

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN24MA111

METEOROLOGY

Specialist's Factual Report

July 10, 2024

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A. ACCIDENT

Location: Halloran Springs, California

Date: 9 February 2024

Time: 2208 Pacific standard time (0608 UTC¹ on 10 February 2024)

Aircraft: Type - Airbus EC130; Registration - N130CZ

B. METEOROLOGY INVESTIGATOR

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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 Pacific standard time for 9 February 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: 35.37304° north latitude; 115.86357° west longitude; at an elevation of about 3,365 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

A weather observation system of unknown type was located at Bicycle Lake Army Airfield (BYS²) in Barstow, California, which was located about 38 miles west 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 2,350 feet. Automated longline³ reports from the BYS system during the times surrounding the accident time are presented here.

[1955] KBYS 100355Z AUTO 22009KT 10SM OVC050 09/02 A2990 RMK AO2
SLP128 T00890018 \$

[2055] KBYS 100455Z AUTO 27003KT 10SM OVC055 08/00 A2991 RMK AO2
SLP128 T00820002 \$

**[2155] KBYS 100555Z AUTO 21007KT 10SM OVC055 07/00 A2991 RMK
AO2 SLP130 T00730003 10104 20072 51004 \$**

[2255] KBYS 100655Z AUTO 27004KT 9SM FEW060 SCT095 07/02 A2991 RMK
AO2 SLP127 T00690024 \$

At 2155, the BYS system reported a wind from 210° at 7 knots, visibility of 10 statute miles or greater, ceiling overcast at 5,500 feet above ground level (agl), temperature of 7°C and dew point temperature of 0°C, altimeter setting of 29.91 inches of mercury; Remarks: automated station with a precipitation discriminator, sea level pressure of 1013.0 hectopascals (hPa), temperature of 7.3°C and dew point temperature of 0.3°C, 6-hour maximum temperature of 10.4°C, 6-hour minimum temperature of 7.2°C, pressure has risen 0.4 hPa over past 3 hours, maintenance needed on the system.

An Automated Weather Observing Station (AWOS) was located at Henderson Executive Airport (HND) in Las Vegas, Nevada, which was located about 50 miles northeast of the accident site at an elevation of about 2,490 feet. Augmented and automated longline reports from the HND AWOS during the times surrounding the accident time are presented here.

[1956] KHND 100356Z 00000KT 10SM OVC090 07/02 A2994 RMK AO2 SLP163
T00670022

[2056] KHND 100456Z 05003KT 10SM FEW031 OVC090 06/02 A2994 RMK
AO2 SLP162 T00610022

**[2156] KHND 100556Z AUTO 25004KT 10SM BKN090 OVC110 06/02
A2994 RMK AO2 SLP161 T00610022 10100 20061 50001**

[2256] KHND 100656Z AUTO 22006KT 10SM -RA SCT029 OVC034 06/03
A2993 RMK AO2 RAB36 SLP158 P0000 T00560028 401060022

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.

At 2156, the HND AWOS reported a wind from 250° at 4 knots, visibility of 10 statute miles or greater, ceiling broken at 9,000 feet agl, overcast clouds at 11,000 feet agl, temperature of 6°C and dew point temperature of 2°C, altimeter setting of 29.94 inches of mercury; Remarks: automated station with a precipitation discriminator, sea level pressure of 1016.1 hPa, temperature of 6.1°C and dew point temperature of 2.2°C, 6-hour maximum temperature of 10.0°C, 6-hour minimum temperature of 6.1°C, pressure has risen 0.1 hPa over past 3 hours.

An Automated Surface Observing Station (ASOS) was located at Barstow-Daggett Airport (DAG) in Daggett, California, which was located about 55 miles southwest of the accident site at an elevation of about 1,930 feet. Automated longline reports from the DAG ASOS during the times surrounding the accident time are presented here.

[1950] KDAG 100350Z AUTO 26014KT 10SM CLR 08/01 A2995 RMK AO2
SLP142 T00780006

**[2150] KDAG 100550Z AUTO 25015KT 10SM CLR 07/M01 A2996 RMK
AO2 SLP141 T00671006 10122 20067 51006**

[2250] KDAG 100650Z AUTO 28010KT 10SM FEW110 06/M01 A2997 RMK AO2
SLP144 T00561006

At 2150, the DAG ASOS reported a wind from 250° at 15 knots, visibility of 10 statute miles or greater, clear skies, temperature of 7°C and dew point temperature of -1°C, altimeter setting of 29.96 inches of mercury; Remarks: automated station with a precipitation discriminator, sea level pressure of 1014.1 hPa, temperature of 6.7°C and dew point temperature of 0.6°C, 6-hour maximum temperature of 12.2°C, 6-hour minimum temperature of 6.7°C, pressure has risen 0.6 hPa over past 3 hours.

Meteorological reporting station CF140 (data courtesy of MesoWest⁴) was located about 13 miles southwest of the accident site at an elevation of about 950 feet. Type, calibration, maintenance, and siting standards of this station, as well as the overall quality of its data, are not known. Reporting of wind and temperature parameters⁵ from CF140 during the times surrounding the accident time are presented here:

⁴ <https://mesowest.utah.edu>

⁵ Temp=temperature (Celsius); D_Temp=dewpoint temperature (Celsius); RH=relative humidity (percent); W_Mag=average wind magnitude (knots); W_Dir=average wind direction (true); G_Mag=gust wind magnitude (knots); WX=present weather.

<u>Time</u>	<u>Temp</u>	<u>D Temp</u>	<u>RH</u>	<u>W Mag</u>	<u>W Dir</u>	<u>G Mag</u>	<u>WX</u>
2100	9.9°	5.0°	72	3.7	070°	4.1	---
2115	9.7°	5.2°	74	3.9	083°	4.3	---
2130	9.9°	4.6°	70	3.7	079°	4.3	---
2145	9.4°	5.3°	76	2.3	219°	3.7	---
2200	9.1°	5.8°	80	4.1	302°	7.2	light rain
2215	8.1°	5.2°	82	9.5	317°	11.5	light rain
2230	8.1°	4.8°	80	9.7	347°	10.5	light rain
2245	7.8°	4.7°	81	7.4	003°	9.1	light rain

2.0 Weather Radar

WSR-88D⁶ Level-II base reflectivity weather radar imagery from the Las Vegas, Nevada, site (KESX) is presented in Figures 1 and 2. KESX was located approximately 52 miles east-northeast of the accident location with an antenna elevation of about 4,950 feet. Assuming standard refraction and considering the 0.95° beam width⁷ for the WSR-88D radar beam, the KESX 0.484° tilt would have “seen” altitudes above the accident location of between about 6,800 and 12,000 feet. Figure 1 indicates that the accident occurred in a region characterized by mostly light values⁸ of reflectivity, and Figure 2 depicts the accident location under light values of reflectivity about the accident time.

⁶ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁷ 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.

⁸

https://www.faa.gov/sites/faa.gov/files/other_visit/aviation_industry/airline_operators/airline_safety/in_FO07008.pdf

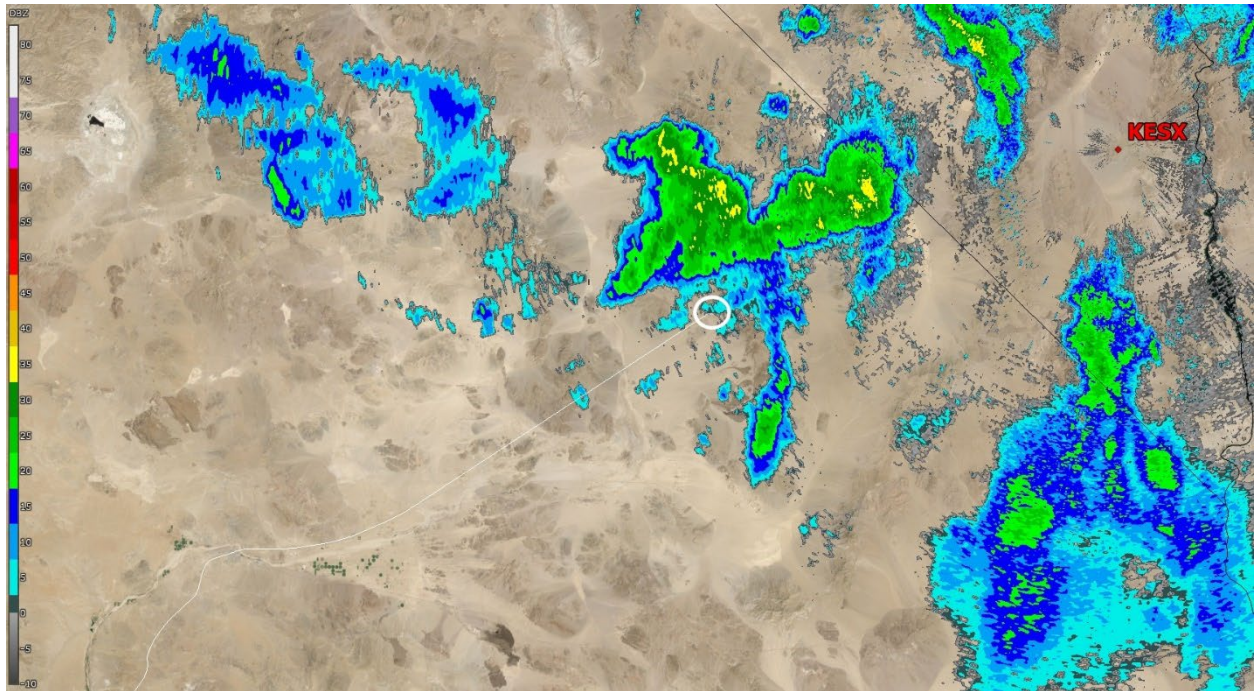


Figure 1 - "Smoothed" KESX 0.484° Level-II base reflectivity product from a sweep initiated at 2206:05. The accident aircraft's flight track is marked by the thin white line and the accident location is denoted by the white circle.

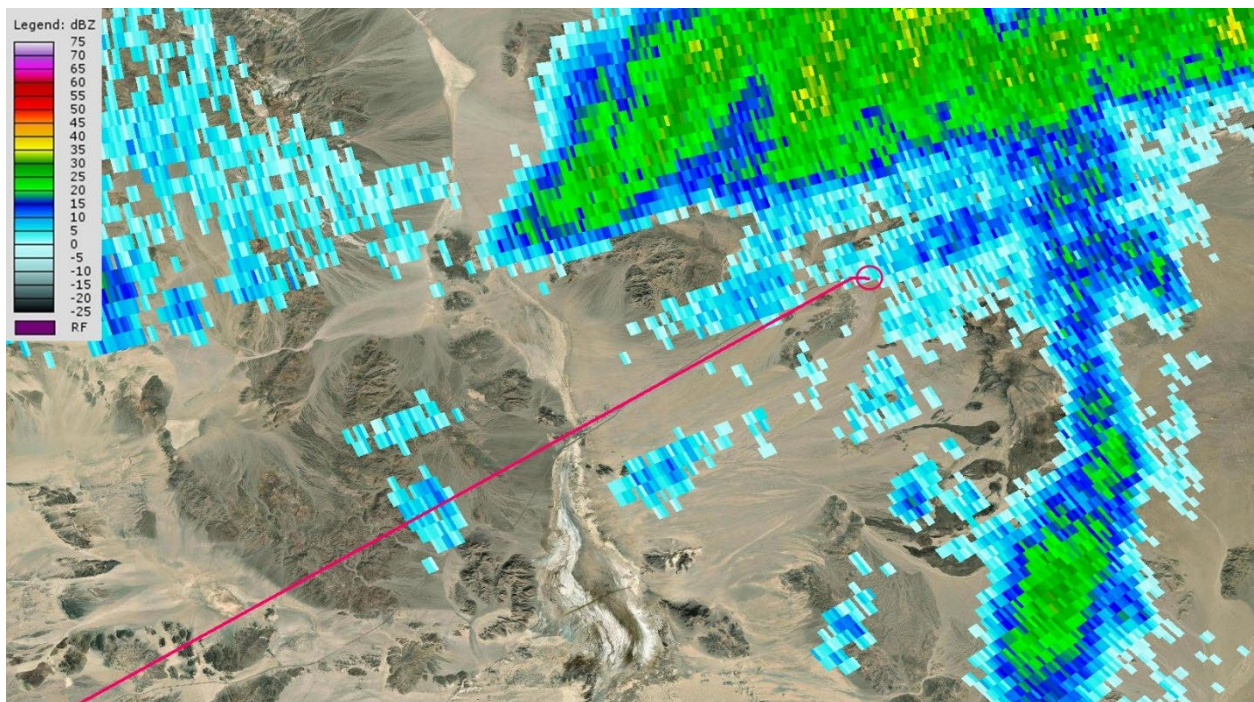
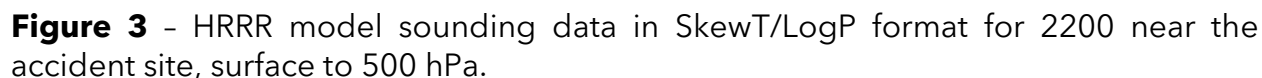


Figure 2 - Unsmoothed KESX 0.484° Level-II base reflectivity product from a sweep initiated at 2206:05. The accident aircraft's flight track is marked by the red line and the accident location is denoted by the red circle.

A High-Resolution Rapid Refresh (HRRR) model⁹ sounding (Figure 3) for near the accident site¹⁰ at 2200 using an elevation of 3,375 feet was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Broken or overcast clouds were identified by RAOB from about 5,900 feet through 15,000 feet. The freezing level was at about 5,300 feet, and RAOB identified the potential for light clear or rime icing between about 5,900 and 8,300 feet. The wind at the surface from the northwest at about 5 knots. Above this level the wind backed¹¹ and increased in magnitude to a west wind at about 15 knots near 10,000 feet.



¹¹ A backing wind's wind barbs turn counter-clockwise with increasing height.

4.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)- 18 infrared (10.3 μ m) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from these data are presented in Figure 4. The brightness temperature over the accident site was -33°C, which, when considering the 2200 HRRR sounding, corresponded to a cloud top height of about 20,000 feet (not shown in Figure 3).

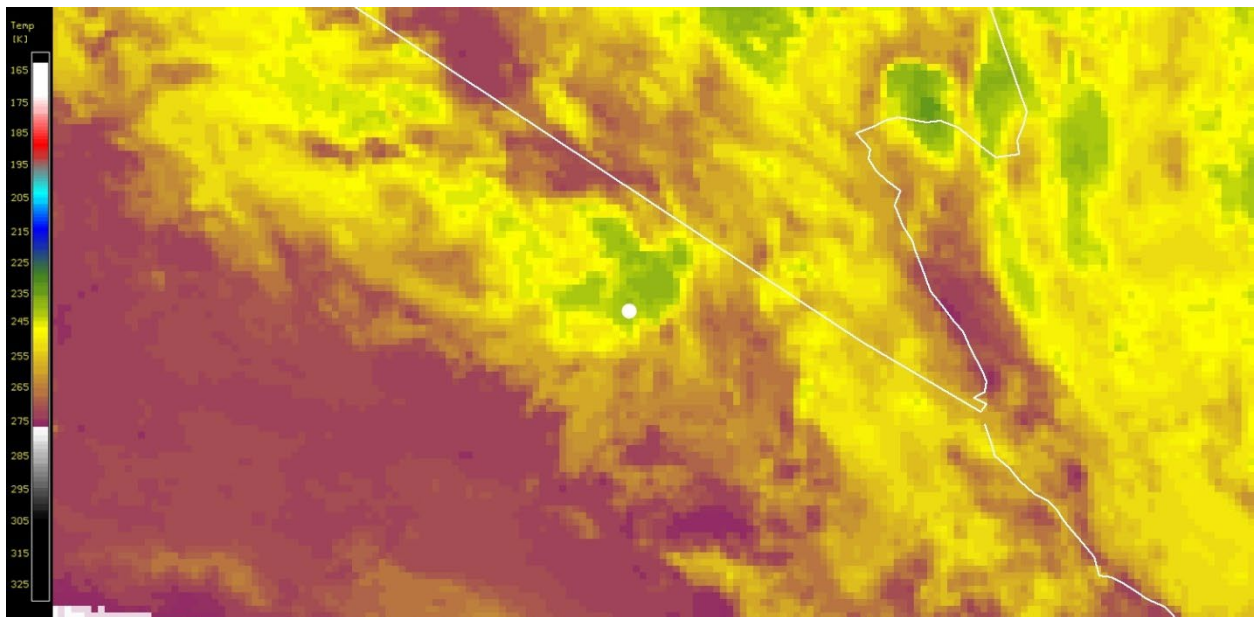


Figure 4 - GOES-18 infrared imagery from 2206. The accident location is denoted by the white dot. Image is not corrected for parallax error.

5.0 Pilot Reports

There were no longline-disseminated pilot reports¹² (PIREPs) reported between 2000 on the day of the accident and 0000 (on the day following the accident day) below 10,000 feet and within 50 miles of the accident location.

¹² These do not include pilot reports only broadcast via radio.

6.0 Area Forecast Discussion

The National Weather Service's (NWS) Las Vegas, Nevada, Weather Forecast Office (WFO) issued the following Synopsis Update and Aviation sections of an Area Forecast Discussion at 1904, applicable for a region that included the accident location.

FXUS65 KVEF 100304

AFDVEF

Area Forecast Discussion

National Weather Service Las Vegas NV

704 PM PST Fri Feb 9 2024

.UPDATE...Scattered rain showers continue to roll across the region with snow showers near the 4000 foot level. So far this evening, precipitation totals across the valley amounted to under a tenth of an inch (0.10") with some higher amounts just to the north of the Metro area. This evening's weather is on track with expected forecast conditions as higher precipitation values remain over the northern portions of the district. Lesser amounts will be observed across the valley. While the potential is very low, thunderstorms can not be ruled-out with some of the passing showers. Yet, between 1 and 3 AM PST, the threat of lightning will have diminished as showers continue to fade. However, with snow levels near 4000 feet, Mountain Pass has the potential of seeing a dusting of snow overnight. Messaging about the situation of slick roadways has been posted so no changes needed overnight.

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.AVIATION...For Harry Reid...Scattered showers moving through the Las Vegas Valley at times this evening will temporarily brush the terminal with light rainfall and ceilings generally down to 5000 ft, but could briefly go as low as 4000 ft followed by gradually lifting ceilings and clearing clouds Saturday morning. North winds 7-10 knots will persist overnight then increase Saturday morning generally 15-25 knots with gusts up to 30 knots especially 18Z-22Z. Wind speeds will decrease after sunset Saturday but should remain around 8-10 knots Saturday evening.

For the rest of southern Nevada, northwest Arizona and southeast California...Scattered to numerous light rain showers and snow showers with widespread ceilings of 4000-5000 ft will persist across most of the region tonight before pulling away across Arizona Saturday morning leading to diminishing clouds but gusty north winds 15-25 knots developing. Gusts up to 30 knots will be possible...especially along the Colorado River Valley during the late morning through afternoon hours. Winds will decrease to 10-15 knots for most sites Saturday evening though speeds 15-25 knots will persist around KIFP Saturday night.

Prior to the AFD issuance at 1904, the NWS Las Vegas WFO issued the following AFD at 1402 (Synopsis and Aviation sections), which was applicable for a region that included the accident location.

FXUS65 KVEF 092202

AFDVEF

Area Forecast Discussion

National Weather Service Las Vegas NV

202 PM PST Fri Feb 9 2024

.SYNOPSIS...Another weather disturbance will affect the area through early Saturday, bringing scattered rain/snow showers. Behind the system, breezy northerly winds are anticipated during the day on Saturday with the strongest gusts across Inyo and San Bernardino counties and along the Colorado River. Beginning on Sunday and continuing through most of next week, a dry and warmer weather pattern will settle in as high pressure builds over the area.

&&

.AVIATION...For Harry Reid...Isolated showers will develop this afternoon around southern Nevada. Showers through at least 00Z should stay outside of the valley, though obscuration of the mountains to the west this afternoon will be possible. BKN CIGs around 6000-8000ft are likely at times this afternoon.

After 00Z, more numerous showers will develop to the north of the terminals and shift south through the evening and early overnight. Increasing confidence that precipitation will move through the valley at some point tonight, including the terminals. The best chance for rain and associated impacts at the terminals will be after 03Z through about 09Z. CIGs will drop to 5000ft and may drop as low as 3000ft with the band of precipitation that moves through. There is a low risk for thunderstorms tonight. If thunderstorms develop, lower CIGs to 2000ft will be possible as well as heavier rain which may reduce visibility at times when the rain moves through. CIGs should slowly improve when the rain exits to the southeast, especially after sunrise.

Winds will remain light and diurnal through tonight. As rain exits Saturday morning, winds will become north to northwest. Wind speeds should remain around 8-10KT until winds increase after 15Z. Northwest winds will gust to 20-25KT through Saturday afternoon. Once rain ends Saturday morning, it will remain dry through the rest of the period.

For the rest of southern Nevada, northwest Arizona and southeast California...Isolated showers will develop across southern Nevada and western Arizona through the afternoon and evening. Occasional light rain

with light snow above 4000ft and CIGs to 5000ft will be possible with the showers through the afternoon. After 00Z, precipitation should become better organized and more widespread in southern Nevada and shift southeast through the night. CIGs will drop to 5000ft with 3000ft CIGs possible with any precipitation. Light to moderate rain with snow above 4000ft is expected. Isolated thunder cannot be ruled out. Further west, precipitation will remain isolated and less impactful.

The better band of precipitation will exit western Arizona Saturday morning after 15Z. Behind this area of precipitation, CIGs will slowly improve. North winds are expected behind this feature as well. Winds will gust to 20-30KT at times. Otherwise, winds will remain light and diurnal at all TAF locations.

7.0 Terminal Aerodrome Forecasts

The closest NWS Terminal Aerodrome Forecast (TAF) site to the accident aircraft's destination of Boulder City Municipal Airport (BVU) was Henderson Executive Airport (HND), which was located 14 miles west of BVU at an elevation of 2,490 feet. 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."¹³ HND was also the closest NWS TAF site to the accident location (located about 50 miles northeast of the accident location).

At 1520, a TAF was issued for HND that forecasted for the accident time: a wind from 190° at 7 knots, visibility greater than 6 statute miles, light rain showers, scattered clouds at 3,500 feet agl and ceiling overcast at 5,000 feet agl; temporary conditions¹⁴ variable wind of ceiling broken at 3,500 feet agl.

*TAF KHND 092320Z 1000/1024 21006KT P6SM VCSH SCT040 BKN070
FM100400 **19007KT P6SM -SHRA SCT035 OVC050**
TEMPO 1006/1010 BKN035
FM101100 35007KT P6SM SCT035 OVC050
TEMPO 1011/1014 BKN035
FM101500 36012G23KT P6SM SCT035 BKN060
FM101800 35015G25KT P6SM FEW070=*

¹³ www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

¹⁴ Temporary conditions - fluctuations to forecast conditions which are expected to last less than one hour in each instance and, in the aggregate, to cover less than half of the indicated period.

At 2136, a TAF was issued for HND that forecasted for the accident time: a wind from 190° at 7 knots, visibility greater than 6 statute miles, moderate rain showers in the vicinity¹⁵, scattered clouds at 5,000 feet agl and ceiling overcast at 9,000 feet agl; temporary conditions variable wind of light rain showers and ceiling broken at 5,000 feet agl.

*TAF KHND 100536Z 1006/1106 **19007KT P6SM VCSH SCT050 BKN090**
TEMPO 1006/1010 -SHRA BKN050
FM101200 35007KT P6SM SCT050 BKN060
FM101600 36012G23KT P6SM SCT060 BKN090
FM101800 35015G25KT P6SM FEW060 SCT090
FM110200 34010KT P6SM SKC=*

8.0 SIGMETs

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

9.0 CWSU Products

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

10.0 G-AIRMETs

A Graphical-Airmen's Meteorological Information (G-AIRMET) is a graphical advisory of weather that may be hazardous to aircraft but are less severe than 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 1845, a G-AIRMET was issued for moderate icing between the freezing level and 16,000 feet and was valid at 2200 for a region that included the accident location.

¹⁵ "In the vicinity" means 5 to 10 statute miles from the point of observation.

This was the only G-AIRMET issued between about 1900 and the accident time that was valid for altitudes below FL180¹⁶ at the accident location.

The only G-AIRMET issued about 1300 that was valid for the accident location at 2200 for altitudes below FL180 was for moderate icing from the freezing level to 16,000 feet. There were G-AIRMETs for instrument flight rule (IFR)¹⁷ and mountain obscuration conditions that were issued at about 1300 and valid for 2200 in the accident region, but their boundaries were north of the accident site and covered areas closer to Las Vegas, Nevada, and were not valid for the area between the accident location and BVU.

11.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) are intended to provide the necessary aviation weather information to give users a complete picture of the weather that might impact flight in the continental United States. 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 5-9 present the GFA precipitation, ceiling, cloud, visibility and 1,000 ft agl wind 00-hour forecasts valid at 2200.

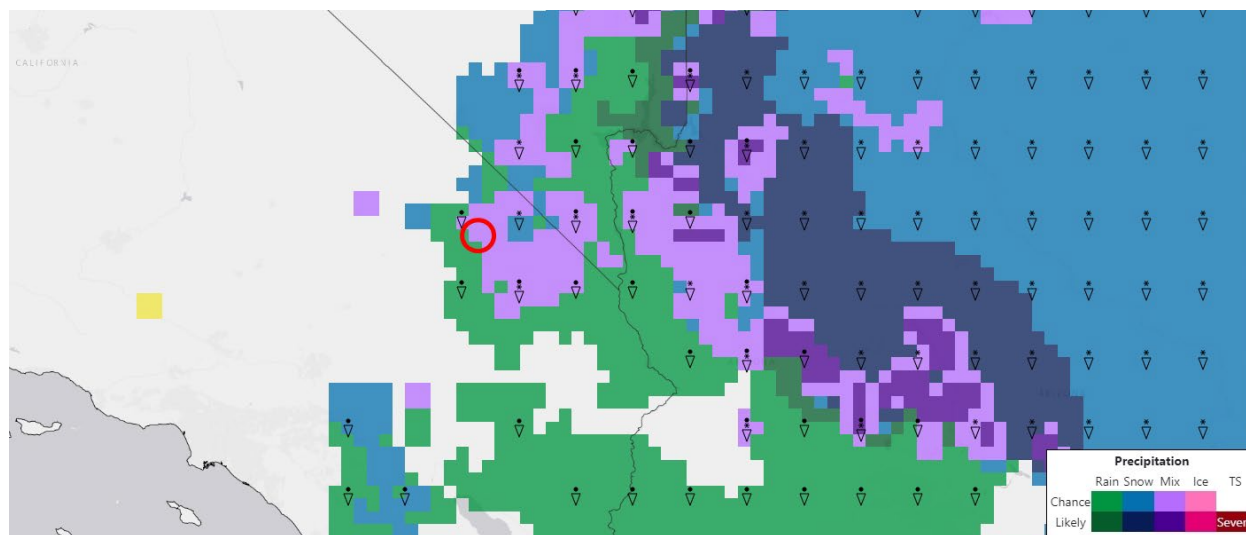


Figure 5 - GFA precipitation 00-hour forecast for 2200. The accident location is in the red circle.

¹⁶ Flight Level (FL) - a standard nominal altitude of an aircraft, in hundreds of feet. This altitude is calculated from the international standard pressure datum of 1013.25 hPa (29.92 inches of mercury), the average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above msl or agl.

¹⁷ IFR conditions - Ceilings less than 1,000 feet agl and/or surface visibility less than three statute miles.

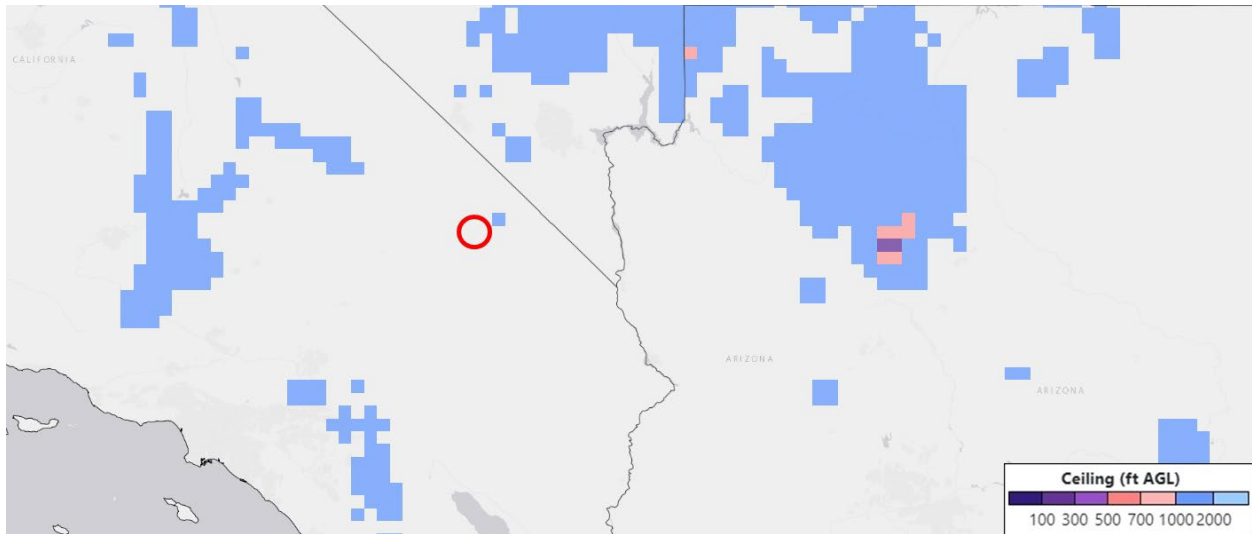


Figure 6 - GFA ceiling 00-hour forecast for 2200. The accident location is in the red circle.

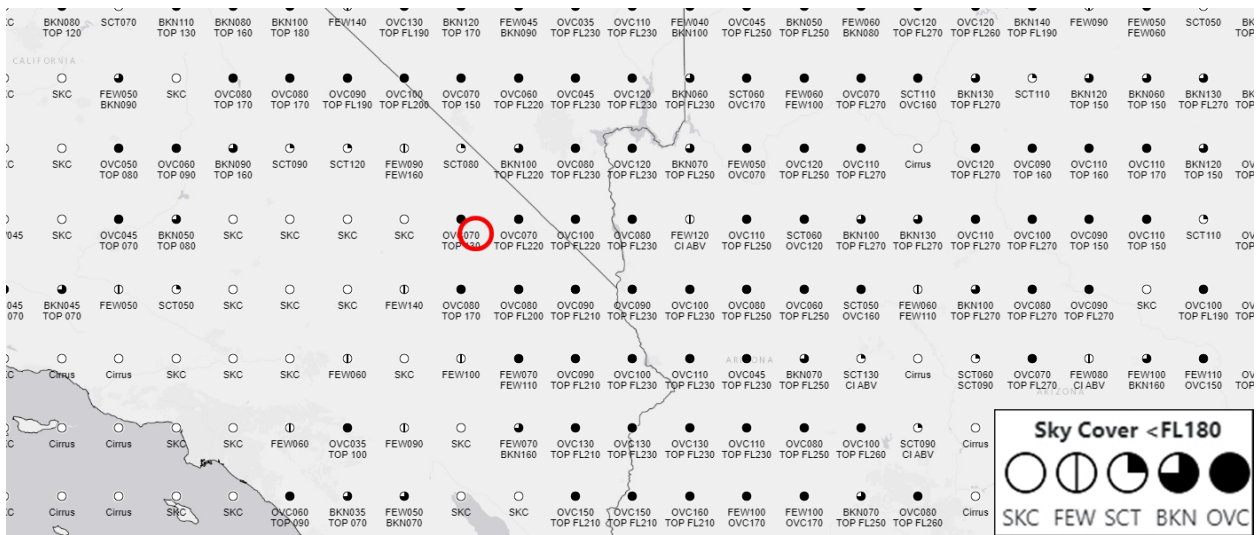


Figure 7 - GFA cloud 00-hour forecast for 2200. The accident location is in the red circle.

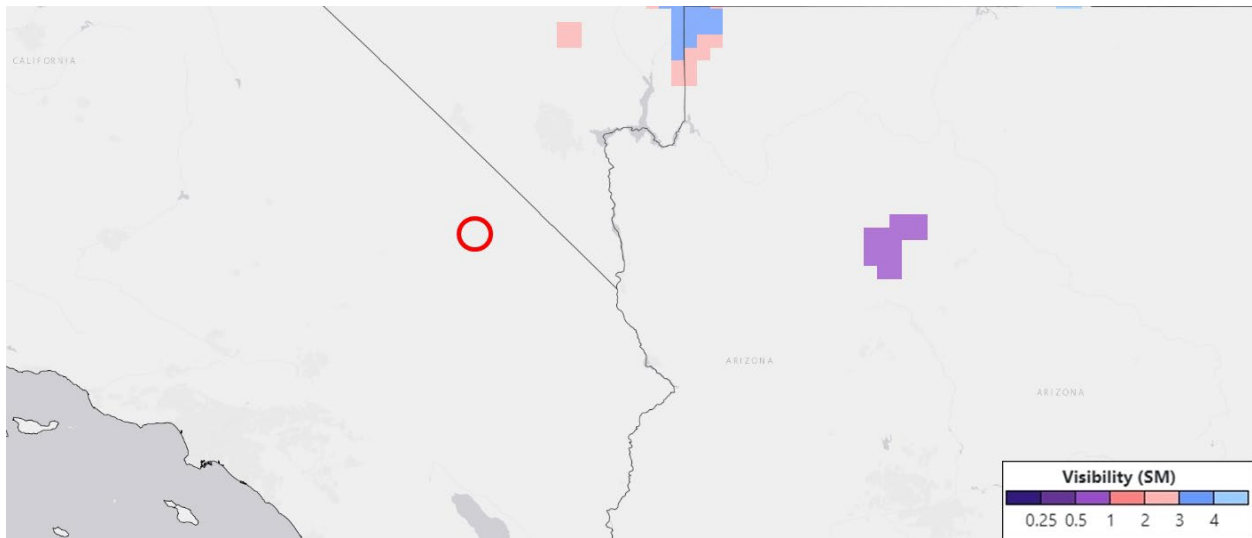


Figure 8 - GFA visibility 00-hour forecast for 2200. The accident location is in the red circle.

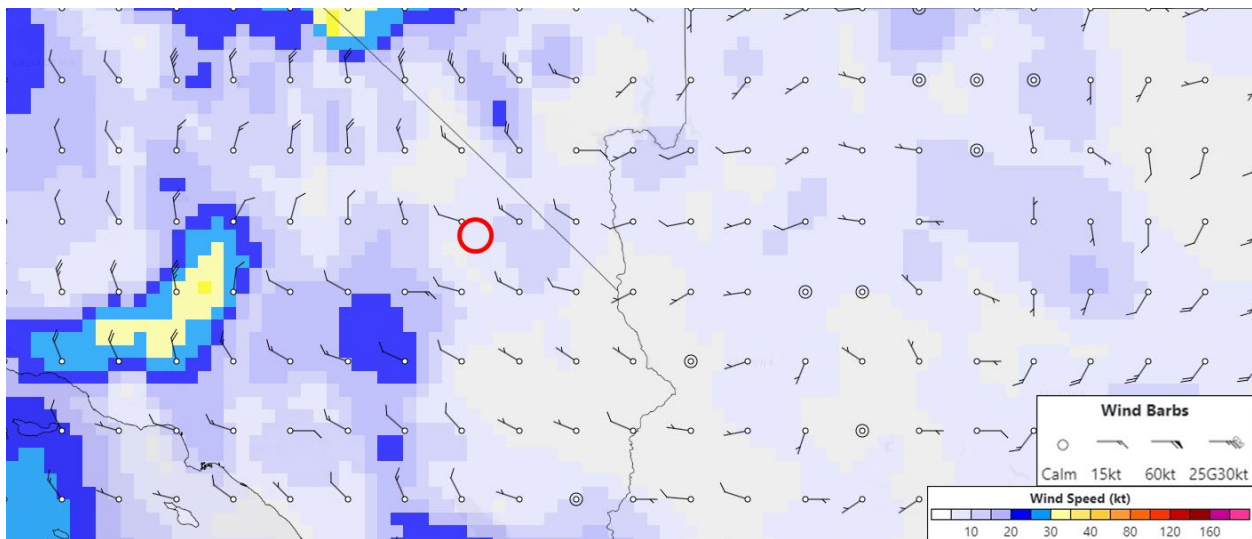


Figure 9 - GFA wind analysis for 1,000 feet agl at 2200. The accident location is in the red circle.

The following information was provided by the AWC. Figures 10-13 present the GFA ceiling, visibility, cloud, and precipitation 07-hour forecasts issued about 1500 and valid for 2200.

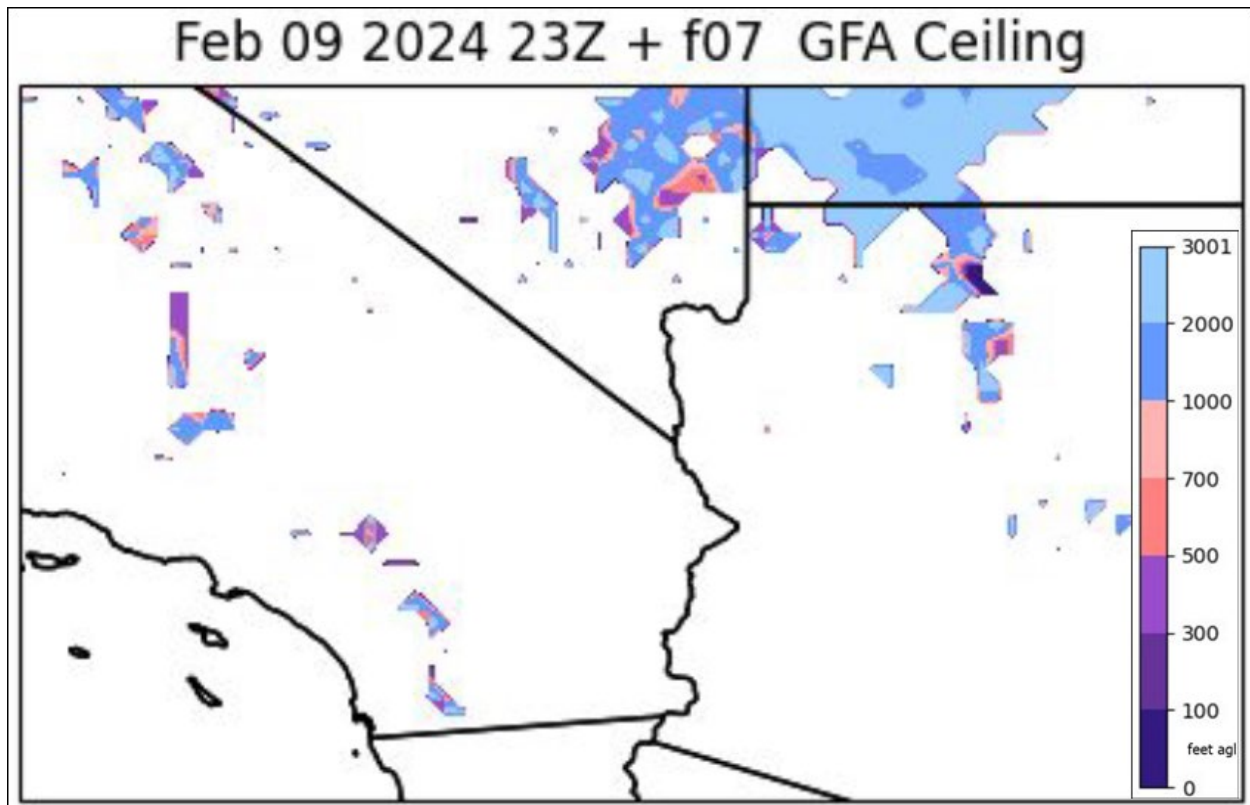


Figure 10 - GFA ceiling 07-hour forecast valid for 2200.

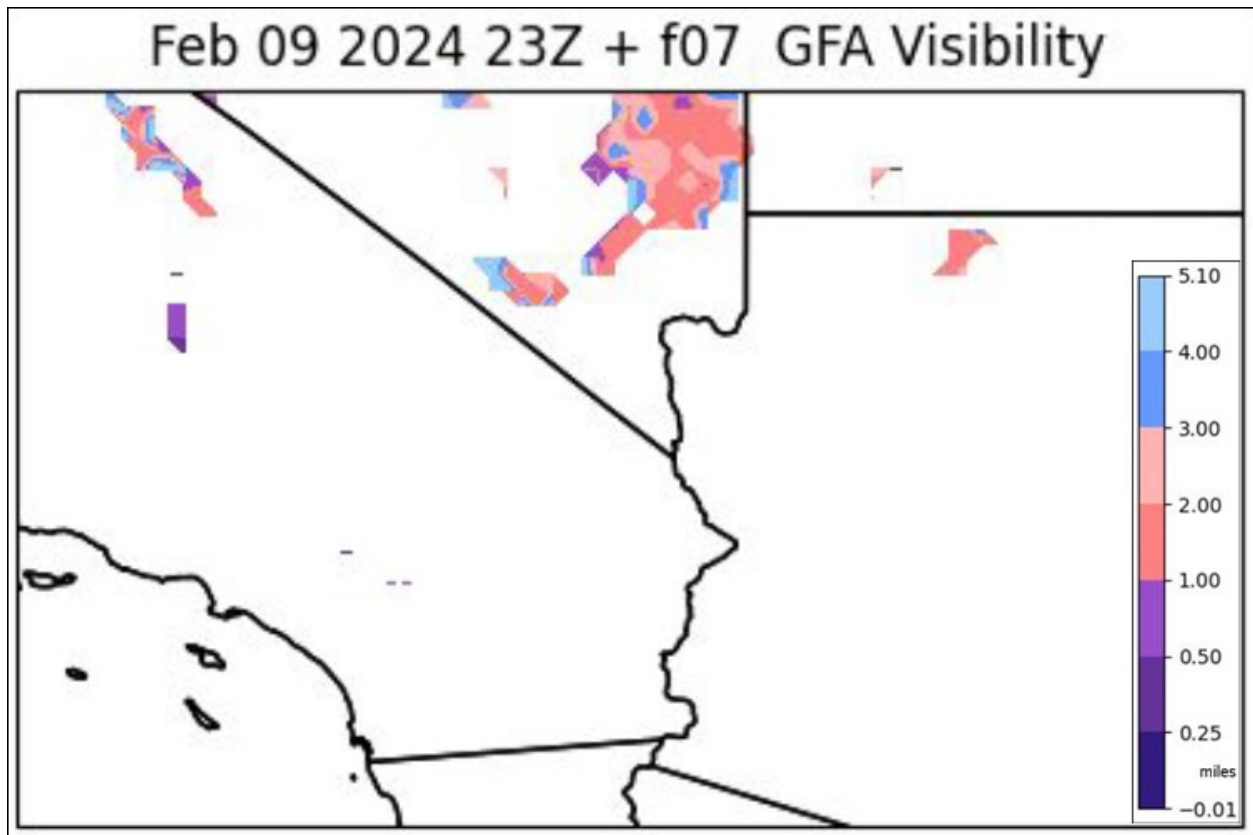


Figure 11 - GFA visibility 07-hour forecast valid for 2200.

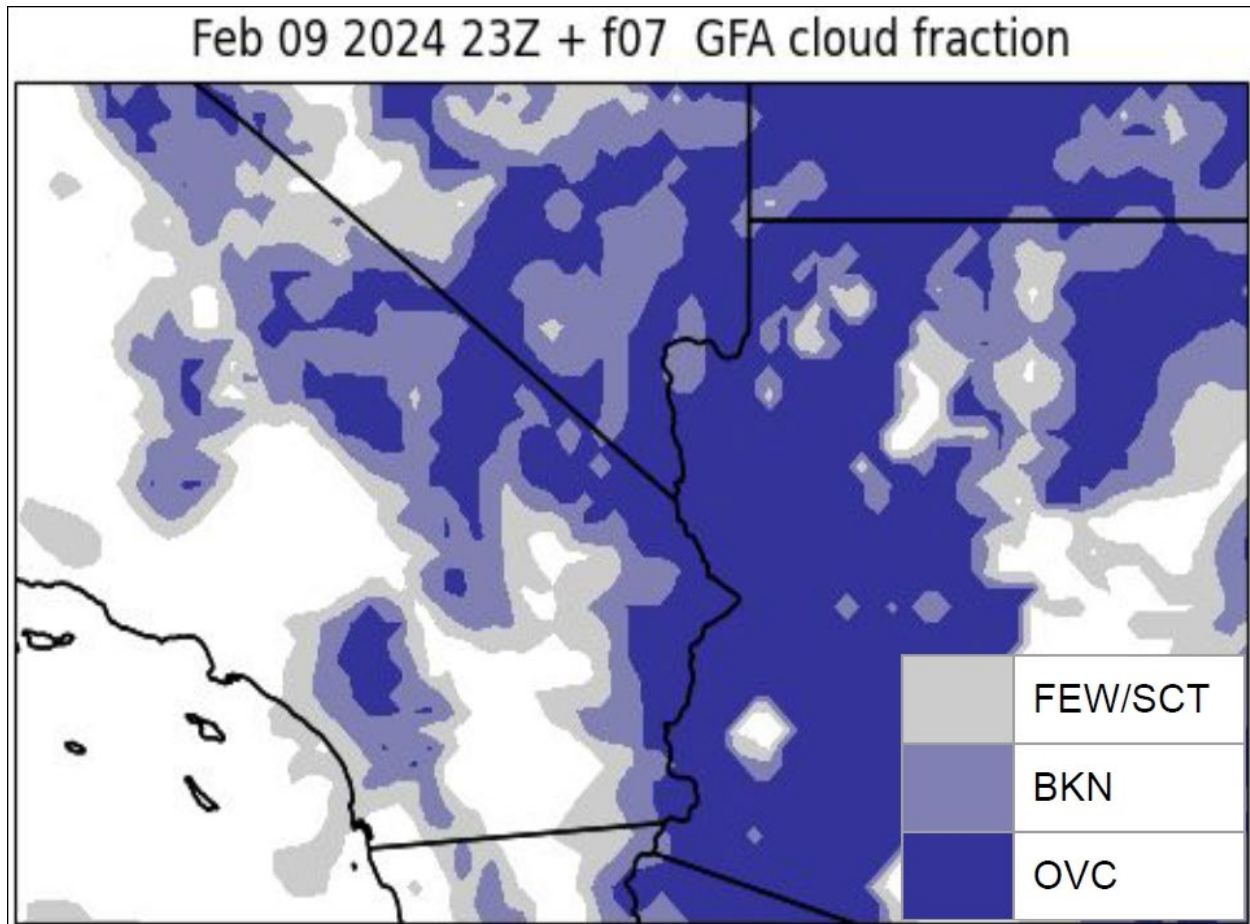


Figure 12 - GFA cloud 07-hour forecast valid for 2200.

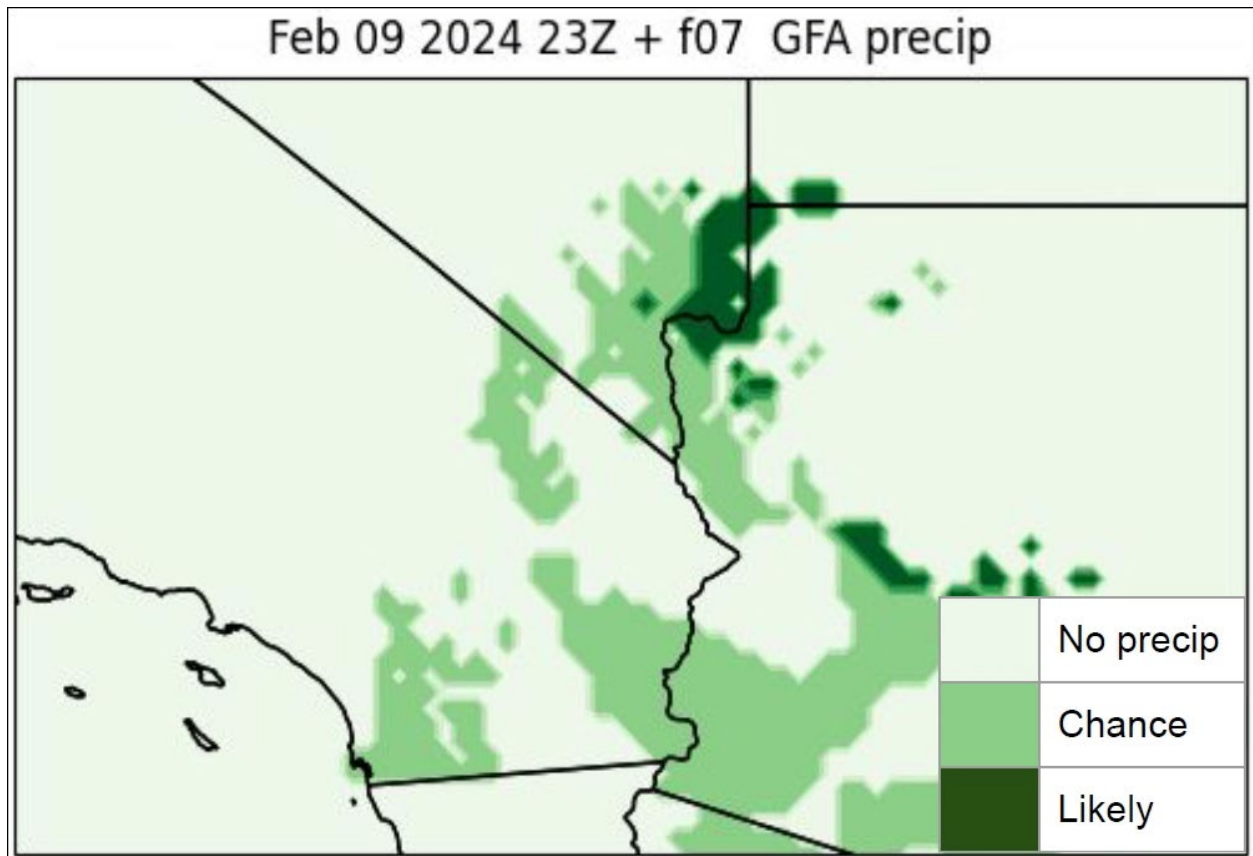


Figure 13 - GFA precipitation 07-hour forecast valid for 2200.

Submitted by:

Mike Richards
Senior Meteorologist