



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

September 11, 2019

Weather Study

METEOROLOGY

WPR19FA216

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A. ACCIDENT

Location: Kooskia, Idaho
Date: August 11, 2019
Time: about 1028 Pacific daylight time (about 1728 UTC¹)
Aircraft: Type: Lancair; Registration: N350CL

B. METEOROLOGIST

Mike Richards
Senior Meteorologist
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C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in Pacific daylight time (PDT) for August 11, 2019 (based upon the 24-hour clock), directions are referenced to true north, distances are in nautical miles and heights are above mean sea level (msl).

Coordinates used for the accident location: 46.157778° north latitude, 115.919722° west longitude, at an elevation of about 1,965 feet.

D. WEATHER INFORMATION

1.0 Weather Radar

WSR-88D Level-II weather radar imagery from Missoula, Montana (KMSX), is presented in figures 1-5. KMSX was located approximately 95 miles northeast of the accident site with an antenna elevation of about 8,000 feet. Assuming standard refraction and considering the 0.95° beam width for the WSR-88D radar beam, a KMSX ~0.5° tilt angle would have “seen” altitudes above the accident location of between about 7,700 and 17,000 feet msl. The images below depict light to heavy values of reflectivity in the immediate area of the accident aircraft's final track position, and a review of the vertical profile of this reflectivity for this area depict heavy values above 30,000 feet msl.²

¹ UTC – abbreviation for Coordinated Universal Time

² A description of Federal Aviation Administration reflectivity classifications is found here:

https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2007/info07008.pdf

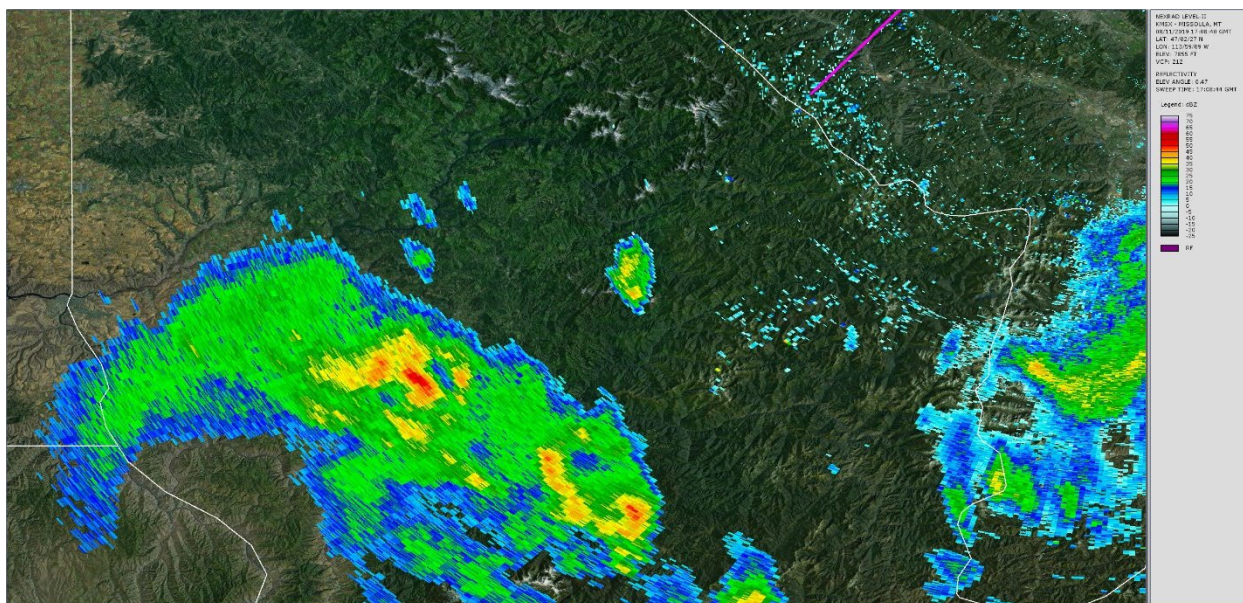


Figure 1 – KMSX WSR-88D Level-II ~0.47° base reflectivity imagery from a sweep that began at 1008 PDT. Accident aircraft's flight track³ through about this time is denoted by the purple line.

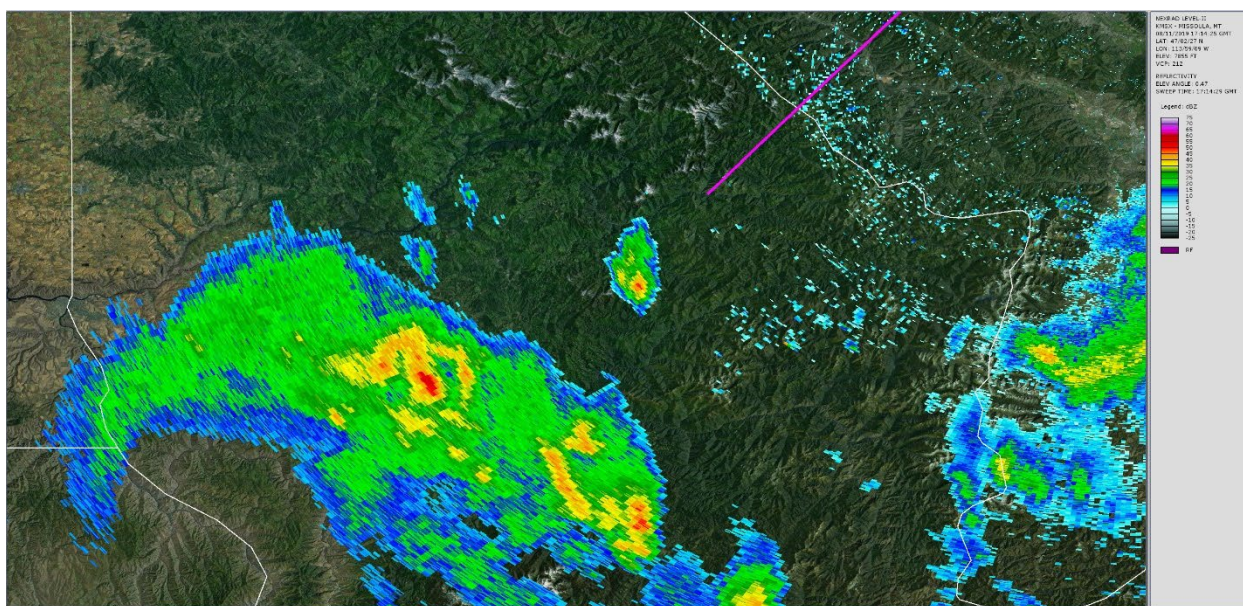


Figure 2 – KMSX WSR-88D Level-II ~0.47° base reflectivity imagery from a sweep that began at 1014 PDT. Accident aircraft's flight track through about this time is denoted by the purple line.

³ Flight track information for the accident aircraft is based on Automatic Dependent Surveillance-Broadcast (ADS-B) data.

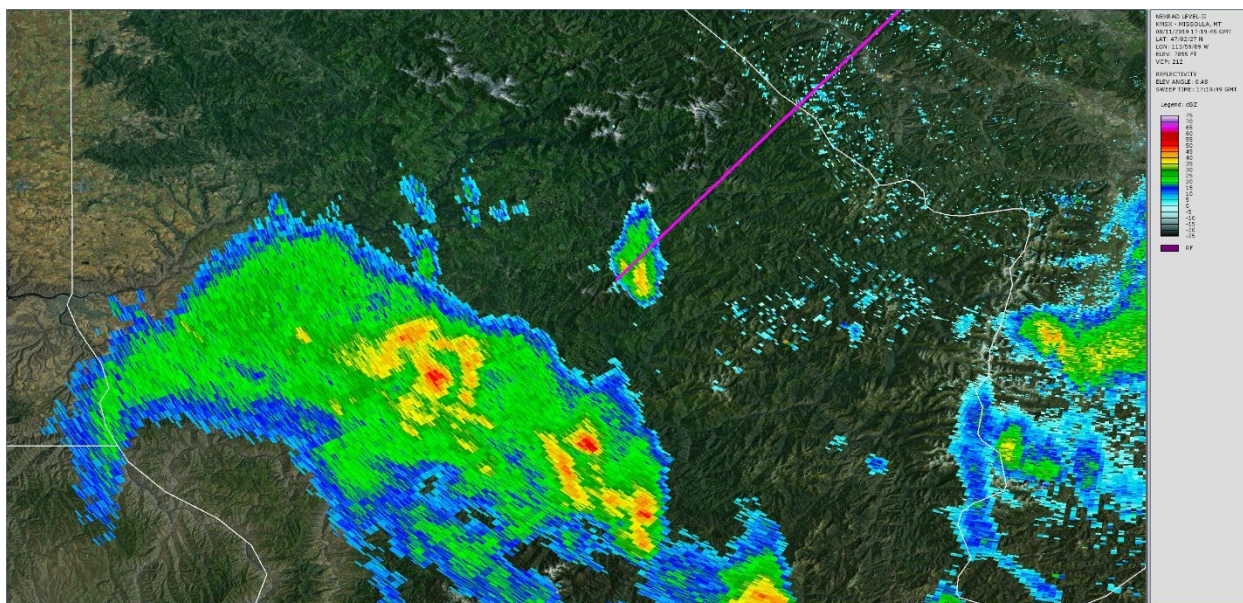


Figure 3 – KMSX WSR-88D Level-II $\sim 0.47^\circ$ base reflectivity imagery from a sweep that began at 1019 PDT. Accident aircraft's flight track through about this time is denoted by the purple line.

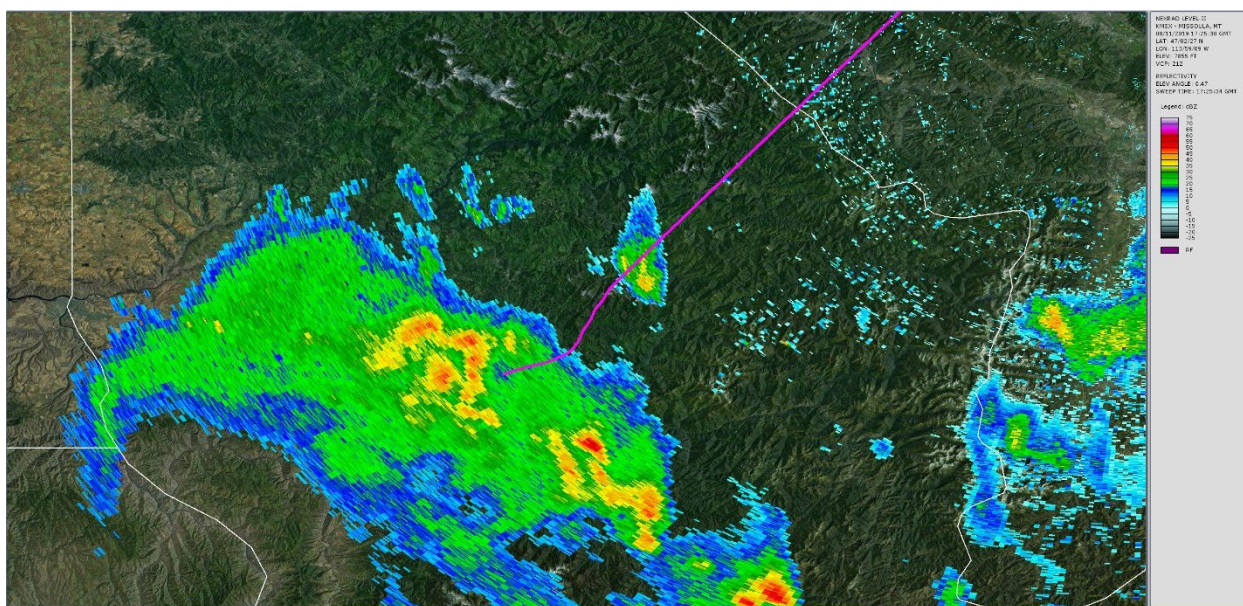


Figure 4 – KMSX WSR-88D Level-II $\sim 0.47^\circ$ base reflectivity imagery from a sweep that began at 1025 PDT. Accident aircraft's flight track through about this time is denoted by the purple line.

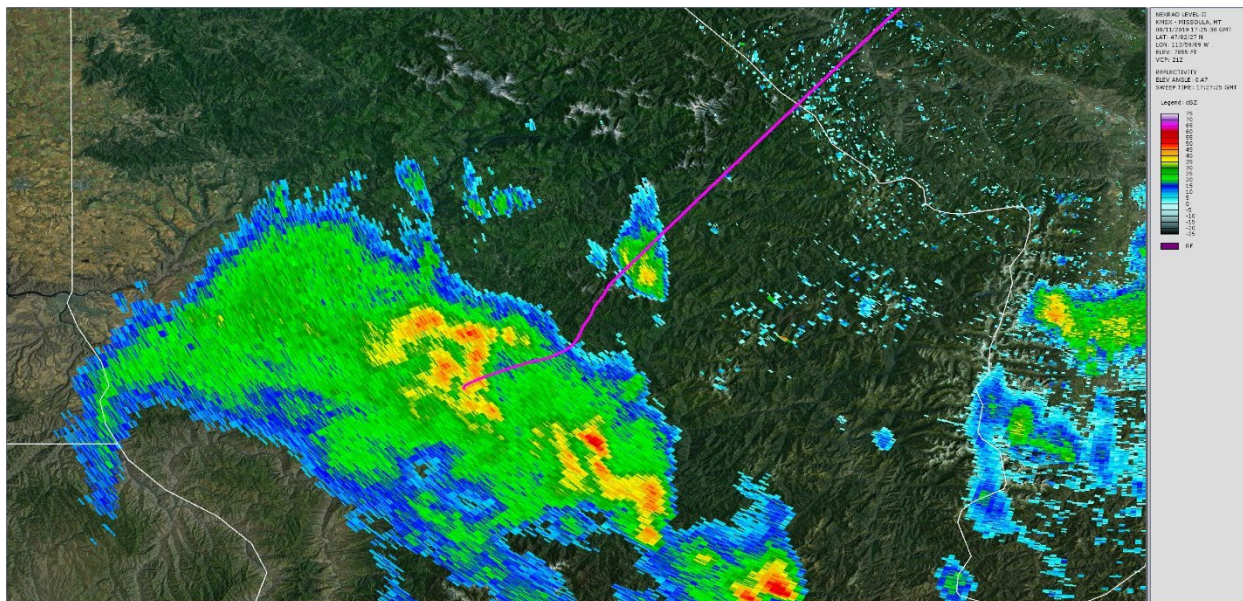


Figure 5 – KMSX WSR-88D Level-II ~0.47° base reflectivity imagery from a sweep that began at 1028 PDT. Accident aircraft’s flight track through about this time is denoted by the purple line.

2.0 Upper Air Data

A High-Resolution Rapid Refresh (HRRR) model⁴ sounding for the accident site at 1100 PDT (figure 6) was retrieved from the National Oceanic and Atmospheric Administration’s Air Resources Laboratory. The (background) wind between 8,000 and 16,000 feet was from the southwest at magnitudes between 5 and 10 knots. Calculations made by the Rawinsonde OBservation Program did not yield any significant areas of non-convective turbulence for this atmosphere but did indicate an icing potential above about 14,000 feet. The freezing level was at about 11,300 feet.

The most-unstable Convective Available Potential Energy (CAPE)⁵ parameter was 509 Joules/kilogram (from 948 hectopascals [hPa]). The Lifting Condensation Level⁶ (LCL) and Level of Free Convection⁷ (LFC) were calculated to be 1,960 feet. Maximum vertical velocity (MVV)

⁴ 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.

⁵ Convective Available Potential Energy - A measure of the amount of energy available for convection. CAPE is directly related to the maximum potential vertical speed within an updraft; thus, higher values indicate greater potential for severe weather.

⁶ Lifting Condensation Level - The level at which a parcel of moist air lifted dry-adiabatically would become saturated.

⁷ Level of Free Convection - The level at which a parcel of air lifted dry-adiabatically until saturated and saturation-adiabatically thereafter would first become warmer than its surroundings in a conditionally unstable atmosphere. On a thermodynamic diagram the level of free convection is given by the point of intersection of the process curve, representing the process followed by the ascending parcel, and the sounding curve, representing the lapse rate of temperature in the environment.

for this atmosphere was calculated as 32 meters/second (about 6,300 feet per minute).⁸ Downdraft CAPE (DCAPE; 6 kilometers agl)⁹ was measured at 317 Joules/kilogram.

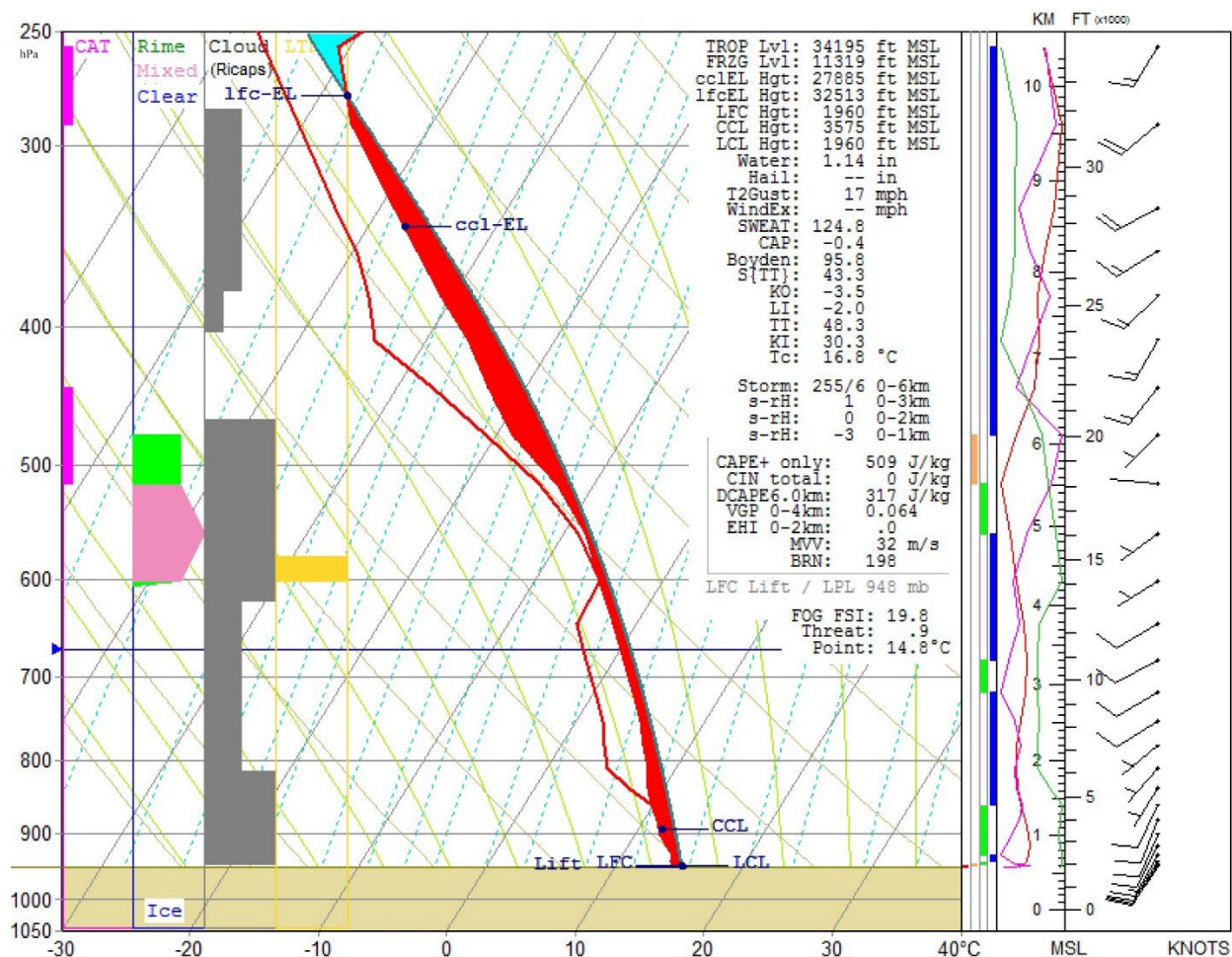


Figure 6 – HRRR model sounding data in SkewT/LogP format for 1100 PDT at the accident site, surface to 250 hPa.

⁸ MVV is not usually considered a realistic estimate for maximum vertical velocity in a storm. Anecdotes suggest considering a value of MVV/2, however it is not well understood when or where such a half-value should be applied.

⁹ The DCAPE can be used to estimate the potential strength of rain-cooled downdrafts within thunderstorm convection and is similar to CAPE. Larger DCAPE values are associated with stronger downdrafts.

3.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-17 visible ($0.64\mu\text{m}$) and infrared ($10.3\mu\text{m}$) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from 1026 PDT is presented in figures 7 and 8. The visible imagery identified cloudy conditions across the accident region in a pattern consistent with convective activity. Infrared imagery depicted minimum brightness temperatures around the accident location of about -50°C , which, when considering the HRRR sounding, corresponded to cloud top heights near 34,000 feet.

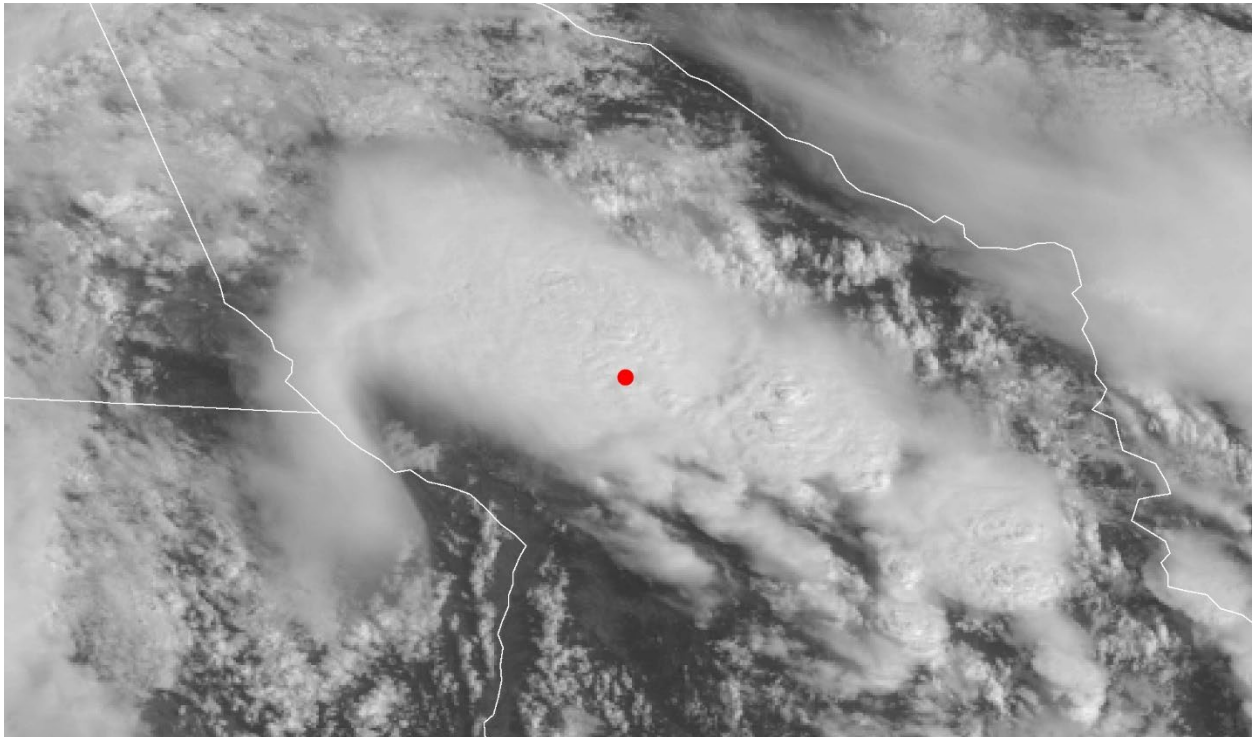


Figure 7 – GOES-17 visible imagery from 1026 PDT. Accident location denoted by red circle. This image has not been corrected for any parallax error.

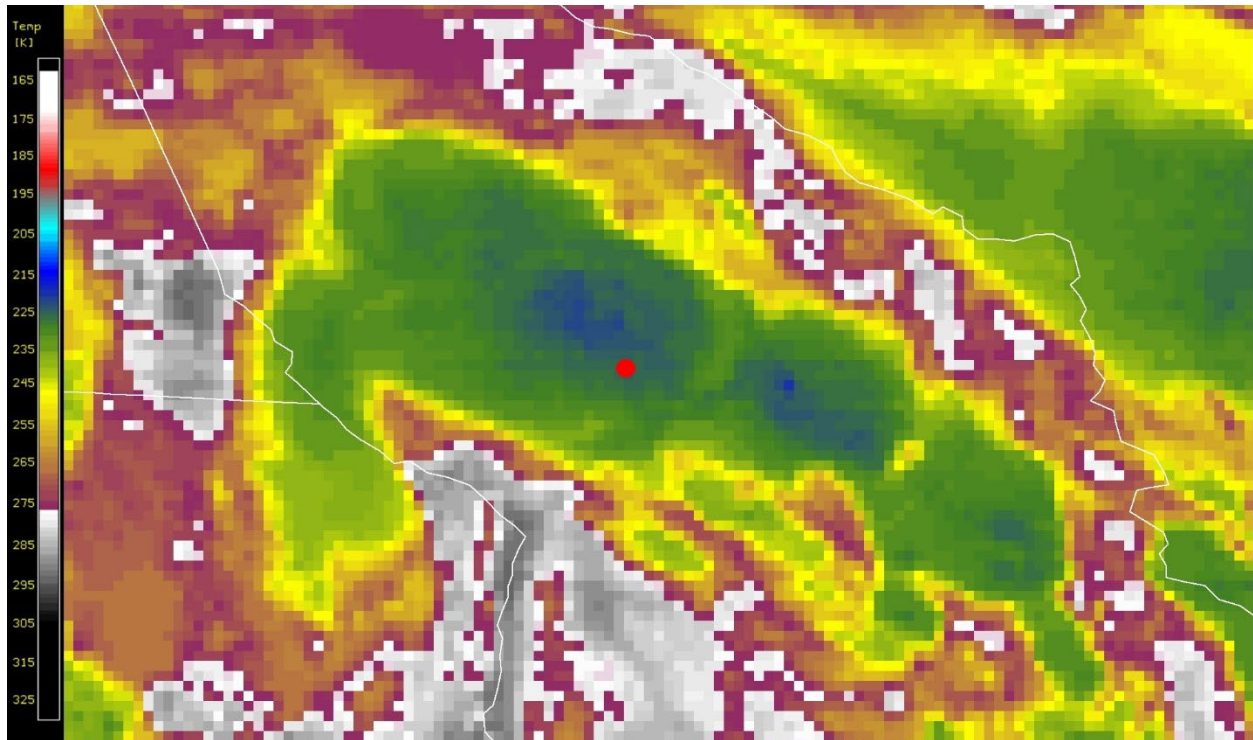


Figure 8 – GOES-17 infrared imagery from 1026 PDT. Accident location denoted by red circle. This image has not been corrected for any parallax error.

4.0 Lightning

Figure 9 depicts total lightning activity detected by the Earth Networks Total Lightning Network (ENTLN) around the accident location¹⁰ from 1025 PDT through 1029 PDT.

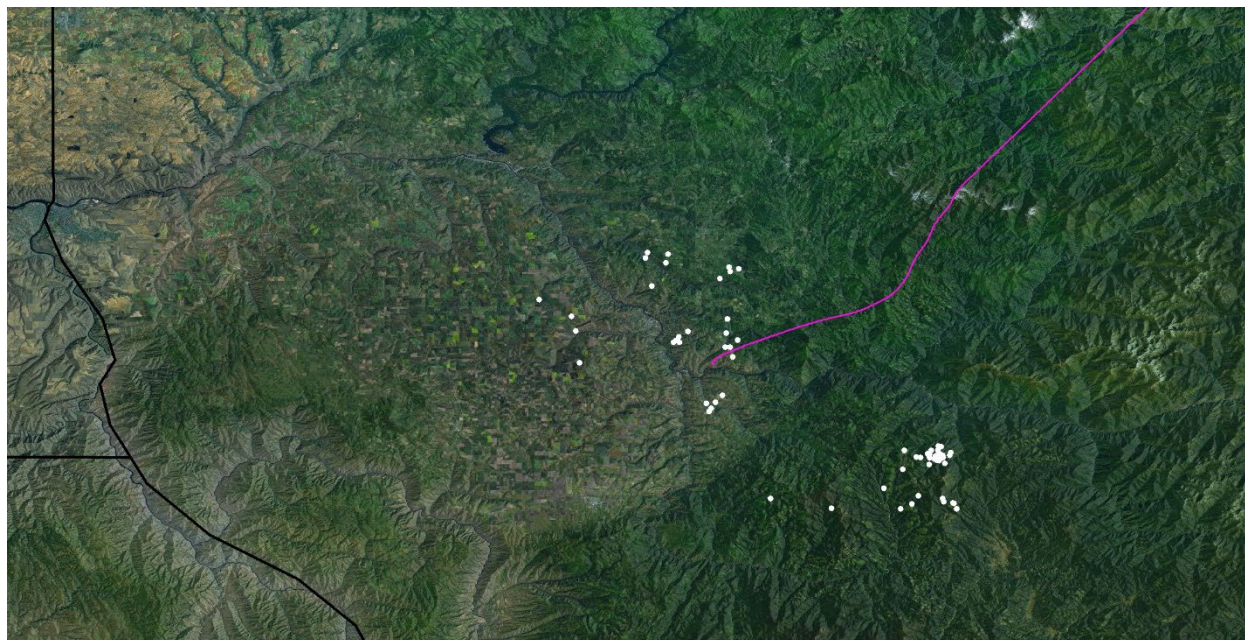


Figure 9 – ENTLN total lightning activity (white dots) for the region near the accident location from 1025 PDT through 1029 PDT. Accident aircraft's flight path is denoted by the purple line.

5.0 Surface Observations

The closest station to the accident site with ceiling and visibility reporting was an Automated Surface Observing System located at Idaho County Airport (GIC¹¹) in Grangeville, Idaho, which was located about 15 miles south-southwest of the accident location at an elevation of about 3,300 feet. Automated reports from KGIC during the times surrounding the accident time are presented here.

[0915 PDT] METAR KGIC 111615Z AUTO 26004KT 10SM SCT034 SCT042 OVC050
15/13 A3002 RMK AO1=

[0935 PDT] METAR KGIC 111635Z AUTO 29005KT 10SM BKN037 OVC050 15/13
A3003 RMK AO1=

¹⁰ Lightning is only depicted for a box bounded by latitudes: 46.56693 and 45.86929; longitudes: -114.85382 and -116.61713.

¹¹ This report uses the 3-digit International Air Transport Association format for airport identification, which does not use the geographic designating digit (e.g., “K” for stations in the continental U.S. and “P” for U.S. stations in Alaska and the Pacific region) as found in the 4-digit International Civil Aviation Organization (ICAO) identifier format. Weather observations from airports in this report are referenced by their reporting station's identifier (using ICAO format that includes the geographic designating digit), not by the airport at which the reporting station is located.

[0955 PDT] METAR KGIC 111655Z AUTO 28006KT A3004 RMK AO1 P0002=
[1015 PDT] METAR KGIC 111715Z AUTO 32009G14KT 10SM OVC027 13/13
A3004 RMK AO1=
 [1035 PDT] METAR KGIC 111735Z AUTO 34006KT 10SM OVC027 12/11 A3006
 RMK AO1=
 [1055 PDT] METAR KGIC 111755Z AUTO 29004KT 10SM SCT027 OVC070 12/11
 A3005 RMK AO1=

At 1015 PDT, KGIC reported a wind from 320° at 9 knots with gusts to 14 knots, visibility of 10 statute miles or greater, ceiling overcast at 2,700 feet above ground level, temperature of 13° Celsius (C) and a dew point temperature of 13°C, altimeter setting of 30.04 inches of mercury; remarks: station without a precipitation discriminator.

6.0 Pilot Reports

There were no publicly disseminated pilot reports¹² (PIREP) made within 50 miles of the accident location within two hours of the accident time.

7.0 AIRMETs

The only Airmen's Meteorological Information (AIRMET) advisory active for the accident location at the accident time below 17,000 feet was issued by the National Weather Service's (NWS) Aviation Weather Center (AWC) at 0745 PDT for mountain obscuration.

WAUS45 KPCI 111445
WA5S
-SLCS WA 111445
AIRMET SIERRA UPDT 2 FOR IFR AND MTN OBSCN VALID UNTIL 112100
AIRMET MTN OBSCN...ID MT WY NV WA OR CA
FROM 20WNW HUH TO 40S YQL TO GTF TO 20NE HVR TO 50SE DDY TO 40ESE
BOY TO 40SE LKV TO 50NE RBL TO 30SE FOT TO 70W OED TO HQM TO TOU TO
20WNW HUH
MTNS OBSC BY CLDS/PCPN. CONDS CONTG BYD 21Z THRU 03Z.

¹² Pilot reports publicly disseminated only over radio were not captured. Only PIREPs with World Meteorological Organization headers that contained UBID** and UBWA** were considered.

8.0 SIGMETs

There were no non-convective Significant Meteorological Information (SIGMET) advisories active for the accident location at the accident time.

At 0955 PDT, the NWS AWC issued the following convective SIGMET that was active for the accident location at the accident time.

*WSUS33 KPCI 111655
SIGW
-MKCW WST 111655
CONVECTIVE SIGMET 33W
VALID UNTIL 1855Z
MT ID OR WA
FROM 10ENE HVR-20WNW DBS-20N BKE-40SSE GEG-30NE FCA-10ENE HVR
AREA TS MOV MOV FROM 20025KT. TOPS TO FL440.*

9.0 CWSU Products

There were no Center Weather Advisories issued by the Center Weather Service Unit (CWSU) at the Seattle Air Route Traffic Control Center that were active for the accident location at the accident time.

10.0 Flight Service

According to Leidos Flight Service (LFS), neither they nor any third party vendors utilizing the LFS system had any contact with the accident aircraft on the accident day or the day prior.

Submitted by:

Mike Richards
Senior Meteorologist

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