

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR25LA053

METEOROLOGY

Environmental Conditions

April 8, 2025

Preliminary - On December 02, 2024, about 1530 Pacific standard time, a Gulfstream AM CORP COMM DIV 690D, N29GA, was substantially damaged when it was involved in an accident near Spokane, Washington. The pilot was not injured. The airplane was operated as a *Title 14 Code of Federal Regulations Part 91* personal flight.

Weather Conditions

Synoptic Conditions - the northwest section of the National Weather Service (NWS) Surface Analysis Chart for 1600 PST is included as figure 1. The chart depicted high pressure at 1034-hectopascals (hPa) dominating over the area. The station model for Spokane depicted calm wind, mist, overcast skies, temperature 29° Fahrenheit (F), dew point temperature 28°F, and a sea-level pressure of 1031.6-hPa. Several other stations over Washington reported mist, fog, and freezing fog during the period.

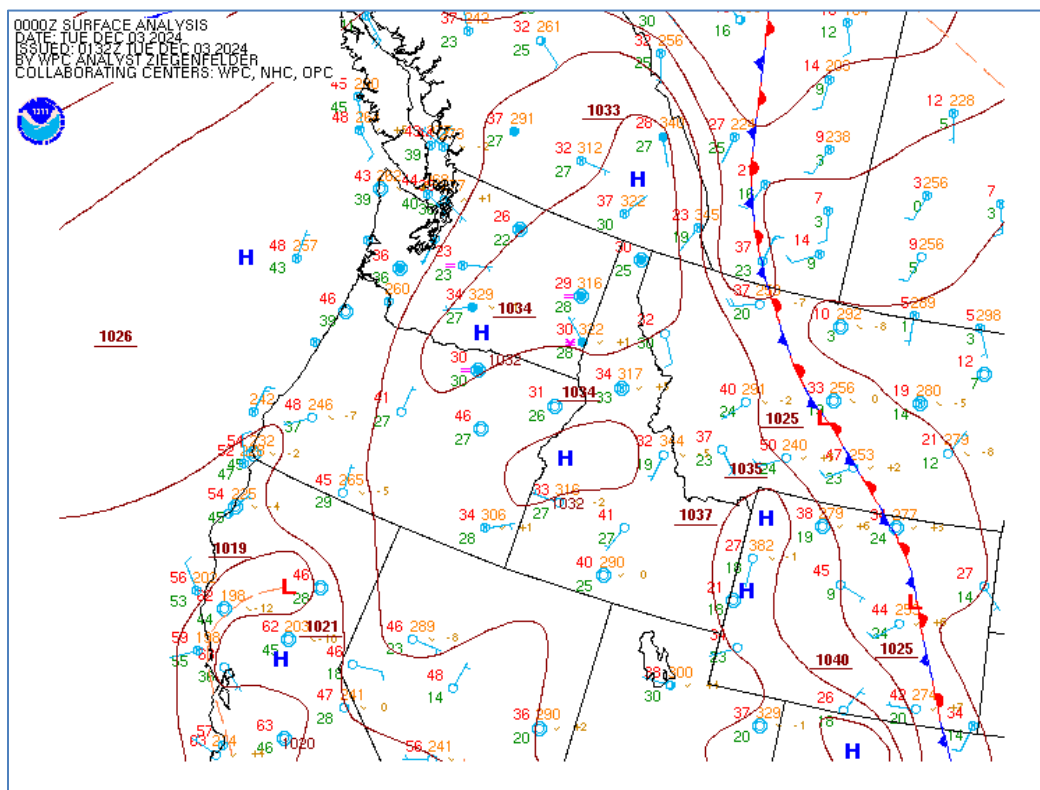


Figure 1 - NWS northwest Surface Analysis Chart for 1600 PST (0000Z DEC 3, 2024)

Surface Weather Observations - The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METAR) and Aviation Selected Special Weather Reports (SPECI). Cloud heights are reported above ground level (agl) in the following section. The magnetic variation over the area was estimated at 14.5° East based on the latest sectional chart for the area.

The accident occurred on approach into Felts Field Airport (KSFF), Spokane, Washington, which lists an elevation of 1,958 ft msl. The airport has a federally installed and maintained Automated Surface Observation System (ASOS), which was

augmented by FAA tower controllers under a Limited Aviation Weather Reporting Service (LAWRS) agreement during normal operating hours. The following conditions were reported surrounding the time of the accident.

Weather observation for KSFF at 1453 PST, wind calm, visibility 4 miles in mist, ceiling broken at 300 ft agl, overcast at 600 ft, temperature -1°C, dew point temperature -2°C, altimeter 30.41 inHg. Remarks: automated observation system with a precipitation discriminator, sea-level pressure 1032.0-hPa, temperature -0.6°C, dew point -1.7°C.

Accident 1530Z

Weather observation for KSFF at 1553 PST, wind calm, visibility 2 miles in mist, ceiling broken at 300 ft agl, overcast at 600 ft, temperature -1°C, dew point temperature -1°C, altimeter 30.42 inHg. Remarks: automated observation system with a precipitation discriminator, sea-level pressure 1032.4-hPa, temperature -0.6°C, dew point -1.1°C, 6-hour maximum temperature 0.0°C, 6-hour minimum temperature -1.1°C, 3-hour pressure tendency risen 0.6-hPa.

A depiction of the conditions from the NWS Aviation Weather Center's website for 1530 PST (2330Z) is included as figure 2. The image depicted LIFR conditions over the Spokane area due to low ceilings and visibilities in mist.

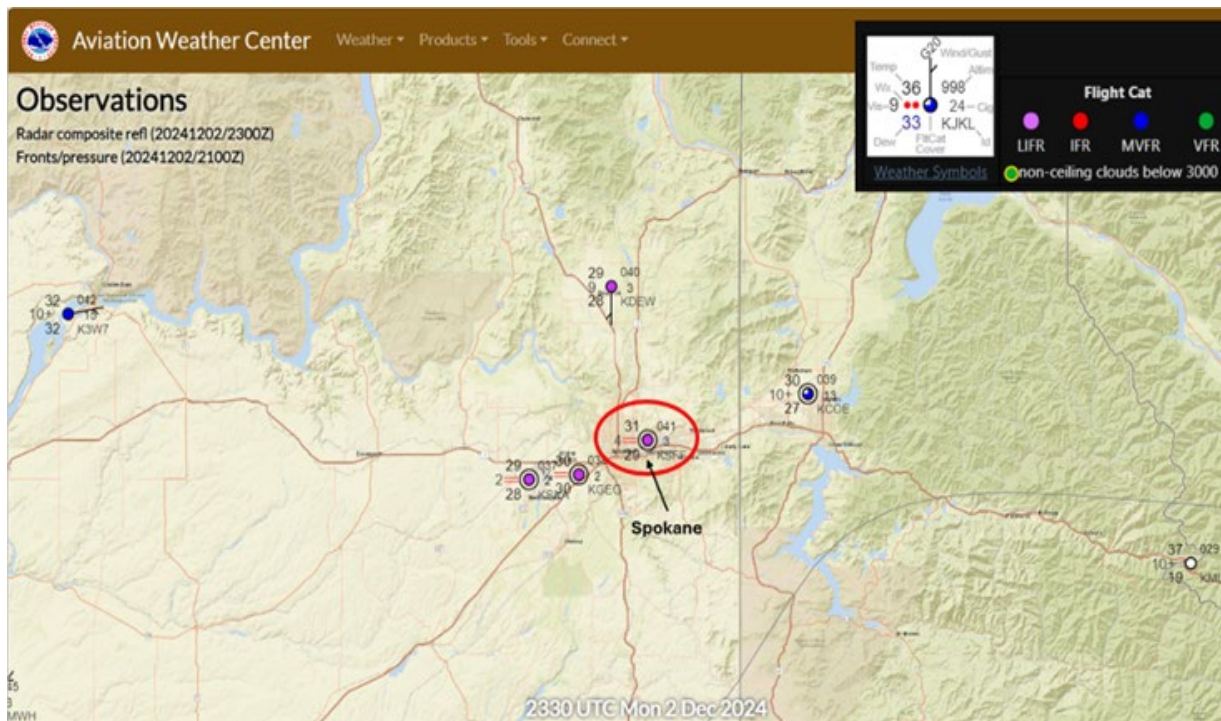


Figure 2 - NWS Aviation Weather Center's METAR with radar overlaid for 1530 PST (2330Z).

The general flight categories and raw observations in standard code and abbreviations with time referenced to UTC were as follows:

Flight category definitions

Category	Color	Ceiling		Visibility
LIFR Low Instrument Flight Rules	Magenta	below 500 feet AGL	and-or	less than 1 mile
IFR Instrument Flight Rules	Red	500 to below 1,000 feet AGL	and/or	1 mile to less than 3 miles
MVFR Marginal Visual Flight Rules	Blue	1,000 to 3,000 feet AGL	and/or	3 to 5 miles
VFR Visual Flight Rules	Green	greater than 3,000 feet AGL	and	greater than 5 miles
NOTES: By definition, IFR is ceiling less than 1,000 feet AGL and/or visibility less than 3 miles while LIFR is a sub-category of IFR. By definition, VFR is ceiling greater than or equal to 3,000 feet AGL and visibility greater than or equal to 5 miles while MVFR is a sub-category of VFR.				

IFR SPECI KSFF 021203Z AUTO 25004KT 10SM OVC009 M03/M04 A3040 RMK AO2 T10281039=

IFR METAR KSFF 021253Z AUTO 00000KT 10SM OVC008 M02/M03 A3040 RMK AO2 SLP312
T10221028=

IFR METAR KSFF 021353Z 08003KT 10SM OVC007 M02/M03 A3040 RMK AO2 SLP314 T10171028=

IFR METAR KSFF 021453Z 07003KT 10SM OVC006 M02/M03 A3041 RMK AO2 SLP317 T10171028
53005=

IFR METAR KSFF 021553Z 00000KT 9SM OVC005 M01/M02 A3042 RMK AO2 SLP320 T10111022=

IFR METAR KSFF 021653Z 36003KT 5SM BR OVC005 M01/M02 A3043 RMK AO2 SLP325
T10111022=

IFR METAR KSFF 021753Z 00000KT 5SM BR OVC005 M01/M02 A3044 RMK AO2 SLP328
T10061017 11006 21028 53010=

IFR METAR KSFF 021853Z 00000KT 7SM OVC007 M01/M02 A3043 RMK AO2 SLP326 T10061017=

IFR METAR KSFF 021953Z 33004KT 8SM OVC007 M01/M02 A3042 RMK AO2 SLP322 T10111022=

IFR SPECI KSFF 021955Z 33004KT 4SM OVC007 M01/M02 A3042=

LIFR METAR KSFF 022053Z 00000KT 4SM BR BKN003 OVC006 M01/M02 A3041 RMK AO2 SLP318
T10061017 58011=

LIFR METAR KSFF 022153Z 00000KT 4SM BR BKN003 OVC006 M01/M02 A3041 RMK AO2 SLP317
T10061017=

LIFR METAR KSFF 022253Z 00000KT 4SM BR BKN003 OVC006 M01/M02 A3041 RMK AO2 SLP320
T10061017=

Accident 2330Z

LIFR METAR KSFF 022353Z 00000KT 2SM BR BKN003 OVC006 M01/M01 A3042 RMK AO2 SLP324
T10061011 10000 21011 53006=

IFR METAR KSFF 030053Z 0000KT 3SM BR OVC005 M01/M02 A3043 RMK AO2 SLP324 T10061017=

IFR METAR KSFF 030153Z 0000KT 4SM BR OVC006 M01/M02 A3042 RMK AO2 SLP321 T10061017=

IFR METAR KSFF 030253Z 0000KT 4SM BR OVC006 00/M02 A3042 RMK AO2 SLP321 T00001017 57002=

IFR METAR KSFF 030353Z 0000KT 5SM BR OVC006 00/M02 A3041 RMK AO2 SLP319 T00001017=

A search of NWS 5-minute observational data indicated that no data was archived between the period from 2055Z and 0655Z on February 3, 2024 for unknown reasons.

Weather Radar Imagery - The NWS Regional Composite Reflectivity image depicted no meteorological echoes over the area surrounding the time of the accident.

Sounding - A High-Resolution Rapid Refresh (HRRR) numerical model data was obtained from the NOAA Air Resources Laboratory archive for 1500 CST (2300Z) for the nearest grid point to the accident site. The data was then plotted on a standard Skew T/log P diagram using the RAOB Analysis software from the surface to 500-hPa or about 18,000 ft and is included as figure 3.

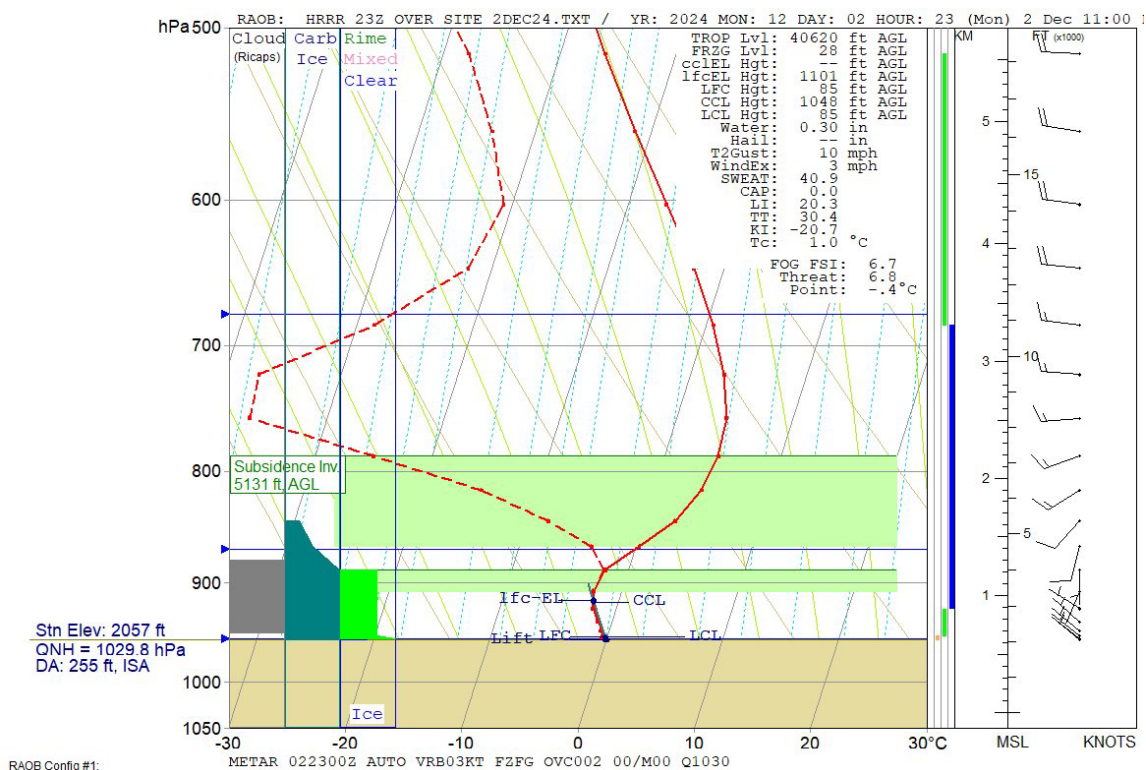


Figure 3 - High-Resolution Rapid Refresh (HRRR) numerical model over the closest grid point to the accident site for 1500 PST.

The sounding depicted an elevation of 2,057 ft over the grid point with a near surface temperature of 0.1C (32.2F), a dew point temperature of -0.1C (31.8F), with a relative humidity of 99%, a surface pressure of 28.23 inches of mercury (inHg), which resulted in a density altitude of 255 ft. The lifted condensation level (LCL) and level of free convection (LFC) were identified at 85 ft agl, with the convective condensation level (CCL) at 1,049 ft agl. The precipitable water content was 0.30 inches. An inversion was noted immediately above the CCL from 3,400 ft through 7,000 ft due to subsidence. The RAOB Analysis program supported a layer of low stratiform clouds with bases at 200 ft agl with tops to 2,200 ft agl or 4,257 ft msl. The atmosphere was characterized as stable with a lifted index of 20.3, and no positive Convective Available Potential Energy (CAPE) values. The sounding depicted multiple freezing levels due to the inversion, with the layer from the surface through 5,000 ft below freezing which also supporting a risk of light rime type icing conditions in that layer to 4,000 ft. The sounding also supported a high risk of severe carburetor type icing conditions from the surface through 4,000 ft. The clouds (gray), carburetor icing (dark green), and structural icing (light green) regions are depicted on the left side of the diagram, with the freezing levels depicted by a blue horizontal line.

The sounding also provided fog indices which indicated a Fog point of -0.4°C for the formation of radiation type fog, with the both the fog stability index (FSI), relative humidity, temperature-dew point spread, and wind supported a near 100% for the formation of fog.

The sounding wind profile indicated a surface wind from 310° at 3 knots, with winds from the northwest at speeds less than 5 knots through 4,000 ft. The winds backed to the southwest above 4,000 ft and slowly veered to the west with height. The mean 0 to 6 km (or 18,000 ft) steering winds were from 290° at 29 knots. The RAOB Analysis program supported the potential for light turbulence within the inversion between about 3,000 ft through 7,000 ft.

A table of the sounding parameters of height, pressure (PRE), temperature (T), dew point temperature (Td), relative humidity (RH), wind direction and speed, and potential for Clear Air Turbulence (CAT), Low-Level Wind Shear (LLWS), and icing intensity and type is included below from the surface through 8,000 ft. Intensity abbreviation for light (LGT), moderate (MDT), severe (SVR).

Height (ft msl)	Pres (hPa)	T (°C)	Td (°C)	RH (%)	Wind (dir/kt)	CAT (FAA)	LLWS (FAA)	Icing (AFGW)
2057	956	0.1	-0.1	99	312/ 3			
2085	955	0.0	-0.4	97	311/ 3			MDT Clear
2168	952	-0.3	-0.4	99	311/ 3			LGT Rime
2306	947	-0.6	-0.7	99	312/ 4			LGT Rime
2556	938	-1.1	-1.2	99	313/ 4			LGT Rime
2921	925	-1.9	-2.0	99	304/ 3	LGT		LGT Rime
3405	908	-2.4	-2.4	100	202/ 1	LGT		LGT Rime
3986	888	-2.0	-2.1	99	180/ 5	LGT		LGT Rime

4644	866	0.3	-3.8	74	194/ 8 LGT
5356	843	2.7	-8.2	44	220/ 11LGT
6222	816	4.1	-14.8	24	236/ 14LGT
7188	787	4.6	-25.0	10	249/ 13LGT
8260	756	4.3	-36.7	3	264/ 14

Satellite Imagery - The NOAA Geostationary Operational Environmental Satellite number 18 (GOES-18) infrared and visible imagery were reviewed surrounding the period. The visible image for 1531 PST is included as figure 4 and depicted an extensive area of low stratiform clouds over the area.

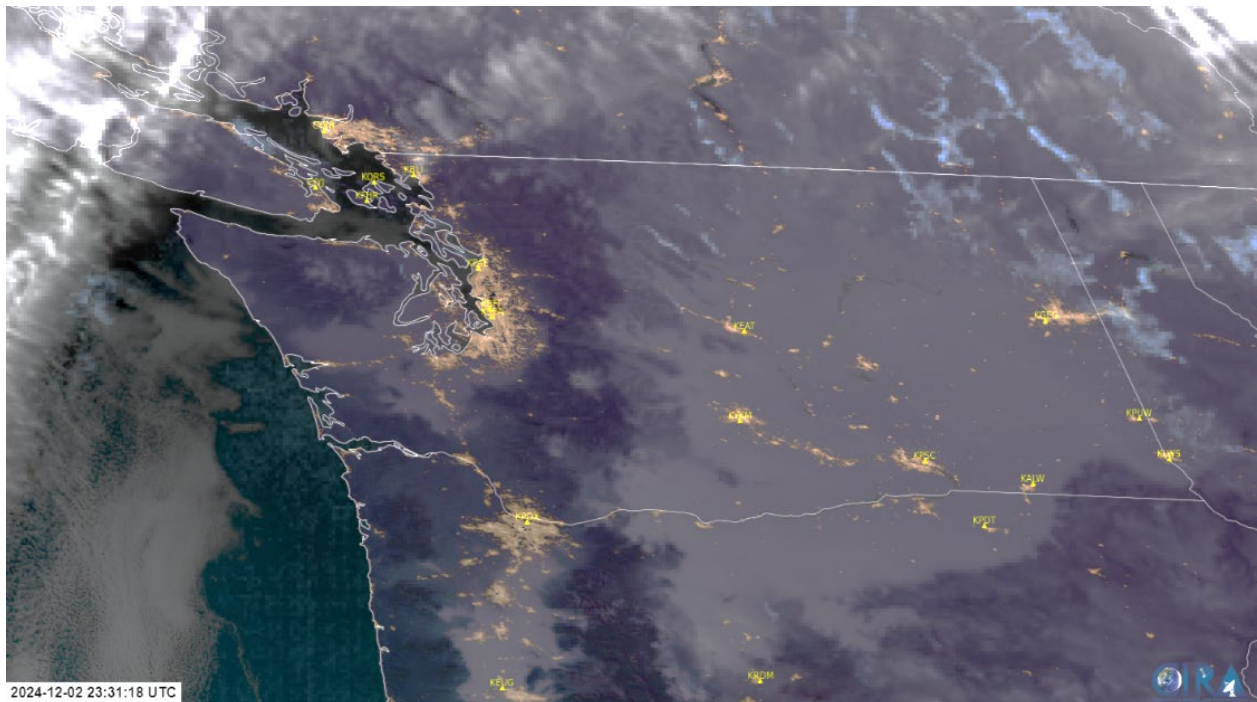


Figure 4 - GOES-18 GeoColor image for 1531 PST depicting low stratiform clouds and fog over the region.

Pilot Reports - The following Pilot Weather Reports (PIREPs) were issued longline within 50 miles of KSFF for the 3 hours prior to the accident. The reports are in standard code and abbreviations, with time referenced to UTC. The time of the accident is included in dark blue italic print for reference.

SFF UA /OV SFF/TM 2044/FL023/TP C172/SK BKN023-TOP038/TA 00/IC LGT RIME

GEG UA /OV GEG/TM 2200/FL039/TP E75L/SK OVCUNKN-TOP039/RM DURC

GEG UA /OV GEG030004/TM 2215/FL040/TP B738/SK OVCUNKN-TOP040/RM DURC

Accident 2330Z

SFF UA /OV RNAV RWY 4L/TM 0105/FL024/TP PC12/SK OVC024-TOP040/TA M02/IC LGT CLR

Weather Forecasts

Terminal Aerodrome Forecast (TAF)- the NWS forecast for KSFF was valid for a 5 mile radius of the airports center point. The forecasts issued by the NWS Spokane Weather Forecast Office (WFO) surrounding the period were as follows:

TAF KSFF 021733Z 0218/0318 VRB03KT P6SM OVC006

FM022200 VRB03KT P6SM OVC010

FM030400 VRB03KT P6SM OVC006=

AMD TAF KSFF 022218Z 0222/0318 00000KT 4SM BR BKN003 OVC006

FM022300 VRB03KT P6SM OVC006=

Graphic Forecast for Aviation (GFA) - the NWS GFA flight categories chart for ceilings and visibility current at the time of the accident is included as figure 5 and depicted an extensive area of LIFR conditions over the area due to low ceilings and freezing fog. While the GFA review of icing conditions is provided as figure 6. The GFA forecast indicated a general risk of trace icing over the area.

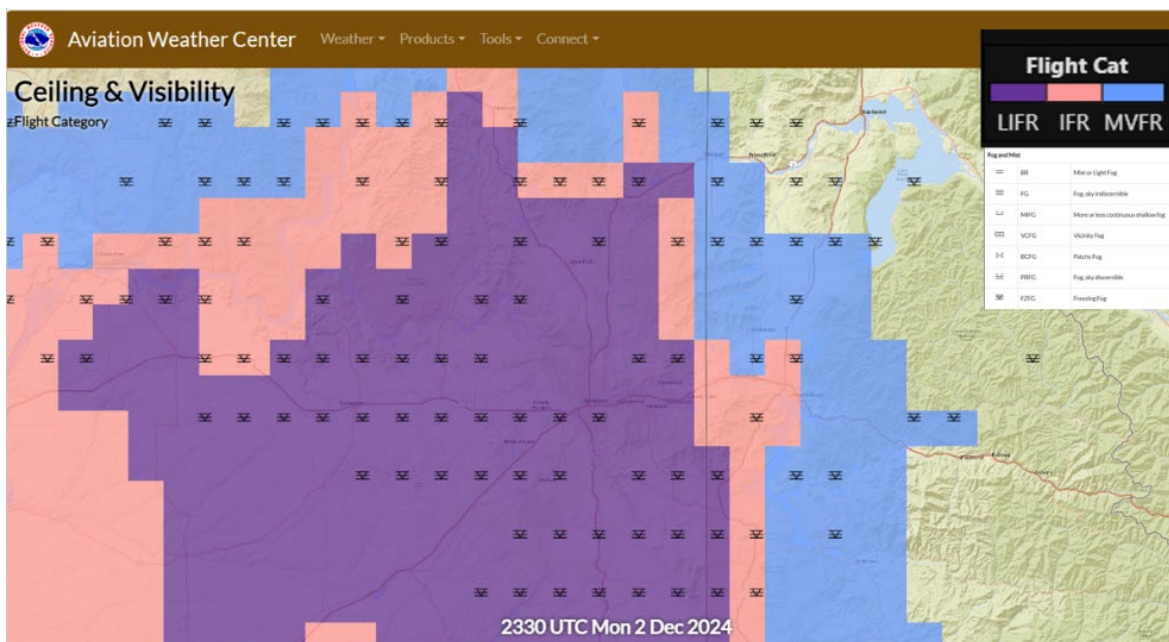


Figure 5 - Graphic Forecast for Aviation (GFA) surface forecast current during period.

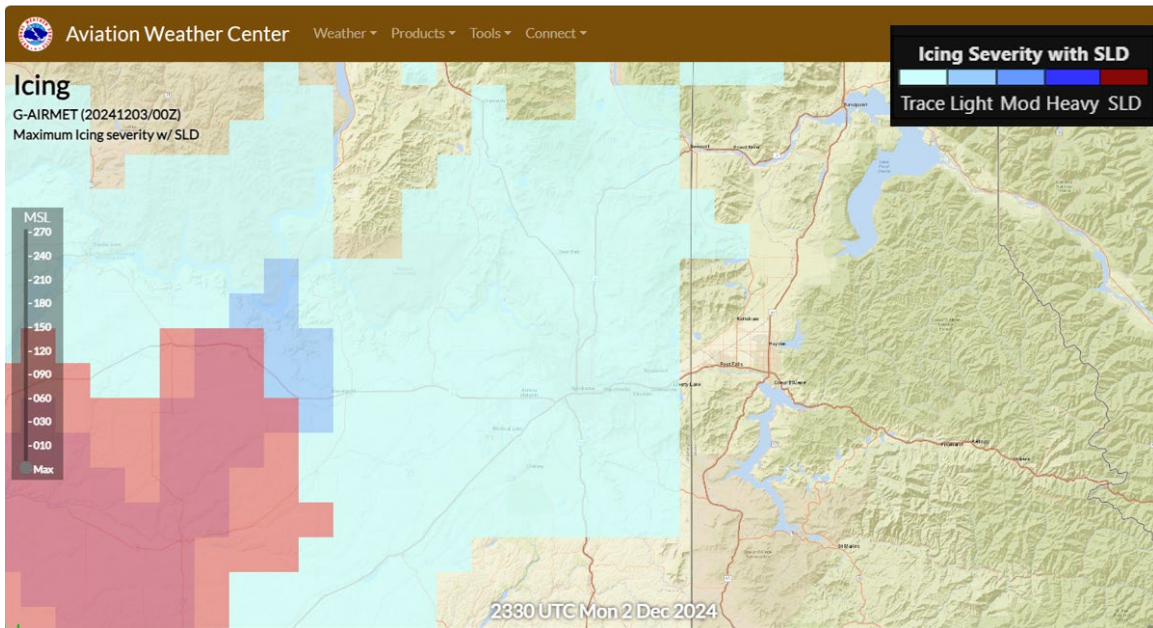


Figure 6 - GFA Icing Potential

Area Forecast Discussion (AFD) - the discussion issued during the period was as follows:

FXUS66 KOTX 022235
AFDOTX

Area Forecast Discussion
National Weather Service Spokane WA
235 PM PST Mon Dec 2 2024

.SYNOPSIS...

A dry and stable weather pattern will persist through the middle of the week, and temperatures seasonably cool in the upper 20s to mid 30s. Chances are increasing that the ridge of high pressure will weaken by the weekend with a return of light precipitation.

.DISCUSSION...

Tonight through Wednesday Night: Upper level high pressure will persist into Wednesday leading to a persistent weather pattern featuring fog and low clouds for most of the region. Low clouds expanded over the past 24 hours covering nearly all elevations below 3500 feet, with the exception being the Central Panhandle Mountains and locations between Sandpoint and Coeur d'Alene that have benefited from a east-northeast boundary layer wind. Now that the stratus is here, we can be more confident in the temperature forecasts since the stratus will limit diurnal changes in temperatures. Low temperatures will be mainly in the upper 20s to low 30s, with high temperatures not much warmer in the low to mid 30s. The cold pool in the Methow Valley is colder, where temperatures will remain in the 20s. The depth of the stratus has been sufficient that we have had some reports of drizzle across the Columbia Basin and at Fairchild AFB. For locations below freezing this will fall as freezing drizzle. Meanwhile some snow flurries are also possible in this setup. Thus a messy forecast, with the main impacts being from freezing fog and localized freezing drizzle. Will have to monitor conditions for any potential advisories. Elevations between 2200-3500 feet are within the stratus layer have the highest potential of freezing fog impacts the next couple days. JW

.AVIATION...

18Z TAFS: IFR stratus is covering most of the region, with MVFR stratus over KEAT. Models show little change in boundary layer moisture and wind through 18z Tuesday and thus not expected much change with the stratus. It will likely lift slightly this afternoon for some improvement, but then lower back down this evening. The lowest visibilities will occur where the stratus intersects the terrain, which is elevations between 2200 and 3500 feet, which includes KEGG/KPUW. For these two sites visibility down to 1/4SM with FZFG will be common for most of the TAF period.

FORECAST CONFIDENCE AND/OR ALTERNATE SCENARIOS:

Confidence is high of stratus plaguing the region through 18z Tue, with widespread IFR/MVFR conditions. Confidence is low with the degree of improvement at KEGG/KPUW this afternoon as well as timing of improvement. With stratus layers typically lifting slightly in the afternoon the forecast leans this way. JW

Inflight Weather Advisories - there were no SIGMETs, Convective SIGMETs, or Center Weather Advisories issued over the area surrounding the period of the accident. The NWS had a series of AIRMET issued at 1245 CST for the area primarily for IFR and mountain obscuration conditions.

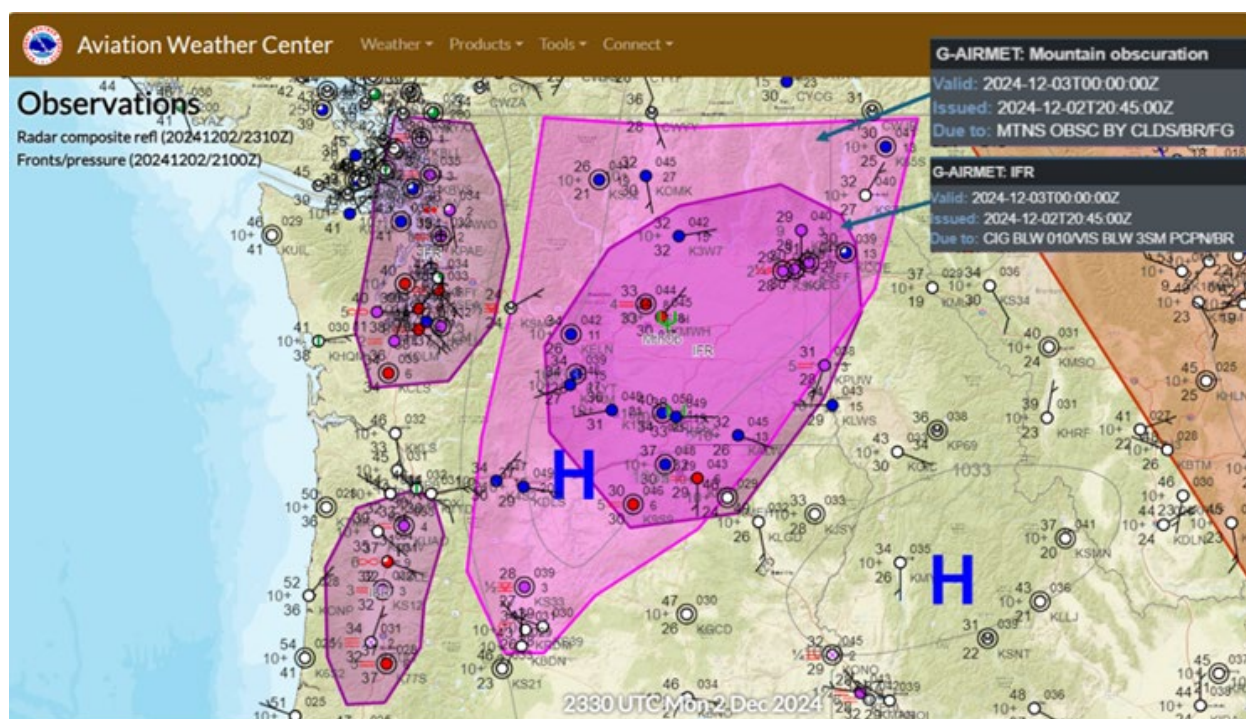


Figure 7 - NWS Surface observations and Graphic-AIRMETs current for period.

WAUS46 KPCI 022045

WA6S

-SFOS WA 022045

AIRMET SIERRA UPDT 5 FOR IFR AND MTN OBSCN VALID UNTIL 030300

.

AIRMET IFR...WA OR

FROM 70WSW YXC TO 70SSW YXC TO 80SSW MLP TO 20ENE DSD TO 20ENE

BTG TO 50NE SEA TO 30S YDC TO 70WSW YXC

CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET IFR...WA

FROM 20WNW HUH TO 50SW YDC TO 50SSE SEA TO 40SE HQM TO 20E TOU
TO 20WNW HUH

CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET IFR...WA OR

FROM 20E BTG TO 40NNE OED TO 60SSW EUG TO 60WSW BTG TO 20E BTG
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 03Z ENDG 03-06Z.

.
AIRMET MTN OBSCN...WA OR ID MT

FROM 30SSW YDC TO 40SSE YXC TO 60NNE BKE TO 40S DSD TO 60SSE BTG
TO 20ESE BTG TO 30SSW YDC

MTNS OBSC BY CLDS/BR/FG. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET MTN OBSCN...WA OR

FROM 20ENE HUH TO 40NE SEA TO 60S BTG TO 60SE EUG TO 60SSW EUG
TO 20NE ONP TO 40WSW HUH TO 20ENE HUH

MTNS OBSC BY CLDS/BR/FG. CONDS ENDG 21-00Z.

WAUS46 KKCI 022045

WA6T

-SFOT WA 022045

AIRMET TANGO UPDT 3 FOR TURB VALID UNTIL 030300

.
NO SGFNT TURB EXP OUTSIDE OF CNVTV ACT.

.
OTLK VALID 0300-0900Z...TURB WA OR AND CSTL WTRS

BOUNDED BY YDC-50WSW YXC-60SSW YXC-50WSW ONP-110WNW ONP-140W TOU-YDC
MOD TURB BTN FL240 AND FL350. CONDS DVLPG 03-06Z. CONDS CONTG THRU 09Z.

....

WAUS46 KKCI 022045

WA6Z

-SFOZ WA 022045

AIRMET ZULU UPDT 5 FOR ICE AND FRZLVL VALID UNTIL 030300

.
NO SGFNT ICE EXP OUTSIDE OF CNVTV ACT.

.
FRZLVL...RANGING FROM SFC-120 ACRS AREA

MULT FRZLVL BLW 100 BOUNDED BY 20WSW YDC-50NNW ISN-70SW RAP-
GLD-60W LBL-60WSW OCS-40NNW DLN-60NNE DNJ-30WSW BOI-40ENE
LKV-20NNE BTG-20N SEA-20WSW YDC

SFC ALG 30NE HUH-50ESE HUH-YKM-20ENE LKV-50ESE LKV
080 ALG 30W HUH-40S HUH-50SW DSD-30W LKV-70SSE LKV

Astronomical Conditions - The United States Naval Observatory's website provided the following astronomical conditions for Spokane on the day of the accident. The time of the accident has been included in bold italic type with the time in PST.

Sun	Time
Begin civil twilight	0644
Sunrise	0719
Accident	1530
Sunset	1559
End civil twilight	1634

Submitted by:

Donald Eick
Senior Meteorologist