

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN24FA243

METEOROLOGY

Specialist's Factual Report

June 11, 2024

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A. ACCIDENT

Location: Selden, Kansas

Date: 30 June 2024

Time: 1752 central daylight time (2252 UTC¹)

Aircraft: Type - Waco YKC; Registration - N14137

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 central daylight time for 30 June 2024 (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: 39.494389° north latitude; 100.46117° west longitude; at an elevation of about 2,745 feet.

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

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Weather Observing Station (AWOS) was located at Oberlin Municipal Airport (OIN²) in Oberlin, Kansas, which was located about 21 miles north of the

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.

accident site at an elevation of about 2,705 feet. Automated longline³ reports from the OIN AWOS during the times surrounding the accident time are presented here.

[1715] KOIN 302215Z AUTO 14006KT OVC005 18/18 A3025 RMK AO1
T01760176 PWINO

[1735] KOIN 302235Z AUTO 12009KT OVC003 17/17 A3025 RMK AO1
T01730173 PWINO

**[1755] KOIN 302255Z AUTO 13007KT OVC003 17/17 A3024 RMK AO1
T01710171 PWINO**

[1815] KOIN 302315Z AUTO 13009KT OVC003 17/17 A3024 RMK AO1
T01710171 PWINO

[1835] KOIN 302335Z AUTO 13010G14KT OVC003 17/17 A3023 RMK AO1
T01720172 PWINO

At 1755, the OIN AWOS reported a wind from 130° at 7 knots, ceiling overcast at 300 feet above ground level (agl), temperature of 17°C and dew point temperature of 17°C, altimeter setting of 30.24 inches of mercury; Remarks: automated station without a precipitation discriminator, temperature of 17.1°C and dew point temperature of 17.1°C, precipitation identifier information not available.

An AWOS was located at Shalz Field Airport (CBK) in Colby, Kansas, which was located about 28 miles west of the accident site at an elevation of about 3,190 feet. Automated longline reports from the CBK AWOS during the times surrounding the accident time are presented here.

[1715] KCBK 302215Z AUTO 13015G22KT 10SM BKN022 OVC028 25/18
A3019 RMK AO2 T02510183

[1735] KCBK 302235Z AUTO 13017G21KT 10SM OVC025 25/18 A3018 RMK
AO2 T02480184

**[1755] KCBK 302255Z AUTO 10017KT 10SM OVC025 24/18 A3018 RMK
AO2 T02380185**

[1815] KCBK 302315Z AUTO 11016G20KT 10SM SCT016 BKN026 BKN031
23/18 A3018 RMK AO2 T02260181

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.

[1835] KCBK 302335Z AUTO 10017KT 10SM BKN007 BKN013 OVC019 20/17
A3018 RMK AO2 T01970172

At 1755, the CBK AWOS reported a wind from 100° at 17 knots, visibility of 10 statute miles or greater, ceiling overcast at 2,500 feet agl, temperature of 24°C and dew point temperature of 18°C, altimeter setting of 30.18 inches of mercury; Remarks: automated station with a precipitation discriminator, temperature of 23.8°C and dew point temperature of 18.5°C.

An AWOS was located at Oakley Municipal Airport (OEL) in Oakley, Kansas, which was located about 28 miles southwest of the accident site at an elevation of about 3,045 feet. Automated longline reports from the OEL AWOS during the times surrounding the accident time are presented here.

[1715] KOEL 302215Z AUTO 13015G19KT 10SM BKN022 BKN029 25/17 A3019
RMK AO1 T02450172

[1735] KOEL 302235Z AUTO 11016G20KT 10SM BKN022 OVC030 25/17
A3019 RMK AO1 T02460173

**[1755] KOEL 302255Z AUTO 13013KT 10SM BKN022 BKN029 24/17
A3017 RMK AO1 T02400174**

[1815] KOEL 302315Z AUTO 13014G21KT 10SM SCT020 SCT028 SCT033
24/17 A3016 RMK AO1 T02430170

[1835] KOEL 302335Z AUTO 14014KT 10SM SCT030 24/17 A3016 RMK AO1
T02430171

At 1755, the OEL AWOS reported a wind from 130° at 13 knots, visibility of 10 statute miles or greater, ceiling broken at 2,200 feet agl, broken clouds at 2,900 feet agl, temperature of 24°C and dew point temperature of 17°C, altimeter setting of 30.17 inches of mercury; Remarks: automated station without a precipitation discriminator, temperature of 24.0°C and dew point temperature of 17.4°C.

An Automated Surface Observing Station (ASOS) was located at Hill City Municipal Airport (HLC) in Hill City, Kansas, which was located about 30 miles east-southeast of the accident site at an elevation of about 2,240 feet. Automated longline reports from the HLC ASOS during the times surrounding the accident time are presented here.

[1705] KHLC 302205Z AUTO VRB04KT 10SM SCT010 OVC017 20/18 A3023
RMK AO2 T02000178 \$

**[1753] KHLC 302253Z AUTO VRB05KT 10SM FEW020 BKN028 23/18
A3019 RMK AO2 SLP210 T02330183 \$**

[1835] KHLC 302335Z AUTO 11005KT 10SM SCT025 24/19 A3018 RMK AO2
T02390189 \$

At 1753, the HLC ASOS reported a variable wind at 5 knots, visibility of 10 statute miles or greater, few clouds at 2,000 feet agl, ceiling broken at 2,800 feet agl, temperature of 23°C and dew point temperature of 18°C, altimeter setting of 30.19 inches of mercury; Remarks: automated station with a precipitation discriminator, sea level pressure of 1021.0 hectopascals (hPa), temperature of 23.3°C and dew point temperature of 18.3°C, maintenance needed on the system.

2.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁴ sounding (Figure 1) for near the accident site⁵ at 1800 using an elevation of about 2,745 feet was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Overcast stratiform clouds were identified by RAOB from about 3,800 feet through 5,800 feet. Above about 5,800 feet, RAOB identified few clouds through 11,000 feet. The freezing level was at about 17,000 feet. The wind nearest the surface was from the southeast at about 10 knots. Above this level the wind veered⁶ and increased in magnitude to a south wind at about 35 knots near 8,000 feet. A temperature inversion was noted between about 5,500 and 6,300 feet.

⁴ 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.

⁵ Coordinates used for the model were latitude: 39.49; longitude: -100.46.

⁶ A veering wind's wind barbs turn clockwise with increasing height.

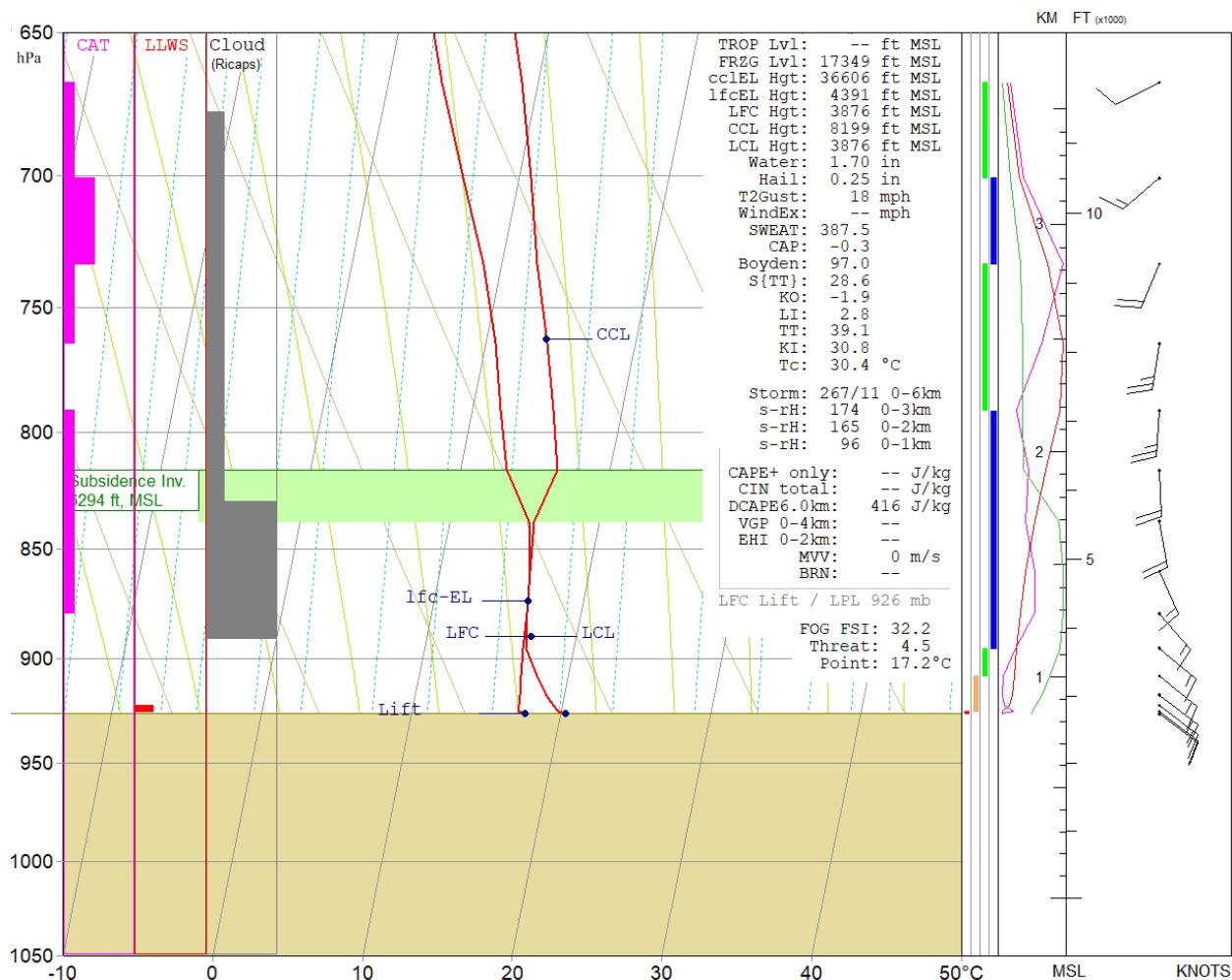


Figure 1 - HRRR model sounding data in SkewT/LogP format for 1800 near the accident site, surface to 650 hPa.

3.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-16 visible ($0.64\mu\text{m}$) and infrared ($10.3\mu\text{m}$) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from these data is presented in Figures 2 and 3. The visible imagery depicted clouds over the accident region. The minimum brightness temperature over the final portion of the accident aircraft's flight path was 286 Kelvin (13°C), which, when considering the 1800 HRRR sounding, corresponded to cloud top heights of about 8,800 feet.

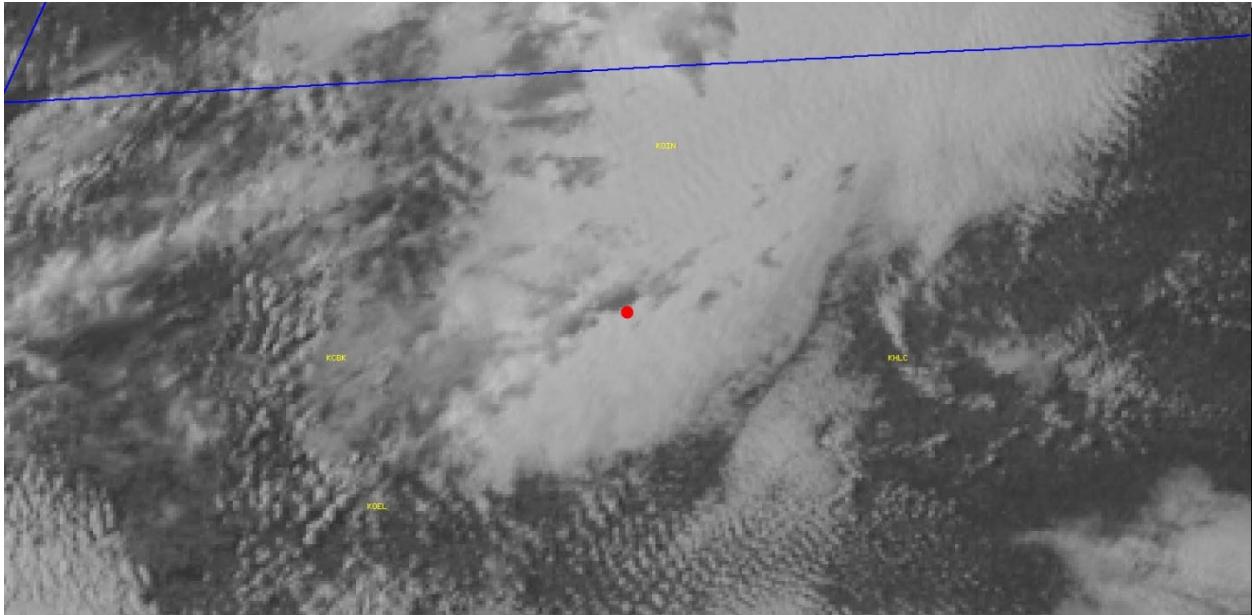


Figure 2 - GOES-16 visible imagery from 1751. Image is not corrected for parallax error. The accident location is denoted by the red dot.

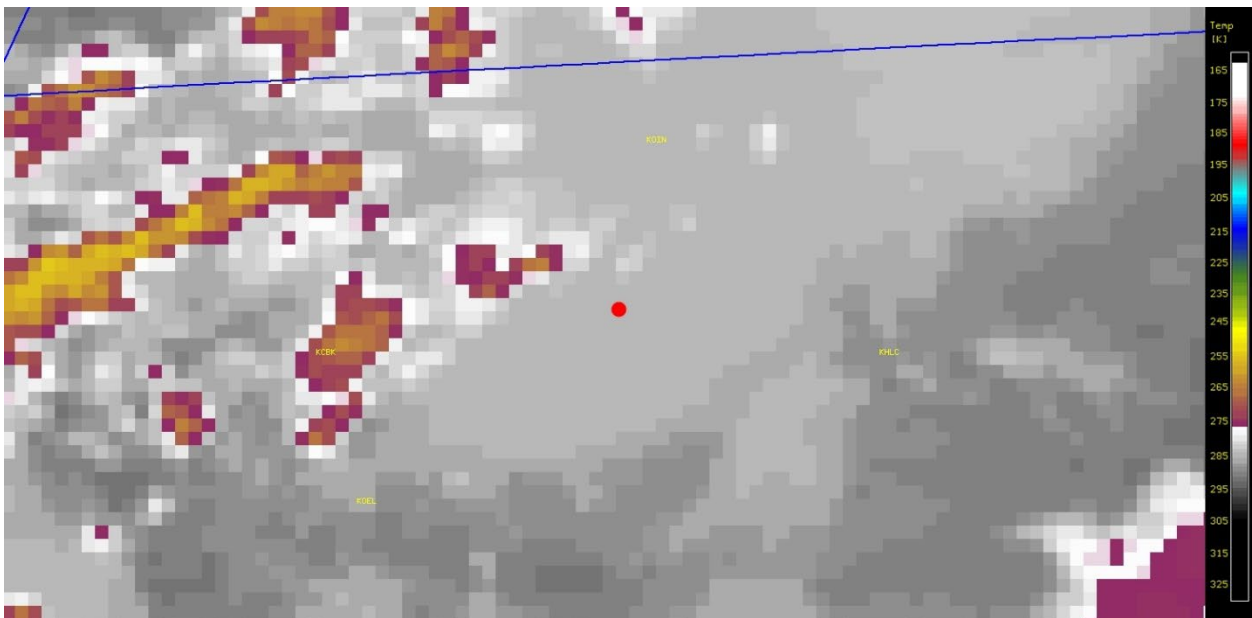


Figure 3 - GOES-16 infrared imagery from 1751. Image is not corrected for parallax error. The accident location is denoted by the red dot.

4.0 Weather Radar

WSR-88D⁷ Level-II base reflectivity weather radar imagery from the Goodland, Kansas, site (KGLD) is presented in Figure 4. KGLD was located approximately 58 miles west of the accident location with an antenna elevation of about 3,715 feet. Assuming standard refraction and considering the 0.95° beam width⁸ for the WSR-88D radar beam, the KGLD 0.482° tilt would have “seen” altitudes above the accident location of between about 6,000 and 11,800 feet. No pertinent areas of reflectivity were identified in the immediate accident region.

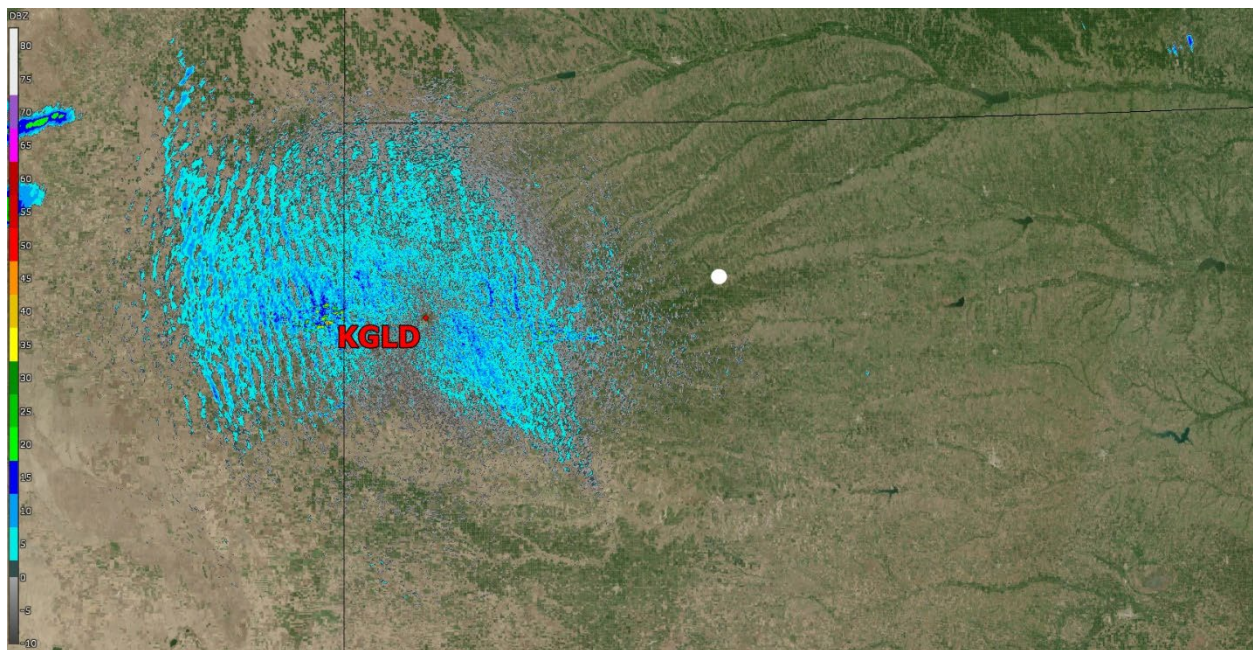


Figure 4 – “Smoothed” KGLD 0.482° Level-II base reflectivity product from a sweep initiated at 1754:03. The accident location is denoted by the white circle.

5.0 Pilot Reports

There were no longline-disseminated pilot reports⁹ (PIREPs) reported between 1600 and 2000 within 90 miles of the accident location.

⁷ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁸ 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.

⁹ These do not include pilot reports only broadcast via radio.

6.0 Area Forecast Discussion

The National Weather Service's (NWS) Goodland, Kansas, Weather Forecast Office (WFO) issued the following Aviation section of an Area Forecast Discussion at 1556, applicable for a region that included the accident location. The Aviation section had first been issued in another AFD at 1056.

FXUS63 KGLD 302056

AFDGLD

Area Forecast Discussion

National Weather Service Goodland KS

256 PM MDT Sun Jun 30 2024

.AVIATION /18Z TAFS THROUGH 18Z MONDAY/...

Issued at 956 AM MDT Sun Jun 30 2024

For KGLD, there will be an IFR/MVFR mix(OVC008-015) of ceilings through at least 09z Monday before shifting to VFR for the remainder of the forecast period. There is a chance for thunderstorms to come near/impact the terminal, but with low confidence on timing, have kept to VCSH and will update as things develop. 09z-13z Monday has chance for lingering showers with no reduction to visibility at this time. Winds, southeast 15-25kts through 13z Monday, then southwest around 20-30kts. LLWS 09z-13z Monday 180@45kts.

For KMCK, current VFR conditions will trend to an IFR/MVFR mix by at least 00z Monday. Some lower ceilings possible from 20z-00z. From 00z-05z Monday there is low confidence on the potential timing for thunderstorms, so have left as VCSH for now and update as needed. Light showers and low ceilings expected from 05z to 16z before going VFR again. Winds, southeast at least through 14z Monday 15-25kts, before going more southerly from 16z onward.

A new Aviation section was issued in an AFD at 1829 by the NWS Goodland WFO, which was applicable for a region that included the accident location.

FXUS63 KGLD 302329

AFDGLD

Area Forecast Discussion

National Weather Service Goodland KS

529 PM MDT Sun Jun 30 2024

.AVIATION /00Z TAFS THROUGH 00Z TUESDAY/...

Issued at 525 PM MDT Sun Jun 30 2024

Low ceilings, and potentially heavy rain, are expected to impact flight categories at KMCK and KGLD throughout the period, including down to LIFR. Storms and showers will be moving in from the west and are

expected to impact KGLD around 2Z with any heavier stuff moving out around 5Z. KMCK's prime time for stronger storms look to be between 4-9Z. Strong gusts up around 50 kts could be possible with storms and the outflows they produce. Light showers and sprinkles are possible throughout the remainder of the period. For KGLD IFR look to linger until an hour or two after sunrise, KMCK may get out of IFR ceilings around 18Z, it depends on how quickly dry winds move into the area. Near the end of the period, a cold front looks to move in a bring more storms with it. Some guidance is suggesting patchy fog around 6Z tonight, but confidence is low this will occur with any ongoing convection.

7.0 SIGMETs

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

8.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the Center Weather Service Unit (CWSU) at the Denver Air Route Traffic Control Center (ARTCC) that were active for the accident location at the accident time.

9.0 G-AIRMETs for IFR Conditions

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 what would be advised by a SIGMET. G-AIRMETs are only valid at specific time "snapshots". G-AIRMETs are valid at discrete times three hours apart for a period of up to 12 hours into the future (i.e., 00-, 03-, 06-, 09- and 12-hour forecasts). They are issued at 0300 UTC, 0900 UTC, 1500 UTC and 2100 UTC (with updates issued as necessary).

At about 1545, a G-AIRMET was issued for instrument flight rule (IFR)¹⁰ conditions in mist for a region that included the accident location and valid at 1600. There was no G-AIRMET issued for IFR conditions before the accident time that was valid at 1900 for the accident location.

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

10.0 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. The GFAs are available through the Aviation Weather Center's (AWC) website and provide hourly analyses and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS. The following information was retrieved from the AWC's GFA archive. Figures 5-10 present the GFA ceiling and cloud top height 00-hour, 01-hour and 02-hour forecasts valid at 1800. The 00-hour, 01-hour and 02-hour visibility GFAs valid for 1800 all identified visibilities greater than 5 statute miles for the geographic domain found in Figures 5-10.

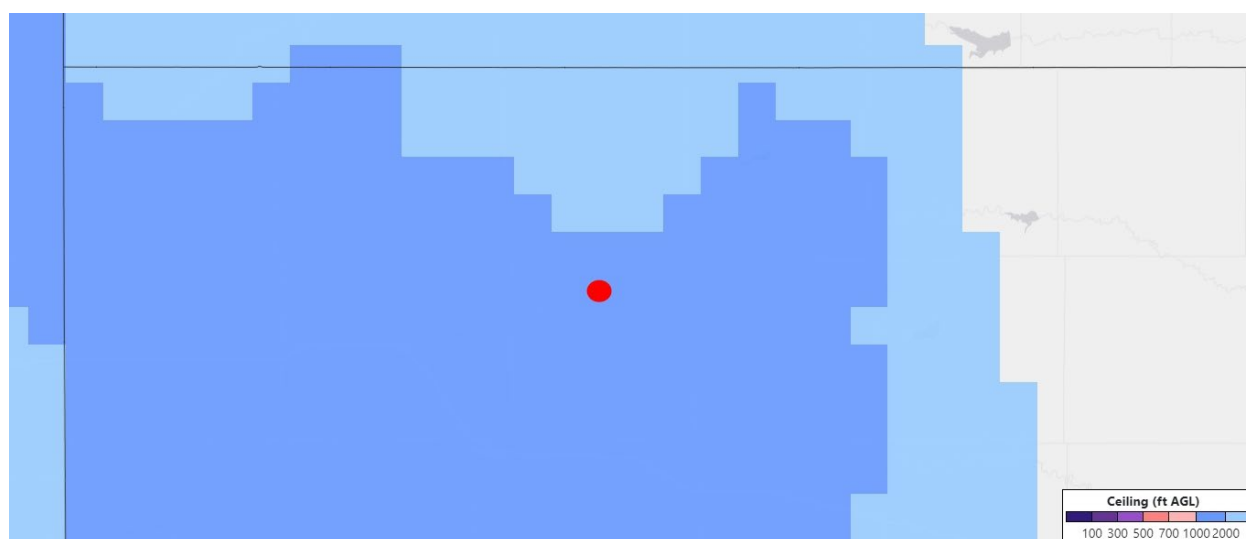


Figure 5 - GFA ceiling 02-hour forecast valid for 1800. The accident location is denoted by the red circle.

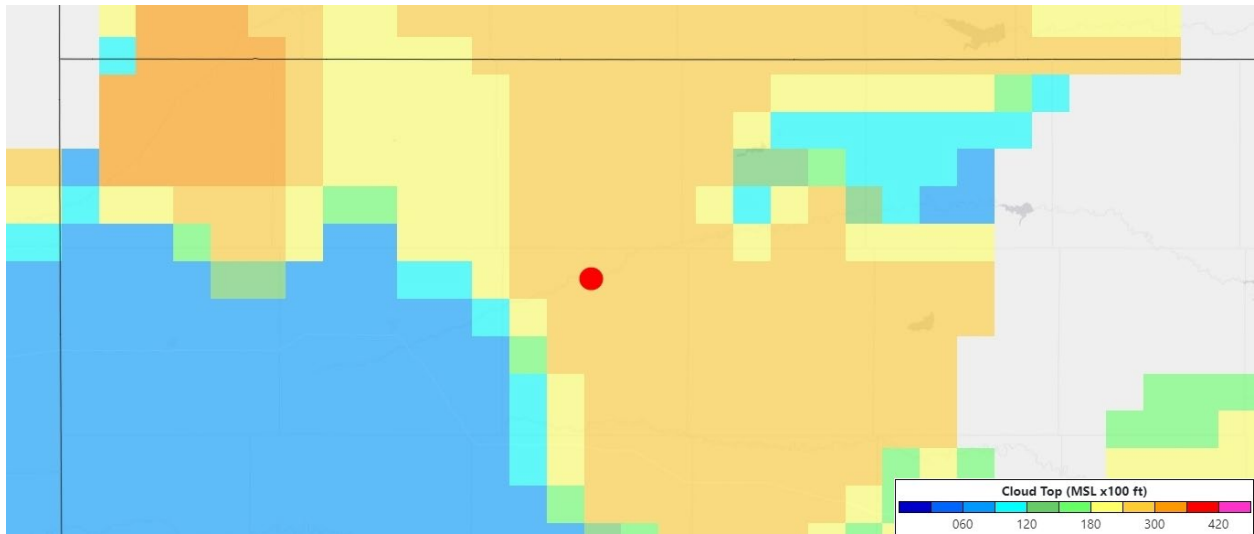


Figure 6 - GFA cloud top height 02-hour forecast valid for 1800. The accident location is denoted by the red circle.

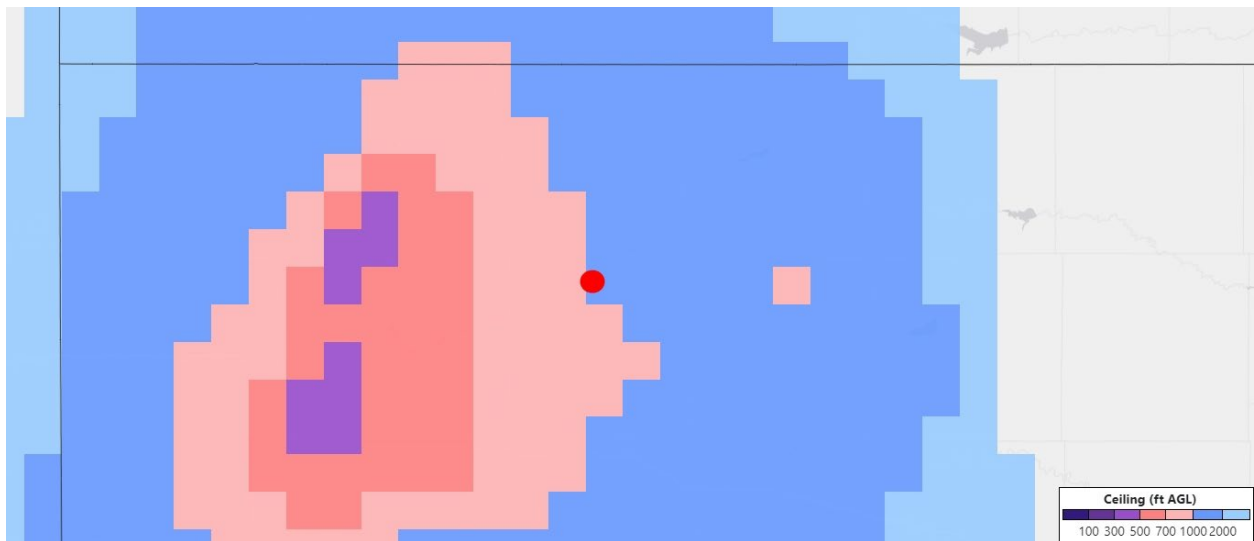


Figure 7 - GFA ceiling 01-hour forecast valid for 1800. The accident location is denoted by the red circle.

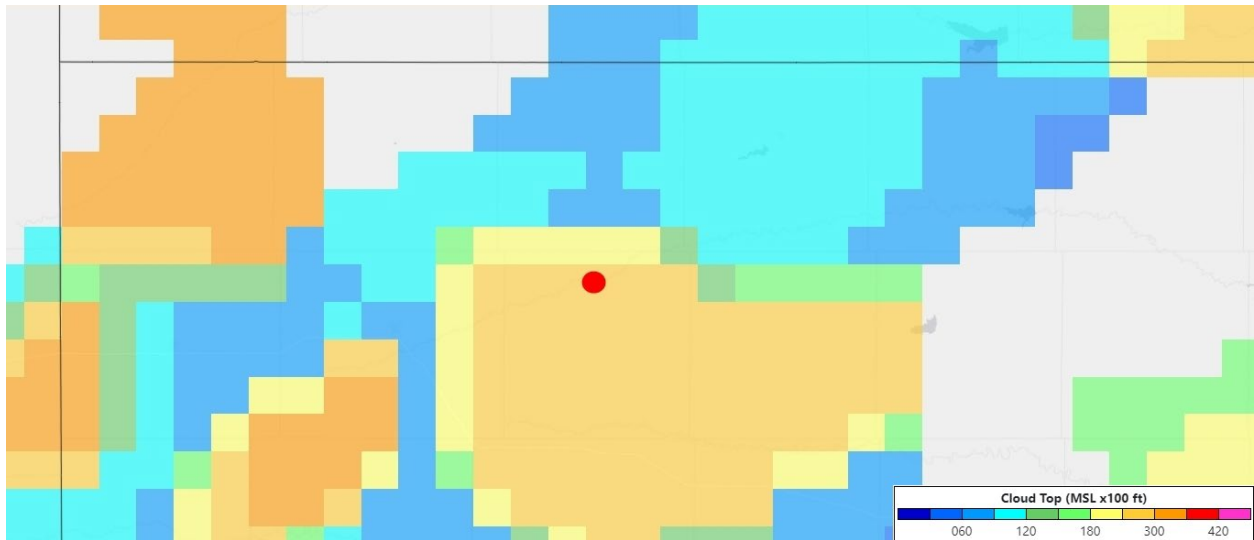


Figure 8 - GFA cloud top height 01-hour forecast valid for 1800. The accident location is denoted by the red circle.

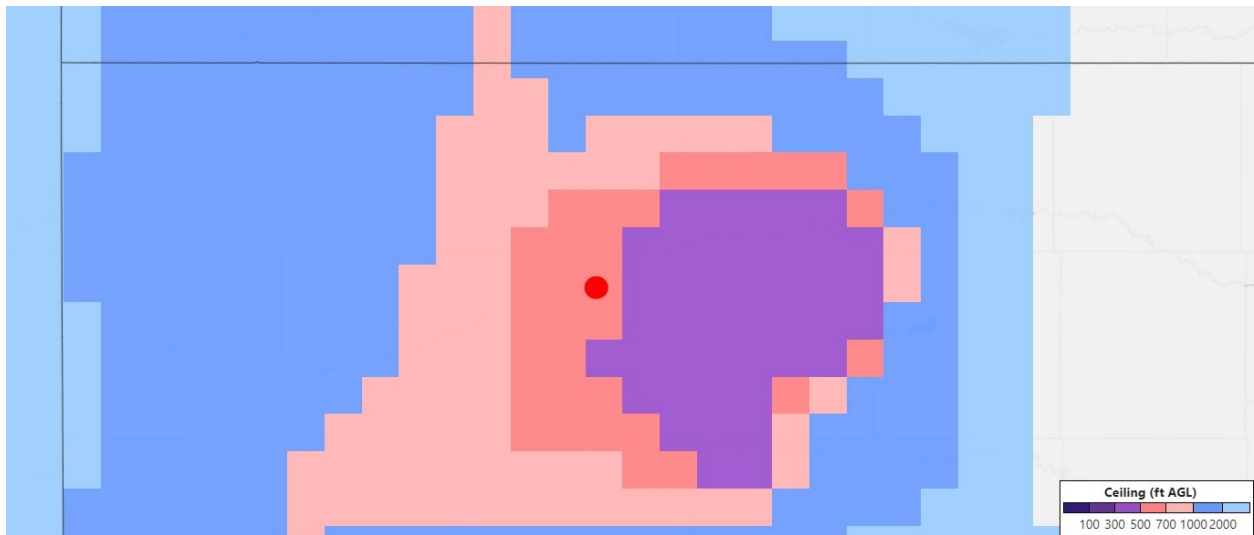


Figure 9 - GFA ceiling 00-hour forecast valid for 1800. The accident location is denoted by the red circle.

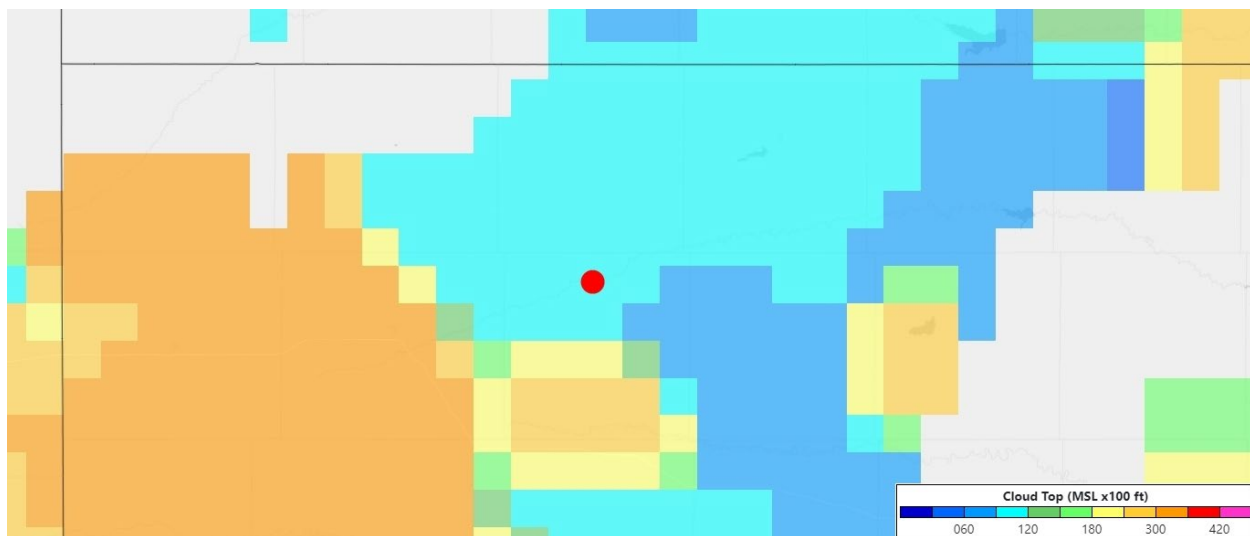


Figure 10 - GFA cloud top height 00-hour forecast valid for 1800. The accident location is denoted by the red circle.

Submitted by:

Mike Richards
Senior Meteorologist