higher cloud tops) were located to the east of the accident site in the Gulf of Maine. Due to the isothermal nature of the temperature profile in the 3,000 to 6,000 ft msl layer, cloud top height estimation is not possible or difficult based on the brightness temperature technique. It should be noted these figures have not been corrected for any parallax error. The Nighttime Microphysics Red, Green, Blue (RGB) imagery¹⁴ from 1656 EST (figure 10) indicated the cloud cover above the accident site was a combination of mid- and low-level water clouds (attachment 1).

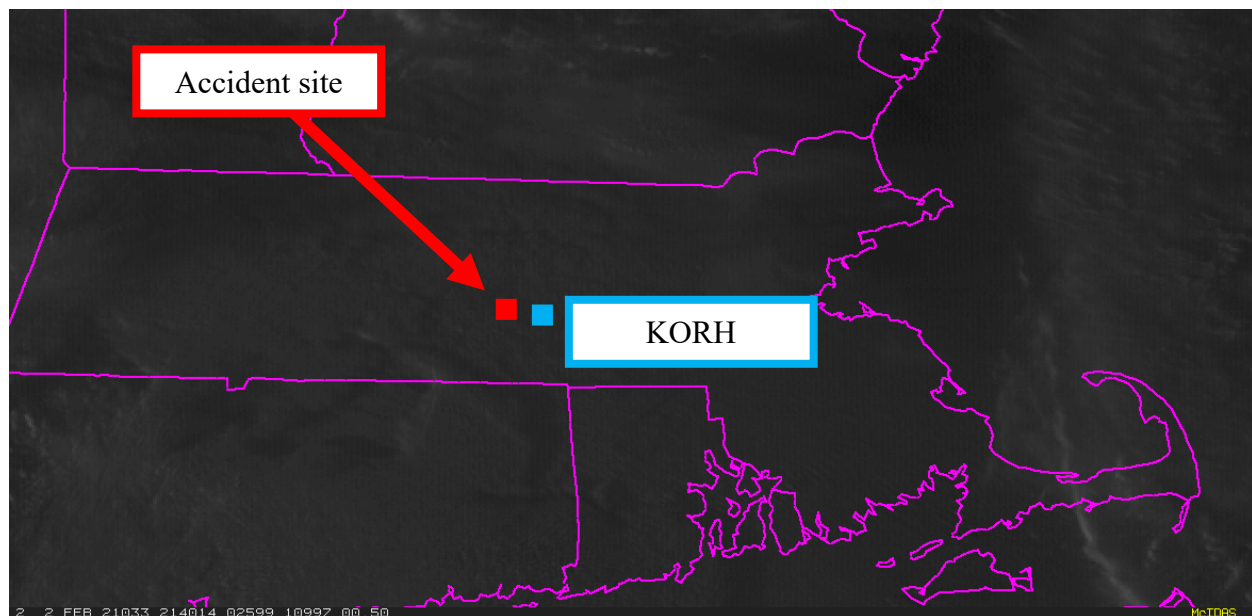


Figure 8 – GOES-16 visible image at 1650 EST.

¹⁴

https://weather.msfc.nasa.gov/sport/training/quickGuides/rgb/QuickGuide_NtMicro_GOESR_NASA_SPoRT_2019_1206.pdf

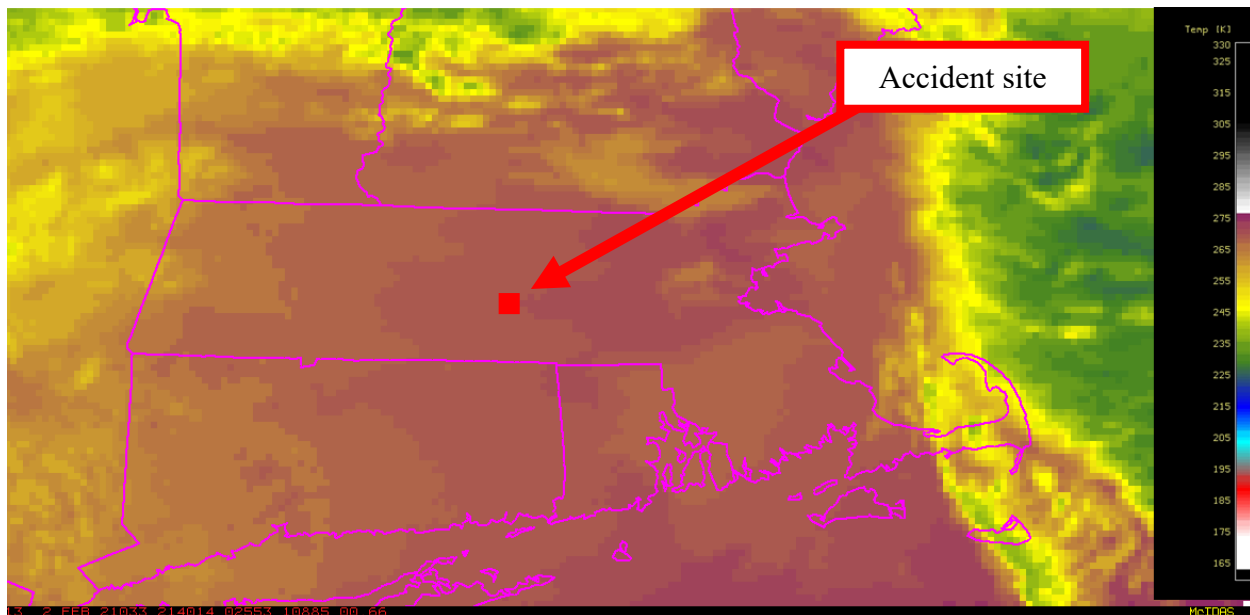


Figure 9 – GOES-16 infrared image at 1700 EST.

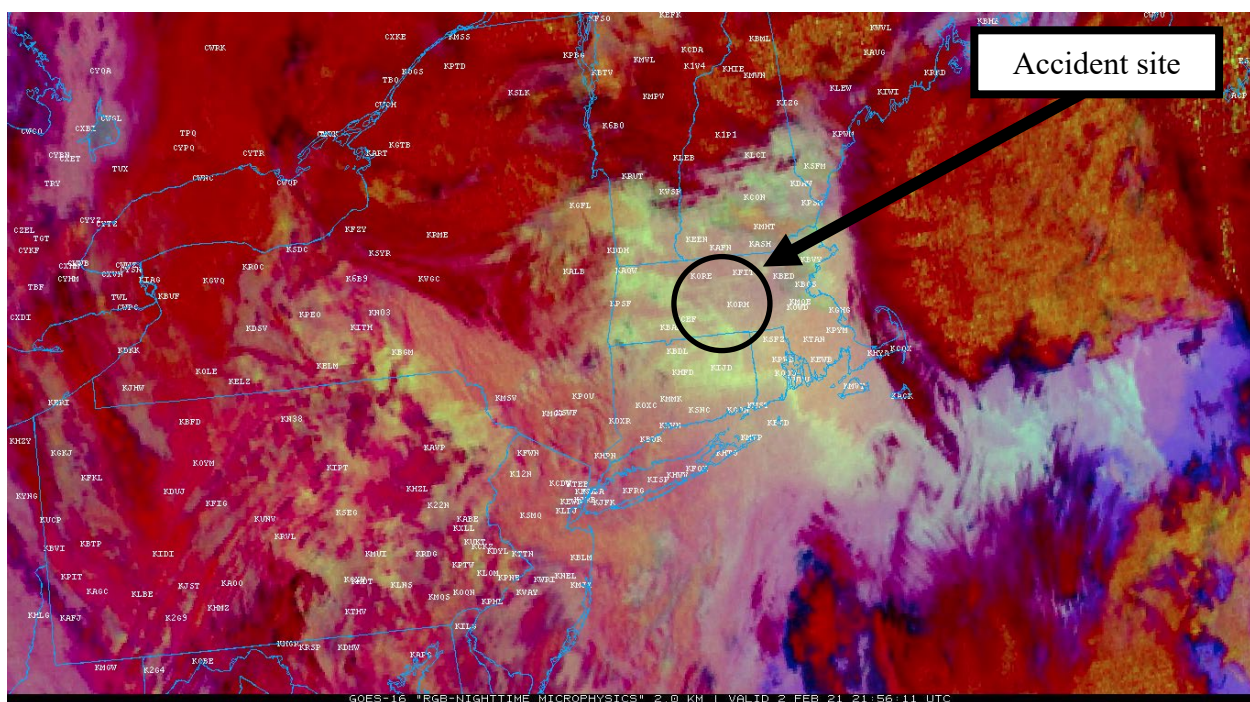


Figure 10 – GOES-16 nighttime microphysics RGB image at 1656 EST.

5.0 Regional Radar Imagery Information

A regional view of the NWS National Composite Radar Mosaic is included as figure 11 for 1655 EST with the approximate location of the accident site marked within a red circle. The composite radar mosaic image depicted no precipitation echoes above the accident site at the accident time.

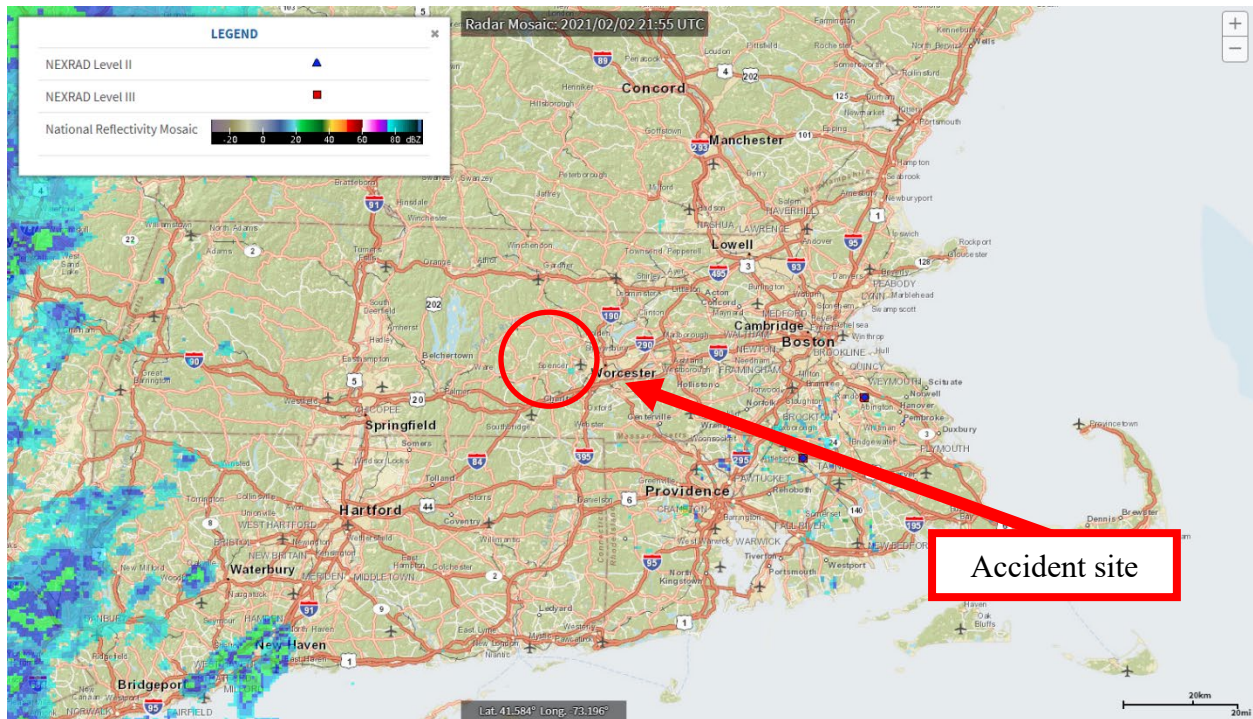


Figure 11 – Regional Composite Reflectivity image for 1655 EST.

6.0 Radar Imagery Information

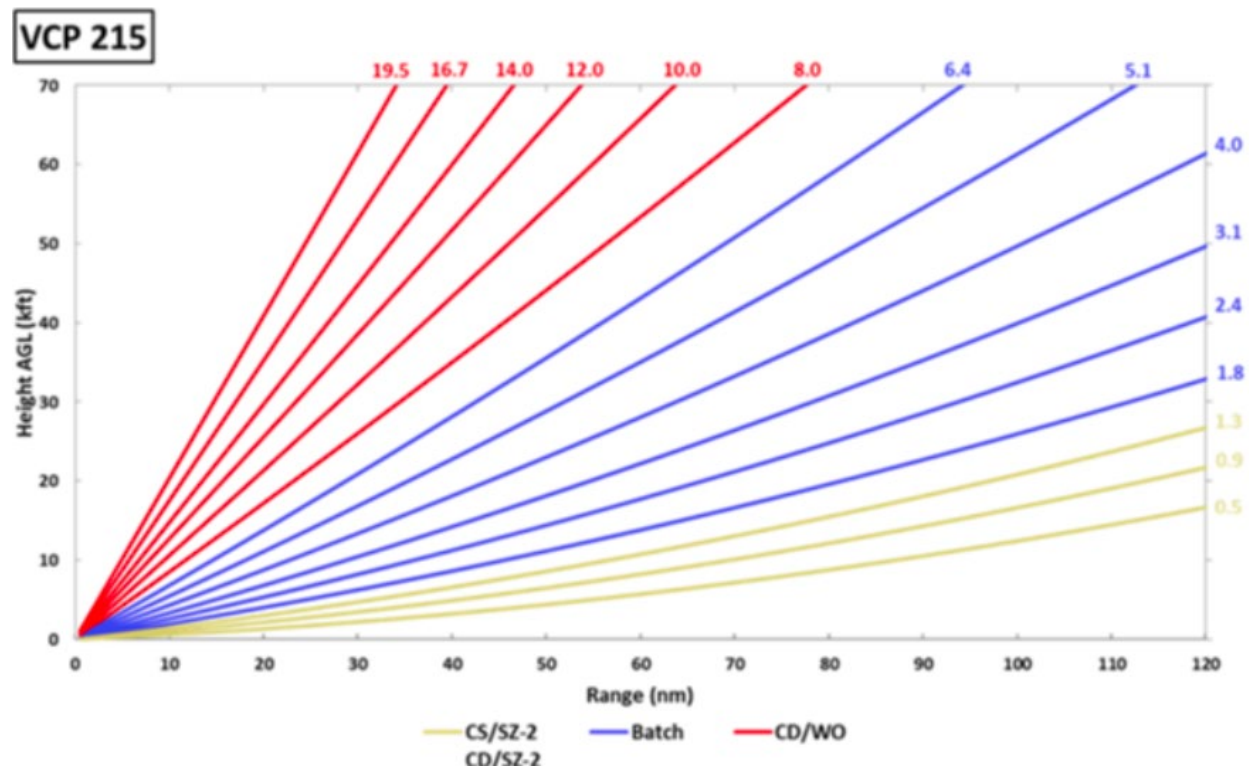
The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D)¹⁵ to the accident site was near Boston, Massachusetts (KBOX) located 41 miles east-southeast of the accident site. The Level II and III archive radar data were obtained from the NCEI utilizing the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software.

6.1 Volume Scan Strategy

The WSR-88D is a computer-controlled radar system, which automatically creates a complete series of specific scans in a specific sequence known as a volume scan. Individual elevation scans are immediately available. Products that require data from multiple elevation scans are not available until the end of the five-to-ten-minute volume scan.

¹⁵ The WSR-88D is an S-band 10-centimeter wavelength radar with a power output of 750,000 watts, and with a 28-foot parabolic antenna that concentrates the energy between a 0.87° and 0.96° beam width. The radar produces three basic types of products: base reflectivity, base radial velocity, and base spectral width.

The WSR-88D operates in two different main scanning modes, identified as Mode A and Mode B. Mode A is the precipitation scan and has three common scanning strategies¹⁶. The most common is where the radar makes 15 elevation scans from 0.5° to 19.5° every six minutes. This particular scanning strategy is documented as volume coverage pattern 215 (VCP-215). Mode B is the clear-air mode, where the radar makes 9 elevation scans during a ten-minute period. During the period surrounding the accident, the KBOX WSR-88D radar was operating in the precipitation mode VCP-215. The following chart provides an indication of the different elevation angles in this VCP, and the approximate height and width of the radar beam with distance from the radar site.



VCP-215 Precipitation Mode Scan Strategy.

¹⁶ Contiguous Surveillance (CS)--The low Pulse Repetition Frequency (PRF) scan of the split cut. Gives a high $R_{\max}$ value to determine proper target location and intensity, but a low $V_{\max}$ value limits the velocities that can be measured. Contiguous Doppler (CD)--The high PRF scan of the split cut. Gives a low $R_{\max}$ value causing more range folded (multiple trip) echoes, but a high $V_{\max}$ value to get higher, more accurate velocity values.

Batch Mode – Uses alternating low and high PRFs on each radial for one full rotation at each elevation angle. The two resulting data sets (low PRF and high PRF) are combined to resolve range ambiguity. Used in the middle elevation angles.

W – With range unfolding (W)

WO – Without range unfolding (WO)

6.2 Beam Height Calculation

Assuming standard refraction¹⁷ of the KBOX WSR-88D radar beam with the antenna elevation at 231 ft, and considering a beamwidth¹⁸ of 0.95°, the following table shows the approximate heights for the radar beam center, base, and top for antenna elevations over the accident site. These heights have been rounded to the nearest 10 ft.

ANTENNA ELEVATION	BEAM CENTER	BEAM BASE	BEAM TOP
KBOX 0.5°	3,620 ft	1,600 ft	5,640 ft

Based on the radar height calculations, the elevation scans from KBOX listed in the above table depicted the conditions between 1,600 ft and 5,640 ft above msl over the accident site and these scans “saw” the closest altitudes to the surface.

6.3 Reflectivity

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors¹⁹ 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. FAA Advisory Circular AC 00-24C²⁰, “Thunderstorms,” dated February 19, 2013, also defines the echo intensity levels and weather radar echo intensity terminology associated with those levels. For dBZ values less than 30 the weather radar echo intensity terminology should be “light.” For dBZ values between 30 and 40, the terminology should be “moderate.” “Heavy” terminology is used for dBZ values greater than 40 dBZ but less than 50 dBZ, inclusive. Finally, any dBZ values above 50 dBZ shall be described as “extreme.”

6.4 Base Reflectivity

Figure 12 presents the KBOX WSR-88D base reflectivity image for the 0.5° elevation scan initiated at 1653:10 EST, with a resolution of 0.5° X 250 m. Reflectivity values between 0 and -10 dBZ were located above KORH at the accident time with little to no reflectivity targets above the accident site at the accident time.

¹⁷ Standard Refraction in the atmosphere is when the temperature and humidity distributions are approximately average, and values set at the standard atmosphere.

¹⁸ Beamwidth - the angular separation between the half power points on the antenna radiation pattern, where the gain is one half the maximum value.

¹⁹ Hydrometeors are any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at the earth’s surface; also, any water particles blown by the wind from the earth’s surface. Hydrometeors are classified as: (a) Liquid or solid water particles suspended in the air: cloud, water droplets, mist, or fog. (b) Liquid precipitation: drizzle and rain. (c) Freezing precipitation: freezing drizzle and freezing rain. (d) Solid (frozen) precipitation: ice pellets, hail, snow, snow pellets, and ice crystals. (e) Falling particles that evaporate before reaching the ground: virga. (f) Liquid or solid water particles lifted by the wind from the earth’s surface: drifting snow, blowing snow, blowing spray. (g) Liquid or solid deposits on exposed objects: dew, frost, rime, and glazed ice.

²⁰

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1020774

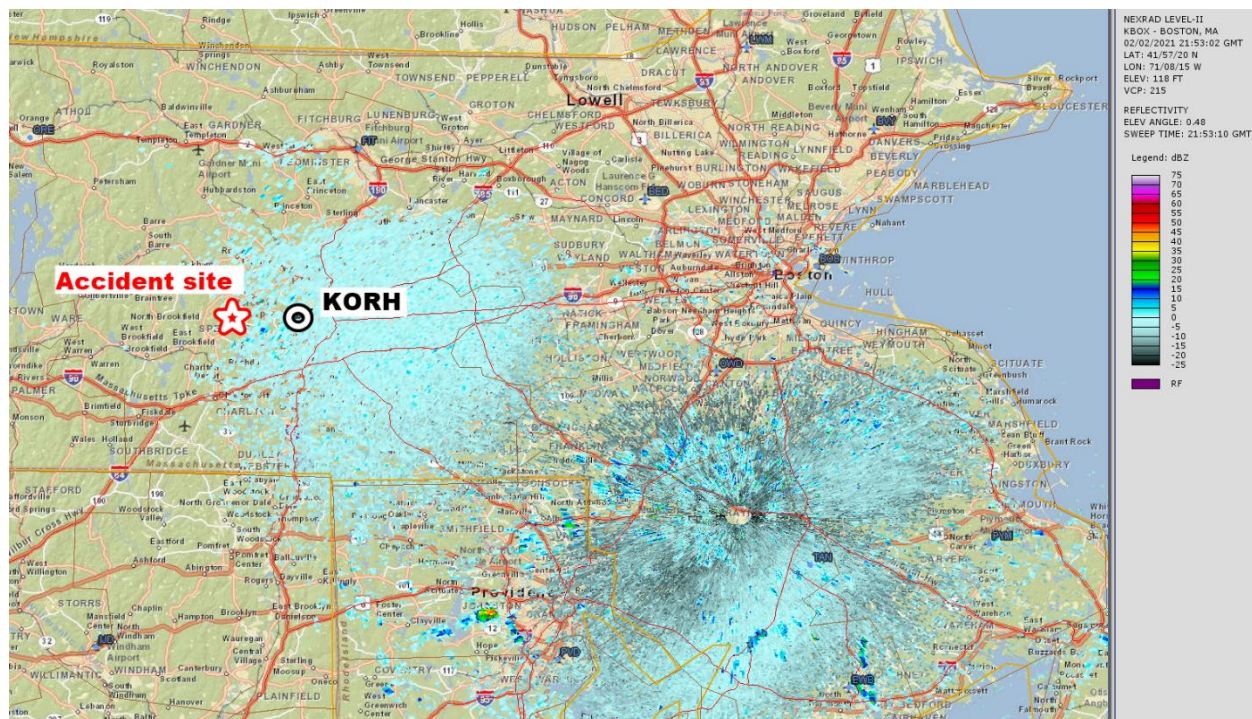


Figure 12 – KBOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 1653:10 EST.

7.0 Pilot Reports

The following are the publicly longline-disseminated pilot reports²¹ (PIREPs) distributed into the national airspace (NAS) within 100 miles of the accident site from about three hours prior to the accident time to two hours after the accident time for below 18,000 ft above msl.

ORH UA /OV ORH/TM 1900/FL010/TP H25C/RM WIND SHEAR 10 KNOTS SHORT FINAL

BDL UA /OV BDL/TM 1907/FL020/TP E75L/SK BKN020

BED UA /OV BED315010/TM 1910/FL030/TP C25B/TA 02/IC TRACE RIME

BED UA /OV BED/TM 1912/FLDURGD/TP C25B/SK BASES OVC019/TA 03 / 050/ M02 / 010/IC LGT RIME 050/RM BRAG RWY 11 KBED

BED UUA /OV BED/TM 1924/FLDURGD/TP FA50/RM LLWS -/+10KT 005-SFC DURD RWY 11 KBED

BED UUA /OV BED/TM 1953/FLDURGD/TP PC24/RM LLWS -/+10KT 005-SFC DURD RWY 11 KBED

BED UUA /OV BED/TM 1955/FLDURGD/TP GLEX/RM LLWS -/+10KT 020-SFC DURD RWY 11 KBED/ BRAG RWY 11 KBED

MHT UA /OV MHT/TM 2007/FL000/TP CRJ7/RM BRAKING ACTION MEDIUM RY35

²¹ Only pilot reports with the World Meteorological Organization headers UBMA**, UBRI**, UBCT**, UBME**, UBVT**, and UBNH** were considered.

BOS UA /OV BOS/TM 2012/FL014/TP A320/SK OVC014/RM ILS RY4R

BED UUA /OV BED/TM 2018/FLDURGD/TP CL60/RM LLWS -10/+5KT 050-SFC DURD RWY 11 KBED/
BRAG RWY 11

BDL UA /OV BDL/TM 2026/FL016/TP F2TH/SK BKN016/RM DURD ILS RY 6

OWD UA /OV BOS225010/TM 2033/FL030/TP C402/TA M05/IC LGT RIME 030-020

BOS UA /OV BOS225010/TM 2044/FL030/TP C402/TA M05/IC LGT RIME 030-020

BOS UA /OV BOS225003/TM 2050/FL030/TP CRJ9/SK BASES 015/ TOPS 030/TA M01/IC LGT RIME

BED UUA /OV BED/TM 2105/FLDURGD/TP CL60/RM LLWS -/+5KT 010-SFC DURD RWY 11 KBED

BED UUA /OV BED/TM 2138/FLDURGD/TP B350/RM LLWS -/+10KT 020-SFC DURD RWY 11 KBED

BVY UA /OV BVY/TM 2140/FL010/TP B06/TB LGT

BOS UA /OV BOS225009/TM 2147/FL025/TP E75S/IC TRACE ICING IN DESCENT.

MHT UA /OV MHT270010/TM 2235/FL090/TP B752/TB NEG 090-020/IC NEG 090-020

BOS UA /OV BOS150005/TM 2235/FL060/TP A319/TB NEG 060-030/IC NEG 060-030

MHT UA /OV MHT FINAL RWY 35/TM 2237/FL023/TP B752/SK OVC023/TA -6/IC LGT RIME 030-024

BED UA /OV BED/TM 2242/FLDURGD/TP C68A/RM BRAG RWY 11 KBED

BOS UA /OV RWY 4R APPCH/TM 2243/FL025/TP C402/IC TRACE

MHT UA /OV MHT FINAL RWY 35/TM 2303/FL020/TP A306/SK OVC020/RM BRAG

LWM UA /OV MHT180012/TM 2312/FL040/TP BE99/TA M04/IC LGT RIME

MHT UA /OV MHT/TM 2325/FL030/TP M20P/TA M05/IC LGT CLR 025-030/RM DURD RY35

PVD UA /OV KENTE/TM 2330/FL030/TP C208/IC LT TRC

BOS UA /OV RWY 4R APPCH/TM 2336/FL016/TP A306/SK OVC016/TB LGT

8.0 SIGMET

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

9.0 CWSU Advisories

The Boston (ZBW) Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU) was responsible for the accident region. The ZBW CWSU did not issue a Meteorological Impact Statement (MIS) or a Center Weather Advisory (CWA) for the accident site at the accident time.

10.0 AIRMETs

There were Airmen's Meteorological Information (AIRMET) advisories Sierra, Zulu, and Tango valid for the accident site at the accident time. The AIRMETs warned of IFR conditions due to precipitation, mist, and fog, moderate icing between the freezing level²² and FL180²³, and moderate turbulence below 10,000 ft msl. Below are also the text of the AIRMETs Sierra, Zulu, and Tango issued at 0945 and 1545 EST, respectively:

WAUS41 KPCI 022045

WA1S

-BOSS WA 022045

AIRMET SIERRA UPDT 4 FOR IFR AND MTN OBSCN VALID UNTIL 030300

.
**AIRMET IFR...ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA
AND CSTL WTRS
FROM 70NW PQI TO 60NE PQI TO 200SE ACK TO 80ESE CYN TO 30SSW SIE
TO 40NNW CSN TO 20ESE HMV TO 50WSW BKW TO 30SE EWC TO 20NNW ERI
TO BUF TO YYZ TO YSC TO 70NW PQI
CIG BLW 010/VIS BLW 3SM PCPN/BR/FG. CONDS CONTG BYD 03Z THRU 09Z.**

.
AIRMET MTN OBSCN...ME NH VT MA NY PA WV MD VA NC SC GA
FROM 70NW PQI TO MLT TO CON TO HAR TO 20NW GSO TO 20NE ODF TO
GQO TO HMV TO HNN TO JHW TO SYR TO MSS TO YSC TO 70NW PQI
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

....

WAUS41 KPCI 021445

WA1S

-BOSS WA 021445

AIRMET SIERRA UPDT 3 FOR IFR AND MTN OBSCN VALID UNTIL 022100

.
AIRMET IFR...MA CT NY LO NJ PA OH LE WV MD DC DE VA AND CSTL WTRS
FROM MSS TO 130ESE SIE TO 180E ECG TO 30NE RDU TO 50SE JST TO
40SSW PSK TO HMV TO HNN TO 50W HNN TO 20ENE AIR TO ERI TO 30ESE
YYZ TO MSS
CIG BLW 010/VIS BLW 3SM PCPN/BR/FG. CONDS CONTG BYD 21Z THRU 03Z.

.
**AIRMET IFR...ME NH VT MA RI CT NY NJ AND CSTL WTRS
FROM 70NW PQI TO 60NE PQI TO 200SE ACK TO 190SSE ACK TO 100S ACK
TO 130ESE SIE TO MSS TO YSC TO 70NW PQI
CIG BLW 010/VIS BLW 3SM PCPN/BR/FG. CONDS CONTG BYD 21Z THRU 03Z.**

.
AIRMET MTN OBSCN...ME NH VT MA NY PA WV MD VA
FROM 70NW PQI TO MLT TO 20WSW ENE TO 30W ETX TO 20W GSO TO HMV
TO HNN TO JHW TO 20NE SYR TO MSS TO YSC TO 70NW PQI
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

....

²² The freezing level ranged from the surface to 8,000 ft msl across the valid AIRMET region.

²³ Flight Level – A Flight Level (FL) is a standard nominal altitude of an aircraft, in hundreds of ft. This altitude is calculated from the International standard pressure datum of 1013.25 hPa (29.92 inHg), the standard sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above mean sea level or above ground level.

WAUS41 KPCI 022045

WA1Z

-BOSZ WA 022045

AIRMET ZULU UPDT 3 FOR ICE AND FRZLVL VALID UNTIL 030300

.
**AIRMET ICE...ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA
AND CSTL WTRS**

**FROM 70NW PQI TO 40NNE PQI TO 50SE HUL TO 200SE ACK TO 160SE SIE
TO 20NE ECG TO HNV TO HNN TO 40WNW AIR TO 20N ERI TO 20ESE YYZ TO
50NNW SYR TO 30ESE YOW TO YSC TO 70NW PQI
MOD ICE BTN FRZLVL AND FL180. FRZLVL SFC-080. CONDS CONTG BYD 03Z
THRU 09Z.**

.
FRZLVL...RANGING FROM SFC-070 ACRS AREA

MULT FRZLVL BLW 070 BOUNDED BY 30NNE PQI-40E HUL-80SSW YSJ-

80ESE ENE-60NE ACK-120ESE ACK-130SE ACK-190SSE ACK-210SSE

HTO-40SE CYN-40SSW BDL-CON-60E YSC-30NNE PQI

SFC ALG 40NNE RDU-30SSW BOS-30S BGR-40W YSJ

040 ALG 200S ACK-160S ACK-80SSE ACK-80SSE BGR-70SW YSJ

....

WAUS41 KPCI 021445

WA1Z

-BOSZ WA 021445

AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 022100

.
AIRMET ICE...CT NY LO NJ PA OH LE WV MD DC DE VA AND CSTL WTRS
FROM 30ESE YOW TO 160SE SIE TO 20NE ECG TO HNV TO HNN TO 40WSW
HNN TO 20N ERI TO 20ESE YYZ TO 30ESE YOW
MOD ICE BTN FRZLVL AND 150. FRZLVL SFC-050. CONDS CONTG BYD 21Z
THRU 03Z.

.
AIRMET ICE...ME NH MA RI NY NJ MD DE CSTL WTRS
FROM 100SE BGR TO 200SE ACK TO 160SE SIE TO 100SE BGR
MOD ICE BTN FRZLVL AND 160. FRZLVL 050-090. CONDS CONTG BYD 21Z
ENDG 00-03Z.

.
**AIRMET ICE...ME NH VT MA RI CT NY NJ AND CSTL WTRS
FROM 90NW PQI TO 40N PQI TO 50WSW YSJ TO 100SE BGR TO 160SE SIE
TO 30ESE YOW TO 20SSE YSC TO 40E YQB TO 90NW PQI
MOD ICE BTN FRZLVL AND 150. FRZLVL SFC-050. CONDS CONTG BYD 21Z
THRU 03Z.**

.
OTLK VALID 2100-0300Z

AREA 1...ICE ME NH MA RI NY NJ MD DE AND CSTL WTRS

BOUNDED BY 40W YSJ-200SE ACK-160SE SIE-110S ACK-30NE ACK-60E

ENE-40W YSJ

MOD ICE BTN FRZLVL AND 160. FRZLVL 030-070. CONDS ENDG 00-03Z.

.
AREA 2...ICE ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA
NC SC GA FL AND CSTL WTRS

BOUNDED BY 70NW PQI-30NE PQI-40W YSJ-60E ENE-110S ACK-160SE

SIE-190ESE ECG-130SSE ILM-200ENE PBI-150ENE OMN-40W CHS-70ENE

LOZ-20N ERI-20SE YYZ-30SE YOW-YSC-70NW PQI

MOD ICE BTN FRZLVL AND 150. FRZLVL SFC-050. CONDS CONTG THRU 03Z.

.
FRZLVL...RANGING FROM SFC-080 ACRS AREA
MULT FRZLVL BLW 080 BOUNDED BY HUL-110SE BGR-ACK-170S ACK-
140SE SIE-40S SAX-40SW BDL-HUL
SFC ALG 30NNE GSO-30SE CSN-30NW SBY-40SSW BDL-50ENE ENE-70SW
YSJ
040 ALG 180ESE SIE-80SE HTO-100SSE BGR-110SSW YSJ
....

WAUS41 KPCI 022045
WA1T
-BOST WA 022045
AIRMET TANGO UPDT 3 FOR TURB STG WNDZ AND LLWS VALID UNTIL 030300

.
AIRMET TURB...ME NH VT MA RI NY AND CSTL WTRS
FROM 70NW PQI TO 60NE PQI TO 200SE ACK TO 200SSE HTO TO 20SW YSC
TO 70NW PQI
MOD TURB BTN FL200 AND FL370. CONDS CONTG BYD 03Z ENDG 06-09Z.

.
AIRMET TURB...PA OH LE WV MD VA NC SC GA FL AND CSTL WTRS
FROM DXO TO 60SSW RDU TO 110SSE ILM TO 180ENE PBI TO 30WSW PZD
TO GQO TO HNV TO HNN TO CVG TO FWA TO DXO
MOD TURB BTN FL180 AND FL400. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET TURB...ME NH VT MA RI CT NY LO AND CSTL WTRS
FROM 70NW PQI TO 60NE PQI TO 150ENE ACK TO 20ESE JFK TO 50WNW
ALB TO 40NNW SYR TO 30N MSS TO YSC TO 70NW PQI
MOD TURB BLW 100. CONDS CONTG BYD 03Z ENDG 06-09Z.

.
AIRMET TURB...NY LO NJ PA LE WV MD DC DE VA NC SC GA
FROM 40NNW SYR TO 20NNE HNK TO 20SW CYN TO 20ESE FLO TO 50S LGC
TO GQO TO 20N HNV TO 40ESE AIR TO 30NNE ERI TO 20E YYZ TO 40NNW
SYR
MOD TURB BLW 090. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET STG SFC WNDZ...ME NH MA AND CSTL WTRS
FROM 60SW YSJ TO 150ENE ACK TO 40ENE BOS TO 40ENE ENE TO 60SW YSJ
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS ENDG 21-00Z.

.
LLWS POTENTIAL...ME NH VT AND CSTL WTRS
BOUNDED BY 70NW PQI-60NE PQI-80SSW YSJ-40NW ENE-YSC-70NW PQI
LLWS EXP. CONDS ENDG 00-03Z.
....

WAUS41 KPCI 021445
WA1T
-BOST WA 021445
AIRMET TANGO UPDT 2 FOR TURB STG WNDZ AND LLWS VALID UNTIL 022100

.
AIRMET TURB...ME NH VT MA RI CT NY NJ MD DE VA AND CSTL WTRS
FROM 70NW PQI TO 60NE PQI TO 200SE ACK TO 160SE SIE TO 30S BDL
TO 40SSW YSC TO 70NW PQI
MOD TURB BTN FL200 AND FL370. CONDS CONTG BYD 21Z THRU 03Z.

.
AIRMET TURB...OH LE WV VA NC SC GA FL AND CSTL WTRS
FROM 20ENE DXO TO 40S GSO TO 140SSE ILM TO 170E PBI TO 20N PBI

TO 40WNW ORL TO GQO TO HNV TO HNN TO CVG TO FWA TO 20ENE DXO
MOD TURB BTN FL180 AND FL400. CONDS CONTG BYD 21Z THRU 03Z.

.
**AIRMET TURB...ME NH VT MA RI CT NY NJ PA AND CSTL WTRS
FROM 70NW PQI TO 60NE PQI TO 110SE BGR TO 40ESE ACK TO 20SSW HTO
TO 40WNW ALB TO 20NNE MSS TO YSC TO 70NW PQI
MOD TURB BLW 100. CONDS CONTG BYD 21Z ENDG 00-03Z.**

.
AIRMET TURB...MA RI CT NY LO NJ PA WV MD DC DE VA NC SC GA AND
CSTL WTRS
FROM 20NNE MSS TO 40WNW ALB TO 20SSW HTO TO 40SSE GSO TO 40SSE
LGC TO GQO TO HNV TO 40WNW SYR TO 20NNE MSS
MOD TURB BLW 080. CONDS CONTG BYD 21Z THRU 03Z.

.
AIRMET STG SFC WINDS...ME NH MA AND CSTL WTRS
FROM 50WSW YSJ TO 140E ACK TO 30NNW ACK TO 30NE ENE TO 50WSW YSJ
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS CONTG BYD 21Z
ENDG 21-00Z.

.
LLWS POTENTIAL...ME NH VT NY AND CSTL WTRS
BOUNDED BY 80NW PQI-30NE PQI-110SSW YSJ-20S CON-40NNW ALB-MSS-
YSC-80NW PQI
LLWS EXP. CONDS CONTG BYD 21Z ENDG 21-00Z.

.
OTLK VALID 2100-0300Z...TURB PA OH LE WV MD VA NC SC GA FL AND
CSTL WTRS
BOUNDED BY 20NNE DXO-20SSW GSO-90SSE ILM-180E PBI-30ESE MCN-
20ENE GQO-HNV-HNN-CVG-FWA-20NNE DXO
MOD TURB BTN FL180 AND FL400. CONDS CONTG THRU 03Z.

....

11.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products made available before the accident flight and valid at 1600 EST are shown in attachment 3. The GFA surface forecast products indicated VFR to IFR surface visibilities, a chance (between 30 and 60 percent) of snow showers, and a surface wind from the north at 15 knots with gusts to 25 knots. The GFA cloud forecast valid before departure for around the accident time indicated overcast ceilings at 1,100 to 1,900 ft msl with cloud top altitudes of FL270 and cirrus clouds above. The Graphical AIRMET²⁴ (G-AIRMET) Sierra valid for the accident site was overlaid on the GFA surface forecast graphics and the G-AIRMET Zulu was overlaid on the GFA cloud forecast graphic. The only human-generated information reflected in the two GFA products are the G-AIRMETs and the GFA is “human-over-the-loop.” For more information, please see attachment 3.

²⁴ <https://aviationweather.gov/gairmet>

12.0 Terminal Aerodrome Forecast

KORH was the closest airport to the accident site with an NWS²⁵ Terminal Aerodrome Forecast (TAF). The KORH TAF valid at the time of the accident was issued at 1231 EST and was valid for a 24-hour period beginning at 1300 EST. The 1231 EST TAF for KORH was as follows:

TAF KORH 021731Z 0218/0318 **02014G32KT 5SM -RASN BR OVC008**
FM022200 01013G28KT P6SM VCSH OVC009
FM030200 36011G21KT P6SM OVC011
FM031600 33010G17KT P6SM OVC021=

After 1300 EST and until 1700 EST, the forecast expected a wind from 020° at 14 knots with gusts to 32 knots, 5 miles visibility, light rain, snow, mist, and an overcast ceiling at 800 ft agl.

13.0 NWS Area Forecast Discussion

The NWS office in Boston/Norton, Massachusetts, (WFO BOX) issued an Area Forecast Discussion (AFD) at 1544 EST (closest AFD to the accident time with an aviation section). The aviation section (below) of the AFD discussed IFR to MVFR conditions with precipitation and temperatures near freezing:

.AVIATION /21Z TUESDAY THROUGH SUNDAY/...
Forecaster Confidence Levels.

Low - less than 30 percent.
Moderate - 30 to 60 percent.
High - greater than 60 percent

18z Update

Overall moderate confidence. Still quite a bit of IFR across the eastern half of the area, and MVFR across the west. Radar showing some light precipitation, which consists of a little bit of snow, a little bit of light rain along with some drizzle mixed in. Given surface temperatures very near 32F, some of that rain and drizzle is freezing on contact. In general the light precipitation will diminish as the afternoon and evening goes on. Quite difficult to get exact timing for the precipitation, and even harder yet to determine if it's -DZ, -FZDZ, -RA or -SN since all are at play. In any case, the emphasis is on light. Many areas, especially in the east, have some fog which are keeping visibilities in the MVFR range.

During the overnight, change will be very slow. IFR and MVFR ceilings will be widespread. MVFR visibilities will be common across eastern areas, with IFR hanging on in some spots (like the Cape and Islands). Surface winds will slowly get less gusty and veer from a NNE to NW direction by 12z.

²⁵ 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." www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

Wednesday should feature widespread MVFR ceilings. Models suggest the potential for flurries/light snow showers during the day. At this point the probabilities are too low to include the TAF, so held back on any VCSH mention.

KBOS TAF...Moderate Confidence in TAF. Light precipitation may last a little later than the 20z currently indicated.

KBDL TAF...Moderate Confidence in TAF. Potential for a brief period of -FZDZ later this afternoon as temperatures fall below freezing.

Outlook /Thursday through Sunday/...

Thursday: VFR. Breezy.

Thursday Night: VFR.

Friday: MVFR/IFR conditions possible. Breezy. Chance RA, chance SN.

Friday Night: Mainly VFR, with local MVFR possible. Breezy. Slight chance RA.

Saturday through Saturday Night: VFR. Breezy.

Sunday: Mainly VFR, with areas IFR possible. Breezy. Chance SN, chance RA.

&&

14.0 Winds and Temperature Aloft Forecast

The NWS 1455 EST Winds and Temperature Aloft forecast valid for the closest point to the accident site is included below:

```
FBUS31 KWN0 021955
FD1US1
DATA BASED ON 021800Z
VALID 030000Z   FOR USE 2000-0300Z. TEMPS NEG ABV 24000

FT   3000    6000    9000   12000   18000   24000   30000   34000   39000
BOS 0617 1905+00 1710-05 1919-12 1728-24 1731-37 184147 185449 195149
```

The closest forecast point to the accident site was Boston, Massachusetts, (BOS). The 1455 EST BOS forecast for use between 1500 EST and 2200 EST indicated a wind at 3,000 ft from 060° at 17 knots, a wind at 6,000 ft from 190° at 5 knots with a temperature of 0°C, and a wind at 9,000 ft from 170° at 10 knots with a temperature of -5°C.

15.0 Pilot Weather Briefing

The accident pilot did request weather information²⁶ from Leidos Flight Service. The accident pilot first requested weather information from Leidos around 1409 EST for a flight ORH to Martha's Vineyard Airport (MVY) and the return flight on February 2. During the weather briefing with Leidos the accident pilot requested PIREPs for cloud tops and if "heard of any icing reports". The weather briefer provided the 1400 EST PIREP (section 7.0) and also discussed the Current Icing Potential (CIP) and Forecast Icing Potential (FIP) products (section 17.0) with cloud tops determined to be near 6,000 ft msl and "will have some sort of icing." In addition, the Leidos text weather briefing (attachment 5) provided all the standard weather information and forecasts (including GFAs) valid at 1410 EST. For more information, please see attachments 4 through 7.

A search of archived ForeFlight information indicated that the accident pilot did request and receive weather information from ForeFlight at 1431 EST and for the information contained therein please see attachment 8.

16.0 Accident Imagery and Pilot Statement

After the accident, imagery was received of the icing remaining on the accident aircraft's wing after impact and that imagery is contained in figures 13 to 15. During an interview, the pilot stated that the flight from ORH to MVY had no icing and they were above the cloud tops around 4,000 ft msl. On the return trip, between MVY and ORH, the accident pilot stated they were above the clouds around 4,000 ft msl and on descent into ORH they started to pick up some ice, but not enough ice to concern the accident pilot. The accident pilot exercised the deicing boots at least twice on descent into ORH and the accident pilot saw that most of the ice cleared from the main wings each time the deicing boots were exercised. However, the accident pilot could not visually confirm icing on the horizontal stabilizer or if the deicing boots on the horizontal stabilizer had worked or not. The accident pilot recalled that on descent into ORH the Automatic Terminal Information Service (ATIS)²⁷ provided 1,000 ft agl overcast ceiling information and doesn't recall any precipitation from the ATIS. For more information, please see the NTSB pilot accident report located in the docket of this investigation.

²⁶ https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-92.pdf

²⁷ https://www.faa.gov/air_traffic/publications/atpubs/atc_html/chap2_section_9.html



Figure 13 – Icing on the accident aircraft’s wing after the accident.



Figure 14 – Icing on the accident aircraft’s wing after the accident.



Figure 15 – Icing on the accident aircraft’s wings after the accident.

17.0 Icing Potential²⁸

CIP and FIP products are created by the NWS Aviation Weather Center (AWC) and are intended to supplement other icing advisories (e.g., AIRMETs and SIGMETs). Figures 16 through 18 are the FIP icing probabilities and icing severity products and 1-hour forecast valid at 1700 EST at 2,000, 3,000, and 4,000 ft above msl, and indicated a 60 to 85% probability of icing at 2,000 to 4,000 ft over the area. The FIP also indicated that the icing intensity near the accident site would range from “trace” to “moderate” categories. The FIP indicated a 60% probability of Supercooled Large Droplets (SLD) over the accident site at the accident time at 4,000 ft msl (attachment 9).²⁹

²⁸ B.C. Bernstein, F. McDonough, M. K. Politovich, B. G. Brown, T. P. Ratvasky, D. R. Miller, C.A. Wolff, and G. Cuning, Current Icing Potential: Algorithm Description and Comparison with Aircraft Observations (Journal of Applied Meteorology, 2005), pp. 969-986.

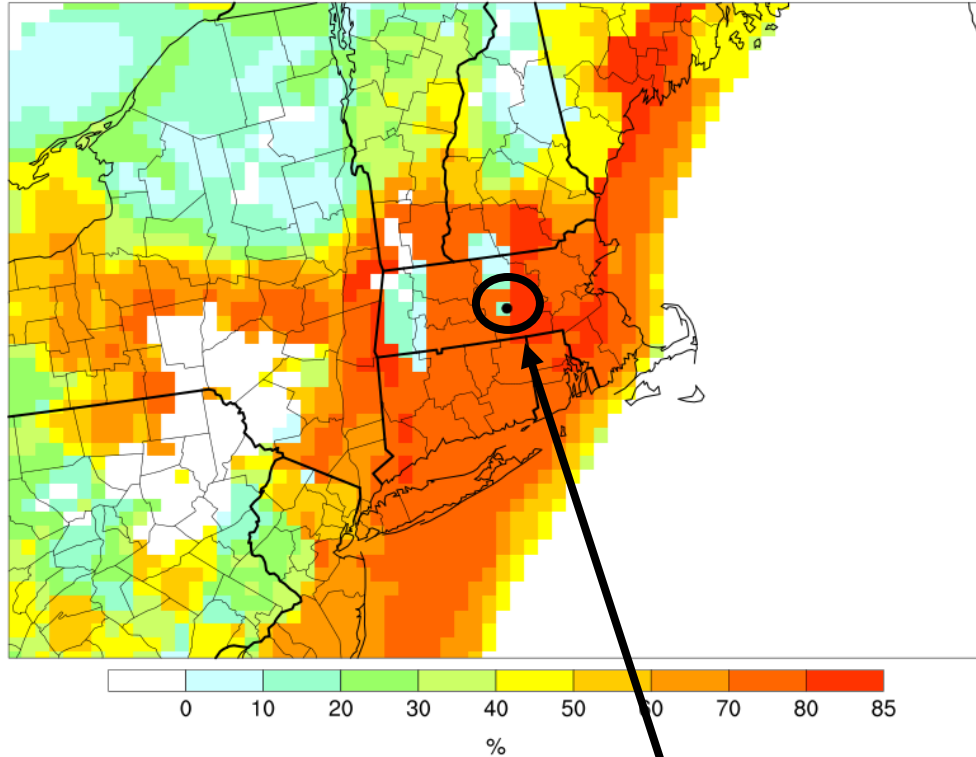
C.A. Wolff, F. McDonough, M. K. Politovich, B.C. Bernstein, and G. Cuning, FIP Severity Technical Document (Prepared for the Aviation Weather Technology Transfer Technical Review Board), pp. 1-44.

<https://arc.aiaa.org/doi/abs/10.2514/6.2009-3531>

²⁹ <https://www.aviationweather.gov/icing/fip>

The CIP product indicated a 70 to 85% probability of icing at 2,000 to 4,000 ft at 1700 EST above the accident site (figures 19, 20, and 21). The CIP also indicated that the icing near the accident site would be in the “light” category above 2,000 ft above msl. In addition, the CIP indicated a 90 to 100% probability of SLD at 1,000 to 4,000 ft above msl at the accident site at 1700 EST (attachment 9). For more FIP and CIP data please see attachment 9.

ICING PROBABILITY at FL 020 01 Hour forecast valid at: 2/2/2021 2200 UTC



ICING SEVERITY CATEGORY at FL 020 01 Hour forecast valid at: 2/2/2021 2200 UTC

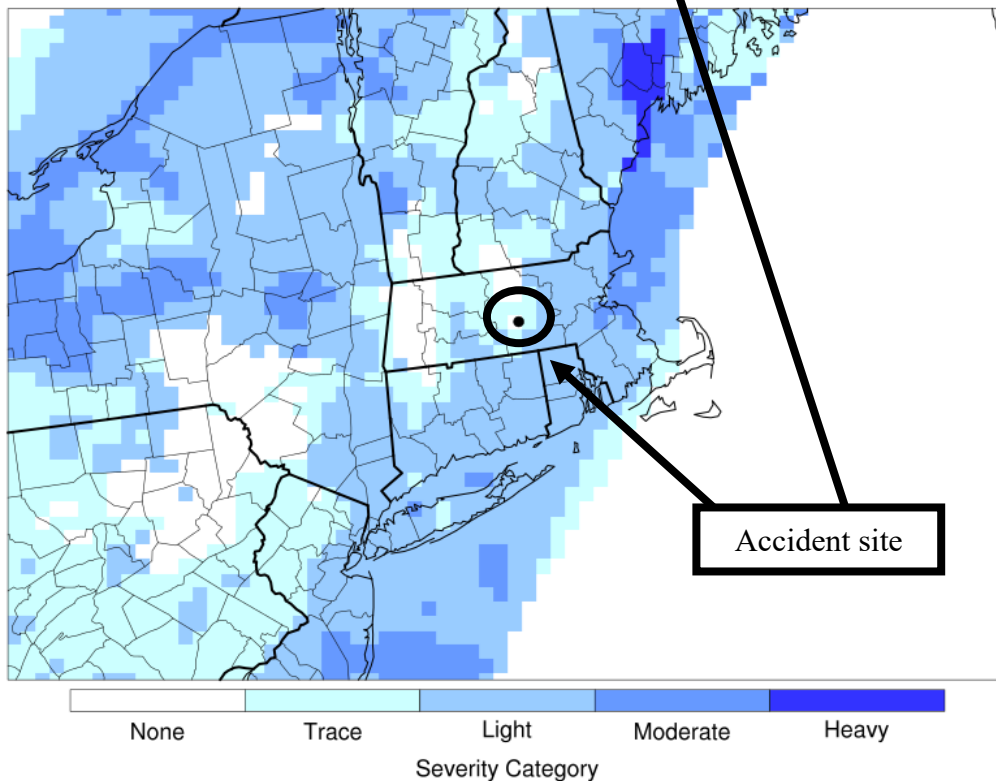


Figure 16 – (top) FIP probability of icing at 2,000 ft above msl and (bottom) FIP severity of icing at 2,000 ft above msl 1-hour forecast valid for 1700 EST.

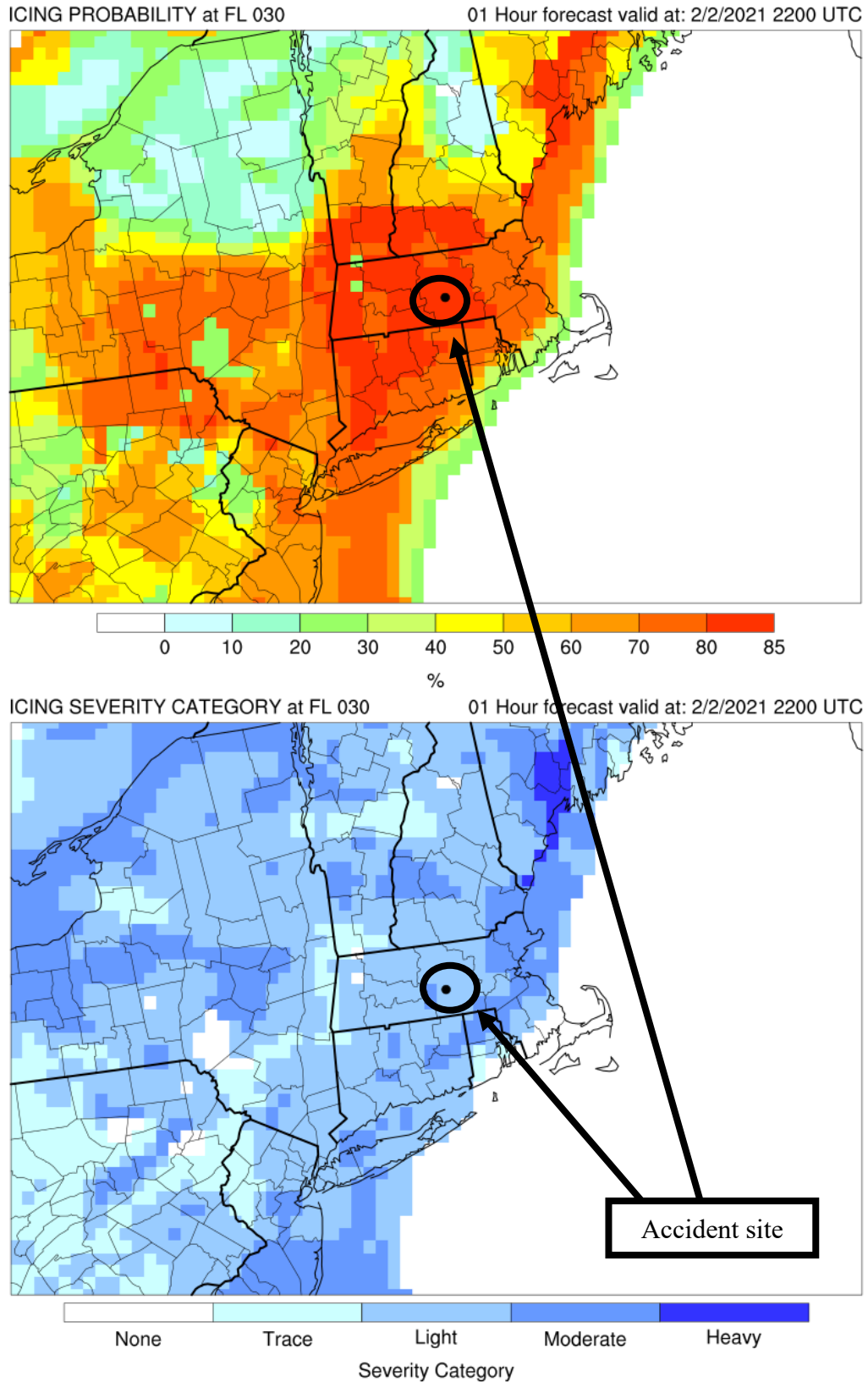


Figure 17 – (top) FIP probability of icing at 3,000 ft above msl and (bottom) FIP severity of icing at 3,000 ft above msl 1-hour forecast valid for 1700 EST.

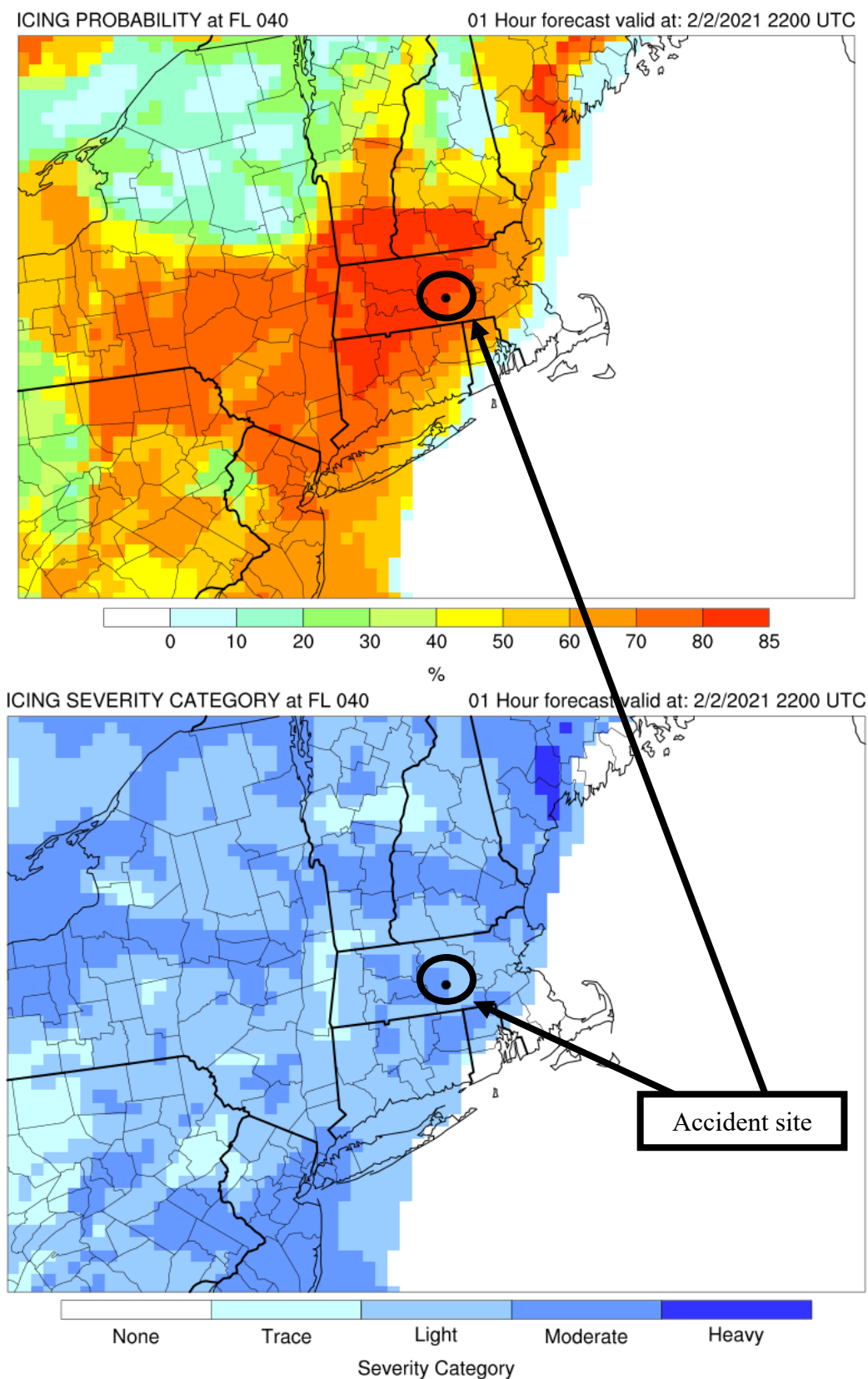
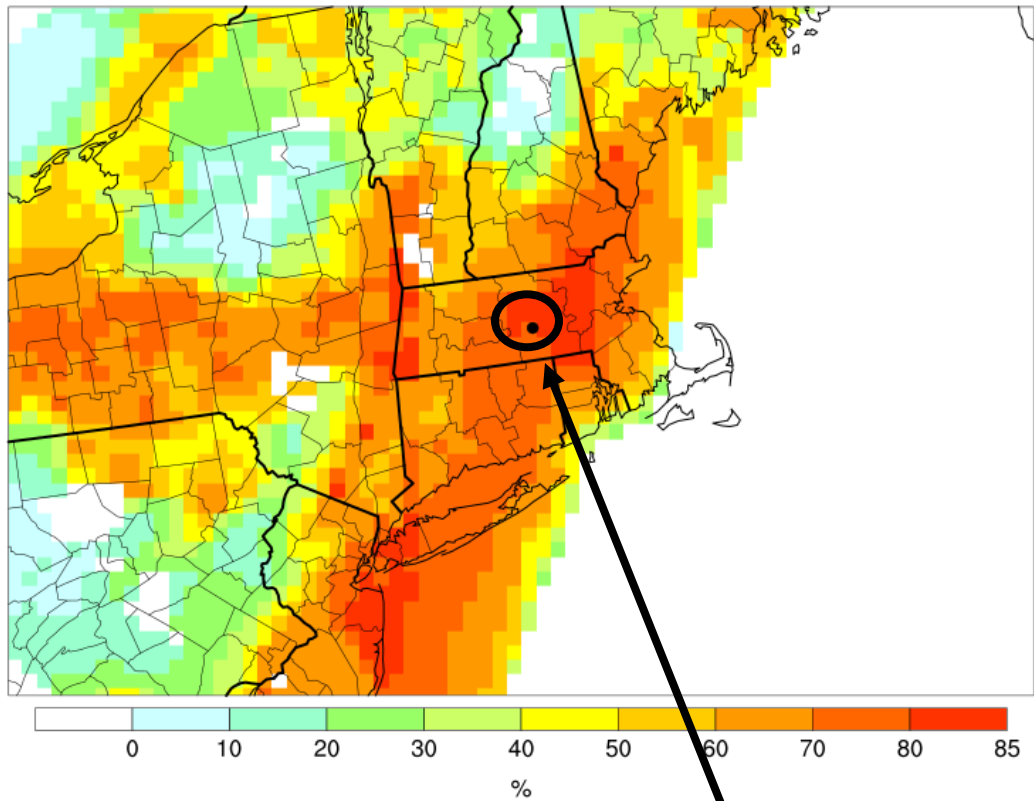


Figure 18 – (top) FIP probability of icing at 4,000 ft above msl and (bottom) FIP severity of icing at 4,000 ft above msl 1-hour forecast valid for 1700 EST.

ICING PROBABILITY at FL 020

2/2/2021 2208 UTC



ICING SEVERITY at FL 020

2/2/2021 2208 UTC

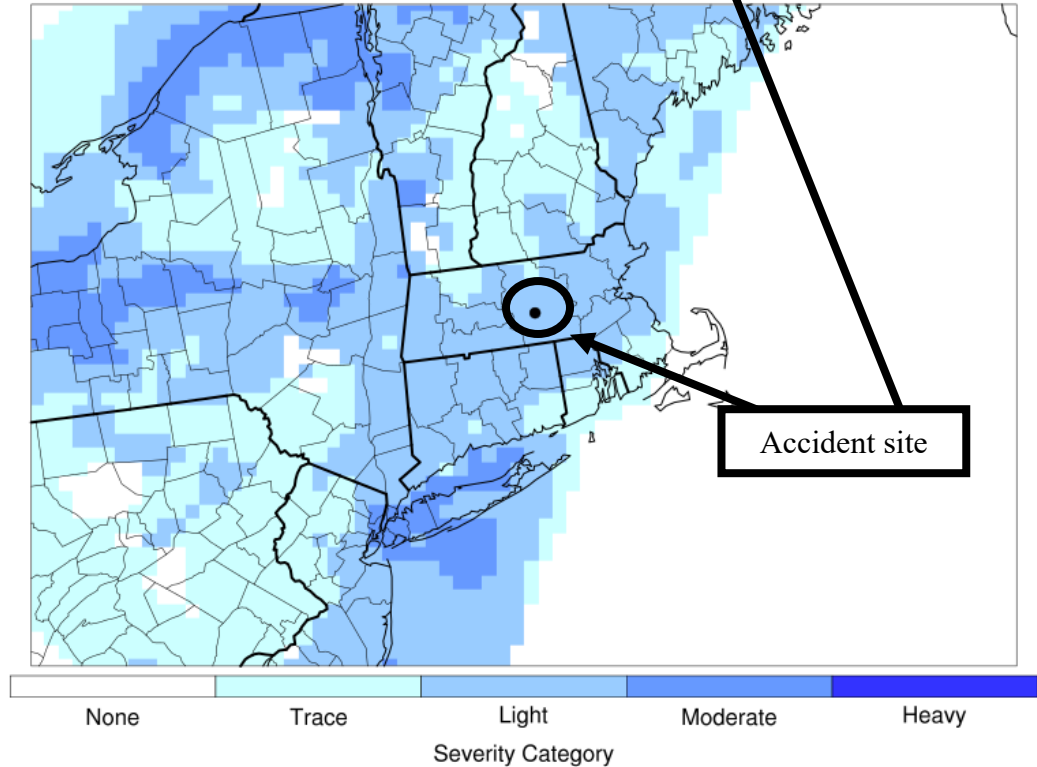
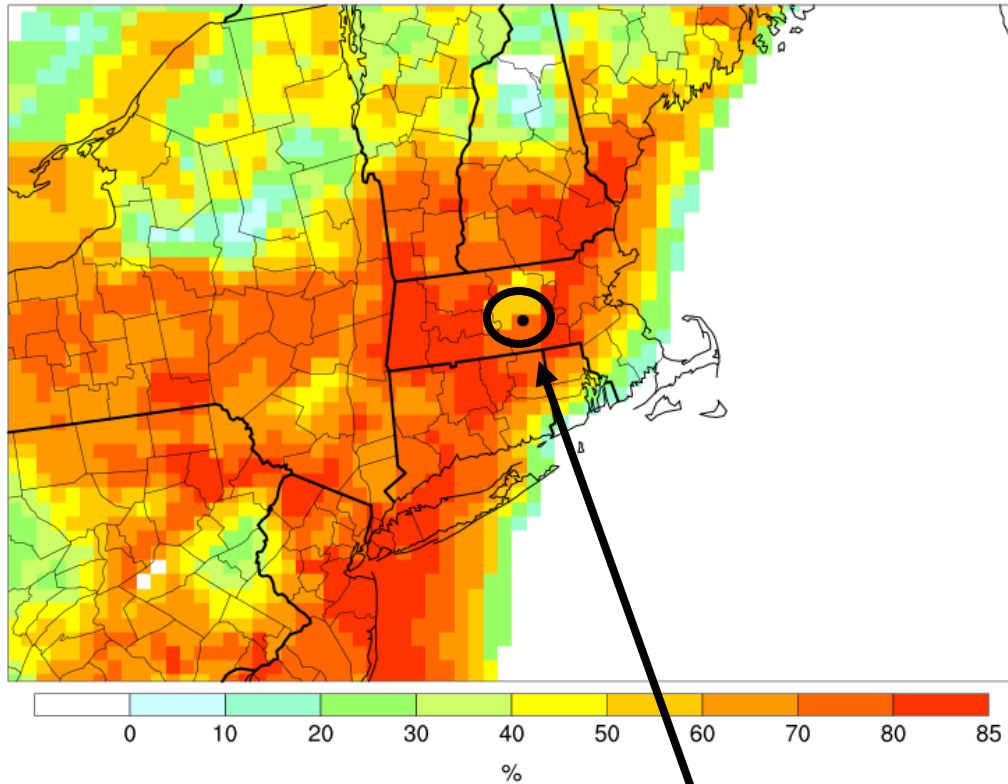


Figure 19 – (top) CIP probability of icing at 2,000 ft above msl and (bottom) CIP severity of icing at 2,000 ft above msl valid for 1700 EST.

ICING PROBABILITY at FL 030

2/2/2021 2208 UTC



ICING SEVERITY at FL 030

2/2/2021 2208 UTC

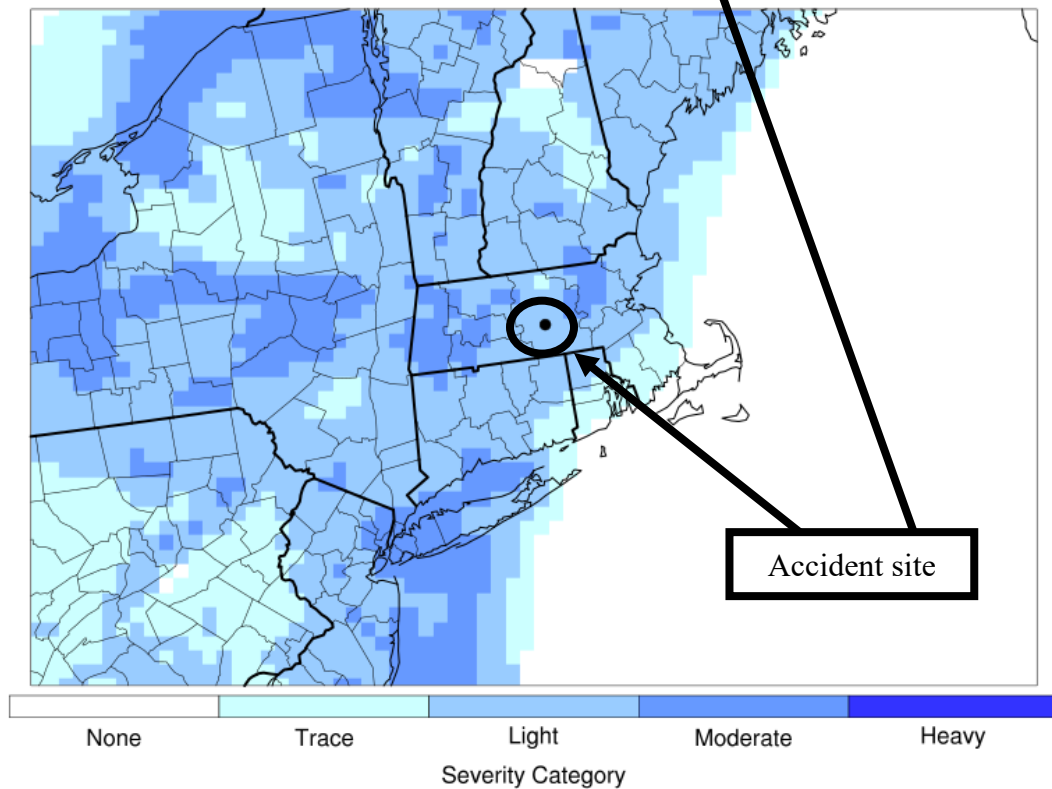
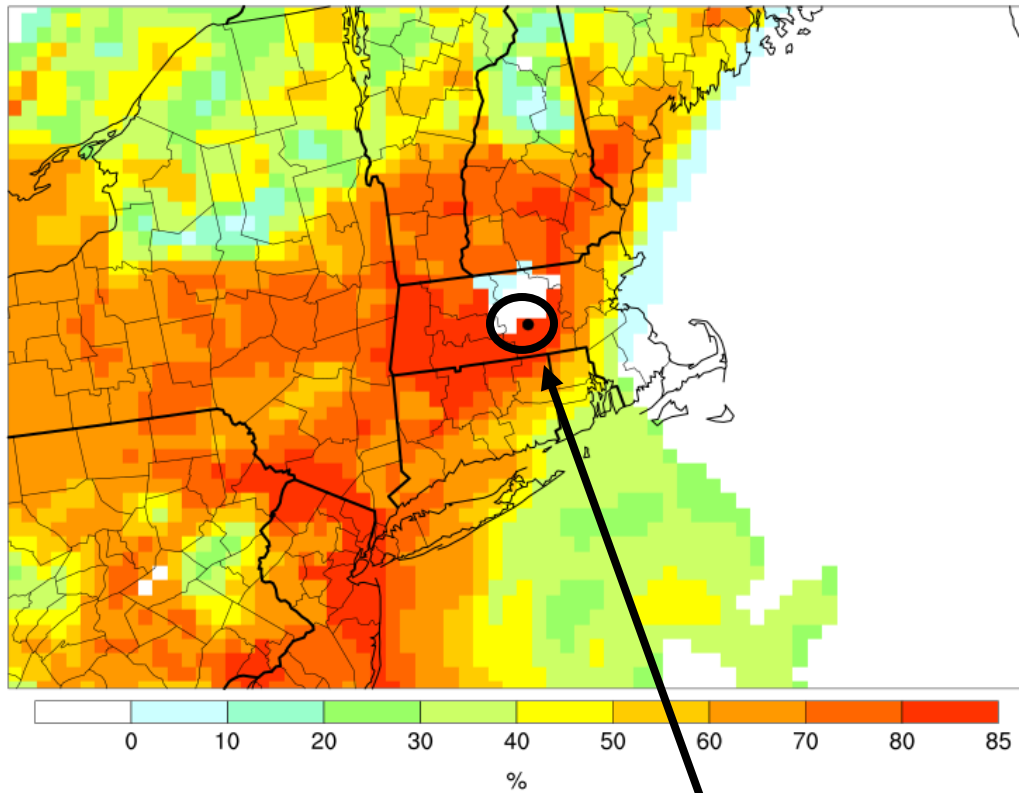


Figure 20 – (top) CIP probability of icing at 3,000 ft above msl and (bottom) CIP severity of icing at 3,000 ft above msl valid for 1700 EST.

ICING PROBABILITY at FL 040

2/2/2021 2208 UTC



ICING SEVERITY at FL 040

2/2/2021 2208 UTC

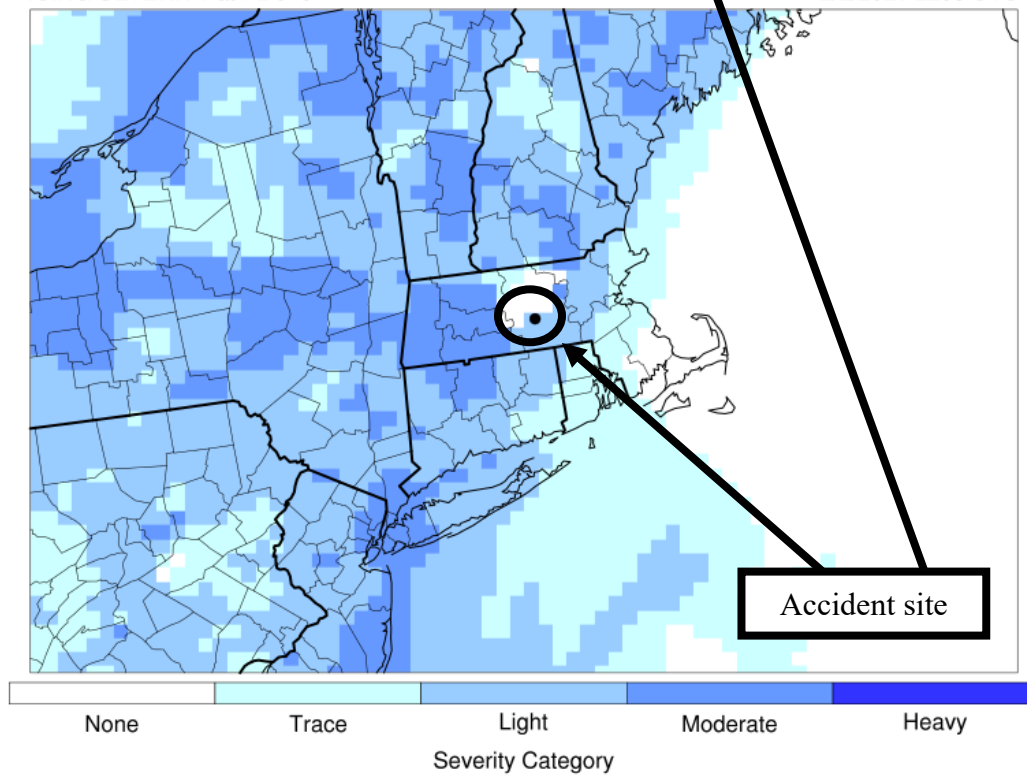


Figure 21 – (top) CIP probability of icing at 4,000 ft above msl and (bottom) CIP severity of icing at 4,000 ft above msl valid for 1700 EST.

18.0 Astronomical Data

The astronomical data obtained for the accident site on February 2, 2021, indicated the following:

SUN	
Begin civil twilight	0630 EST
Sunrise	0659 EST
Sun transit	1202 EST
Accident time	1656 EST³⁰
Sunset	1704 EST
End civil twilight	1733 EST

E. LIST OF ATTACHMENTS

Attachment 1 – KORH ASOS icing sensor information

Attachment 2 – GOES-16 visible satellite animation between 1436 and 1736 EST

Attachment 3 – GFA valid for the accident site at accident time

Attachment 4 – Leidos weather briefing information text part 1

Attachment 5 – Leidos weather briefing information text part 2

Attachment 6 – Leidos weather briefing with accident pilot around 1409 EST

Attachment 7 – Leidos provided GFAs

Attachment 8 – ForeFlight weather briefing information from 1431 EST

Attachment 9 – CIP and FIP imagery for the accident time

³⁰ Inserted accident time for reference and context.

Submitted by:

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