

Synoptic conditions: A review of the NWS Surface Analysis Chart depicted no boundaries or fronts over the route of flight. It should be noted that Tropical Storm Alberto had made landfall in central Mexico in the day prior to the accident. The storm was responsible for bring warm moist air into the southwestern, which was responsible for increased cloud and precipitation across the region. The NWS Short Range Prognostic Chart valid for 1800Z or 1200 MDT was also reviewed. The chart depicted a large area of precipitation expected over New Mexico with rain likely or a 60-70% probability of precipitation over the accident site.

Surface Observations: The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METAR) 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 estimated at 7.5° East based on the latest sectional chart for the area.

Ruidoso, NM

The closest weather reporting location to the accident site was from Sierra Blanca Regional Airport (KSRR), Ruidoso, NM, about 11 miles southwest at an elevation of 6814 ft. The airport had an Automated Weather Observation System (AWOS), which broadcasted weather line of sight on 126.475 VHF and disseminated observations longline every 20-minutes. Coordinates of airport 33.4609444°N -105.5301389°W. At the time of the accident the following conditions were reported:

Weather observation for KSRR at 1015 MDT, automated, wind from 130 at 11 knots, visibility 10 miles or more, ceiling broken at 300 ft agl, broken at 700 ft, temperature 17 Celsius (C), dew point temperature 17 C, altimeter 30.39 inches of mercury (inHg). Automated weather observation system with a precipitation discriminator.

Weather observation for KSRR for 1035 MDT missing for unknown reasons.

Weather observation for KSRR at 1115 MDT, automated, wind from 130 at 11 knots, visibility 5 miles in light rain, ceiling broken at 400 ft agl, broken at 6,500 ft, temperature 17 C, dew point temperature 17 C, altimeter 30.40 inHg. Automated weather observation system with a precipitation discriminator, hourly precipitation 0.01 inches.

The general flight categories and raw observations issued surrounding the period were as follows:

LIFR METAR KSRR 211155Z AUTO 15010KT IOSM OVC004 15/15 A3036 RMK AO2=
IFR METAR KSRR 211215Z AUTO 14008KT IOSM BKN006 OVC017 15/15 A3036 RMK AO2 LTG DSNT W=
IFR METAR KSRR 211235Z AUTO 14010KT IOSM BKN005 BKN017 15/15 A3036 RMK AO2=
MVFR METAR KSRR 211255Z AUTO 14008KT IOSM SCT005 SCT012 BKN019 15/15 A3037 RMK AO2=
MVFR METAR KSRR 211315Z AUTO 13007KT IOSM FEW005 BKN017 BKN023 15/15 A3038 RMK AO2=
MVFR METAR KSRR 211335Z AUTO 15007KT IOSM FEW005 BKN015 OVC023 16/16 A3038 RMK AO2=
IFR METAR KSRR 211355Z AUTO 13008KT IOSM BKN006 OVC013 16/16 A3038 RMK AO2=
MVFR METAR KSRR 211415Z AUTO 13009KT IOSM SCT006 BKN010 OVC060 17/17 A3038 RMK AO2 LTG DSNT W=
MVFR METAR KSRR 211435Z AUTO 13005KT IOSM FEW006 BKN015 OVC060 17/17 A3039 RMK AO2=
IFR METAR KSRR 211455Z AUTO 15007KT 9SM BKN005 OVC013 17/17 A3039 RMK AO2=
LIFR METAR KSRR 211515Z AUTO 14007KT 5SM -RA OVC004 16/16 A3039 RMK AO2 LTG DSNT W P000I=
 METAR KSRR 211535Z Missing
LIFR METAR KSRR 211555Z AUTO 14011KT 9SM -RA BKN003 OVC007 17/17 A3039 RMK AO2 P0002=
LIFR **METAR KSRR 211615Z AUTO 13011KT IOSM BKN003 BKN007 17/17 A3039 RMK AO2=**
METAR KSRR 211635Z Missing

Accident 16452

LIFR **METAR KSRR 211715Z AUTO 13011KT 5SM -RA BKN004 BKN065 17/17 A3040 RMK AO2 P000I=**
METAR KSRR 211735Z Missing
LIFR METAR KSRR 211755Z AUTO 13011KT 4SM -RA BKN003 17/17 A3040 RMK AO2 P0005=
LIFR METAR KSRR 211615Z AUTO 13011KT IOSM BKN003 BKN007 17/17 A3039 RMK AO2
LIFR METAR KSRR 211715Z AUTO 13011KT 5SM -RA BKN004 BKN065 17/17 A3040 RMK AO2 P000I
LIFR METAR KSRR 211755Z AUTO 13011KT 4SM -RA BKN003 17/17 A3040 RMK AO2 P0005

LIFR METAR KSRR 211815Z AUTO 13010KT 10SM -RA BKN004 17/17 A3040 RMK AO2 P000
LIFR METAR KSRR 211835Z AUTO 13015KT 8SM -RA BKN004 17/17 A3039 RMK AO2 P0002

The observations indicated MVFR conditions during the early morning with low ceilings and light rain developing over the area after 0855 MDT, with LIFR conditions being reported at the time of the accident.

NWS Aviation Weather Center's METAR display - A display of the NWS AWC METAR site for 1045 MDT is included as figure 1 with the approximate accident site marked by the red star, and a regional radar mosaic overlaid. The chart depicted LIFR conditions over KSRR and general MVFR to VFR conditions over the other reporting sites east and southwest of the accident site. Multiple stations were reporting rain over the area at the time.

Upper Air Sounding - A High-Resolution Rapid Refresh (HRRR) numerical model was obtained from the NOAA Air Resource Laboratory for the closest grid location to the accident site for 1100 MDT. The data was then plotted on a standard Skew T log P diagram from the surface to 450-hPa or about 22,000 ft. A depiction of the sounding is included as figure 2. The sounding depicted an elevation of 8,127 ft over the grid site with a near surface temperature of 13.5 C (56F), a dew point temperature of 13.5 C (56F), a relative humidity of 100%, with a density altitude of 9,457 ft. The sounding depicted a lifted condensation level (LCL) and level of free convection (LFC) at the surface, with the convective condensation level (CCL) at 1,938 ft agl. The freezing level was at 16,7500 ft and supported icing in-clouds above this level. The sounding was saturated from the surface through 18,600 ft, with higher altocumulus and cirrus clouds above. The precipitable water content was 1.15 inches. The Lifted Index (LI) was -0.9, and the positive Convective Available Potential Energy (CAPE) was only 225 Joules/kilogram and indicated a weak threat for thunderstorm development. The RAOB Analysis program supported nimbostratus type clouds with visibility near 3 miles in light rain, with ceiling overcast at 300 ft agl. A table of the sounding parameters is included below.

The sounding parameters of height, pressure, temperature (T), dew point temperature (Td), relative humidity (RH), wind direction and speed, and potential clear air turbulence, and low-level wind shear (LLWS) from the surface to 10,000 ft were as follows:

Height (ft msl)	Pres (hPa)	T (OC)	Td (OC)	RH (%)	Wind (deg kt)	CAT (FAA)	LLWS (FAA)
8127	763	13.5	13.5	100	136/ 11		
8163	762	13.4	13.4	100	136/ 10	LGT	LIGHT
8236	760	13.3	13.3	100	137/ 13		LIGHT
8382	756	13.1	13.1	100	139/ 15		
8640	749	12.7	12.7	100	141/ 16		
9012	739	12.1	12.1	100	145/ 17		
9501	726	11.4	11.4	100	150/ 18		
10075	711	10.5	10.5	100	155/ 18		
10698	695	9.5	9.5	100	163/ 18	LGT	
11374	678	8.4	8.4	100	173/ 17	LGT	
12105	660	7.3	7.1	99	185/ 17	LGT	
12895	641	6.0	5.6	97	195/ 18	LGT	
13791	620	4.4	3.9	97	204/ 19		
14801	597	2.6	1.8	94	210/ 18		
15890	573	1.1	-0.6	88	213/ 17		
17067	548	-0.4	-3.1	82	217/ 17		
18441	520	-2.4	-5.8	77	216/ 21	LGT	
19931	491	-5.1	-6.3	91	206/ 24		TRC Rime

Satellite data: The GOES-16 infrared and visible imagery were reviewed and documented surrounding the period. The GOES-16 infrared image at 4X magnification is included as figure 3 for 1046 MDT and depicted an extensive area of overcast clouds over southeastern New Mexico, extreme western Texas, and into Mexico. The radiative cloud top brightness temperature over the accident site was 252 Kelvin or -21°C, which corresponded to cloud tops near 26,000 ft. Figure 4 is the GOES-16 visible image for the same period at 2X magnification. The imagery was consistent with that of nimbostratus type

clouds associated with precipitation.

Weather Radar Imagery - The closest Weather Surveillance Radar 1988 Doppler (WSR-88D) was located about 49 miles southwest of the accident site at Holloman Air Force base (KHDX). The composite reflectivity image for 1044 MDT is included as figure 5 and depicted a large area of echoes ranging from 10 dBZ to 40 dBZ over southern New Mexico, and echoes in the range of 5 to 20 dBZ over KSRR and the accident site consistent with that of light rain. A review of local lightning data indicated no cloud-to-ground lightning strikes within 20 miles of the accident site in the hour period prior to the accident, and rules out any thunderstorms in the immediate vicinity of the accident site.

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors, 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. The FAA Aviation Weather Handbook defines echoes less than 30 dBZ as "light" in intensity, "moderate" echoes 30-40 dBZ, "heavy" with echoes of >40-50 dBZ, and "extreme" intensity with echoes above >50 dBZ. These are the new standard radio phraseology terms used by air traffic controllers to describe weather conditions to pilots as shown in the table below. Light rain is typically reported at the surface when reflectivities reach 20 dBZ, while air traffic control weather displays, and airborne weather radar typically do not display echoes less than 30 dBZ or light intensity echoes on their weather displays.

<u>Reflectivity (dBZ)</u>	<u>Weather Radar Echo Intensity Terminology</u>
<30 dBZ	Light
30 - 40 dBZ	Moderate
>40 - 50 dBZ	Heavy
>50 dBZ	Extreme

Pilot Reports - a search for pilot reports or PIREPs within 100 miles of the accident site resulted in no reports in the national database surrounding the period within 3 hours of the accident.

NWS Forecasts

Terminal Aerodrome Forecast (TAF) - there were no station nearby with any TAFs.

NWS Area Forecast Discussion for the area:

FXUS65 KABQ 211200

AFDABQ

Area Forecast Discussion

National Weather Service Albuquerque NM

600 AM MDT Fri Jun 21 2024

...New AVIATION...

.SYNOPSIS...

Issued at 305 AM MDT Fri Jun 21 2024

An upper level disturbance will move out of the Great Basin and into the Rockies today while rich moisture remains in place over New Mexico. This will lead to scattered to numerous showers and thunderstorms across northern and central areas of the state today and well into the evening. Several areas could observe heavy downpours, and a few strong to severe storms are also possible, especially in northwestern New Mexico where large hail and damaging winds could occur. Temperatures today will be cooler than normal for late June, running in the 70's and 80's in most locations. Showers and thunderstorms will not be as numerous on Saturday and Sunday, but there is still the potential for isolated to scattered activity that could produce locally heavy rainfall under slower moving storms. Through the weekend and the first part of next week, temperatures will rise, turning hot in many lower elevation locations while isolated to scattered showers and storms redevelop daily over the mountains and nearby areas. Rain chances will increase again Wednesday and Thursday of next week when more moisture will arrive from the east.

.SHORT TERM...

(Today through Saturday)

Issued at 305 AM MDT Fri Jun 21 2024

Today and tonight, a shortwave trough will cross the northern and central Rockies drawing rich subtropical moisture northward over the forecast area. By this afternoon precipitable water values are forecast to vary around 1.25-1.60 inches, or from 150-250 percent of normal. Scattered to numerous showers and thunderstorms are forecast today and this evening, then the focus will be west of the central mountain chain after midnight. With the trough passing to our north, shear and instability profiles look sufficient for severe thunderstorms to develop over northwest and west central areas, where large hail and damaging winds will be the greatest threat. Isolated tornados cannot be ruled out, either. Given how much antecedent moisture has improved over the last 48 hours, and some very sensitive locations due to recent flash flooding and recent burn scars, will issue a Flash Flood Watch for northwest and west central areas for this afternoon and tonight, as well as for the Sangre de Cristo and Sacramento Mountain Burn Scars.

.AVIATION...

(12Z TAFS)

Issued at 552 AM MDT Fri Jun 21 2024

Areas of low clouds will continue to produce MVFR and IFR conditions over north central and eastern areas for much of the morning, while scattered rain showers and isolated thunderstorms continue to stream northward along and east of the central mountain chain. This afternoon and evening, scattered to numerous showers and thunderstorms will develop. Some thunderstorms west of the Tusas Mountains, Jemez Mountains, and Mount Taylor will be capable of producing large hail and damaging winds. Elsewhere, wet microbursts will be capable of producing brief, localized, and erratic wind gusts near 45 kt. After midnight, scattered to isolated showers and thunderstorms will favor central and western areas, with little or no activity over the south central mountains and eastern plains.

.FIRE WEATHER...

Issued at 305 AM MDT Fri Jun 21 2024

With deep Gulf moisture in place, scattered to numerous showers and thunderstorms will return today and Saturday with a risk of locally heavy rainfall. Winds will be weaker in many places today, except for breezy to windy conditions east of the Sangre de Cristo Mountains. A high pressure system aloft will move over the forecast area from the east Sunday through mid-week, and moisture will recycle with daily rounds of scattered to isolated showers and thunderstorms favoring central and western areas through Tuesday. Wetting footprints will shrink in size through this period, and high temperatures will climb above 1991-2020 averages areawide. Tuesday night into Wednesday a moist backdoor front is forecast to push into the area increasing thunderstorm coverage and wetness for Wednesday and Thursday.

Graphic Forecast for Aviation (GFA) - 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, such as in this case at KHSP. The GFA is available at the NWS AWC website and through other weather briefing services.

The GFA 3-hour Surface Forecast and Cloud Forecasts valid for 0900 MDT, and the 6-hour forecasts valid for 1200 MDT are included as figures 6-9. The charts depicted surface winds from the south with a change less than 60% probability of thunderstorms and rain showers expected during the period. While the GFA cloud forecasts expected broken to overcast cloud cover over the southern portion of the state. With an enlarge GFA chart for the period of the accident depicting overcast clouds with a base near 6,000 ft msl with tops to 34,000 ft over the area. Graphic-AIRMETs for IFR and mountain obscuration conditions extended over the region.

NWS Inflight Weather Advisories - The NWS had no SIGMETs, Convective SIGMETs or Center Weather Advisories current over the area during the period. The NWS did have several Graphic-AIRMET current for mountain obscuration over the area. Figure 10 is a METARs, radar and G-AIRMET for mountain obscuration current for 1045 MDT.

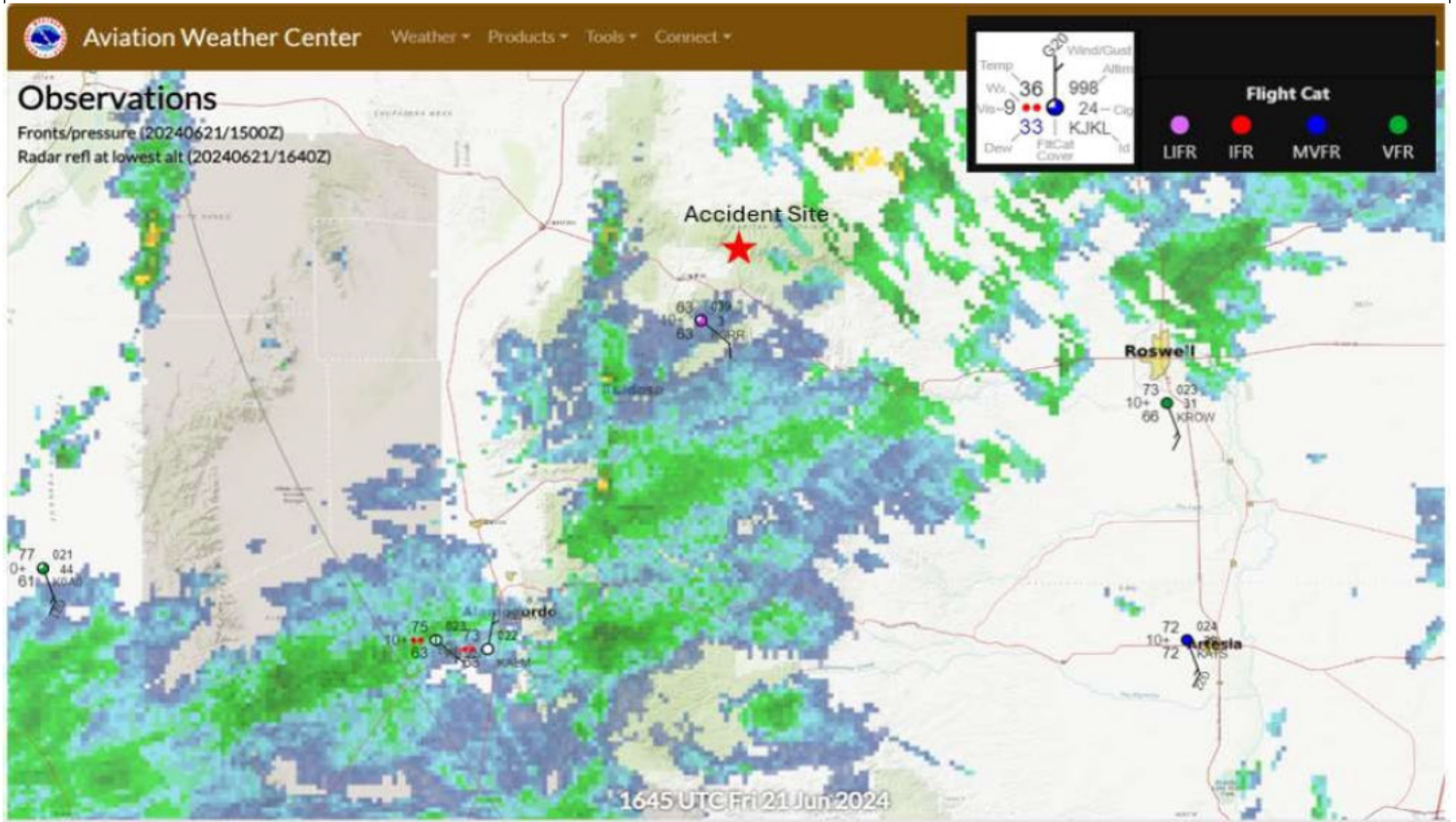
Data Reauested

Preliminary Analysis

[REDACTED]

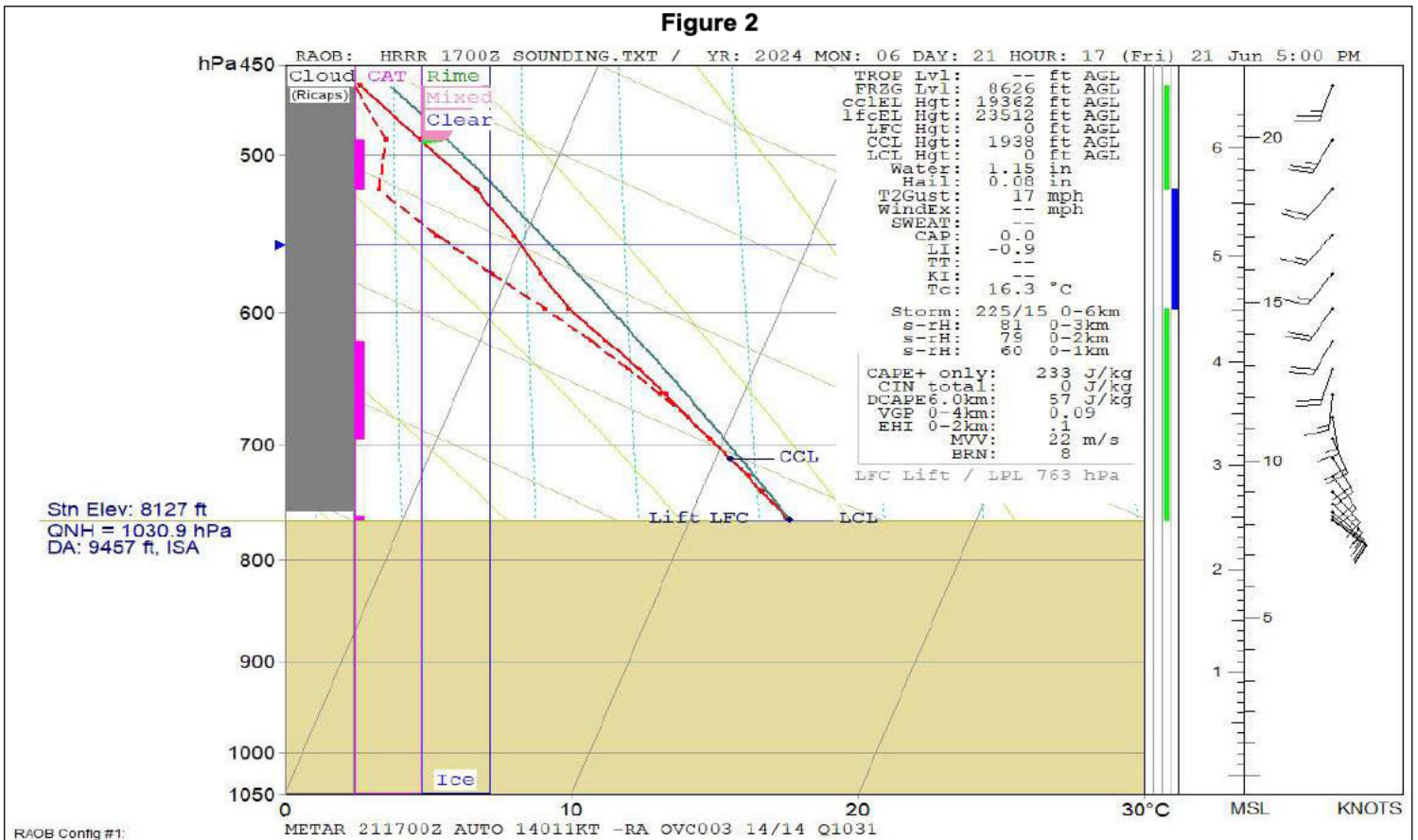
Additional Details

Figure 1



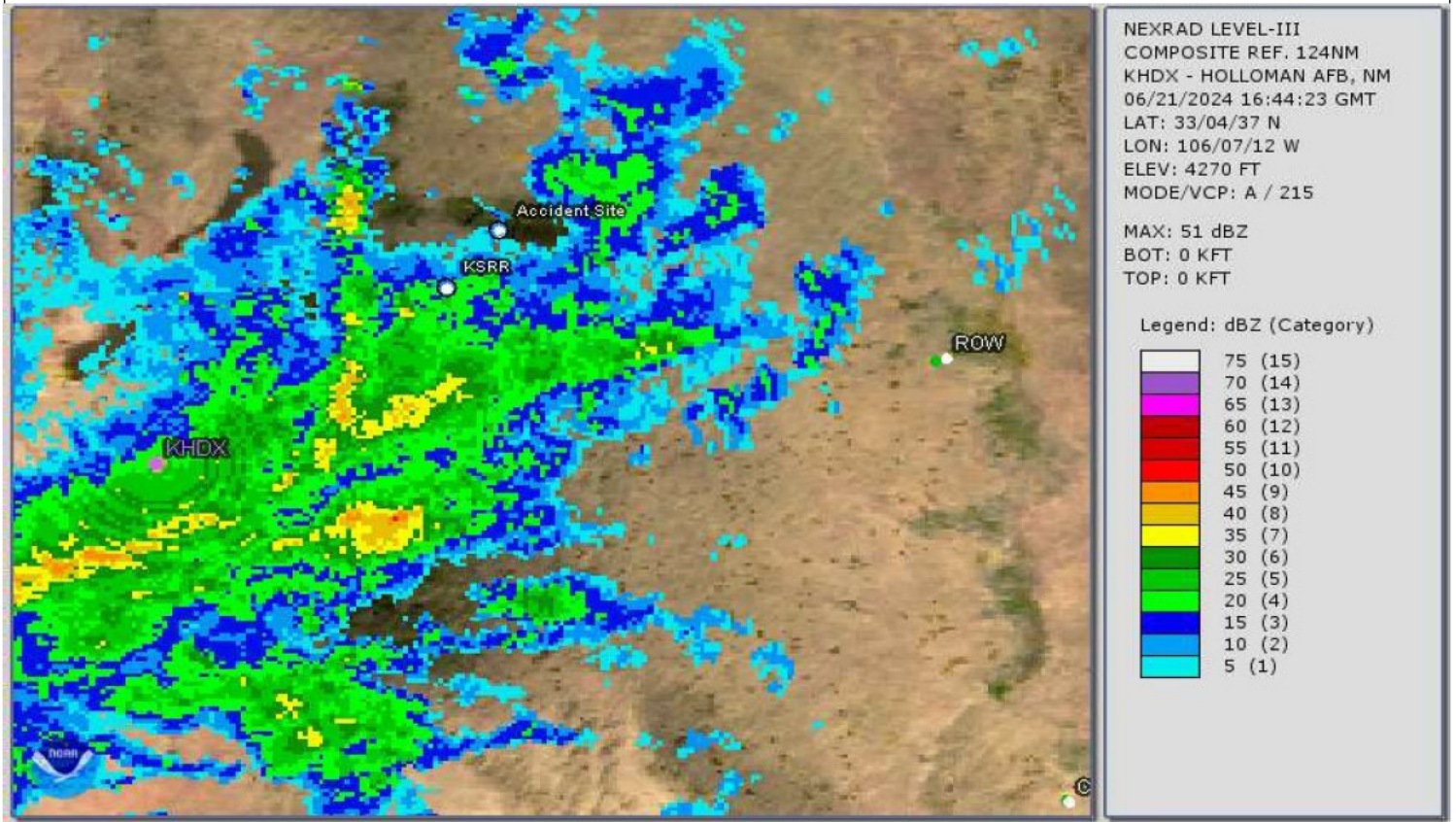
NWS Aviation Weather Center's METAR display for 1045 MDT (1645Z) with the radar mosaic overlaid. The approximate accident site is marked by the red star.

Figure 2



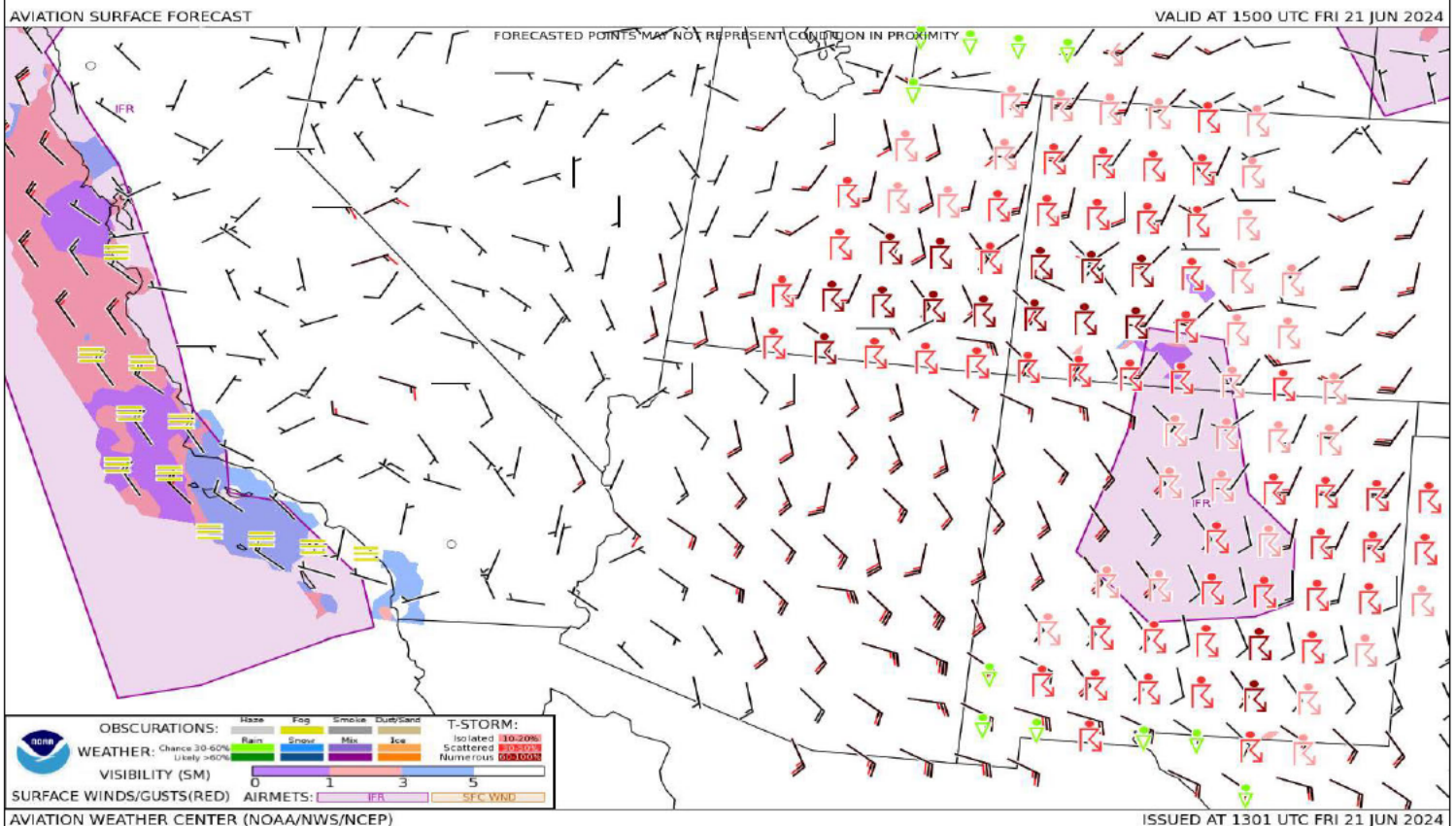
A High-Resolution Rapid refresh (HRRR) numerical model for 1100 MDT over the approximate accident site. Sounding supports nimbostratus clouds with bases near 300 ft and tops near 26,000 ft.

Figure 5



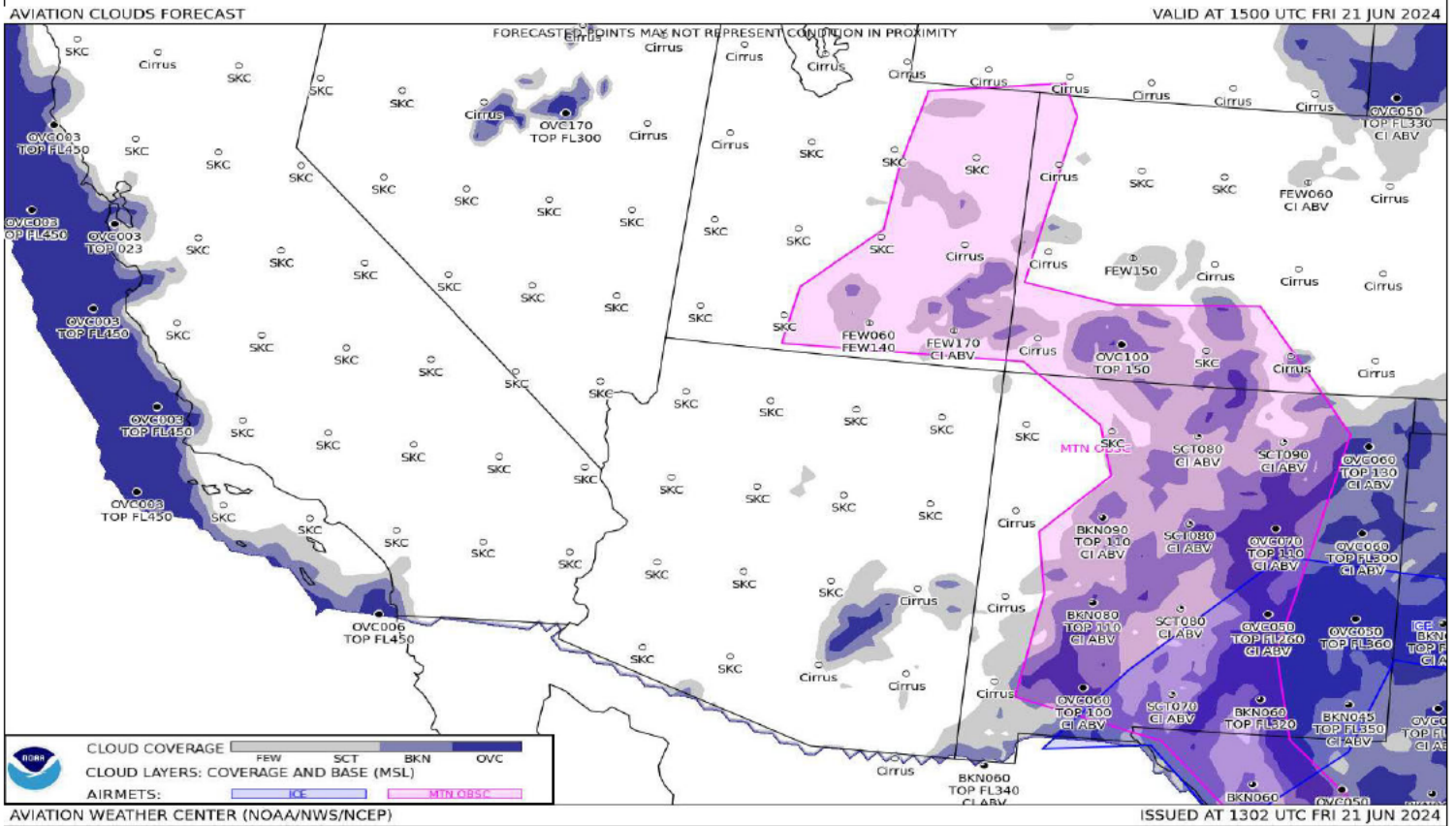
KHDX Composite Radar for 1044 MDT with very light intensity echoes over the accident site, consistent with light rain.

Figure 6



Graphic Forecast for Aviation (GFA) 3-hour Surface Forecast valid for 0900 MDT.

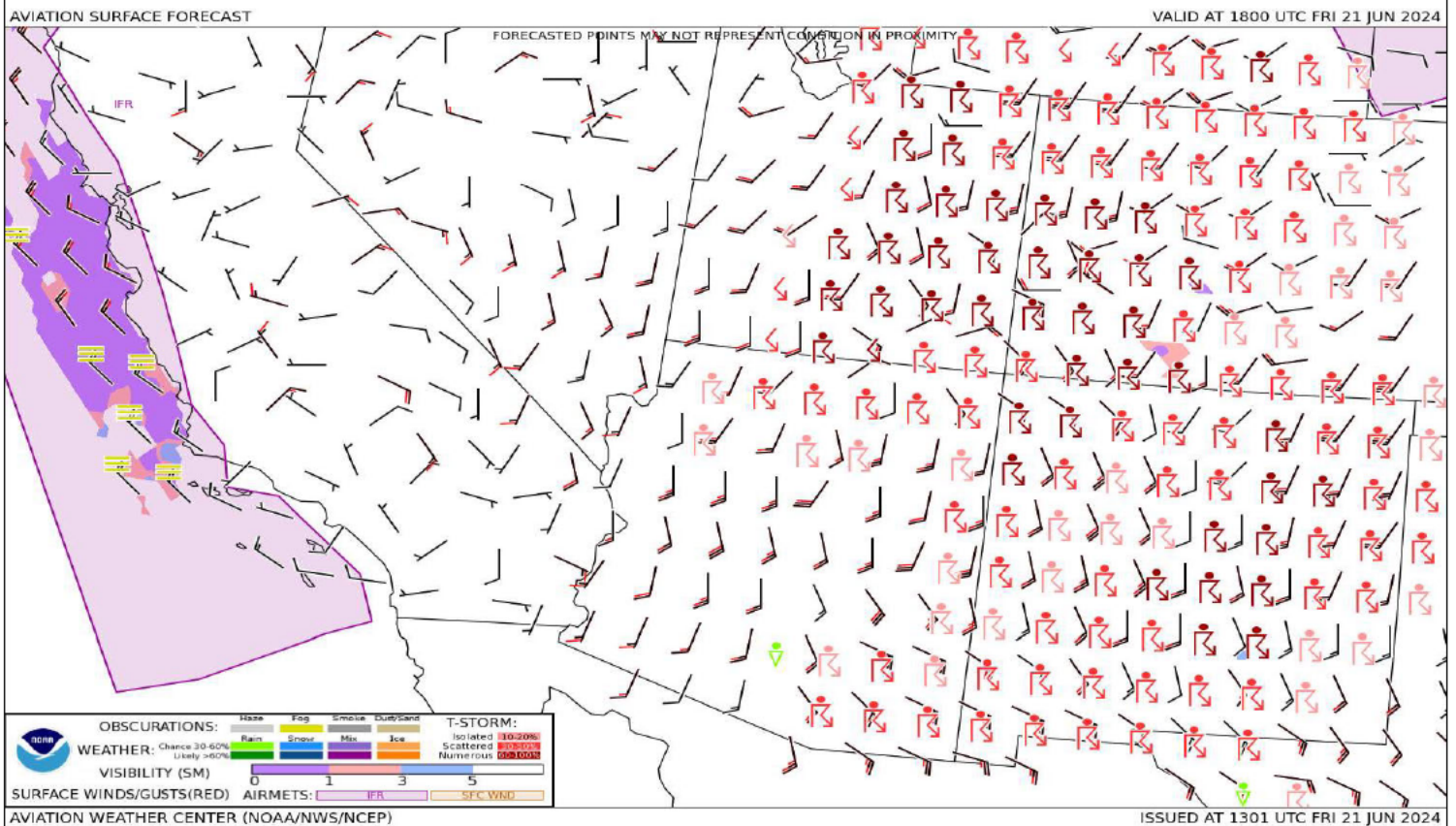
Figure 7



Caption

Graphic Forecast for Aviation (GFA) 3-hour Cloud Forecast valid for 0900 MDT.

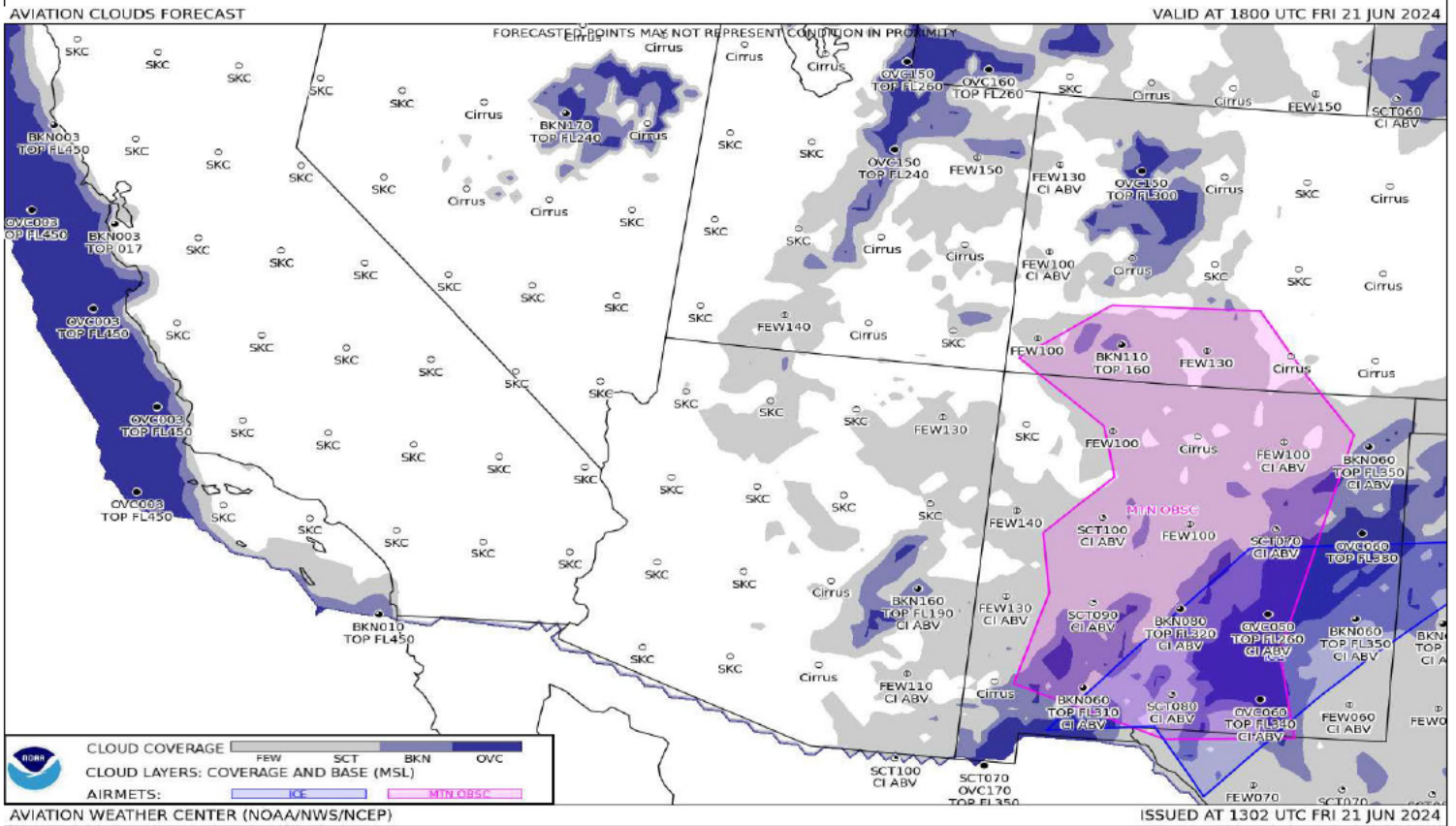
Figure 8



Caption

Graphic Forecast for Aviation (GFA) 6-hour Surface Forecast valid for 1200 MDT.

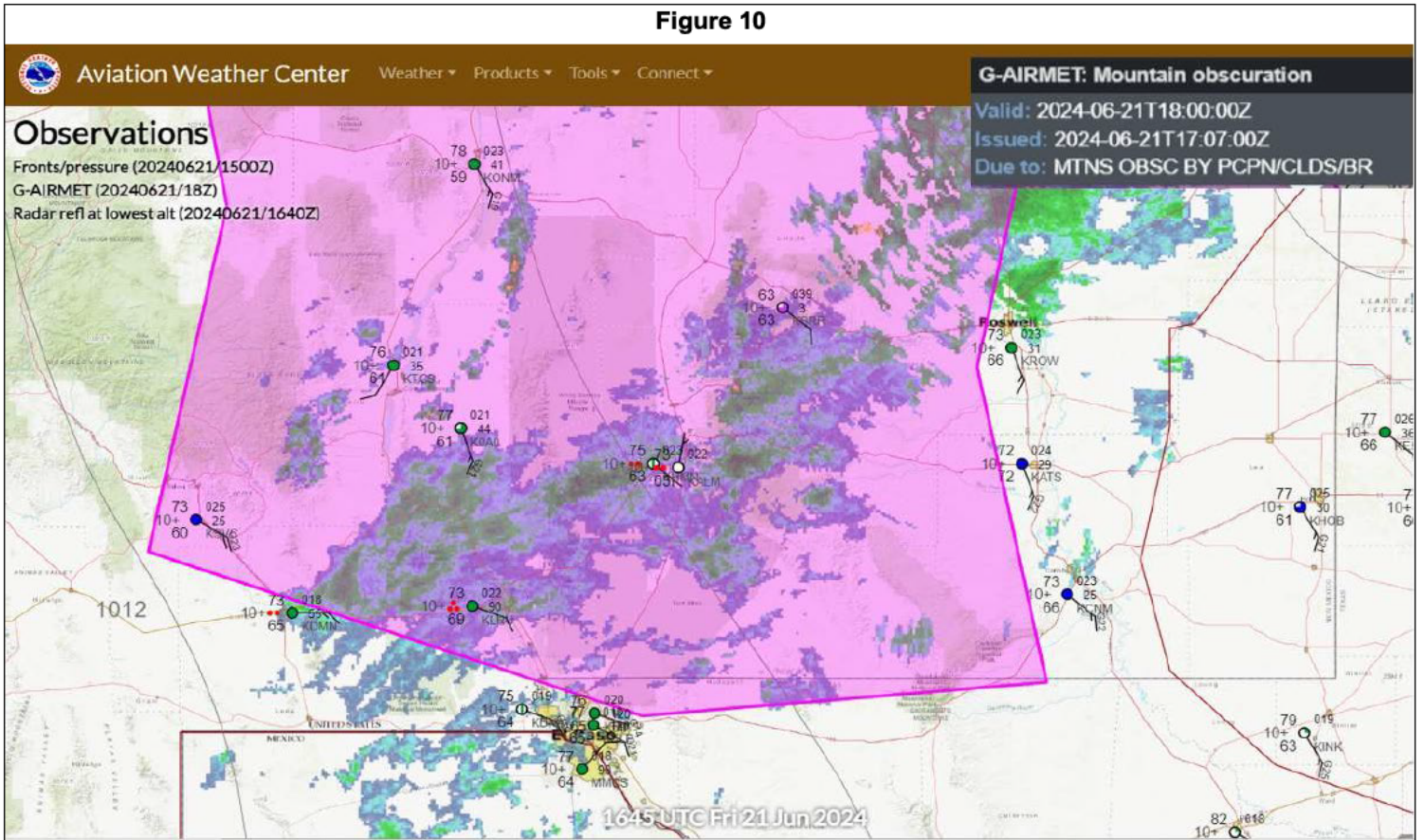
Figure 9



Caption

Graphic Forecast for Aviation (GFA) 6-hour Cloud Forecast valid for 1200 MDT.

Figure 10



Caption

METAR display with radar overlaid and Graphic-AIRMET for mountain obscuration conditions for 1045 MDT.