



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

June 8, 2022

Specialist's Factual Report

METEOROLOGY

WPR22FA068

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A. ACCIDENT

Location: El Cajon, California
Date: December 27, 2021
Time: 1914 Pacific standard time (0314 UTC on December 28, 2021)¹
Aircraft: Type – Learjet 35A; Registration – N880Z

B. METEOROLOGIST

Mike Richards
Senior Meteorologist
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 Pacific standard time (PST) for December 27, 2021 (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) unless otherwise noted. The accident site was located at about: 32.821182° north latitude; 116.93942° west longitude at an elevation of about 580 feet.

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

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Weather Observing System (AWOS) was located at Gillespie Field Airport (SEE²) which was in El Cajon, California, about 1.5 miles west of the accident location at an elevation of about 385 feet and had a magnetic variation of about 11°30’ east. Augmented longline³ reports

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.

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

from the SEE AWOS during the times surrounding the accident time are presented here, and the observation closest in time to the accident time is highlighted by bold text.

[1747 PST] METAR KSEE 280147Z VRB06KT 10SM FEW029 BKN042 11/06
A2995=
[1813 PST] SPECI KSEE 280213Z VRB06KT 5SM BR FEW019 BKN026 11/07
A2997=
[1855 PST] METAR KSEE 280255Z VRB05KT 3SM BR BKN020 OVC026 10/08
A2998=
[1955 PST] METAR KSEE 280355Z VRB05KT 3SM BR SCT011 BKN020 11/09
A2996=

At 1855 PST, the SEE AWOS reported a variable wind at 5 knots, visibility of 3 statute miles, mist, ceiling broken at 2,000 feet above ground level (agl), overcast clouds at 2,600 feet agl, temperature of 10° Celsius (C) and dew point temperature of 8°C, altimeter setting of 29.98 inches of mercury.

One-minute SEE AWOS data (OMO) were provided by the County of San Diego and a subset of the OMO for times surrounding the accident time are presented below with the parameters: time average wind magnitude (WM; knots), average wind direction (WD; true), gust wind magnitude (GM; knots), variable wind (VM), visibility (V; statute miles), variable visibility (VarV; statute miles), present weather (WX), sky condition (SKY; feet agl) and liquid equivalent precipitation (P; hundredths of an inch since the top of the previous hour). A”/” indicates a missing value (see Attachment 1). The full raw OMO dataset as provided by the County of San Diego can be found in Attachment 1. Correspondence with the County of San Diego regarding the AWOS and its data, as well as the referenced AWOS manual, can be found in Attachment 2.

<u>Time</u>	<u>WM</u>	<u>WD</u>	<u>GM</u>	<u>VW</u>	<u>V</u>	<u>VarV</u>	<u>WX</u>	<u>SKY</u>	<u>P</u>
1850	/	/	/	/	3		BR	SCT015 BKN022 BKN028	2
1851	/	/	/	/	3		BR	SCT016 BKN022 BKN028	2
1852	6	180°	/		4		BR	SCT016 BKN022 BKN028	2
1853	6	180°			4		BR	SCT016 BKN022 BKN028	3
1854	/	/	/	/	4		BR	SCT015 BKN021 BKN028	3
1855	/	/	/	/	3		BR	SCT015 BKN021 BKN028	3
1856	5	170°			3		BR	SCT015 BKN021 BKN028	3
1857	5	180°			3		BR	SCT014 BKN020 BKN026	3
1858	/	/	/	/	3		BR	SCT014 BKN020 BKN026	3
1859	/	/	/	/	3		BR	SCT014 BKN020 BKN026	3
1900	4	180°			3		BR	SCT014 BKN021 BKN028	3

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.

1901	5	180°			2 1/2	BR	BKN014 BKN021 BKN028	0
1902	/	/	/	/	2 1/2	1 1/2-3	BR	BKN013 BKN021 BKN028 0
1903	4	190°		VRB	2	BR	FEW010 BKN014 BKN020	0
1904	4	180°			2	BR	FEW010 BKN014 BKN020	0
1905	5	190°			2	BR	FEW007 BKN013 BKN021	0
1906	4	190°			2	BR	FEW007 BKN013 BKN018	0
1907	5	190°			2	BR	FEW009 BKN015 BKN022	0
1908	/	180°	/		2	BR	FEW009 BKN015 BKN022	0
1909	/	/	/	/	2	BR	FEW007 SCT013 BKN018	0
1910	/	/	/	/	2	BR	FEW007 SCT013 BKN018	0
1911	5	190°	/		2	BR	FEW009 BKN016 OVC028	0
1912	/	/	/	/	2 1/2	BR	FEW009 BKN016 OVC028	0
1913	/	/	/	/	2 1/2	BR	FEW010 BKN016 OVC028	1
1914	/	/	/	/	2 1/2	BR	FEW010 BKN016 OVC028	1
1915	/	/	/	/	2 1/2	BR	FEW008 BKN016 OVC028	1
1916	5	190°	/		2 1/2	-RA	FEW008 BKN016 OVC028	1
1917	5	190°			2 1/2	-RA	FEW010 BKN016 OVC023	1
1918	6	190°			2 1/2	-RA	FEW008 BKN016 OVC023	1
1919	6	190°			2 1/2	-RA	SCT012 BKN018 OVC023	1
1920	6	190°			2 1/2	-RA	SCT013 BKN017 OVC021	1

2.0 Weather Radar

WSR-88D⁴ Level-II base reflectivity weather radar imagery from the San Diego, California, site (KNKX) is presented in figure 1. KNKX was located about 8 miles northwest of the accident location at an elevation of about 1,050 feet. Assuming standard refraction and considering the 0.95° beam width⁵ for the WSR-88D radar beam, the KNKX 0.52° tilt would have “seen” altitudes over the accident location of between about 1,130 and 1,930 feet. The imagery revealed that at the accident time there were light values of reflectivity⁶ along the final portion of the accident aircraft’s flight path and in the immediate vicinity of the accident location.

⁴ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁵ 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.

⁶ According to the Federal Aviation Administration’s Advisory Circular 00-24C, a reflectivity intensity of “light” is dBZ values less than 30, “moderate” is dBZ values between 30 and 40, “heavy” is dBZ values greater than 40 and less than or equal to 50, and “extreme” is dBZ values greater than 50.

(https://www.faa.gov/documentlibrary/media/advisory_circular/ac%2000-24c.pdf)

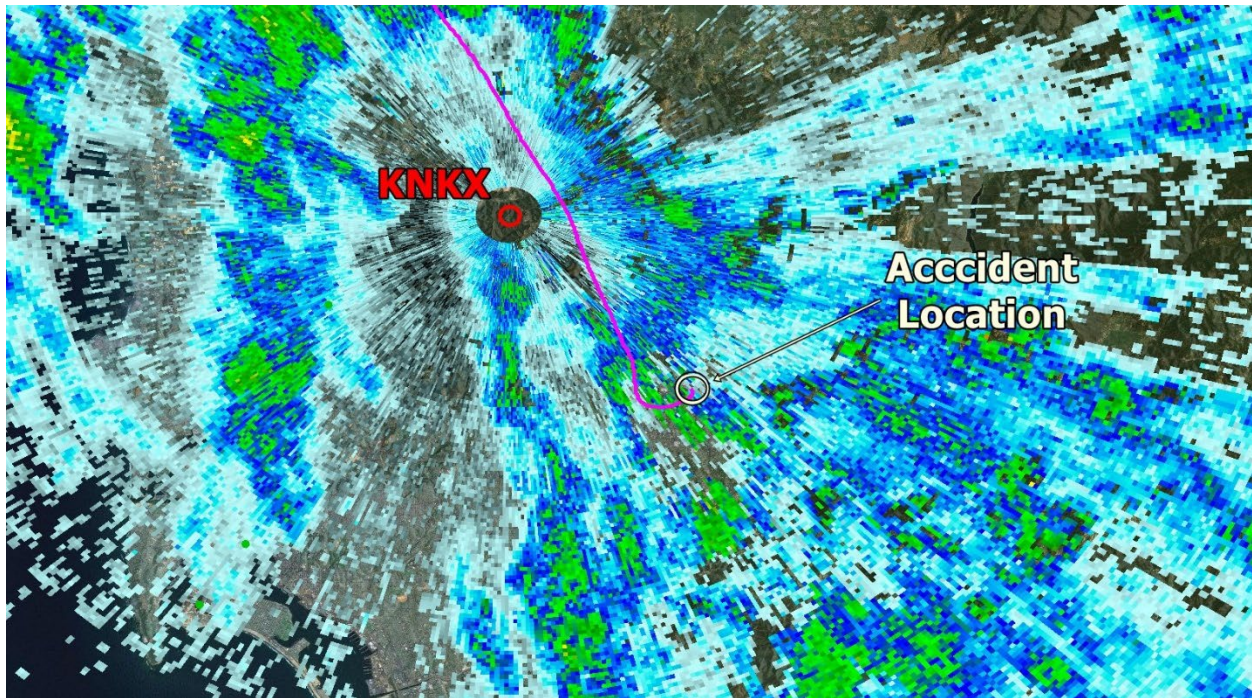


Figure 1 – KNKX 0.52° Level-II base reflectivity product from a sweep initiated at 1913:69 PST. Accident aircraft flight path marked by purple line.

3.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁷ sounding (figure 2) for near the accident site⁸ at 1900 PST using an elevation of 387 feet was retrieved from the National Oceanic and Atmospheric Administration's Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Cloudy conditions were identified by RAOB from about 2,000 to 9,800 feet. The freezing level was noted at about 5,600 feet. The wind at about 100 feet agl was from the south-southwest at about 10 knots. Above this level the wind veered⁹ slightly and increased in magnitude to a west-southwest wind of about 25 knots at about 4,000 feet.

⁷ 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.

⁸ Coordinates used for the model were 32.83, -116.97.

⁹ A veering wind's wind barbs turn clockwise with increasing height.

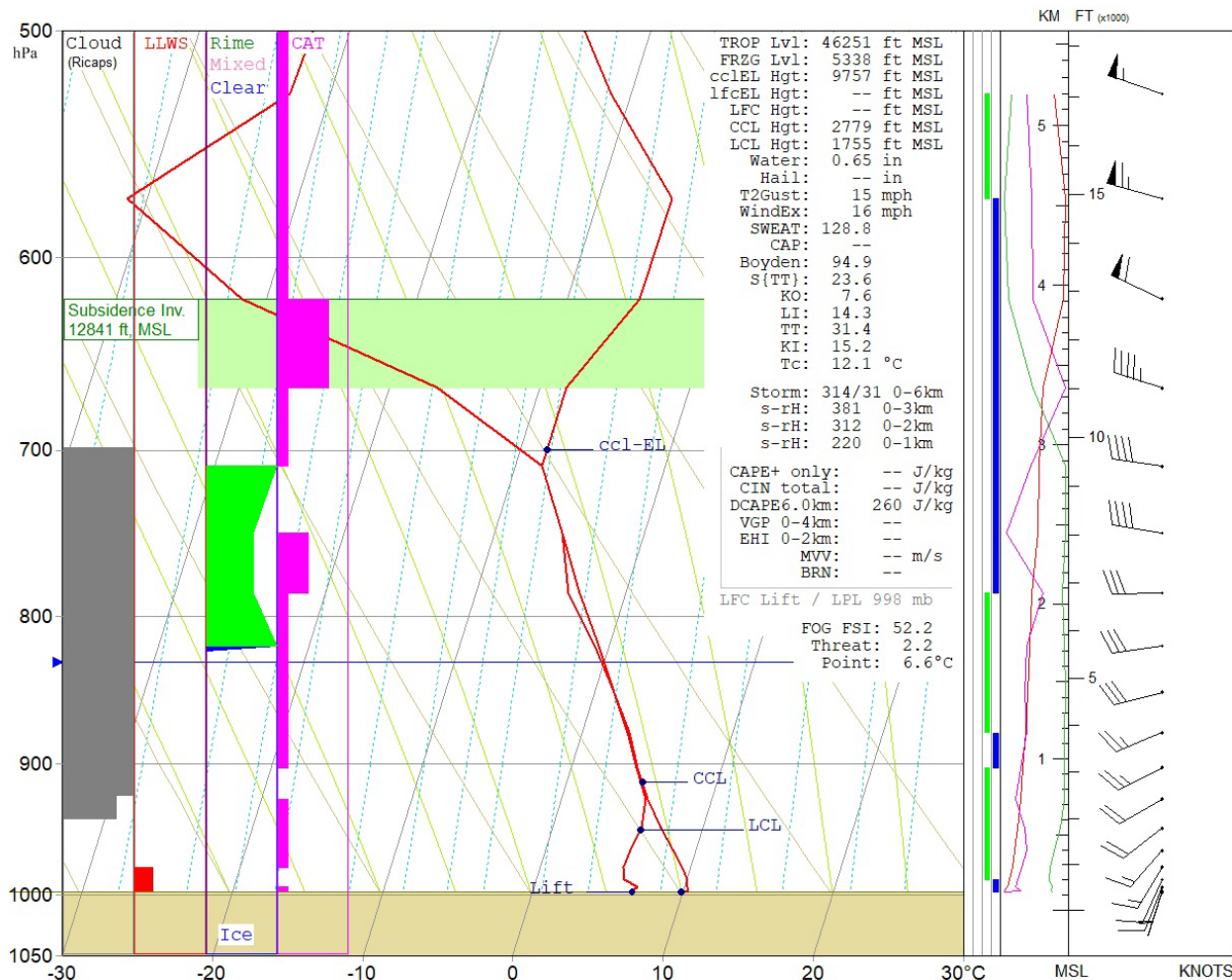


Figure 2 – HRRR model sounding data in SkewT/LogP format for 1900 PST near the accident site, surface to 500 hectopascals.

4.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-17 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 1911 PST is presented in figure 3. Infrared cloud-top temperatures over the accident site were about -4°C, which, when considering the 1900 PST HRRR sounding, corresponded to cloud top heights of about 7,300 feet.

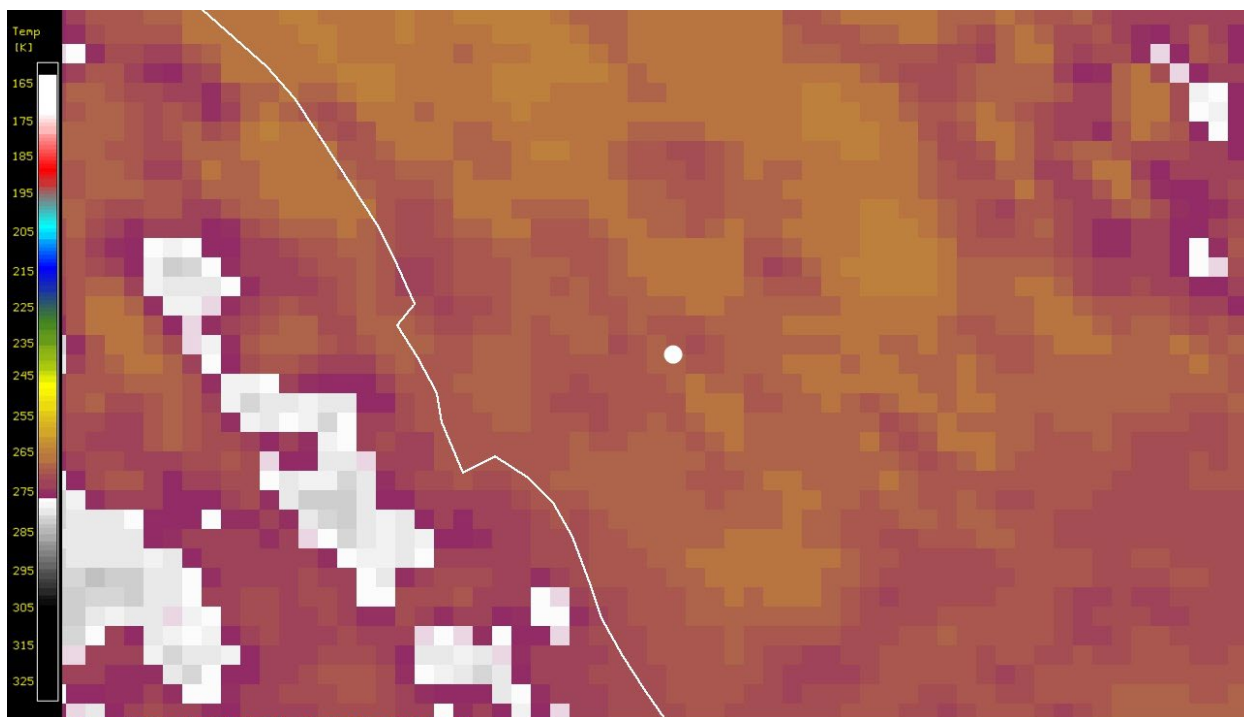


Figure 3 – GOES-17 infrared imagery from 1911 PST. Accident location denoted by the white dot. Image is not corrected for parallax error.

5.0 Pilot Reports

The following longline-disseminated pilot reports¹⁰ (PIREPs) were applicable within 20 miles of the accident location within 2 hours of the accident time.

SAN UA /OV 2 MILES EAST/TM 0300/FL1500/TP B737/SK BKN015/RM BASES
VARIABLE BETWEEN 015 AND 020

MYF UA /OV 2E/TM 0320/FLUNKN/TP C25A/SK OVC013 - TOP UNKN/IC LGT
RIME/RM LLWS +/- 10KT 2 MILE FINAL

SAN UA /OV RUNWAY 27/TM 0411/FL000/TP B737/SK BKN028/WX 7SM /RM
BREAKING ACTION GOOD

SAN UA /OV 20 S JLI/TM 0435/FL090/TP B737/TB LITE

6.0 Area Forecast Discussion

The National Weather Service (NWS) San Diego, California, Weather Forecast Office issued the following Aviation section of an Area Forecast Discussion at 1400 PST.

¹⁰ These do not include pilot reports only broadcast via radio.

*FXUS66 KSGX 272156
AFDSGX
Area Forecast Discussion
National Weather Service San Diego CA
200 PM PST Mon Dec 27 2021*

.AVIATION...

272100Z...SCT-BKN030-050 through 23Z with isolated -SHRA. Clouds thickening and lowering to BKN-OVC020-030 between 23Z-09Z with more widespread showers moving in from the northwest. CIGS down to 015 and vis lowering to 2-5 miles in the heaviest showers tonight.

Mountain slopes becoming obscured in clouds/fog/pcpn tonight. W-NW winds 25-35 kt in the mtns and desert slopes with gusts to 60 kt and moderate to strong up/downdrafts and LLWS.

Showers ending most areas tonight except isolated showers Tuesday in the mountains and in San Diego County. Mountain occasionally obscured in clouds and fog Tuesday.

7.0 AIRMETs

Airmen's Meteorological Information (AIRMET) advisories for instrument flight rule (IFR)¹¹ conditions, mountain obscuration, moderate turbulence below FL180¹², low-level wind shear (LLWS) and moderate icing between the freezing level and 17,000 feet were active for the accident location at the accident time. The same AIRMETs for moderate turbulence below FL180 and LLWS were reissued at 1913 PST.

WAUS46 KPCI 280245

WA6S

-SFOS WA 280245

AIRMET SIERRA FOR IFR AND MTN OBSCN VALID UNTIL 280900

AIRMET IFR...CA AND CSTL WTRS

*FROM HEC TO 50S TRM TO 20S MZB TO 30SW LAX TO 30NNW LAX TO HEC CIG
BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 09Z ENDG 09-12Z.*

AIRMET MTN OBSCN...CA

*FROM 50SE OED TO 40SSE LKV TO 40S FMG TO 70WSW BTY TO 20S HEC TO
40WSW BZA TO 20S MZB TO 20NW LAX TO 30SSE EHF TO 20NNE EHF TO RBL TO
50SE OED*

***MTNS OBSC BY CLDS/PCPN/BR.** CONDS CONTG BYD 09Z THRU 15Z.*

WAUS46 KPCI 280245

¹¹ IFR conditions - Ceilings less than 1,000 feet agl and/or visibility less than three statute miles.

¹² 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.

WA6T

-SFOT WA 280245

AIRMET TANGO FOR TURB AND LLWS VALID UNTIL 280900

AIRMET TURB...CA NV AZ AND CSTL WTRS

FROM SAC TO EHF TO PGS TO 30S TUS TO BZA TO 30SE MZB TO 60WSW RZS TO 40SW OAK TO SAC

MOD TURB BLW FL180. CONDS CONTG BYD 09Z THRU 15Z.

LLWS POTENTIAL...CA NV AZ AND CSTL WTRS

BOUNDED BY 80NNW FMG-70NNE FMG-BTY-PHX-90SSW PHX-BZA-20WSW MZB-50NNE SAC-80NNW FMG

LLWS EXP. CONDS CONTG BYD 09Z ENDG 12-15Z.

WAUS46 KKKI 280245

WA6Z

-SFOZ WA 280245

AIRMET ZULU FOR ICE AND FRZLVL VALID UNTIL 280900

AIRMET ICE...CA AND CSTL WTRS

FROM 140WSW FOT TO 40SSW FMG TO 20S BTY TO 20SSW EED TO 40E MZB TO 60WSW MZB TO 140SW SNS TO 140WSW FOT

MOD ICE BTN FRZLVL AND 170. FRZLVL SFC-050. CONDS CONTG BYD 09Z THRU 15Z.

8.0 SIGMETs

There were no Convective Significant Meteorological Information (SIGMET) advisories active for the accident location at the accident time. At 1912 PST, the following SIGMET was issued for an area that included the accident location at the accident time and advised of occasional severe turbulence below 12,000 feet.

WSUS06 KKKI 280312

WS6Q

-SFOQ WS 280312

SIGMET QUEBEC 1 VALID UNTIL 280712

CA AND CSTL WTRS

FROM 60WSW LAS TO EED TO BZA TO MZB TO EHF TO 60WSW LAS

OCNL SEV TURB BLW 120. RPTD BY C56X and CRJ2. CONDS CONTG BYD 0712Z.

9.0 CWSU Products

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

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. Hourly model data and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS are available, however only certain imagery are archived by the NWS.

The following images (Figures 4 and 5) depict GFA forecast information on sky condition, icing, mountain obscuration, IFR condition and surface wind Graphical-AIRMET (G-AIRMET) advisories, surface visibility, surface wind, precipitation, and other obscurations and hazards, valid for a time near the accident time. This GFA forecast imagery depicted broken sky conditions over the accident site with a point to the southwest of the accident site identifying overcast clouds at 2,800 feet with tops to 13,000 feet. G-AIRMETs for mountain obscuration and icing were active for the accident location. Surface visibility was greater than 5 statute miles at the accident location. A west-southwesterly surface wind of 15 knots with gusts to 20 knots, as well as moderate rain and slight rain showers, were depicted near the accident location. A G-AIRMET for IFR conditions was active over the accident region.

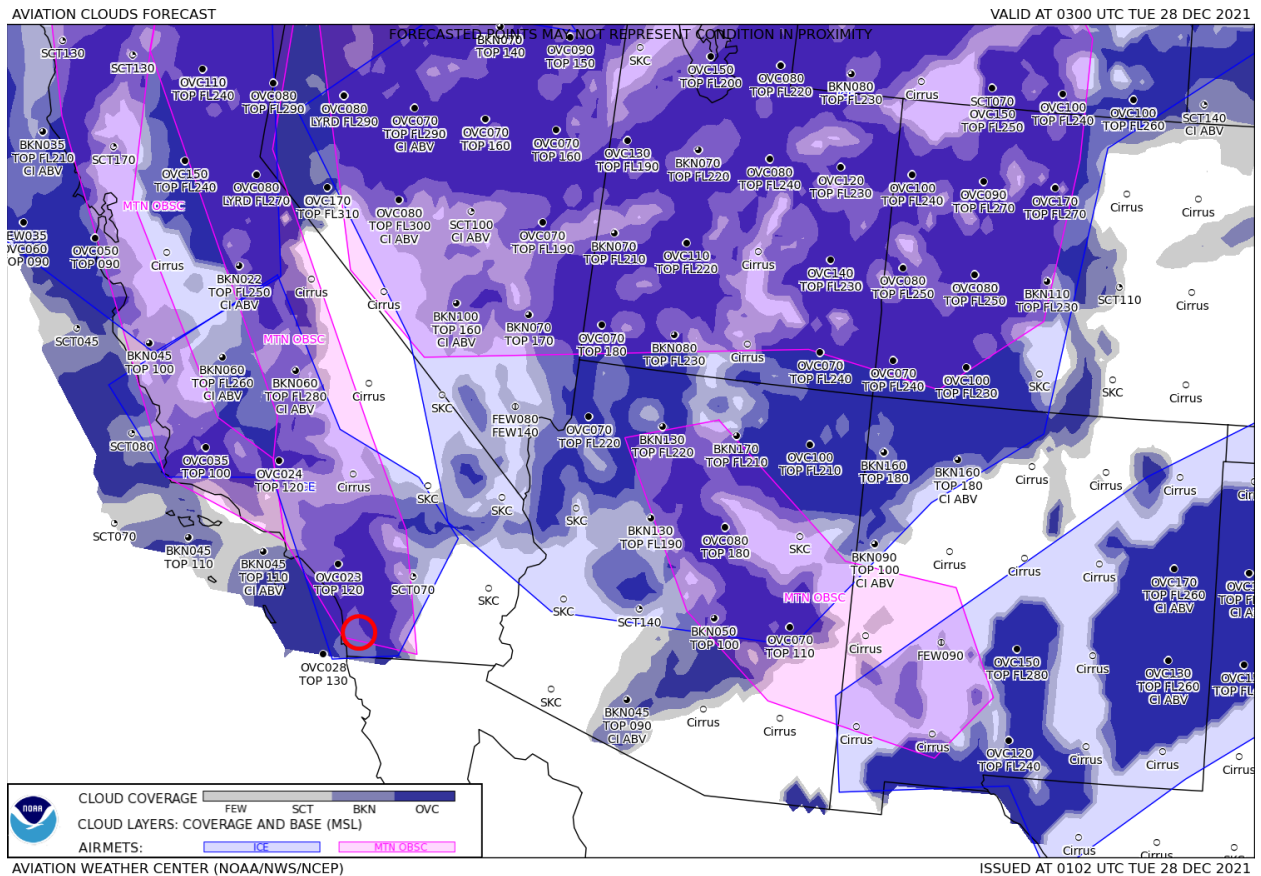


Figure 4 – GFA forecast imagery depicting sky condition and icing and mountain obscuration G-AIRMETs issued about 1700 PST and valid for 1900 PST. The accident location is located within the red circle.

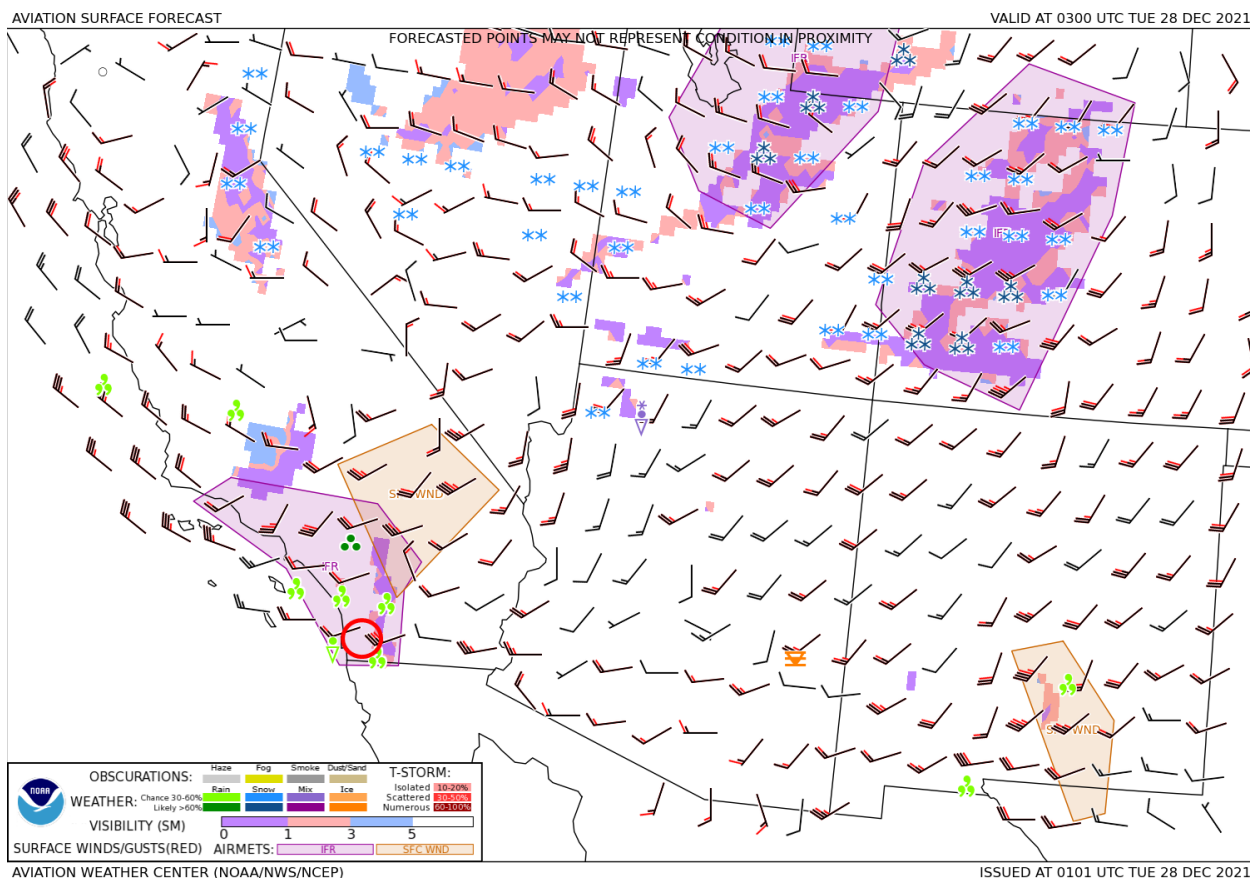


Figure 5 – GFA forecast imagery depicting IFR conditions and surface wind G-AIRMETs, surface visibility, surface wind, precipitation, and other obscurations and hazards. Issued about 1700 PST and valid for 1900 PST. The accident location is located within the red circle.

11.0 Astronomical Data

According to the Federal Aviation Administration¹³, on the accident day and relative to the accident location, sunset occurred at 1649 PST and civil twilight ended at 1716 PST. According to mooncalc.org¹⁴, the moon had set at 1217 PST, and at the time of the accident and relative to the accident location, the moon was below the horizon.

¹³ https://avcams.faa.gov/sunrise_sunset.php

¹⁴ <https://www.mooncalc.org/>

E. LIST OF ATTACHMENTS

Attachment 1 – One-minute SEE AWOS data.

Attachment 2 – Correspondence with the County of San Diego regarding the SEE AWOS and its data; referenced AWOS manual.

Submitted by:

Mike Richards
Senior Meteorologist