



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

February 27, 2020

Weather Factual

METEOROLOGY

ANC20FA005

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A. ACCIDENT

Location: Blythe, California
Date: November 25, 2019
Time: 1739 Pacific standard time
0139 Coordinated Universal Time (UTC) November 26, 2019
Aircraft: Beech V35; Registration: N14UC

B. METEOROLOGIST

Paul Suffern
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

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 including the National Centers for Environmental Information (NCEI). All times are Pacific standard time (PST) based upon the 24-hour clock, where local time is -8 hours from UTC, and UTC=Z. Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of miles. NWS airport and 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 location used was at latitude 33.6853° N, longitude 115.2672° W at an approximate elevation of 770 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 (AC) "Aviation Weather Services", AC 00-45H change 2¹.

¹

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1030

1.1 Surface Analysis Chart

The southwest section of the NWS Surface Analysis Chart for 1900 PST is provided as figure 1 with the location of the accident site marked within the red circle. The chart depicted low pressure systems at 994- and 993-hectopascals (hPa) over southwestern and central Colorado, respectively, with a cold front stretching southwestward from Colorado through Arizona and across southern California into the eastern Pacific Ocean. The accident site was located north of the cold frontal boundary on the cold air side of the front.

The station models around the accident site depicted air temperatures in the mid-60's to 70 degrees Fahrenheit (°F), dew point temperatures in the mid 20's to low 30's °F with a temperature-dew point spread of 39° or more, a north to northwest wind at 10 to 15 knots, and clear skies.

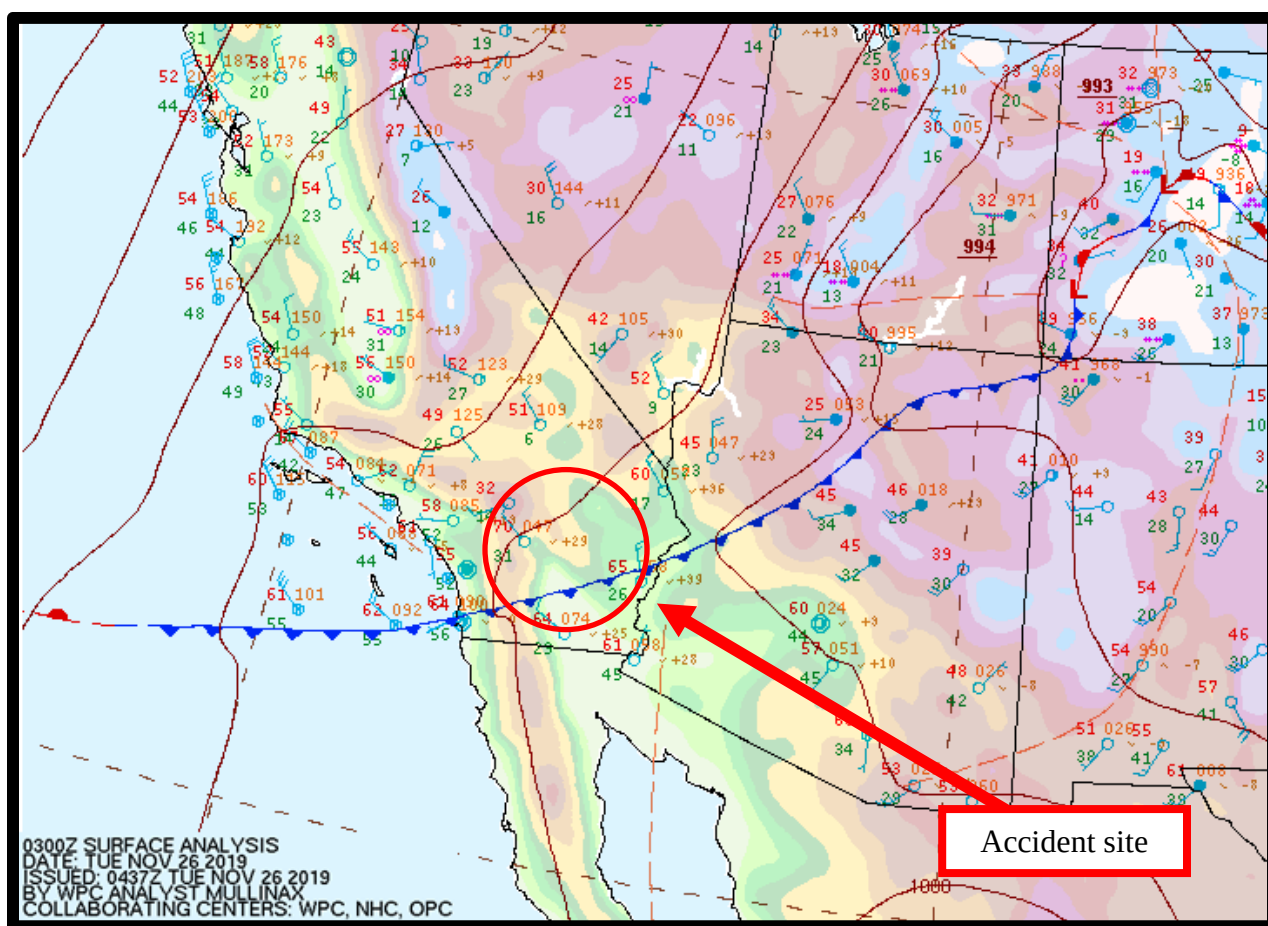


Figure 1 – NWS Surface Analysis Chart for 1900 PST

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 1600 PST at 925-, 850-, 700-, 500-, and 300-hPa are presented in figures 2 through 6. There was a low- and mid-level trough² located near and above the accident site at 925-, 850-, 700-, and 500-hPa (figures 2, 3, 4, and 5). Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present. The wind was from the west at 10 knots at 925-hPa (figure 2) with the wind rapidly increasing with height by 700-hPa with the wind at 55 knots from the north at 700-hPa (figure 4). By 300-hPa, the wind was from the northwest between 70 and 110 knots (figure 6).

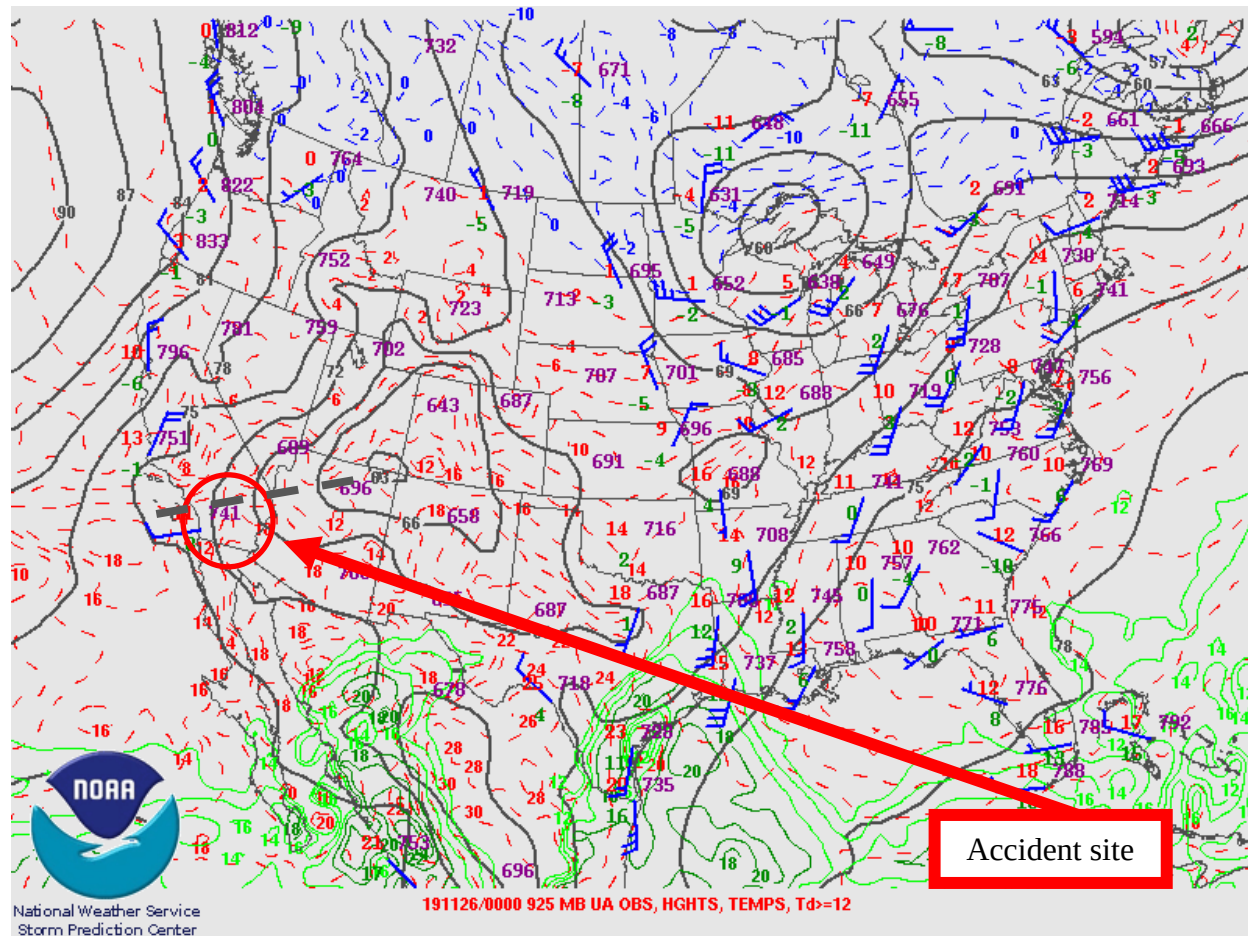


Figure 2 – 925-hPa Constant Pressure Chart for 1600 PST

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

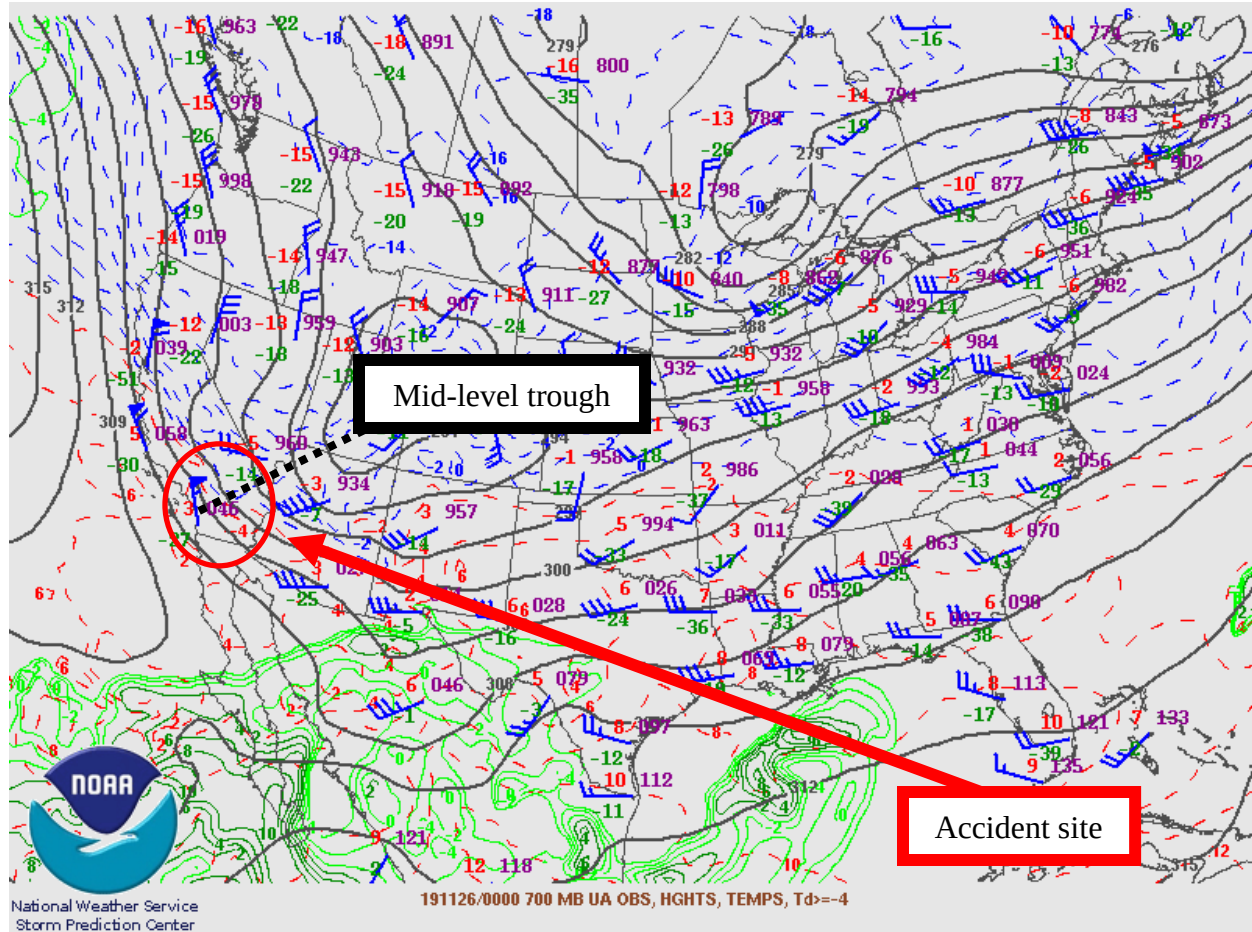


Figure 4 – 700-hPa Constant Pressure Chart for 1600 PST

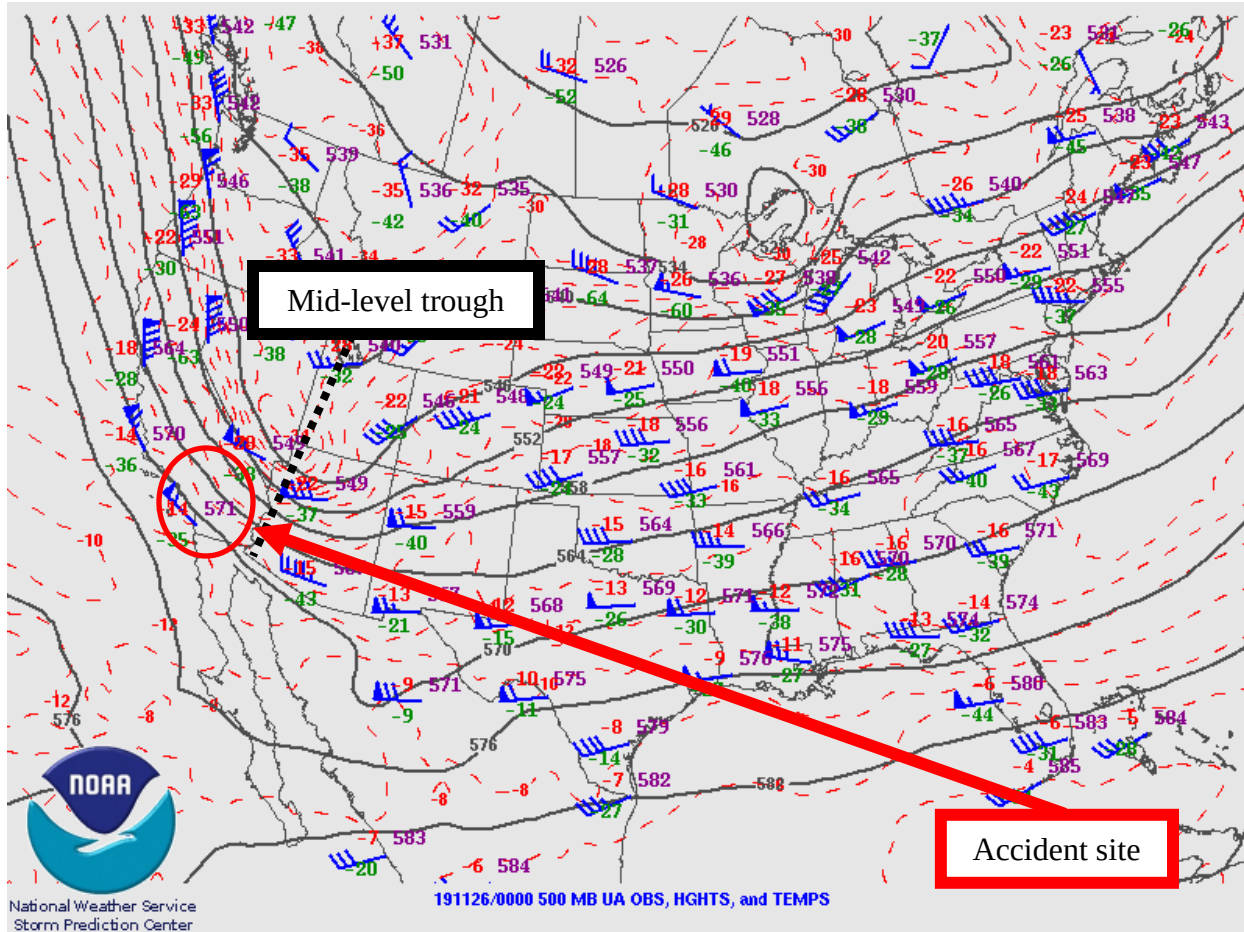


Figure 5 – 500-hPa Constant Pressure Chart for 1600 PST

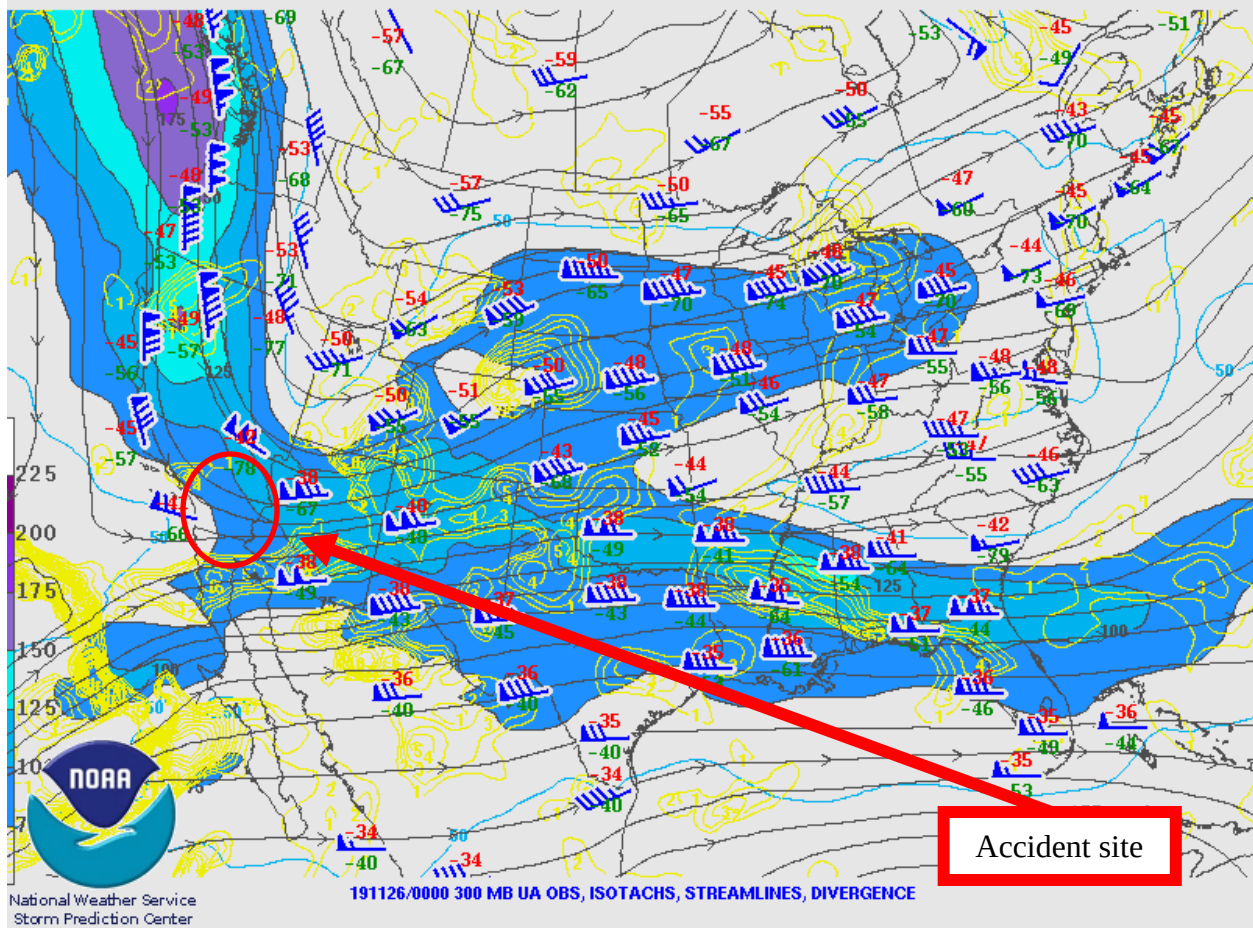


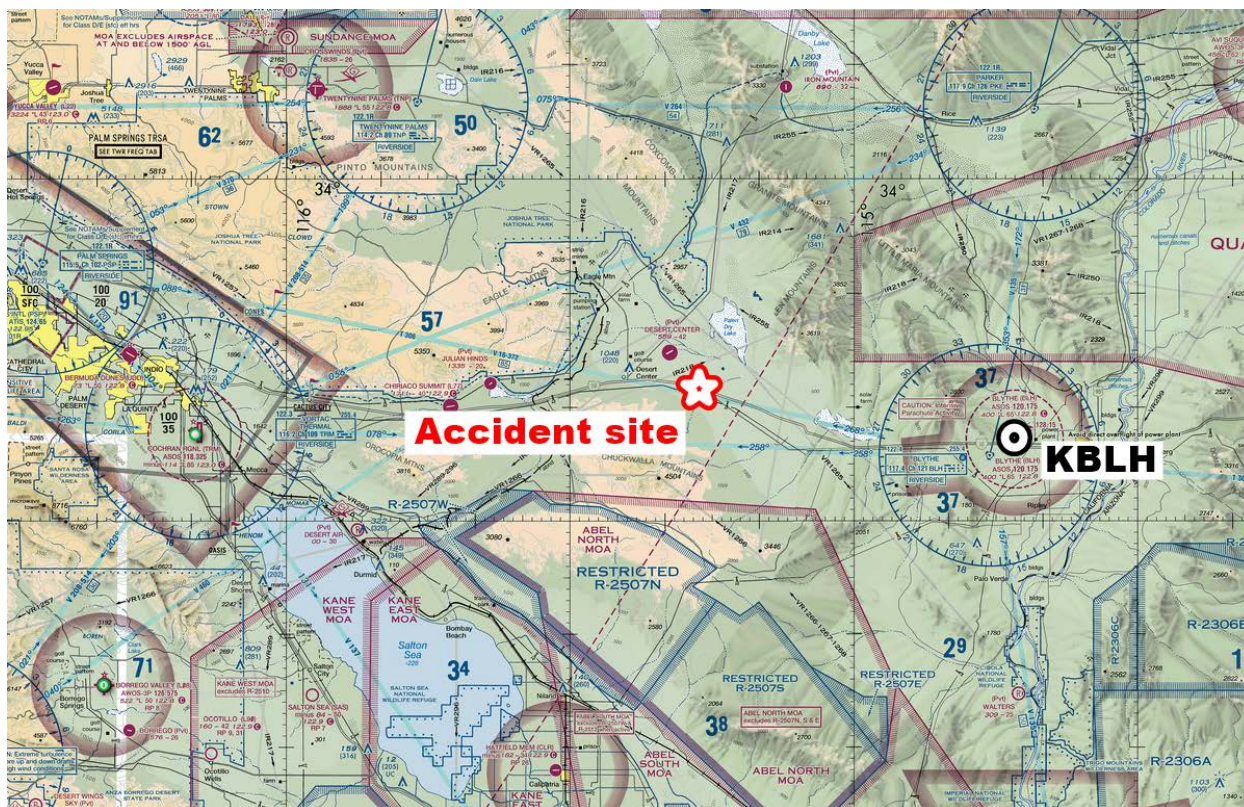
Figure 6 – 300-hPa Constant Pressure Chart for 1600 PST

2.0 SPC Convective Outlook

No thunderstorms were forecast for the accident site at the accident time.

3.0 Surface Observations

The area surrounding the accident site was documented using official Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). Figure 7 is a sectional chart with the accident site and the closest weather reporting location to the accident site marked.



The closest official weather reporting facility to the accident site was from Blythe Airport (KBLH), Blythe, California, at an elevation of 400 ft, located 28 miles east of the accident site (figure 7). KBLH had an Automated Surface Observing System (ASOS³) whose reports were not supplemented. KBLH had an 11° easterly magnetic variation⁴. The following observations were taken and disseminated during the times surrounding the accident:⁵

[1152 PST] METAR KBLH 251952Z AUTO 18012KT 10SM CLR 21/02 A2971 RMK
AO2 SLP057 T02060022=

[1252 PST] METAR KBLH 252052Z AUTO 20020G26KT 10SM CLR 23/M02 A2962
RMK AO2 PK WND 20028/2029 PRESFR SLP028 T02281017 58065=

[1352 PST] METAR KBLH 252152Z AUTO 21020G25KT 10SM CLR 24/M03 A2958
RMK AO2 PK WND 18029/2122 SLP014 T02391028=

³ ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, weather, ceiling, temperature, dewpoint, altimeter, and barometric pressure.

⁴ Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>

⁵ Bolded sections in this report highlight information that directly reference the weather conditions that affected the accident location around the accident time.

[1452 PST] METAR KBLH 252252Z AUTO 22025G30KT 8SM CLR 23/00 A2956 RMK AO2 PK WND 22030/2247 SLP006 T02330000=

[1552 PST] METAR KBLH 252352Z AUTO 24015KT 10SM FEW080 22/01 A2959 RMK AO2 PK WND 23029/2259 PRESRR SLP017 T02220006 10239 20122 55011=

[1652 PST] METAR KBLH 260052Z AUTO 32022G30KT 7SM OVC055 22/M04 A2963 RMK AO2 PK WND 33034/0036 WSHFT 0009 SLP030 T02171039=

ACCIDENT TIME 1739 PST

[1752 PST] METAR KBLH 260152Z AUTO 31019G26KT 9SM BKN044 21/M03 A2967 RMK AO2 PK WND 33032/0108 SLP044 T02061033=

[1852 PST] METAR KBLH 260252Z AUTO 34016G21KT 10SM CLR 18/M03 A2971 RMK AO2 SLP058 T01831033 53039=

[1952 PST] METAR KBLH 260352Z AUTO 31007KT 10SM CLR 17/M09 A2975 RMK AO2 SLP072 T01721089=

KBLH weather at 1652 PST, automated, wind from 320° at 22 knots with gusts to 30 knots, 7 miles visibility, an overcast ceiling at 5,500 ft above ground level (agl), temperature of 22°Celsius (C), dew point temperature of -4°C, and an altimeter setting of 29.63 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator, peak wind from 330° at 34 knots at 1636 PST, wind shift at 1609 PST, sea level pressure 1003.0 hPa, temperature 21.7°C, dew point temperature -3.9°C.

KBLH weather at 1752 PST, automated, wind from 310° at 19 knots with gusts to 26 knots, 9 miles visibility, a broken ceiling at 4,400 ft agl, temperature of 21°C, dew point temperature of -3°C, and an altimeter setting of 29.67 inHg. Remarks: automated station with a precipitation discriminator, peak wind from 330° at 32 knots at 1708 PST, sea level pressure 1004.4 hPa, temperature 20.6°C, dew point temperature -3.3°C.

The observations for KBLH surrounding the period indicated VFR⁶ conditions with northwest winds gusting to 34 knots. The surface wind shifted from the southwest to the northwest at 1609 PST.

⁶ 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.

4.0 Upper Air Data

The closest official upper air sounding to the accident site, located in an area with a similar wind pattern as the accident site was from Vandenberg Air Force Base, California, KVBG, located 271 miles northwest of the accident site, with a site number 72393 and an elevation of 367 ft. The 1600 PST KVBG sounding was plotted on a standard Skew-T Log P diagram,⁷ and is included in figure 8 (with data from the surface to 600-hPa (or approximately 14,000 ft msl). This data was analyzed using the RAOB⁸ software package. The sounding depicted the lifted condensation level (LCL)⁹ at 2,082 ft agl and the convective condensation level (CCL)¹⁰ at 13,186 ft agl. The sounding had a less than 45 percent relative humidity from 1,000 ft msl through 25,000 ft. The freezing level was located at 12,071 ft msl. The precipitable water value was 0.34 inches.

⁷ 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.

⁸ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania.

⁹ LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹⁰ 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.

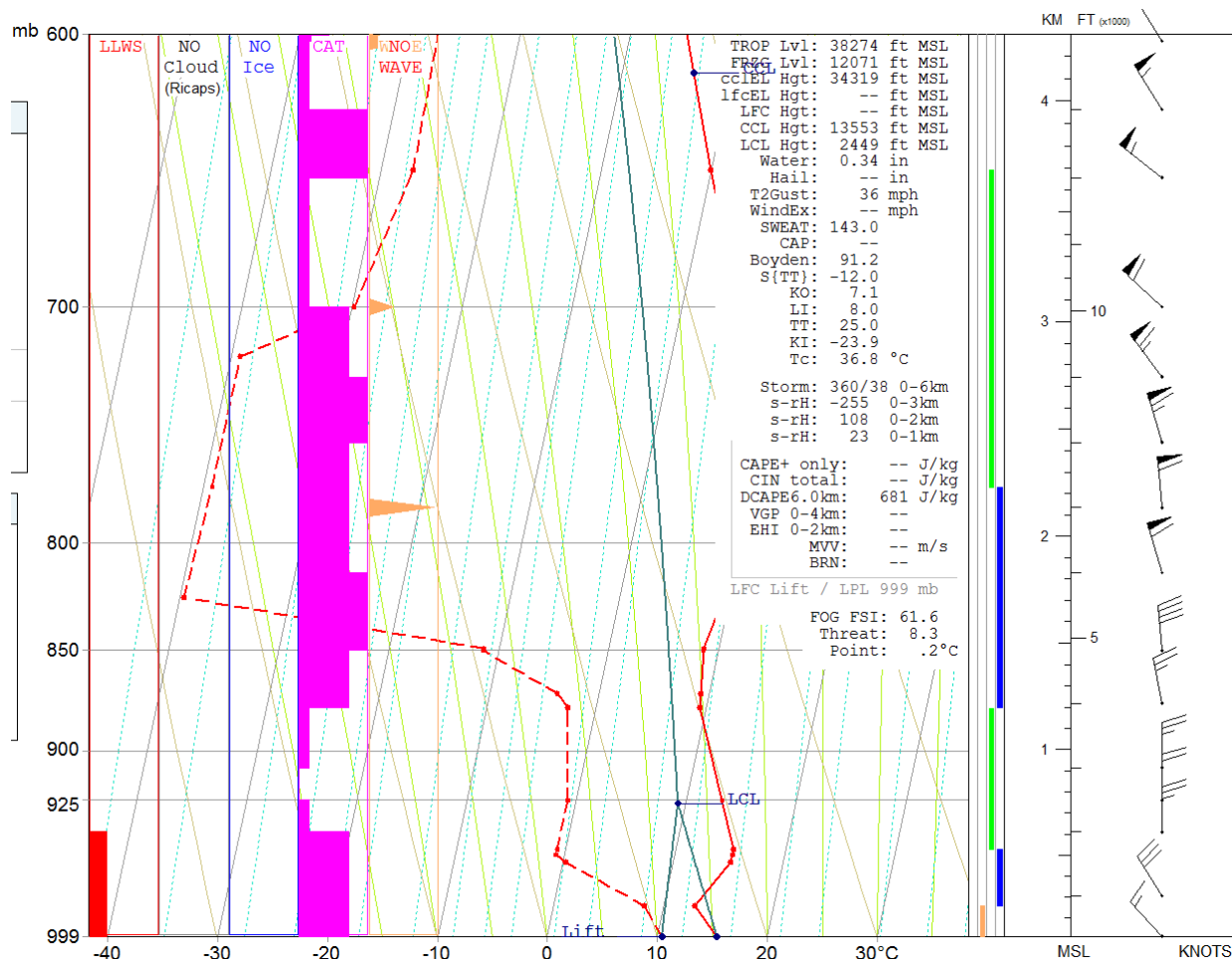


Figure 8 – 1600 PST KVBG sounding

The 1600 PST KVBG sounding indicated alternating conditionally unstable and stable environments from the surface through 14,000 ft msl. RAOB did not identify the possibility of clouds for below 14,000 ft msl. No icing was indicated by RAOB below 14,000 ft msl.

The 1600 PST KVBG sounding wind profile indicated a surface wind from 320° at 17 knots with the wind increasing in speed to 29 knots by 1,000 ft msl. RAOB identified low-level wind shear (LLWS) potential between the surface and 2,000 ft. RAOB indicated the possibility of moderate to extreme clear-air turbulence in several layers above 2,000 ft msl continuing through 16,000 ft msl. RAOB also indicated the possibility of severe mountain wave conditions¹¹ between 6,000 and 8,000 ft with updraft and downdraft speeds as high as 3,927 ft per minute (fpm) (figure 9). RAOB also identified moderate to severe mountain wave conditions at 14,000 ft msl with updraft and downdraft speeds as high as 1,633 fpm. For more information on Mountain wind and wave conditions please see FAA AC 00-57¹².

¹¹ Default RAOB mountain range parameters were used.

¹² https://www.faa.gov/documentLibrary/media/Advisory_Circular/00-57.pdf

Level	Height (ft-MSL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD / FF (deg / kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)	Wave/x---W---Turb nm fpm max
1	367	999	15.4	10.4	72	320 / 17				
2	843	982	12.8	8.2	74		SVR	LIGHT		
3	1000	976				330 / 29				
4	1528	958	15.2	0.2	36					
5	1644	954	15.2	-0.8	33					
6	1731	951	15.2	-0.8	33		SVR	LIGHT		
7	2000	942				360 / 26	LGT			
8	2498	925	13.2	-0.8	38	360 / 22				
9	3000	908				360 / 23	LGT			
10	3927	878	9.4	-2.6	43	350 / 24				
11	4145	871	9.2	-3.8	40		SVR			
12	4808	850	8.6	-11.4	23	355 / 38				
13	4840	849	8.6	-11.4	23					
14	5618	825	9.4	-39.6	2		XTR			
15	6000	813				345 / 59	SVR			
16	7000	784				355 / 58				8.11 3927 SEVERE
17	7317	775	9.8	-39.2	2		SVR			
18	8000	756				345 / 67	XTR			
19	9000	728				325 / 65				
20	9308	720	6.8	-39.2	2		SVR			
21	10064	700	5.2	-29.8	6	315 / 62	LGT			5.31 763 LT-MD
22	12000	651				310 / 56				
23	12110	648	-0.1	-27.1	11		XTR			
24	13000	626				330 / 53	LGT			
25	14000	602				330 / 58				4.29 1633 MD-SV
26	15294	573	-7.7	-27.7	18		MDT			
27	16000	557				340 / 64	SVR			
28	18731	500	-13.9	-35.9	14	310 / 67				
29	20000	475				310 / 70				
30	20476	466	-16.7	-46.7	6		MDT			
31	21000	456				305 / 65				
32	23990	403	-26.1	-51.1	8					6.65 500 LIGHT

Figure 9 – 1600 PST KVBG sounding text data

5.0 Satellite Data

Data from the Geostationary Operational Environmental Satellite number 17 (GOES-17) data was obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. Visible (band 2) and infrared (bands 13) imagery at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period. Satellite imagery surrounding the time of the accident, from 1400 PST through 2200 PST at approximately 5-minute intervals were reviewed, and the closest images to the time of the accident are documented here. Given the sun angle and time of day the visible imagery did not provide useful information.

Figure 10 is the GOES-17 infrared imagery from 1740 PST at 4X magnification and with a temperature enhancement curve applied with the accident site highlighted by a red square. Inspection of the infrared imagery indicated no cloud cover above the accident site at the accident time. Wave-like patterns can be seen in the low-level water vapor imagery moving southeastward across the accident site and southern California at the accident time (attachment 1). It should be noted these figures have not been corrected for any parallax error.

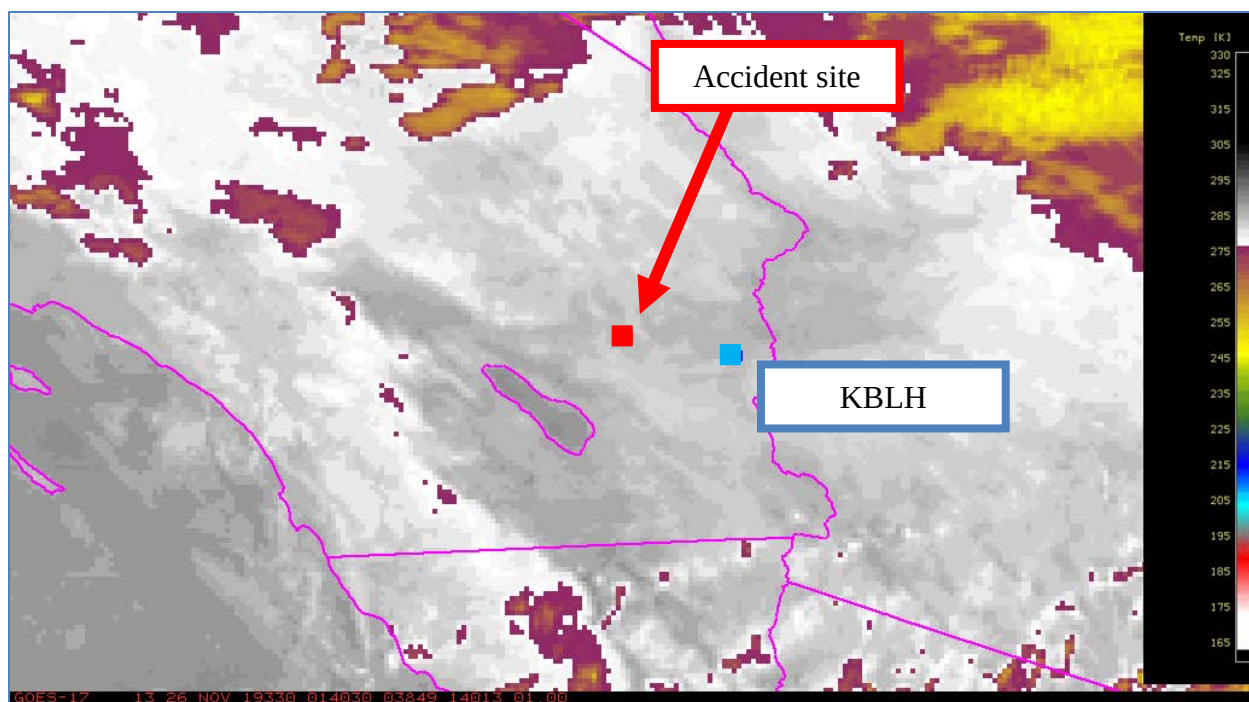


Figure 10 – GOES-17 infrared image at 1740 PST

Attachment 2 presents the GOES-17 Nighttime Microphysics RGB¹³ (red green blue) imagery from 1631 to 1831 PST. Inspection of the Nighttime Microphysics RGB imagery indicated a boundary moving southeastward across the accident site and KBLH around the accident time and corresponded with the wind shift at KBLH (section 3.0).

6.0 Regional Radar Imagery Information

A regional view of the NWS national composite radar mosaic is included as figure 11 for 1740 PST with the approximate location of the accident site marked within a red circle. The image depicted no precipitation echoes over the accident site at the accident time.

¹³ Also see: <https://nasasporttraining.wordpress.com/2017/02/23/nighttime-microphysics-rgb-application-aviation-module-2/>

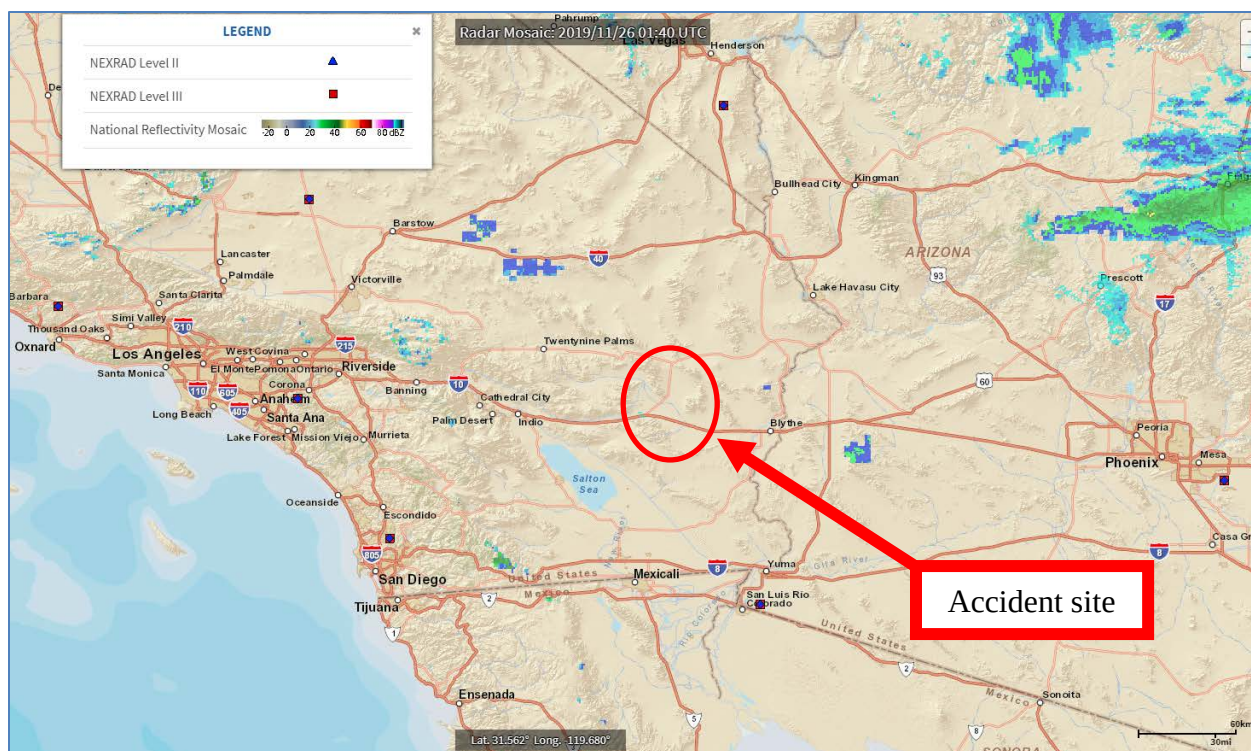


Figure 11 – Regional Composite Reflectivity image for 1740 PST

7.0 Pilot Reports

All pilot reports¹⁴ (PIREPs) within 100 miles of the accident site from about five hours prior to the accident time to about four hours after the accident time for below 18,000 ft are provided below:

PSP UUA /OV KPSP/TM 2102/FL065/TP PA46/TB SEV/RM PILOT REPORTED THAT IT WAS THE WORST TURBULENCE EXPERIENCED IN HIS 15 YEAR FLYING CAREER

PSP UA /OV PSP/TM 2207/FL030/TP E75L/TB SVR TB/RM SVR TB ON FINAL TO PSP/ E75L/ 030 AND BELOW

PHX UA /OV BXK257055/TM 2300/FL080/TP SR22/TB LT TURB/RM ZAB FDOS

IPL UUA /OV IPL235021/TM 2316/FL070/TP C208/TB MOD-SEV INTMT/RM ZLAWC AWC-WEB/

TRM UA /OV TRM050025/TM 2335/FL030/TP E135/TB MOD/RM ZLAWC AWC-WEB/

NJK UA /OV IPL245022/TM 2349/FL100/TP M20P/TB LGT/RM 60KT HEADWIND WESTBOUND

PSP UA /OV KPSP/TM 0044/FL002/TP CRJ7/TB MOD/RM GAIN OF 20 KNOTS AT 200 FEET AGL ON FINAL FOR 31L. MODERATE TURBULENCE ALL THE WAY DOWN.

PSP UA /OV PSP/TM 0123/FL080/TP CRJ7/WV LOSS OF 40 KT AT 8000/TB MOD

¹⁴ Only pilot reports with the World Meteorological Organization (WMO) header UBCA**, UBAZ**, and UBNV** identifier were considered.

There were several PIREPs classified as “Urgent” during the period due to severe turbulence conditions. In addition, the PIREPs indicated strong headwind conditions along with wind shear. A pilot report near Palm Springs, California, (PSP, located 62 miles west of the accident site) at 1723 PST reported a loss of 40 knots at 8,000 ft in moderate turbulence.

8.0 SIGMET

There were Significant Meteorological Information (SIGMET) advisories valid for the accident site at the accident time (figures 12, 13, and 14). SIGMET Uniform 3 issued at 1505 PST and valid until 1905 PST warned of occasional severe turbulence below 12,000 ft with those conditions reported by aircraft. SIGMET Whiskey 1 issued at 1544 PST and valid until 1944 PST warned of occasional visibilities below 3 miles in widespread dust below 10,000 ft:

WSUS06 KPCI 252305
WS6U
-SFOU WS 252305
SIGMET UNIFORM 3 VALID UNTIL 260305
CA NV AZ NM AND CSTL WTRS
FROM 30SE CZQ TO 80NE INW TO 20NNE DMN TO MZB TO 40WNW RZS TO
30SE CZQ
**OCNL SEV TURB BLW 120. DUE TO STG LOW LVL WNDS AND MTN WV ACT AND
STG UDDFS AND LLWS. RPTD BY ACFT. CONDS CONTG BYD 0305Z.**

....

WSUS06 KPCI 252344
WS6W
-SFOW WS 252344
SIGMET WHISKEY 1 VALID UNTIL 260344
CA NV AZ
FROM 40NNE MOD TO 50SSE BTY TO 30S DRK TO 20N BZA TO 30SW EHF TO
30SSW MOD TO 40NNE MOD
OCNL VIS BLW 3SM IN WDSR DS BLW 100. CONDS CONTG BYD 0344Z.

....

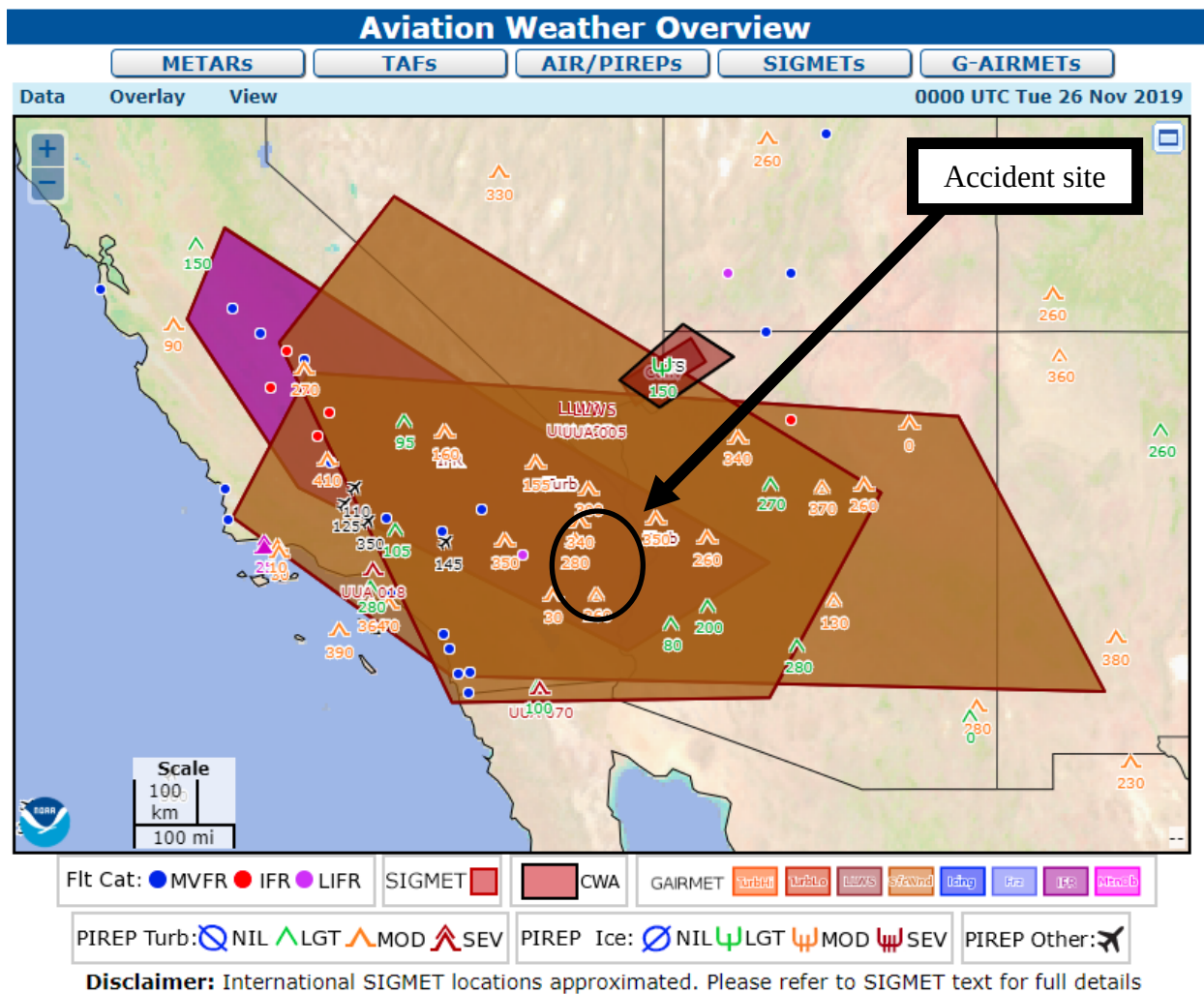


Figure 12 – CWAs and SIGMETs map valid at 1600 PST

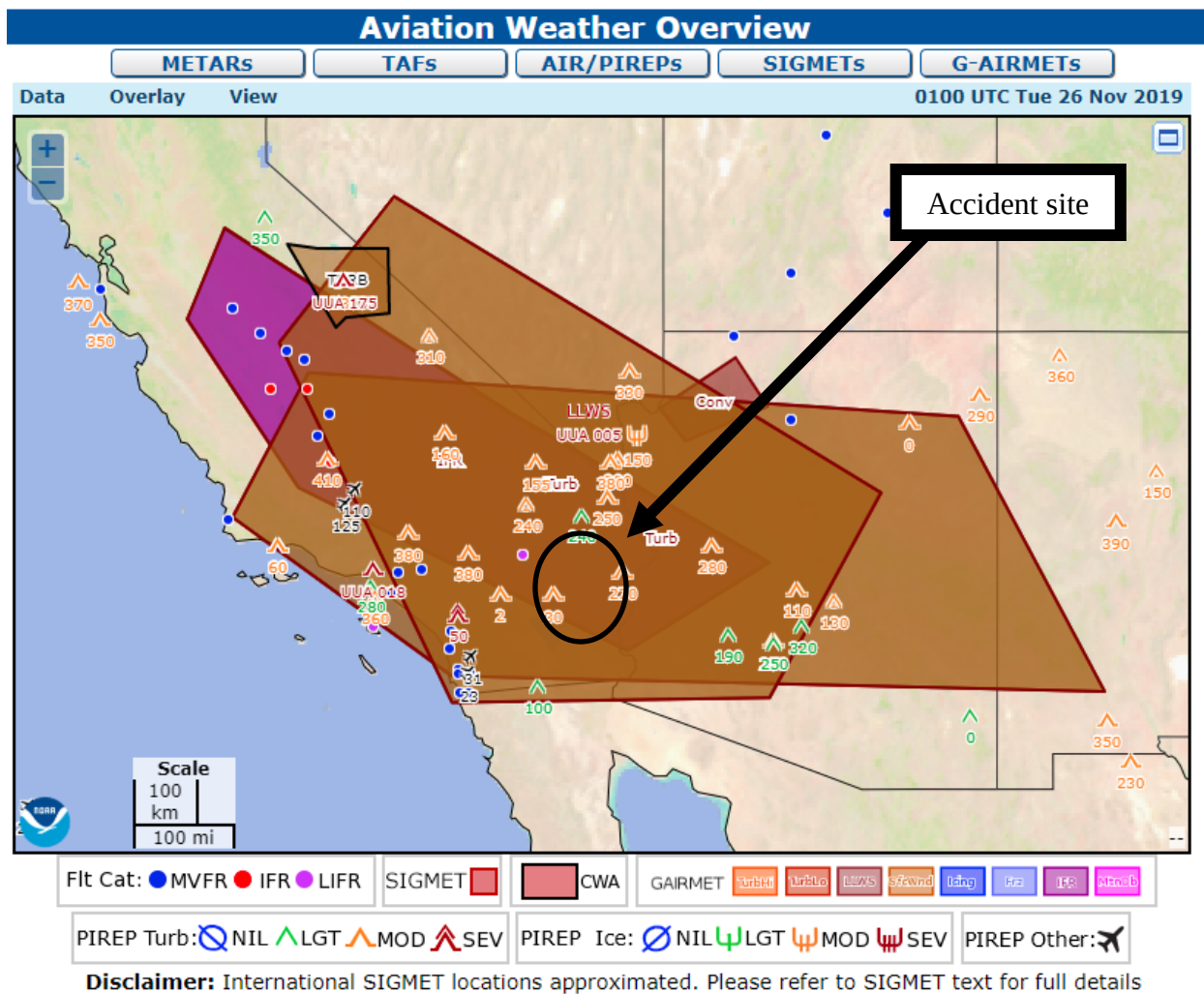


Figure 13 – CWAs and SIGMETs map valid at 1700 PST

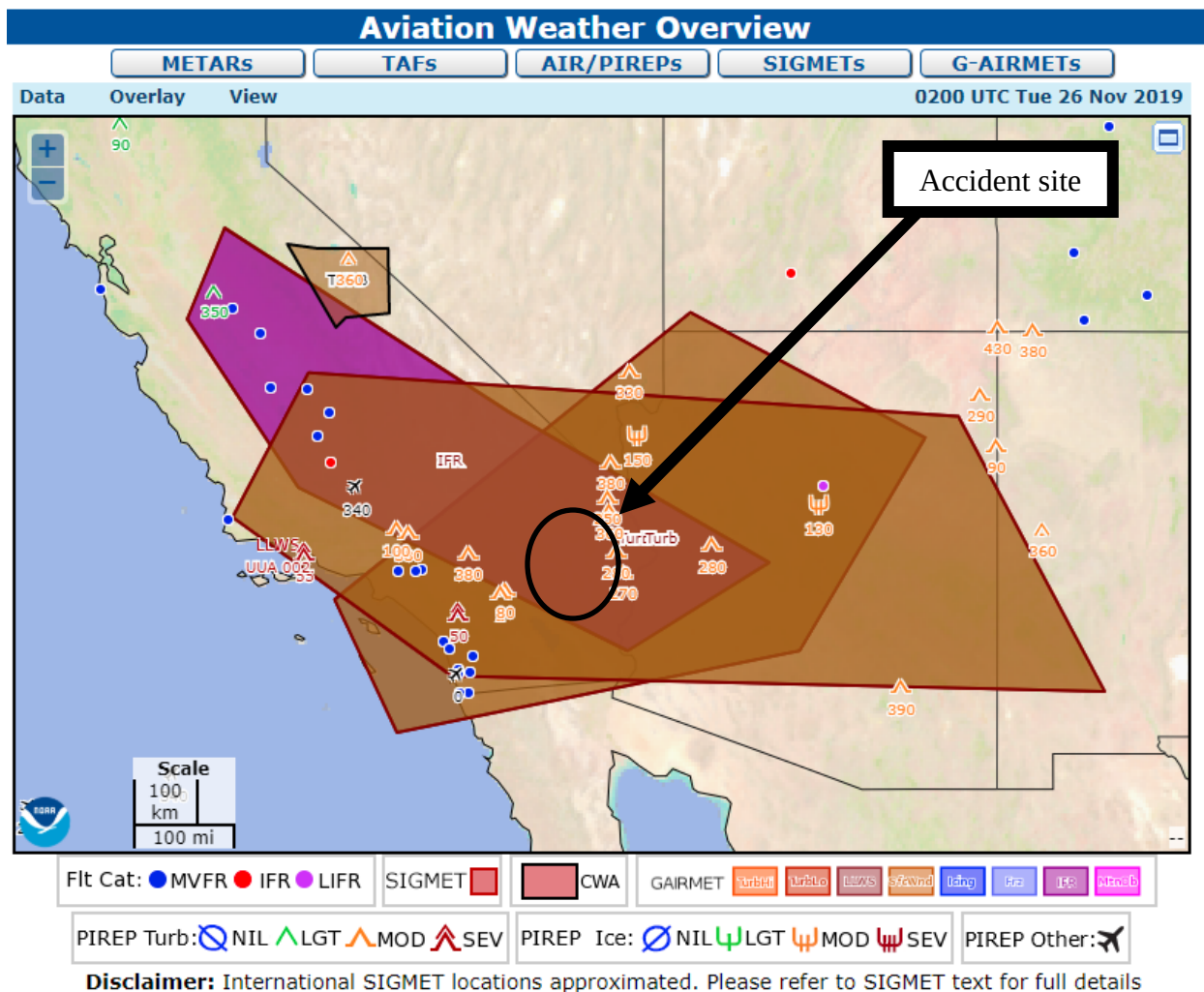


Figure 14 – CWAs and SIGMETs map valid at 1800 PST

9.0 CWSU Advisories

There were no Center Weather Service Unit (CWSU) Center Weather Advisories (CWA) valid for the accident site at the accident time. There was a CWSU Meteorological Impact Statement (MIS) issued by the Los Angeles CWSU (ZLA) at 0948 PST and valid through 2200 PST for the accident site and the MIS discussed occasional severe turbulence, LLWS, and strong up and downdrafts over the terrain:

FAUS20 KZLA 251748

ZLA MIS 03 VALID 251800-260600

...FOR ATC PLANNING PURPOSES ONLY...

STRONG W AND NW WINDS OVER COASTAL MOUNTAINS AND SIERRA NEVADA AND VERY STRONG JET STREAM ABOVE WILL CAUSE OCCASIONAL SEVERE TURBULENCE...LOW-LEVEL WIND SHEAR AND STRONG UP AND DOWNDRAFT OVER THE MOUNTAINS AND DESERTS OF SOUTHERN AND CENTRAL CALIFORNIA AS WELL AS SOUTHERN NEVADA AND WESTERN ARIZONA UNTIL 261100Z. ANOTHER STRONGER WINTER STORM WILL BRING STRONG WINDS INTO THE AREA AS WELL AS SNOW EVENTUALLY DOWN TO 2500 FT BETWEEN 270000Z AND 301200Z.

=

10.0 AIRMETs

Airmen's Meteorological Information (AIRMET) advisories Tango and Sierra were valid for the accident site at the accident time. The AIRMETs warned moderate turbulence below 18,000 ft, sustained surface winds greater than 30 knots, (SIGMET Uniform 3 amended AIRMET Tango), and mountain obscuration conditions due to clouds and mist (SIGMET Whiskey 1 amended AIRMET Sierra):

WAUS46 KPCI 260130 AAA

WA6T

-SFOT WA 260130 AMD

AIRMET TANGO UPDT 6 FOR TURB AND STG SFC WNDZ VALID UNTIL 260300

.

...SEE SIGMET UNIFORM SERIES...

.

...SEE SIGMET VICTOR SERIES...

.

AIRMET TURB...OR CA ID NV UT AZ NM AND CSTL WTRS
FROM 60E DSD TO 40NNW BVL TO 70WSW RSK TO 40WSW ALS TO 30S DMN
TO 50S TUS TO BZA TO 20S MZB TO 220SW MZB TO 140WSW FOT TO 30SE
ONP TO 60E DSD
MOD TURB BTN FL180 AND FL400. CONDS CONTG BYD 03Z THRU 09Z.

.

**AIRMET TURB...CA ID WY NV UT CO AZ NM AND CSTL WTRS...UPDT
FROM 40SSW BOY TO 20SSW DDY TO 30NNE CYS TO 40ESE TBE TO 50SW
TXO TO INK TO ELP TO 50S TUS TO BZA TO 20S MZB TO 130SW MZB TO
90SSW SNS TO 20E FOT TO 60WSW BAM TO 20E SLC TO 40SSW BOY
MOD TURB BLW FL180. CONDS CONTG BYD 03Z THRU 09Z.**

.

AIRMET STG SFC WNDZ...CA AND CSTL WTRS
FROM 40SSW ENI TO 70SW LAX TO 110SW MZB TO 220SW MZB TO 140WSW
ENI TO 40SSW ENI
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS CONTG BYD 03Z
ENDG 06-09Z.

.

**AIRMET STG SFC WNDZ...CA NV AZ
FROM OAL TO 30NNW PGS TO 40E BZA TO 60SSE TRM TO 40ENE LAX TO
50SE CZQ TO OAL
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS ENDG 00-03Z.**

.

OTLK VALID 0300-0900Z...TURB CA NV UT CO AZ NM AND CSTL WTRS
BOUNDED BY 50SW MLD-50SE HVE-GLD-50W LBL-30ESE TBE-INK-ELP-50S
TUS-BZA-20S MZB-110SW MZB-60WNW RZS-20W SNS-60SSW LKV-50SW MLD
MOD TURB BTN FL180 AND FL400. CONDS CONTG THRU 09Z.

....

WAUS46 KPCI 252045

WA6Z

-SFOZ WA 252045

AIRMET ZULU UPDT 4 FOR ICE AND FRZLVL VALID UNTIL 260300

.

AIRMET ICE...WA OR CA AND CSTL WTRS

FROM 30SW YDC TO 40NNW YKM TO 60SW YKM TO 40W LKV TO 70S OED TO
30NE FOT TO 160WNW FOT TO 140W TOU TO 60SW HQM TO 30NW BTG TO HUH
TO 30SW YDC
MOD ICE BTN FRZLVL AND 150. FRZLVL SFC-050. CONDS CONTG BYD 03Z
THRU 09Z.

.
AIRMET ICE...WA OR ID MT NV UT
FROM 50NNW MLP TO 70SSE FCA TO 30W HLN TO 20E LKT TO 40NE DNJ TO
60E BOI TO 50WSW MLD TO 30NE ELY TO 60S BAM TO 30NNE BAM TO 80SE
LKV TO 60NW REO TO 70S YKM TO 30N PDT TO 40NNE GEG TO 50NNW MLP
MOD ICE BLW 130. CONDS CONTG BYD 03Z THRU 09Z.

.
FRZLVL...RANGING FROM SFC-135 ACRS AREA
MULT FRZLVL 050-110 BOUNDED BY 130W FOT-40SW ENI-70SSW PYE-
120SW PYE-140WSW FOT-130W FOT
SFC ALG 20NW HUH-YKM-40SE OED-60E CZQ-30WNW BTY
040 ALG 150WNW FOT-30W FOT-40NNE RBL
080 ALG 130WSW PYE-40S OAK-60SE EHF-20S EED
120 ALG 150SW SNS-30NW MZB-50W BZA

....

WAUS46 KKCI 252346 AAA
WA6S
-SFOS WA 252346 AMD
AIRMET SIERRA UPDT 5 FOR IFR AND MTN OBSCN VALID UNTIL 260300

.
...SEE SIGMET WHISKEY SERIES...UPDT

.
AIRMET IFR...WA OR ID MT
FROM 60NNW GEG TO MLP TO BKE TO 30SW PDT TO 60NNW GEG
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS ENDG 21-00Z.

.
AIRMET MTN OBSCN...WA OR ID MT
FROM 50WSW YXC TO GTF TO DLN TO 20SSE BOI TO 70NE LKV TO 50SSW
PDT TO PDT TO 20NW GEG TO 50WSW YXC
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET MTN OBSCN...CA
FROM 50SSW HEC TO 60S TRM TO 20S MZB TO 40NNW MZB TO LAX TO
50SSW HEC
MTNS OBSC BY CLDS/BR. CONDS DVLPG 00-03Z. CONDS CONTG BYD 03Z
ENDG 06-09Z.

.
AIRMET MTN OBSCN...WA OR CA
FROM YDC TO 60SSW YKM TO 70SE OED TO 30NNW FOT TO 70WNW OED TO
HUH TO YDC
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

.
OTLK VALID 0300-0900Z...IFR WA OR
BOUNDED BY 60SE TOU-30E SEA-20ENE OED-60WNW OED-60SE TOU
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS DVLPG 06-09Z. CONDS CONTG
THRU 09Z.

....

11.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products made available before the accident flight are shown in attachment 3. The GFA surface forecast products indicated mainly VFR surface visibilities with a patch of LIFR surface visibilities in the areas of dust. A surface wind from the west and northwest was forecast at 15 to 25 knots with gusts to 35 knots. The GFA cloud forecast products indicated clear skies for the accident site with a broken cloud ceiling at 4,000 ft msl and cloud tops to 6,000 ft msl for the intended destination location. For more information please see attachment 3.

12.0 Terminal Aerodrome Forecast

KBLH was the closest site with a NWS issued Terminal Aerodrome Forecast (TAF). The KBLH TAF valid at the accident time was issued at 1621 PST and was valid for a 24-hour period beginning at 1600 PST. The 1621 PST TAF for KBLH was as follows:

TAF AMD KBLH 260021Z **2600/2624 24015KT P6SM FEW250**
FM260300 33017G29KT P6SM SKC
FM261000 34012KT P6SM SKC=

The TAF expected a wind from 240° at 15 knots, greater than 6 miles visibility, and few clouds at 25,000 ft agl.

13.0 NWS Area Forecast Discussion

The NWS Office in Phoenix, Arizona, issued the following Area Forecast Discussion (AFD) at 1729 PST (closest AFD to the accident time with an aviation section). The aviation section of the AFD discussed gusty wind conditions with gusts to 30 knots and patchy dusty restricting visibilities:

FXUS65 KPSR 260129
AFDPSR

Area Forecast Discussion
National Weather Service Phoenix AZ
629 PM MST Mon Nov 25 2019

.UPDATE...Updated Aviation discussion.

&&

.SYNOPSIS...

Cool and dry conditions will continue through Tuesday. Another potent weather system will approach from the northwest on Wednesday. This system will likely bring periods of rain across the lower deserts beginning by late Wednesday to early Thursday before tapering off late this week and into the early weekend. Snow across portions of the Arizona high country and Joshua Tree National Park is also likely during the second half of the week and into the weekend. Temperatures late this week and into next weekend will be sharply cooler.

&&

.DISCUSSION...

The first in a series of shortwave upper troughs is moving through the Great Basin this afternoon. This feature is forecast to amplify gradually while approaching the Four Corners later this evening. An associated low-level cold front is moving through western Nevada and eastern California, and is resulting in a significant increase in winds. These strong winds will extend southward into parts of southeast California this afternoon and evening, where a Wind Advisory remains in effect. Localized gusts up to 50 mph will be possible across parts of JTNP, eastern Riverside County, and far southwest Imperial County. Could see gusty winds across southwest and south-central Arizona for a few hours later this evening. Hi-resolution model guidance continues to indicate isolated to scattered showers may develop near the cold front across southern Gila County, and potentially over parts of Pinal County early Tuesday morning. Any precipitation totals will be very light owing to the lack of any significant moisture. Tuesday will also see temperatures several degrees cooler in the wake of the cold front.

By Wednesday, the large upper trough emanating from the Pacific Northwest will encompass most of the Pacific coast, with strong southwesterly flow overspreading all of southern California and Arizona. Rich moisture associated with a southern-stream low off the Baja coast will advect northeastward, but the main portion of this plume will remain situated south and east of here. However, as the trough continues to deepen, some of this moisture will advect into central Arizona and result in widespread precipitation development Thursday morning across south-central Arizona as low-level flow southerly flow strengthens significantly. Meanwhile, the primary branch of ascent associated with the trough will begin spreading eastward across southeast California, resulting in increasing precipitation chances and falling snow levels behind a strong cold front. The front will rapidly progress eastward late Thursday and early Friday, and likely be associated with a separate more well-developed band of precipitation.

Multiple impacts will be associated with this storm system as it moves eastward. Snowfall is expected to begin early Thursday across Joshua Tree NP, where a Winter Storm Watch has been issued for western parts of the park for elevations above 4000 feet. The peak period of precipitation east of the Colorado River will begin Thursday afternoon and last through Friday morning. Significant warm-advection and orographic ascent should contribute to the widespread development of precipitation across northern parts of La Paz and Maricopa Counties into southern Gila County, and across the lower deserts of south-central Arizona. Localized flash flooding will be possible across these areas, and may need to consider a Flash Flood Watch for this period eventually. Ensemble members continue to show a wide spread for precipitation totals here, but mean QPF remains consistent between 1-1.5" across most of the Phoenix area. Snow levels will initially start high, but rapidly fall on Friday morning from west to east from around

7000 feet to 4500 feet. As this occurs, significant snow accumulations are likely across the highest elevations of far northeast Maricopa County and southern Gila County, with up to 14 inches possible at the peaks. Have issued a Winter Storm Watch from late Thursday through early Saturday above 4500 feet for these areas.

More significant drying will occur late Friday, and result in a decrease in precipitation chances for all areas except southern Gila County. Cold air will linger during the weekend, and will see outlying areas approach freezing on both Saturday and Sunday morning. Will continue monitoring for the potential for a Freeze Watch during this period. Beyond next weekend, the storm track looks to remain active with potentially another weaker storm system affecting the Southwest early next week.

&&

.AVIATION...Updated at 0130Z.

South-Central Arizona including KPHX, KIWA, KSDL, and KDVT: A frontal boundary will move through the Phoenix area early this evening, which will stymie the typical downslope flow. Latest model guidance indicates winds with a westerly component will approach 40 kt ahead of, and behind the front just above the surface. Winds this strong will not be realized at the surface. However, a short period of gusts to 20-30 kt is possible. Winds will also remain strong enough at the surface to preclude LLWS, which will generally be displaced further eastward. A weaker pressure gradient between storm systems will result in lighter winds Tuesday.

Southeast California/Southwest Arizona including KIPL and KBLH: Windy conditions have developed behind a frontal boundary and gusts up to 30 kt are anticipated the next few hours. Patchy dust that developed further west will migrate eastward tonight, though restrictions in visibility below 6SM are not anticipated. A weaker pressure gradient between storm systems will result in lighter winds late tonight and into Tuesday.

&&

.FIRE WEATHER...

Wednesday through Sunday:

Good precipitation chances return by late Wednesday to early Thursday as a strong low pressure system approaches the region. High chances for wetting rains are seen from Wednesday night through Friday. The late week weather system will also bring cooler to much cooler temperatures and breezy to at times windy conditions. Min RH values above to well above 20 percent are expected in all locales through the period.

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.SPOTTER INFORMATION STATEMENT...

Spotters should follow standard reporting procedures.

&&

.PSR WATCHES/WARNINGS/ADVISORIES...

AZ...Winter Storm Watch from Thursday evening through Friday evening
for AZZ557-558-563.

CA...Wind Advisory until 6 AM PST Tuesday for CAZ560.

Winter Storm Watch from late Wednesday night through late
Thursday night for CAZ560.

Wind Advisory until 1 AM PST Tuesday for CAZ564-568.

Wind Advisory until 7 PM PST this evening for CAZ562.

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14.0 NWS Wind Advisory

The NWS Office in Phoenix, Arizona, issued the following Wind Advisory at 1230 PST which was valid along the accident route. The Wind Advisory was valid through 0100 PST on November 26 and warned of surface wind gusts to 50 mph and difficult driving conditions for larger vehicles traveling along roads with crosswinds:

CAZ564-568-260900-
/O.CON.KPSR.WI.Y.0035.000000T0000Z-191126T0900Z/
Chuckwalla Mountains-Chiriaco Summit-
Including the cities of Imperial Hot Mineral Springs and Chiriaco
Summit
1230 PM PST Mon Nov 25 2019

...WIND ADVISORY REMAINS IN EFFECT UNTIL 1 AM PST TUESDAY...

*** WHAT...West winds 20 to 30 mph with gusts up to 50 mph
expected.**

*** WHERE...Chuckwalla Mountains and Chiriaco Summit.**

*** WHEN...From noon today to 1 AM PST Tuesday.**

*** IMPACTS...Difficult driving conditions, especially for larger
vehicles traveling along roads with crosswinds. Light,
unsecured objects may become airborne.**

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A Wind Advisory means that sustained wind speeds of between 30 and 40 mph are expected, or wind gusts of between 40 and 58 mph. Winds this strong can make driving difficult, especially for high profile vehicles. In addition, strong winds over desert areas could result in briefly lowered visibilities to well under a mile at times in blowing dust or blowing sand. Use extra

caution.

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15.0 Winds and Temperature Aloft Forecast

The NWS 1155 PST Winds and Temperature Aloft forecast valid for 1600 PST for the closest point to the accident site is included below:

```
FBUS31 KWN0 251955
FD1US1
DATA BASED ON 251800Z
VALID 260000Z   FOR USE 2000-0300Z. TEMPS NEG ABV 24000

FT  3000    6000    9000   12000   18000   24000   30000   34000   39000
BLH 2732 3142+09 3064+06 2972+02 2971-14 2982-29 288742 750349 277356
```

The accident site was closest to the Blythe, California (BLH) forecast point. The BLH forecast for use between 1200 and 1900 PST indicated a wind at 3,000 ft from 270° at 32 knots, at 6,000 ft a wind from 310° at 42 knots with a temperature of 9°C, at 9,000 ft a wind from 300° at 64 knots with a temperature of 6°C, and at 12,000 ft a wind from 290° at 72 knots with a temperature of 2°C.

16.0 CWSU ZLA Products

The ZLA CWSU issued a weather story at 1000 PST (attachment 4) that warned of breezy to windy conditions, severe turbulence, LLWS, and dusty conditions for southern California. The morning and afternoon ZLA CWSU air traffic controller (ATC) pre-duty weather briefings are contained in attachments 5 and 6.

17.0 Pilot Weather Briefing

The accident pilot did not request or receive a weather briefing through the FAA contract Automated Flight Service Station provider Leidos.

A search of archived ForeFlight information indicated that the accident pilot did not request a weather briefing via ForeFlight Mobile nor did the pilot view any static weather imagery (attachment 7). However, the accident pilot did view airport information (either airport or weather information valid at those airports) from various airports along the proposed route of flight between 1450:20 PST and 1527:14 PST (attachment 7). There is no record of the accident pilot receiving or retrieving any other weather information before or during the accident flight.

18.0 Astronomical Data

The astronomical data obtained for the accident site on November 25, 2019, indicated the following conditions:

SUN

Begin civil twilight	0555 PST
Sunrise	0622 PST
Sun transit	1128 PST
Sunset	1634 PST
End civil twilight	1701 PST
<i>Accident</i>	<i>1739 PST¹⁵</i>

MOON

Moonrise	0511 PST
Moon transit	1046 PST
Moonset	1614 PST
<i>Accident</i>	<i>1739 PST¹⁶</i>

At the time of the accident the Moon was below the horizon.

E. LIST OF ATTACHMENTS

Attachment 1 – GOES-17 Low-level water vapor animation from 1636 to 1801 PST

Attachment 2 – GOES-17 RGB animation from 1631 to 1831 PST

Attachment 3 – GFA products available before the accident flight for around the accident time

Attachment 4 – ZLA CWSU weather story issued at 1000 PST

Attachment 5 – ZLA CWSU ATC morning pre-duty weather briefing

Attachment 6 – ZLA CWSU ATC afternoon pre-duty weather briefing

Attachment 7 – ForeFlight Correspondence

¹⁵ Inserted accident time for reference and context.

¹⁶ Inserted accident time for reference and context.

Submitted by:

Paul Suffern
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