

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN24LA011

METEOROLOGY

Specialist's Factual Report

October 23, 2023

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. METEOROLOGY SPECIALIST	3
C. DETAILS OF THE INVESTIGATION	3
D. FACTUAL INFOIRMATION.....	3
1.0 SYNOPTIC SITUATION	3
1.1 Surface Analysis Chart.....	4
1.2 Surface Prognostic Chart	5
2.0 OBSERVATIONS.....	6
2.1 Red Oak, Iowa	6
2.2 NWS METAR Regional Display.....	7
3.0 SOUNDING.....	8
4.0 SATELLITE IMAGERY	10
5.0 PILOT REPORTS	14
6.0 NWS FORECASTS	15
6.1 Terminal Aerodrome Forecast.....	15
6.2 Area Forecast Discussion.....	15
6.3 Graphic Forecast for Aviation.....	16
6.4 Winds and Temperature Aloft Forecast.....	18
6.5 NWS Icing Products.....	19
7.0 NWS INFLIGHT WEATHER ADVISORIES	21
E. ATTACHMENTS.....	22

A. ACCIDENT

Location: Red Oaks, Iowa
Date: October 15, 2023
Time: 0951 central daylight time (CDT)
1451 coordinated universal time (UTC)
Airplane: Cirrus SR22 Registration: N6JA

B. METEOROLOGY SPECIALIST

Donald Eick
Senior Meteorologist
National Transportation Safety Board
Washington, D.C.

C. 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 documents the pertinent meteorological parameters to the accident. All times are reported as central daylight time (CDT) based upon the 24-hour clock, local time is -5 hours from UTC, and UTC=Z. Airport and 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. continental 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 41.010833°N and longitude 95.258861°W at an elevation of about 1,045 ft.

D. FACTUAL INFOIRMATION

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 (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 and other products can be found in the Federal Aviation Administration (FAA) "Aviation Weather Handbook", FAA-H-8083-28¹.

1.1 Surface Analysis Chart

The northcentral section of the NWS Surface Analysis Chart for 1000 CDT is included as figure 1 with the approximate accident location marked by the red star. The chart depicted two high pressure systems over North and South Dakota at 1033-hectopascals² with a ridge extending southward. No boundaries were depicted in the immediate vicinity of the accident site. The station models surrounding the accident site depicted northerly winds of about 10 knots, overcast clouds, temperatures near 50° Fahrenheit (F), with dew point temperatures in the mid-40s° F. A station model east of the accident site for Osceola (KI75), Iowa, was reporting light continuous rain at the time.

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

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

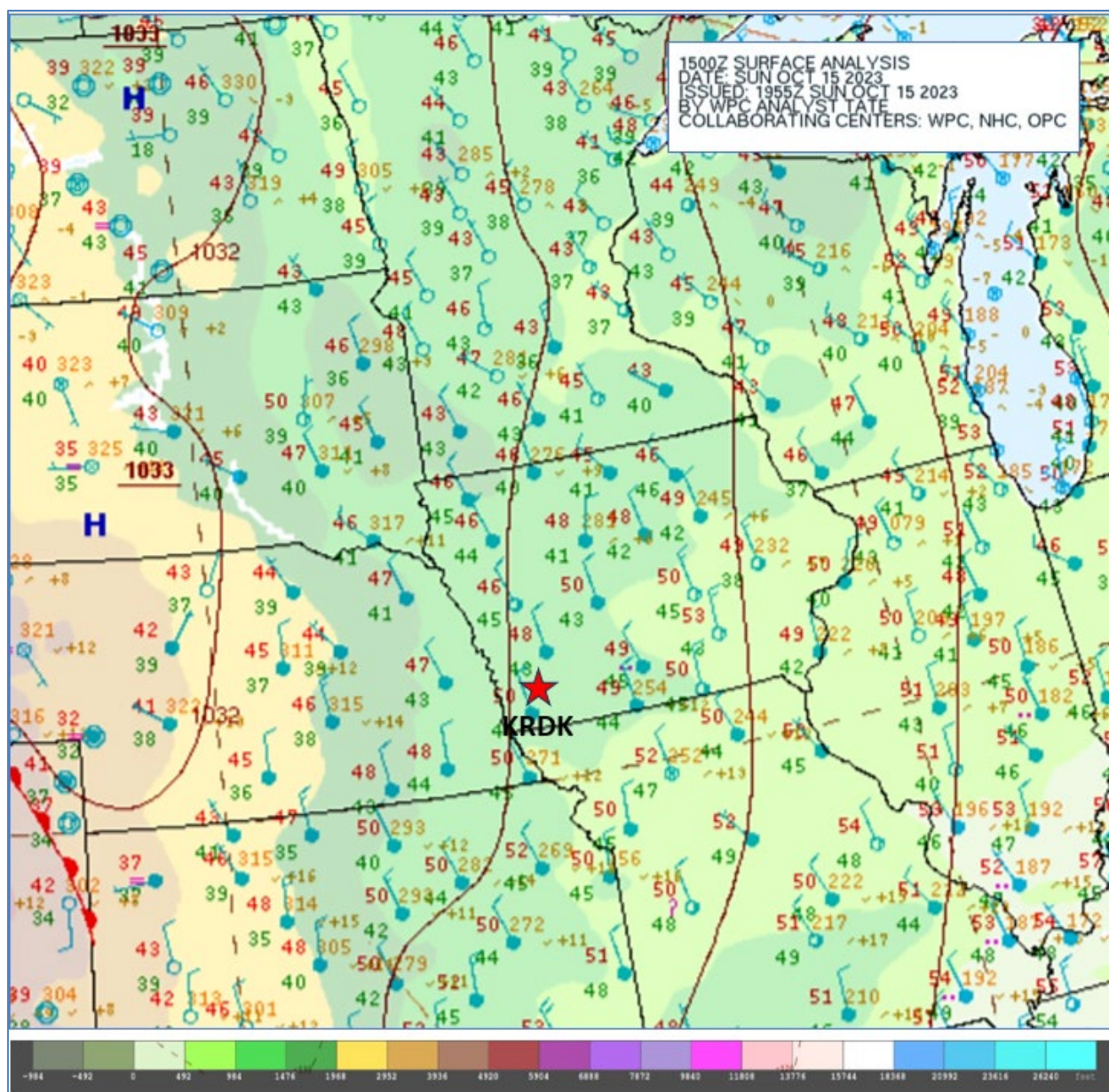


Figure 1 - The northcentral section of the NWS Surface Analysis Chart for 1000 CDT with the approximate accident location marked by the red star.

1.2 Surface Prognostic Chart

The NWS 6-hour Surface Prognostic Chart current for the period and valid for 1300 CDT depicting the primary pressure systems, fronts, isobars³, and precipitation is included as figure 2. A small area of rain was depicted over western Iowa with a chance of extensive rain over eastern Missouri.

³ Isobars are a line of equal pressure. Wind is directly related to the pressure field, and thus isobars provide an indication of wind direction and speed depending on the gradient.

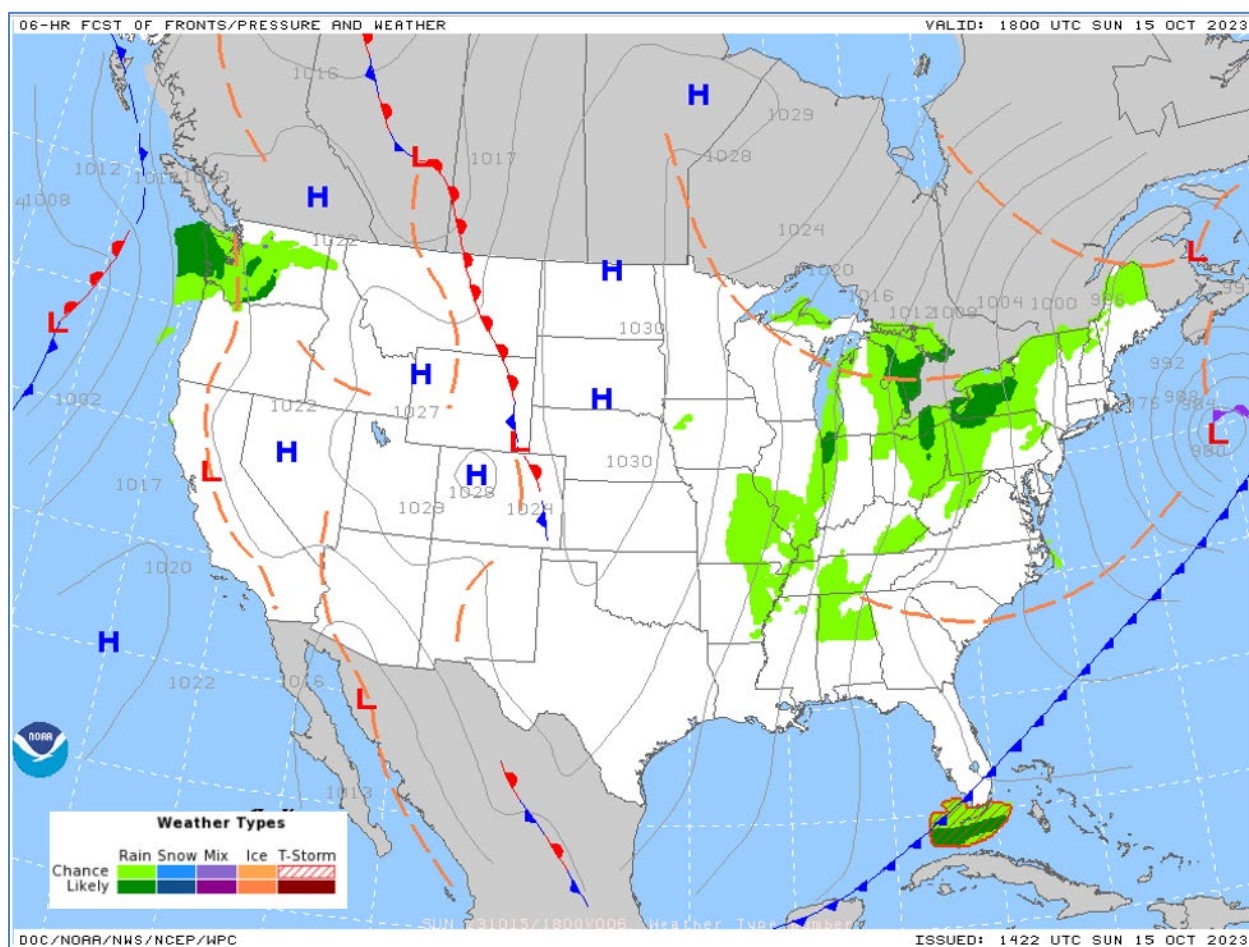


Figure 2 - NWS 6-hour Surface Prognostic Chart valid for 1300 CDT with pressure systems, fronts, and precipitation expected during the period.

2.0 Observations

The closest reporting station and destination airport was documented using official Aviation Routine Weather Reports (METAR⁴) and Aviation Selected Special Weather Reports (SPECI). Cloud heights are reported above ground level (agl) in the following section. The magnetic variation over the area was 2° East.

2.1 Red Oak, Iowa

The initial report of encountering icing occurred in the vicinity of Red Oak Municipal Airport (KPDK), Red Oak, Iowa, and the aircraft diverted to the airport where the accident occurred. The airport listed an elevation of 1,045 ft and had an Automated

⁴ METAR is an abbreviation of METeorological Aerodrome Report, which is the international standard for reporting weather.

Weather Observation System (AWOS) installed, which broadcasted⁵ weather on 125.525 MHz locally and disseminated observations longline⁶ every 20-minutes. At the approximate time of the accident, KRDK reported the following conditions.

KRDK weather observation at 0935 CDT, automated, wind from 350° at 11 knots, visibility 10 miles or more, ceiling overcast at 5,500 ft agl, temperature 9°C (48°F), dew point temperature 8°C (46°F), altimeter 30.32 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator.

The general flight categories⁷ and raw observations surrounding the period from about 0700 through 1100 CDT were as follows.

VFR METAR KRDK 151215Z AUTO 34005KT 10SM SCT041 BKN049 OVC060 08/08 A3030 RMKAO2
VFR METAR KRDK 151255Z AUTO 32008KT 10SM OVC055 08/08 A3030 RMK AO2=
VFR METAR KRDK 151315Z AUTO 33009KT 10SM OVC055 08/08 A3031 RMK AO2=
VFR METAR KRDK 151335Z AUTO 33009KT 10SM OVC055 09/09 A3031 RMK AO2=
VFR METAR KRDK 151355Z AUTO 33009KT 10SM OVC055 09/09 A3032 RMK AO2=
VFR METAR KRDK 151415Z AUTO 34009KT 10SM OVC060 09/09 A3032 RMK AO2=
VFR METAR KRDK 151435Z AUTO 35011KT 10SM OVC055 09/08 A3032 RMK AO2=
Accident 1451Z
VFR METAR KRDK 151455Z AUTO 33008KT 10SM OVC055 10/08 A3032 RMK AO2=
VFR METAR KRDK 151515Z AUTO 33008KT 10SM OVC055 10/08 A3033 RMK AO2=
VFR METAR KRDK 151535Z AUTO 35012KT 10SM FEW021 FEW025 OVC060 10/07 A3033 RMK
VFR METAR KRDK 151555Z AUTO 35010G17KT 10SM FEW019 SCT024 OVC060 11/07 A3034 RMK

2.2 NWS METAR Regional 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 3. The image depicted VFR to MVFR conditions prevailing over the area with generally northerly winds at 5 to 15 knots, with temperatures from 48° to 50°F, and temperature-dew point spreads of 4°F or less. Scattered and very light intensity echoes were also depicted over the region, with no specific echoes over KRDK at the time of the image.

⁵ ASOS/AWOS broadcast of weather is typically line-of-sight and typically are engineered to be receivable to a maximum range of 25 miles, and a maximum altitude of 10,000 ft.

⁶ Longline refers to transmitting the data through communication protocols to the FAA and NWS, where it is further distributed to users on various in near real-time.

⁷ As defined by the NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories to describe general ceiling and visibility conditions:

- LIFR (Low Instrument Flight Rules). Ceiling less than 500 feet and/or visibility less than 1 mile.
- IFR (Instrument Flight Rules). Ceiling 500 to less than 1,000 feet and/or visibility 1 to less than 3 miles.
- MVFR (Marginal Visual Flight Rules). Ceiling 1,000 to 3,000 feet and/or visibility 3 to 5 miles inclusive.
- VFR. (Visual Flight Rules) Ceiling greater than 3,000 feet and visibility greater than 5 miles; includes sky clear.

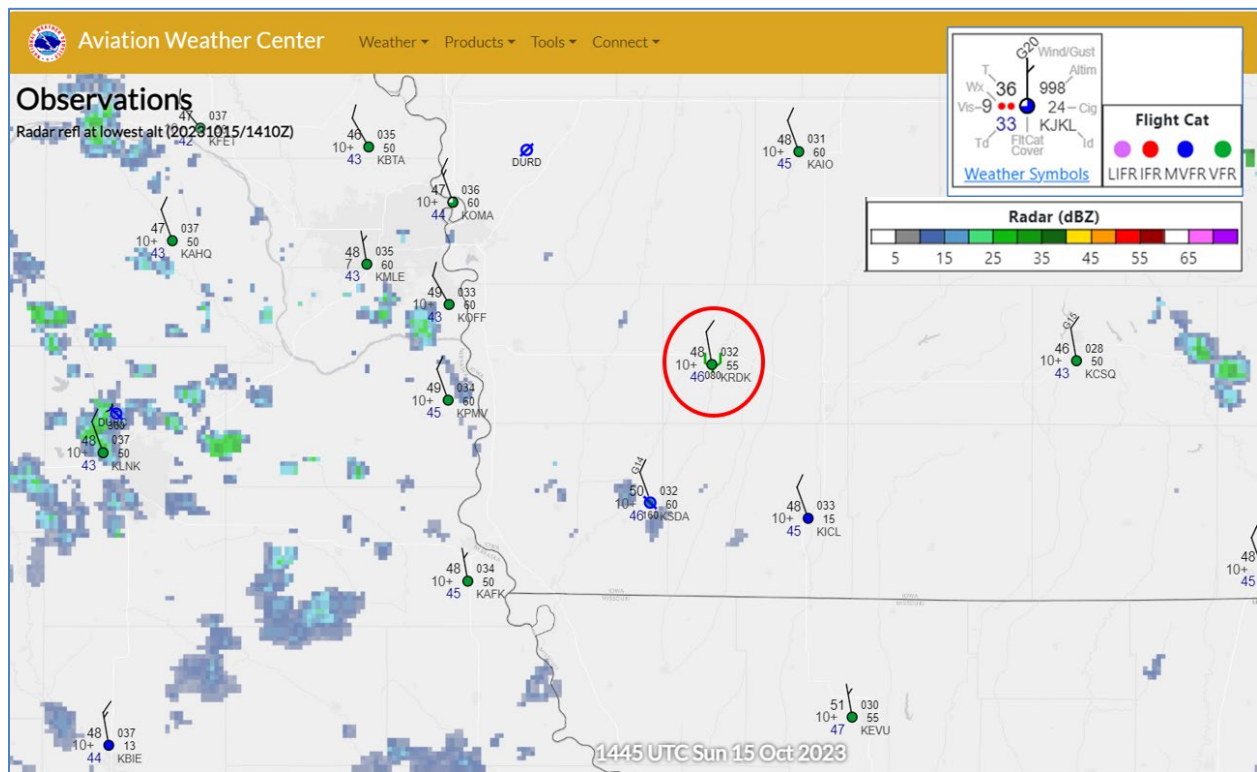


Figure 3 - NWS Aviation Weather Center's METAR display for 0945 CDT with radar overlaid with the accident site and the general vicinity of the initial icing encounter located within the red circle.

3.0 Sounding

A High Resolution Rapid Refresh (HRRR) numerical model⁸ data were obtained from the NOAA Air Resource Laboratory for 1000 CDT for the closest grid point to the accident site and the icing encounter. The data were then plotted on a standard Skew T log P diagram⁹ using the RAOB Analysis software¹⁰. Figure 4 is the HRRR sounding for 1000 CDT from the surface through 450-hPa or about 22,000 ft.

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 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 Universal RAOBwinsonde OBservation program is an interactive sounding analysis program developed by Eosonde Research Services (ERS) previously known as Environmental Research Services, The Villages, Florida.

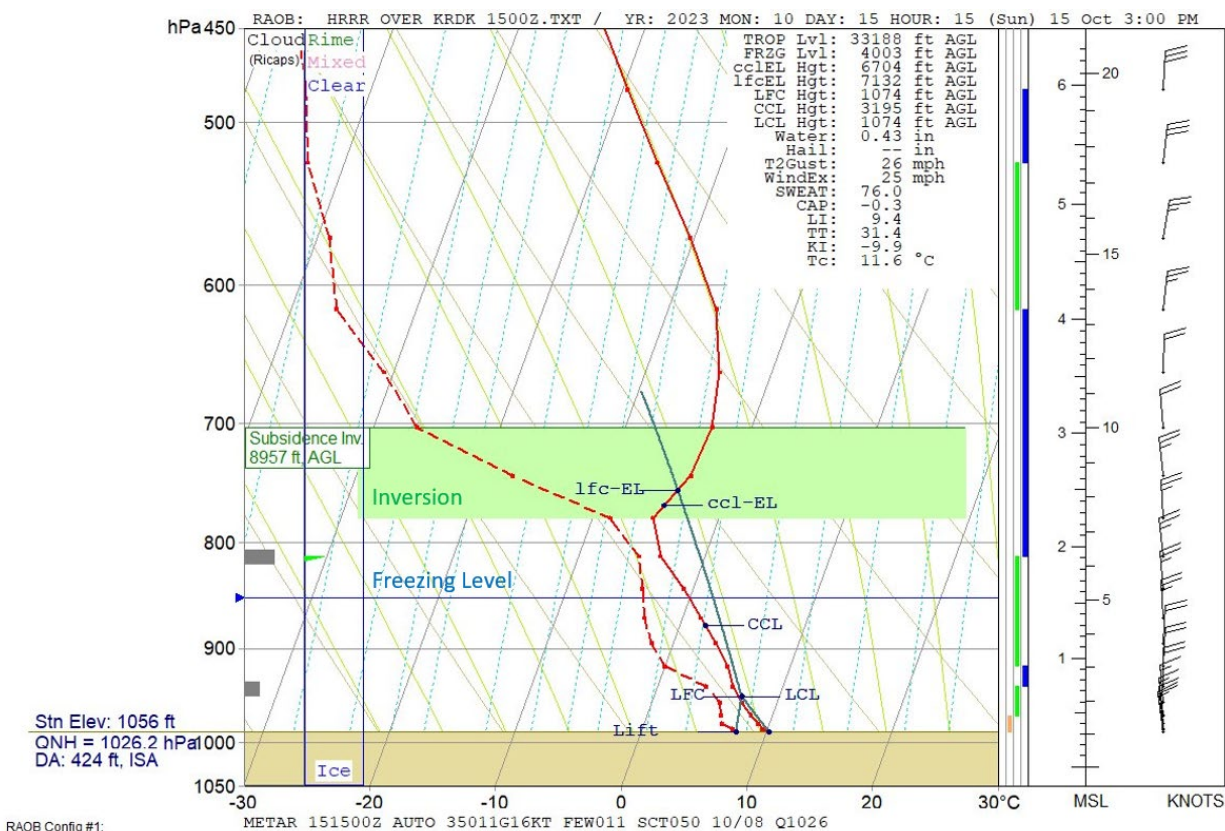


Figure 4 - HRRR sounding over the closest grid point to KRDK and the accident aircraft's icing report for 1000 CDT.

The HRRR sounding depicted an elevation of 1,056 ft over the grid point with a near surface temperature of 10.2°C (50.4°F), a dew point temperature of 7.6°C (45.7°F), with a relative humidity of 84%, which resulted in a density altitude of 424 ft. The sounding depicted a lifted condensation level (LCL)¹¹ and level of free convection (LFC)¹² at 1,074 ft agl, with the convective condensation level (CCL)¹³ at 3,195 ft agl. The freezing level was identified at 4,003 ft agl (5,059 ft msl) and is indicated by the blue line across the sounding diagram. An inversion was noted above 7,000 ft through 9,000 ft where temperatures increased with altitude while remaining below freezing, with dry air above 10,000 ft with the temperature-dew point spreads in excess of 20°C. The precipitable water content was 0.43 inches. The Lifted Index (LI)¹⁴ was 9.4 and the

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 Level of Free Convection (LFC) - the level where a parcel becomes buoyant, or "warmer" than the environmental temperature at the same level. The LFC represents the bottom of the layer containing Convective Available Potential Energy (CAPE).

¹³ 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.

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. Positive values indicate a

convective available potential energy (CAPE)¹⁵ was 112 Joules/kilogram, both of which indicated a stable atmosphere. The RAOB Analysis program supported a few clouds near 1,100 ft agl and a scattered to broken layer of stratocumulus type clouds near 5,000 ft agl with tops near 7,000 ft, with a potential for rime type icing within that layer (between 6,000 ft and 7,000 ft msl).

The HRRR wind profile indicated a near surface wind from 350° at 11 knots gusting to 16 knots, with little variation with height and wind speeds increasing near 6,000 ft to 26 knots. The mean 0 to 6 kilometer (18,000 ft) wind was from 360° at 24 knots. At 7,000 ft the sounding indicated a wind from about 355° at 26 knots with a temperature of -4.6°C, a dew point temperature of -7.4°C, with a relative humidity of 80%.

A table of the HRRR sounding parameters of height, pressure (Pres), temperature (T), dew point temperature (Td), relative humidity (RH), wind direction and speed, derived clear air turbulence (CAT), low-level wind shear (LLWS), and icing potential from the surface through 12,000 ft is included below.

Height (ft-msl)	Pres (hPa)	T (°C)	Td (°C)	RH (%)	Wind (dir/kts)	CAT (FAA)	LLWS (FAA)	Icing-Type (AFGW)
1056	988	10.2	7.6	84	352/ 11			
1139	985	9.6	7.2	85	352/ 13			
1305	979	9.1	6.2	82	353/ 14			
1556	970	8.3	5.9	85	353/ 15			
1950	956	7.2	5.4	88	355/ 16			
2434	939	6.0	3.9	86	360/ 18			
3041	918	5.0	0.0	70	002/ 19			
3719	895	3.4	-1.7	69	003/ 21	LGT		
4471	870	1.5	-3.0	72	356/ 23			
5333	842	-0.7	-4.0	78	355/ 24			
6280	812	-3.5	-5.2	88	354/ 26			
7387	778	-5.2	-8.6	77	356/ 26			
8612	742	-3.4	-17.6	32	354/ 24			
10013	703	-3.1	-26.6	14	355/ 21			
11609	661	-4.1	-30.8	10	001/ 21			

4.0 Satellite Imagery

NOAA Geostationary Operational Environmental Satellite number 16 (GOES-16) infrared and visible imagery were obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System

stable atmosphere, while negative numbers indicate instability.

¹⁵ Convective Available Potential Energy (CAPE) is a measure of the amount of energy available for convection. CAPE is directly related to the maximum potential vertical speed within an updraft; thus, higher values indicate greater potential for severe weather.

(McIDAS) software. The infrared band 13 at a wavelength of 10.3 microns (μm) provided a resolution of 2 kilometers (km) with radiative cloud top temperatures, and the visible band 2 imagery at a wavelength of 0.64 μm provided a resolution of 0.5 km. The images have not been corrected for parallax error.

Figure 5 is the GOES-16 infrared image for 0931 CDT at 4X magnification, which was near the time the accident pilot reported encountering icing conditions and requesting a higher altitude and then diversion to KRDK. The radiative cloud top temperature over KRDK at the time was 266 Kelvin or -7.16°C , which corresponded to cloud tops near 7,500 ft based on the HRRR sounding.

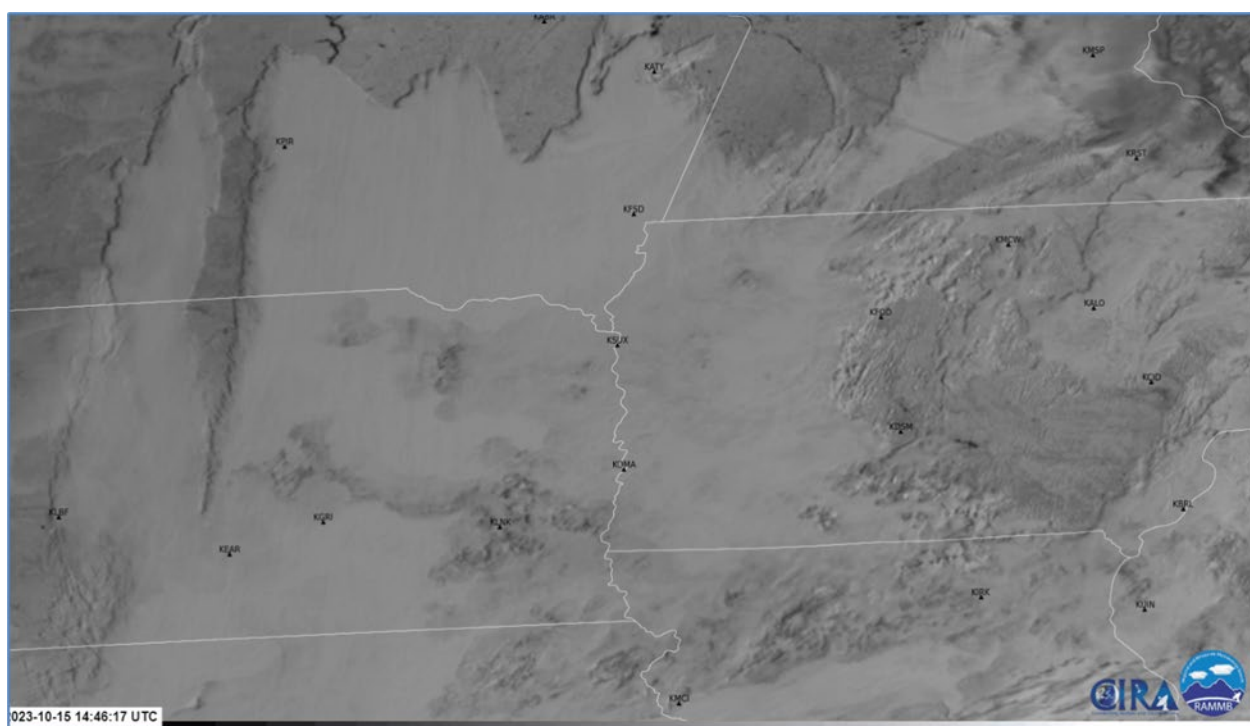
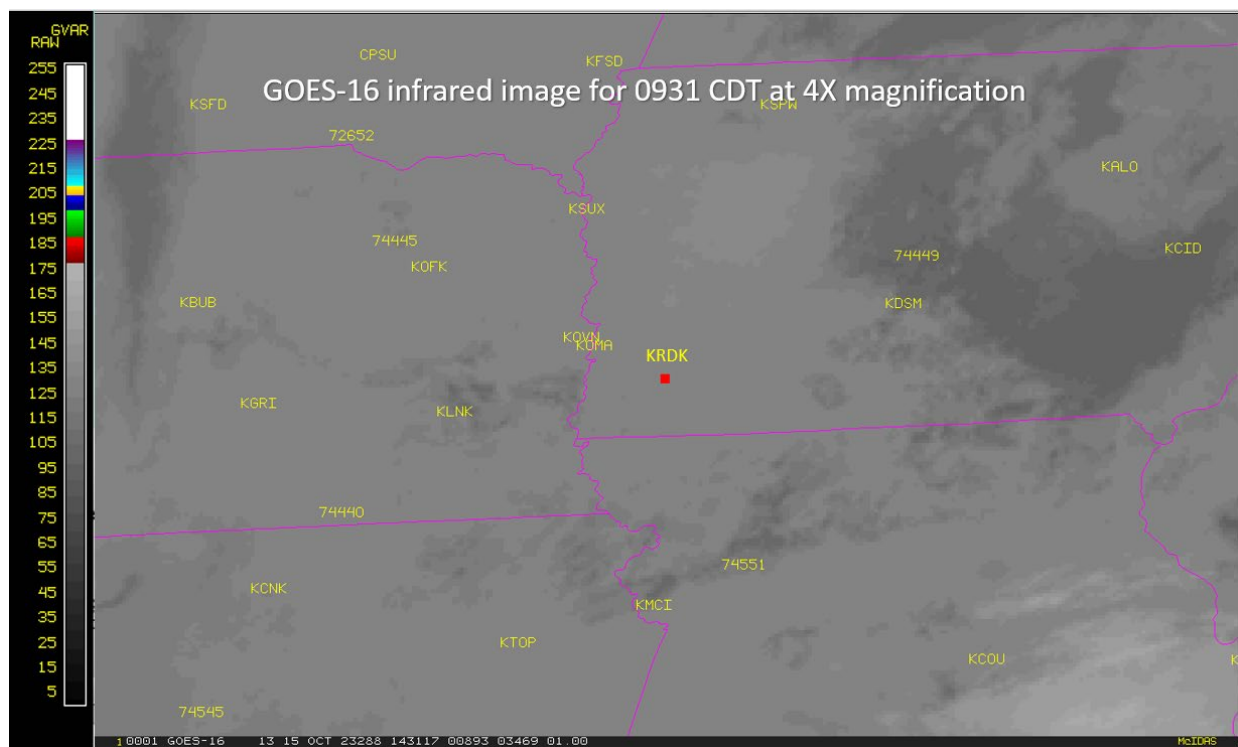
Figure 6 is the GOES-16 ABI Snow/Ice band image at 0946 CDT which takes advantage of the difference between the refraction components of water and ice at the 1.61 μm wavelength. Liquid water clouds are bright in this channel while ice clouds are darker because ice absorbs rather than reflects radiation at this wavelength. The imagery depicted liquid phase low-level clouds¹⁶ were present over the area.

Figure 7 is the GOES-16 visible image for 0931 CDT at 2X magnification. The image depicts an extensive area of stratocumulus type clouds over western Iowa and Nebraska. While figure 8 is the GOES-16 GeoColor¹⁷ image for the same period which better defined the low overcast cloud cover.

Attachments 1 and 2 are the GOES-16 ABI Snow/Ice band and GeoColor satellite animations from about 0900 through 1000 CDT over the region.

¹⁶ Research has shown that cloud top temperatures warmer than -15°C have been shown to be associated with clouds in the liquid phase and capable of having super cooled cloud droplets at altitude above the freezing level and supporting icing in-clouds. Reference is also made in FAA Advisory Circular AC 91-74B, section 2-2 Cloud Types and Aircraft Icing.

¹⁷ GeoColor imagery provides as close an approximation to daytime True Color imagery as is possible from GOES-16, and thus allows for intuitive interpretation of meteorological and surface-based features. The 5-min imagery is mapped into a 1.5 km Mercator grid over the Continental U.S.



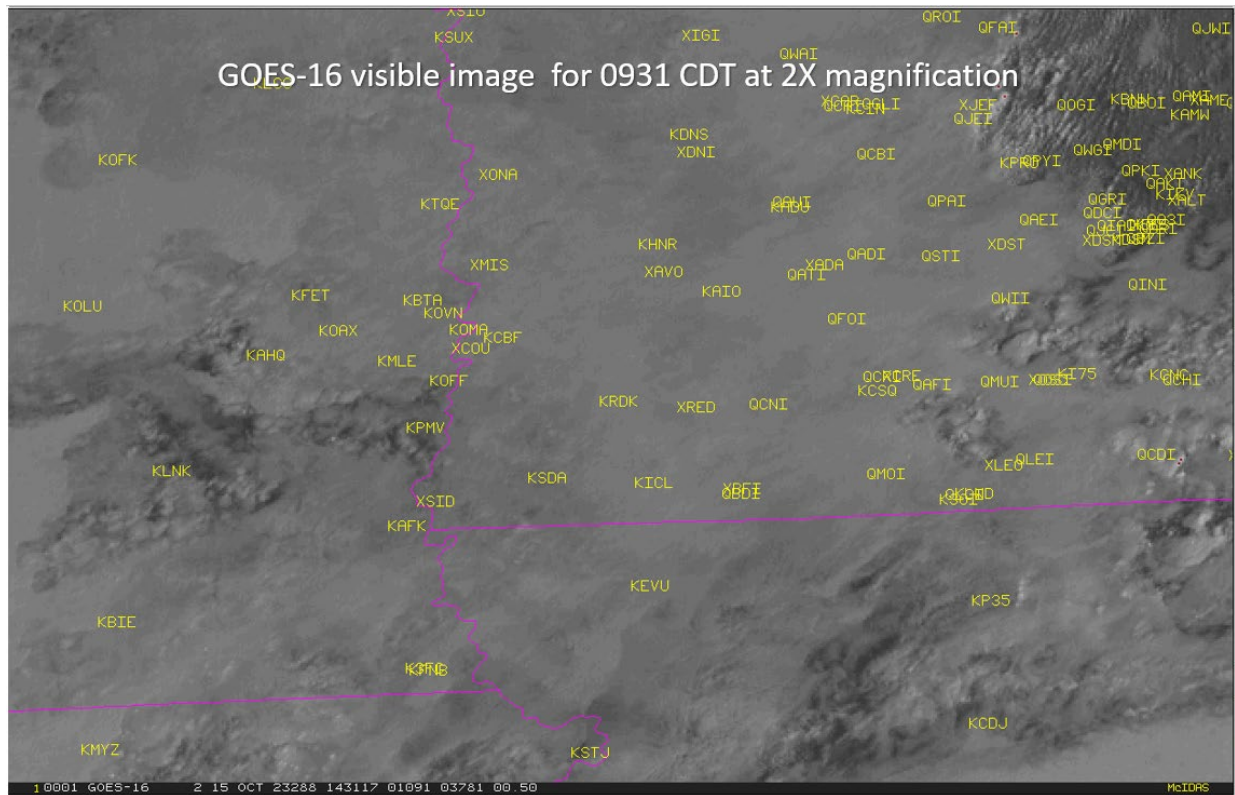


Figure 7 - GOES-16 visible image for 0931 CDT at 2X magnification at the time of the icing report.

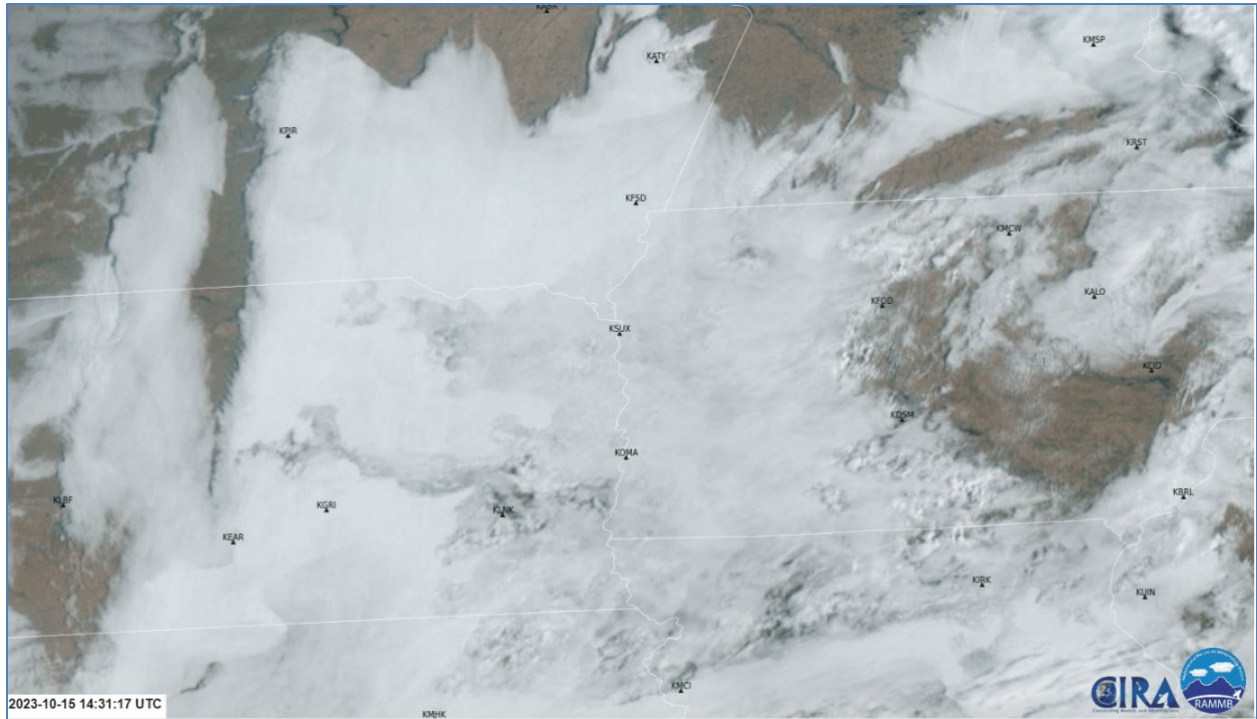


Figure 8 - GOES-16 GeoColor image for 0931 CDT depicting true daytime color imagery.

5.0 Pilot Reports

The following pilot reports or PIREPs were reported¹⁸ within 100 miles and below 18,000 ft surrounding the period from 0800 through 1100 CDT. The PIREP in blue dark type is from the accident pilot's report of encountering icing to air traffic control at about 0935 CDT.

FET UA /OV KFET/TM 1252/FL080/TP B350/SK TOP074/RM DURC

DSM UA /OV DSM/TM 1309/FL080/TP A320/SK BASE 021 TOP 027 BASE 071 TOP 076/TB OCNL LGT CHOP /IC NEG/RM DURC

HSI UA /OV HSI/TM 1354/FL065/TP PA46/IC NEG/RM BASES 052 TOP 065

SDA UA /OV KSDA/TM 1426/FL160/TP PC12/SK BASE 025 TOP 090/TB NEG/IC NEG/RM DURC

LNK UA /OV LNK/TM 1426/FLDURGC/TP C56X/SK OVC050-TOP078/TA M03

OMA UA /OV OMA050010/TM 1428/FLDURGD/TP C68A/SK OVC068-TOP081/IC NEG

FOD UA /OV FOD/TM 1432/FL070/TP C414/TA M06/IC TRACE TYPE UNKN

RDK UA /OV KRDK/TM 1435/FL080/TP SR22/SK OVC060/TA M05/IC LGT RIME 070-080/RM DURC

OMA UA /OV OVR/TM 1455/FL125/TP LJ45/TA M03/IC LGT RIME 085/RM DURC

LNK UA /OV LNK/TM 1504/FL080/TP E145/SK 066 BASE 073 TOP/IC NEG/RM DURC

LWD UA /OV LMN010030/TM 1518/FL050/TP P28A/WX BR/IC NEG

SLB UA /OV IDG/TM 1532/FL090/TP BE36/IC NEG

CIN UA /OV CIN/TM 1543/FL030/TP P28A/SK 030 BASE 050 TOP/IC NEG/RM DURC

EVU UA /OV TRAIG/TM 1553/FL100/TP BE58/TB NEG/IC NEG/RM VFR ON TOP SKY CLEAR ABV

Of the 14 PIREPs recorded over the region, 8 reported no icing while 3 pilots reported encountering a trace to light rime icing conditions between the period from 0932 and 1355 CDT. Cloud tops ranged from 6,400 ft to 9,000 ft surrounding the period.

¹⁸ Includes PIREPs disseminated longline and may not include "ride reports" or other reports made on radio frequency to air traffic control.

6.0 NWS Forecasts

The NWS Omaha/Valley, Nebraska (KOAX) Weather Forecast Office (WFO) was responsible for the issuance of the local forecasts and weather warnings for the KRDK area. The NWS AWC located in Kansas City, Missouri, was responsible for the aviation graphic products and advisories documented below.

6.1 Terminal Aerodrome Forecast

The NWS does not issue a Terminal Aerodrome Forecast (TAF) for KRDK. A TAF is a concise forecast of wind, clouds, weather for a period of general 24-hours, and is valid for a 5 statute mile radius of the airports center point. The closest civilian TAF to KRDK was issued for Eppley Airfield (KOMA), Omaha, Nebraska, approximately 34 miles northwest of KRDK. The TAF issued for KOMA valid for the period was as follows.

*TAF KOMA 151127Z 1512/1612 34009KT P6SM OVC050
TEMPO 1512/1513 BKN015
FM151700 34012G20KT P6SM BKN050
FM160000 33008KT P6SM SCT250=*

The KOMA forecast valid from 0700 through 1200 CDT, expected a wind from 340 at 9 knots, visibility better than 6 miles, ceiling overcast at 5,000 ft agl, with a temporary period between 0700 and 0800 of a ceiling broken at 1,500 ft agl.

6.2 Area Forecast Discussion

The NWS Area 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 it relates 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. These are generated roughly every 6 hours and corresponds to the release of the latest TAFs for that office. The NWS KOAX AFD issued at 0554 CDT was as follows.

*FXUS63 KOAX 151054
AFDOAX*

*Area Forecast Discussion
National Weather Service Omaha/Valley NE
554 AM CDT Sun Oct 15 2023*

...Updated Aviation Forecast Discussion...

*.DISCUSSION...
Issued at 314 AM CDT Sun Oct 15 2023*

Key Messages:

- *Below average temperatures* Sunday and Monday before a warm up on Tuesday.
- *Frost possible Monday and Tuesday morning.*
- *Next chance for precipitation is Wednesday.*

Sunday through Tuesday:

*Stratocumulus coverage will continue throughout most of the day Sunday, keeping high temperatures below normal and in the low to mid 50's. Gradual clearing will move from the west to the east during the late afternoon and early evening hours. An amplifying midlevel ridge over the western CONUS will bring a slight increase in temperatures on Monday with highs expected in the low 60's. *Northwesterly winds* will shift to southerly Monday night and bring increased warm air advection to the area. Clear skies will also help high temperatures to reach the upper 60's on Tuesday. However, frost is possible on both Monday and Tuesday mornings as low temperatures are expected in the mid 30's. A frost advisory will likely be issued later today for a portion of our area Monday morning.*

.AVIATION...(For the 12Z TAFS through 12Z Monday morning)
Issued at 551 AM CDT Sun Oct 15 2023

VFR conditions through most of the period, with still an hour or two of MVFR clouds at KOMA this morning. Otherwise, northwest winds 8-10 knots at TAF issuance, increasing to 12 to 20 knots 17-00z, then 6-9 knots 00-12z.

.OAX WATCHES/WARNINGS/ADVISORIES...
NE...None.
IA...None.

The AFD indicated that stratocumulus clouds were prevailing over the area with general VFR conditions prevailing with temporary MVFR conditions during the morning hours, with northwesterly winds of 8 to 10 knots and increasing to 20 knots during the afternoon with clearing skies.

6.3 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 reported in msl heights, from graphical output from the NWS National Digital Forecast Database (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 3-hour central region GFA surface and cloud forecasts current for the period and valid for 1000 CDT are included as figures 9 and 10 respectively. The GFA surface forecast (figure 9) expected northerly

winds at 15 knots with gusts to 20 knots, with a chance¹⁹ of rain immediately north in western Iowa. While the 3-hour GFA cloud forecast (figure 10) depicted a few clouds to clear skies below 12,000 ft over southwestern Iowa, with broken clouds at 6,000 ft with tops near 8,000 ft msl over Omaha and eastern Nebraska. Two G-AIRMETs for icing conditions were depicted over Minnesota and Wisconsin to the north with another G-AIRMET for icing over Missouri to the southeast.

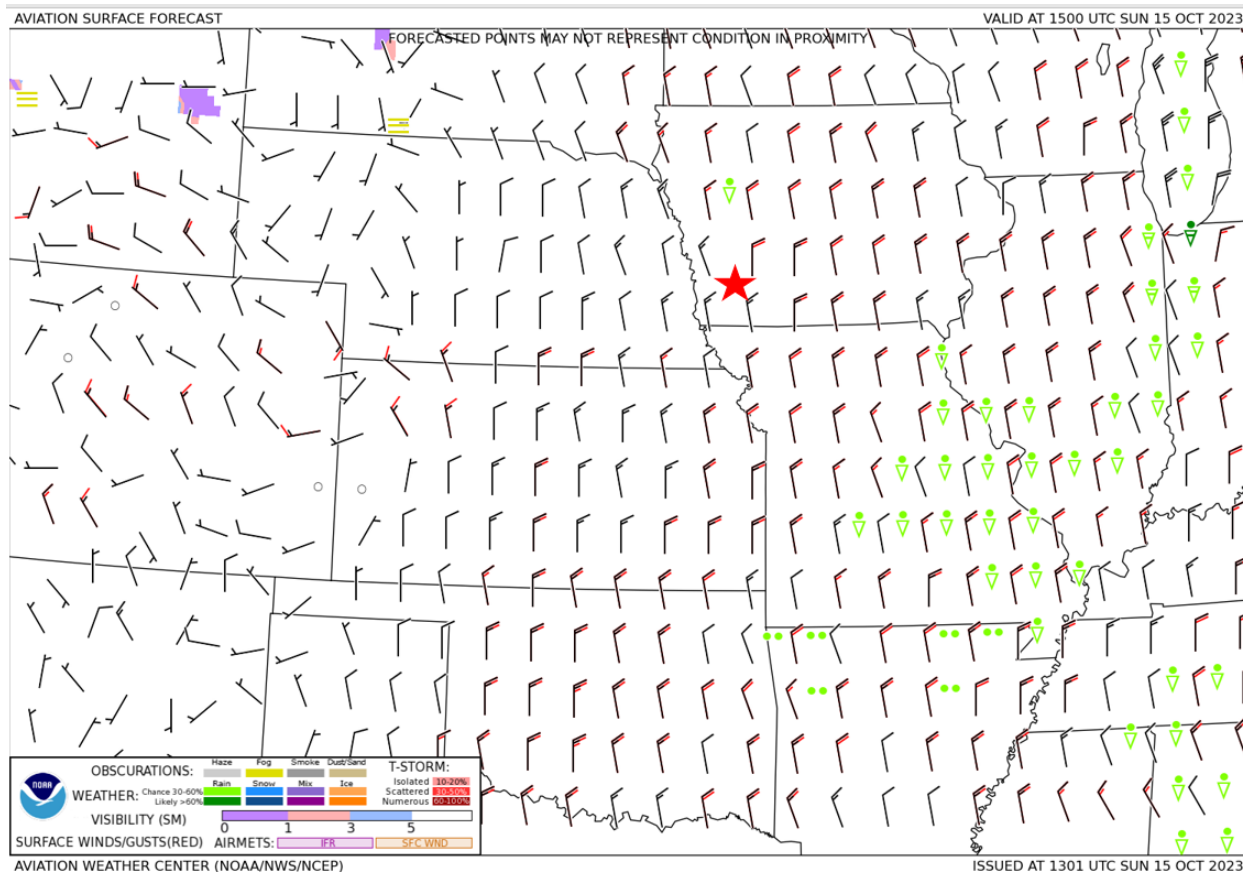


Figure 9 - NWS 3-hour Graphic Forecast for Aviation Surface Forecast valid for 1000 CDT.

¹⁹ Chance refers to a 30 to 60% probability of occurrence.



The NWS Winds and Temperature Aloft Forecast²⁰ current for the period and for use between 0900 through 1600 CDT for the 3 forecast points surrounding the accident site were as follows.

VALID 151800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
-OMA	3417	3623-02	3625-02	3625-04	3628-17	3633-30	344944	345351	344652
-DSM	3414	0118-02	0216-02	0317-05	3626-18	3637-31	354146	354351	344351
-MKC	3418	3520-01	3522-06	3625-05	3628-17	3437-29	334943	334750	324351

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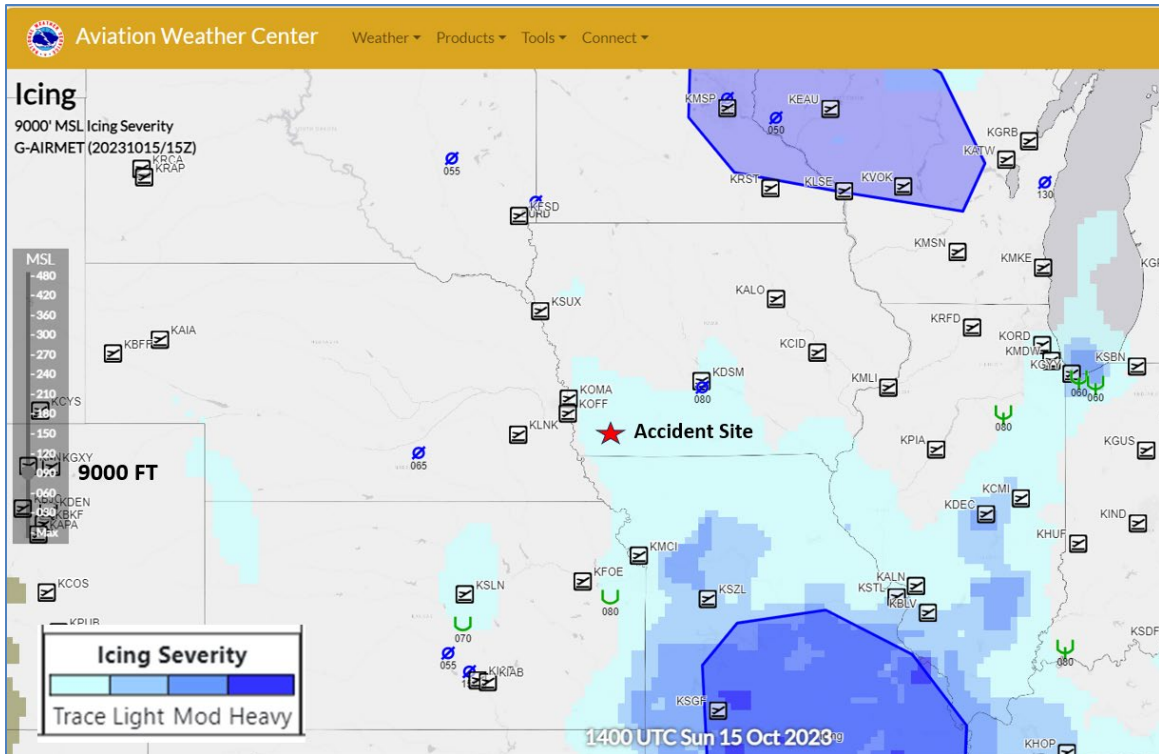


Figure 12 - NWS AWC Current Icing Product (CIP) icing severity for 9,000 ft valid for 0900 CDT.

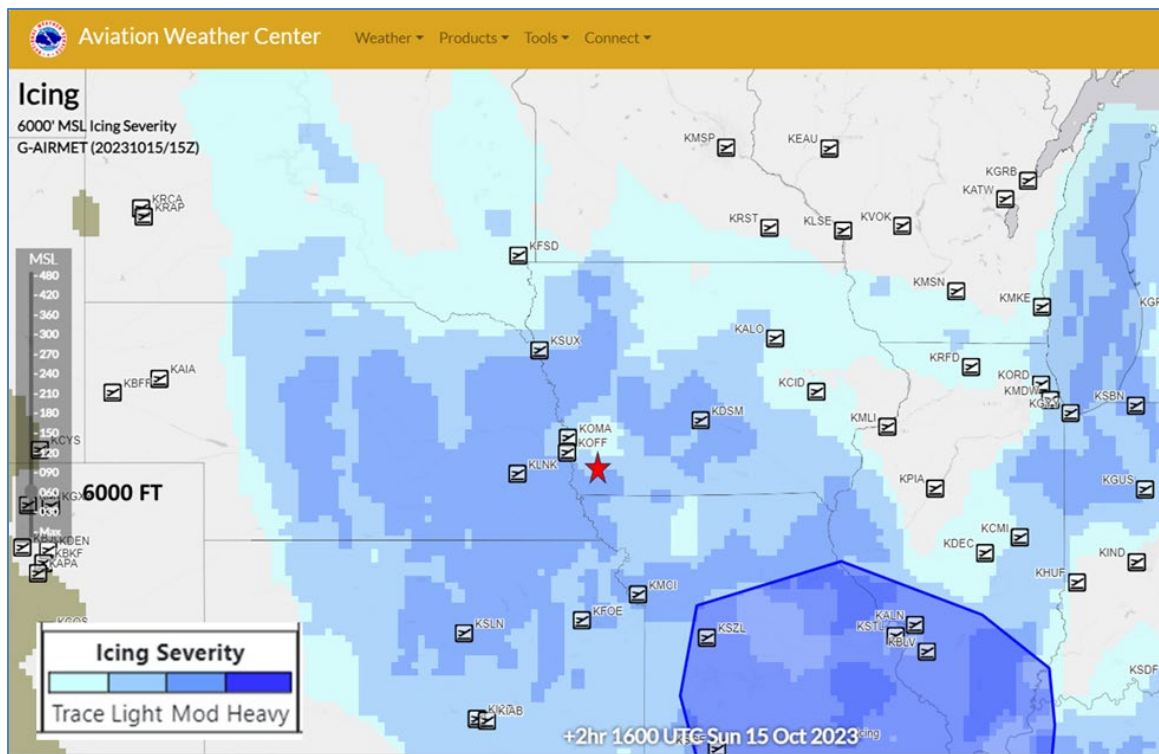


Figure 13 - NWS Forecast Icing Product (FIP) icing severity for 6,000 ft valid for 1100 CDT.

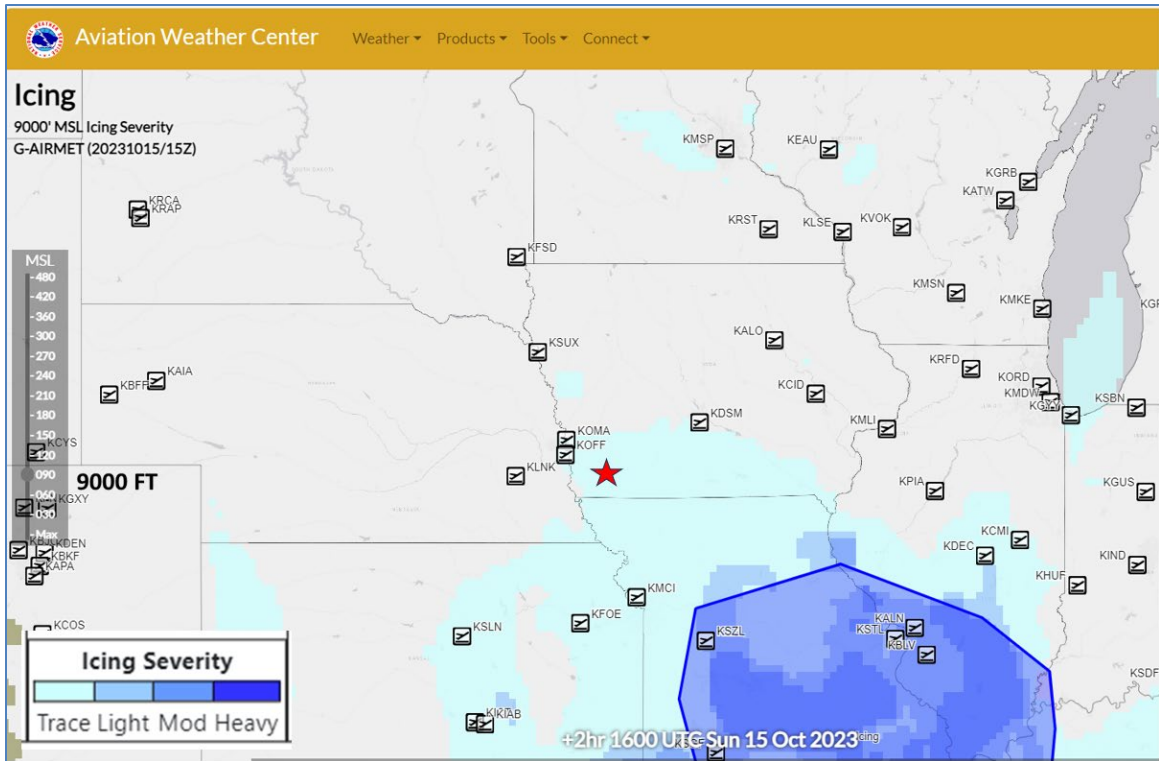


Figure 14 - NWS Forecast Icing Product (FIP) icing severity for 9,000 ft valid for 1100 CDT.

7.0 NWS Inflight Weather Advisories

In-flight Aviation Weather Advisories are forecasts that advise en route aircraft of the development of potentially hazardous weather. Inflight aviation weather advisories in the conterminous U.S. are issued by the NWS AWC, as well as from the Center Weather Service Units (CWSU) at the various Air Route Traffic Control Centers (ARTCCs). There are four basic types of inflight aviation weather advisories: the Significant Meteorological Information (SIGMET), the Convective SIGMET, the G-AIRMET, and the Center Weather Advisory (CWA). Inflight advisories serve to notify en-route pilots of the possibility of encountering hazardous flying conditions that may not have been forecast at the time of the preflight briefing. Whether or not the condition described is potentially hazardous to a particular flight is for the pilot to evaluate based on experience and the operational limits of the aircraft. Once issued they are broadcast by FAA air traffic controllers upon issuance and available on inflight weather broadcasts.

At the time of the accident the NWS had no SIGMETs, Convective SIGMETs, CWAs, or G-AIRMETs current over the accident site surrounding the period. A G-AIRMET was issued at 0945 CDT for a small area of IFR conditions over northeast Iowa and southeast Minnesota, which was not applicable for the accident flight and is depicted in figure 15.

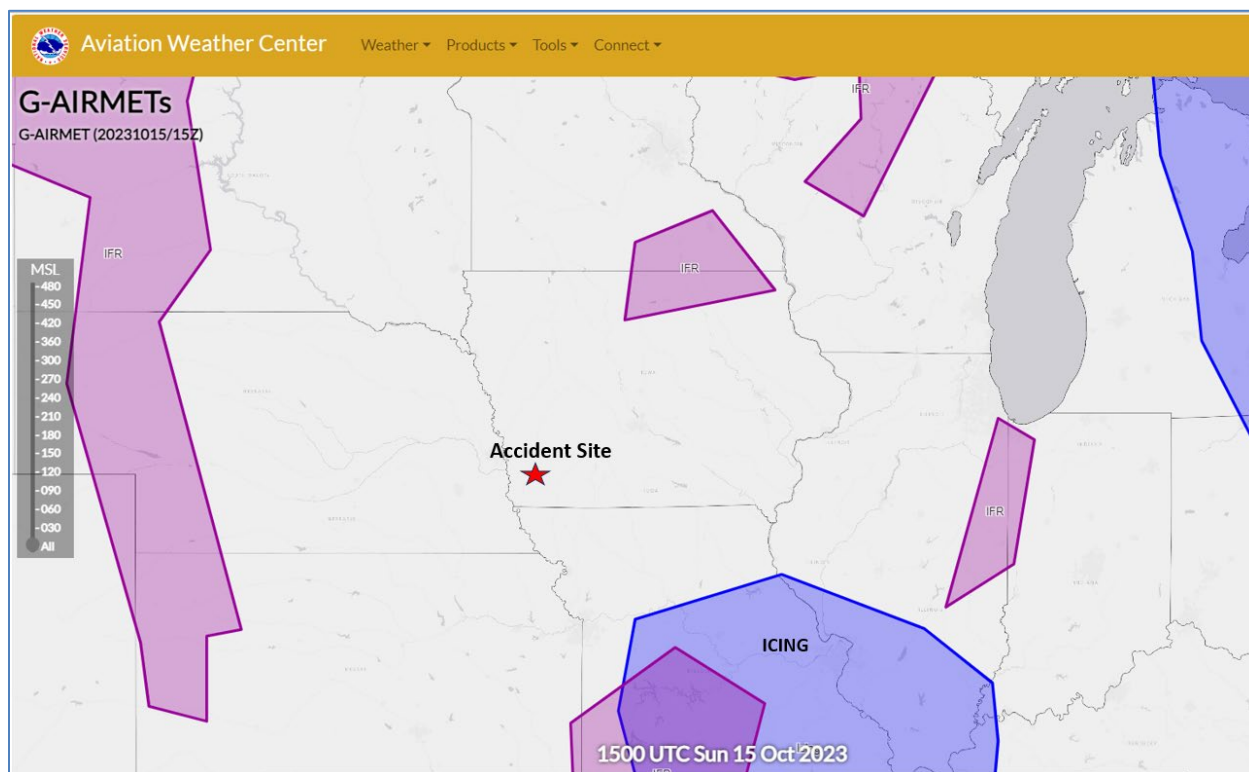


Figure 15 - Graphic-AIRMETs current over the region at 1000 CDT with accident site.

E. ATTACHMENTS

Attachment 1 - GOES-16 ABI Snow/Ice band 5 satellite animation from 0900 through 1000 CDT over the northern plains.

Attachment 2 - GOES-16 GeoColor satellite imagery from 0900 through 1000 CDT over the northern plains.

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