

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR22FA004

METEOROLOGY

Specialist's Factual Report

October 25, 2022

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A. ACCIDENT

Location: Santee, California
Date: October 11, 2021
Time: 1214 Pacific daylight time (PDT)
1914 coordinated universal time (UTC)
Airplane: Cessna 340A; Registration: N7022G

B. METEOROLOGY SPECIALIST

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NTSB Senior Meteorologist
Washington, D.C.

C. SUMMARY

On October 11, 2021, at 1214 Pacific daylight time, a Cessna 340A, N7022G, was destroyed when it was involved in an accident near Santee, California. The pilot and one person on the ground were fatally injured, and 2 people on the ground sustained serious injuries. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

The flight departed from Yuma International Airport (NYL), Yuma, AZ at 1121 mountain daylight time and was destined for Montgomery-Gibbs Executive Airport (MYF), San Diego, California.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation remotely, collecting data from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). This report documents the general weather products and forecasts over the region during the period and documents the pertinent meteorological parameters to the accident. All times are reported as Pacific daylight time (PDT) based upon the 24-hour clock, local time is -7 hours from UTC, and UTC=Z. Airport and 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. Directions are referenced to true north and distances in nautical miles. Heights are in feet (ft) above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 32.85702° N and longitude 116.96358° W, at an elevation of about 370 ft.

E. FACTUAL INFORMATION

1.0 Synoptic Conditions

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 (NCEP) and the WPC located in College Park, Maryland. These are the base products used in describing weather features and in the creation of forecasts and warnings. Reference to these charts can be found in the joint NWS and Federal Aviation Administration (FAA) Advisory Circular "Aviation Weather Services", AC 00-45H change 2¹.

1.1 Surface Analysis Chart

The southwest section of the NWS Surface Analysis Chart for 1100 PDT is included as figure 1 with the approximate accident site marked by the red star. The chart depicted a low-pressure system at 998-hectopascals (hPa) over central California with a cold front extending southwestward into southern California. A trough extended northwest and southward from the low-pressure system over eastern California. The accident site was located south of the cold front in the warm air sector of the front and west of the trough.

The station models on the chart depicted southerly winds of 10 to 15 knots over southern California with stronger winds of 25 knots in the vicinity of the front, with broken clouds, with temperatures in the mid 60's degrees Fahrenheit (°F), and dew point temperatures in the mid 50's.

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

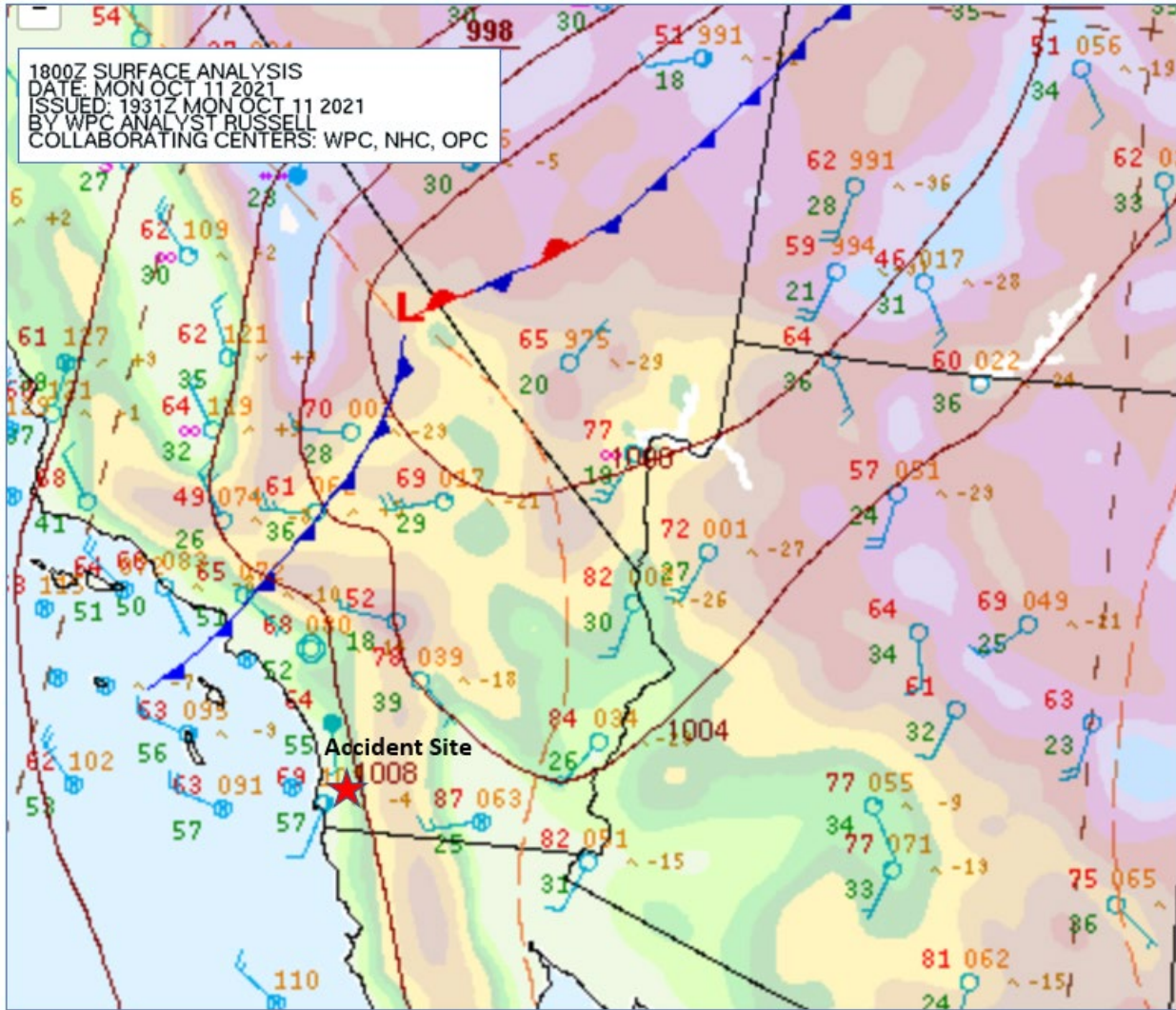


Figure 1. Southwest section of the NWS Surface Analysis Chart for 1100 PDT with the approximate accident site marked by the red star.

1.2 Regional Composite Radar Mosaic

The southwest section of the NWS National Composite Radar Mosaic was reviewed to determine if there were any significant areas of precipitation in the vicinity at the time of the accident. Figure 2 is the composite radar mosaic for 1215 PDT with the approximate accident site noted by a red star. The radar mosaic depicted no significant echoes over the region at the time of the accident.

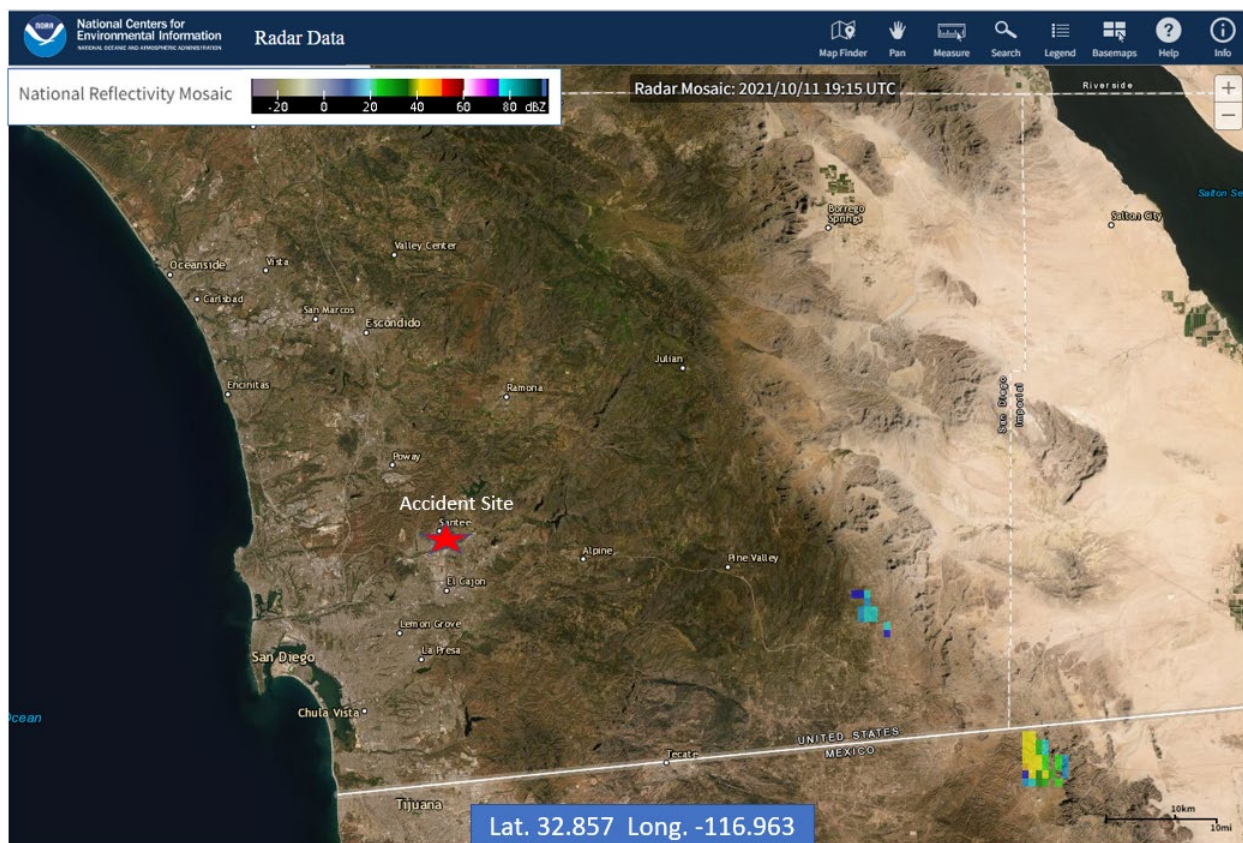


Figure 2. Southwest section of the National Composite Reflectivity Mosaic for 1215 PDT.

2.0 Surface Observations

The area was documented using official Aviation Routine Weather Reports (METAR²) and Aviation Selected Special Weather Reports (SPECI). Cloud heights are reported above ground level (agl) in the following section, and the magnetic variation was estimated at 11.5° east based on the latest sectional chart for the area.

2.1 Gillespie Field Airport, San Diego/El Cajon

The closest weather reporting facility to the accident site was from Gillespie Field Airport (KSEE), San Diego/El Cajon, California located 1.8 miles south of the accident site. The airport listed an elevation of 386 ft and had an Automated Weather Observation System (AWOS), which was augmented by air traffic control personnel during normal operating hours. The conditions surrounding the time of the accident were as follows:

² Abbreviation for Meteorological Aerodrome Report (METAR).

Weather observation for KSEE at 1155 PDT, wind from 200° at 12 knots gusting to 17 knots, visibility 10 miles or more, ceiling broken at 2,700 ft agl, temperature 19° Celsius (C), dew point temperature 13° C, altimeter setting 29.80 inches of mercury.

Accident 1214 PDT.

Weather observation for KSEE at 1255 PDT, wind from 210° at 11 knots, visibility 10 miles or more, ceiling broken at 3,000 ft agl, temperature 20° C, dew point temperature 13° C, altimeter setting 29.78 inches of mercury.

The general flight categories³ and raw observation for KSEE surrounding the period from 0930 through 1500 PDT were as follows:

MVFR METAR KSEE 111647Z VRB06KT 10SM BKN023 18/12 A2983=

MVFR METAR KSEE 111747Z 18008KT 10SM BKN026 19/12 A2983=

MVFR METAR KSEE 111855Z 20012G17KT 10SM BKN027 19/13 A2980=

Accident 1914Z

MVFR METAR KSEE 111955Z 21011KT 10SM BKN030 20/13 A2978=

VFR METAR KSEE 112055Z 19008KT 10SM SCT025 BKN031 20/13 A2973=

MVFR METAR KSEE 112147Z 19016G24KT 7SM HZ BKN024 BKN030 BKN037 19/12 A2973=

2.2 Montgomery-Gibbs Executive Airport, San Diego

The accident airplane's destination was at Montgomery-Gibbs Executive Airport (KMYF), San Diego, California, located 9 miles west-southwest of the accident site. The airport lists an elevation of 427 ft and had an Automated Surface Observation System (ASOS) which was also augmented by air traffic controllers

³ 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 or the lowest layer of clouds reported as broken or overcast, or the vertical visibility into a surface based obscuration 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.

during normal operating hours. At the time of the accident the following conditions were being reported.

Weather observation for KMYF at 1153 PDT, wind from 180° at 10 knots, visibility 10 miles or more, ceiling broken at 1,700 ft agl, overcast at 2,800 ft, temperature 19° C, dew point temperature 14° C, altimeter setting 29.80 inHg. Remarks; automated station with a precipitation discriminator, sea-level pressure 1008.6-hPa, temperature 19.4° C, dew point temperature 13.9° C.

The general flight categories and raw observations reported between 0930 and 1600 PDT were as follows.

MVFR METAR KMYF 111653Z 19008KT 10SM SCT017 OVC023 18/14 A2982 RMK AO2 SLP095 T01830139=

MVFR METAR KMYF 111753Z 19011G18KT 10SM OVC020 19/14 A2981 RMK AO2 SLP091 T01890139 10189 20128 58006=

MVFR **METAR KMYF 111853Z 18010KT 10SM BKN017 OVC028 19/14 A2980 RMK AO2 SLP086 T01940139=**

Accident 1914Z

MVFR METAR KMYF 111953Z 18013KT 9SM SCT023 OVC029 19/13 A2977 RMK AO2 SLP078 T01940128=

MVFR METAR KMYF 112053Z 21016G22KT 8SM BKN023 20/13 A2974 RMK AO2 SLP068 T02000128 58024=

MVFR METAR KMYF 112153Z 20014G20KT 8SM BKN021 OVC027 19/13 A2973 RMK AO2 SLP063 T01940128=

MVFR METAR KMYF 112253Z 24010KT 8SM OVC027 19/12 A2973 RMK AO2 SLP063 T01890122=

2.3 San Diego International Airport, San Diego

San Diego International Airport (KSAN), San Diego, was located 13 miles southwest of the accident site and reported the following conditions surrounding the period. The airport also had an ASOS and whose reports were also augmented as needed. At the time of the accident the following conditions were being reported.

Weather observation for KSAN at 1151 PDT, wind from 210° at 11 knots, visibility 10 miles or more, scattered clouds at 2,000 ft agl, ceiling broken at 2,900 ft, temperature 21° C, dew point temperature 14° C, altimeter setting 29.81 inHg. Remarks; automated station with a precipitation discriminator, sea-

level pressure 1009.5-hPa, temperature 20.6° C, dew point temperature 13.9° C.

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

IFR METAR KSAN 111451Z 15006KT 5SM BR BKN008 18/15 A2984 RMK AO2 SLP104 T01780150 56005=

MVFR SPECI KSAN 111505Z 15007KT 8SM SCT008 BKN021 18/14 A2983 RMK AO2 T01780144=

MVFR METAR KSAN 111551Z 15007KT 9SM FEW008 BKN022 18/13 A2984 RMK AO2 SLP106 T01830128=

MVFR METAR KSAN 111651Z 19008KT 10SM FEW008 OVC024 19/14 A2984 RMK AO2 SLP103 T01940144=

MVFR METAR KSAN 111751Z 19011KT 10SM BKN025 21/14 A2983 RMK AO2 SLP101 T02060139 10206 20172 58004=

MVFR **METAR KSAN 111851Z 21011KT 10SM SCT020 BKN029 21/14 A2981 RMK AO2 SLP095 T02060139=**

Accident 1914Z

MVFR METAR KSAN 111951Z 21011G19KT 9SM FEW021 BKN029 21/14 A2979 RMK AO2 SLP089 T02060139=

MVFR SPECI KSAN 112010Z 23013G22KT 8SM OVC030 21/14 A2978 RMK AO2 T02060139=

MVFR METAR KSAN 112051Z 21011G21KT 9SM SCT023 BKN030 21/13 A2977 RMK AO2 SLP080 T02060133 58020=

MVFR SPECI KSAN 112055Z 21012G21KT 9SM BKN025 BKN030 21/13 A2977 RMK AO2 T02060133=

MVFR METAR KSAN 112151Z 22012KT 8SM BKN024 21/13 A2974 RMK AO2 SLP072 T02060128=

VFR SPECI KSAN 112244Z 24012G23KT 8SM SCT024 BKN031 21/13 A2975 RMK AO2 T02060128=

VFR METAR KSAN 112251Z 23011KT 8SM SCT024 BKN031 21/13 A2974 RMK AO2 SLP071 T02060128=

2.4 Aviation Weather Center METAR Depiction

A depiction of the observations from the NWS Aviation Weather Center's (AWC) METAR website⁴ for 1229 PDT is included as figure 3 with the approximate accident site marked by the red star. The image depicted generally MVFR conditions over the area with southwesterly winds at 10 knots with gusts to 15 knots near the coastal sections of southern California. VFR conditions were present inland over the Imperial Valley to the east of the accident site with winds from the west-southwest at 10 to 20 knots gusting to 25 to 30 knots.

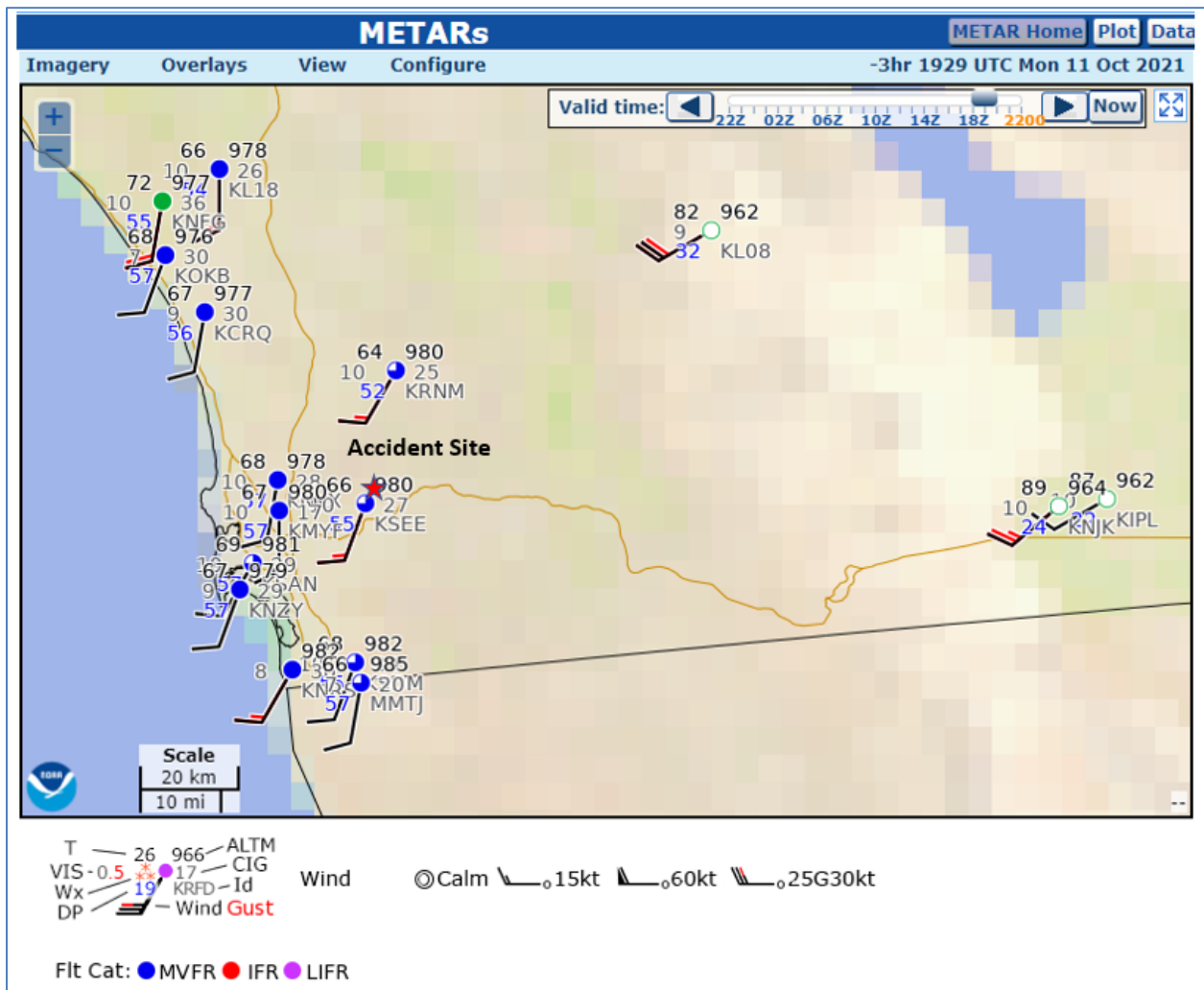


Figure 3. NWS Aviation Weather Center's METAR display for 1229 PDT with approximate accident site marked by red star.

⁴ <https://www.aviationweather.gov/metar>

3.0 Atmospheric Sounding

A High-Resolution Rapid Refresh (HRRR)⁵ numerical model was obtained from the NOAA Air Resource Laboratory using the nearest grid point to the accident site coordinates. The HRRR model data was then plotted on a standard skew T log P diagram⁶ using the RAOB Analysis software⁷ for 1200 PDT from the surface to 450-hPa (approximately 22,000 ft) and is included as figure 4.

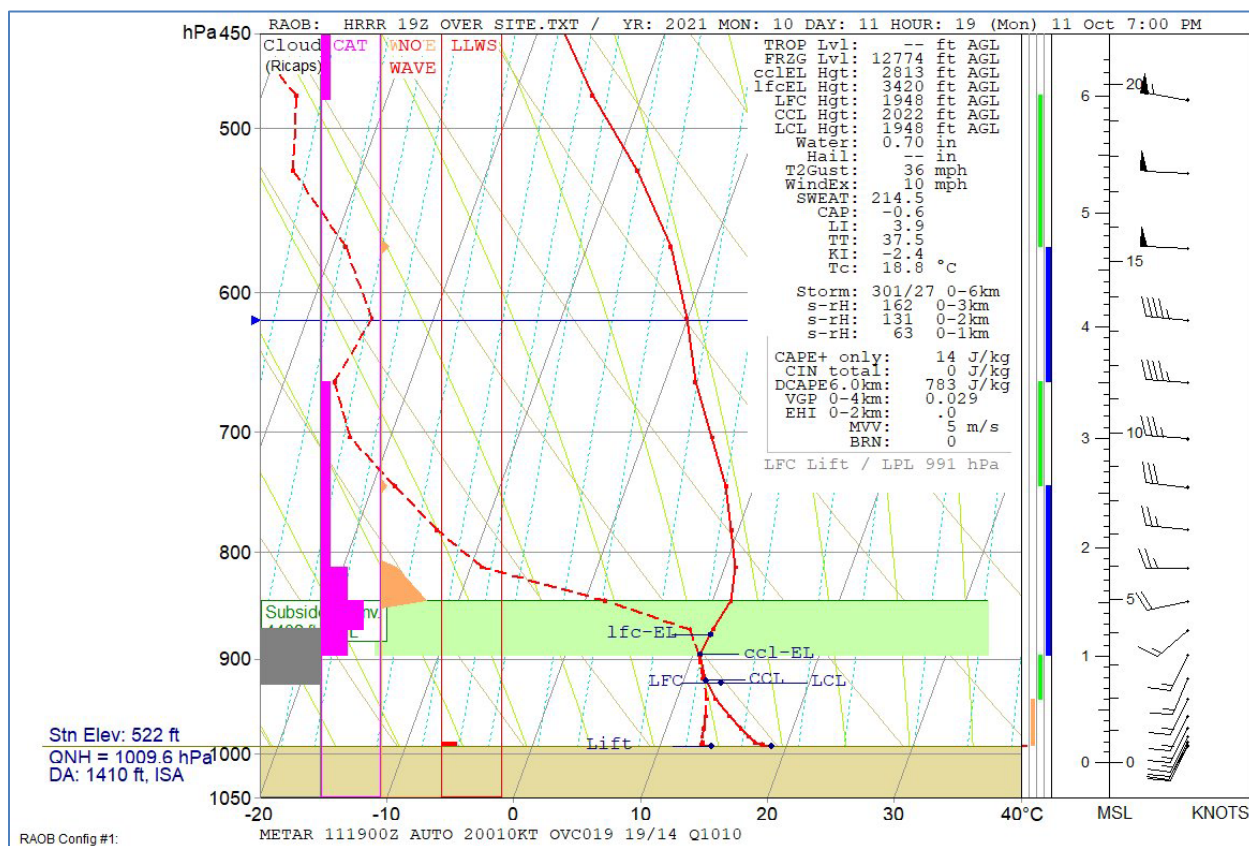


Figure 4. HRRR sounding for 1200 PDT over the approximate accident site coordinates.

The sounding over the approximate accident site depicted a station elevation of 522 ft with a near surface temperature of about 19° C (66° F), a dew point temperature of 14° C (57° F), with a relative humidity of 74%, with a resulting density

⁵ 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.

⁶ Skew T log P diagram is a standard meteorological plot or thermodynamic diagram 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.

⁷ RAOB -The Universal RAWinsonde OBServation program is an interactive sounding analysis program developed by Eosonde Research Services (ERS) previously known as Environmental Research Services, The Villages, Florida.

altitude of 1,410 ft. The lifted condensation level (LCL)⁸ and level of free convection (LFC)⁹ were identified at 1,948 ft agl, and the convective condensation level (CCL)¹⁰ at 2,022 ft agl. A low-level temperature inversion associated with subsidence was noted between 3,000 to 5,000 ft (green shaded area) where temperature increased with height. The precipitable water content at 0.70 inches. The RAOB program supported a broken to overcast layer of clouds from the LCL of from 1,900 ft agl with tops near 4,000 ft. The layer below 2,000 ft was characterized as unstable. The freezing level was identified near 13,000 ft, which was above the accident airplane's cruising level and therefore not a factor.

The HRRR wind profile indicated surface winds from the south or from 200° at 10 knots, with wind veering¹¹ to the west with height above the inversion with wind speeds increasing with height wind speeds greater than 50 knots above 15,000 ft. The mean 0 to 6 km winds (or approximately 18,000 ft) were from 270° at 35 knots. A table of the HRRR sounding parameters below 8,000 ft were as follows.

Height (ft msl)	Pres (hPa)	T (°C)	Td (°C)	RH (%)	Wind (dd/kt)	CAT (FAA)	LLWS (FAA)	Icing (AFGWC)	MTN Wave (nm-fpm-max)
522	991	18.8	14.1	74	205/ 10				
550	990	18.1	13.3	74	207/ 10		LIGHT		
635	987	17.4	13.3	77	205/ 12				
806	981	16.8	13.1	79	205/ 13				
1064	972	15.9	13.0	83	205/ 14				
1439	959	14.7	12.8	88	204/ 15				
1965	941	13.1	12.4	96	204/ 15				
2588	920	11.7	11.5	99	202/ 15				
3314	896	10.6	10.5	99	205/ 16	MDT			
4090	871	10.9	9.1	89	227/ 17	SVR			
4954	844	11.5	1.6	51	257/ 20	MDT		2.09	1225 MD-SV
5979	813	10.9	-9.1	24	270/ 25	LGT		3.21	496 LT-MD
7109	780	9.5	-13.7	18	277/ 27	LGT			
8426	743	7.8	-18.3	14	278/ 31	LGT		4.95	184 LIGHT

The RAOB analysis program indicated a high potential for moderate and greater turbulence between 3,000 and 8,000 ft (indicated by magenta on left axis), and also mountain wave conditions (indicated in orange on left axis) with a potential predominant wave at 5,000 ft capable of producing moderate to severe turbulence with downdrafts to 1,225 fpm based on the worst case mountain wave parameters.

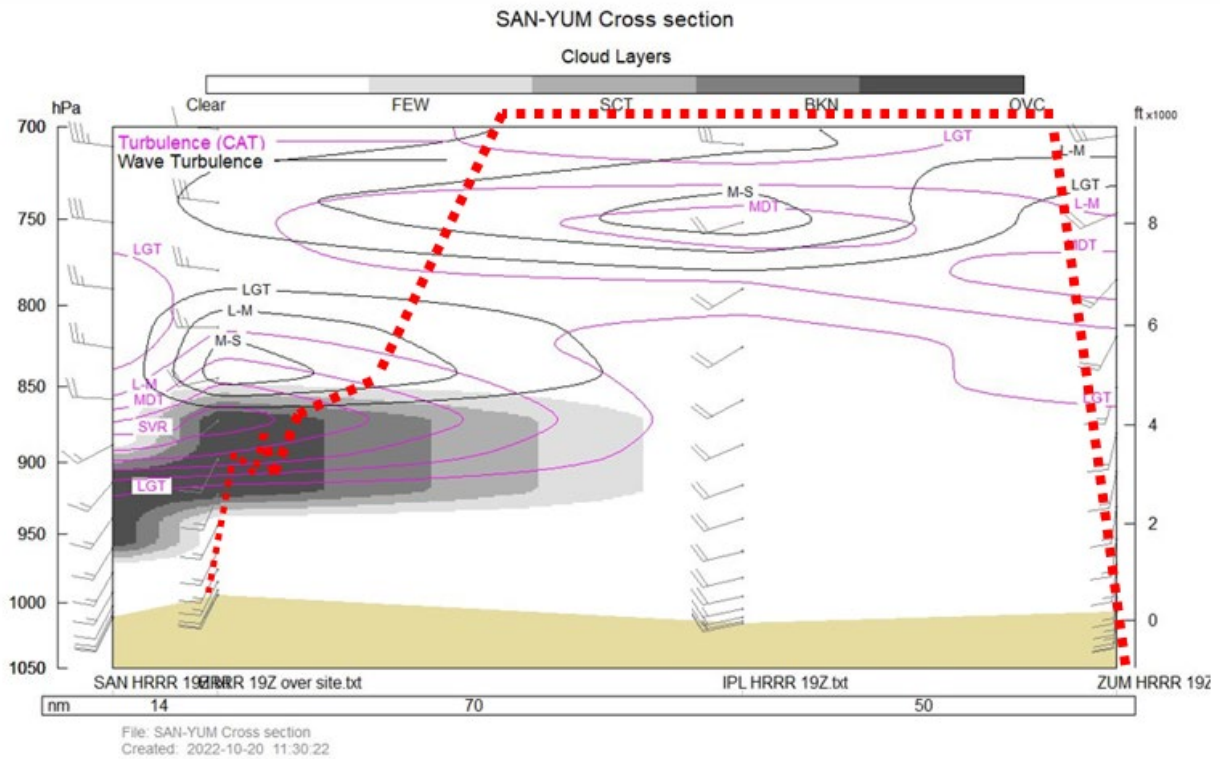
⁸ Lifted Condensation Level (LCL) - the level at which a lifted parcel becomes saturated. The LCL height corresponds to cloud base height for forced ascent.

⁹ Level of Free Convection (LFC) - the level where a parcel becomes buoyant, or "warmer" than the environmental temperature at the same level. The LFC represents the bottom of the layer containing CAPE.

¹⁰ Convective Condensation Level (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.

¹¹ Veering refers to a cyclonic change in wind direction with height and infers warm air advection aloft.

A cross section from Yuma to San Diego using HRRR model data for 1200 PDT is included as figure 5 with clouds and expected clear air turbulence (CAT), and mountain wave activity. The red dashed line represents the approximate flight track of N7022G over the cross section. The image depicted broken to overcast clouds over the accident site and over the flight track¹² with a high potential for moderate and greater turbulence.



RAOB Config #1:

Figure 5. Cross section of winds, clouds, turbulence, and potential mountain wave turbulence over the route of flight (red dotted line) between KYUM and KSAN.

4.0 Satellite Imagery

The NOAA Geostationary Operational Environmental Satellite number 17 (GOES-17) imagery were obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System (McIDAS) software. The infrared, visible, and moisture (low-level water vapor) channel imagery were reviewed surrounding the period, and the closest images to the accident time documented. The infrared long wave imagery (band 13) at a wavelength of 10.3

¹² The flight track and RAOB sounding indicated that most of the accident airplane's approach was conducted in clouds or instrument meteorological conditions (IMC).

microns (μm) provided radiative cloud top temperatures and the low-level water vapor imagery (band 10) at $7.3 \mu\text{m}$ had a nominal spatial resolution of 2 km. The visible image (band 2) at a wavelength of $0.64 \mu\text{m}$ provided a resolution of 0.5 km.

Figure 6 is the GOES-17 infrared for 1216 PDT at 4X magnification with MB temperature enhancement curve applied with the accident site marked by the red square and the cold front (blue) and trough (yellow dash line) from 1100 PDT overlaid. The chart depicted a band of low clouds over southwestern California. The radiative cloud top temperature over the accident site was 286 Kelvin or 12.8°C , which corresponded to cloud tops near 3,000 ft based on the HRRR sounding. Figure 7 is the GOES-17 low-level water vapor imagery for the same period at 4X magnification and depicted significant moisture over the area supporting low-level clouds. Figure 8 is the GOES-17 visible image for 1216 PDT which depicted a broken layer of clouds over southwestern California which extended over the accident site.

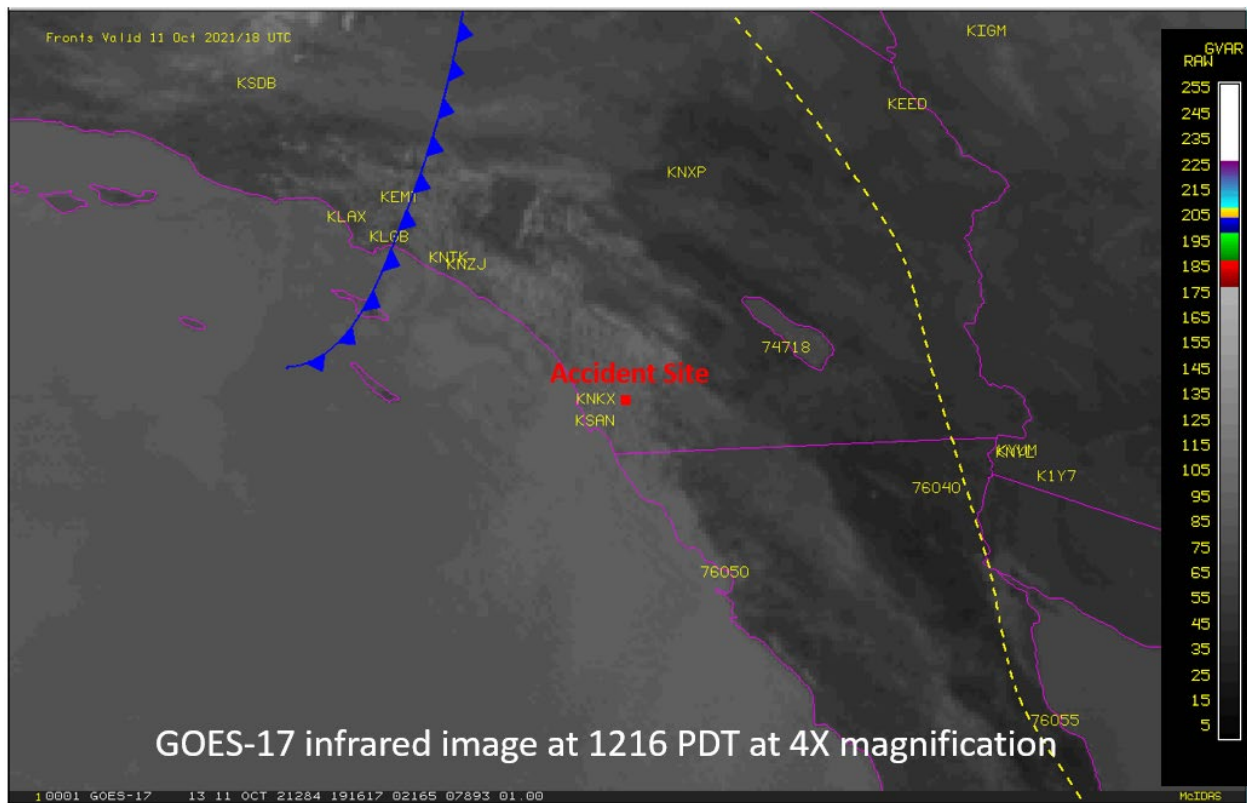


Figure 6. GOES-17 infrared image for 1216 PDT at 4X magnification with accident site marked.

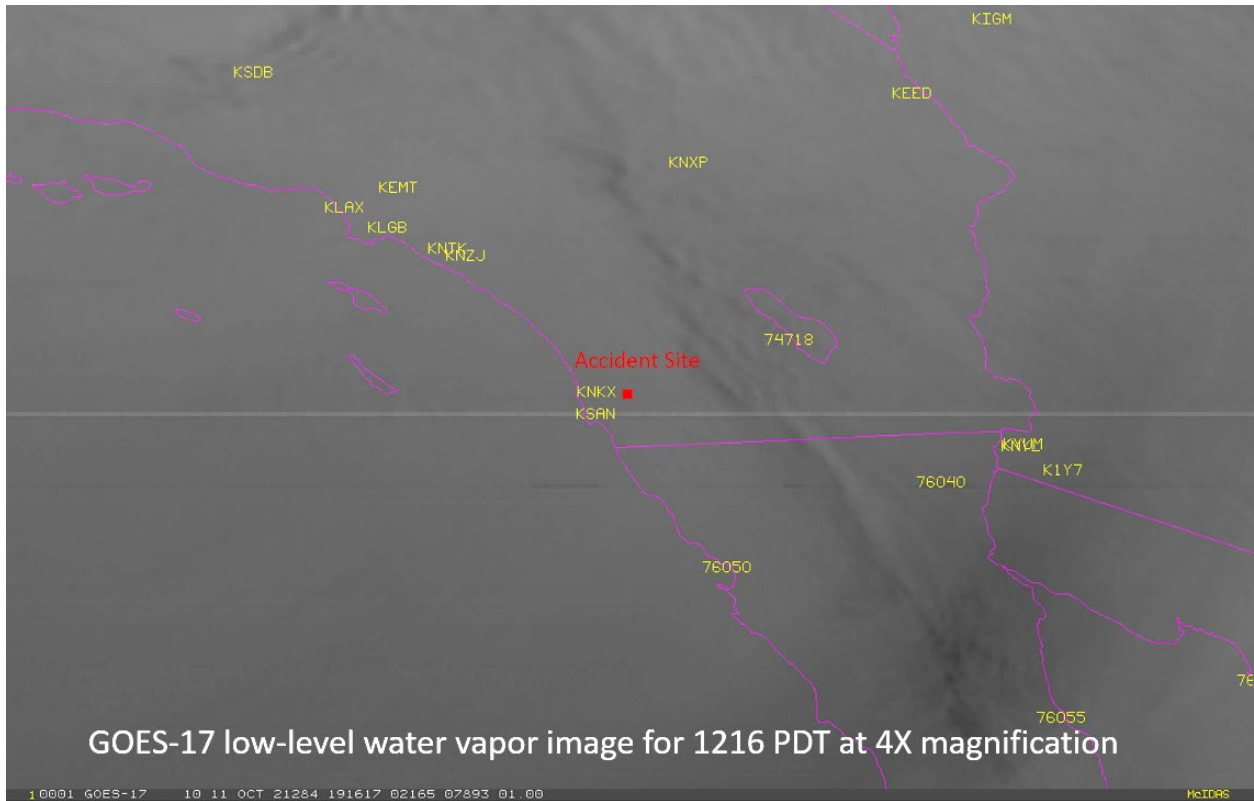


Figure 7. GOES-17 low-level water vapor image for 1216 PDT at 4X magnification.

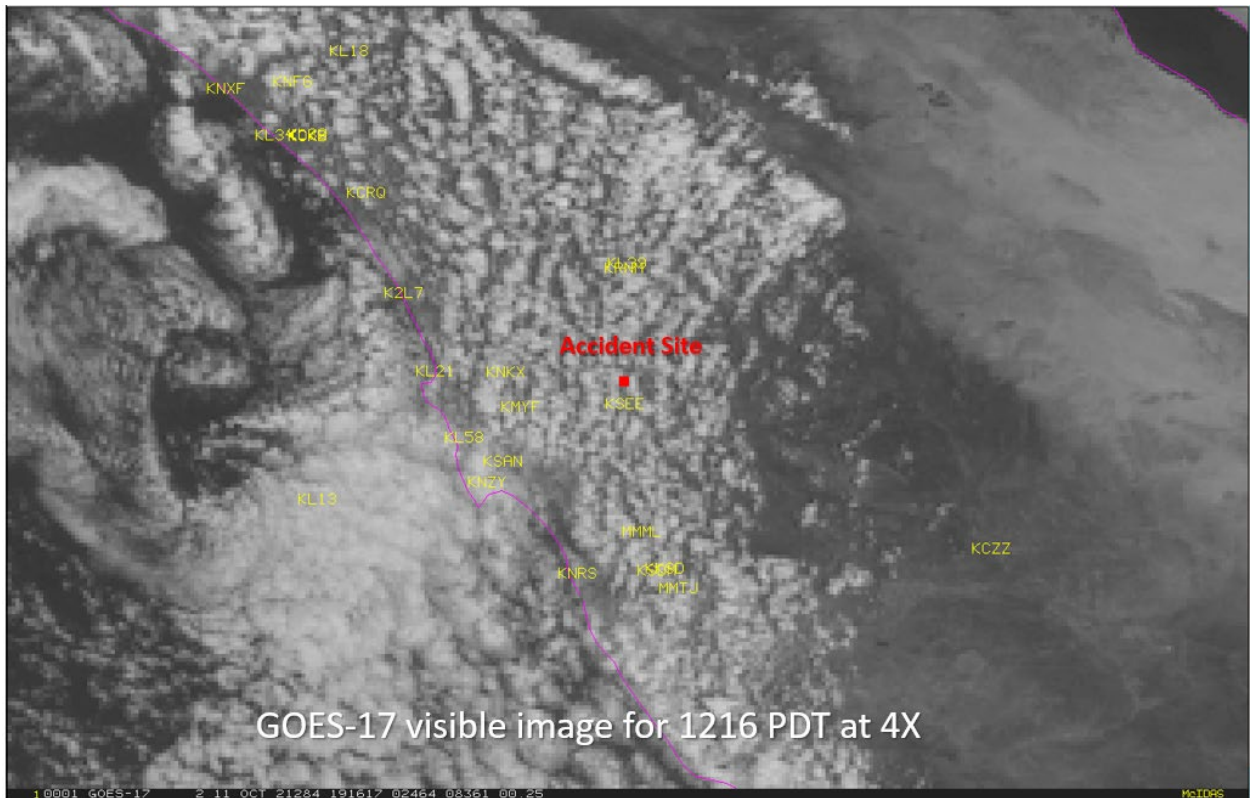


Figure 8. GOES-17 visible image for 1216 PDT at 4X magnification.

5.0 Pilot Reports

A search of the NWS database¹³ for relevant pilot reports or PIREPs surrounding the period from 1000 and 2100 PDT within 100 miles of the accident site provided the following reports. The reports are included in original code and abbreviation with altitude referenced to msl heights. Urgent PIREPs (UUA) are in bold text.

SMO UA /OV SMO03004/TM 1710/FL030/TP BE20/SK OVC020-TOP310/RM DURD

CNO UA /OV KCNO/TM 1750/FL045/TP C172/TB MOD/RM INBOUND CNO 6NM SE

LAX UA /OV LAX060005/TM 1821/FL029/TP B39M/SK BKN029

CNO UA /OV CNO/TM 1844/FL015/TP DA40/TB NEG

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MYF UA /OV 1/2 MI EAST OF MYF/TM 1959/FL014/TP C172/SK BKN020/WX 7SM /TB LIGHT

LAX UA /OV LAX060005/TM 2016/FL022/TP A321/SK BKN022

CNO UA /OV KCNO/TM 2023/FL014/TP C172/TB LGT CHOP

MYF UA /OV 3MI WEST OF MYF/TM 2030/FL020/TP C172/SK BKN021 TOPS 026

TRM UA /OV JLI045025 /TM 2056 /FL100 /TP M20P /WV 260049KT /RM MTN WAVE 090-110-ZLAWC AWC-WEB

SAN UA /OV SAN/TM 2102/FL034/TP E75L/RM BASES TO THE EAST 018 TOPS 034

RIV UA /OV RIV/TM 2113/FL100/TP C560/TB MOD 100

SDM UA /OV 27004 /TM 2122/FL023/TP F2TH/SK BKN 023/RM PILOT ON GPS 08L BROKE OUT 4 MILES WEST OF FIELD AT 023

SAN UA /OV SAN/TM 2141/FL015/TP B739/RM +/- 10 ON FINAL

LAX UA /OV LAX250015/TM 2248/FL075/TP B777/TB MOD CAT 075-085/RM ZLAWC AWC-WEB/

CNO UA /OV CNO/TM 2249/FL012/TP BE9L/TB MOD

SBD UA /OV SBD/TM 2300/FL120/TP FA7X/IC LGT RIME 120

CRQ UA /OV OCN050017/TM 2308/FL080/TP BE9L/TB MOD

¹³ Includes PIREPs making into the NWS database and may not include "ride reports" or other reports made on radio frequency to air traffic control and not formally entered as a PIREP into the national database.

PSP UUA /OV KPSP/TM 2314/FL010/TP E75L/TB MOD/RM 20KT TAILWIND ON FINAL FOR 13R UNTIL FIFTY FEET. MODERATE TURBULENCE ALL THE WAY DOWN IN DESCENT

SBD UA /OV SBD 15N/TM 2335/FL140/TP C25A/IC MOD RIME 140-130

SBD UA /OV SBD 15N/TM 2340/FL160/TP B739/TB MOD 160

PSP UUA /OV PSP315015/TM 2345/FL170/TP E55P/TB SEV 170-160

CNO UA /OV CNO/TM 2353/FL015/TP P28A/TB LGT-MOD

SAN UA /OV JLI180015/TM 2359/FL090/TP P28A/TB MOD

BUR UA /OV VNY225010/TM 0025/FL120/TP E75L/TB MOD TURBULANCE

CNO UA /OV PDZ/TM 0030/FL040/TP M20P/TB CONS MOD

LAX UA /OV LAX180015/TM 0044/FL100/TP B767/TB MOD 080-095

BUR UA /OV EMT270005/TM 0105/FL045/TP C782/TB MOD TURB

TRM UUA /OV TRM175015/TM 0112/FL100/TP C172/RM DOWNDRAFTS LOSS OF 3000FT-ZLAWC AWC-WEB/

CNO UA /OV KCNO/TM 0122/FL014/TP C172/TB MOD

PSP UUA /OV PSP225010/TM 0130/FL150/TP C68A/TB SEV 150-130

PSP UUA /OV PSP/TM 0136/FL010/TP B739/TB LIGHT/MODERATE/RM LIGHT TO MODERATE TURBULENCE ON DESCENT TO RUNWAY 31L. GAINS AND LOSSES OF 15 KNOTS ON FINAL.

EMT UUA /OV EMT 10NE/TM 0150/FL80/TP C68A/TB MOD-SEV 80

LAX UUA /OV LAX200009/TM 0158/FL120/TP E145/TB MOD-SEV 085-115

LAX UA /OV LAX200010/TM 0255/FL100/TP B737/TB OCNL MOD 100/RM DURC MOD TURB 090-100 AWC-WEB/

BUR UA /OV VNY120006/TM 0325/FL020/TP A320/SK SKC/WX FV06SM/TA 17/WV 30015G22/TB MOD/IC NA/RM MOD TURB REPORTED ON FINAL TO RWY 33 AT KBUR

A plot of the PIREPs over the GOES-17 low-level water vapor image is included as figure 9, the reports of light turbulence are depicted by a white square, moderate in yellow, severe in red, and an orange square reports of mountain wave activity. The accident site is noted by the blue star.

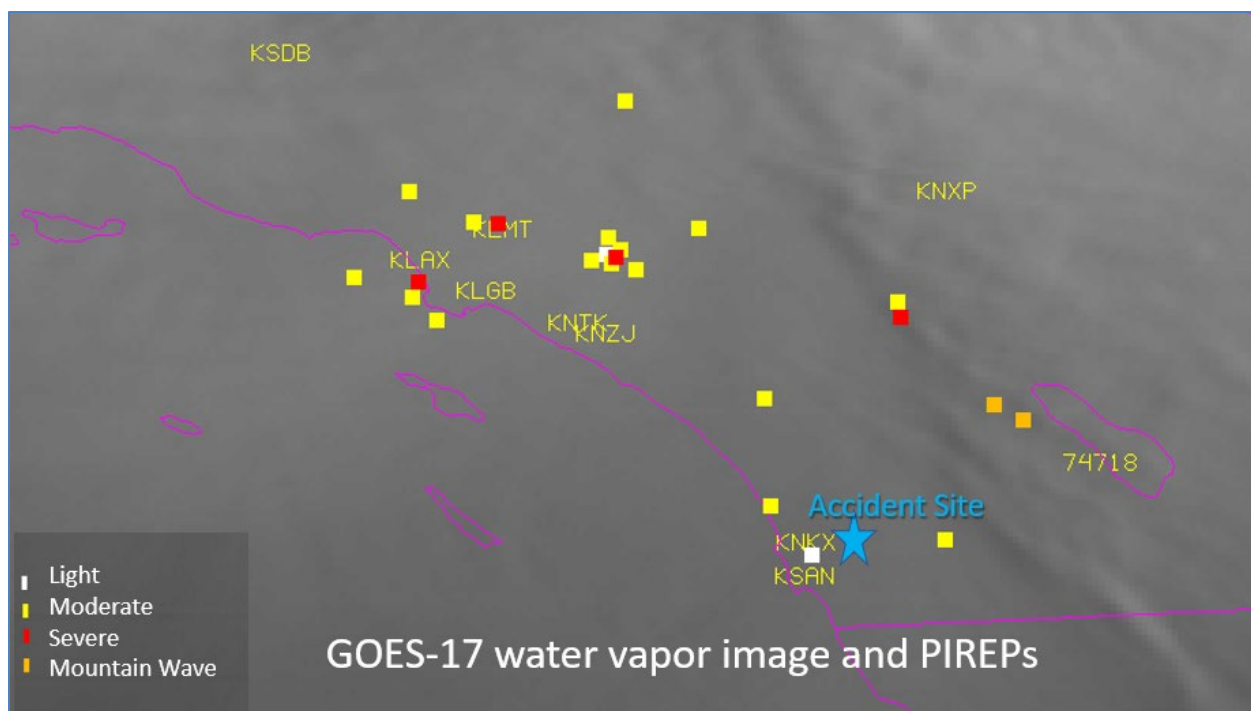


Figure 9. GOES-17 water vapor image and turbulence PIREPs.

6.0 NWS Forecasts and Advisories

The forecasts issued by the local NWS San Diego (KSGX) Weather Forecast Office (WFO) and the AWC located in Kansas City, MO, issued surrounding the period are documented below.

6.1 Terminal Aerodrome Forecast

The closest Terminal Aerodrome Forecast (TAF) to the accident site was issued for KSAN located approximately 12 miles southwest of KSEE. While a TAF is only valid for a 5 mile radius of the airports center point, it is often included in route briefings for the area. The TAF that was issued for the period that covered the accident was as follows, with the forecast is bold type current at the time of the accident.

TAF KSAN 111738Z 1118/1224 19008KT P6SM OVC024

FM112000 22015G23KT P6SM SCT035

FM112300 24019G28KT P6SM SKC

FM120600 30011G21KT P6SM SKC

FM121200 29012KT P6SM SKC

FM121700 29009KT P6SM SKC=

The forecast for KSAN current for the period expected MVFR conditions to prevail with a wind from 190° at 8 knots, visibility 6 miles or more, ceiling overcast at 2,400 ft agl. After 1300 through 1600 PDT, VFR conditions were expected with a wind from 220° at 15 knots gusting to 23 knots, visibility better than 6 miles and scattered clouds at 3,500 ft agl.

6.2 Area Forecast Discussion

The NWS Area Forecast Discussion (AFD) are issued by each WFO to describe the short-term weather conditions within their region with an aviation section that includes the general conditions as they relate to the creation of the TAF. These are useful for additional aviation-related issues that cannot be encoded into the TAF and provide some reasoning behind the forecast. These are generated roughly every 6 hours and correspond to the release of the latest TAFs for that office. The AFD short term, and aviation sections issued by KSGX at 0829 PDT and was valid at the time of the accident. The marine section has been excluded.

*FXUS66 KSGX 111529
AFDSGX*

*Area Forecast Discussion
National Weather Service San Diego CA
829 AM PDT Mon Oct 11 2021*

.SYNOPSIS...

A cold storm system developing over the Great Basin will bring much cooler and blustery weather today. Damaging wind gusts are possible over the mountains by this afternoon, with gale force winds and rough seas into the coastal waters. There will be some blowing dust in the deserts, and even a chance for a few light showers, mainly over the mountains. The winds will weaken overnight, but the Autumn chill will last into Tuesday, followed by a warming trend for the remainder of the week.

.DISCUSSION...FOR EXTREME SOUTHWESTERN CALIFORNIA INCLUDING ORANGE...SAN DIEGO...WESTERN RIVERSIDE AND SOUTHWESTERN SAN BERNARDINO COUNTIES...

Areas of low clouds have overspread the CA Bight and extended well inland at 8 AM PDT. An eddy was evident in the cloud pattern offshore and the SE winds were just beginning to surface along the coast. Surface pressure gradients were still fairly weak but trending onshore and SW-W winds were already gusting 35 MPH or more over some mountain areas. Expect some clouds to be with us all day, especially along the coastal slopes of the mountains as the winds ramp up. Lower elevations should turn partly cloudy. It will be noticeably cooler today, with daytime high temps some 10F lower than yesterday. No forecast updates planned.

From previous discussion...

The winds will gradually increase during the day in all areas. Gusts will hit 50-70 mph in the mountains and adjacent desert slopes. Most desert areas will get gusts 35-55 mph, while coast and valleys will reach 25-35 mph. Check the details on our wind advisory and warning. Winds

will taper off this evening but may hang on a little longer along the coast. There is a small chance of showers mainly in the mountains or far inland valleys/foothills this afternoon through early evening. A dusting of snow is possible above 7,000 feet elevation or so. The chance of showers only lasts about six hours. Cold and rather dry air will push into the region and clear the clouds. Daytime temperatures Tuesday will be in the 60s and 70s for inland areas, 15-20 degrees below average. With winds calming down before the bulk of the night, the temperature will drop efficiently in the dry air. Dry and clear weather is expected for several days with a touch of offshore flow to keep coastal clouds out of the picture. Daytime temperatures will rise each day such that by Friday and Saturday we'll be close to average with 70s and 80s common at lower elevations. Relative humidity will be quite low inland each afternoon, but thankfully without any strong winds. The high pressure and touch of offshore flow will diminish this coming weekend, leading to a cooling trend next week and possibly a return of some coastal low clouds. A deep trough of low pressure is shown to develop over the northeast Pacific, but it's too early to speculate much on whether or not that will bring us rain.

.AVIATION...

111530Z...Coast/Valleys...Areas of low clouds with bases 1000-2500 ft MSL through 21Z. Clouds will dissipate from northwest to southeast through 23Z, high terrain could be obscured in low clouds at times. After 17Z...WNW winds increasing to 15-25kt with gusts to 30 kt through 06Z Tue, with strongest winds near the coast and over higher terrain.

Mountains/Deserts...WNW winds gusting to 25-35 kt through 18Z, followed by stronger and more widespread wind gusts of 50-65 kt from the mountain crests to the desert mountain slopes and through San Gorgonio Pass through 10Z Tuesday. At KPSP...prevailing winds will be NW 20-30kt Mon afternoon/evening with gusts of 35-40kt, but a rotor could produce lighter east winds at times. Areas of LLWS and MOD turbulence possible, especially after 03Z Tue as winds shift to N/NE.

.SGX WATCHES/WARNINGS/ADVISORIES...

CA...High Wind Warning from 11 AM this morning to 3 AM PDT Tuesday for Apple and Lucerne Valleys-Riverside County Mountains- San Bernardino County Mountains-San Diego County Mountains.

Wind Advisory from 1 PM this afternoon to 3 AM PDT Tuesday for Coachella Valley-Orange County Coastal Areas-Orange County Inland Areas-San Bernardino and Riverside County Valleys- The Inland Empire-San Diego County Coastal Areas-San Diego County Deserts-San Diego County Valleys-San Gorgonio Pass Near Banning-Santa Ana Mountains and Foothills.

6.3 Graphic Turbulence Guidance

The Graphic Turbulence Guidance (GTG) was developed by the National Center for Atmospheric Research (NCAR) and is now run operationally at NOAA NCEP and is available to users on the AWC website from the surface to 45,000 ft. The current GTG version 3.0 model is generated from the NOAA Rapid Refresh (RAP) numerical model with a horizontal spacing of 13.5 kilometers with 50 vertical levels, and provides a computer-generated four-dimensional forecast related to the expected intensity of atmospheric turbulence provided in Eddy Dissipation Rate (EDR). EDR ($m^{2/3} s^{-1}$) is aircraft independent and is the International Civil Aviation Organization (ICAO) standard for turbulence reporting. EDR varies from close to 0,

“smooth”, to near 1, “extreme” for most aircraft types. NCAR defines the following EDR values to various aircraft weight classes and turbulence intensities and is included as figure 10, note values are in tenths and are multiplied by 100 for ease of interpretation. The Cessna 340 fits in the light-weight category¹⁴.

AC weight class	Estimated EDR Threshold * 100			
	Light	Moderate	Severe	Extreme
Light	13	16	36	64
Medium (Large)	15	20	44	79
Heavy	17	24	54	96

Figure 10 - Aircraft weight classes and estimated EDR thresholds for turbulence.

Figure 11 is the NWS GTG initial forecast for 1200 PDT and indicated potential EDR values of 20 to 40 over southwestern California in the vicinity of the accident site, which varied between moderate and severe turbulence.

¹⁴ Light category aircraft - is defined as an aircraft with a maximum takeoff weight of less than 15,500 pounds.

GTG - Max combined intensity (1000 ft. MSL to FL500)

00 hr forecast valid 1900 UTC Mon 11 Oct 2021

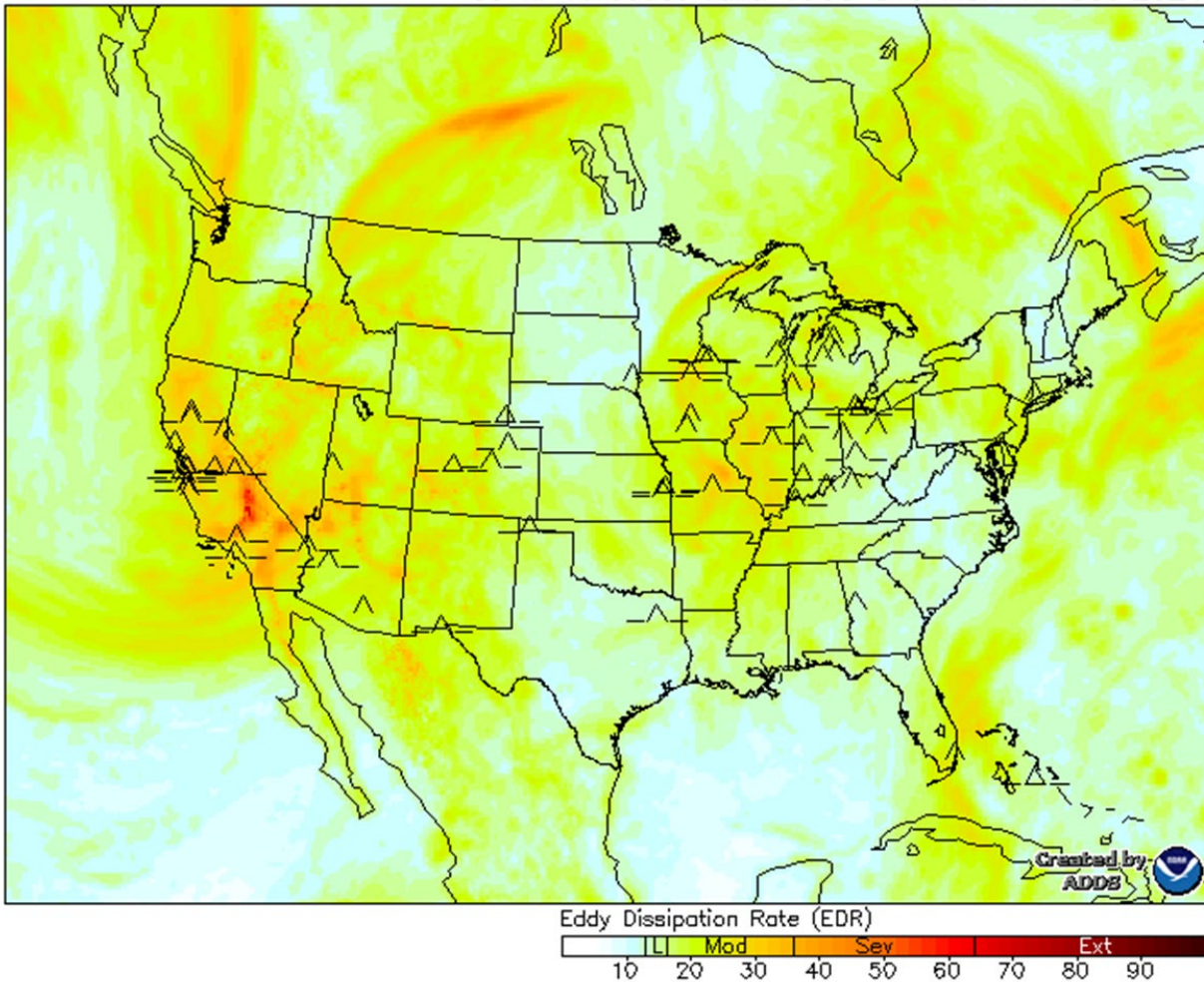


Figure 11. GTG maximum combined turbulence for 1200 PDT.

6.4 Winds and Temperature Aloft Forecast

The Winds and Temperature Aloft Forecast (FB)¹⁵ current for the route of flight was valid for 1100 PDT and for use between 0700 and 1400 PDT was as follows.

¹⁵ Derived from FBUS31 KWNO winds aloft bulletin.

FBUS31 KWNO 111358
FD1US1
-DATA BASED ON 111200Z
VALID 111800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
-BLH	2421	2322+12	2423+06	2530+01	2545-12	2556-26	257740	258345	750050
-ONT	1906	2617+10	2735+06	2843+00	2856-13	2859-26	287740	288048	268552
-SAN	2315	2724+11	2831+08	2840+03	2854-11	2858-24	277039	267346	269851

The closest forecast point to the accident site was for San Diego (SAN), which expected a wind at 3,000 ft from 230° at 15 knots; and at 6,000 ft a wind from 270° at 24 knots with a temperature of 11° C.

6.5 Inflight Weather Advisories

Inflight Aviation Weather Advisories are forecasts to advise en route aircraft of the development of potentially hazardous weather. Inflight aviation weather advisories in the conterminous U.S. are issued by the NWS AWC, as well as from the Center Weather Service Units (CWSU) at the various FAA Air Route traffic Control Center's (ARTCCs). There are four basic types of inflight aviation weather advisories: the Significant Meteorological Information (SIGMET), the Convective SIGMET, the AIRMET, and the Center Weather Advisory (CWA). Inflight advisories serve to notify en-route pilots of the possibility of encountering hazardous flying conditions which may not have been forecast at the time of the preflight briefing. Whether or not the condition described is potentially hazardous to a particular flight is for the pilot to evaluate based on experience and the operational limits of the aircraft. Once issued they are broadcast by FAA controllers upon issuance and available on other inflight weather broadcasts.

During the period surrounding the accident the NWS AWC had no SIGMETs or Convective SIGMETs current for the area but had AIRMETs for low-altitude turbulence and strong surface winds over southwestern California along the general route of flight. The advisories are plotted over the GOES-17 visible satellite image and is included as figure 12.

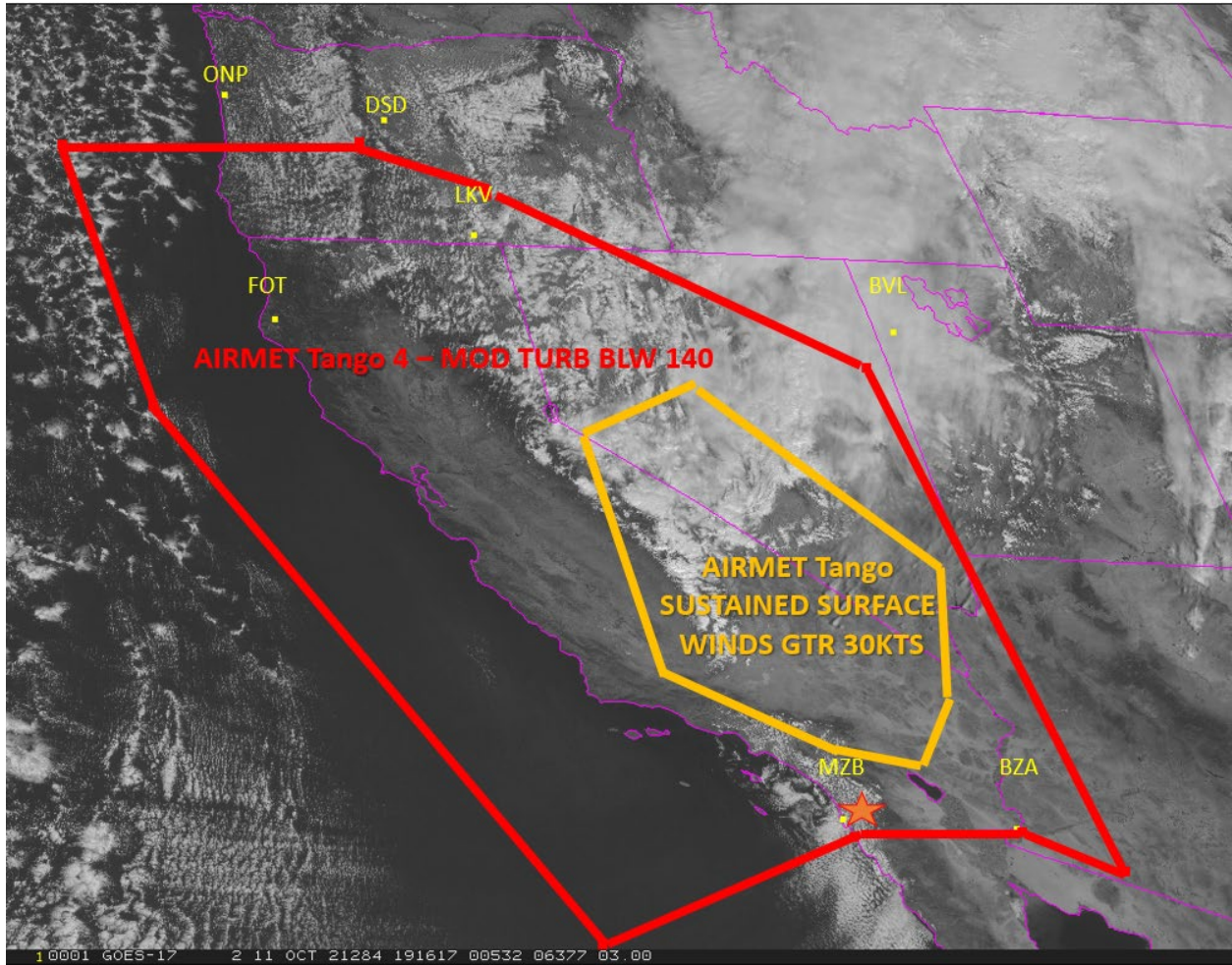


Figure 12. AIRMET Tango advisories for moderate turbulence and strong surface winds current at the time of the accident.

Immediately after the accident, the Los Angeles CWSU issued CWA number 101 for moderate to severe turbulence below 14,000 ft, with strong updrafts and downdrafts, and potential blowing dust for an area about 100 miles north-northwest of the accident site, which is depicted in figure 13. The text of the AIRMETs and CWA advisory are included below.

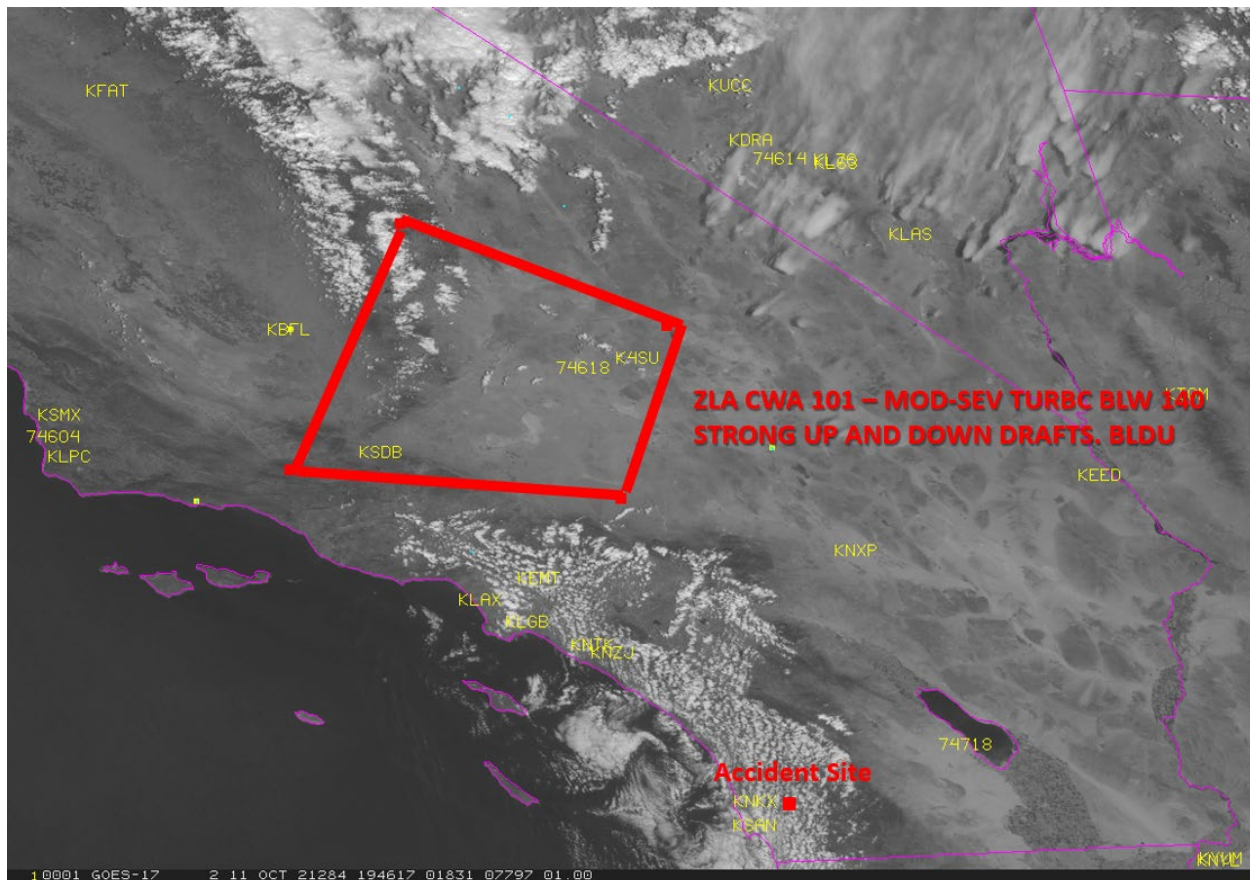


Figure 13. Las Angeles CWSU CWA number 101 for moderate-to-severe turbulence below 14,000 ft and strong updrafts and downdrafts and blowing dust.

AIRMETS

WAUS46 KKCI 111445

WA6T

-SFOT WA 111445

AIRMET TANGO UPDT 2 FOR TURB STG WNDZ AND LLWS VALID UNTIL 112100

AIRMET TURB...OR CA NV UT AZ AND CSTL WTRS

FROM 40SW DSD TO 50NE LKV TO 50SW BVL TO 80ESE BZA TO BZA TO 20S MZB TO 220SW MZB TO 140WSW FOT TO 140WSW ONP TO 70SSW ONP TO 40SW DSD
MOD TURB BLW FL180. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET STG SFC WNDZ...CA AND CSTL WTRS

FROM 40W FOT TO 50S FOT TO 30S ENI TO 30WNW SNS TO 60WNW RZS TO 20S LAX TO 130WSW MZB TO 210SSW RZS TO 150WSW ENI TO 40W FOT
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET STG SFC WNDZ...CA NV AZ

FROM 80SSW BAM TO 50NE LAS TO 20WSW EED TO 20E TRM TO 50WNW TRM TO 30ENE RZS TO 70SSE FMG TO 80SSW BAM

SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS DVLPG 15-18Z.
CONDS CONTG BYD 21Z THRU 03Z.

Center Weather Advisory

FAUS21 KZLA 111949
ZLA1 CWA 111950
ZLA CWA 101 VALID UNTIL 112150
FROM 55NE EHF-45NNW HEC-50WSW HEC-30ENE RZS-55NE EHF
MOD-SEV TURB BLW 140. STRONG UP AND DOWN DRAFTS. BLDU. CA

7.0 Astronomical Data

The United States Naval Observatory website¹⁶ provided the following astronomical conditions over the accident site coordinates on October 11, 2021. The time of the accident has been included in bold italic print for reference.

<u>SUN</u>	<u>Time (PDT)</u>
Begin Civil Twilight	0625
Sunrise	0649
<i>Accident</i>	<i>1214 PDT</i>
Upper Transit	1234
Sunset	1819
End Civil Twilight	1844

At the time of the accident the sun was located 49° above the horizon at an azimuth of 172°.

Submitted by:

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Senior Meteorologist

¹⁶ https://aa.usno.navy.mil/data/RS_OneDay