



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

May 23, 2018

Weather Study

METEOROLOGY

ANC18LA031

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A. ACCIDENT

Location: Atkasuk, Alaska
Date: April 11, 2018
Time: 0818 Alaska daylight time (1618 UTC¹)
Airplane: Cessna 208B; N814GV

B. METEOROLOGIST

Mike Richards
Senior Meteorologist
Operational Factors Division (AS-30)
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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 Alaska daylight time (AKDT) for April 11, 2018 (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) unless otherwise noted.

Coordinates used for the accident location: 70.489722° north latitude, 157.504722° west longitude, at an elevation of about 75 feet.

D. WEATHER INFORMATION

1.0 Synoptic Conditions

The National Weather Service (NWS) Surface Analysis Chart for 0700 AKDT is presented in figure 1. The surface analysis chart identified a 999 hectopascals (hPa) low pressure center to the east of the accident site along the north Alaskan coast. A stationary front stretched west from this low pressure center along the northern edge of the Brooks Range. A coastal station model north of the accident site depicted clear skies and a 10-knot north wind, however other nearby coastal station models depicted overcast skies with a calm wind. Temperatures in area of the accident were between 6 and 10 degrees Fahrenheit (°F), with dewpoint depressions of 4°F and 3°F.

¹ UTC – abbreviation for Coordinated Universal Time
MET WEATHER STUDY

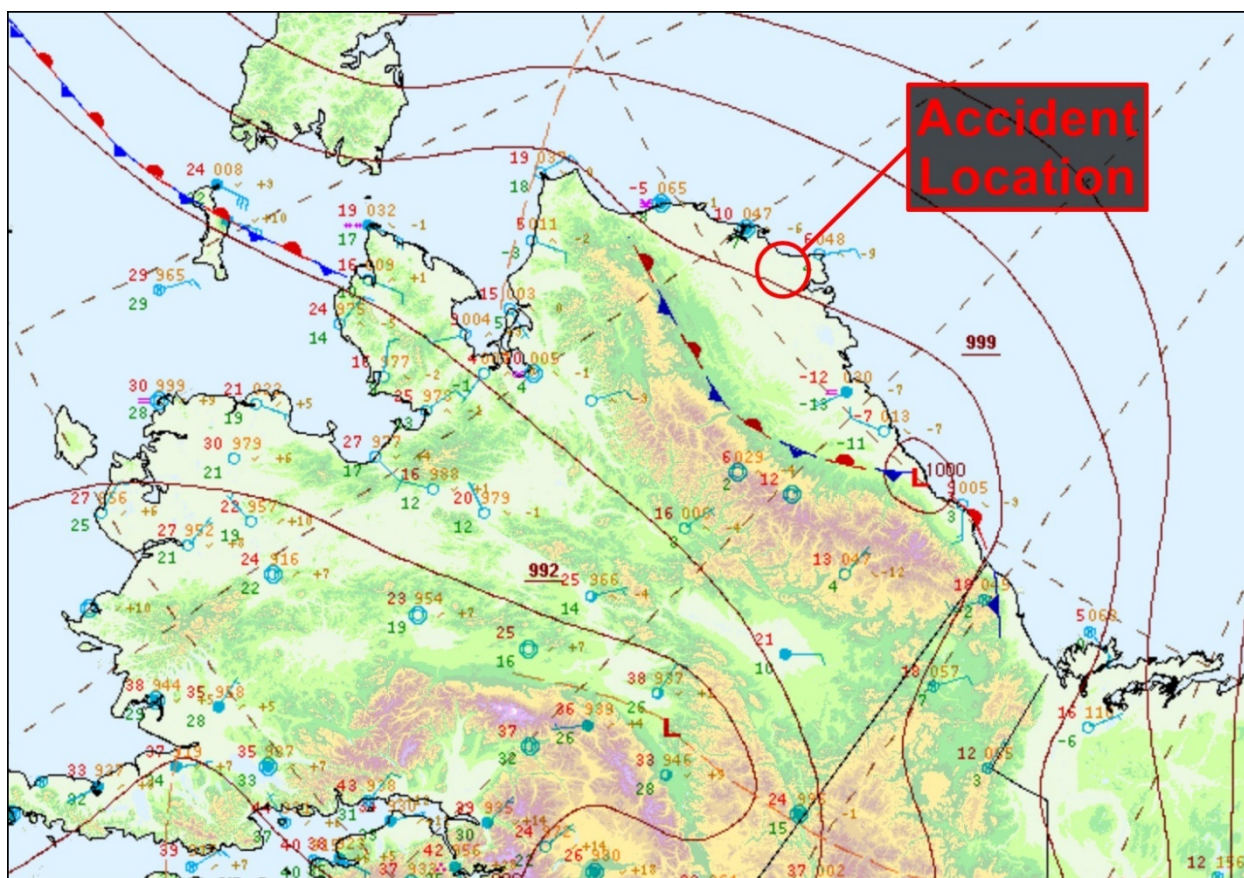


Figure 1 - NWS Surface Analysis Chart for 0700 AKDT.

2.0 Surface Observations

An Automated Weather Observing System (AWOS) was located at Atkasuk Edward Burnell Sr. Memorial Airport (PATQ) in Atkasuk, Alaska, and was located about 2 miles southeast of the accident location at an elevation of about 100 feet. Raw automated one-minute observations from PATQ during the times surrounding the accident time were provided by the Federal Aviation Administration (FAA) and are presented below. Attachment 1 presents the raw PATQ one-minute observations between 0400 AKDT and 1500 AKDT. Sky condition was missing from all documented PATQ one-minute observations (see further information later in this section).

- [0808 AKDT] PATQ 111608Z AUTO 34004KT 1 1/4SM -SN BR M19/M21 A2965 350 87 -3800 320/04 RMK AO2 VIS 3/4V3 P0000 FZRANO TSNO \$
- [0809 AKDT] PATQ 111609Z AUTO 34004KT 1 1/4SM -SN BR M19/M21 A2965 350 87 -3800 320/04 RMK AO2 VIS 1/2V3 P0000 FZRANO TSNO \$
- [0810 AKDT] PATQ 111610Z AUTO 34004KT 1SM -SN BR M19/M21 A2965 350 87 -3800 320/0 RMK AO2 VIS 1/2V2 1/2 P0000 FZRANO TSNO \$

[0811 AKDT] PATQ 111611Z AUTO 34004KT 1SM -SN BR M19/M21 A2965 350 87
-3800 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0812 AKDT] PATQ 111612Z AUTO 34004KT 1SM -SN BR M19/M21 A2965 350 87
-3800 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0813 AKDT] PATQ 111613Z AUTO 34004KT 1SM -SN BR M19/M21 A2965 350 87
-3800 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0814 AKDT] PATQ 111614Z AUTO 34004KT 3/4SM -SN BR M19/M21 A2964 350 87
-3800 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0815 AKDT] PATQ 111615Z AUTO 33004KT 3/4SM -SN BR M19/M21 A2964 350 87
-3800 310/0 RMK AO2 P0000 FZRANO TSNO \$

[0816 AKDT] PATQ 111616Z AUTO 33004KT 3/4SM -SN BR M19/M21 A2964 350 87
-3800 310/0 RMK AO2 P0000 FZRANO TSNO \$

[0817 AKDT] PATQ 111617Z AUTO 33004KT 3/4SM -SN BR M19/M21 A2964 350 87
-3800 310/0 RMK AO2 P0000 FZRANO TSNO \$

**[0818 AKDT] PATQ 111618Z AUTO 34004KT 3/4SM -SN BR M19/M21 A2964 350
87 -3800 320/0 RMK AO2 P0000 FZRANO TSNO \$**

[0819 AKDT] PATQ 111619Z AUTO 34003KT 3/4SM -SN BR M18/M21 A2964 350 83
-3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0820 AKDT] PATQ 111620Z AUTO 34003KT 3/4SM -SN BR M18/M21 A2964 350 83
-3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0821 AKDT] PATQ 111621Z AUTO 34003KT 3/4SM -SN BR M18/M21 A2964 350 83
-3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0822 AKDT] PATQ 111622Z AUTO 34003KT 3/4SM -SN BR M18/M21 A2964 350 83
-3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0823 AKDT] PATQ 111623Z AUTO 34003KT 1/2SM -SN FZFG M18/M21 A2964 350
83 -3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0824 AKDT] PATQ 111624Z AUTO 34004KT 1/2SM -SN FZFG M18/M21 A2964 350
83 -3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0825 AKDT] PATQ 111625Z AUTO 34004KT 1/2SM -SN FZFG M18/M20 A2964 350
87 -3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0826 AKDT] PATQ 111626Z AUTO 34003KT 1/2SM -SN FZFG M18/M20 A2964 350
87 -3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0827 AKDT] PATQ 111627Z AUTO 34003KT 1/2SM -SN FZFG M18/M20 A2964 350
87 -3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

[0828 AKDT] PATQ 111628Z AUTO 34003KT 1/4SM -SN FZFG M18/M20 A2964 350
87 -3700 320/0 RMK AO2 P0000 FZRANO TSNO \$

At 0818 AKDT, PATQ reported a wind from 340° at 4 knots, 3/4 mile visibility, light snow, mist, temperature -19° Celsius (C) and dew point temperature -21°C, altimeter setting of 29.64 inches of mercury, pressure altitude 350 feet, relative humidity 87 percent, density altitude -3,800 feet; remarks: station with a precipitation discriminator, trace precipitation since last hourly observation, freezing rain information not available, thunderstorm information not available, maintenance needed on the system.

According to the FAA (see Attachment 2), the local Atqasuk “Service A” was inoperative during the days leading up to and including the accident day, which affected long-line dissemination² of the PATQ AWOS observations and the Atqasuk FAA weather camera imagery. This issue was first noted by the FAA on March 19, 2018. The FAA indicated that both VHF and telephone transmissions from the PATQ AWOS had been “serviceable.” Review of historical PATQ weather observations revealed that the last observation disseminated longline to the public prior to the accident occurred at 1040 AKDT on March 18, 2018.

The following Notice to Airmen (NOTAM), which advised of the PATQ AWOS ceilometer being out of service, was active between April 3, 2018, and April 21, 2018. This issue was first noted by the FAA on December 26, 2017. According to the FAA, there were no requirements to issue NOTAMs for Service A or FAA weather camera outages. Review of historical PATQ weather observations revealed that the last sky condition observation disseminated longline to the public (including via MADISHF³) prior to the accident occurred at 2145 AKDT on December 25, 2017.

!ATK 04/001 ATK SVC AUTOMATED WX BCST SYSTEM CEILING OUT OF
SERVICE 1804030615-1804211400EST

An Automated Surface Observing System (ASOS) was located at Wiley Post-Will Rogers Memorial Airport (PABR) in Utqiagvik, Alaska, and was located about 50 miles north-northeast of the accident location at an elevation of about 50 feet. Automated observations from PABR during the times surrounding the accident time are presented here.

[0653 AKDT] METAR PABR 111453Z 03009KT 10SM CLR M14/M16 A2967 RMK
AO2 SLP048 I3000 T11441156 58009 \$=

**[0753 AKDT] METAR PABR 111553Z 03009KT 9SM CLR M14/M16 A2966 RMK
AO2 SLP045 T11441161 \$=**

[0853 AKDT] METAR PABR 111653Z 03010KT 10SM CLR M14/M16 A2965 RMK
AO2 SLP043 T11441161 \$=

² “Long-line dissemination” refers to the dissemination of weather observations beyond the station (to the general public), but in this context does not include broadcast of weather observations from the station by radio, or the *availability* of weather observations by phone line.

³ MADISHF – High-frequency observations made available by NOAA’s Meteorological Assimilation Data Ingest System (MADIS)

At 0753 AKDT, PABR reported a wind from 030° at 9 knots, visibility 9 statute miles, sky clear under 12,000 feet, temperature -14°C and dew point temperature -16°C, altimeter setting of 29.66 inches of mercury; remarks included: station with a precipitation discriminator, maintenance needed on the system.

An ASOS was located at Wainwright Airport (PAWI) in Wainwright, Alaska, and was located about 51 miles west of the accident location at an elevation of about 45 feet. Automated observations from PAWI during the times surrounding the accident time are presented here.

[0707 AKDT] SPECI PAWI 111507Z AUTO 00000KT 10SM OVC003 M12/M14 A2967
RMK AO2 T11221139 TSNO=

**[0753 AKDT] METAR PAWI 111553Z AUTO 02005KT 6SM BR OVC002 M10/M12
A2966 RMK AO2 SLP045 T11001117 TSNO=**

[0849 AKDT] SPECI PAWI 111649Z AUTO 02005KT 9SM OVC004 M09/M11 A2965
RMK AO2 TSNO=

[0853 AKDT] METAR PAWI 111653Z AUTO 02006KT 9SM OVC004 M09/M11
A2965 RMK AO2 SLP042 T10941111 TSNO=

At 0753 AKDT, PAWI reported a wind from 020° at 5 knots, visibility 6 statute miles, mist, ceiling overcast at 200 feet above ground level (agl), temperature -10°C and dew point temperature -12°C, altimeter setting of 29.66 inches of mercury; remarks included: station with a precipitation discriminator, thunderstorm information not available.

3.0 Pilot Reports

There was one publicly-disseminated pilot report (PIREP)⁴ made within 100 miles and two hours of the accident time. At 1003 AKDT, a Bell 412 helicopter at an unknown altitude, 10 miles north of PATQ, reported a forward visibility of 0 miles and freezing fog with a remark that the forward visibility was 1/4 statute miles.

BRW UA /OV ATK360010 /TM 1803 /FLUNKN /TP B412 /WX FV00SM FZFG /RM
FV 1/4SM=

⁴ Only pilot reports with the WMO header UBAK** were considered. Pilot reports publicly-disseminated only over radio were not captured.

4.0 Upper Air Data

A Global Data Assimilation System (GDAS) model sounding (figure 2) for the accident location at 0700 AKDT was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory. The wind near the surface was from the northeast at about 5 knots. Above this level the wind remained from the northeast and steadily increased in magnitude to 25 knots near 9,000 feet. The relative humidity was greater than 90 percent below about 1,100 feet and calculations made by the Rawinsonde OBservation Program (RAOB) identified the potential for ice fog below about 900 feet. The potential for light and moderate intensities of rime icing were identified in this layer. ROAB did not yield any significant areas of non-convective turbulence for this atmosphere below 500 hPa (about 17,500 feet).

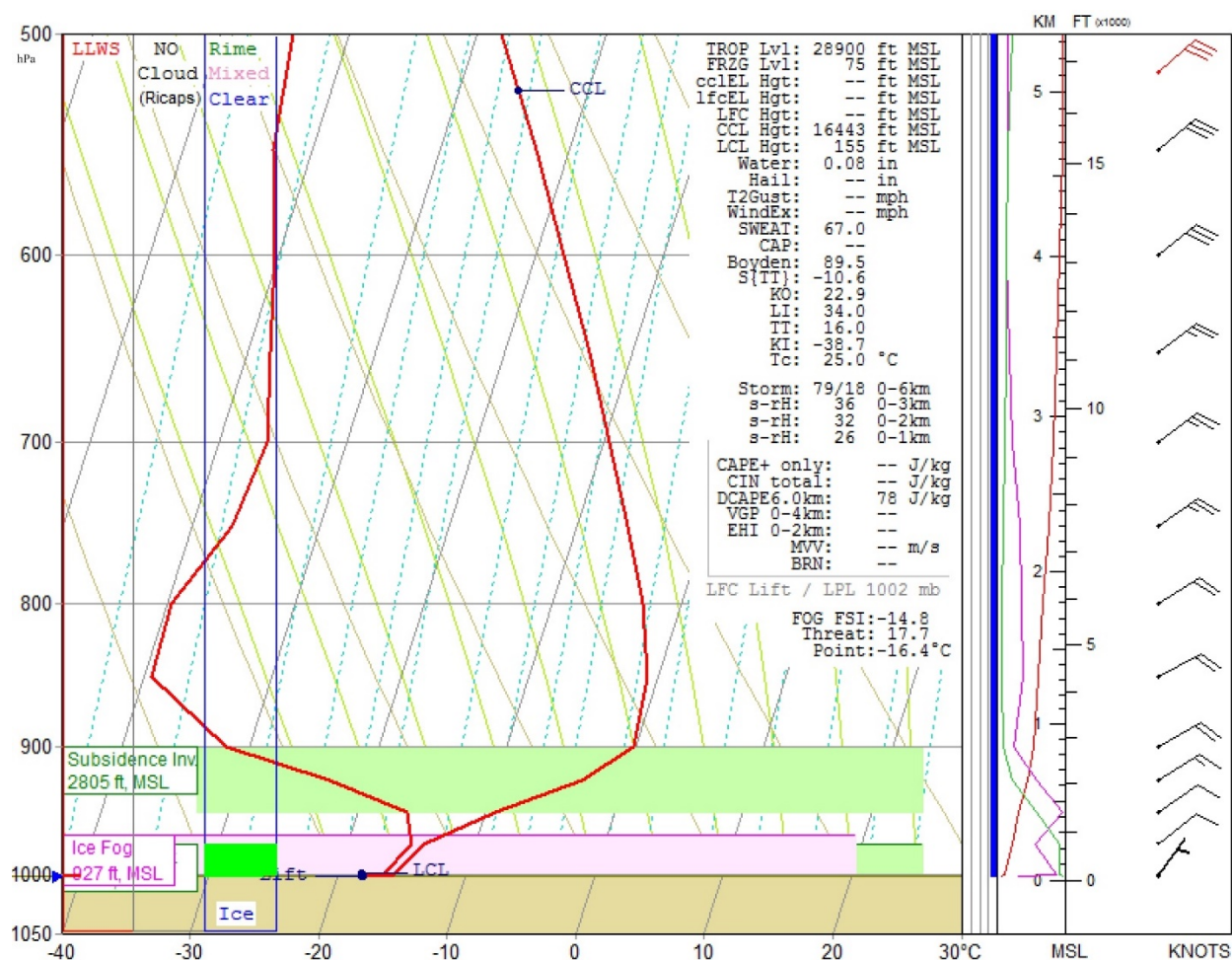


Figure 2 – GDAS model sounding data in SkewT/LogP format for 0700 AKDT at the accident site, surface to 500 hPa.

5.0 Satellite Imagery

Advanced Very-High-Resolution Radiometer (AVHRR) near-infrared ($1.6\mu\text{m}$) and infrared ($10.8\mu\text{m}$) data from the NOAA-19 low earth orbiting platform were obtained from the NOAA. Imagery from the morning of the accident are presented in figures 3-5. The $1.6\mu\text{m}$ data is very good at discriminating between snow and cloud. Imagery of the $1.6\mu\text{m}$ data (figures 3 and 4) depict cloudy conditions close to or over the accident location at 0715 AKDT and covering the accident region at 0856 AKDT. The 0856 AKDT image, retrieved about 40 minutes after the accident, indicated the cloud boundary was about halfway between PABR and the accident site. The $10.8\mu\text{m}$ image from 0856 AKDT (figure 5) retrieved brightness temperatures over the accident area of -14°C . When considering the GDAS sounding, due to a large temperature inversion near the ground, -14°C corresponded to heights of both about 700 feet and about 11,500 feet. Based on the GDAS model sounding's moisture profile for the accident location, the estimation of about 700 feet is appropriate and the estimation of about 11,500 feet is disregarded.

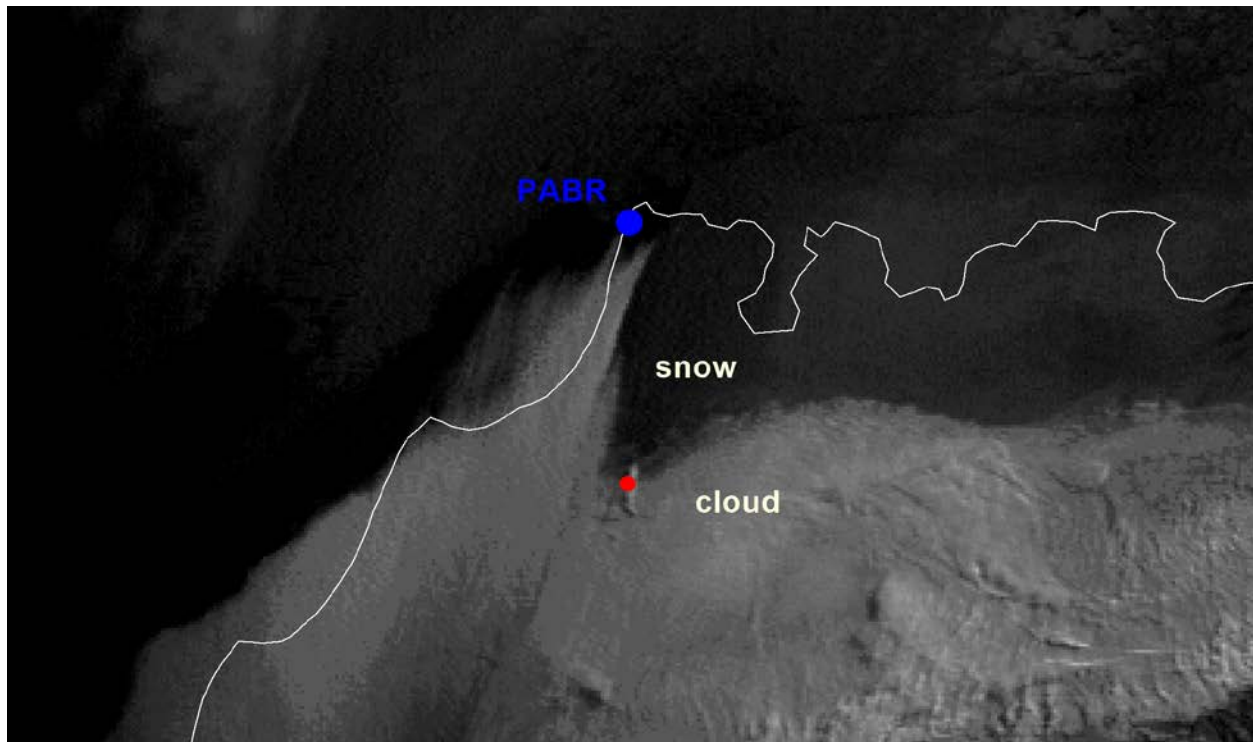


Figure 3 – AVHRR near-infrared ($1.6\mu\text{m}$) imagery from 0715 AKDT. Accident location denoted by red circle. Image has been contrast-enhanced.

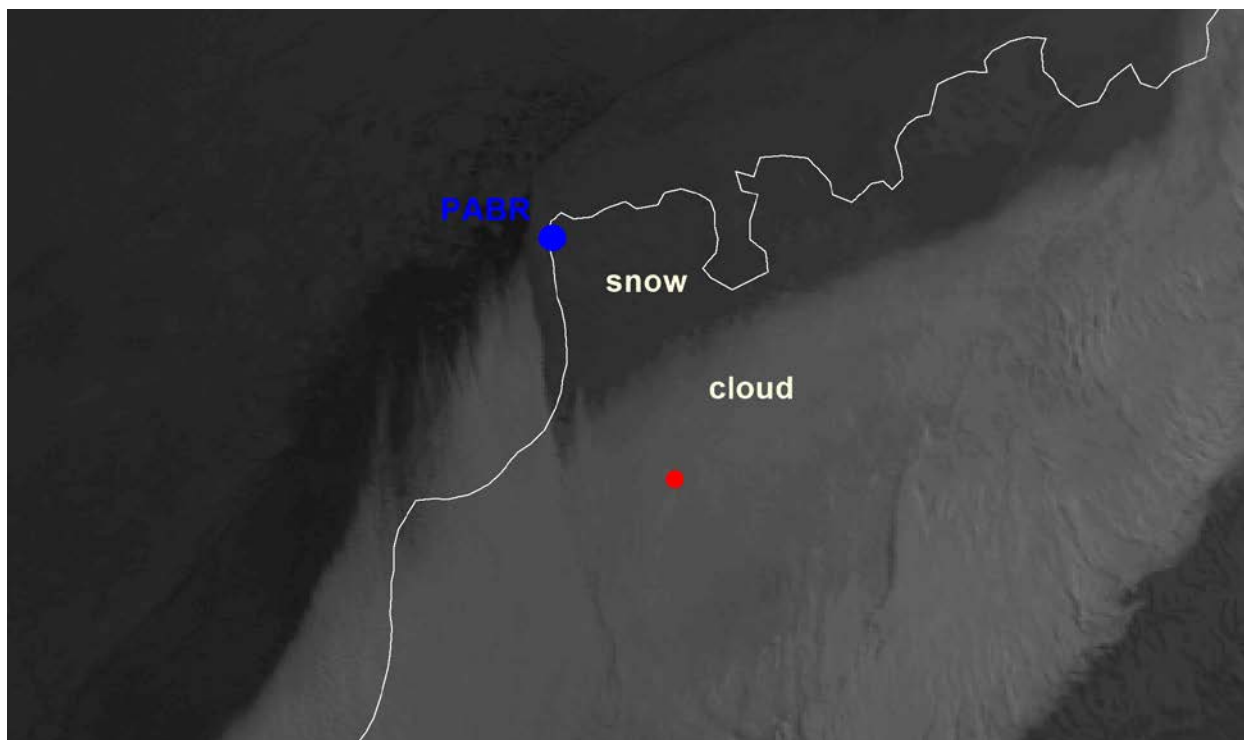


Figure 4 – AVHRR near-infrared (1.6μm) imagery from 0856 AKDT. Accident location denoted by red circle.

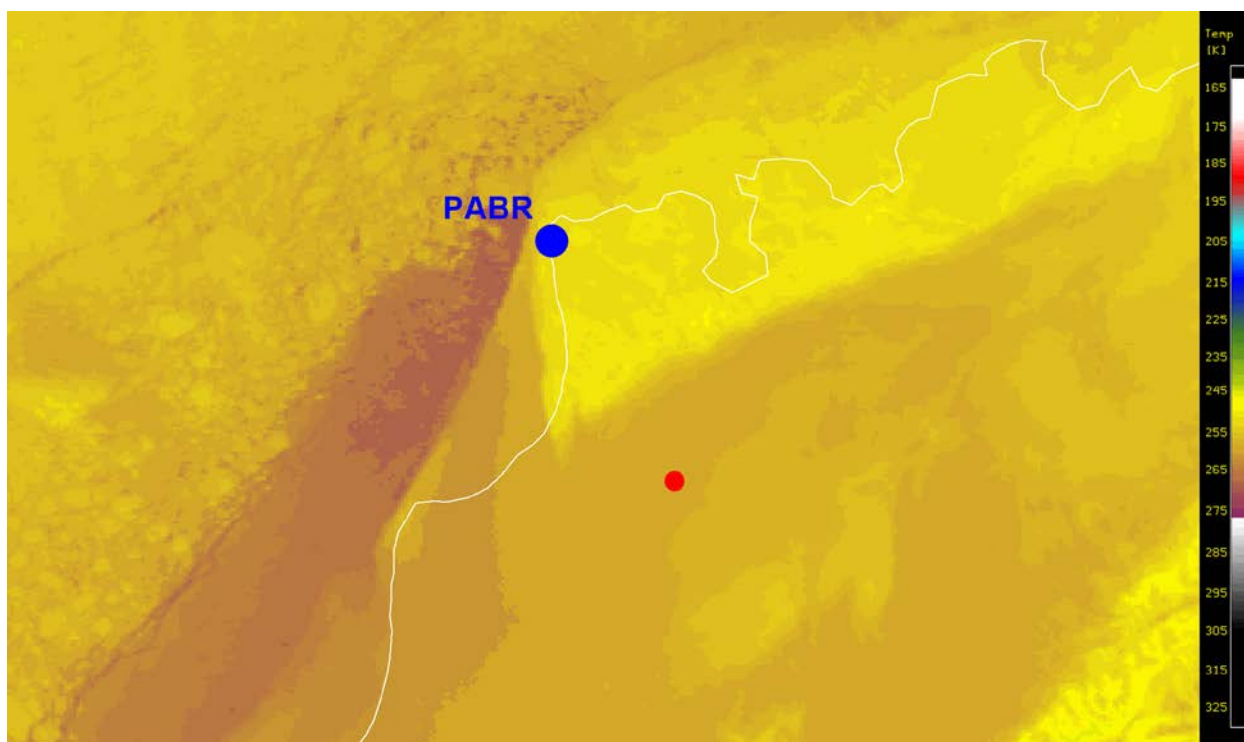


Figure 5 – AVHRR infrared (10.8μm) imagery from 0856 AKDT. Accident location denoted by red circle.

6.0 Weather Cameras

Images from the Barrow (Utqiagvik) and Wainwright FAA weather cameras for the times surrounding the accident period are presented in Attachment 3. According to the Leidos Corporation (under contract with the FAA) the Atkasuk weather cameras were out of service at the time of the accident (and had been out of service since March 18, 2018).⁵

7.0 AIRMETs

An Airmen's Meteorological Information (AIRMET) advisory SIERRA for IFR conditions and mountain obscuration was issued by the Alaska Aviation Weather Unit (AAWU) at 0710 AKDT and was active for the accident site at the accident time. For the area west of Nuiqsut Airport in Nuiqsut, Alaska, it advised of occasional ceilings below 1,000 feet agl and isolated visibilities below 3 statute miles and mist.

WAAK49 PAWU 111510 AAA
WA9O
FAIS WA 111508 AMD
AIRMET SIERRA FOR IFR AND MT OBSC VALID UNTIL 112015
.
ARCTIC SLP CSTL FG UPDT
PAQT W OCNL CIG BLW 010/ISOL VIS BLW 3SM BR. NC.

8.0 SIGMETs

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

9.0 Area Forecast

An amended Area Forecast that included the forecast for the "ARCTIC SLP CSTL FG" region (which included the accident location) was issued by the AAWU at 0710 AKDT. The Area Forecast included the pertinent AIRMET information, and for the accident region forecasted scattered clouds at 200 feet above msl, ceiling broken at 1,000 feet above msl, estimated stratus cloud tops at 1,500 feet above msl, visibility 3-5 statute miles and mist.

FAAK59 PAWU 111510 AAA

⁵ It is not clear if the weather cameras were not operational, or if the weather cameras were operational but not disseminating any information.

FA9W
 FAIC FA 111501 AMD
 AK NRN HLF...

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AIRMETS VALID UNTIL 112015
 CB IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR
 CONDS.
 NON MSL HEIGHTS NOTED BY AGL OR CIG.

.

ARCTIC SLP CSTL FG...VALID UNTIL 120000 UPDT
 ...CLOUDS/WX...UPDT
*****AIRMET IFR***PAQT W OCNL CIG BLW 010/ISOL VIS BLW 3SM BR.**
 NC...
PAQT W SCT002 BKN010 EST ST TOP 015. VIS 3-5SM BR.
 ELSW FEW006 SCT015. ISOL CIG BLW 010/ISOL VIS BLW 3SM BR.
 ALG CST/OFSHR E PASC SFC WND E 20G30KT DMNSHG SLOLY.
 OTLK VALID 120000-120600...IFR CIG BR.
 ...TURB...
 NIL SIG.
 ...ICE AND FZLVL...
 NIL SIG. FZLVL 040 EXC 015 S.

Prior to this, an Area Forecast that included the forecast for the “ARCTIC SLP CSTL FG” region (which included the accident location) was issued by the AAWU at 0402 AKDT. For the accident region this Area Forecast forecasted few clouds at 600 feet above msl and scattered clouds at 4,000 feet above msl, and widely scattered ceilings below 1,000 feet agl and visibility below 3 statute miles and mist.

FAAK59 PAWU 111202
 FA9W
 FAIC FA 111215
 AK NRN HLF...

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AIRMETS VALID UNTIL 112015
 CB IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR
 CONDS.
 NON MSL HEIGHTS NOTED BY AGL OR CIG.

.

ARCTIC SLP CSTL FG...VALID UNTIL 120000
 ...CLOUDS/WX...
FEW006 SCT040. WDLY SCT CIG BLW 010/VIS BLW 3SM BR.
 ALG CST/OFSHR E PASC SFC WND E 20G30 KTS DCRG AFT 17Z.
 OTLK VALID 120000-120600...IFR CIG BR.
 ...TURB...
 NIL SIG.

...ICE AND FZLVL...
NIL SIG. FZLVL 040 EXC 015 S.

10.0 Area Forecast Discussion

An Area Forecast Discussion (AFD) that covered the accident region was issued at 0356 AKDT by the NWS Weather Forecast Office in Fairbanks, Alaska. The general discussion and the “North Slope and Brooks Range” section of that AFD are presented here.

FXAK69 PAFG 111156
AFDAFG

Northern Alaska Forecast Discussion
National Weather Service Fairbanks AK
356 AM AKDT Wed Apr 11 2018

.DISCUSSION...

The main forecast concern will be winds along the West Coast and parts of the western Interior and Brooks Range through the rest of the week. Otherwise, quiet weather pattern will continue over the next couple of days. Model solutions are fairly similar through Saturday with the spread in GFS and ECMWF solutions increasing after Saturday. and into the extended forecast period.

Aloft...at H500, a compact 528 dam low sandwiched between two upper level ridges over eastern Siberia and over the eastern Interior and western Canada. This low will remain in place over the Brooks Range and weaken through tonight as a strong shortwave and trough associated with a strong upper low in the high arctic swings south towards the arctic coast. As the trough and shortwave approach the coast, the shortwave will break off and move southwest into the Chukchi Sea Thursday evening and then forming a closed low over the Bering Strait by Friday morning. The trough will move east grazing the arctic coast Friday. A second shortwave will move south within this trough, pushing it further south into the Interior Saturday. Upper level ridge will build north over western Alaska this weekend and shift east into early next week.

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North Slope and Brooks Range...Primary forecast concern is winds and associated blowing snow. Ahead of the upper level trough, light snow is expected to develop over the eastern half of the North Slope and upslope areas in the north side of the eastern Brooks Range. This will bring a few inches of fresh snow through Thursday morning ahead of the strong north gap winds that will develop Thursday afternoon. North gap winds with gusts to around 40 mph through Brooks Range passes will persist into Friday morning before weakening. Fresh snow combined with strong north gap winds will likely result in blowing snow with low visibilities. May need to consider the need for a winter weather advisory for blowing snow in the eastern Brooks Range gaps. Cooling trend expected over the next couple of days with the coldest day being

Saturday afternoon with highs near zero along the coast to the teens in the Brooks Range and lows on Sunday morning zero to 10 below.

Coastal Hazard Potential Days 3 and 4...None.

&&

.AFG WATCHES/WARNINGS/ADVISORIES...

Wind Advisory for AKZ217-AKZ219.

Heavy Freezing Spray Warning for PKZ210.

Small Craft Advisory for PKZ210.

Brisk Wind Advisory for PKZ220-PKZ225-PKZ230-PKZ235-PKZ240-PKZ245.

&&

11.0 AAWU Graphical Products

Selected graphic forecasts issued by the AAWU are presented here.

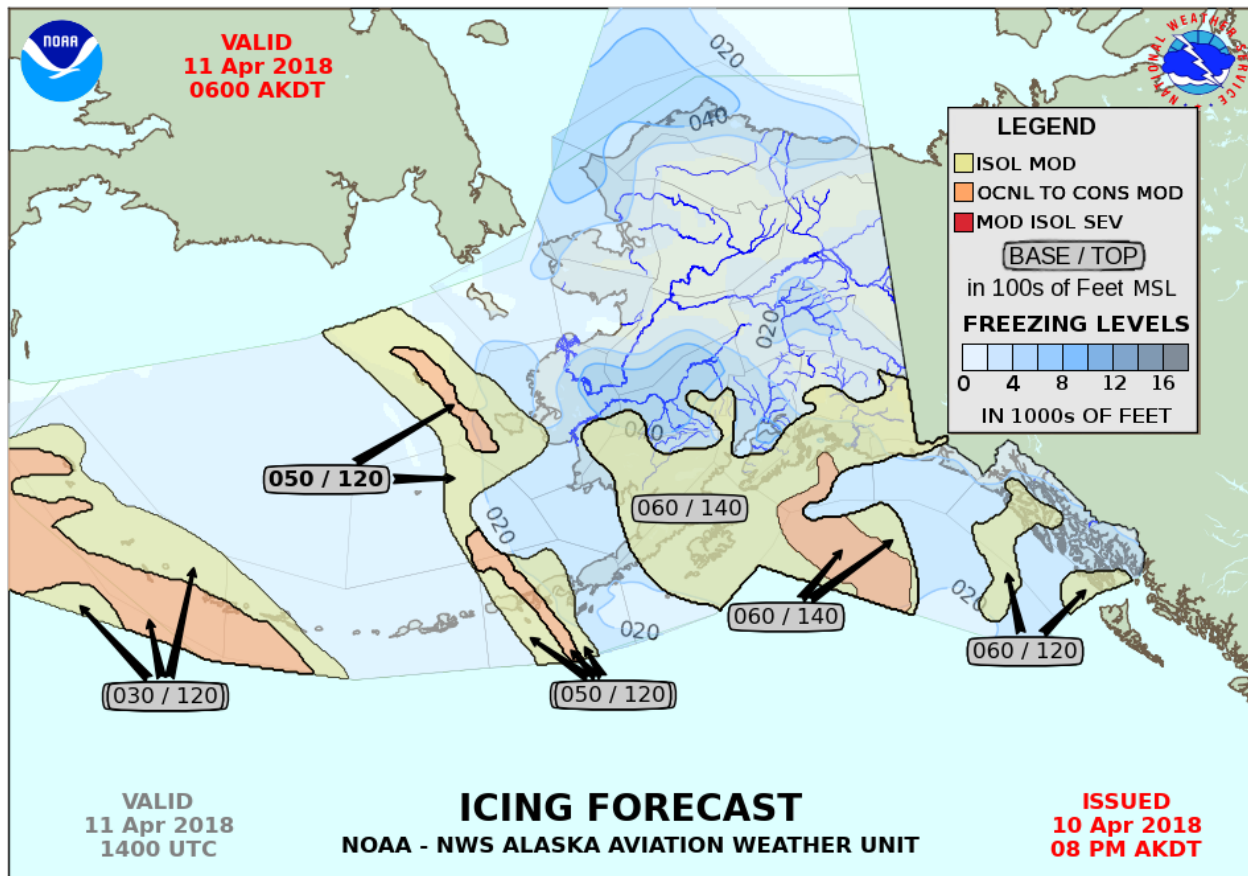


Figure 6 – AAWU icing forecast issued at 2000 AKDT on April 10, 2018, and valid for 0600 AKDT on the accident day.

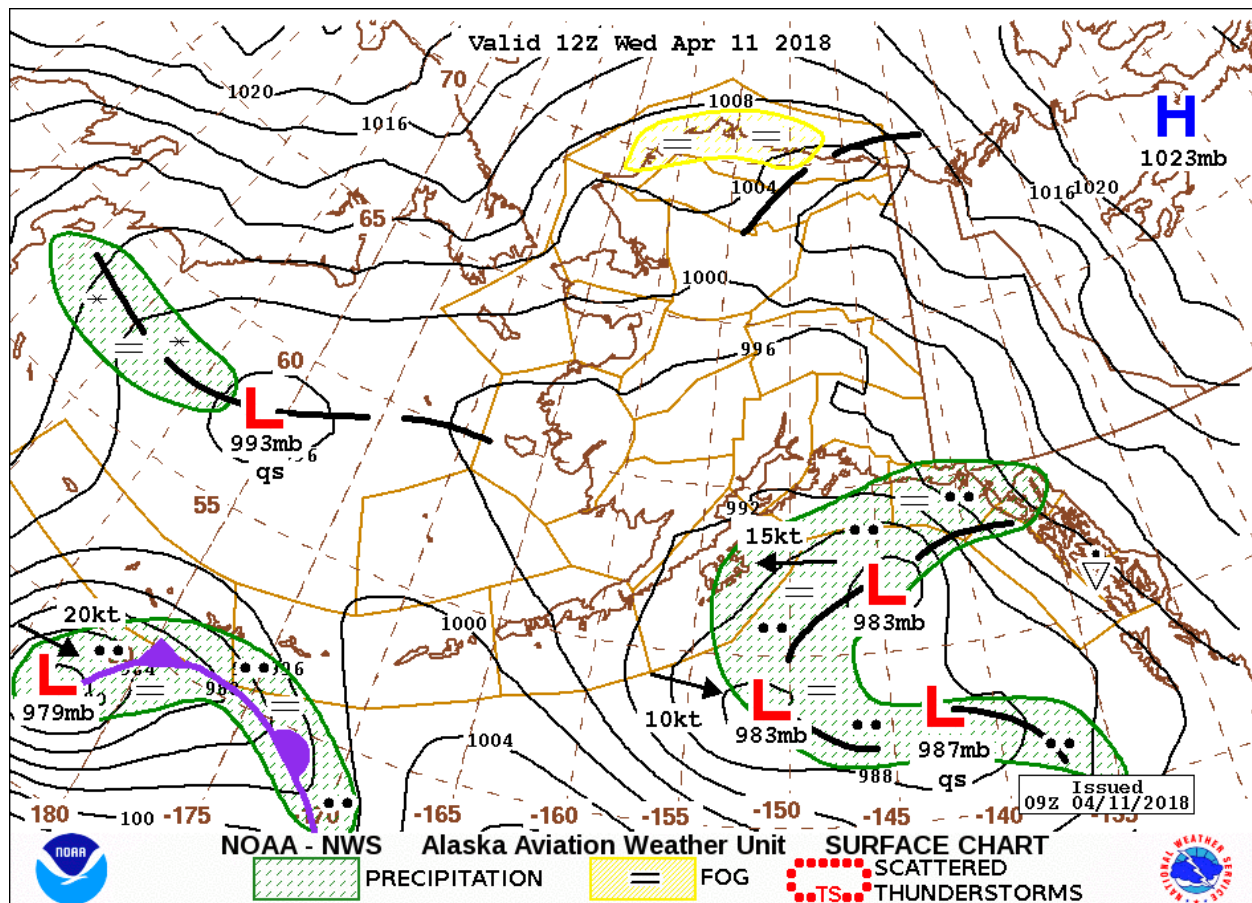


Figure 7 – AAWU surface forecast chart issued at 0100 AKDT and valid for 0400 AKDT.

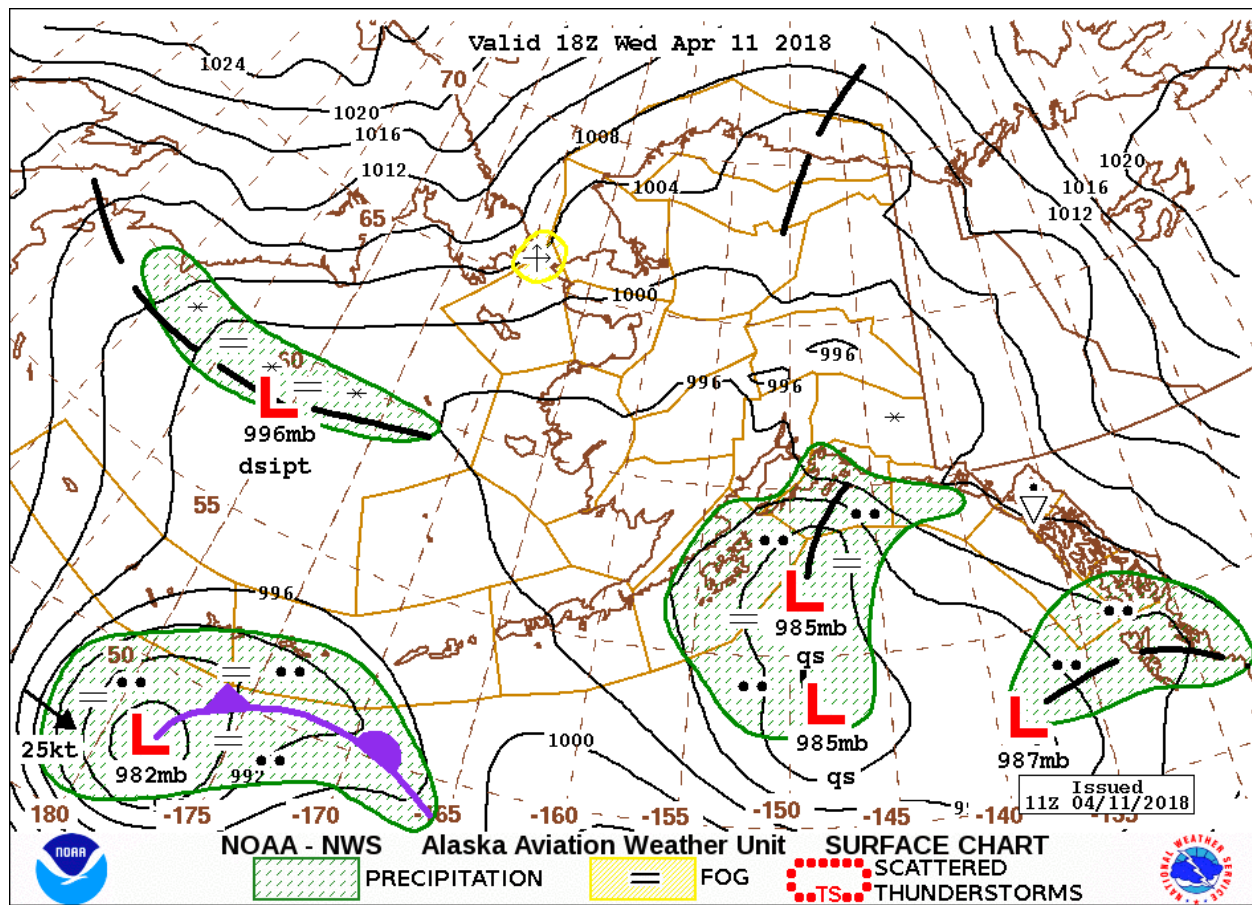


Figure 8 – AAWU surface forecast chart issued at 0300 AKDT and valid for 1000 AKDT.

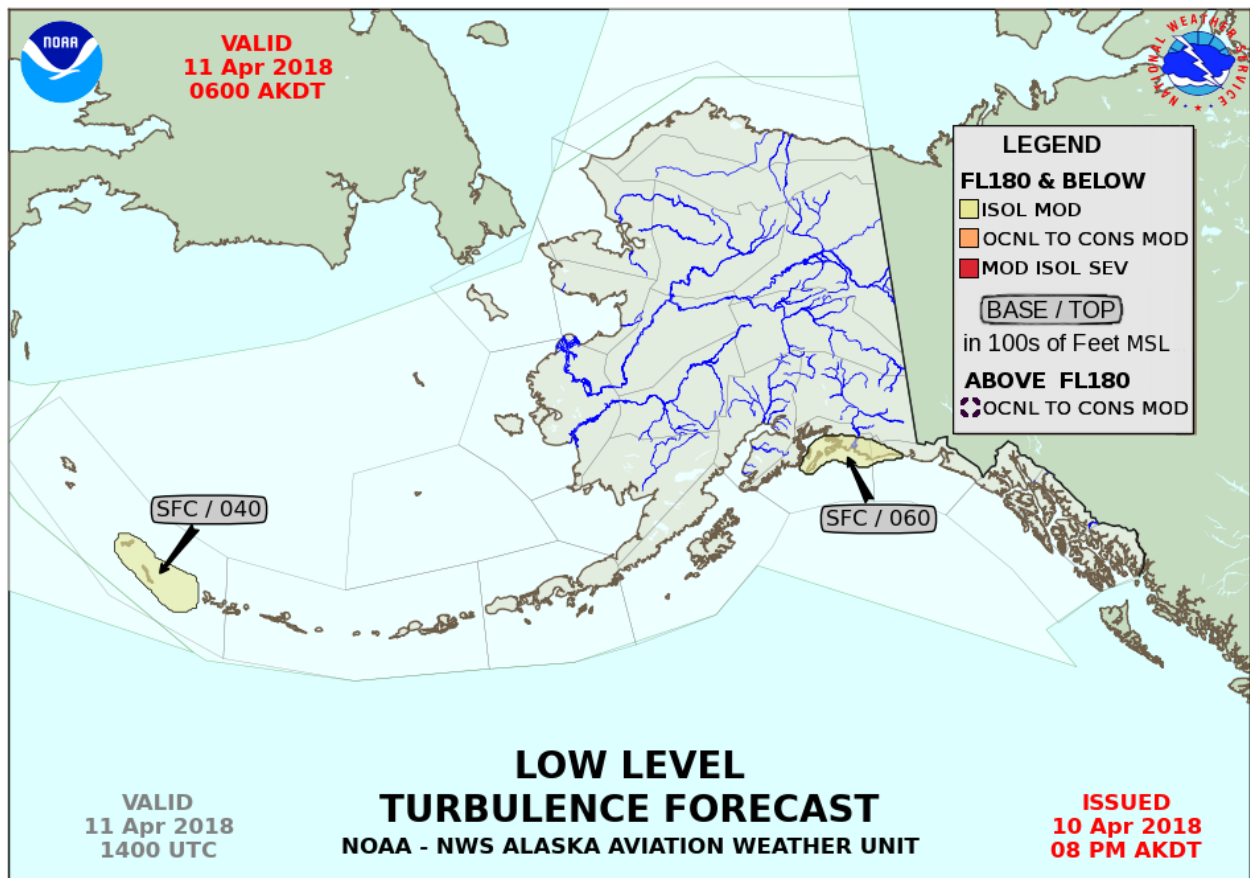


Figure 9 – AAWU low level turbulence forecast issued at 2000 AKDT on April 10, 2018, and valid for 0600 AKDT on the accident day.

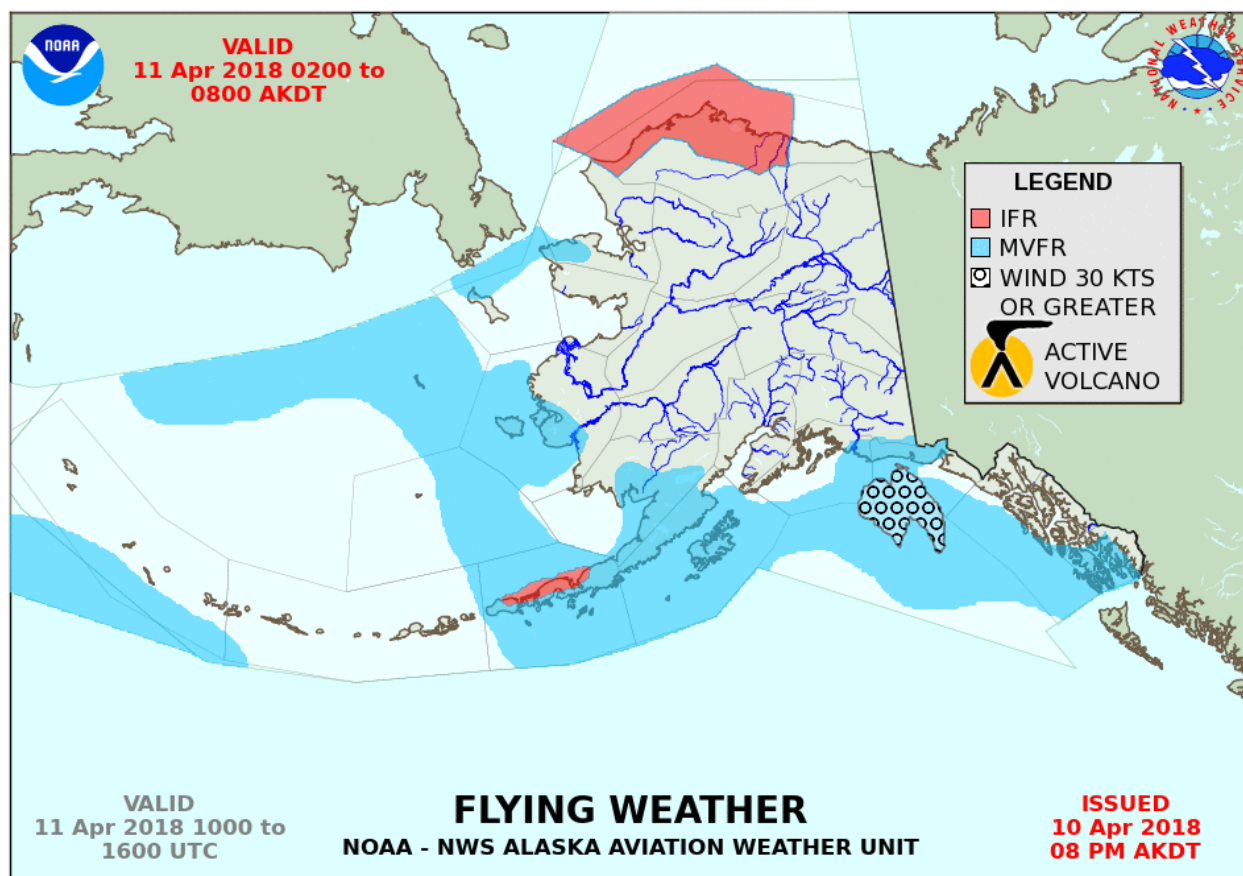


Figure 10 – AAWU “Flying Weather” forecast chart issued at 2000 AKDT on April 10, 2018, and valid for 0800 AKDT on the accident day.

12.0 Terminal Aerodrome Forecasts

Terminal Aerodrome Forecasts (TAF) were not issued for PATQ and the closest NWS TAF site was PABR. According to National Weather Service Instruction 10-813, “A NWS TAF consists of the expected meteorological conditions significant to aviation at an airport for a specified time period. For the U.S., this is the area within five (5) statute miles (SM) of the center of an airport’s runway complex.”⁶

⁶ www.nws.noaa.gov/directives/sym/pd01008013curr.pdf
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13.0 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 active for the accident site at the accident time.

14.0 Astronomical

The astronomical data obtained from the United States Naval Observatory for 70° 29' north latitude and 157° 30' west longitude, for the accident location, indicated the following:

Sun Times

Begin Civil Twilight	0522 AKDT
Sunrise	0641 AKDT

Moon Times

Moonrise	0804 AKDT
Moonset	2226 AKDT

Phase of the Moon

Waning Crescent with 19% of the Moon's visible disk illuminated.



15.0 FAA Weather Briefings

There is no record of the accident pilot receiving an Alaska Flight Service Station weather briefing on the day before or the day of the accident.

E. LIST OF ATTACHMENTS

- Attachment 1 - PATQ one-minute observations between 0400 AKDT and 1500 AKDT.
- Attachment 2 - Email correspondence between FAA and NTSB regarding PATQ AWOS and Atkasuk FAA weather cameras.
- Attachment 3 - Images from the Barrow (Utqiagvik) and Wainwright FAA weather cameras for the times surrounding the accident period.

Submitted by:

Mike Richards
Senior Meteorologist

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