



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

April 11, 2019

Specialist's Report

METEOROLOGY

WPR19LA058

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A. ACCIDENT

Location: Colusa, California
Date: January 7, 2019
Time: 1050 Pacific standard time
1850 Universal Coordinated Time (UTC)
Airplane: Beech A36; Registration: N100JB

B. METEOROLOGIST

Don Eick
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Operational Factors Division (AS-30)
National Transportation Safety Board

C. SUMMARY

On January 7, 2019, about 1050 Pacific standard time, a Beech A36 airplane, N100JB, collided with terrain about 2 miles south of the Colusa County Airport (O08), Colusa, California. The private pilot and passenger were fatally injured. The airplane was destroyed. The airplane was registered to Chalk Hill Consulting Group LLC, and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight. Instrument and visual meteorological conditions prevailed in the area and an instrument flight plan was filed for the cross-country flight. The flight was originating at the time of the accident and was destined for Palo Alto (KPAO), 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 from the Washington D.C. office, collecting data from official National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). All times are Pacific standard time (PST) based upon the 24-hour clock, local time is -8 hours from UTC, and UTC=Z. 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. 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 estimated at latitude 39.153144° N and longitude 122.019913° W at an elevation of approximately 36 ft.

E. WEATHER 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) 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.

1.1 Surface Analysis Chart

The western portion of the NWS Surface Analysis Chart for 1000 PST is included as figure 1 with the approximate accident site marked by a red star. The chart depicted a deep low-pressure system off the Pacific coast at 971-hectopascals (hPa)¹ with an associated occluded frontal system, with a warm front extending southeastward to the California coast and a cold front extending south. Another low-pressure system at 1015-hPa was located to the east of the accident site in Nevada with a stationary front extending eastward across Nevada. A trough of low pressure extended south of the low in Nevada into southern California. A high-pressure area at 1023-hPa was located over Oregon to the northeast. The accident site was located in a col or neutral point between the two low-pressure systems and the high-pressure system to the northeast in an area of a weak pressure gradient.

¹ Hectopascals (hPa) is the new standard term for reporting sea-level pressure and is interchangeable with the former term millibar (mb) with the same units. Standard sea-level pressure is 1013.25-hPa at 59° F (15° C).

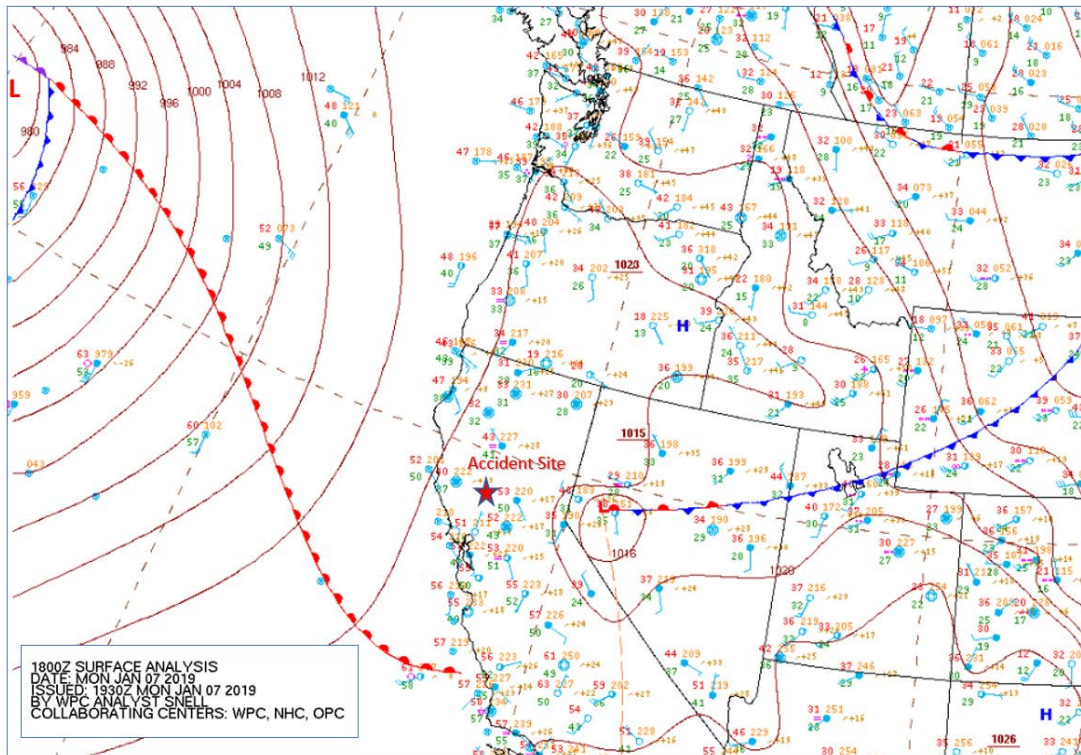


Figure 1 - western section of the NWS Surface Analysis Chart for 1200 PST

The station models on the chart surrounding the accident site depicted variable winds over the interior section of California at 10 knots or less, with overcast cloud cover. The temperatures were in the lower 50's degrees Fahrenheit (F), with dew point temperatures near 50° F. Several station north and south of the accident site reported visibility restriction in mist².

A review of the NWS Surface Analysis Charts prior to 1200 PST indicated the low-pressure system and associated front and trough over Nevada, had moved eastward across central California during the previous 24-hours and produced high winds, moderate to heavy rain, and low ceilings over the region on January 6th. At the time of the accident, the system had weakened but was still an active weather producer over extreme eastern California and Nevada.

1.2 National Composite radar Mosaic

The California section of the NWS National Composite Radar Mosaic for 1050 PST is included as figure 2 with the approximate accident site marked by a red star. The composite radar mosaic image depicted echoes over the higher elevations to the west and northwest over the Northern Coastal Range and east over the Sierra Nevada Mountains, with another band of echoes to the south extending from San Francisco eastward to Stockton associated with rain showers. No significant echoes were identified over the accident site.

² Mist is defined as a suspension in the air of microscopic water droplets that reduce the visibility at the Earth's surface to not less than 5/8 statute miles. The term mist is used in weather reports when there is such obscurity, and the corresponding relative humidity is 95% or more. Fog is reported if visibility is less 5/8 mile.

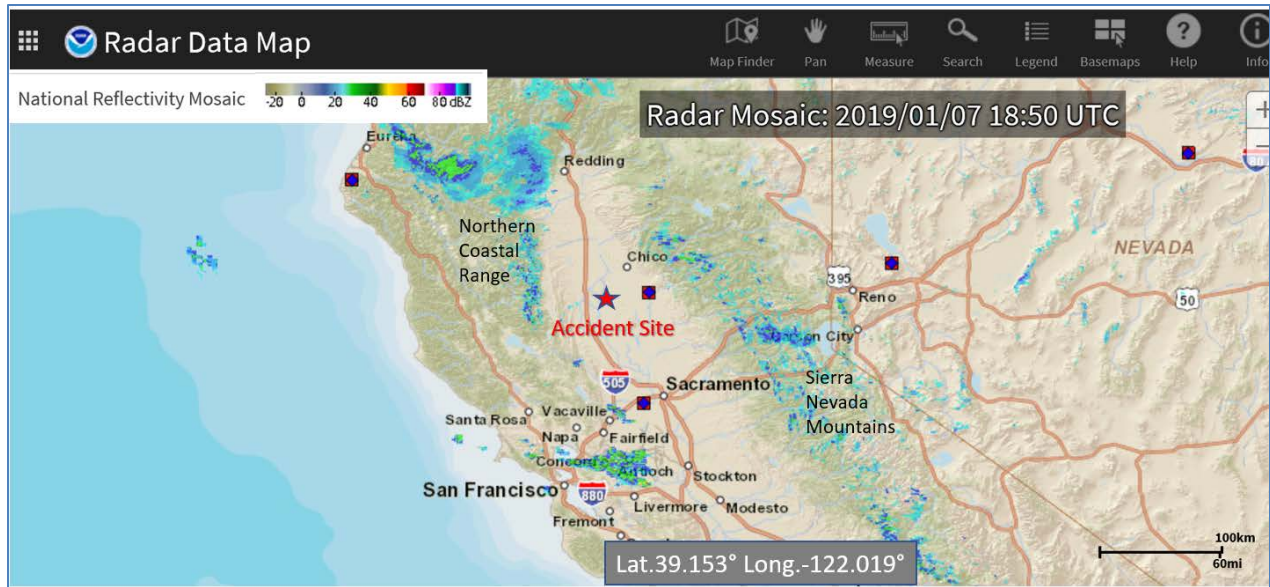


Figure 2 - California section of the National Composite Radar Mosaic for 1050 PST

1.3 12-hour Surface Prognostic Chart

The NWS 12-hour Surface Prognostic Chart valid for the period is included as figure 3 and depicted the expected conditions at 2200 PST. The chart continued to depict the low-pressure system and associated frontal system off the California coast with a large area of precipitation extending over northern California, Oregon, and Washington. A chance of light rain was expected over northern California in the vicinity of the accident site, with rain likely or greater than a 50% probability along the northwest California coast.

12 Hours Surface Prognostic

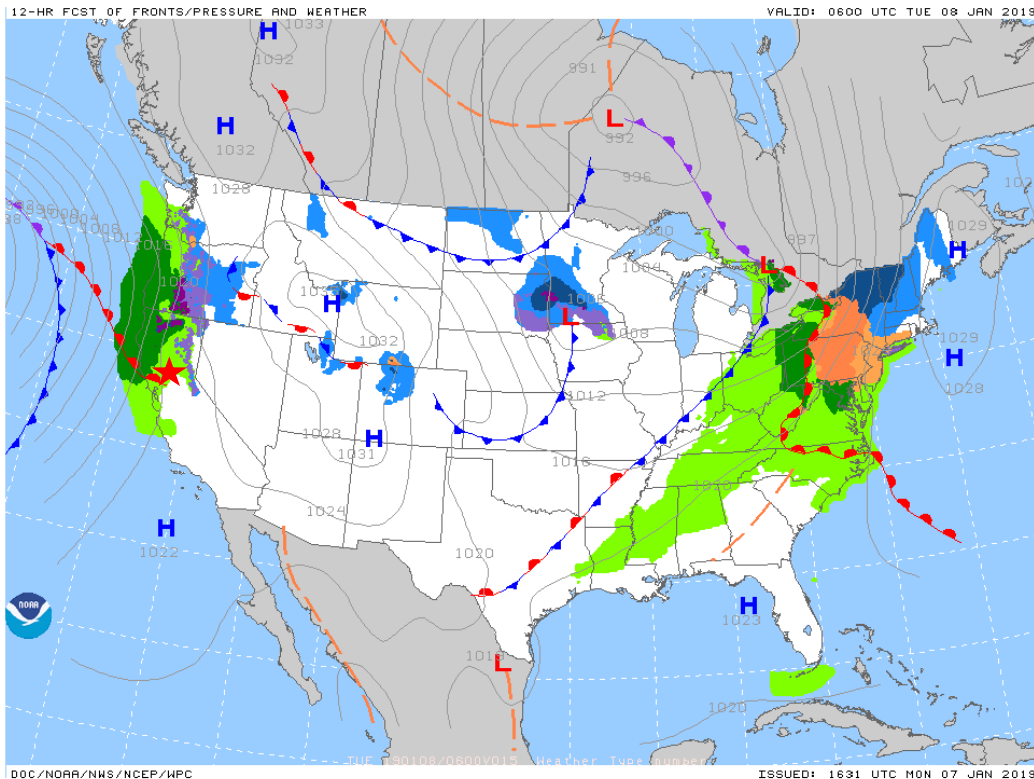


Figure 3 - 12-hour Surface Prognostic Chart valid for 2200 PST

1.4 12- and 24-hour Low-Level Significant Weather Prognostic Chart

The 12-hour Low-Level Significant Weather Prognostic valid for 1600 PST on January 7, 2019 is included in figure 4 on the left panel, and the 24-hour forecast valid for 0400 PST on January 8, 2019 on the right. The chart provided the general flight categories³ of IFR, MVFR, and VFR conditions expected during the period, non-convective turbulence below 24,000 ft, and the freezing level.

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 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.

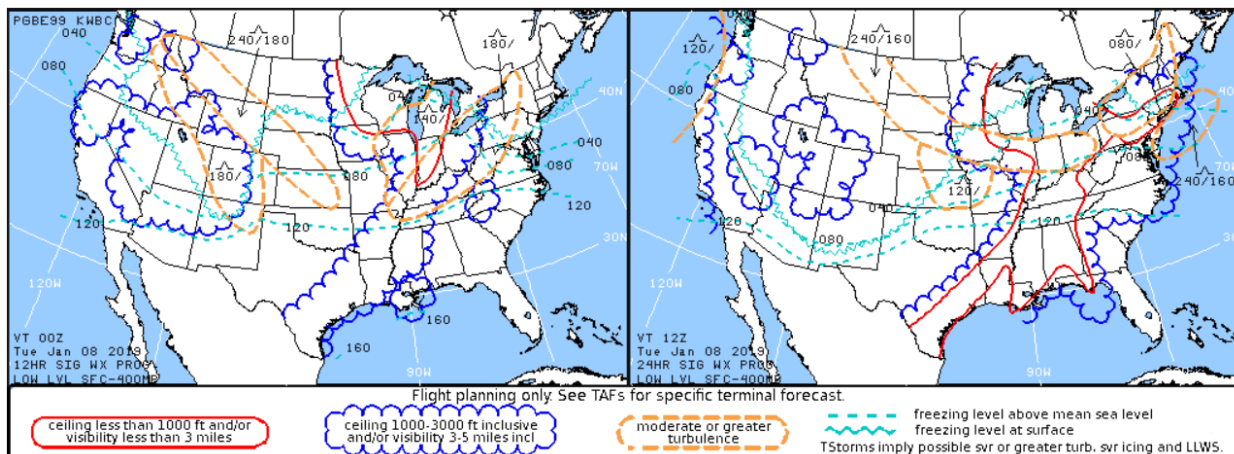


Figure 4 - 12- and 24-hour Low-Level Significant Weather Prognostic Charts valid during the period

The 12-hour prognostic chart depicted a large area of MVFR conditions expected over northern California that bordered the accident site, no significant turbulence forecast at the time, and the freezing level near 8,000 ft over the area.

2.0 Surface Observations

The surrounding area was documented using Meteorological Aerodrome Reports (METAR) and Specials observations (SPECI). The area had a magnetic variation of 14° East based on the sectional chart for the area. Cloud heights are reported in height above ground level (agl) in the following section.

2.1 Colusa County Airport, Colusa

The accident airplane departed from Colusa County Airport (O08) which lists an elevation of 49 ft. The airport does not have a control tower or any weather reporting capability other than a wind indicator. A witness⁴ at the time the accident aircraft departed estimated the clouds or ceiling at 500 ft agl with visibility of 1 mile. The accident site was located about 2 miles southwest of the airport.

2.2 Yuba County Airport, Marysville

The closest weather reporting location to the accident site was from Yuba County Airport (KMYV), Marysville, California, located approximately 20 miles east of KO08 at an elevation of 64 ft. The airport had a federally installed and maintained Automated Surface Observations System (ASOS), which was not augmented by any observers. At the time of the accident the following conditions were reported:

KMYV weather observation at 1253 PST, automated, wind from 140° at 8 knots, visibility 10 miles or more, ceiling broken at 1,300 ft agl, overcast at 8,000 ft, temperature 12° Celsius (C), dew

⁴ See Witness Statements section 9.0 of this report.

point temperature 9° C, altimeter 30.20 inches of mercury (Hg). Remarks: automated observation system with a precipitation discriminator, sea level pressure 1022.8-hPa, temperature 11.7° C, dew point 9.4° C.

The general flight categories and raw observations that were transmitted from the evening of January 6th into morning hours of January 7th through 1530 PST were as follows:

MVFR METAR KMYV 070553Z AUTO 18024G31KT 4SM -RA BR FEW044 FEW055 OVC080 09/08 A2982 RMK AO2 PK WND 17033/0532 PRESRR SLP099 P0013 60154 T00940083 10094 20078 51021

MVFR METAR KMYV 070653Z AUTO 20010KT 10SM FEW010 BKN022 OVC032 09/08 A2987 RMK AO2 RAE41 SLP117 P0001 T00940083

MVFR SPECI KMYV 070659Z AUTO 19010KT 8SM SCT008 BKN013 OVC032 09/08 A2987 RMK AO2 T00940083

IFR SPECI KMYV 070713Z AUTO 20010KT 6SM BR BKN007 BKN014 09/08 A2988 RMK AO2

IFR METAR KMYV 070753Z AUTO 22009KT 4SM BR BKN006 OVC010 09/08 A2990 RMK AO2 SLP129 T00890078 400940072

MVFR METAR KMYV 070853Z AUTO 25004KT 3SM BR SCT006 OVC012 08/07 A2994 RMK AO2 SLP143 60001 T00830072 53027

IFR METAR KMYV 070953Z AUTO 27003KT 4SM BR BKN006 OVC011 08/07 A3000 RMK AO2 SLP161 T00830072

LIFR SPECI KMYV 071014Z AUTO 00000KT 2 1/2SM BR BKN004 OVC007 08/07 A3002 RMK AO2 CIG 003V007 T00830072

LIFR SPECI KMYV 071034Z AUTO 00000KT 4SM BR OVC003 08/07 A3003 RMK AO2 T00830072

LIFR METAR KMYV 071053Z AUTO 00000KT 3SM BR OVC003 08/07 A3004 RMK AO2 CIG 002V006 SLP174 T00780072

IFR SPECI KMYV 071107Z AUTO 00000KT 6SM BR OVC005 08/07 A3004 RMK AO2 CIG 002V006

LIFR SPECI KMYV 071140Z AUTO 00000KT 3SM BR OVC004 08/07 A3005 RMK AO2 T00830072

LIFR METAR KMYV 071153Z AUTO 00000KT 5SM BR OVC003 08/07 A3005 RMK AO2 SLP180 60001 70213 T00830072 10094 20078 51037

MVFR SPECI KMYV 071237Z AUTO 19003KT 10SM SCT004 OVC016 09/08 A3006 RMK AO2 T00890078

MVFR METAR KMYV 071253Z AUTO 17004KT 10SM FEW009 OVC016 09/08 A3006 RMK AO2 SLP183 T00890078

IFR SPECI KMYV 071318Z AUTO 19004KT 10SM BKN008 OVC014 09/08 A3008 RMK AO2 CIG 006V011 T00940083

MVFR SPECI KMYV 071331Z AUTO 18003KT 10SM BKN010 OVC016 09/08 A3008 RMK AO2 CIG 006V013 T00940083

MVFR METAR KMYV 071353Z AUTO 16004KT 10SM BKN010 BKN021 OVC120 09/08 A3010 RMK AO2 CIG 007V012 SLP196 T00940083

VFR SPECI KMYV 071401Z AUTO 16004KT 10SM FEW008 SCT021 OVC120 09/08 A3011 RMK AO2

VFR METAR KMYV 071453Z AUTO 15005KT 10SM SCT011 BKN120 09/08 A3013 RMK AO2 SLP207 T00940083 53027

MVFR SPECI KMYV 071500Z AUTO 16004KT 10SM BKN011 BKN120 09/08 A3014 RMK AO2 CIG 008V013 T00940083

VFR SPECI KMYV 071551Z AUTO 15009KT 10SM SCT011 BKN110 09/08 A3013 RMK AO2

VFR METAR KMYV 071553Z AUTO 15007KT 10SM SCT011 BKN110 09/08 A3013 RMK AO2 SLP207 T00940083

VFR SPECI KMYV 071627Z AUTO 17004KT 8SM FEW006 BKN100 09/08 A3016 RMK AO2 T00940083

VFR METAR KMYV 071653Z AUTO 00000KT 7SM FEW006 BKN120 10/09 A3018 RMK AO2 SLP223 T01000089

VFR METAR KMYV 071753Z AUTO 16007KT 10SM FEW009 SCT085 OVC110 11/10 A3020 RMK AO2 SLP228 T01110100 10111 20083 53023

MVFR SPECI KMYV 071814Z AUTO 16008KT 10SM FEW009 BKN013 OVC120 11/10 A3020 RMK AO2 T01110100

MVFR SPECI KMYV 071848Z AUTO 16007KT 10SM BKN015 OVC080 12/09 A3020 RMK AO2

Accident 1850Z

MVFR METAR KMYV 071853Z AUTO 14008KT 10SM BKN013 OVC080 12/09 A3020 RMK AO2 SLP228 T01170094

VFR SPECI KMYV 071916Z AUTO 17008KT 10SM SCT013 BKN075 OVC100 12/09 A3019 RMK AO2

VFR METAR KMYV 071953Z AUTO 16009KT 10SM OVC075 12/09 A3018 RMK AO2 SLP224 T01170094

VFR METAR KMYV 072053Z AUTO 16004KT 10SM OVC080 12/09 A3018 RMK AO2 SLP222 T01220089 58007

VFR METAR KMYV 072153Z AUTO 14004KT 10SM SCT017 13/08 A3016 RMK AO2 SLP215 T01280083

VFR METAR KMYV 072253Z AUTO 26003KT 10SM CLR 13/08 A3018 RMK AO2 SLP223 T01280083

MVFR SPECI KMYV 072319Z AUTO 29006KT 10SM SCT016 BKN029 OVC110 13/09 A3018 RMK AO2 T01280094

A review of the observations indicated that IFR to LIFR conditions in light to heavy rain and mist existed at the airport during the early morning on January 7th with 2.13 inches of precipitation recorded overnight. MVFR conditions prevailed at KMYV at the time of the accident due to ceilings broken between 1,300 to 1,500 ft, with an overcast layer at 8,000 ft.

2.3 Beale Air Force Base, Marysville

The next closest weather reporting location to the accident site was from Beale Air Force Base (KBAB), Marysville, California, 27 miles east of the accident site at an elevation of 113 ft. The airport had an ASOS and was augmented by Air Force Weather Observers. The following conditions were reported at the approximate time of the accident:

KBAB special weather observation at 1016 PST, wind from 150° at 7 knots, visibility 10 miles or more, scattered clouds at 1,300 ft agl, ceiling broken at 3,000 ft, temperature 12° C, dew point 10° C, altimeter 30.18 inches of Hg. Remarks: sea-level pressure 1022.3-hPa, maintenance indicator⁵.

The raw observations two hours either side of the time of the accident and general flight conditions were as follows:

IFR METAR KBAB 071458Z AUTO 14007KT 10SM BKN009 BKN019 OVC110 10/10 A3012 RMK AO2 CIG 009V019 BKN009 V SCT SLP203 T00980096 52030 \$

MVFR SPECI KBAB 071513Z AUTO 15007KT 10SM BKN010 OVC015 10/10 A3013 RMK AO2 CIG 008 RWY33 SLP206 \$

VFR SPECI KBAB 071543Z AUTO 14008KT 10SM FEW009 SCT013 BKN110 OVC140 10/09 A3012 RMK AO2 SLP203 \$

VFR METAR KBAB 071558Z AUTO 14009KT 10SM FEW009 SCT023 BKN110 OVC140 10/09 A3012 RMK AO2 SLP203 T00970094 \$

VFR METAR KBAB 071658Z AUTO 12006KT 10SM FEW095 BKN120 OVC140 11/10 A3017 RMK AO2 SLP220 T01050102 \$

MVFR SPECI KBAB 071743Z AUTO 13008KT 10SM SCT010 BKN014 OVC100 12/10 A3017 RMK AO2 CIG 010V110 BKN V SCT CIG 010 RWY33 SLP220 \$

MVFR METAR KBAB 071758Z AUTO 14007KT 10SM OVC013 12/10 A3017 RMK AO2 CIG 012 RWY33 SLP220 T01190100 10119 20095 53017 \$

MVFR SPECI KBAB 071816Z 15007KT 10SM SCT013 BKN030 12/10 A3018 RMK SLP223 \$

Accident 1850Z

VFR METAR KBAB 071858Z 19005KT 10SM SCT016 BKN080 12/09 A3018 RMK AO2A SLP223 T01240094\$

VFR METAR KBAB 071958Z 19008KT 10SM OVC075 12/09 A3016 RMK AO2A SLP216 T01240092 \$

⁵ The "\$" indicates that maintenance is required on the system due to a sensor out of designed performance standards.

VFR METAR KBAB 072058Z 17004KT 10SM OVC080 13/09 A3016 RMK AO2A SLP216 T01280089 58005 \$
 MVFR METAR KBAB 072158Z 10004KT 10SM OVC024 13/10 A3014 RMK AO2A SLP210 T01290095 \$
 VFR METAR KBAB 072258Z 26004KT 10SM SCT024 13/10 A3016 RMK AO2A SLP216 T01330099 \$

A review of the observations indicated that MVFR conditions prevailed at KBAB immediately surrounding the time of the accident, with a gradual improving trend.

2.4 Oroville Municipal Airport, Oroville

Oroville Municipal Airport (KOVE), Oroville, California, was located 27 miles northeast of the accident site at an elevation of 194 ft. The airport had an ASOS and reported the following conditions at the approximate time of the accident:

KOVE weather observation at 1053 PST, automated, wind from 180° at 6 knots, visibility 10 miles or more, a few clouds at 1,400 ft, ceiling broken at 2,000 ft, overcast at 10,000 ft, temperature 12° C, dew point 9° C, altimeter 30.21 inches of Hg. Remarks: automated observation system, sea-level pressure 1023.1-hPa, temperature 11.7° C, dew point 8.9° C.

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

LIFR METAR KOVE 071353Z AUTO 00000KT 4SM BR OVC004 08/08 A3010 RMK AO2 SLP196
 LIFR SPECI KOVE 071401Z AUTO 14003KT 6SM BR OVC003 08/08 A3010 RMK AO2 T00830078
 LIFR SPECI KOVE 071415Z AUTO 11003KT 1 3/4SM BR OVC003 08/08 A3011 RMK AO2 T00830078
 LIFR SPECI KOVE 071432Z AUTO 16003KT 3SM BR OVC003 09/08 A3013 RMK AO2 T00890078
 IFR SPECI KOVE 071445Z AUTO 11003KT 8SM OVC005 09/08 A3014 RMK AO2 T00890078
 LIFR METAR KOVE 071453Z AUTO 00000KT 5SM BR OVC004 09/08 A3015 RMK AO2 SLP212 T00890078
 53026
 MVFR METAR KOVE 071553Z AUTO 12006KT 6SM BR FEW004 BKN017 OVC100 09/08 A3014 RMK AO2
 SLP210 T00890083
 MVFR METAR KOVE 071553Z AUTO 12006KT 6SM BR FEW004 BKN017 OVC100 09/08 A3014 RMK AO2
 SLP210 T00890083
 VFR SPECI KOVE 071615Z AUTO 15005KT 10SM FEW010 BKN070 OVC095 10/08 A3017 RMK AO2
 PRESRR T01000083
 MVFR SPECI KOVE 071623Z AUTO 16006KT 10SM FEW010 BKN020 OVC090 10/09 A3017 RMK AO2
 T01000089
 MVFR METAR KOVE 071653Z AUTO 16009KT 10SM FEW011 BKN022 OVC110 11/09 A3019 RMK AO2
 SLP225 T01060089
 MVFR SPECI KOVE 071708Z AUTO 15007KT 10SM FEW008 BKN014 OVC110 11/09 A3018 RMK AO2
 T01060089
 IFR SPECI KOVE 071727Z AUTO 15007KT 10SM BKN009 OVC014 11/09 A3019 RMK AO2 CIG 007V011
 T01060089
 MVFR SPECI KOVE 071741Z AUTO 14010KT 10SM SCT009 OVC018 11/09 A3019 RMK AO2 T01110089
 MVFR METAR KOVE 071753Z AUTO 14008KT 10SM FEW009 BKN018 OVC090 11/09 A3020 RMK AO2
 SLP228 T01110089 10111 20083 53017
 VFR SPECI KOVE 071832Z AUTO 15010KT 10SM SCT016 OVC100 12/09 A3020 RMK AO2 T01220089
 MVFR METAR KOVE 071853Z AUTO 18006KT 10SM FEW014 BKN020 OVC100 12/09 A3021 RMK AO2
 SLP231 T01170089
 VFR SPECI KOVE 071920Z AUTO 18005KT 10SM SCT017 OVC085 12/09 A3019 RMK AO2 T01170089
 VFR METAR KOVE 071953Z AUTO 18007KT 10SM BKN075 OVC100 12/09 A3018 RMK AO2 SLP220
 T01220089

The observations indicated that LIFR to IFR conditions prevailed during the morning with a gradual improving trend at the time of the accident with MVFR conditions being reported.

2.5 Remote Automated Weather Stations

A search of MesoWest website⁶ from the University of Utah archive data for official NWS observations and Remote Automated Weather Stations (RAWS) sites operated by the United States Forestry Service and the Bureau of Land Management provided the following temperature, dew point, and wind plot in figure 5 at 1050 PST. The temperature is displayed to the left of the station and dew point temperature to the right in °F, with wind direction by the barb with speeds in miles per hour (mph). The display indicated a generally southerly winds of 5 to 10 mph at the majority of the stations with temperatures in the mid 50's °F over the eastern Sacramento Valley, and temperatures in the mid 40's over the western section of the valley and in the higher elevations.

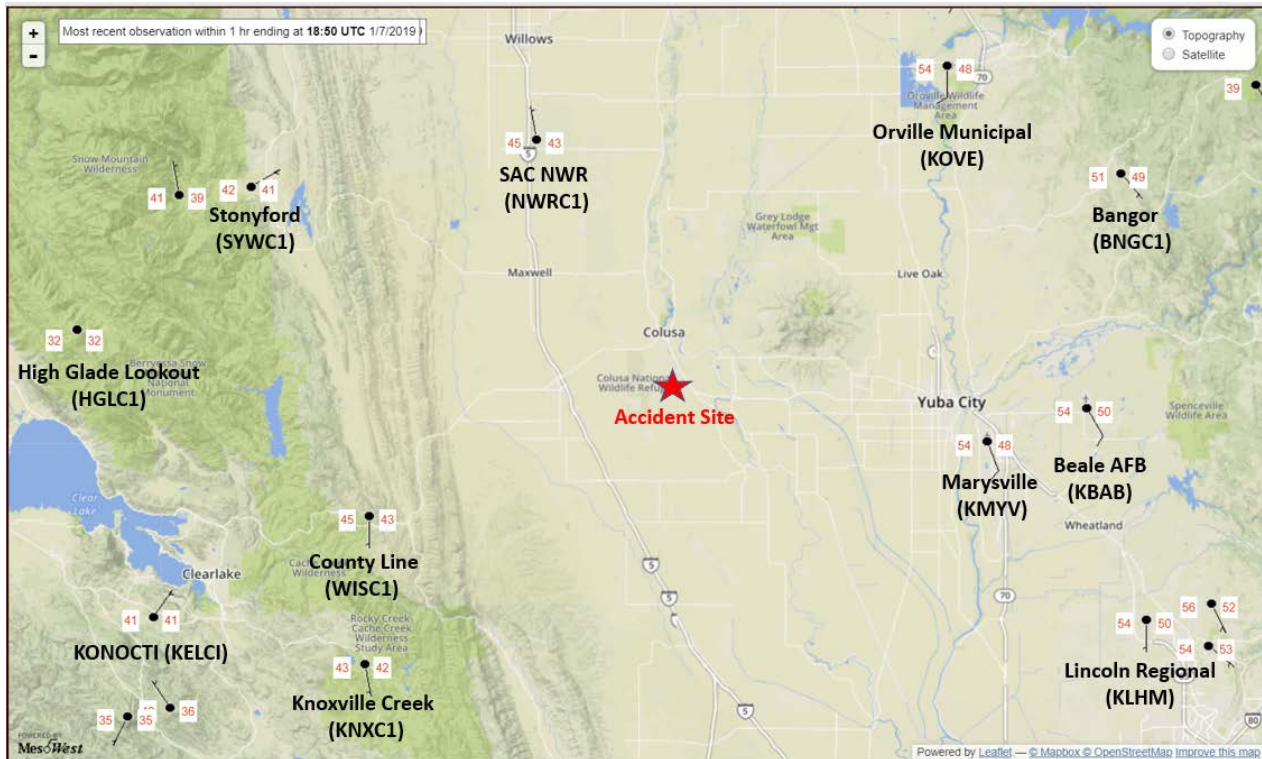


Figure 5 – MesoWest display of NWS and RAWS observations at 1050 PST

The RAWS sites surrounding the area provided the following data:

SAC NWR (NWRC1)

Location: 39.417222° N -122.182500° W (17.5 NM NNW)
 Elevation: 120 ft
 Time: 1029 PST
 Temperature: 45° F
 Dew Point: 43° F

⁶ <https://mesowest.utah.edu>

Relative Humidity: 93%
Wind: N 3 peak 6 mph

County Line (WISC1)

Location: 39.018833° N -122.411694° W (19 NM WSW)
Elevation: 2,085 ft
Time: 1036 PST
Temperature: 45° F
Dew Point: 43° F
Relative Humidity: 94%
Wind: S 3 peak 7 mph

Knoxville Creek (KNXC1)

Location: 38.861944° N -122.417222° W (25 NM SW)
Elevation: 2,200 ft
Time: 1009 PST
Temperature: 43° F
Dew Point: 42° F
Relative Humidity: 97%
Wind: S 1 peak 5 mph

Stonyford (SYWC1)

Location: 39.367294° N -122.572894° W (28 NM NW)
Elevation: 1,263 ft
Time: 1026 PST
Temperature: 42° F
Dew Point: 41° F
Relative Humidity: 95%
Wind: ENE 3 peak 5 mph

KONOCTI (KELC1)

Location: 38.911889° N -122.706314° W (35 WSW)
Elevation: 2,163 ft
Time: 0952 PST
Temperature: 41° F
Dew Point: 41° F
Relative Humidity: 100%
Wind: NE 2 peak 5 mph

Bangor (BNGC1)

Location: 39.380747° N -121.386228° W (35 NW)
Elevation: 803 ft
Time: 0950 PST
Temperature: 51° F
Dew Point: 49° F
Relative Humidity: 93%
Wind: SSE 5 peak 10 mph

High Glade Lookout (HGLC1)

Location: 39.208897° N -122.809989° W (37 W)
Elevation: 4,807 ft
Time: 1036 PST
Temperature: 32° F
Dew Point: 32° F
Relative Humidity: 100%
Wind: calm

3.0 Sounding

To determine the vertical structure and state of the atmosphere over the accident site a High-Resolution Rapid Refresh (HRRR)⁷ numerical model data was retrieved from the NOAA Air Resources Laboratory and plotted on a standard Skew T log P diagram⁸ using the complete Rawinsonde Observation RAOB program software⁹. Figure 6 is the HRRR plot from the surface through 450-hPa (or approximately 21,000 ft) from the 1000 PST model run valid for 1100 PST in the vicinity of the accident site.

The HRRR model sounding indicated an elevation of 57 ft over the accident site with a surface temperature of 9.1° C (48.4° F) with a dew point temperature of 7.0° C (44.6° F), with a resulting relative humidity of 87%. The sounding depicted the lifted condensation level (LCL)¹⁰ at 869 ft agl (921 ft msl) with an inversion due to subsidence immediately above the LCL to 2,060 ft, where temperature increased with height. The freezing level was at 7,164 ft. The atmosphere was characterized as stable with a Lifted Index of +14.0, and the precipitable water content was 0.68 inches.

⁷ The HRRR is a National Oceanic and Atmospheric Administration (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 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.

⁹ RAOB software – The complete RAWinsonde OBServation program is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania, for plotting and analyzing upper air data.

¹⁰ Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

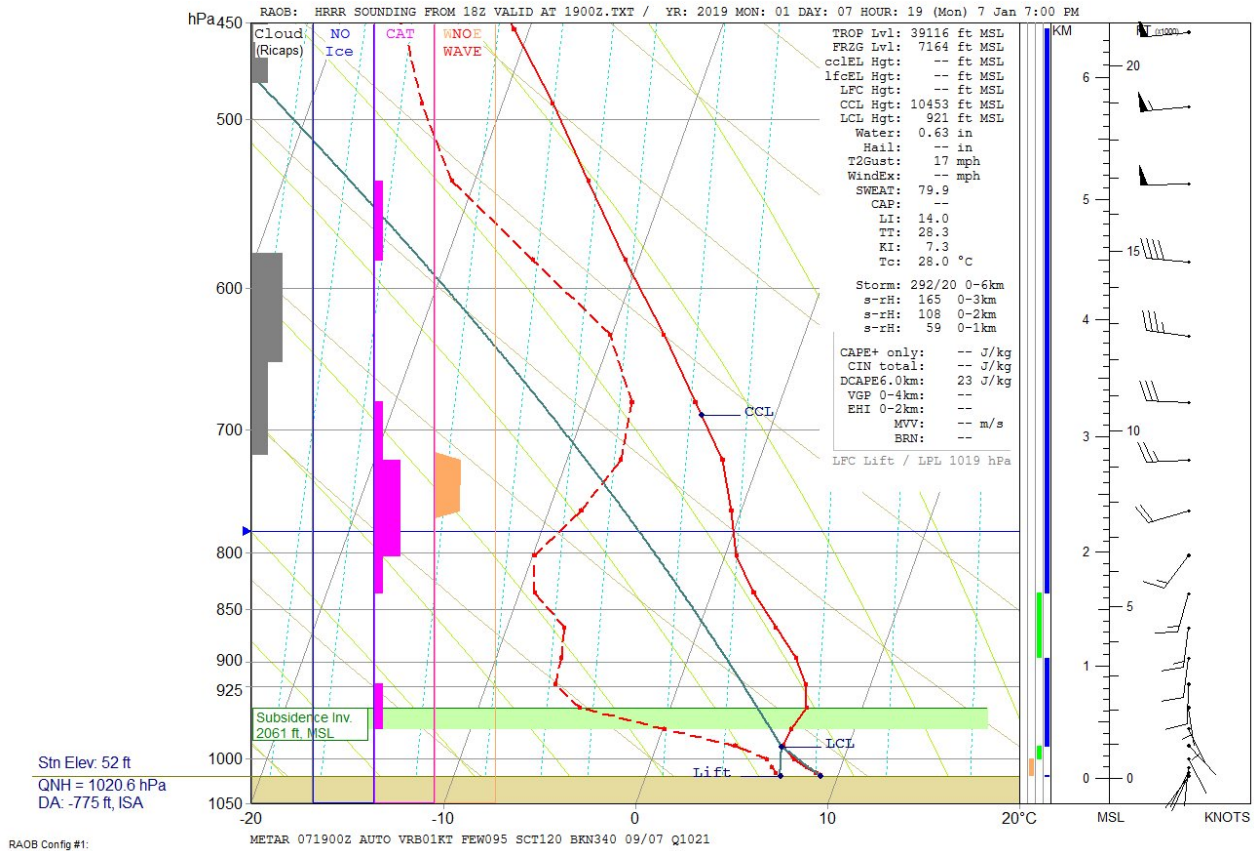


Figure 6 - HRRR numerical model sounding for 1100 PST

The HRRR wind profile indicated a calm surface winds, with winds from the south immediately above the inversion at 10 knots which veered to the west with height. The mean 0 to 6 kilometer (18,000 ft) wind was from 260° at 26 knots. The level of maximum wind was located at approximately 36,170 ft, with a wind from 255° at 69 knots which was located below the tropopause at 39,000 ft. The RAOB algorithm indicated an 82 to 90% probability of moderate turbulence between 6,000 and 8,000 ft with a vertical wind shear greater than 6 knots/1000 ft.

Figure 7 is a table of the HRRR model heights, pressure, temperature (T), dew point (Td), relative humidity (RH%), and wind direction and speed, clear air turbulence (CAT), low-level wind shear (LLWS), and icing potential from the surface to 21,000 ft.

Height (ft+MSL)	Pres (hPa)	T (C)	Td (C)	RH (%)	DD / FF (deg / kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)	Wave/x---W---Turb nm fpm max
52	1019	9.1	7.0	87	214 / 1				
79	1018	9.1	7.0	87	203 / 1				
159	1015	8.8	6.7	87	206 / 1				
320	1009	8.2	6.4	88	186 / 1				
563	1000	7.4	6.0	91	155 / 1				
944	986	6.6	4.1	84	139 / 2				
1441	968	6.7	0.1	63	156 / 3	LGT			
2061	946	7.1	-4.7	43	173 / 7	LGT			
2754	922	6.6	-6.4	39	182 / 10				
3523	896	5.6	-6.6	41	187 / 12				
4403	867	4.0	-7.0	45	187 / 13				
5403	835	2.2	-9.2	43	195 / 14	LGT			
6468	802	0.6	-9.9	45	215 / 15	MDT			
7744	764	-0.5	-8.3	56	252 / 18	MDT			2.13 574 LT-MD
9188	723	-1.9	-7.2	67	268 / 25	LGT			3.00 700 LT-MD
10820	679	-4.4	-7.7	78	273 / 31				
12707	631	-7.3	-10.1	80	278 / 35				
14762	582	-10.7	-15.5	68	275 / 40	LGT			
16921	534	-14.1	-21.2	55	268 / 49				
18999	491	-17.4	-24.2	55	264 / 54				
20967	453	-20.8	-26.5	60	264 / 52				

Figure 7 - HRRR sounding parameters for 1100 PST

4.0 Satellite Imagery

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 (McIDAS) software. The infrared long wave and visible imagery were obtained surrounding the time of the accident, with the images closest to the time of the accident documented below. The infrared long wave imagery (band 13) at a wavelength of 10.3 microns (μm) provided radiative cloud top temperatures with a nominal spatial resolution of 2 km. The visible (band 2) at a wavelength of 0.64 μm images at a resolution of 1 km.

Figure 8 is the GOES-17 infrared image at 1052 PST at 4X magnification with a standard MB temperature enhancement curve applied to highlight the higher and colder cloud clouds associated with deep convection and cirriform type clouds. The image depicted an area of enhanced clouds over the accident site with a radiative cloud top temperature of 233° Kelvin or -40.16° C, which corresponded to cloud tops near 29,000 ft based on the HRRR sounding.

Figure 9 is the GOES-17 visible image at 1052 PST and depicted an overcast layer of clouds over the accident site. The image indicated that the clouds over the accident site was more pronounced and vertically defined than the low to mid-level stratiform clouds over KMYV and KBAB to the east. The clouds were observed moving east with time and consistent with the mean wind in the HRRR sounding.

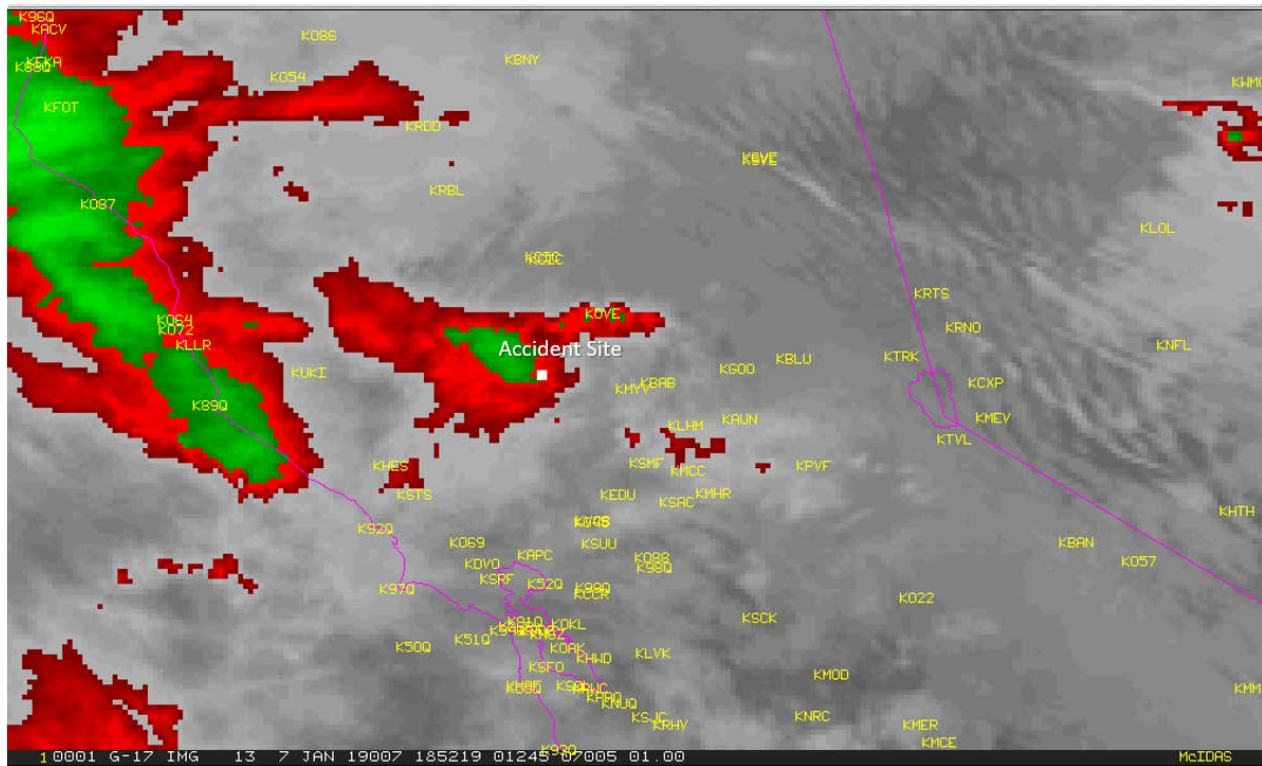


Figure 8 - GOES-17 color enhanced infrared image at 1052 PST at 4X magnification

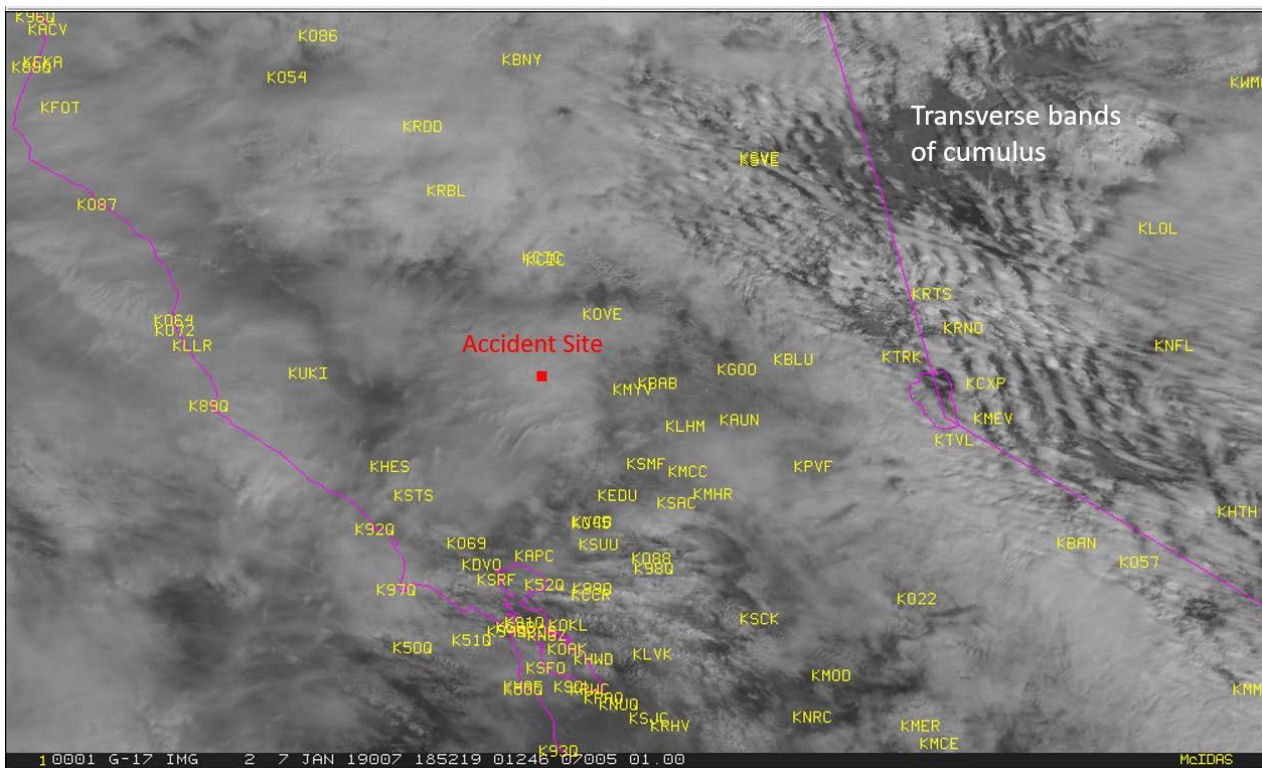


Figure 9 - GOES-17 visible image at 1052 PST

Both the infrared and visible images depicted transverse bands of clouds oriented perpendicular to the flow in which they are embedded over eastern California and Nevada to the northeast and east of the accident site. When observed at high levels in cirriform clouds typically indicate the location of turbulence. Transverse bands observed at low levels (called transverse rolls or T rolls) often indicate the presence of a temperature inversion (or cap) as well as directional shear in the low- to mid-level winds, and potential turbulence at high altitudes.

5.0 Weather Surveillance Radar Imagery

The closest Weather Surveillance Radar 1988 Doppler (WSR-88D) was from Beale Air Force Base (KBXX), with the radar antenna located near Oroville Municipal Airport (KOVE) located approximately 27 miles northeast of the accident site. The KBXX WSR-88D was the precipitation mode during the period. Figure 10 is the KBXX WSR-88D 0.5° base reflectivity image with the flight track overlaid in purple. The image depicted an extensive area of very light intensity echoes associated with non-meteorological echoes or ground clutter.

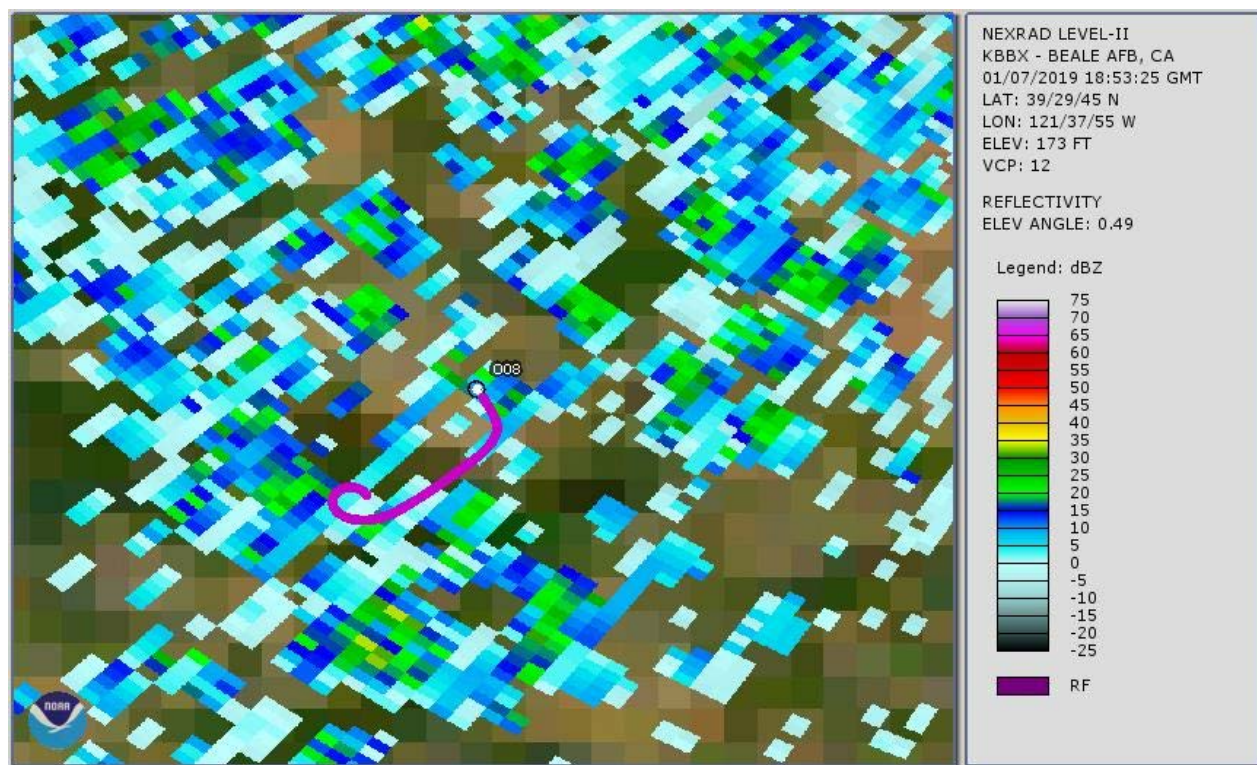


Figure 10 - KBXX WSR-88D 0.5° base reflectivity image at 1053 PST with flight track

6.0 Pilot Reports

The following pilot reports or PIREPs below 18,000 ft and within 150 miles of the accident site were in the NWS database for the period from 0600 to 1300 PST. Cloud bases and tops are reported in msl heights. The reports in raw format were as follows:

SFO UA /OV OSI240013/TM 1415/FL170/TP B737/TA M20/IC LGT RIME 170-210/RM ZOA CWSU

RNO UA /OV HNW220015/TM 1427/FL075/TP B738/TB LGT CHOP 075-130/RM DURC
RNO UA /OV RNO/TM 1438/GL044/TP B38/RM BRAKING ACTION GOOD RY16R RNO
OAK UA /OV OAK/TM 1447/FL180/TP B737/TB LGT/IC MOD MX/RM ZOA CWSU
SMF UA /OV ILA/TM 1451/FL120/TP C208/TA M04/IC MOD MX/RM ZOA CWSU
SMF UA /OV ILA /TM 1458 /FL100 /TP C208 /TA M08 /IC MOD MX 100 /RM ZOA CWSU AWC-WEB
SAC UA /OV LIN135005/TM 1536/FL100/TP PC12/TA M03/IC LGT-MOD RIME 100-150
RNO UUA /OV RNO120008/TM 1651/FL100/TP C560/TB MOD-SEV 100-090/RM DURD
MOD UA /OV MOD/TM 1702/FL005/TP PA24/SK BKN005-TOP011/RM DURC
SMF UA /OV SMF010009/TM 2056/FL070/TP E75S/TB LGT CHOP/RM DURC 070 TO 190

The PIREPs indicated several reports of light to moderate icing above 10,000 ft. There was one urgent report of an encounter with moderate to severe turbulence descending into Reno (RNO) between 10,000 and 9,000 ft. Another aircraft near the time of the accident reported light chop at 7,000 to 19,000 ft near Sacramento. There were no other significant reports of low-level turbulence or wind shear over the area during the period.

7.0 NWS Forecasts and Advisories

7.1 Terminal Aerodrome Forecast

The NWS does not issue a Terminal Aerodrome Forecast for O08. The closest TAF to the departure was for KBAB located approximately 26 miles east of the accident site. TAFs are valid for a 5 mile radius around an airport's center. When planning a flight to an airport that does not have a TAF, pilots typically refer to the closest available TAFs to supplement the information in weather forecast products that cover large areas, such as the Graphic Aviation Forecast (GFA), Airmen's Meteorological Information (AIRMET) bulletins, and other graphical products. The KBAB TAF available for preflight planning prior to the accident airplane's departure was an amended forecast issued at 0445 PST. The forecast period valid for the period is indicated in bold italic print below.

***TAF AMD KBAB 071245Z 0712/0817 17009KT 9999 BKN007 OVC012 QNH3000INS
BECMG 0714/0715 18009KT 9999 BKN030 OVC060 QNH3003INS
TEMPO 0715/0717 BKN015
BECMG 0805/0806 VRB06KT 9999 FEW025 BKN060 QNH3015INS
BECMG 0815/0816 19012KT 9999 SCT015 BKN025 OVC100 QNH3006INS TX12/0722Z TN08/0712Z***

The KBAB TAF expected from 0400 PST wind from 170° at 9 knots, visibility better than 6 miles (military 10 kilometers or more or code "9999"), ceiling broken at 700 ft agl, overcast at 1,200 ft, with forecast altimeter or QHN 30.00 inches of Hg. Becoming from 0800 to 0900 PST, wind from 180° at 9 knots, visibility better than 6 miles, ceiling broken at 3,000 ft agl, overcast at 6,000 ft, altimeter setting 30.03 inches of Hg, with a temporary period from 0900 to 1100 PST of ceiling broken at 1,500 ft.

7.2 Area Forecast Discussion

The NWS Sacramento WFO issued the following Area Forecast Discussion (AFD), which provided a review of the synoptic conditions and provided a discussion of the weather conditions expected over the area in plain language, and an aviation discussion with regards to the TAFs issued. While the product is not a common flight planning product, it provides insight into the forecast conditions during the period and can be beneficial to pilots. The AFD issued at for the morning at 0336 PST was as follows:

*Area Forecast Discussion
National Weather Service Sacramento CA
336 AM PST Mon Jan 7 2019*

.SYNOPSIS...

Decreasing wind and precipitation today. Active weather pattern continues with the next system forecast to move into the region Tuesday afternoon into Wednesday followed by additional systems into next week.

.DISCUSSION...

Yesterday's strong system has shifted east of the region though showers linger across the west slopes of the northern Sierra Nevada and across portions of the Central Valley. Winds have diminished across most of the area, but gusty southerly winds will continue this morning across the Sierra. Precipitation over the past 24 hours has mostly ranged from a half inch to around an inch in the valley to 1 to 3 inches in the foothills and mountains.

Warm-advection will result in areas of lingering precipitation today, mainly over the higher terrain across the northern and western portions of the forecast area. Upper ridging moves in later today thru early Tuesday, but won't be enough to completely shut off precipitation across far northern California.

Next system slowly approaches Tuesday with increasing wind and precipitation spreading inland ahead of the frontal passage Tuesday night. Snow levels look to increase Tuesday to 6500 to 7500 feet, then lower slightly behind the front on Wednesday.

Ridging and drier weather for most of the region Thursday.

.AVIATION...

MVFR conditions, with local IFR/LIFR conditions over interior NorCal next 24 hours. Local gusts to 20 kts from KSAC southward through 14Z. Next Pacific system will spread precipitation across interior NorCal after 02Z-06Z Tuesday.

..

The AFD synoptic and discussion section indicated that the general weather conditions were improving from the day before with the low-pressure system having moved eastward, and the next big active system approaching the California west coast. Some rain showers were lingering across the west slopes of the northern Sierra Nevada Mountains and across portions of the Central Valley. The aviation section indicated that the forecaster expected MVFR conditions to prevail, with local IFR/LIFR conditions over interior north California during the period. No other weather advisories were in effect for the area.

7.3 Graphic Forecast for Aviation

The Graphic Forecast for Aviation (GFA) images issued at approximately 0800 PST for enroute conditions for 1000 CST and covered the time of the accident are included in figures 11 and 12, with the approximate accident site marked by a red star. These images would have been made available to the accident pilot had they received a Leidos or ForeFlight weather briefing before departure or if the accident pilot checked the GFA products on the aviationweather.gov website.

The GFA wind, visibility, and weather depiction included restricted visibility with rain showers over the accident site and was included in the AIRMET for IFR conditions. The GFA cloud cover image depicted overcast clouds with bases at 8,000 ft msl and tops to 15,000 ft with higher cirrus clouds above.

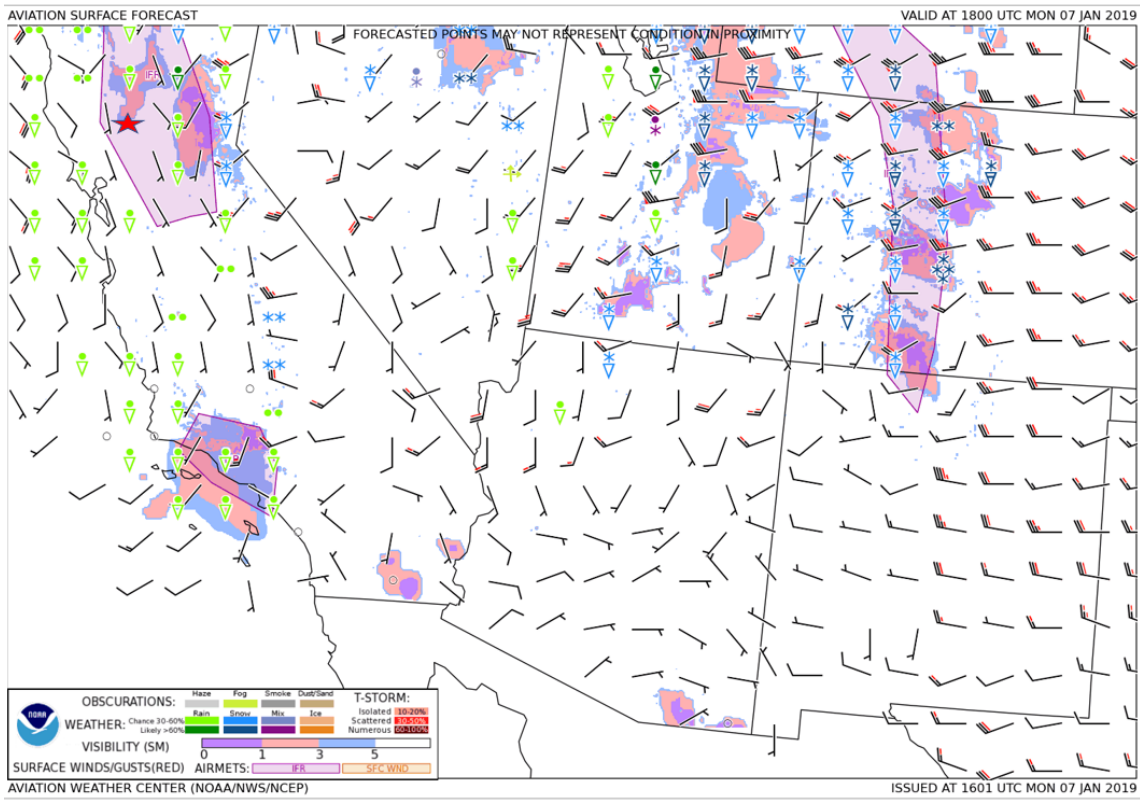


Figure 11 - GFA wind, visibility, weather with AIRMET for IFR conditions valid for 1000 PST

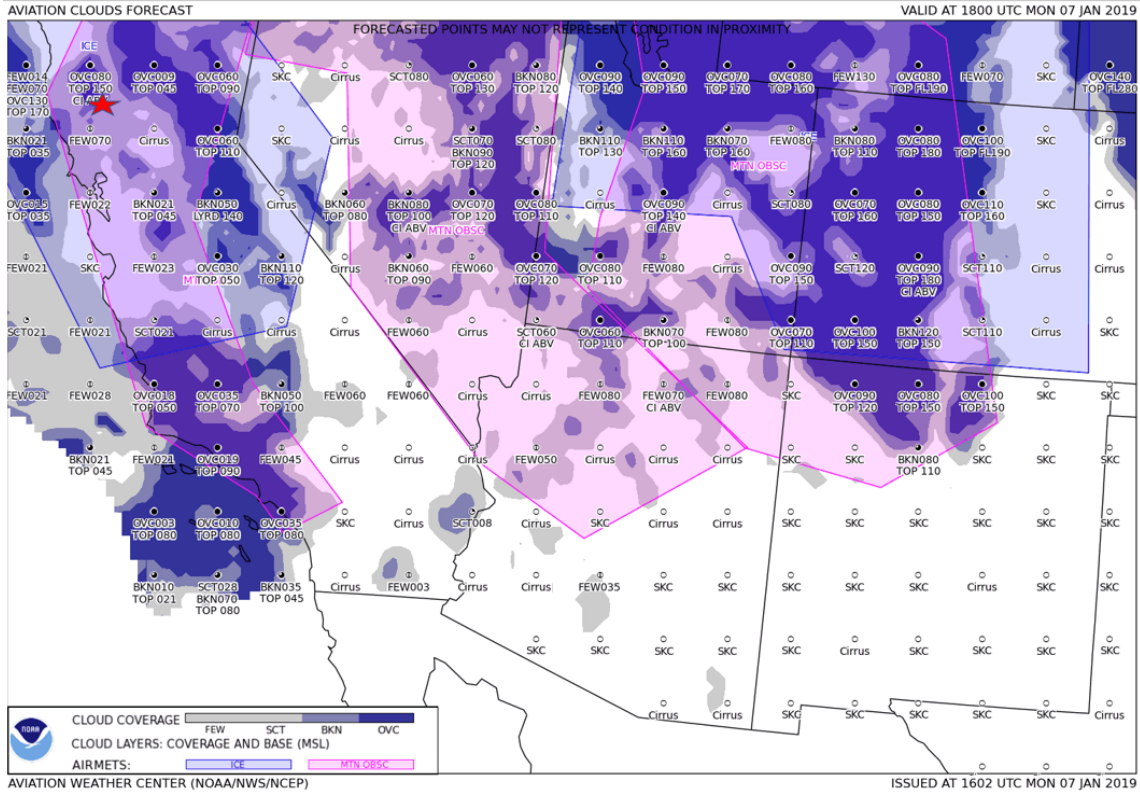


Figure 12 - GFA cloud cover and AIRMET for icing and mountain obscuration conditions valid for 1000 PST

7.4 Winds and Temperature Aloft Forecast

The NWS Winds and Temperatures Aloft Forecast (FD) current for the period were valid for 1600 PST and for use from 1200 through 1900 PST, and were as follows:

*WINDS ALOFT FORECASTS
 DATA BASED ON 071800Z
 VALID 080000Z FOR USE 2000-0300Z. TEMPS NEG ABV 24000*

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
SAC	1625	1717+03	2517+00	2431-05	2643-16	2554-27	254743	255752	245359
RBL	1616	1822+00	2323-01	2333-06	2545-18	2556-27	255444	256454	255959
RNO		2406	2819-02	3030-06	2745-16	2655-27	255443	265653	246761
SFO	1518	2010+05	2219+00	2428-04	2542-16	2451-27	254943	255852	255458

The forecast winds for Sacramento (SAC) expected a wind at 3,000 ft from 160° at 25 knots, with a veering wind with height. At 6,000 ft the wind was from 170° at 17 knots with a temperature of 3° C and at 9,000 ft from 250° at 17 knots with a temperature of 0° C.

7.5 Inflight Weather Advisories

The NWS issues inflight weather advisories designated as Severe Weather Forecast Alerts (AWW's), Convective SIGMET's (WST's), SIGMET's (WS's), Center Weather Advisories (CWA's), and AIRMET's (WA's). 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 on the basis of experience and the operational limits of the aircraft.

The NWS did not issue any AWW's or Convective SIGMETs for any organized thunderstorms on January 7, 2019 over California. The NWS issue a SIGMET at 0620 PST over eastern California for severe turbulence between 27,000 and 41,000 ft associated with mountain wave activity, the advisory was cancelled at 1010 PST. The NWS Oakland (KZOA) Center Weather Service Unit (CWSU) did not issue any CWA's or Meteorological Impact Statements (MIS) during the period. The NWS AWC did have a full series of AIRMET advisories current for the region and are included below in graphic form (figures 13-15) followed by the text bulletins.

AIRMET Sierra for IFR and mountain obscuration conditions

SIERRA 2019-01-07 21:00:00

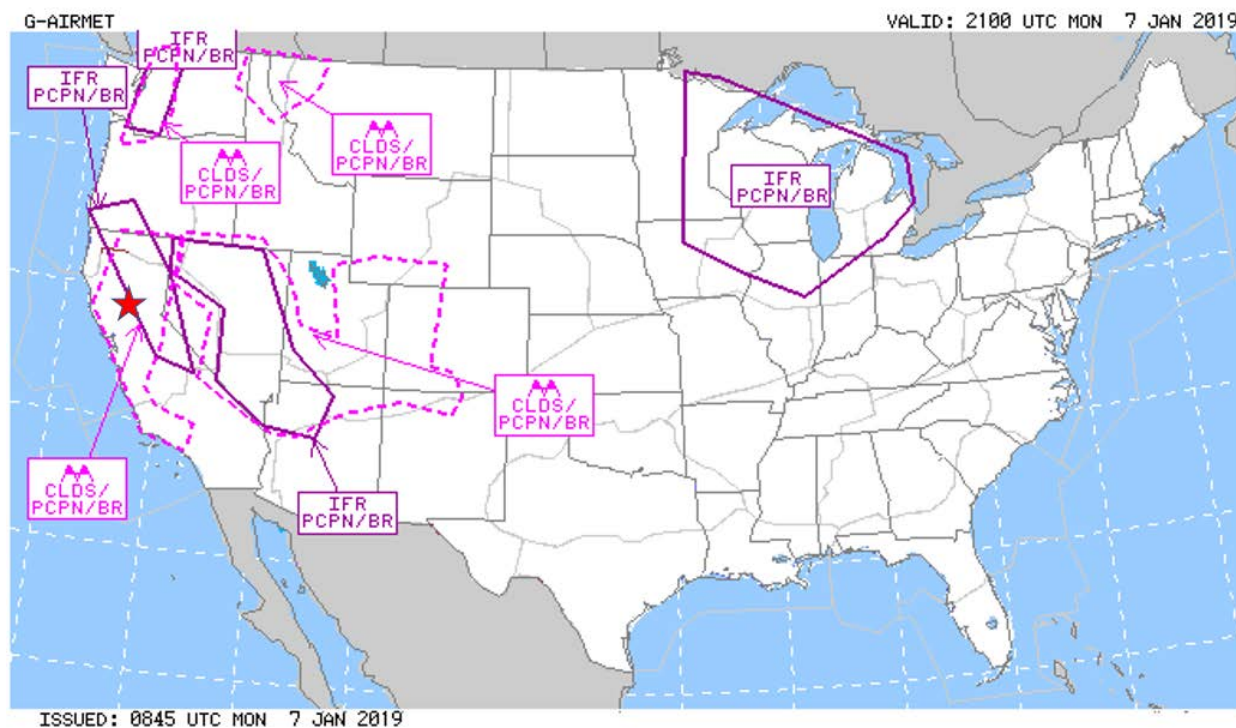


Figure 13 - G-AIRMET Sierra image for 1300 PST

WAUS46 KKCI 071445
WA6S
-SFOS WA 071445
AIRMET SIERRA UPDT 2 FOR IFR AND MTN OBSCN VALID UNTIL 072100

AIRMET IFR...OR CA AND CSTL WTRS
FROM 20SW EUG TO 40NE OED TO 50NE RBL TO 40N CZQ TO 30SSE MOD
TO 20E OAK TO 30SSW OAK TO 40SSW ENI TO 60WSW OED TO 20SW EUG
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS ENDG 18-21Z.

AIRMET IFR...CA AND CSTL WTRS
FROM 20E EHF TO 40E LAX TO 60W MZB TO 100S SNS TO 20E EHF
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS ENDG 18-21Z.

AIRMET MTN OBSCN...WA OR CA
FROM 30SE YDC TO 60S DSD TO 30NE REO TO 50SE REO TO 40SE LKV TO
70WSW OED TO 80WNW OED TO 30NE ONP TO 50WSW HUH TO 30SE YDC
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z ENDG 00-03Z.

AIRMET MTN OBSCN...OR CA ID NV UT AZ
FROM 30SSE TWF TO 30ESE BVL TO 60SSE ILC TO 30SSW BCE TO 50E INW
TO 40WNW PHX TO EED TO 50SSE OAL TO 40SSW FMG TO 40SE LKV TO 30SSE TWF
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET MTN OBSCN...OR CA
FROM 60WSW OED TO 40SE LKV TO 40SSW FMG TO 50SSE OAL TO 30WNW TRM TO
30WNW MZB TO 20SSE LAX TO 40SW RZS TO 20W ENI TO 40S FOT TO 60WSW OED
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

....

AIRMET Tango for turbulence conditions

TANGO 2019-01-07 18:00:00

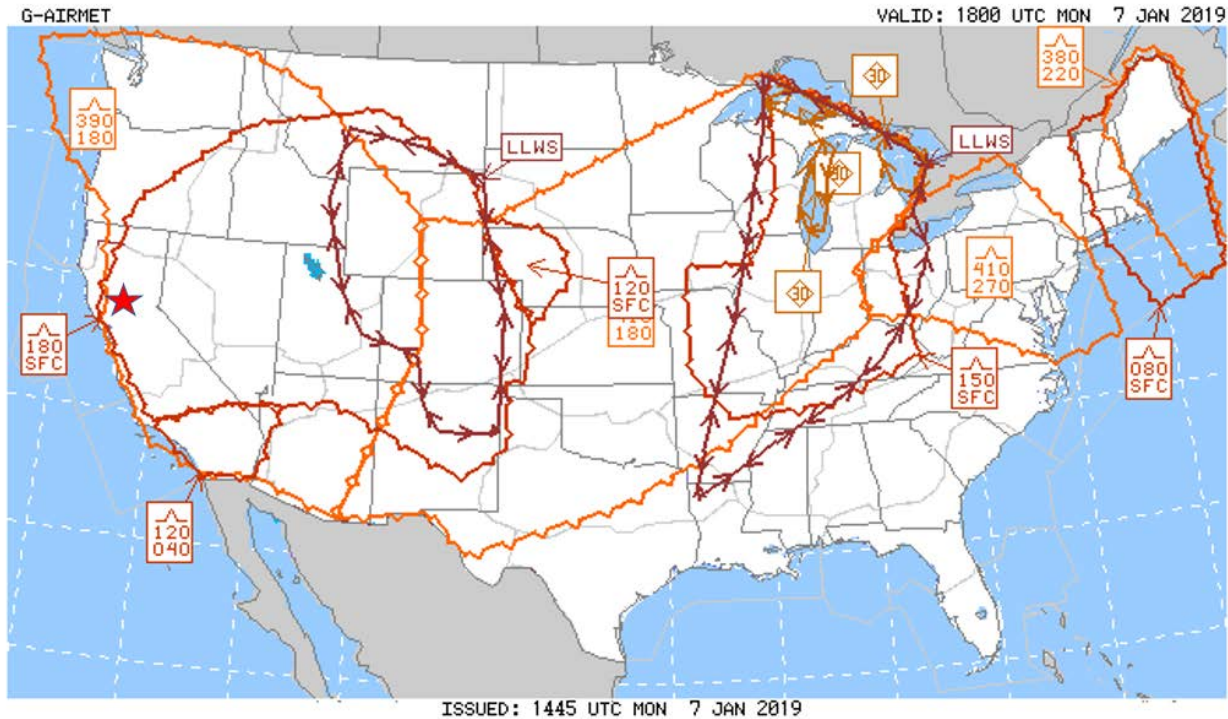


Figure 14 - G-AIRMET Tango for turbulence image for 1000 PST

WAUS46 KPCI 071445
WA6T
-SFOT WA 071445
AIRMET TANGO UPDT 4 FOR TURB STG WND AND LLWS VALID UNTIL 072100

...SEE SIGMET NOVEMBER SERIES...

AIRMET TURB...WA OR CA ID MT WY NV UT CO AZ NM AND CSTL WTRS
FROM 20WNW HUH TO 40SSE YXC TO 40SE GTF TO BOY TO HBU TO 50S TUS
TO BZA TO 30SE MZB TO 40SSW RZS TO 130WNW FOT TO 160W ONP TO
140W TOU TO 50NW TOU TO 20WNW HUH
MOD TURB BTN FL180 AND FL390. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET TURB...CA NV AZ AND CSTL WTRS
FROM 40NNE HEC TO 20SW PGS TO 20SW BZA TO 20S MZB TO RZS TO 40NNE HEC
MOD TURB BTN 040 AND 140. CONDS CONTG BYD 21Z ENDG 21-00Z.

AIRMET TURB...WA OR CA ID MT WY NV UT CO AZ NM AND CSTL WTRS
FROM MLP TO LWT TO 50NW RAP TO 70SW RAP TO BFF TO GLD TO 50W LBL
TO 30ESE TBE TO 20SSW TXO TO 30SW CME TO PGS TO 40SW LAS TO RZS
TO 20SW SNS TO FOT TO 40W OED TO 40NE DSD TO MLP
MOD TURB BLW FL180. CONDS CONTG BYD 21Z THRU 03Z.

LLWS POTENTIAL...CA ID WY NV UT
BOUNDED BY 40SE MLD-40W MTU-30E HVE-20ENE BCE-ILC-40SE OAL-60NE
EHF-20N MOD-RBL-90SSE LKV-50WNW BAM-70ENE BAM-20NE BVL-40SE MLD
LLWS EXP. CONDS ENDG 15-18Z.

OTLK VALID 2100-0300Z
AREA 1...TURB WA OR CA ID MT WY NV UT CO AZ NM AND CSTL WTRS
BOUNDED BY 30SSE YQL-80SW DIK-70SW RAP-BFF-GLD-50W LBL-20ESE TBE-
INK-50S TUS-BZA-20S EED-70SW BAM-20SE EUG-150WSW HQM-140W TOU-
40NNE TOU-30SSE YQL
MOD TURB BTN FL180 AND FL390. CONDS CONTG THRU 03Z.

AREA 2...STG SFC WND OR CA CSTL WTRS
BOUNDED BY 160WSW HQM-80WSW ONP-50WSW ENI-130WSW ENI-140WSW FOT-
160WSW HQM
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS DVLPG 00-03Z.
CONDS CONTG THRU 03Z.

....

The advisory was amended at 1010 PST and were as follows:

WAUS46 KPCI 071810 AAA
WA6T
-SFOT WA 071810 AMD
AIRMET TANGO UPDT 5 FOR TURB STG WND AND LLWS VALID UNTIL 072100

AIRMET TURB...WA OR CA ID MT WY NV UT CO AZ NM AND CSTL WTRS
FROM 20WNW HUH TO 40SSE YXC TO 40SE GTF TO BOY TO HBU TO 50S TUS
TO BZA TO 30SE MZB TO 40SSW RZS TO 130WNW FOT TO 160W ONP TO
140W TOU TO 50NW TOU TO 20WNW HUH
MOD TURB BTN FL180 AND FL390. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET TURB...CA NV AZ AND CSTL WTRS
FROM 40NNE HEC TO 20SW PGS TO 20SW BZA TO 20S MZB TO RZS TO 40NNE HEC
MOD TURB BTN 040 AND 140. CONDS CONTG BYD 21Z ENDG 21-00Z.

.
**AIRMET TURB...WA OR CA ID MT WY NV UT CO AZ NM AND CSTL WTRS
FROM MLP TO LWT TO 50NW RAP TO 70SW RAP TO BFF TO GLD TO 50W LBL
TO 30ESE TBE TO 20SSW TXO TO 30SW CME TO PGS TO 40SW LAS TO RZS
TO 20SW SNS TO FOT TO 40W OED TO 40NE DSD TO MLP
MOD TURB BLW FL180. CONDS CONTG BYD 21Z THRU 03Z.**

.
LLWS POTENTIAL...CA ID WY NV UT
BOUNDED BY 40SE MLD-40W MTU-30E HVE-20ENE BCE-ILC-40SE OAL-60NE
EHF-20N MOD-RBL-90SSE LKV-50WNW BAM-70ENE BAM-20NE BVL-40SE MLD
LLWS EXP. CONDS ENDG 15-18Z.

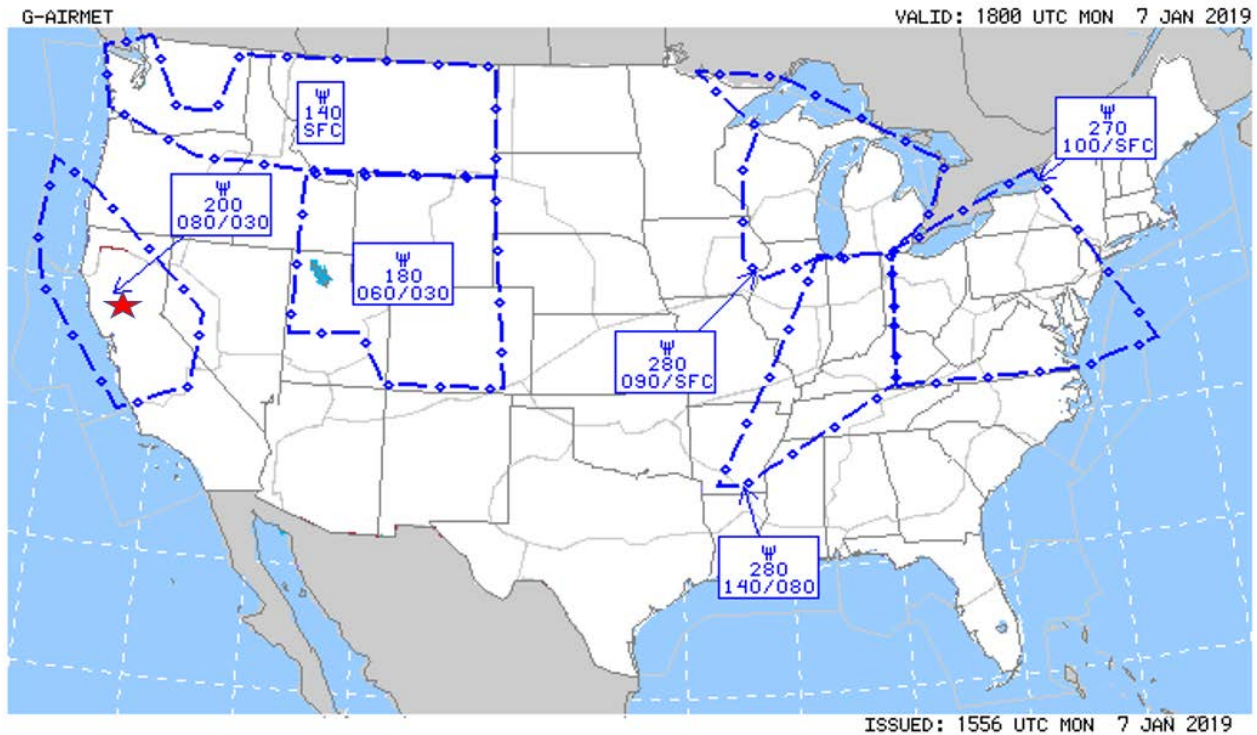
.
OTLK VALID 2100-0300Z
AREA 1...TURB WA OR CA ID MT WY NV UT CO AZ NM AND CSTL WTRS
BOUNDED BY 30SSE YQL-80SW DIK-70SW RAP-BFF-GLD-50W LBL-20ESE TBE-
INK-50S TUS-BZA-20S EED-70SW BAM-20SE EUG-150WSW HQM-140W TOU-
40NNE TOU-30SSE YQL
MOD TURB BTN FL180 AND FL390. CONDS CONTG THRU 03Z.

.
AREA 2...STG SFC WNDS OR CA CSTL WTRS
BOUNDED BY 160WSW HQM-80WSW ONP-50WSW ENI-130WSW ENI-140WSW FOT-
160WSW HQM
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS DVLPG 00-03Z.
CONDS CONTG THRU 03Z.

....

AIRMET Zulu for icing conditions

ZULU 2019-01-07 18:00:00



WAUS46 KKCI 071445
WA6Z
-SFOZ WA 071445
AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 072100

AIRMET ICE...WA OR ID MT WY AND CSTL WTRS
FROM HUH TO 50NNW ISN TO 70NW RAP TO BKE TO 60NNW ONP TO 20WNW TOU TO HUH
MOD ICE BLW 140. CONDS CONTG BYD 21Z ENDG 21-00Z.

AIRMET ICE...WA OR CA NV AND CSTL WTRS
FROM 120WSW HQM TO 40WSW BTG TO 40SSW DSD TO 40WNW BAM TO 20NE
OAL TO 30SSW EHF TO 130WSW SNS TO 140WSW FOT TO 160SW ONP TO 120WSW HQM
MOD ICE BTN FRZLVL AND FL200. FRZLVL 030-080. CONDS CONTG BYD 21Z THRU 03Z.

OTLK VALID 2100-0300Z...ICE WA OR CA ID MT WY NV UT CO AND CSTL WTRS
BOUNDED BY 120W TOU-50SW BOI-CYS-ALS-60NE BTY-70ESE CZQ-30SSW
EHF-130WSW SNS-140WSW FOT-110WNW ONP-120W TOU
MOD ICE BTN FRZLVL AND FL200. FRZLVL 030-090. CONDS CONTG THRU 03Z.

FRZLVL...RANGING FROM SFC-125 ACRS AREA
SFC ALG HUH-20ENE SEA-40N OED-20SSE OED-80SSE OED-30NNW FMG
040 ALG 160NW FOT-80NW FOT-60N RBL
080 ALG 140SW FOT-MOD-50NE EHF-40W LAS
120 ALG 200SSW RZS-50SE TRM-BZA

....

8.0 Weather Briefing Data

A search of the FAA Automated Flight Service Station (AFSS) provider Leidos indicated that they had no requests from the pilot for a weather briefing, or to file a flight plan, and no other contact with him. A similar search with ForeFlight also came up with no contact for any weather briefing information. It is therefore unknown what the pilot reviewed to familiarize himself with regards to the reported and forecast weather conditions prior to flight.

9.0 Witness Statement

The owner of one the Fixed Based Operations (FBO) at KO08 witnessed the pilot, his passenger, and his dog arrive in a pickup truck that morning. He also witnessed the aircraft startup and taxi to runway 13 and heard the pilot on the common traffic frequency (UNICOM) announce that they were departing. The witness indicated that the weather at the time was a ceiling at 500 ft agl and visibility was approximately a mile. Approximately 30 minutes later he received a call from the Oakland Center trying to locate the aircraft. The full record of conversation is included as attachment 1.

10.0 Astronomical Conditions

The United States Naval Observatory's website¹¹ was used to document the astronomical conditions for Colusa, Colusa County, California, on the day of the accident. The following data from that website with the accident site added for reference in bold italic type.

<u>Sun</u>	
Begin civil twilight	0658 PST
Sunrise	0728 PST
<i>Accident</i>	<i>1050 PST</i>
Sun transit	1214 PST
Sunset	1701 PST
End civil twilight	1731 PST

At the time of the accident the Sun was 25° above the horizon on an azimuth of 158°.

F. LIST OF ATTACHMENTS

Attachment 1 – Record of conversation of witness

Submitted by:

¹¹ <https://aa.usno.navy.mil/index.php>

Don Eick
Senior Meteorologist

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