



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

May 27, 2022

Specialist's Factual Report

METEOROLOGY

WPR22FA100

A. ACCIDENT

Location: White Hills, Arizona

Date: February 19, 2022

Time: 1328 mountain standard time
2028 Coordinated Universal Time (UTC)

Aircraft: Vans RV-7A airplane; Registration: N787NV

B. METEOROLOGY SPECIALIST

Specialist Paul Suffern
National Transportation Safety Board
Washington, DC

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's Factual Report contains the meteorological factors pertinent to the weather surrounding the accident time. All times are mountain standard time (MST) and are based upon the 24-hour clock, where local time is -7 hours from UTC. Directions are referenced to true north and distances are 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 an approximate latitude 35.716° N, Longitude 114.482° W, and elevation of 2,415 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 southwestern United States for 1400 MST is provided as figure 1 with the location of the accident site within the black circle. The chart depicted a low-pressure system over southcentral Arizona at 1015-hectopascals (hPa). A surface trough² was depicted from southcentral Arizona northwest then northward into northeastern Nevada. Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present. Another low-pressure system was located in northeastern Nevada at 1018-hPa with a high-pressure system located in central Utah at 1025-hPa. The accident site was located just to the east of the surface trough.

The station models around the accident site depicted air temperatures in the mid 60's degrees Fahrenheit (°F), dew point temperatures between 10 and 20°F, with temperature-dew point spreads of 47°F or more, clear skies, and a northeast wind around 10 knots.

¹ https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1030235

² Trough - An elongated area of relatively low atmospheric pressure or heights.

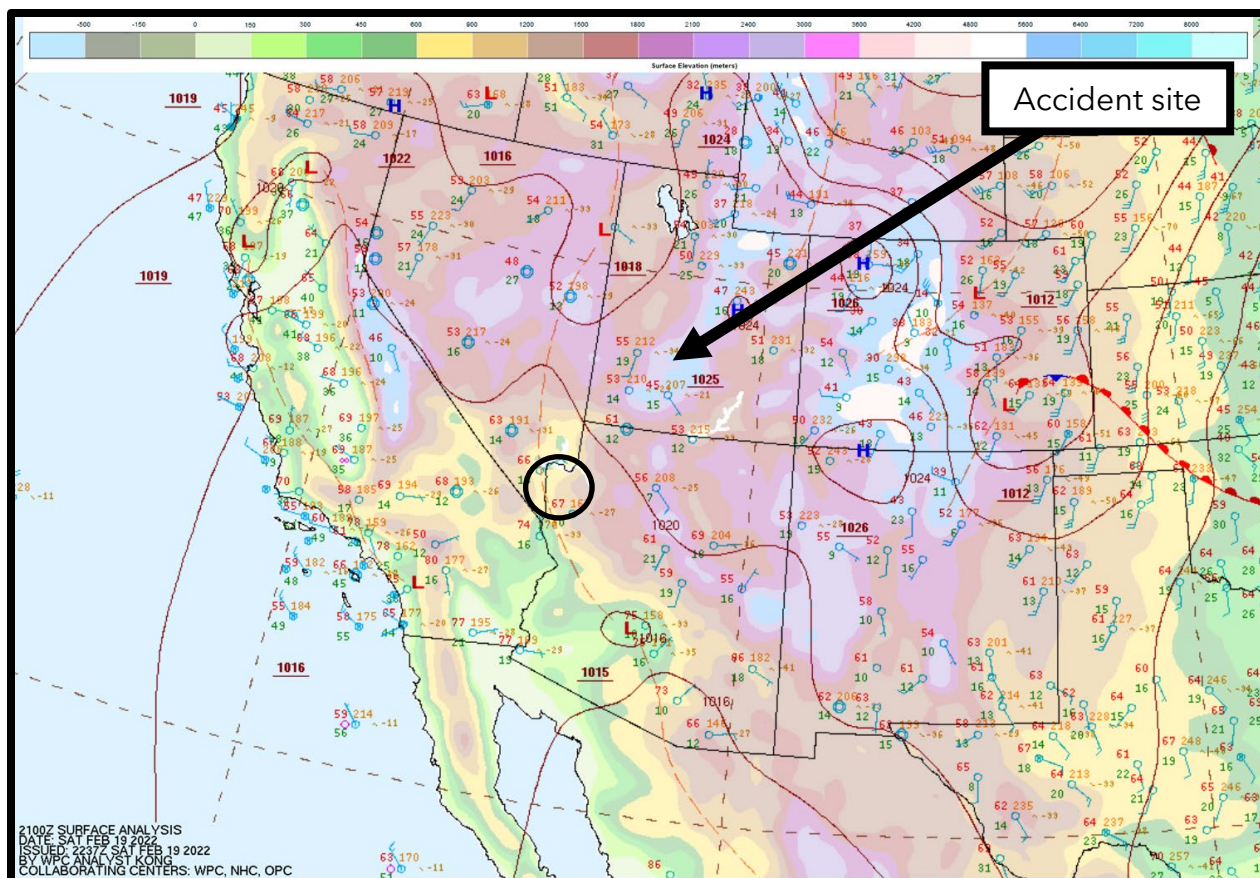


Figure 1. NWS Surface Analysis Chart for 1400 MST.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METARs) and Special Reports (SPECIs). The following observations were taken from standard code and are provided in plain language. Figure 2 is a local sectional chart with the accident site and the closest weather reporting locations marked. The chart depicted the magnetic variation³ of 11° east over the area.

³ Magnetic variation - The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>

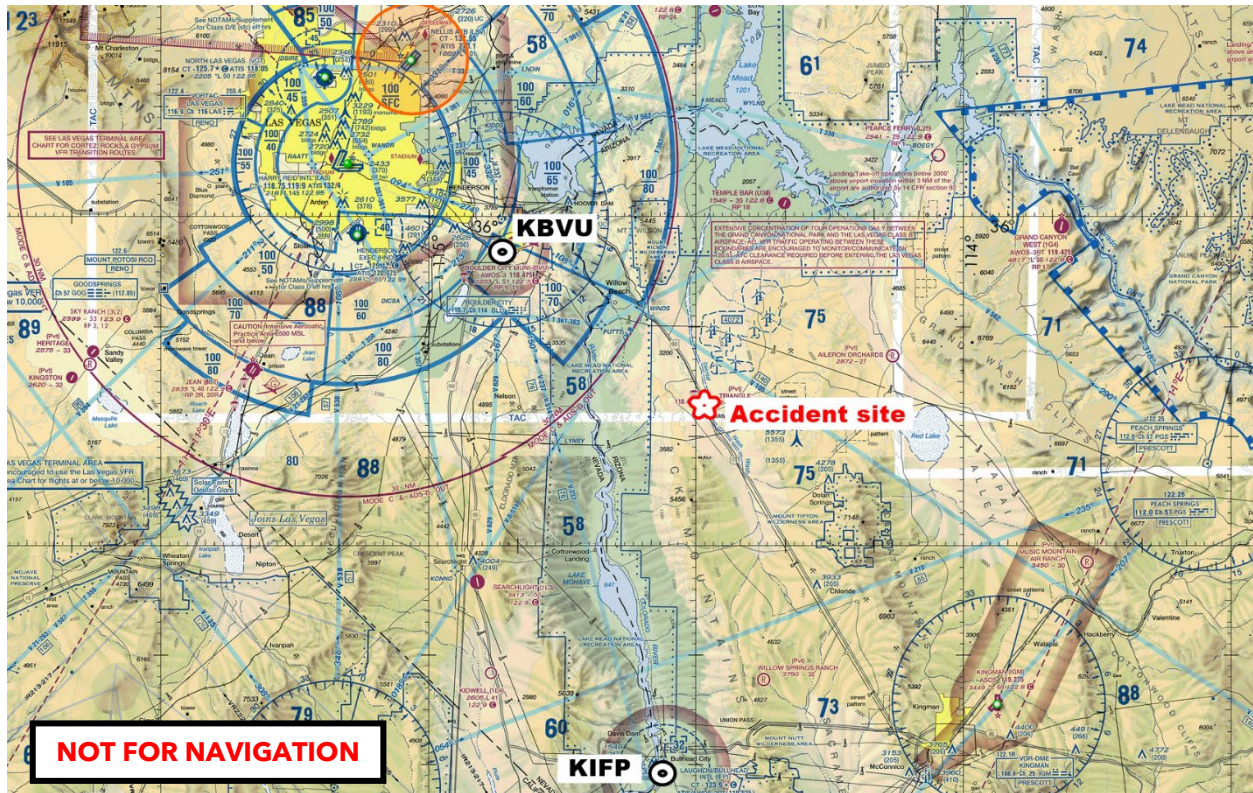


Figure 2. Sectional map of the accident area with the location of the accident site and surface observation sites.

Boulder City Municipal Airport (KBVU) had the closest official weather station to the accident site. KBVU had an Automated Weather Observing System (AWOS⁴) whose longline⁵ reports were not augmented. The KBVU AWOS was located 23 miles northwest of the accident site, at an elevation of 2,203 ft, and issued the following observations surrounding the period of the accident:⁶

⁴ AWOS - Automated Weather Observing System is equipped with meteorological instruments to observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to 12,000 feet, and altimeter setting. AWOS are maintained by the FAA.

⁵ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases 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 weather observations are distributed.

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.

[1155 MST] METAR KBVU 191855Z AUTO 03007KT 10SM CLR 17/M08
A3021 RMK AO2=

[1215 MST] METAR KBVU 191915Z AUTO 04006G11KT 10SM CLR
18/M08 A3021 RMK AO2=

[1235 MST] METAR KBVU 191935Z AUTO 05010KT 10SM CLR 18/M08
A3019 RMK AO2=

[1255 MST] METAR KBVU 191955Z AUTO 04011KT 10SM CLR 18/M08
A3018 RMK AO2=

***[1315 MST] METAR KBVU 192015Z AUTO 04009KT 10SM CLR
19/M08 A3016 RMK AO2=***

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***[1335 MST] METAR KBVU 192035Z AUTO 04007KT 10SM CLR
19/M09 A3015 RMK AO2=***

[1355 MST] METAR KBVU 192055Z AUTO 05008KT 10SM CLR 19/M08
A3013 RMK AO2=

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

KBVU weather at 1315 MST, automated, wind from 040° at 9 knots, visibility 10 miles or greater, clear skies below 12,000 ft above ground level (agl), temperature of 19° Celsius (C), dew point temperature -8°C, and an altimeter setting of 30.16 inches of mercury (inHg). Remarks, automated station with a precipitation discriminator.

KBVU weather at 1335 MST, automated, wind from 040° at 7 knots, visibility 10 miles or greater, clear skies below 12,000 ft agl, temperature of 19°C, dew point temperature -9°C, and an altimeter setting of 30.15 inHg. Remarks, automated station with a precipitation discriminator.

The closest official weather station to the accident site south of the accident site was Laughlin/Bullhead International Airport (KIFP). KIFP had an AWOS whose longline reports were augmented by air traffic control (ATC) when the tower was in operation⁷. The KIFP AWOS was located 34 miles south of the accident site at an elevation of 707 ft. KIFP AWOS observations surrounding the accident time are shown below:

⁷ ATC operational hours 0800 to 1800 local time.

[0852 MST] METAR KIFP 191552Z 01020KT 20SM CLR 16/M08 A3017=

[0948 MST] METAR KIFP 191648Z 01018KT 20SM CLR 17/M08 A3017=

[1047 MST] METAR KIFP 191747Z 35015KT 20SM SKC 19/M07 A3016=

[1147 MST] METAR KIFP 191847Z 36020KT 20SM CLR 20/M08 A3014=

***[1253 MST] METAR KIFP 191953Z 35020KT 20SM CLR 21/M08
A3011=***

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***[1351 MST] METAR KIFP 192051Z 36012KT 20SM CLR 23/M08
A3008=***

[1450 MST] METAR KIFP 192150Z 36012KT 20SM CLR 24/M09 A3004=

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

KIFP weather at 1253 MST, wind from 350° at 20 knots, visibility 20 miles, clear skies, temperature of 21°C, dew point temperature -8°C, and an altimeter setting of 30.11 inHg.

KIFP weather at 1353 MST, wind from 360° at 12 knots, visibility 20 miles, clear skies, temperature of 23°C, dew point temperature -8°C, and an altimeter setting of 30.08 inHg.

The observations from KBVU and KIFP surrounding the accident time indicated VFR⁸ conditions with a north to northeast surface wind between 7 and 20 knots.

⁸ 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 Local Wind Farm Data

A private wind farm company was contacted to request wind information from their wind sensors. The private wind farm company weather sensor information provided was approximately 11 miles northeast of the accident site at an approximate elevation of 3,220 ft. The wind information is provided in meters per second (m/s) with sensors located at various levels above ground level. The factual dataset and information can be found in attachments 1 and 2.

4.0 Upper Air Sounding

A High-Resolution Rapid Refresh (HRRR)⁹ model sounding was created for the approximate accident site coordinates for 1300 MST with a surface elevation of 2,438 ft.¹⁰ The 1300 MST HRRR sounding was plotted on a standard Skew-T Log P diagram¹¹ from the surface to 600-hPa (or approximately 14,000 ft) along with the derived stability parameters and is included as figure 3. These data were analyzed using the RAOB¹² software package. The sounding depicted the lifted condensation level (LCL)¹³ at 12,512 ft and the convective condensation level (CCL)¹⁴ at 18,061 ft. The freezing level was located at 10,739 ft. The precipitable water value was 0.18 inches.

⁹ 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.

¹⁰ HRRR sounding was created using NOAA Air Resource Laboratory:

<https://ready.arl.noaa.gov/READYamet.php>

¹¹ 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.

¹² RAOB - (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Esonde Research Services, The Villages, Florida.

¹³ LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹⁴ 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.

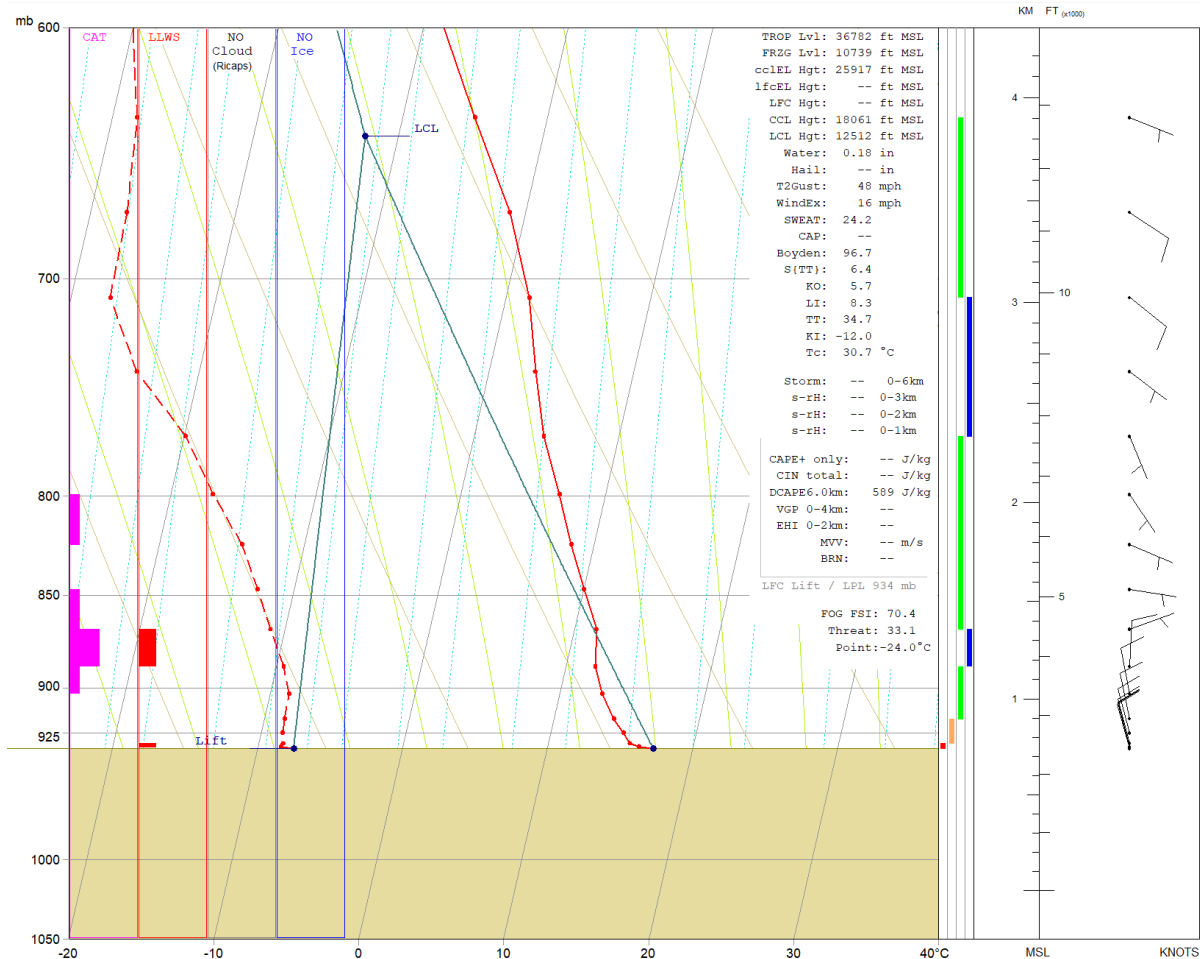


Figure 3. 1300 MST HRRR sounding.

The 1300 MST HRRR sounding for the accident site indicated an unstable to conditionally unstable environment from the surface through 8,000 ft with a stable layer between 4,000 and 4,500 ft. No clouds were indicated by RAOB below 14,000 ft. No icing potential was indicated by RAOB below 14,000 ft.

The 1300 MST HRRR sounding wind profile indicated a near surface wind from 345° at 11 knots with the wind remaining northerly at 10 to 12 knots below 5,000 ft. Above 5,000 ft, the wind became southeast to easterly between 5 and 10 knots through 14,000 ft. RAOB indicated the possibility of light low-level wind shear (LLWS) below 2,000 ft agl, and light clear air turbulence below 6,500 ft.

5.0 Pilot Reports

The longline-disseminated pilot reports¹⁵ (PIREPs) distributed into the national airspace (NAS) were reviewed for about two hours either side of the accident time and no PIREPs were issued into the NAS within 100 miles of the accident site for below 18,000 ft.

6.0 Significant Meteorological Information

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

7.0 Center Weather Service Advisories

The Los Angeles (ZLA) Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU) was responsible for the accident region. There were no Center Weather Advisories (CWAs) valid from ZLA CWSU at the accident time.

8.0 Airmen's Meteorological Information

There were no Airmen's Meteorological Information (AIRMET) advisories valid for the accident site at the accident time.

9.0 Terminal Aerodrome Forecast

There were no NWS Terminal Aerodrome Forecast¹⁶ (TAF) located within 30 miles of the accident site.

¹⁵ Only pilot reports with the World Meteorological Organization headers UBNV**, UBUT**, UBCA**, and UBAZ** were considered. These do not include pilot reports only broadcast via radio.

¹⁶ According to NWS Instruction 10-813: "An 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

10.0 National Weather Service Area Forecast Discussion

The NWS weather forecast office in Las Vegas, Nevada, (WFO VEF) was responsible for the public forecast in the region of the accident site. WFO VEF issued the following Area Forecast Discussion (AFD) at 0215 MST, the closest AFD to the accident time with an aviation section, that identified breezy north winds up to 25 knots during the afternoon (including the accident timeframe):

FXUS65 KVEF 190915
AFDVEF

Area Forecast Discussion
National Weather Service Las Vegas NV
115 AM PST Sat Feb 19 2022

.SYNOPSIS...Quiet weather with a slow warming trend can be expected through Sunday, followed by colder and unsettled weather with chances for rain and snow next week as a large low pressure system drops down from Canada into the Western states.
&&

.SHORT TERM...through tonight. Early morning satellite loop showed clear skies areawide. Surface obs showed light winds, aside from breezy north winds in the Colorado River Valley, and temperatures averaging about five degrees warmer than 24 hours ago. Low pressure well offshore of central California early this morning will continue tracking south and will be offshore of the Baja by late tonight. Light flow and dry air over our area will lead to a quiet weather day, with high temperatures a few degrees warmer than yesterday.

.LONG TERM...Sunday through next Thursday.

Broad longwave troughing begins to take hold over the western US Sunday afternoon and remains in place until Thursday. Within the longwave trough, two waves are forecast to propagate through, bringing weather impacts to our area next week.

The first wave comes in on Monday, primarily bringing gusty winds to the entire CWA. Given their west-southwest direction, strongest winds will be in San Bernardino, Clark, and Mohave counties. Gusts in these locations will likely exceed 40-50 mph. Winds elsewhere should be in the 30-40 mph range. The strong winds and the potential for blowing dust will make for hazardous travel, especially for high-profile vehicles. Monday is expected to be the windiest day of the week, but winds may remain elevated through Wednesday. Precipitation wise, not expecting much out of this first system given the modest dynamics and limited moisture. Best precip chances will be in Lincoln, northeastern Clark, and northern Mohave counties. Snow levels are forecast to be between 4500-5500 ft on Monday.

Late Tuesday through Thursday, the more potent, second system comes in as the base of the longwave trough pivots through our area. There

are still some timing discrepancies, with the ECMWF ensemble still slower than the GEFS and GEPS. However, guidance seems to be centering the most impactful weather around Wednesday. Moisture with this system looks to still be limited, but better than the preceding wave. Combined with better dynamics, precip chances will be greater across the entire CWA. Amounts are forecast to be relatively light across the area, with highest values on the high terrain and Mohave County. The colder air associated with this system will bring snow levels down enough to allow for low-elevation snow. Whether or not we see low-elevation snow depends on the timing of the cold air and precip. Currently looks like there will be some overlap, so I would not be surprised to see some snow flakes in Las Vegas Wednesday or Thursday morning, especially on the western edge of town. With light precip rates and warm ground temperatures, not expecting any snow accumulation in the lower elevations. Light snow accumulations will be possible in the northern 1/3 of our area. A couple inches of snow are possible on Mt. Charleston and the higher elevations in Mohave County. Winds with this second wave will be gusty, but should be weaker than Monday's. Wind direction should turn more northerly as the system departs late Wednesday or Thursday. After the recent stretch of warm weather, it looks like winter is coming back to claim her throne.

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.AVIATION...For Harry Reid...Light southwest winds will continue through mid morning then become northeast at less than 10kts. Mainly clear skies are expected through the TAF period.

For the rest of southern Nevada, northwest Arizona and southeast California...Breezy northerly winds up to 25kts are expected this afternoon in the Lower Colorado River Valley. Elsewhere, winds less than 10kts favoring typical diurnal variations can be expected today. High clouds AOA 20kft at KDAG and KEED late this afternoon and evening otherwise, skies will be mainly clear through the TAF period.

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.SPOTTER INFORMATION STATEMENT...Spotters are encouraged to report any significant weather or impacts according to standard operating procedures.

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11.0 Winds and Temperature Aloft Forecast

The NWS 1259 MST Winds and Temperature Aloft forecast valid for the closest point to the accident site is included below:

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FBUS31 KWNO 191959  
FD1US1  
DATA BASED ON 191800Z  
VALID 200000Z FOR USE 2000-0300Z. TEMPS NEG ABV 24000  
  
FT 3000 6000 9000 12000 18000 24000 30000 34000 39000  
LAS 9900+09 2105+04 9900-03 1607-18 1206-32 141347 240753 252555
```

The closest forecast point to the accident site was Las Vegas, Nevada (LAS). The 1259 MST LAS forecast for use between 1300 MST and 2000 MST indicated a calm wind at 6,000 ft with a temperature of 9°C and a wind at 9,000 ft from 210° at 5 knots with a temperature of 4°C.

12.0 Pilot Weather Briefing

The accident pilot did not request weather information¹⁷ from Leidos Flight Service.

A search of archived ForeFlight information indicated that the accident pilot did have a ForeFlight account. The accident pilot did not request a ForeFlight weather briefing before the accident flight nor had the accident pilot viewed static Weather Imagery in ForeFlight prior to the flight. The accident pilot had viewed the Harry Reid International Airport (KLAS) information (which does include text weather information for the airport) at 1124 MST. With no internet access while in flight, ForeFlight is still able to access weather information directly from the FAA, but leaving no remote record of such access. For more information please see attachment 3.

¹⁷ https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-92.pdf

13.0 Astronomical Data

The astronomical data obtained for the accident site on February 19, 2022, indicated the following:

SUN

Begin civil twilight 0654 MST

Sunrise 0720 MST

Sun transit 1252 MST

Accident time 1328 MST¹⁸

Sunset 1824 MST

End civil twilight 1850 MST

At the time of the accident the Sun was located at an altitude of 42.46° and azimuth of 192.11°.

E. LIST OF ATTACHMENTS

Attachment 1 - Wind farm dataset

Attachment 2 - Additional wind farm dataset information

Attachment 3 - ForeFlight correspondence

Submitted by:

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Senior Meteorologist

¹⁸ Inserted accident time for reference and context.