

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ANC24FA089

METEOROLOGY

Specialist's Factual Report

September 30, 2024

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A. ACCIDENT

Location: King Salmon, Alaska

Date: 7 September 2024

Time: 0924 Alaska daylight time (1724 UTC¹)

Aircraft: Type - Bell 206B; Registration - N306FW

B. METEOROLOGY INVESTIGATOR

Mike Richards

Senior Meteorologist

Office of Aviation Safety

Operational Factors Division (AS-30)

National Transportation Safety Board

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 Alaska daylight time for 7 September 2024 (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). The accident site was located at about: 58.658754° north latitude; 156.6469° west longitude at sea level.

This report provides information on weather conditions and forecasts applicable to the accident flight.

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Surface Observing Station (ASOS) was located at King Salmon Airport (AKN²) in King Salmon, Alaska, which was located about 1 mile north of the accident site at an elevation of about 75 feet. It had a magnetic variation of about 13°E.

¹ UTC - abbreviation for Coordinated Universal Time

² 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.

Augmented longline³ reports from the AKN ASOS during the times surrounding the accident time are presented here and the observation closest in time to the accident time is highlighted with bold text.

[0803] PAKN 071603Z 17004KT 1/4SM R12/1600V2200FT FG VV002 05/05
A2996 RMK AO2 T00500050

[0854] PAKN 071654Z 17005KT 1/4SM R12/2000V2200FT FG VV002 07/07
A2997 RMK AO2 SLP150 T00670067

**[0933] PAKN 071733Z 16006KT 1/4SM R12/1000V1200FT FG VV002
08/08 A2998 RMK AO2 T00830083**

[0954] PAKN 071754Z 17006KT 1/4SM R12/1000FT FG VV002 09/09 A2998

[1001] PAKN 071801Z 17005KT M1/4SM R12/1000V1200FT FG VV002 09/09
A2998 RMK AO2 T00940094

At 0933, the PAKN ASOS reported a wind from 160° at 6 knots, visibility of 1/4 statute mile, runway 12 Runway Visual Range (RVR) 1,000 feet variable 1,200 feet, fog, vertical visibility of 200 feet, temperature of 8°C and dew point temperature of 8°C, altimeter setting of 29.98 inches of mercury; Remarks: automated station with a precipitation discriminator, temperature of 8.3°C and dew point temperature of 8.3°C.

5-minute automated observations from the AKN ASOS during the times surrounding the accident time are presented here and the observation closest in time to the accident time is highlighted with bold text.

[0915] 5-MIN PAKN 071715Z 16005KT 1/4SM R12/1200V1800FT FG VV002
07/07 A2998 20 100 -800 140/05 RMK AO2 T00720072

[0920] 5-MIN PAKN 071720Z 16007KT 1/4SM R12/1200V1400FT FG VV002
08/08 A2998 20 100 -800 150/07 RMK AO2 T00780078

**[0925] 5-MIN PAKN 071725Z 16006KT M1/4SM R12/1000V1200FT FG
VV002 08/08 A2998 20 100 -800 140/06 RMK AO2 T00780078**

[0930] 5-MIN PAKN 071730Z 17006KT 1/4SM R12/1000V1200FT FG VV002
08/08 A2998 20 100 -700 150/06 RMK AO2 T00830083

[0935] 5-MIN PAKN 071735Z 16006KT 1/4SM R12/0800V1200FT FG VV002
08/08 A2998 20 100 -700 140/06 RMK AO2 T00830083

³ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases (effectively, the whole world) and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline-dissemination of weather observations is the primary vehicle through which the general global public has access to surface weather observations, particularly outside of the aviation community.

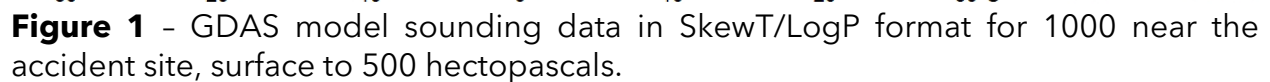
At 0925, the AKN ASOS five-minute report indicated a wind from 160° at 6 knots, visibility of less than 1/4 statute mile, runway 12 RVR 1,000 feet variable 1,200 feet, fog, vertical visibility of 200 feet, temperature of 8°C and dew point temperature of 8°C, altimeter setting of 29.98 inches of mercury, pressure altitude of 20 feet, relative humidity of 100 percent, density altitude of -800 feet, magnetic wind direction of 140° with a wind magnitude of 6 knots; Remarks included: automated station with a precipitation discriminator, temperature of 7.8°C and dew point temperature of 7.8°C.

2.0 GDAS Model Sounding

A Global Data Assimilation System (GDAS) model⁴ sounding (Figure 1) for near the accident site⁵ at 1000 was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. At 1000, RAOB noted few clouds about 800 feet, with scattered to broken clouds layers above that to about 8,000 feet. The freezing level was identified at about 7,100 feet. The wind near the surface was from the southwest at about 5 knots, above which it veered to a west-northwest wind of about 5 knots near 10,000 feet. RAOB did not identify any significant low-level wind shear or any areas of significant turbulence or icing below 15,000 feet.

⁴ The GDAS is the system used by the Global Forecast System model to place observations into a gridded model space for the purpose of starting, or initializing, weather forecasts with observed data.

⁵ Coordinates used for the model were latitude: 58.66; longitude: -156.65.



Geostationary Operational Environmental Satellite (GOES)-18 visible (0.64 μm) and infrared (10.3 μm) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Images from these data at 0920 are presented in Figures 2 and 3. Figure 2 presents a regional view of cloud coverage and identifies cloudy conditions over the accident site. Brightness temperatures (Figure 3) over the accident location were 6°C, which, when considering the 1000 HRRR sounding, corresponded to a height of about 3,600 feet.

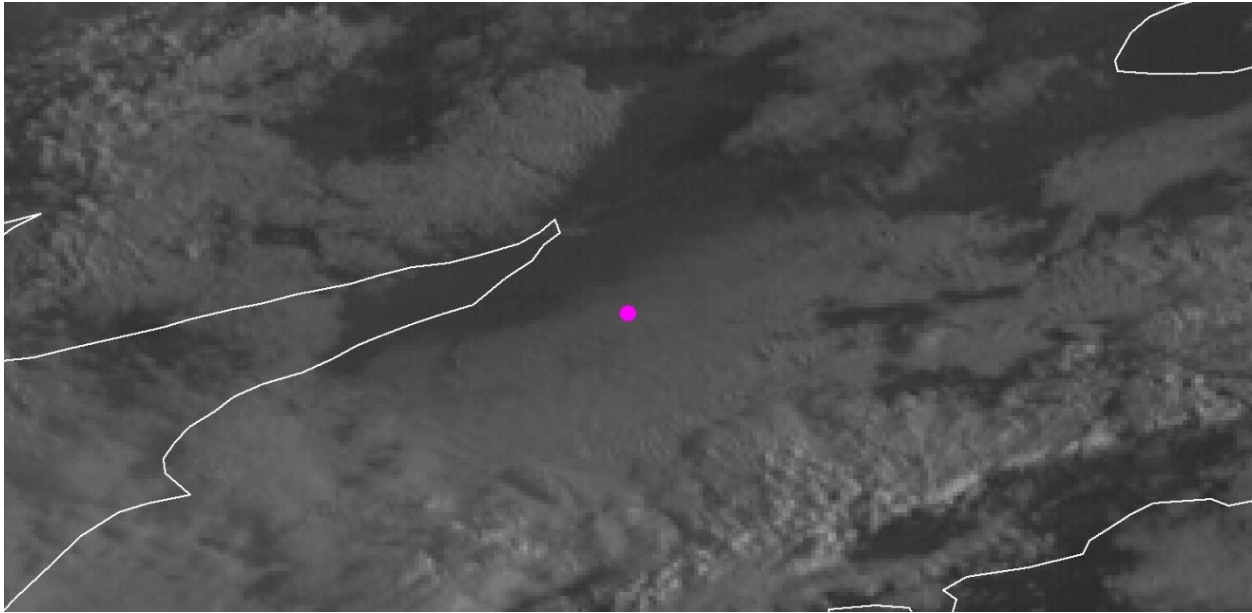


Figure 2 - GOES-18 visible imagery from 0920. Image is not corrected for parallax error. The accident location is denoted by the purple dot.

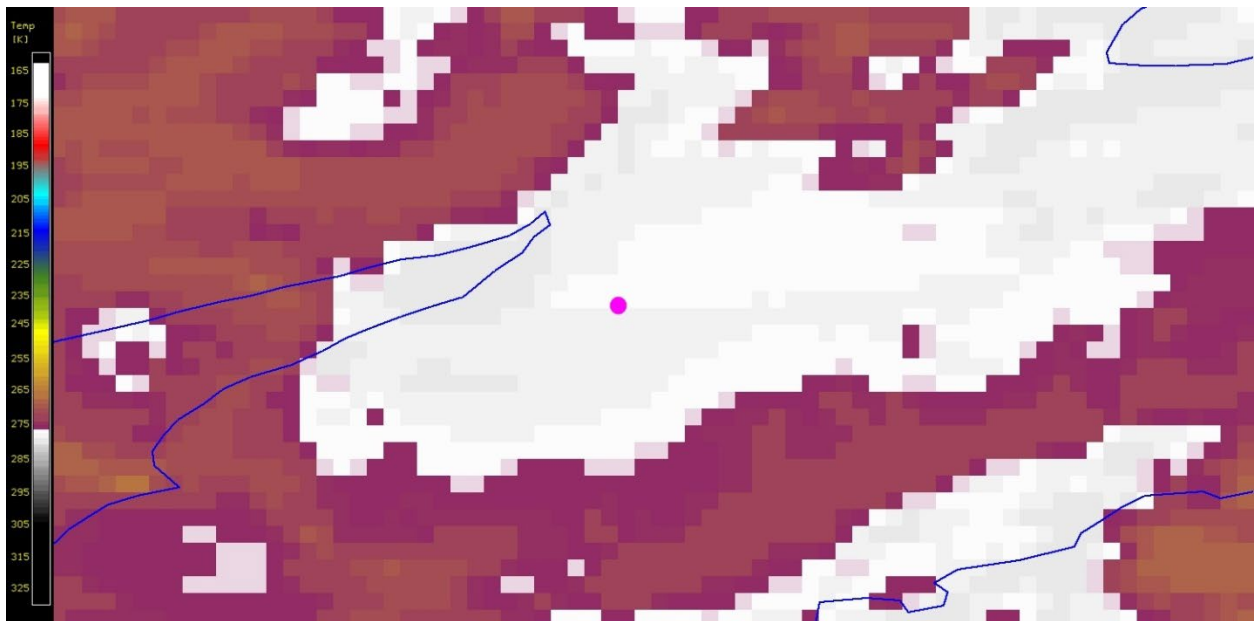


Figure 3 - GOES-18 infrared imagery from 0920. Image is not corrected for parallax error. The accident location is denoted by the purple dot.

Figure 4 presents a “daytime microphysical RGB” GOES-18 band combination image for 0920. This imagery combines various pieces of infrared satellite data to help determine cloud phase and height. Figure 5 presents an interpretation of this type of imagery.⁶

⁶

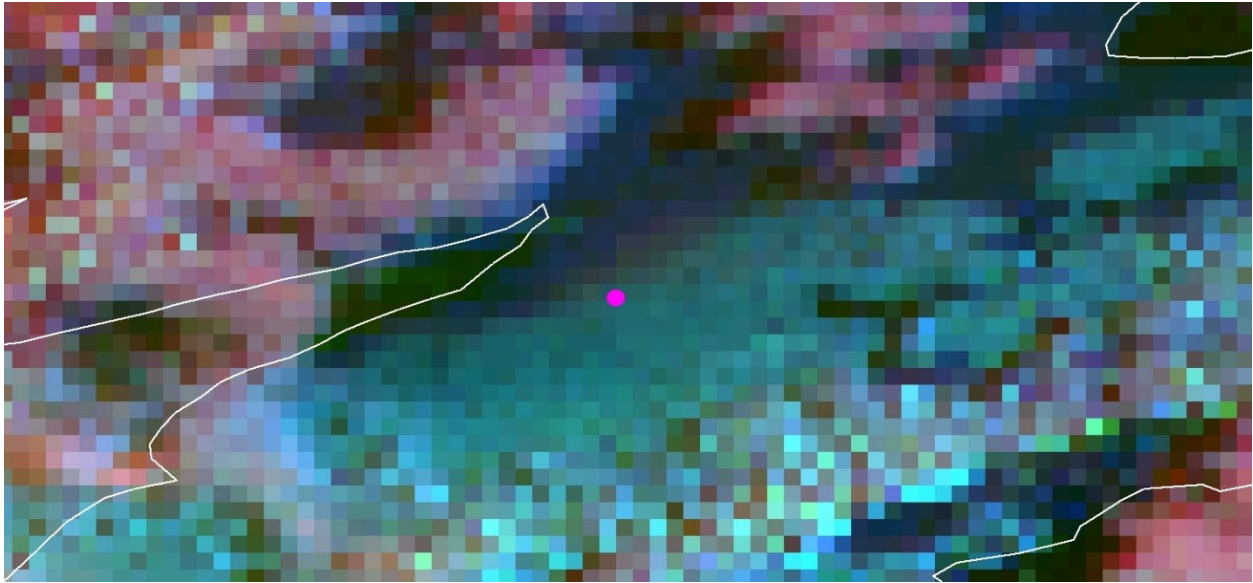


Figure 4 - GOES-18 daytime microphysical RGB image from 0920. This image has not been corrected for any parallax error. The accident location is denoted by the purple dot. This image has been contrast-enhanced.

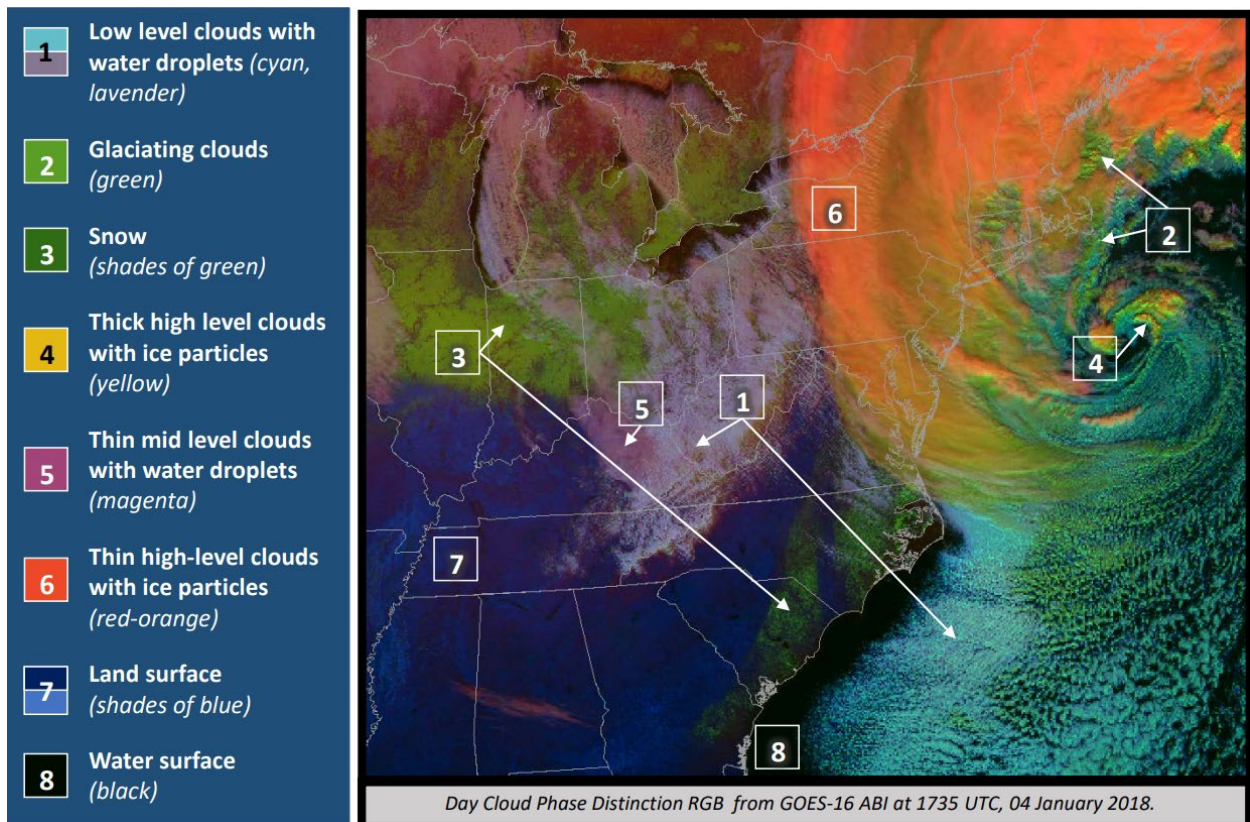


Figure 5 - Interpretation aid for the GOES-18 daytime microphysical RGB image found in Figure 4.

https://www.star.nesdis.noaa.gov/goes/documents/ABIQuickGuide_DayNightCloudMicroCombo.pdf

4.0 Pilot Reports

There were no longline-disseminated pilot reports⁷ (PIREPs) reported within 150 miles of the accident location between 0700 and 1200.

5.0 Weather Radar

WSR-88D⁸ Level-II base reflectivity weather radar imagery from the King Salmon, Alaska, site (PAKC) is presented in Figure 6. PAKC was located about 1 mile north-northeast of the accident location with an antenna elevation of about 145 feet. Assuming standard refraction and considering the 0.95° beam width⁹ for the WSR-88D radar beam, the PAKC 0.527° tilt would have “seen” altitudes above the accident location of between about 150 and 250 feet. According to the National Weather Service (NWS), the accident location was within, or very close to, PAKC’s “cone of silence,” which is an area very close to and above the radar site that the radar’s antenna has difficulty “seeing.”¹⁰ Areas of light reflectivity¹¹ were seen in the region. A loop of PAKC radar imagery surrounding the time of the accident indicated that this light reflectivity appeared in the same location at various times (the reflectivity was “standing”).

⁷ These do not include pilot reports only broadcast via radio.

⁸ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁹ Here we define the angular width of the radar beam as the region of transmitted energy that is bounded by one-half the maximum power. The maximum power lies along the beam centerline and decreases outward from the radar antenna.

¹⁰ <https://www.weather.gov/media/ohx/PDF/Radar101.pdf>

¹¹

https://www.faa.gov/sites/faa.gov/files/other_visit/aviation_industry/airline_operators/airline_safety/in_FO07008.pdf

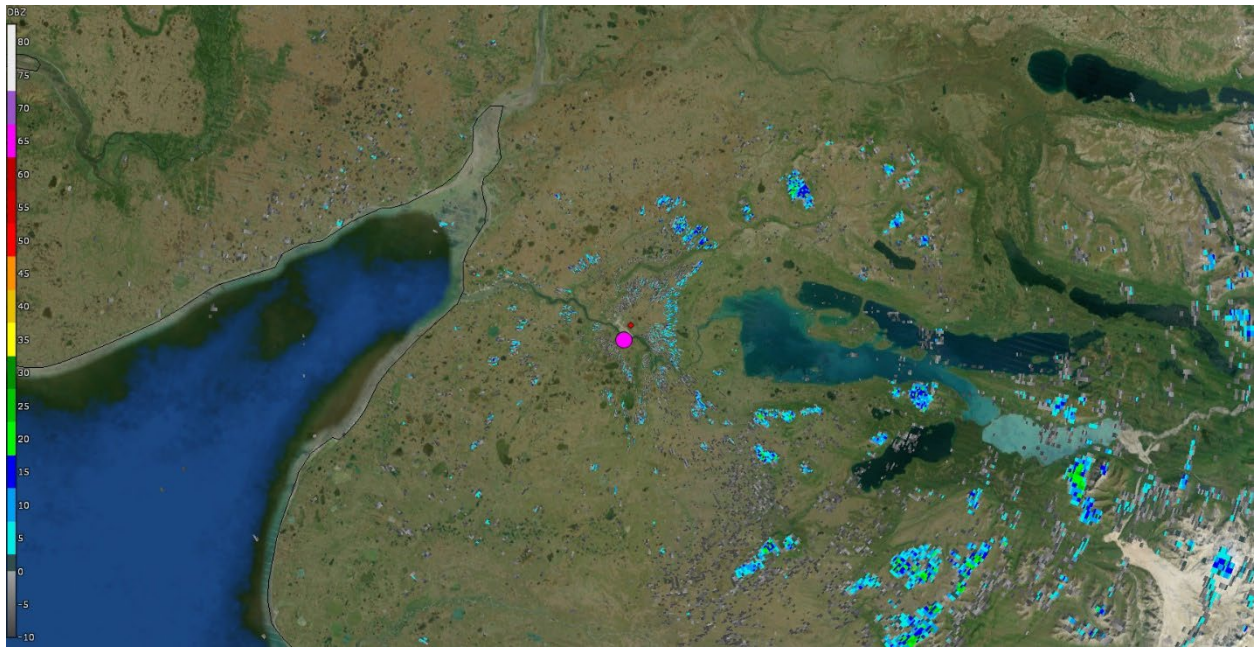


Figure 6 – PAKC 0.527° Level-II base reflectivity product from a sweep initiated at 0923:46. The accident location is denoted by the purple dot, and PAKC is denoted by the adjacent smaller red dot.

6.0 AIRMETS

Presented below are Airmen's Meteorological Information (AIRMET) advisories that were active for the accident location at the accident time below 10,000 feet. At 0400 an AIRMET SIERRA for occasional ceilings below 1,000 feet above ground level (agl), visibility below 3 statute miles in light and mist, and mist with conditions improving was issued by the NWS Alaska Aviation Weather Unit and was valid for an area that included the accident site until 1215.

WAAK48 PAWU 071200

WA80

ANCS WA 071215

AIRMET SIERRA FOR IFR AND MT OBSC VALID UNTIL 072015

BRISTOL BAY AH

S PATG-PAIG LN OCNL CIG BLW 010/VIS BLW 3SM -RA BR/BR. IMPR.

7.0 Area Forecast

An Area Forecast that forecasted for the region of the accident location ("Bristol Bay") was issued by the NWS Alaska Aviation Weather Unit (AAWU) at 0401. This Area Forecast included the AIRMET information, and for the area southwest of the "PATG-PAIG line" forecasted: scattered clouds at 400 feet, overcast clouds at 1,300 feet, stratus tops estimated at 3,000 feet, increasing cirrus above, visibility 3 statute miles in mist. Other information in the Area Forecast was not applicable to both the accident location and accident time below 10,000 feet.

FAAK58 PAWU 071201

FA8W

ANCC FA 071215

AK SRN HLF EXCP SE AK...

AIRMETS VALID UNTIL 072015

CB IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HEIGHTS NOTED BY AGL OR CIG.

BRISTOL BAY AH...VALID UNTIL 080000

...CLOUDS/WX...

*****AIRMET IFR***S PATG-PAIG LN OCNL CIG BLW 010/VIS BLW 3SM -RA
BR/BR. IMPR...**

AIRMET MT OBSCW PAIG MTS OCNL OBSC BY CLDS/PCPN. IMPR...

**SW PATG-PAIG LN SCT004 OVC013 ST TOP EST 030 INCRG CI ABV. VIS
3SM BR.**

ELSW FEW025 SCT070. OVR AHKLUN MTS OCNL BKN020.

AFT 18Z W PAEH SPRDG E SCT006 BKN015 OVC025 TOP FL350. VIS 3-5SM -
RA BR.

AFT 20Z W PAEH SFC WND INCRG S 20G30KT.

OTLK VALID 080000-080600...W PATG IFR CIG RA BR. ALG CST MVFR CIG.
ELSW VFR.

...TURB...

AIRMET TURBSW PAJZ-PALJ LN OCNL MOD TURB FL280-FL400.
WKN...

...ICE AND FZLVL...

AIRMET ICEAFT 18Z W PAEH OCNL MOD ICEIC 150-FL220. NC... FZLVL
080.

8.0 Area Forecast Discussion

The NWS Anchorage, Alaska, Weather Forecast Office issued the following Short Term Discussion and Short Term Forecast sections of an Area Forecast Discussion at 0506, which was applicable for a region that included the accident location.

FXAK68 PAFC 071306

AFDAFC

Southcentral and Southwest Alaska Forecast Discussion

National Weather Service Anchorage AK

506 AM AKDT Sat Sep 7 2024

.SHORT TERM FORECAST SOUTHCENTRAL ALASKA (Days 1 through 3)...

Discussion:

Scattered showers are starting to wind down across the Gulf as the quasi-stationary low starts to push eastwards in response to a ridge building over western Alaska this morning. Low stratus and fog have started to develop along the western Kenai Peninsula per nighttime microphysics RGB satellite imagery, especially in areas that received heavier rainfall from yesterday's convection. Expect the low stratus and fog to continue to spread along the Cook Inlet and into the lower Susitna Valley by mid-morning. Some areas could see stratus and fog linger into the afternoon as the ridge builds in, but most areas should be able to mix out later this morning.

A shortwave trough moving across the Northern Slope and its attendant front are starting to spark a round of showers this morning across the Tanana Valley and northern slopes of the Alaska Range where stronger forcing is positioned; however, there is a good chance that scattered showers may extend down into the northern Susitna Valley and the northern Talkeetna Mountains this morning...moving towards the northern Copper River Basin by this afternoon.

Another low up near Kamchatka will send its front sweeping eastwards across western Alaska today, and while this front will be quickly weakening as it approaches Southcentral...will see more widespread showers work over the Alaska Range into the Susitna Valley by Sunday morning. On the heels of that system, a quick moving disturbance (the extratropical remnants of former Tropical Storm Leepi) will move through near-zonal flow Sunday bringing another round of more widespread rainfall to portions of Southcentral. Models are struggling to handle this system, both in terms of the strength of the mid-level wave and the track of the system as it moves across the AKPen and ejects out into the Gulf. The NAM favors a more northerly track with rain spreading up the inlet and into the Mat-SU Valley. The GFS and GEM have the low further south with much of the heavier rainfall remaining confined to the Gulf coastal regions. The ECMWF is the farthest south solution and would keep the bulk of the precipitation over the Gulf.

- PP

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.SHORT TERM FORECAST SOUTHWEST ALASKA, THE BERING
SEA/ALEUTIANS
(Days 1 through 3)..

A front currently over the Pribilof Islands will move east today, pushing into a shortwave ridge currently over Southwest Alaska. This ridge, and mostly calm winds over the Mainland, have allowed more fog and low stratus to develop, but it's not quite as established as Friday. As the front moves east, it will bring light rain to the Kuskokwim Delta before the front really breaks down over Bristol Bay and the Interior. These areas will likely see some light rain, but little accumulation.

Quickly on the heels of today's front will be a quick moving shortwave embedded in a ~120kt zonal jet streak. Pockets of gales will surround the somewhat compact low. Rain will start out on the heavier side near Shemya tonight due to the tropical origins of the former tropical depression Leepi, but expect intensity to lessen as it moves east and cooler air is slowly entrained into the system. The center of the low is expected to be over/near the Alaska Peninsula late Sunday night and into Monday morning, but the north/south positioning amongst the guidance is still 50 to 100 miles apart. This forecast package represents a position close to the ensemble mean and the GFS track.

-CJ

9.0 SIGMETs

There were no Significant Meteorological Information (SIGMET) advisories active for the accident region at the accident time.

10.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the Center Weather Service Unit (CWSU) at the Anchorage Air Route Traffic Control Center that were applicable for the accident flight.

11.0 AAWU Graphic Products

Aviation-related graphic products issued by the AAWU applicable to the accident time are presented in Figures 7-10. The graphics forecasted IFR¹² conditions and fog over the accident area. No icing or low-level turbulence of moderate severity or greater was forecasted over the accident region.

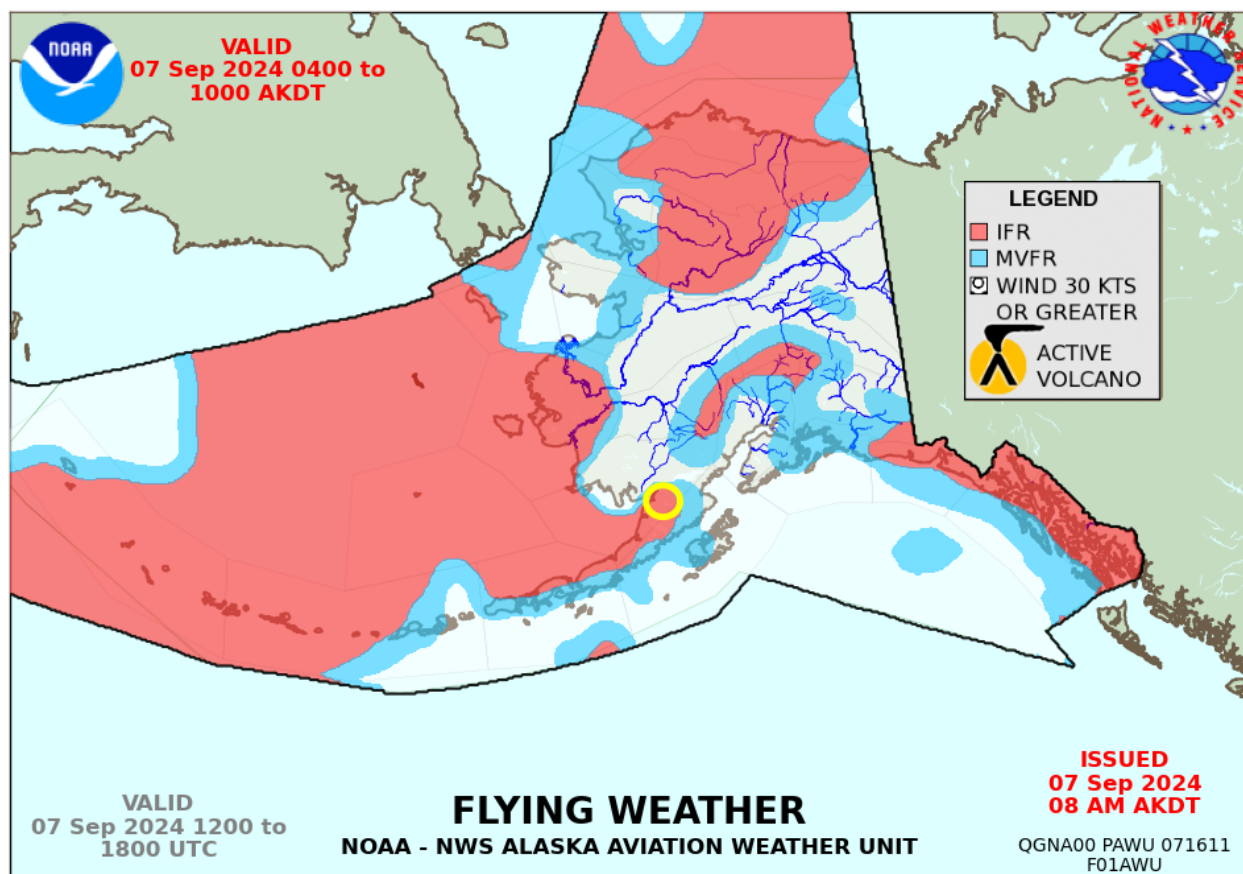


Figure 7 - Flying Weather graphic issued at 0800 and valid until 1000. The accident location is within the yellow circle.

¹² Instrument Flight Rules (IFR) - IFR means a ceiling less than 1,000 feet agl and/or visibility less than 3 statute miles.

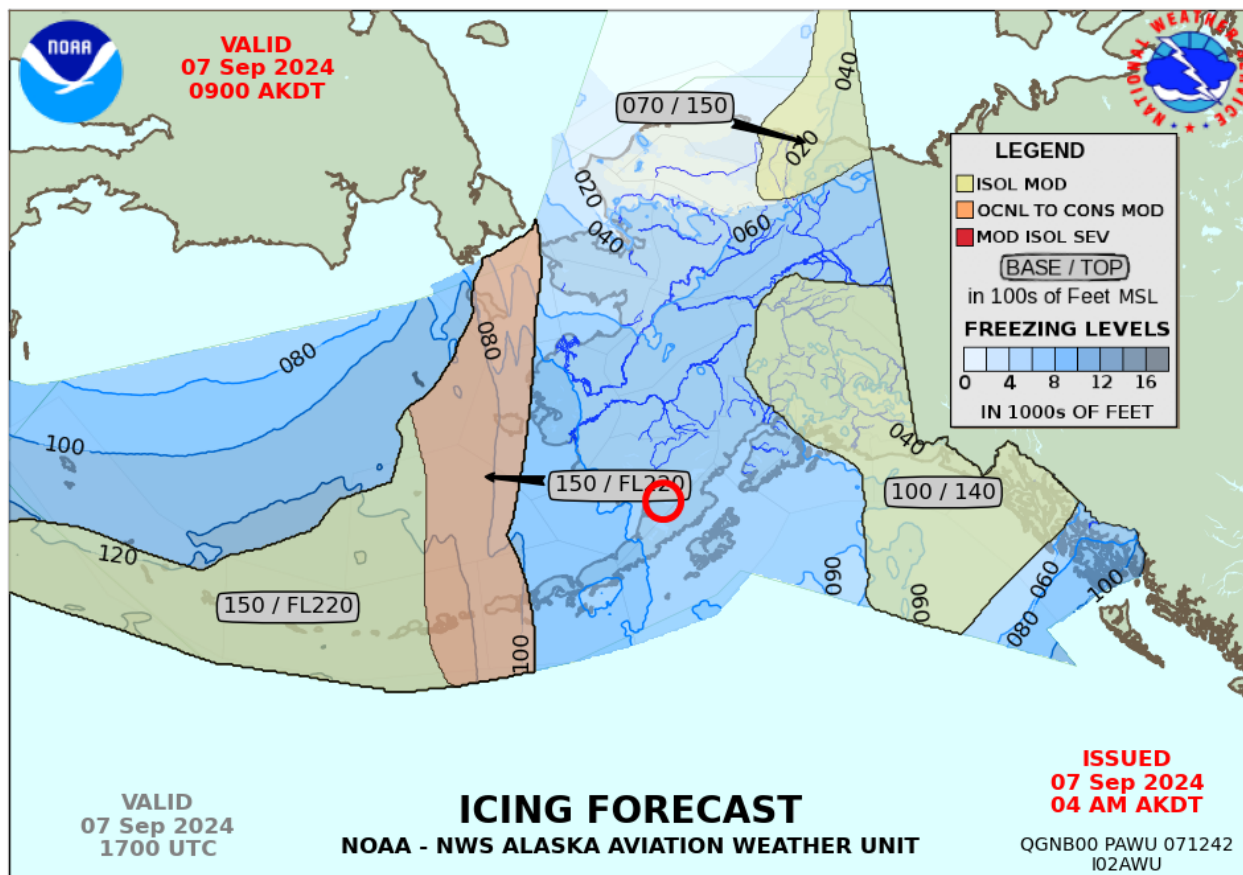


Figure 8 - Icing Forecast graphic issued at 0400 and valid for 0900. The accident location is within the red circle.

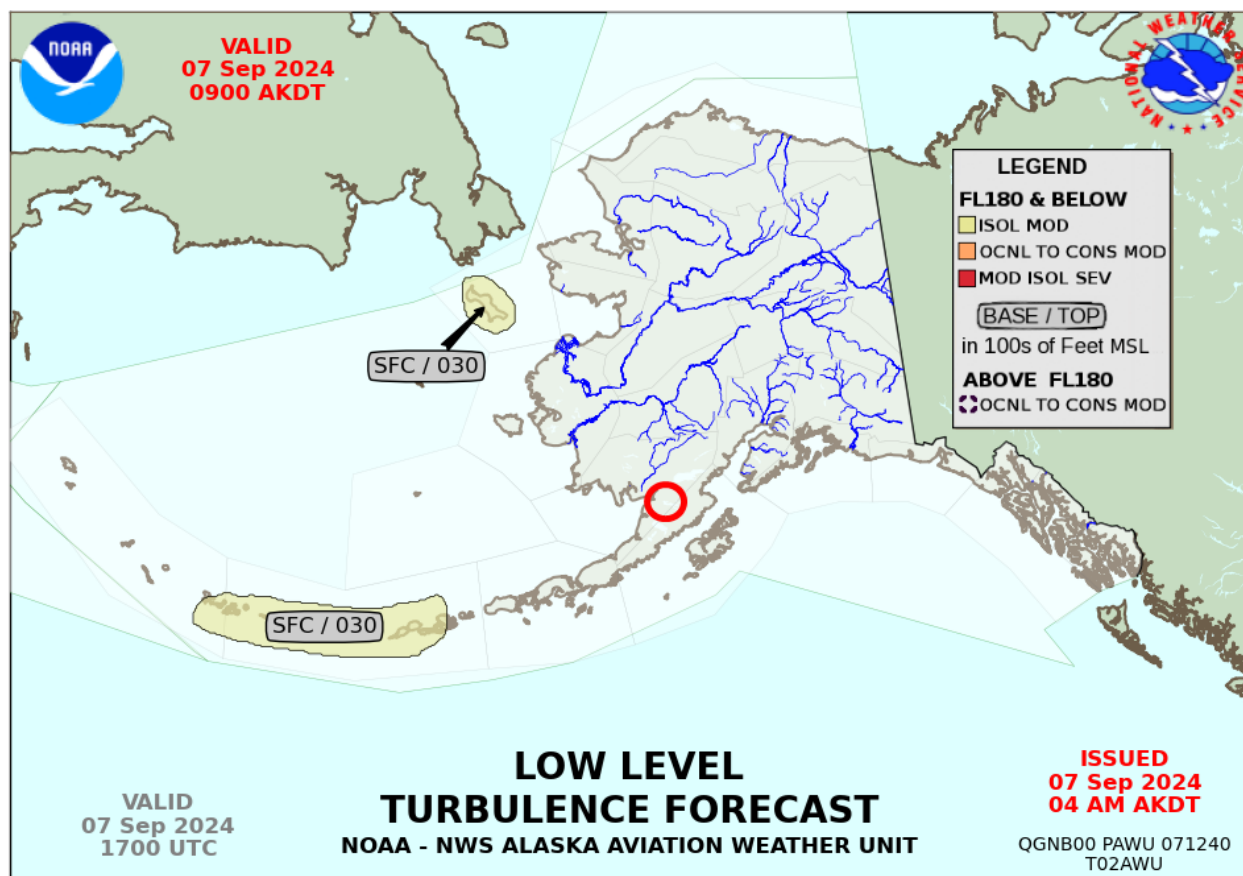


Figure 9 - Low Level Turbulence Forecast graphic issued at 0400 and valid for 0900. The accident location is within the red circle.

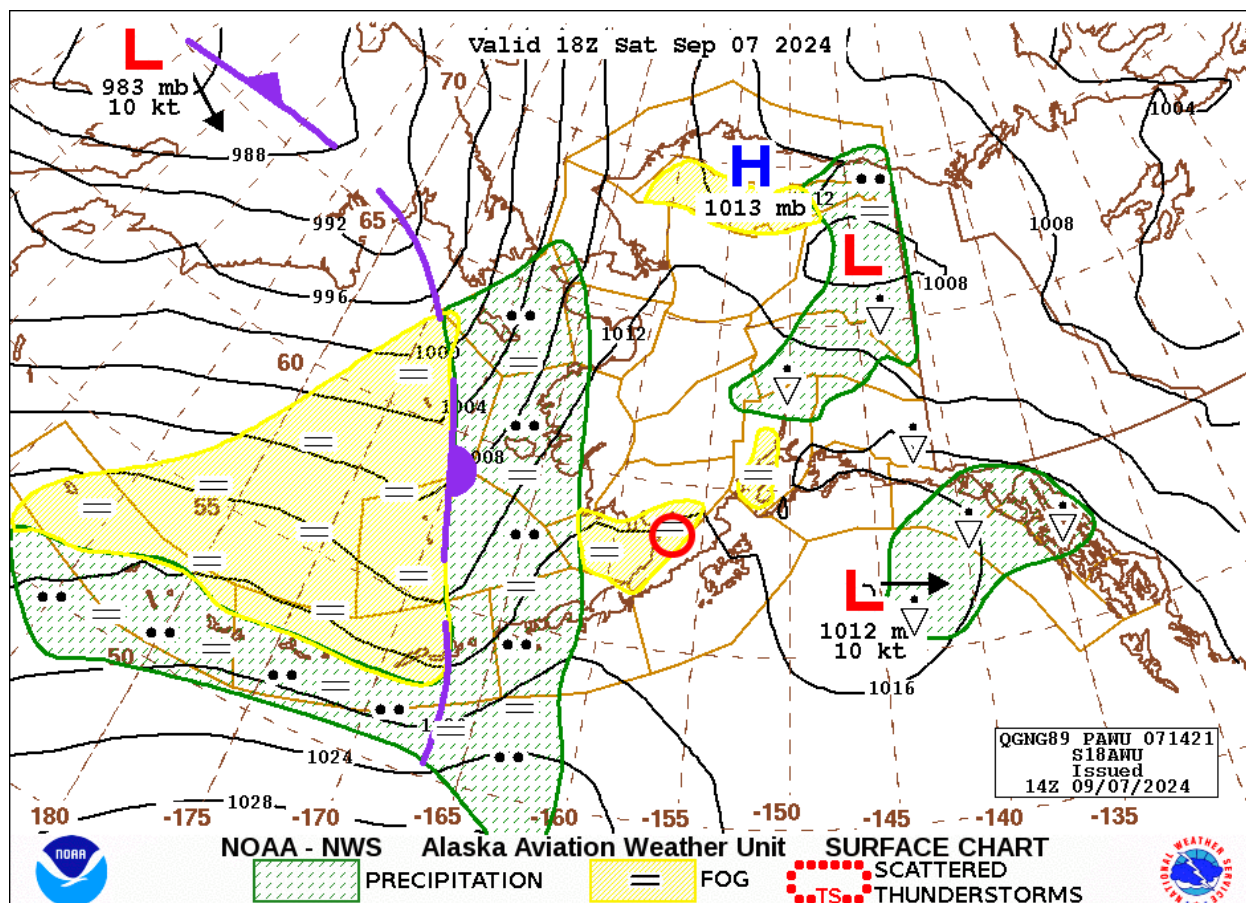


Figure 10 – Surface forecast chart issued at 0600 on and valid for 1000. The accident location is within the red circle.

12.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) are intended to provide the necessary aviation weather information to give users a complete picture of the weather that might impact flight in the continental United States. The GFAs are available through the Aviation Weather Center's (AWC) website and provide hourly analyses and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS. The following information was retrieved from the AWC's GFA archive. Figures 11-18 present the GFA ceiling, cloud base, cloud top and visibility 00-hour and 01-hour forecasts valid for near the accident time.

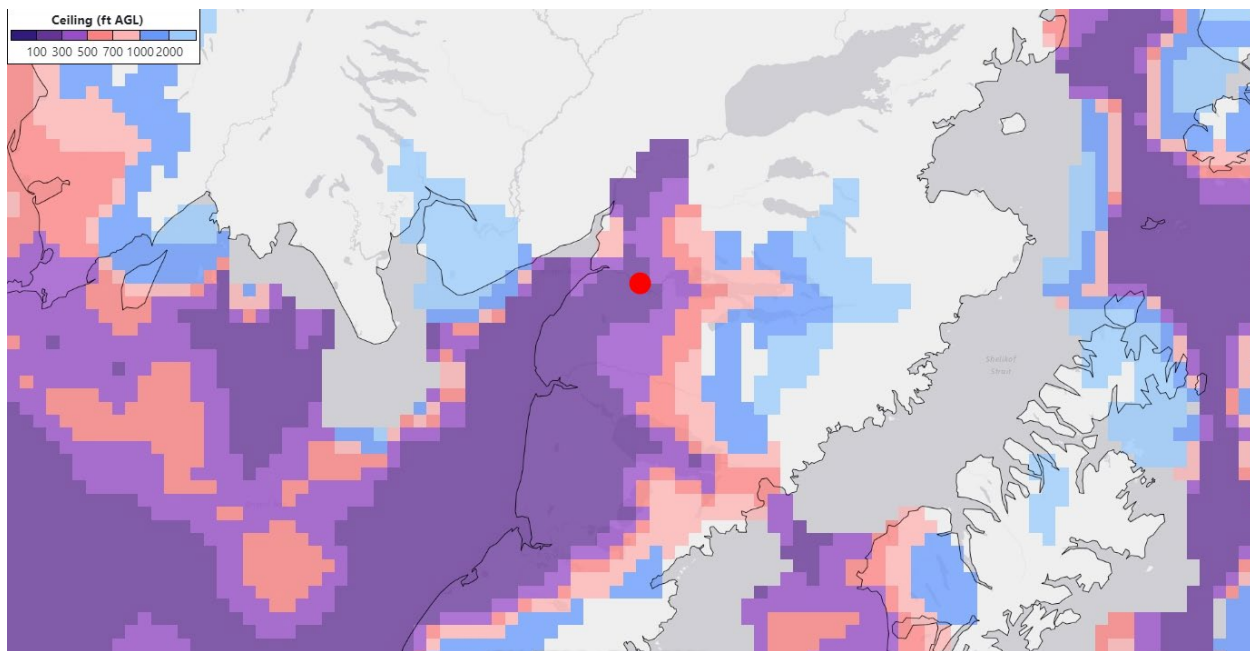


Figure 11 - GFA ceiling 00-hour forecast valid for 0930. The accident location is denoted by the red dot.

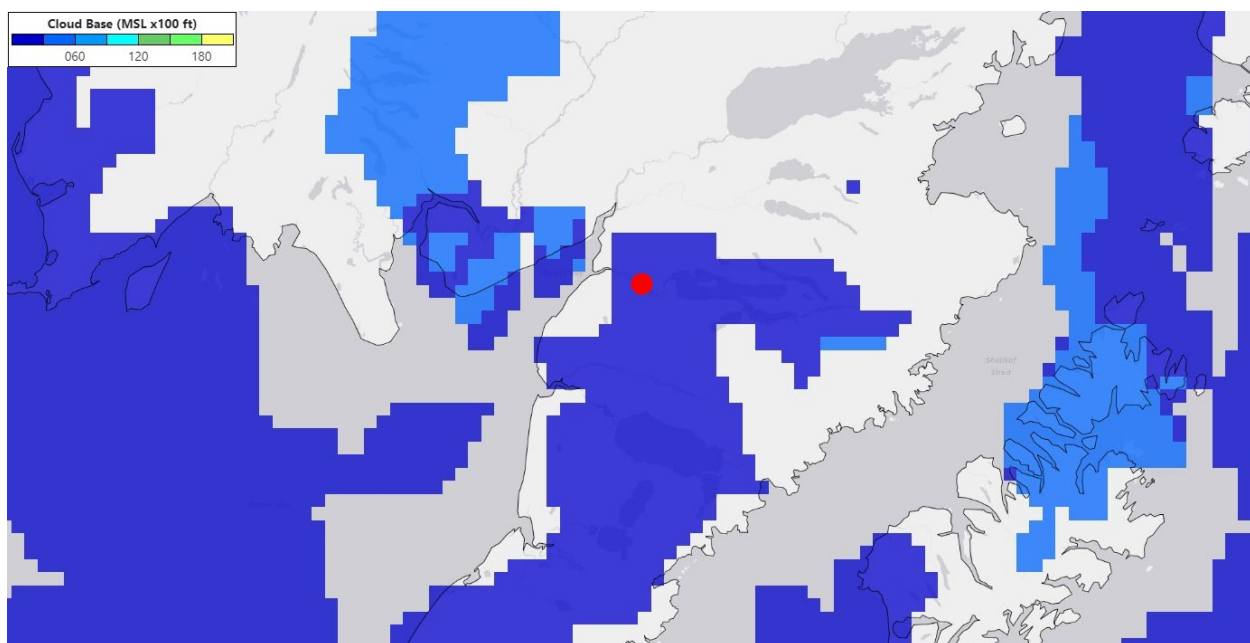


Figure 12 - GFA cloud base 00-hour forecast valid for 0930. The accident location is denoted by the red dot.

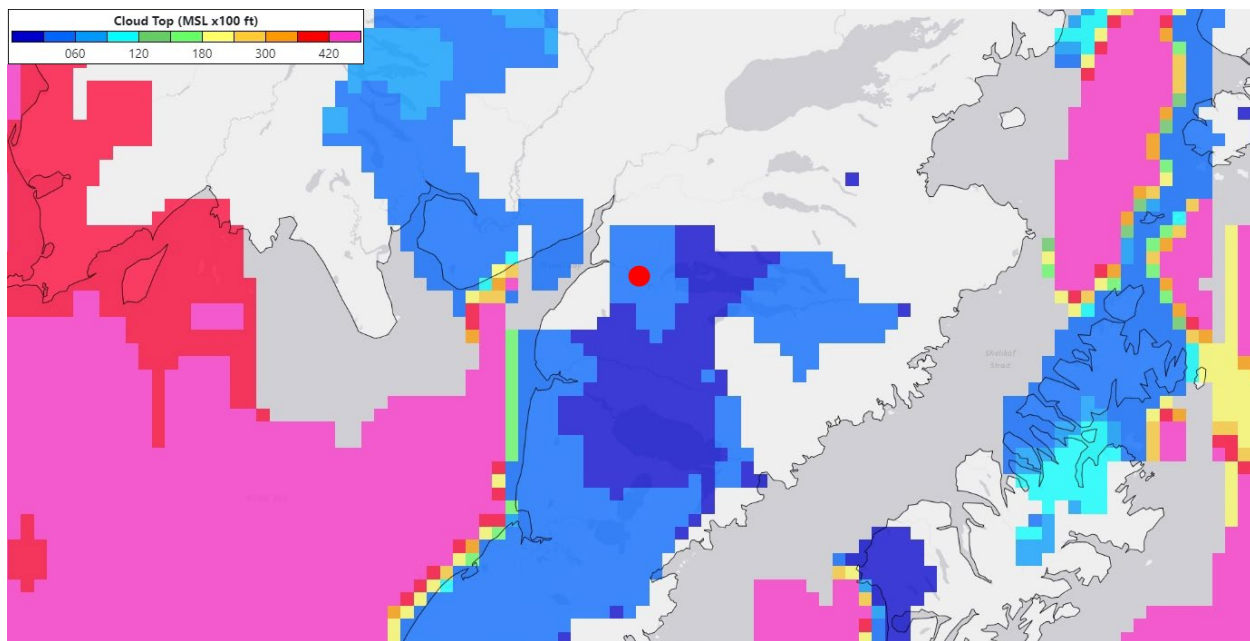


Figure 13 - GFA cloud top 00-hour forecast valid for 0930. The accident location is denoted by the red dot.

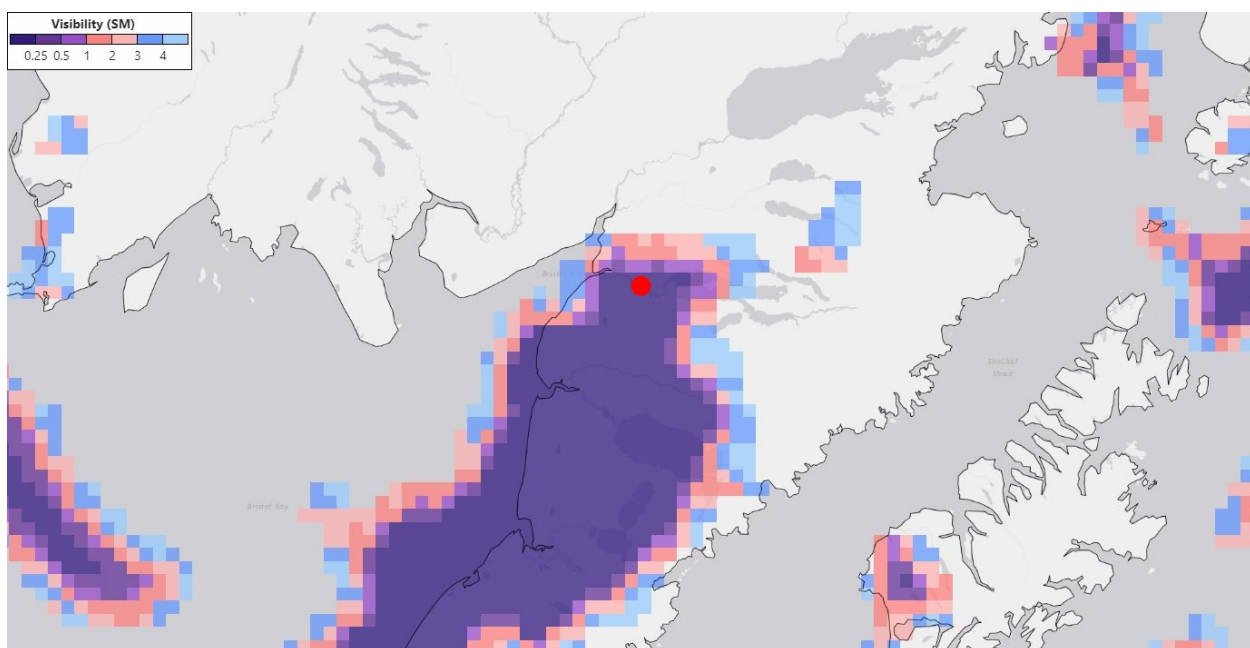


Figure 14 - GFA visibility 00-hour forecast valid for 0930. The accident location is denoted by the red dot.

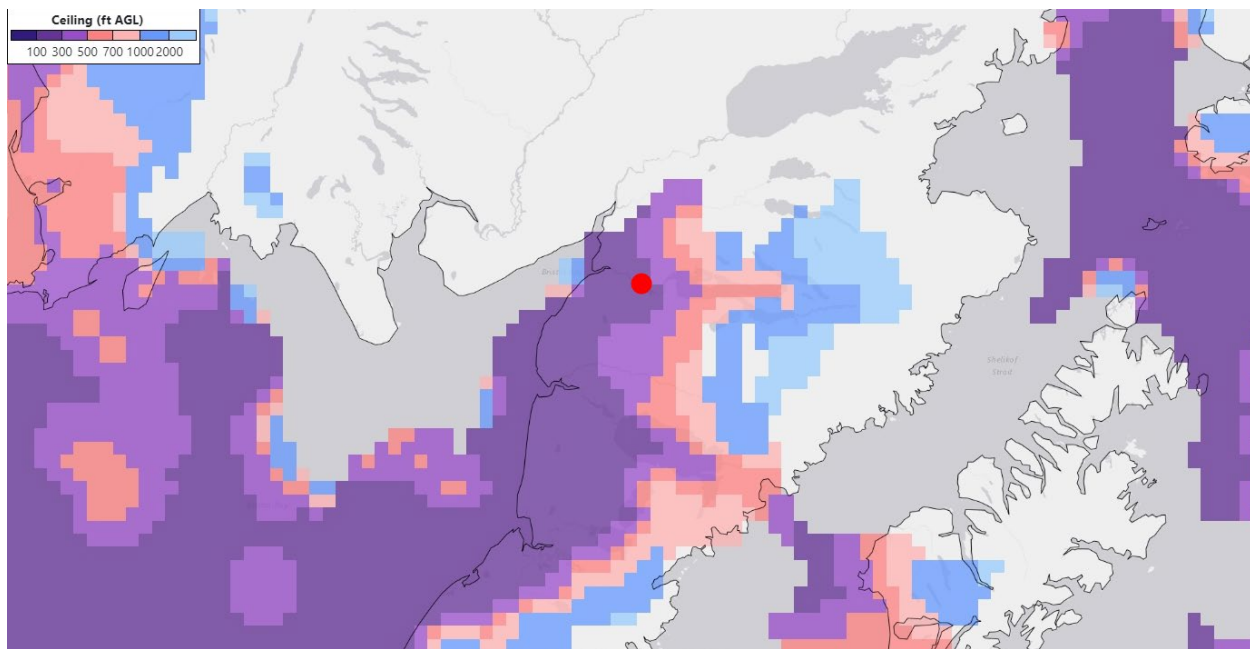


Figure 15 - GFA ceiling 01-hour forecast valid for 0900. The accident location is denoted by the red dot.

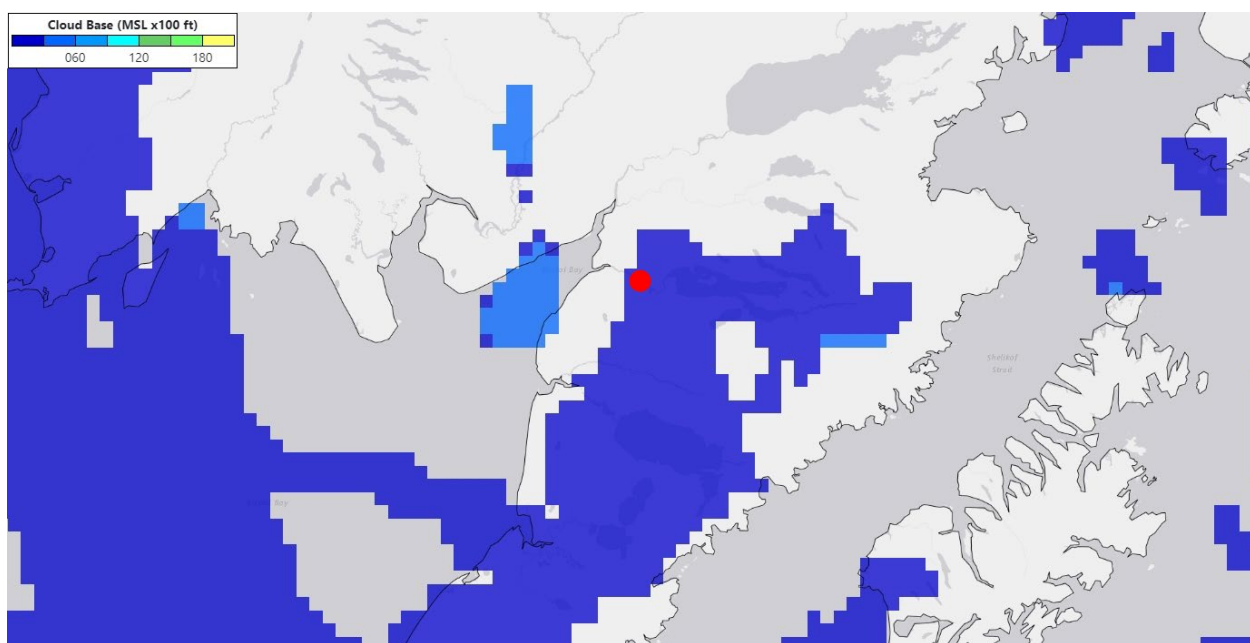


Figure 16 - GFA cloud base 01-hour forecast valid for 0900. The accident location is denoted by the red dot.

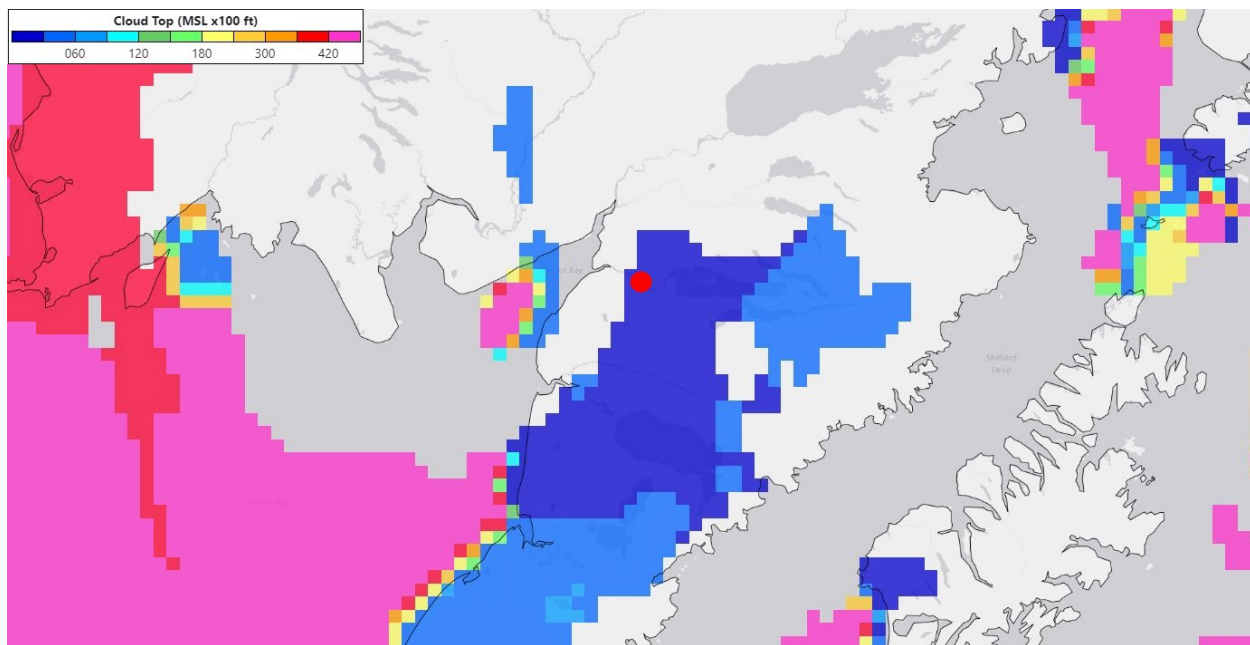


Figure 17 - GFA cloud top 01-hour forecast valid for 0900. The accident location is denoted by the red dot.

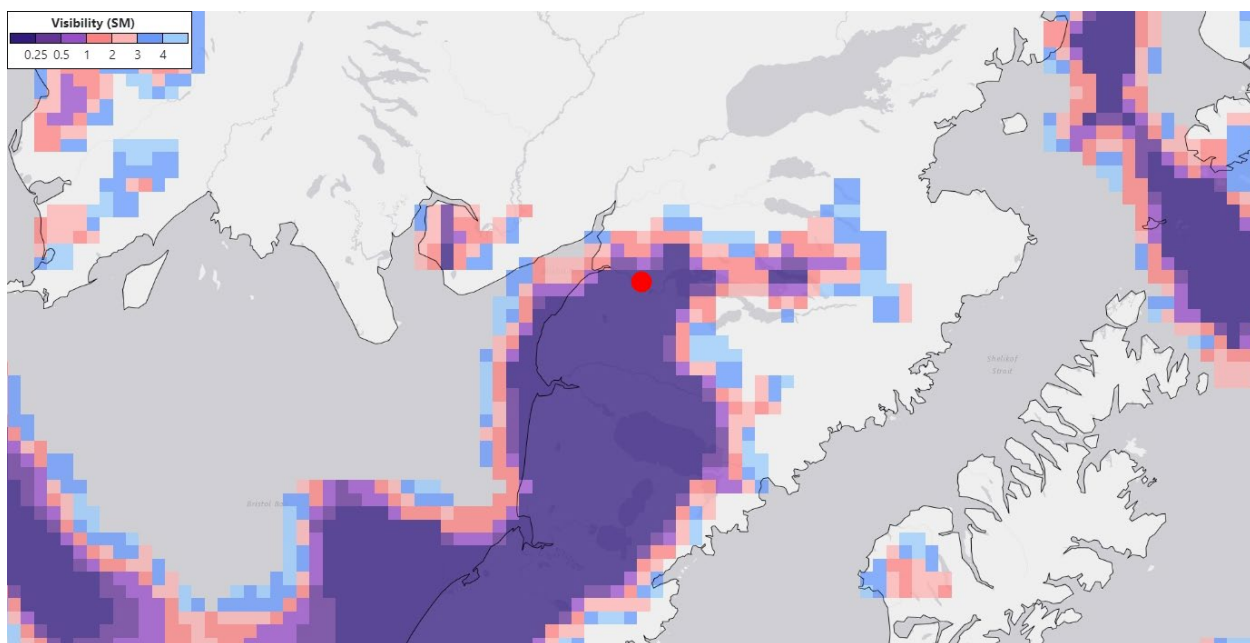


Figure 18 - GFA visibility 01-hour forecast valid for 0900. The accident location is denoted by the red dot.

13.0 Weather Cameras

Imagery from the Federal Aviation Administration (FAA) weather cameras located at PAKN for times surrounding the accident time can be found in Attachment 1.



Figure 19 - Image from the south-facing FAA weather camera at PAKN taken at 0924.

E. LIST OF ATTACHMENTS

Attachment 1 - Images from the King Salmon FAA weather cameras for times surrounding the accident time on the accident day.

Submitted by:

Mike Richards
Senior Meteorologist