Docket No. SA-540

Exhibit No. 5-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Meteorology – Factual Report

(39 Pages)

8/17/2017

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

June 15, 2017

Group Chairman's Factual Report

METEOROLOGY

ANC17MA001

Table Of Contents

A. ACCIDENT

Location: Togiak, Alaska
Date: October 2, 2016
Time: about 1154 Alaska daylight time (1954 UTC[1])
Aircraft: Cessna 208B; N208SD

B. METEOROLOGIST

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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 Alaska daylight time (AKDT) for October 2, 2016 (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: 59.165556° north latitude, 160.653333° west longitude, elevation of about 1,920 feet.

D. SUMMARY

On October 2, 2016, about 1154 AKDT, a turbine-powered Cessna 208B Grand Caravan airplane, N208SD, sustained substantial damage after impacting steep, mountainous, rocky terrain about 12 miles northwest of Togiak, Alaska. The airplane was being operated as flight 3153 by Hageland Aviation Services, Inc., dba Ravn Connect, Anchorage, Alaska, as a scheduled commuter flight under the provisions of 14 Code of Federal Regulations Part 135 and visual flight rules. All three people on board (two commercial pilots and one passenger) sustained fatal injuries. Visual meteorological conditions prevailed at the Togiak airport and company flight following procedures were in effect. Flight 3153 departed Quinhagak, Alaska, at 1133 AKDT, destined for Togiak.

[1] UTC – abbreviation for Coordinated Universal Time

E. FACTUAL INFORMATION

1.0 Synoptic Conditions

The National Weather Service (NWS) Surface Analysis Chart for 1900 AKDT is presented in figure 1. The surface analysis chart identified a low pressure center in the Gulf of Alaska. A trough stretched from the low pressure center northwestward in south-central Alaska.

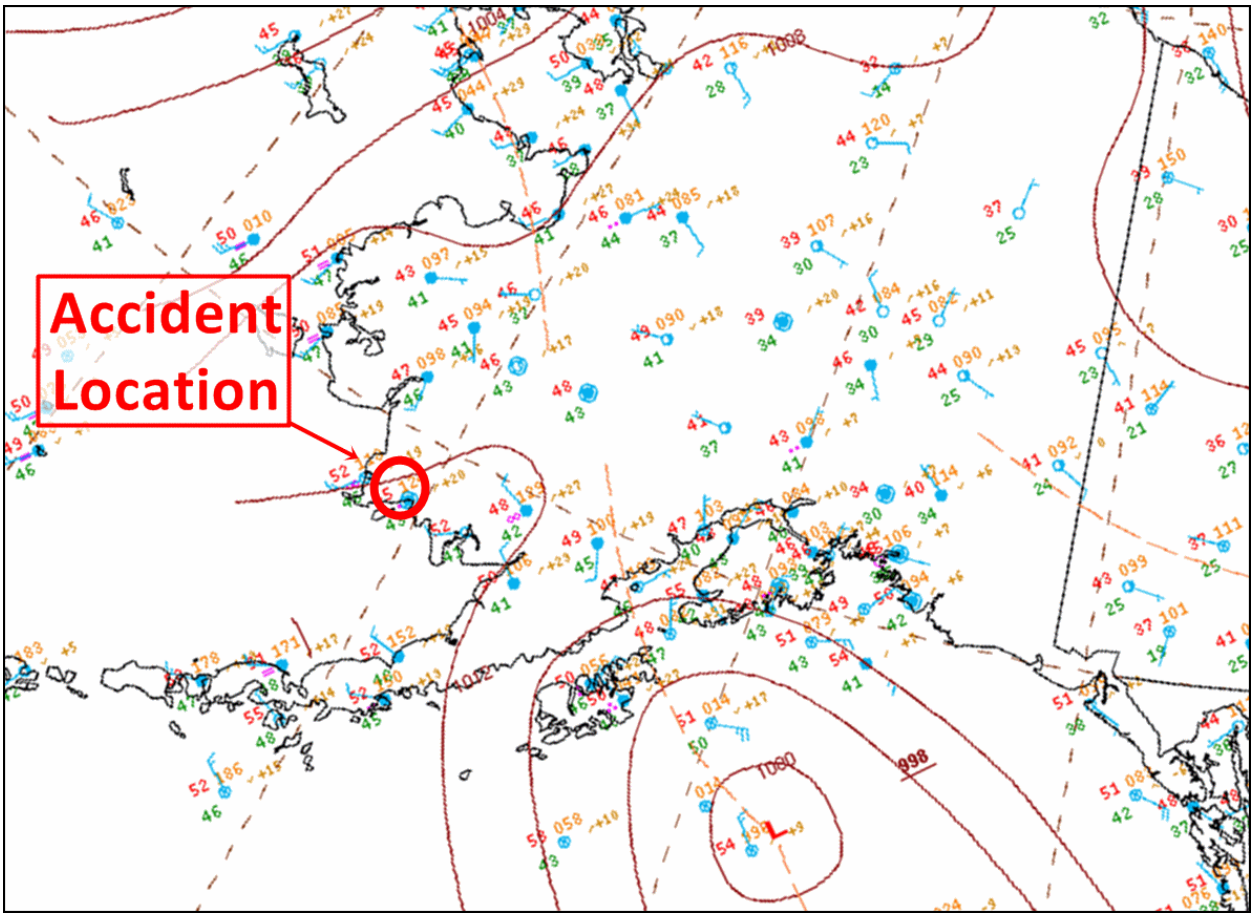

Figure 1 - NWS Surface Analysis Chart for 1300 AKDT.

2.0 Surface Observations

An Automated Weather Observing System was located at Togiak Airport (PATG) in Togiak Village, Alaska, about 10 miles southeast of the accident location at an elevation of 18 feet. Automated reports from PATG during the times surrounding the accident time are presented here:

[0956 AKDT] METAR PATG 021756Z AUTO 00000KT 10SM -RA OVC022 07/04 A2984 RMK AO2 RAB42 SLP104 P0000 60000 T00720044 10072 20061 53018=

[1056 AKDT] METAR PATG 021856Z AUTO 00000KT 10SM OVC016 07/06 A2986 RMK AO2 RAE49 SLP112 P0000 T00670061=

[1139 AKDT] SPECI PATG 021939Z AUTO 00000KT 9SM -RA SCT014 OVC044 08/06 A2987 RMK AO2 RAB32 P0000=

[1156 AKDT] METAR PATG 021956Z AUTO 00000KT 7SM -RA SCT039 OVC047 07/06 A2988 RMK AO2 RAB32 SLP119 P0001 T00720056=

[1231 AKDT] SPECI PATG 022031Z AUTO 12003KT 8SM -RA SCT021 BKN027 OVC046 08/06 A2989 RMK AO2 P0000=

At 1139 AKDT, PATG reported a calm wind, visibility of 9 statute miles, light rain, scattered clouds at 1,400 feet above ground level (agl), overcast cloud base at 4,400 feet agl, temperature of 8° Celsius (C) and a dew point temperature of 6°C, altimeter setting of 29.87 inches of mercury; remarks included: station with a precipitation discriminator, rain began at 1132 AKDT, trace amount of precipitation since 1056 AKDT.

At 1156 AKDT, PATG reported a calm wind, visibility of 7 statute miles, light rain, scattered clouds at 3,900 feet agl, overcast cloud base at 4,700 feet agl, temperature of 7° C and a dew point temperature of 6°C, altimeter setting of 29.88 inches of mercury; remarks included: station with a precipitation discriminator, rain began at 1132 AKDT, 0.01 inches of precipitation since 1056 AKDT.

3.0 Weather Radar

WSR-88D Level-II weather radar imagery from Bethel, Alaska (PABC), is presented in figure 2. PABC was located approximately 104 miles north of the accident site at an elevation of about 162 feet. Assuming standard refraction and considering the 0.95° beam width for the WSR-88D radar beam, the PACG 0.527° tilt would have "seen" altitudes between about 7,900 and 18,400 feet above msl at the accident location. There were areas of light reflectivity (≤ 15dBZ) near the accident location.

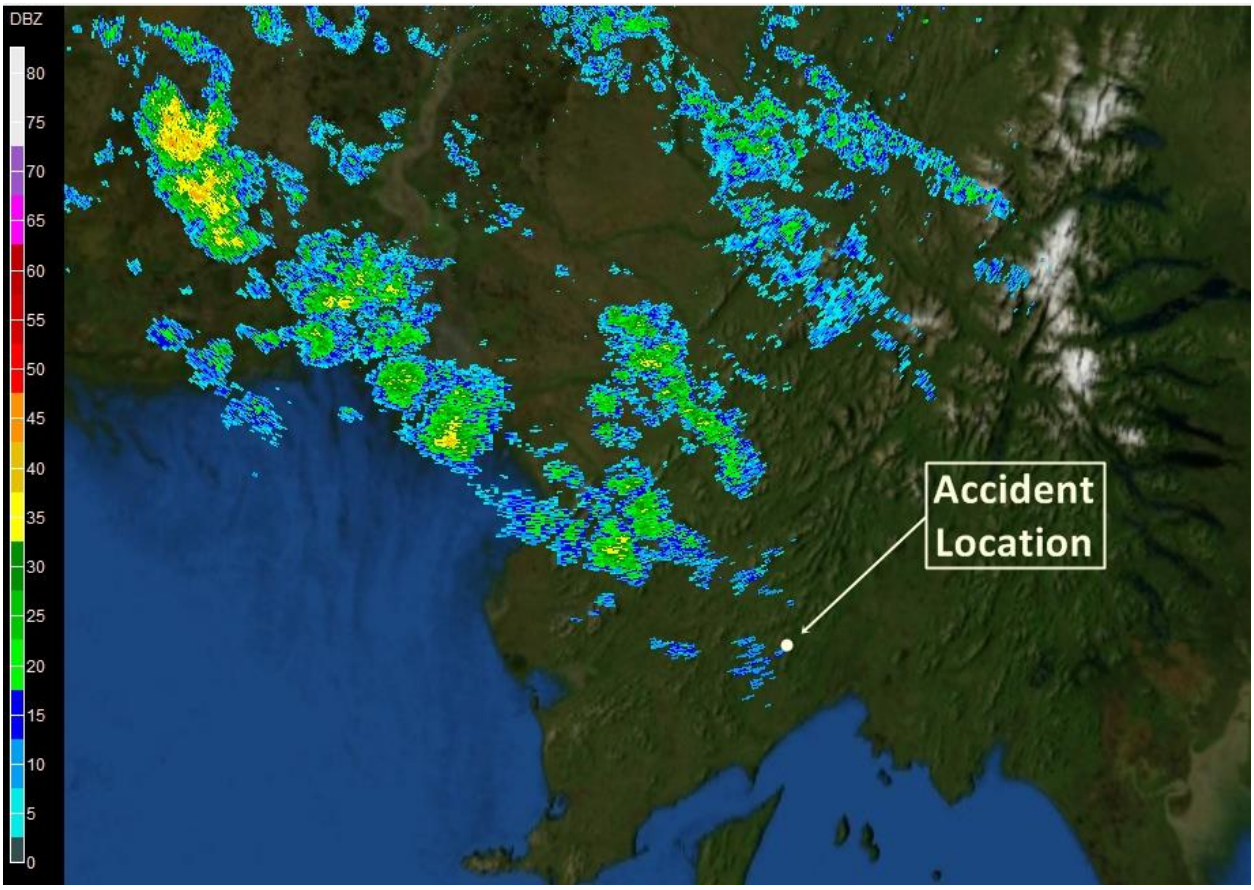

Figure 2 – PABC 0.527° Level-II reflectivity product from 1152 AKDT.

4.0 Terminal Aerodrome Forecasts

Terminal Aerodrome Forecasts were not issued for PATG.

5.0 Upper Air Data

A 0.5° Global Data Assimilation System (GDAS) model sounding (figure 3) for the accident location at 1300 AKDT was retrieved from the National Oceanic and Atmospheric Administration's Air Resources Laboratory. The wind between the surface and 5,000 feet was westerly between 7 and 20 knots. Above 5,000 feet, the wind remained from the west with no significant change in magnitude below 10,000 feet. Relative humidity was greater than 90 percent between about 1,000 feet and 7,000 feet, and greater than 95 percent between about 1,800 feet and 5,700 feet. The freezing level was about 4,800 feet and there were no areas of significant turbulence identified by the Rawinsonde Observation Program (RAOB).

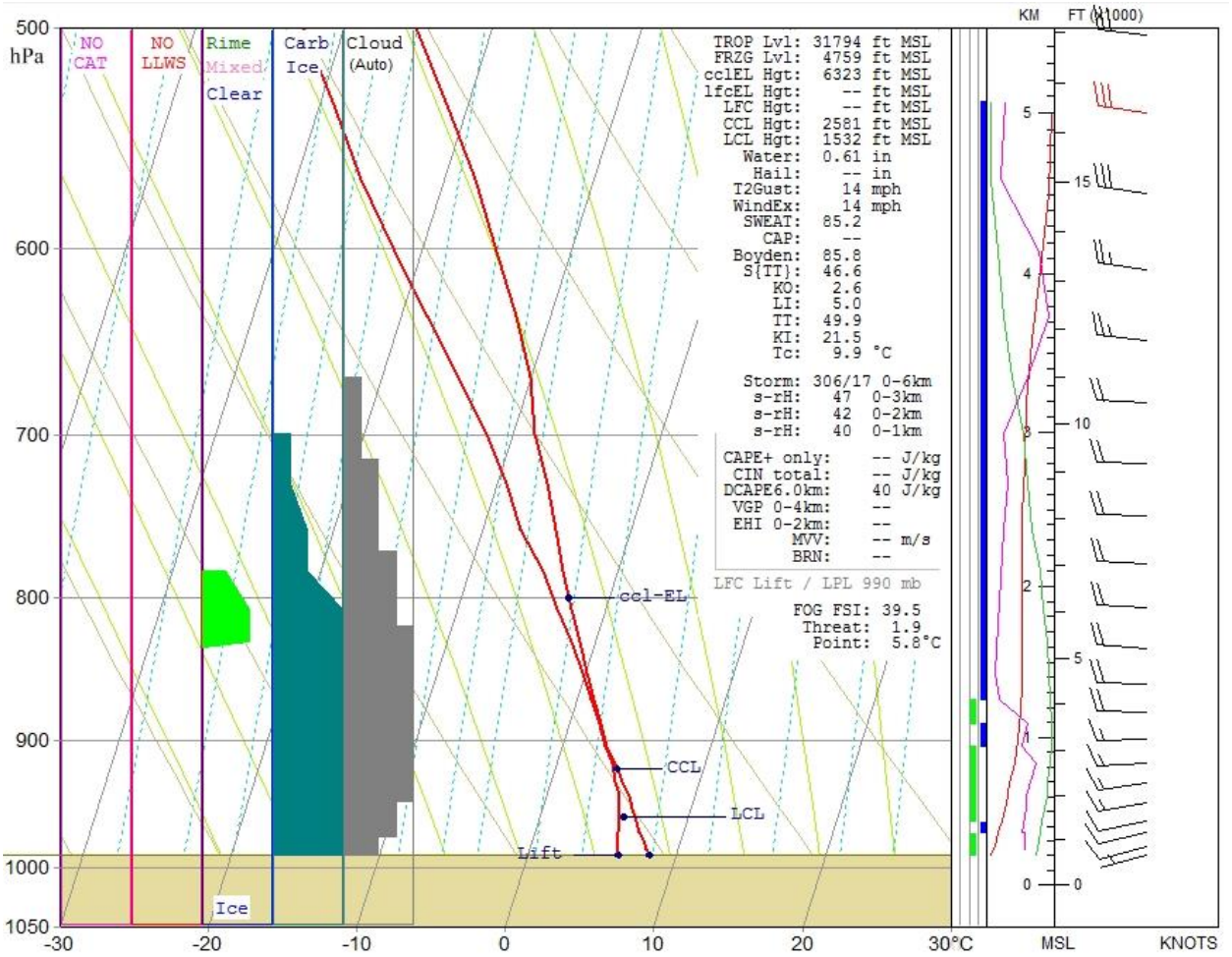

Figure 3 – GDAS model sounding data in SkewT/LogP format for 1300 AKDT at the accident site, surface to 500 hPa.

6.0 Pilot Reports

There were no publicly disseminated pilot reports[2] made within two hours of the accident time and 100 miles of the accident location.

7.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-15 visible (0.63µm) and infrared (10.7µm) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from 1145 AKDT are presented in figures 4 and 5. The GOES-15 imagery identified cloudy conditions over the accident location, with infrared cloud-top temperatures over the accident site retrieved as about -6°C. When considering the GDAS model sounding, -6°C corresponded to cloud top heights of about 8,300 feet. It should be noted these figures have not been corrected for any parallax error.

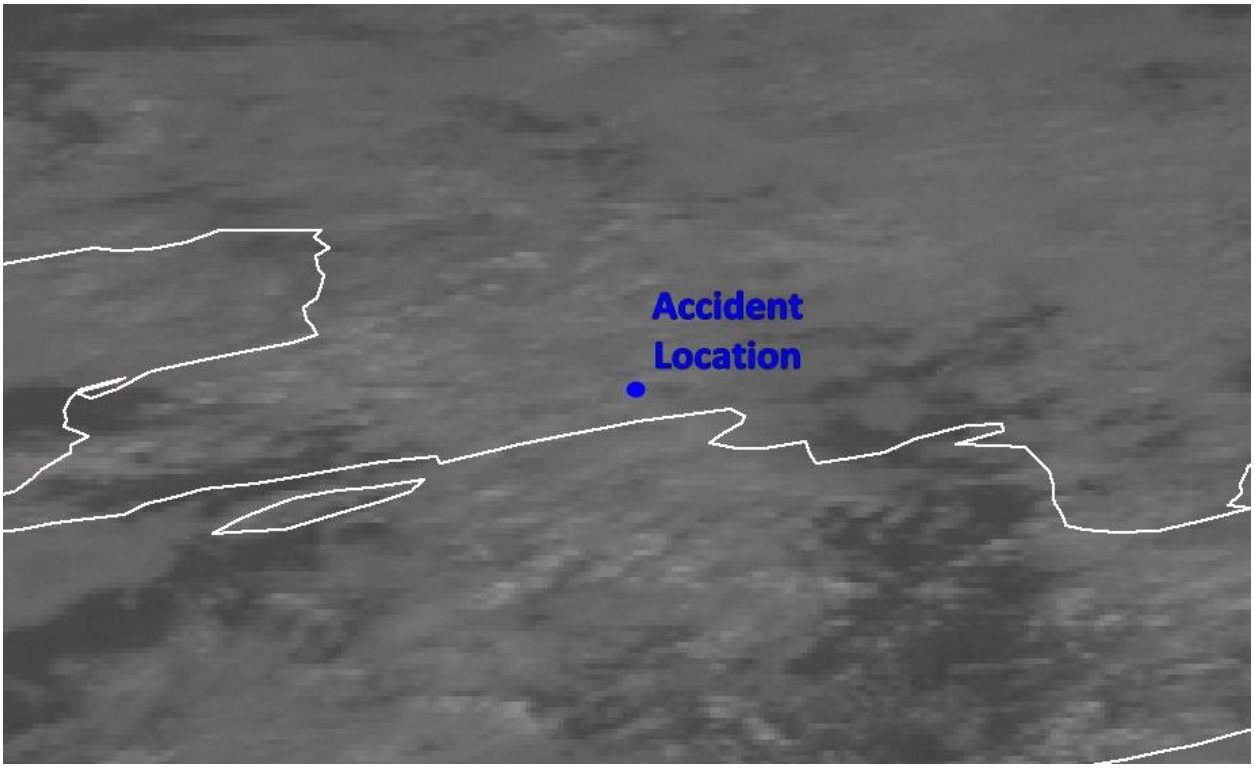

Figure 4 – GOES-15 0.62 µm (visible) imagery from 1145 AKDT. Not corrected for any parallax error.

[2] Only pilot reports with the WMO header UBAK** were considered.

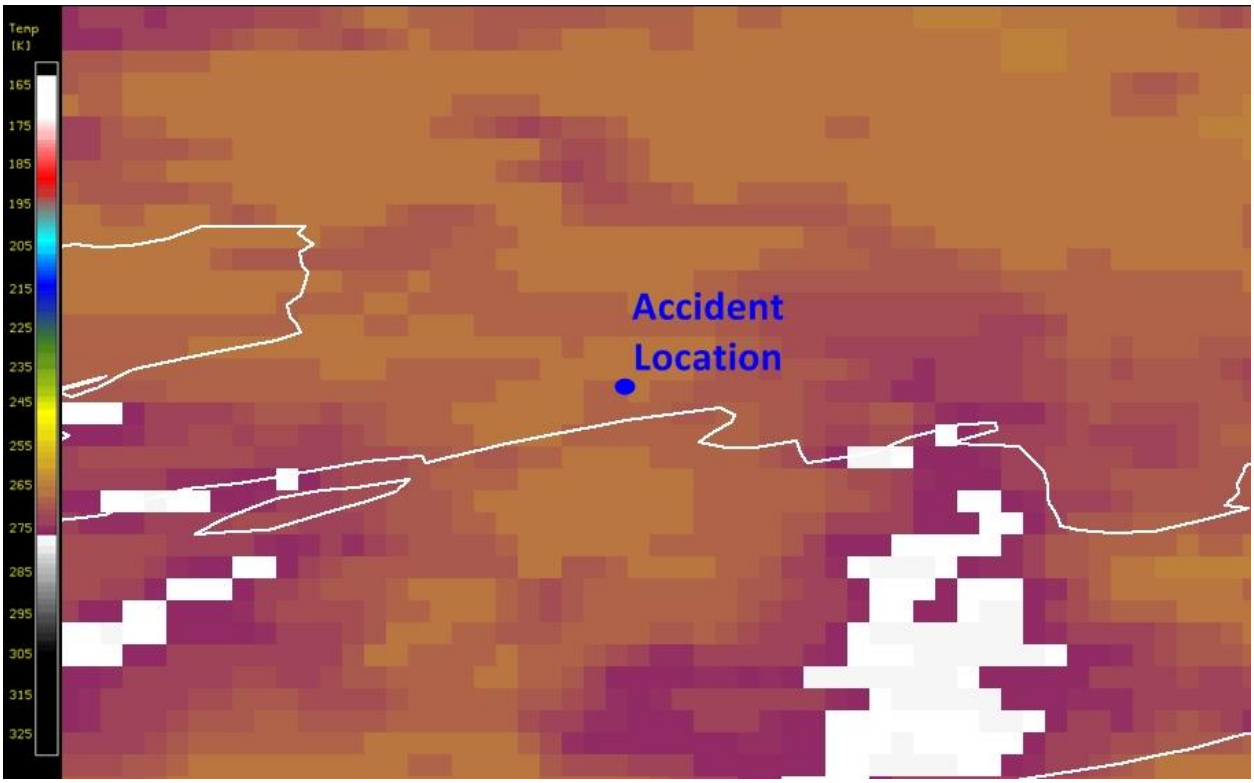

Figure 5 – GOES-15 10.7µm (infrared) color-enhanced imagery from 1145 AKDT. Not corrected for any parallax error.

8.0 Weather Cameras

Images from the Togiak Federal Aviation Administration (FAA) weather cameras, which were located near PATG, were retrieved for times surrounding the accident time. Presented here are images from the Togiak west-facing (figure 8-11) and north-facing (figure 13-15) cameras. Neither had a view in the direction of the accident location.

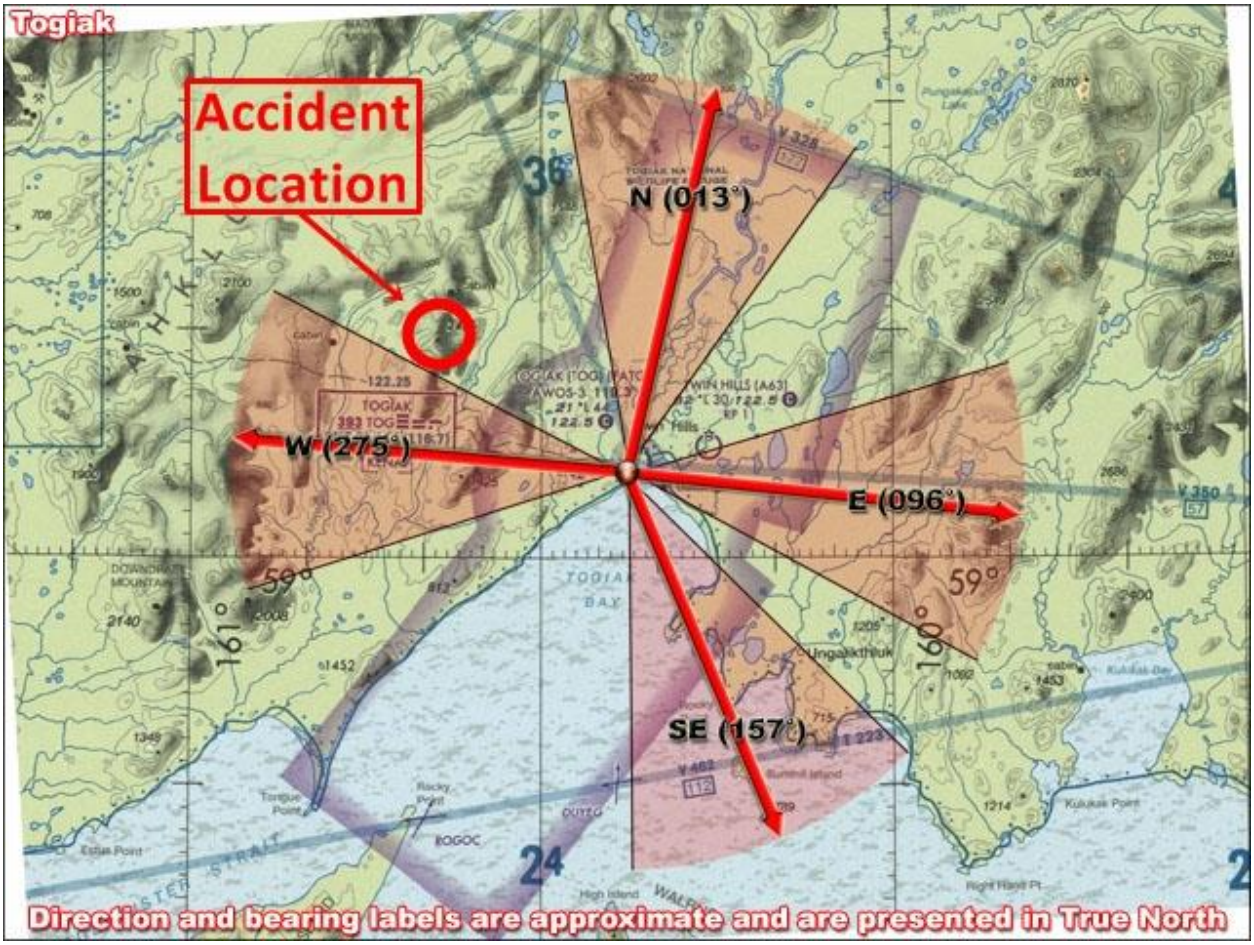

Figure 6 – Diagram depicting the views for the Togiak FAA weather cameras.

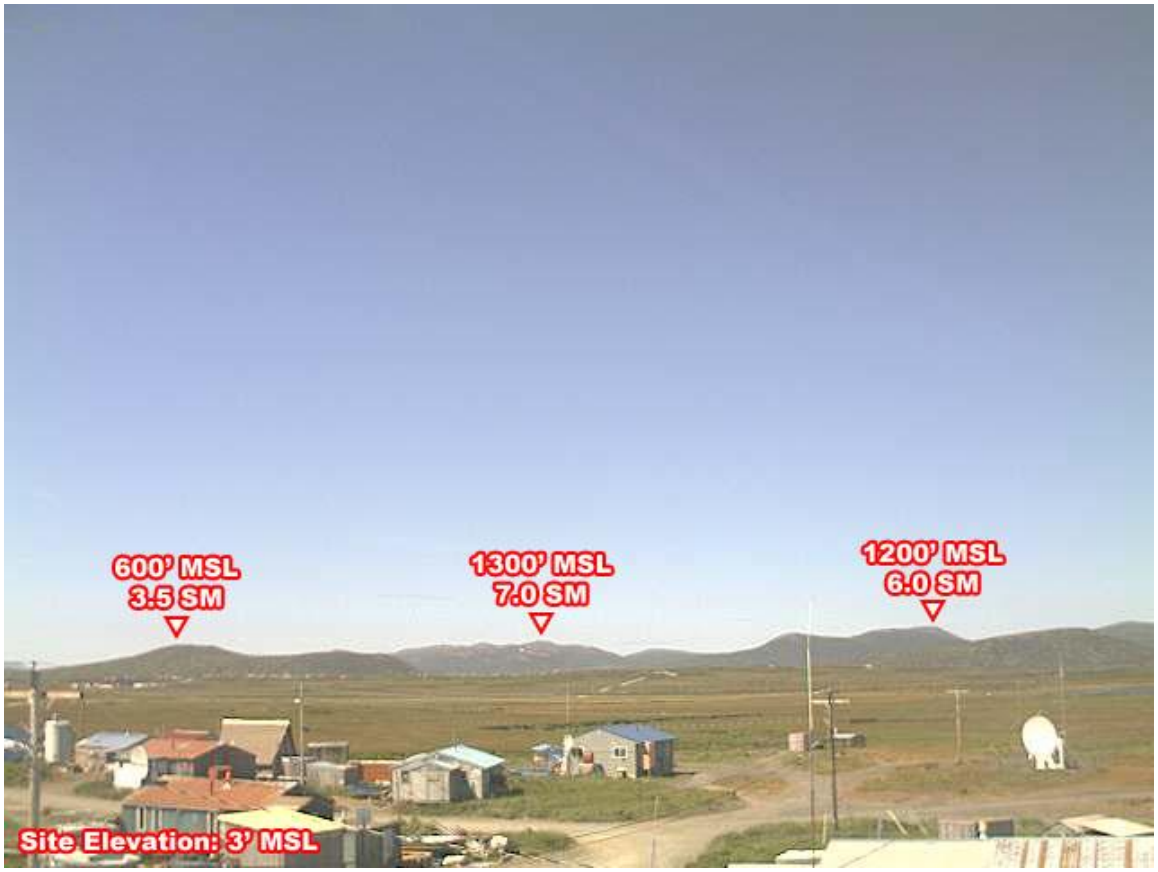

Figure 7 – Clear day image for the west-facing Togiak FAA weather camera.

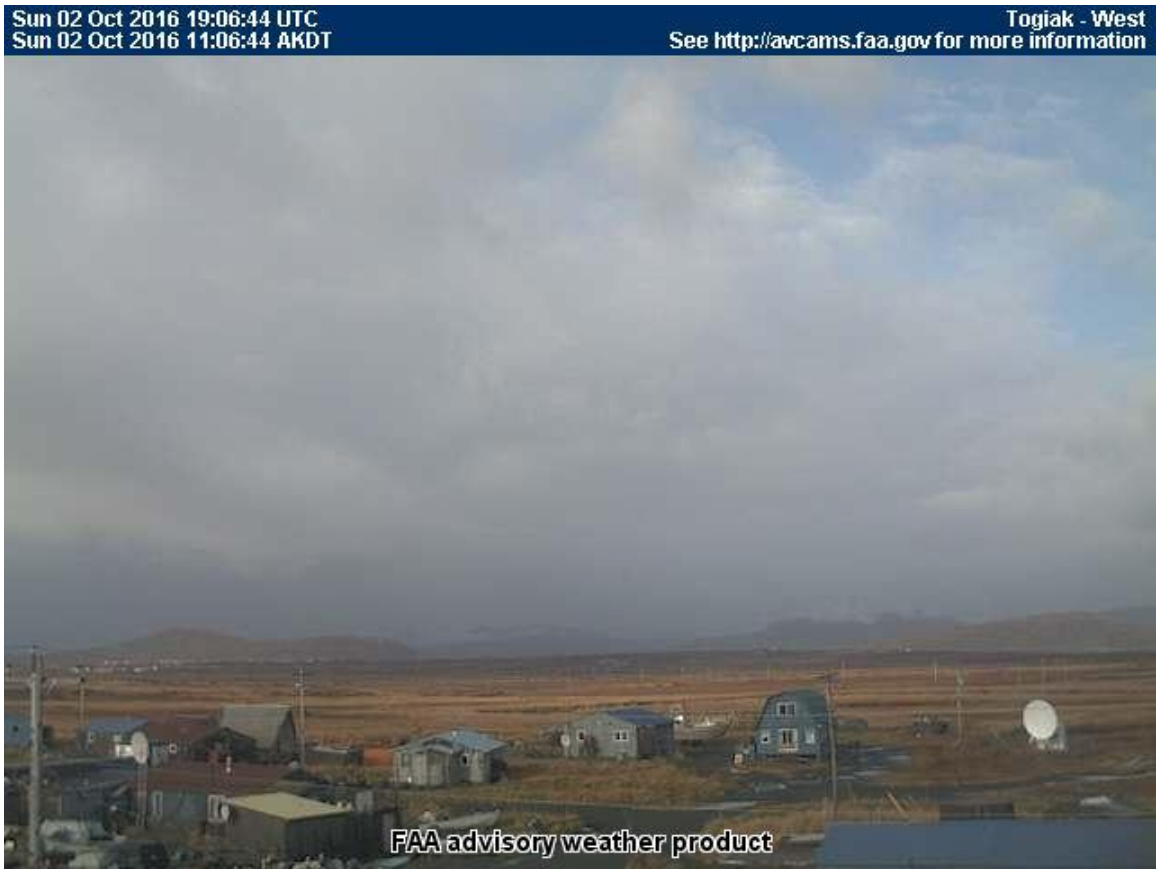

Figure 8 – West-facing Togiak camera image at about 1106 AKDT.

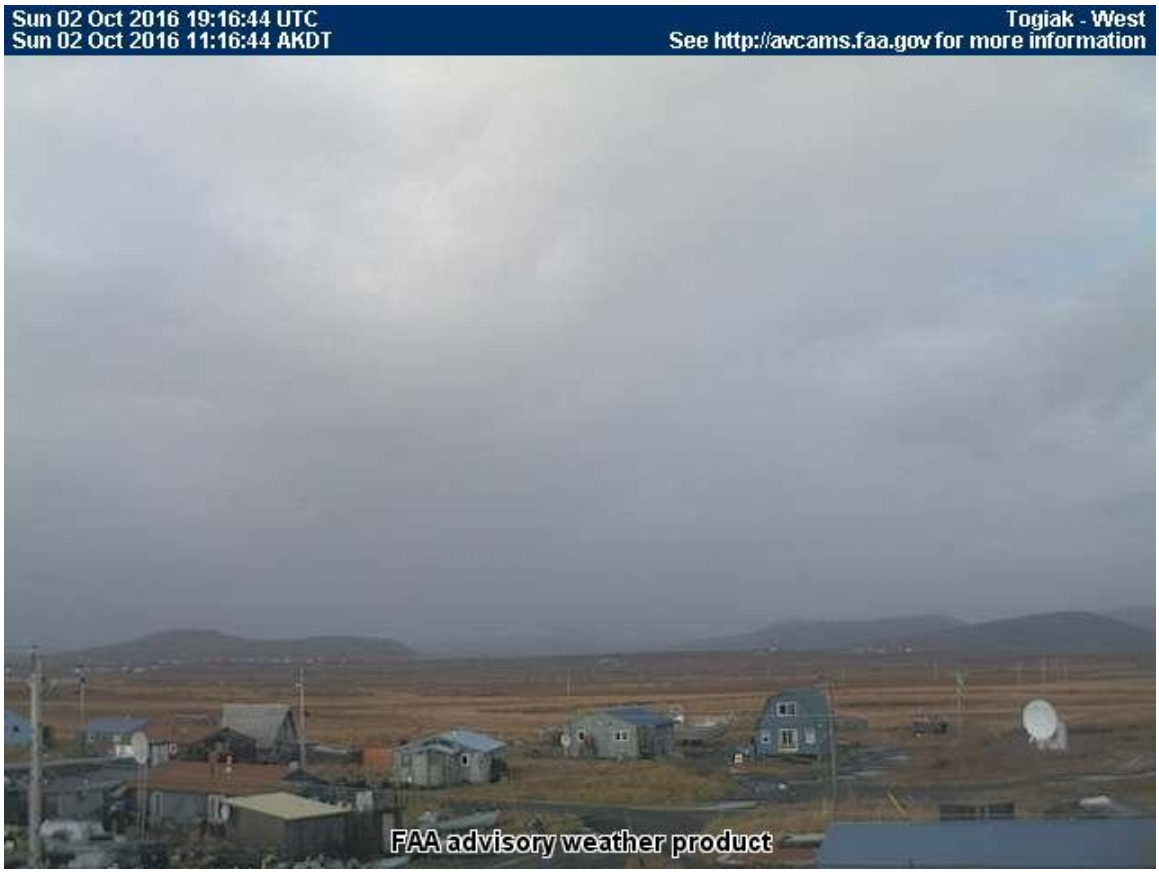

Figure 9 – West-facing Togiak camera image at about 1116 AKDT.

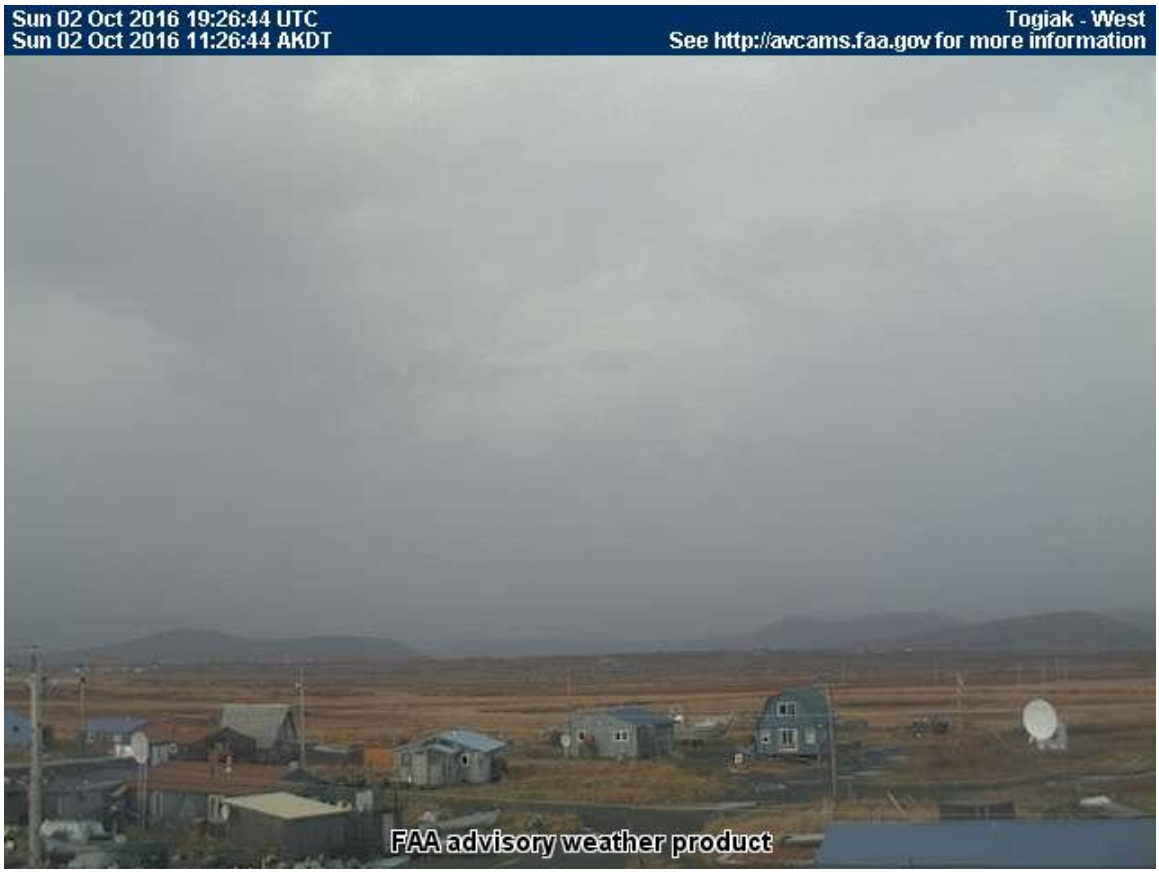

Figure 10 – West-facing Togiak camera image at about 1126 AKDT.

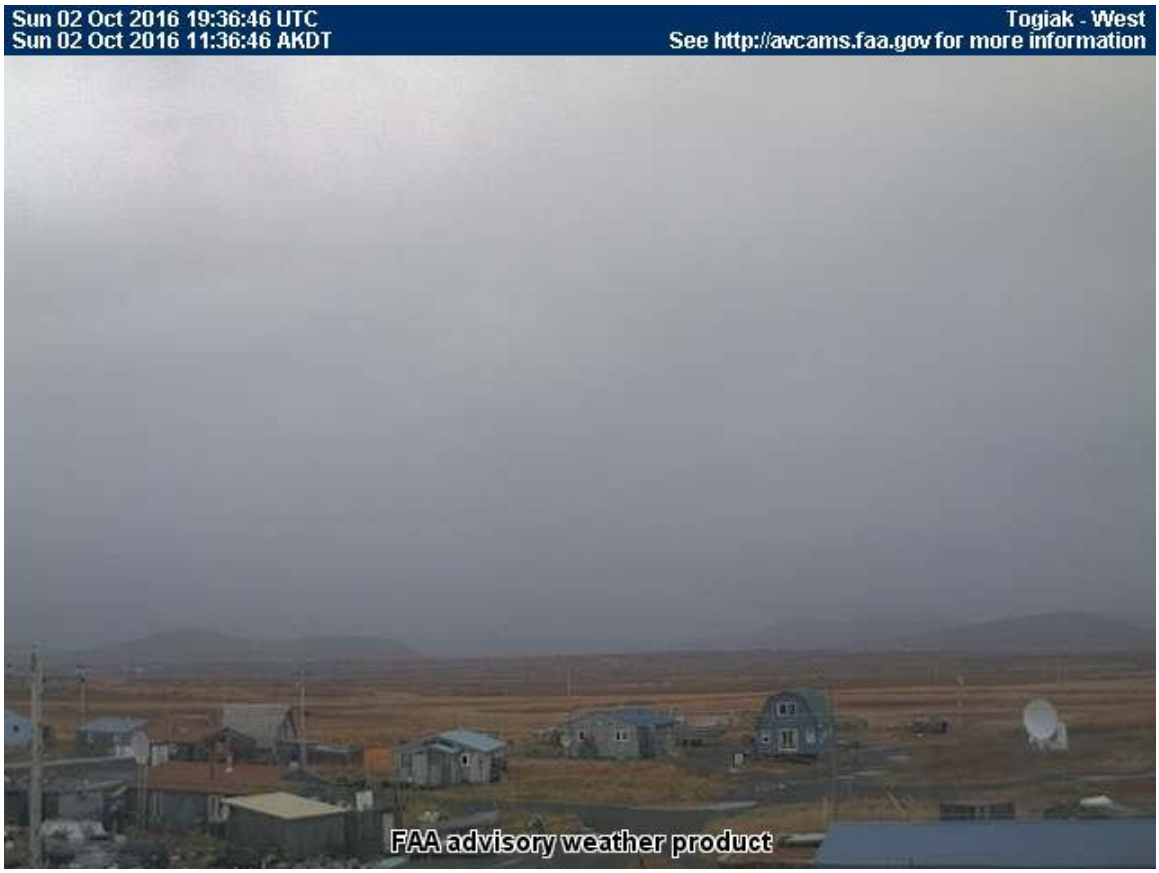

Figure 11 – West-facing Togiak camera image at about 1136 AKDT.

Figure 12 – West-facing Togiak camera image at about 1146 AKDT.

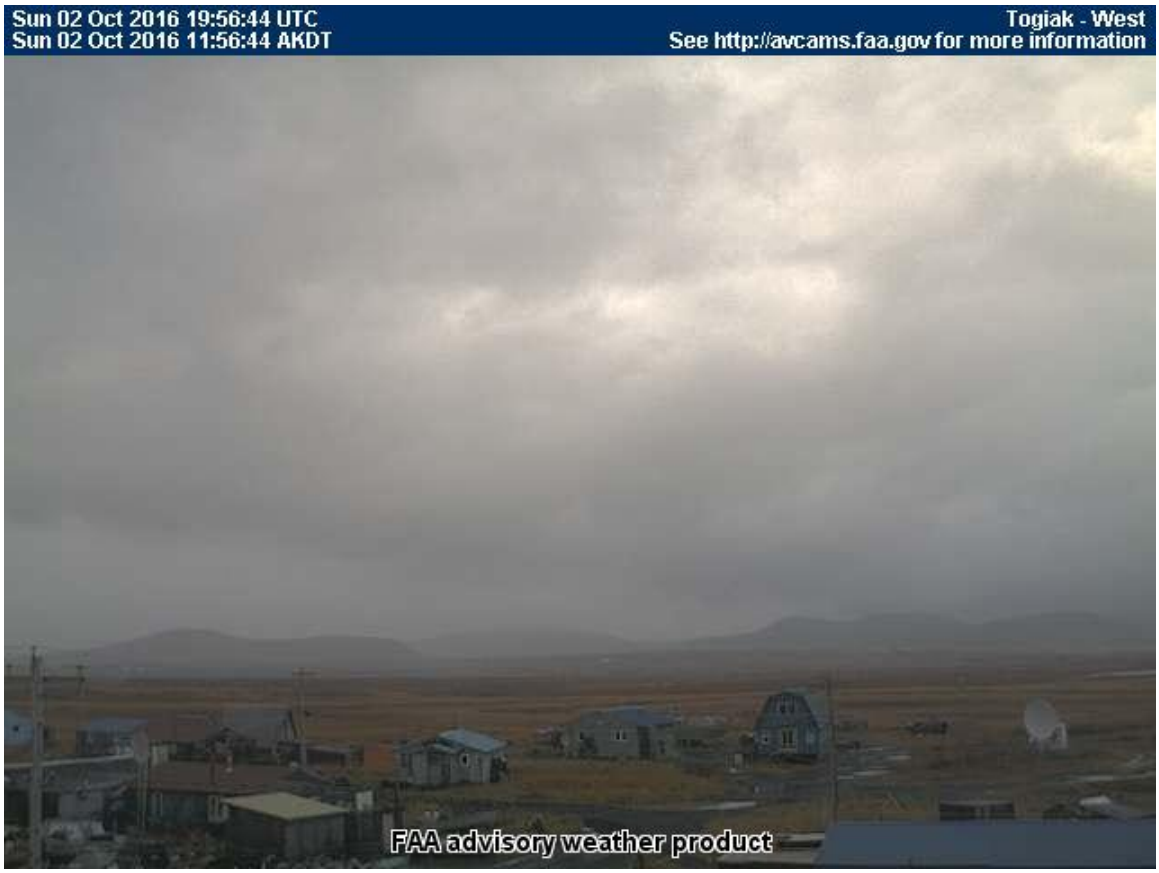

Figure 13 – West-facing Togiak camera image at about 1156 AKDT.

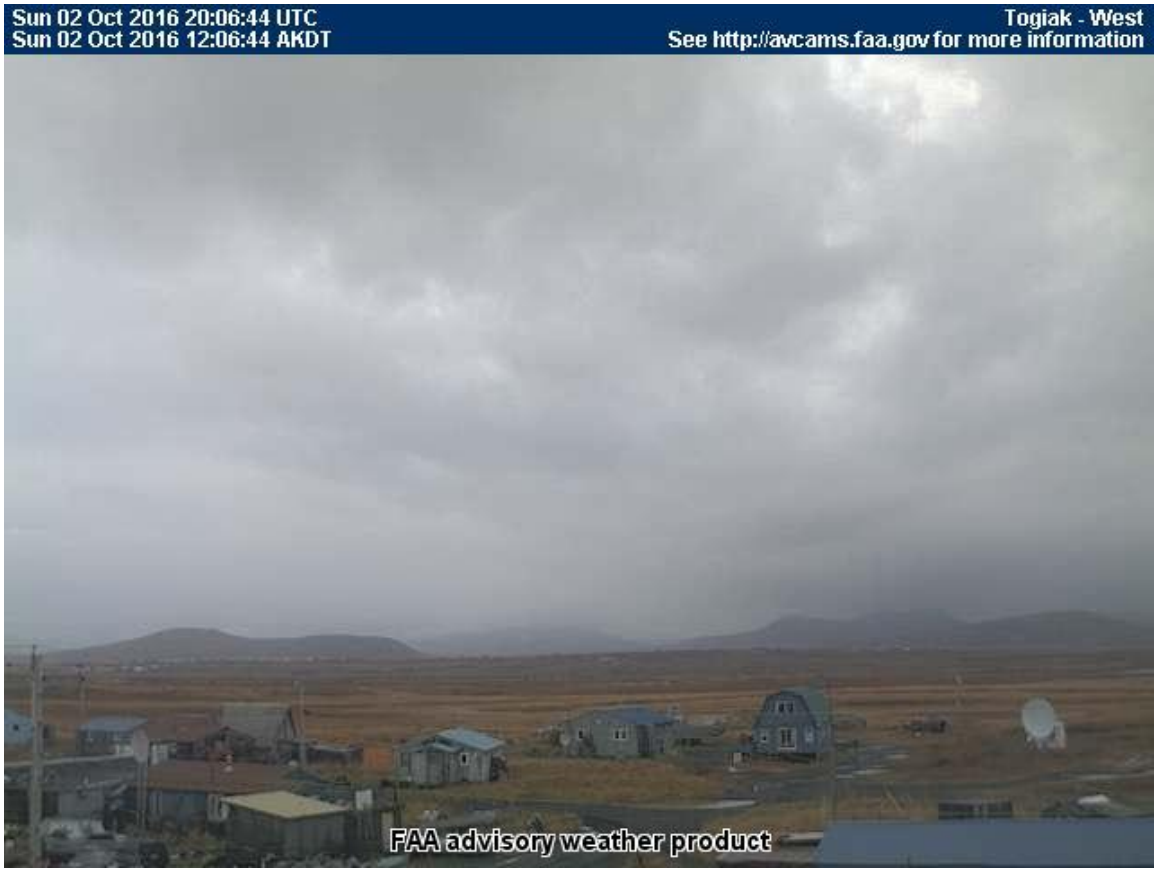

Figure 14 – West-facing Togiak camera image at about 1206 AKDT.

Figure 15 – West-facing Togiak camera image at about 1216 AKDT.

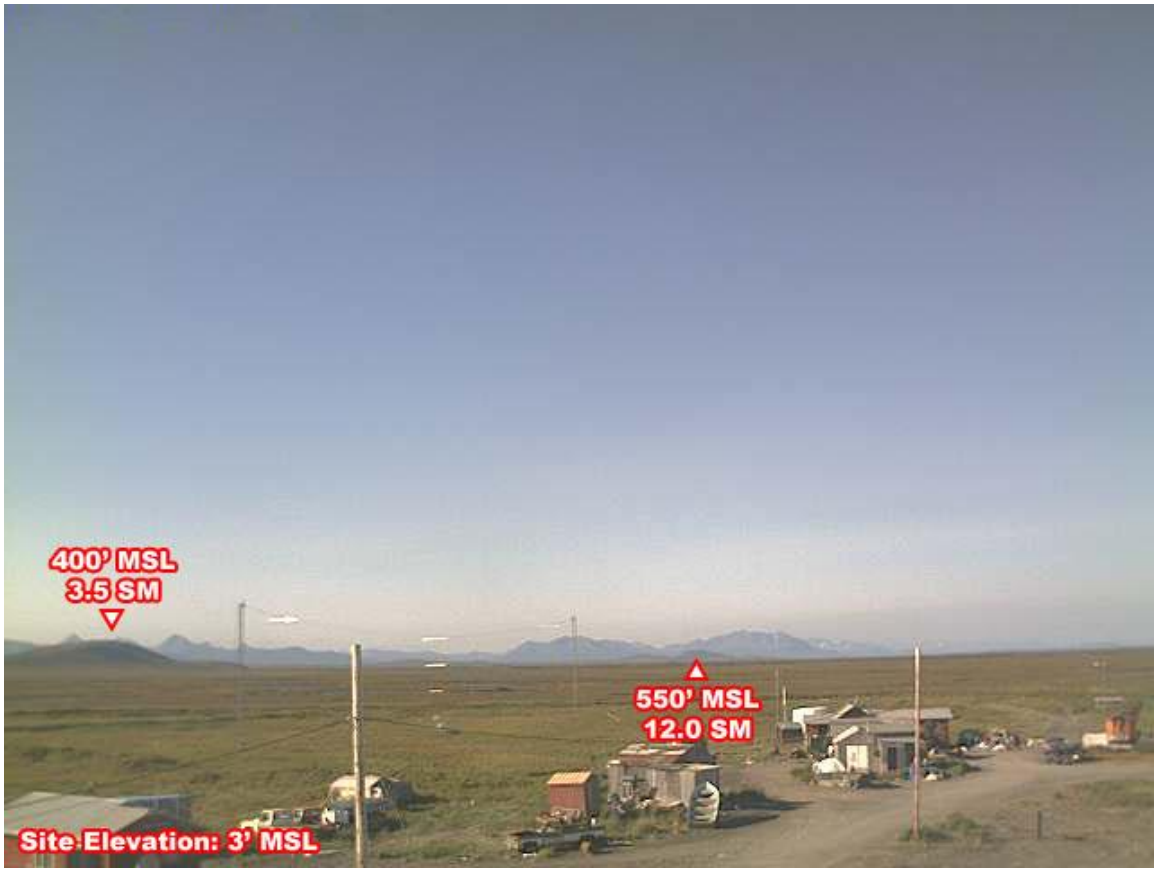

Figure 16 – Clear day image for the north-facing Togiak FAA weather camera.

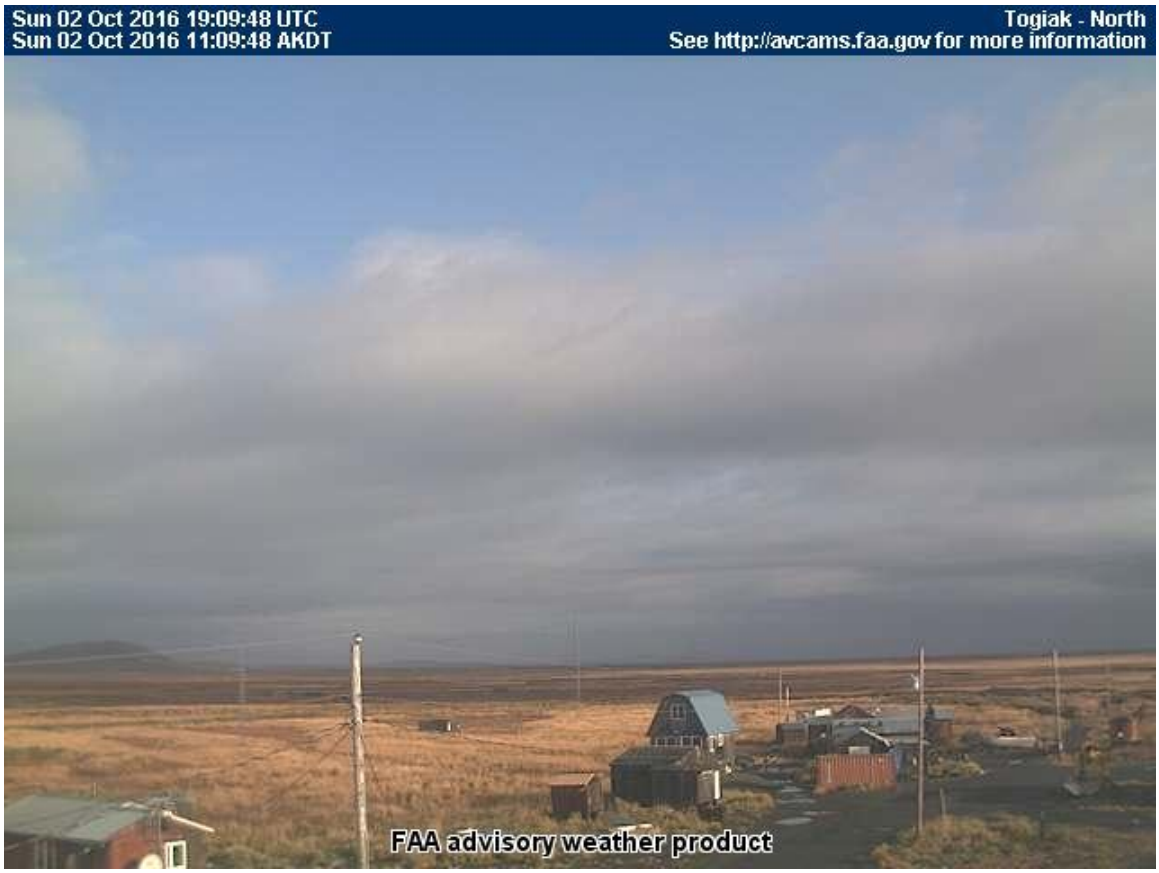

Figure 17 – North-facing Togiak camera image at about 1109 AKDT.

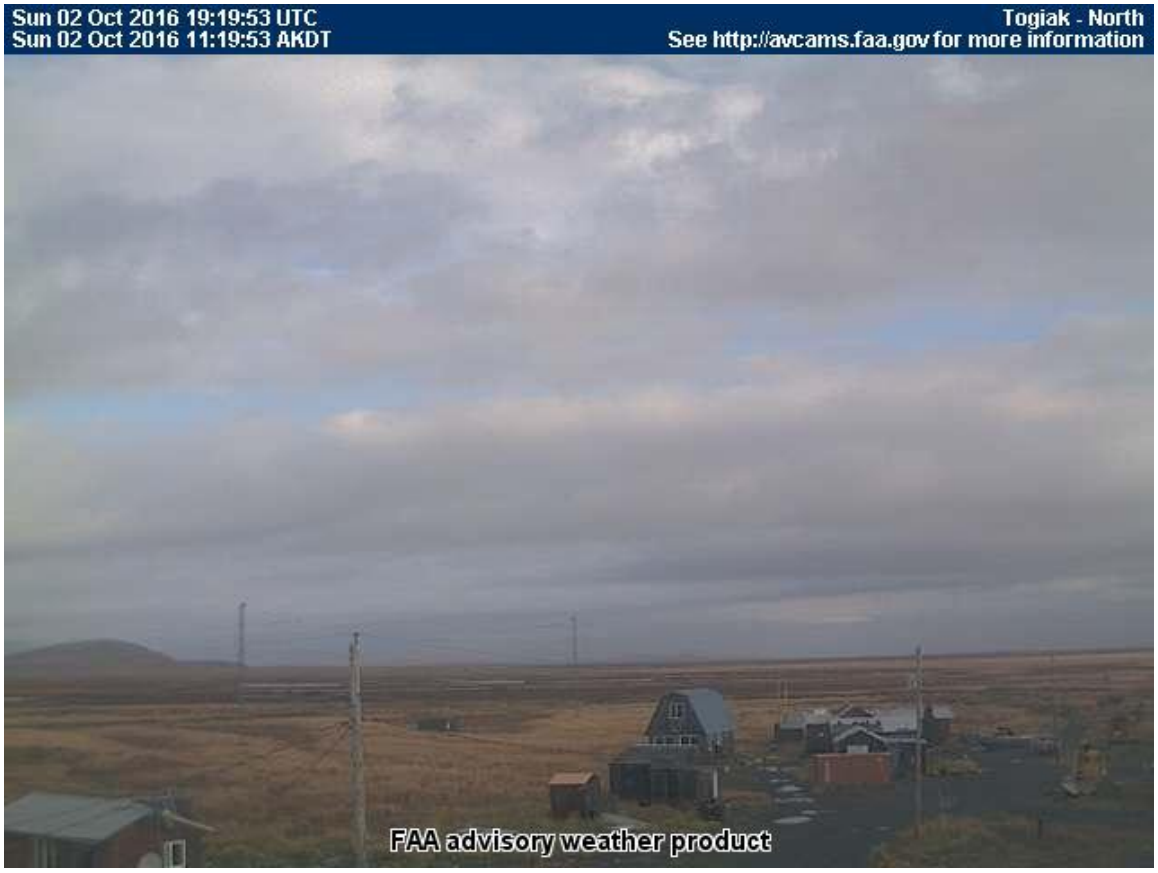

Figure 18 – North-facing Togiak camera image at about 1119 AKDT.

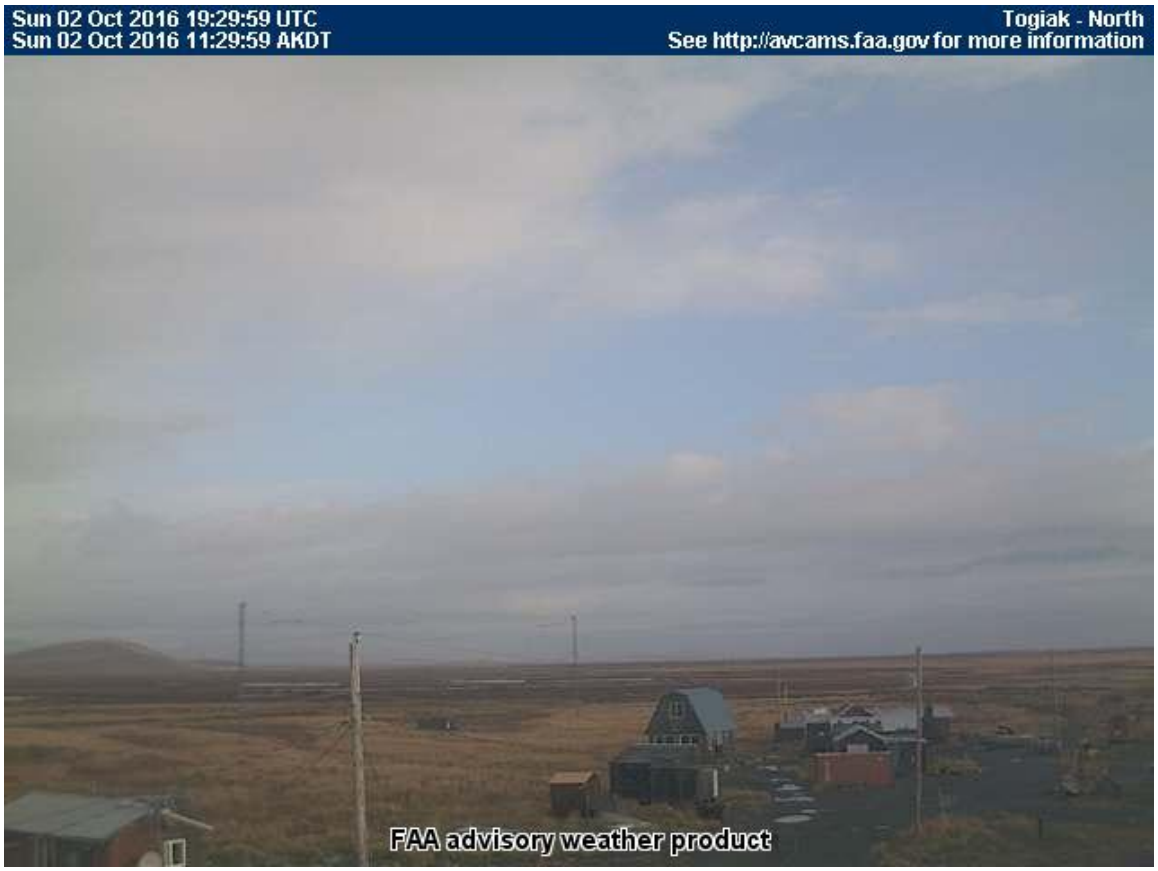

Figure 19 – North-facing Togiak camera image at about 1129 AKDT.

Figure 20 – North-facing Togiak camera image at about 1139 AKDT.

Figure 21 – North-facing Togiak camera image at about 1149 AKDT.

Figure 22 – North-facing Togiak camera image at about 1159 AKDT.

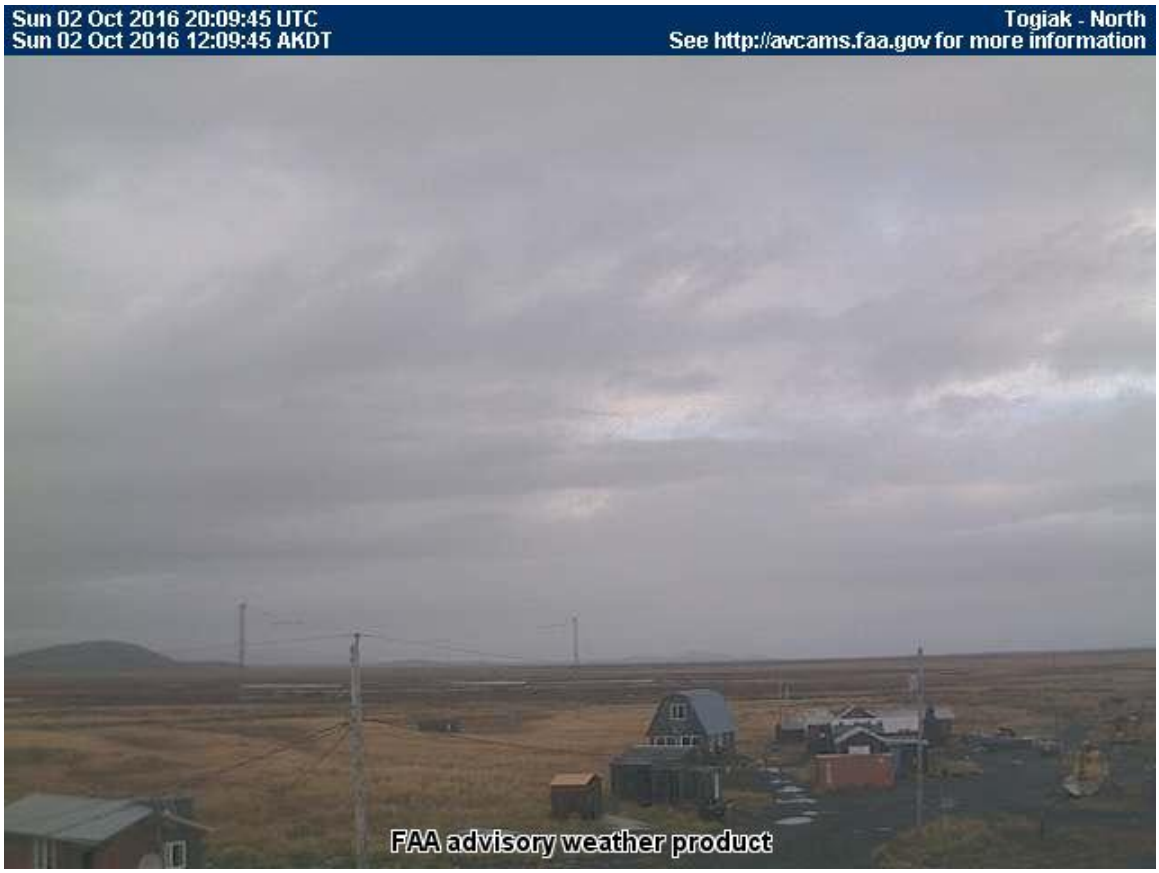

Figure 23 – North-facing Togiak camera image at about 1209 AKDT.

9.0 AIRMETs

An Airmen's Meteorological Information (AIRMET) advisory for instrument flight rules (IFR)[3] conditions and mountain obscuration was issued at 0428 AKDT for the region of the accident. It advised of occasional IFR conditions, light rain and mist north of a line between Togiak Airport and King Salmon Airport in King Salmon, Alaska, and elsewhere along the Aleutian Range. It also advised that mountains would occasionally be obscured in clouds and precipitation.

WAAK48 PAWU 021228
WA8O
ANCS WA 021226 COR
AIRMET SIERRA FOR IFR AND MT OBSC VALID UNTIL 022015
.
BRISTOL BAY AH
N PATG-PAKN LN AND ELSW ALG ALEUTIAN RANGE OCNL CIG BLW 010/VIS BLW 3SM -RA BR. NC.
.
BRISTOL BAY AH
MTS OCNL OBSC CLDS/PCPN. NC.

10.0 SIGMETs

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

11.0 Area Forecast

An Area Forecast that included the forecast for the accident location was issued by the Alaska Aviation Weather Unit at 0428 AKDT. The Area Forecast included the AIRMET information, and for the area north of a line between Togiak Airport and King Salmon Airport in King Salmon, Alaska, and elsewhere along the Aleutian Range, it added scattered clouds at 500 feet, a broken ceiling at 1,500 feet and an overcast cloud base at 2,500 feet with cloud tops to 16,000 feet and layered clouds above to FL200[4] with light rain. Elsewhere in the region it advised of scattered clouds at 1,500 feet, a broken ceiling at 2,500 feet and an overcast cloud base at 4,500 feet with

[3] IFR conditions - ceilings less than 1,000 feet agl and/or surface visibility less than three statute miles.
[4] Flight Level (FL) - a standard nominal altitude of an aircraft, in hundreds of feet. This altitude is calculated from the International standard pressure datum of 1013.25 hPa (29.92 in Hg), the average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above msl or agl.

cloud tops to 12,000 feet with decreasingly separated cloud layers above to FL200, occasional broken ceiling at 2,500 feet and isolated visibility of 5 statute miles with light rain showers.

FAAK58 PAWU 021228
FA8W
ANCC FA 021224 COR
AK SRN HLF EXCP SE AK...
.
AIRMETS VALID UNTIL 022015
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 030000
...CLOUDS/WX...UPDT
*****AIRMET IFR***N PATG-PAKN LN AND ELSW ALG ALEUTIAN RANGE OCNL CIG BLW 010/VIS BLW 3SM -RA BR. NC...**
*****AIRMET MT OBSC***MTS OCNL OBSC CLDS/PCPN. NC...**
N PATG-PAKN AND ELSW ALG ALEUTIAN RANGE SCT005 BKN015 OVC025 TOP 160 LYRS ABV TO FL200 -RA. OCNL CIG BLW 010/VIS BLW 3SM -RA BR.
ELSW SCT015 BKN025 OVC045 TOP 120 DCRG SEPD LYRS ABV TO FL200. OCNL BKN025. ISOL VIS 5SM -SHRA.
OFSHR/ALG W FACING CST SFC WND W 20G30KT.
TIL 21Z VCY GAPS ALEUTIAN RANGE SFC WND NW 20G30KT.
OTLK VALID 030000-030600...MVFR CIG SHRA.
...TURB...
TIL 21Z AKPEN S PAKN ISOL MOD TURB BLW 040.
...ICE AND FZLVL...
NE PANW ISOL MOD ICEIC 070-150. FZLVL 040.

12.0 AAWU Graphical Products

Graphical forecasts issued by the Alaska Aviation Weather Unit (AAWU) applicable to the accident time are presented here.

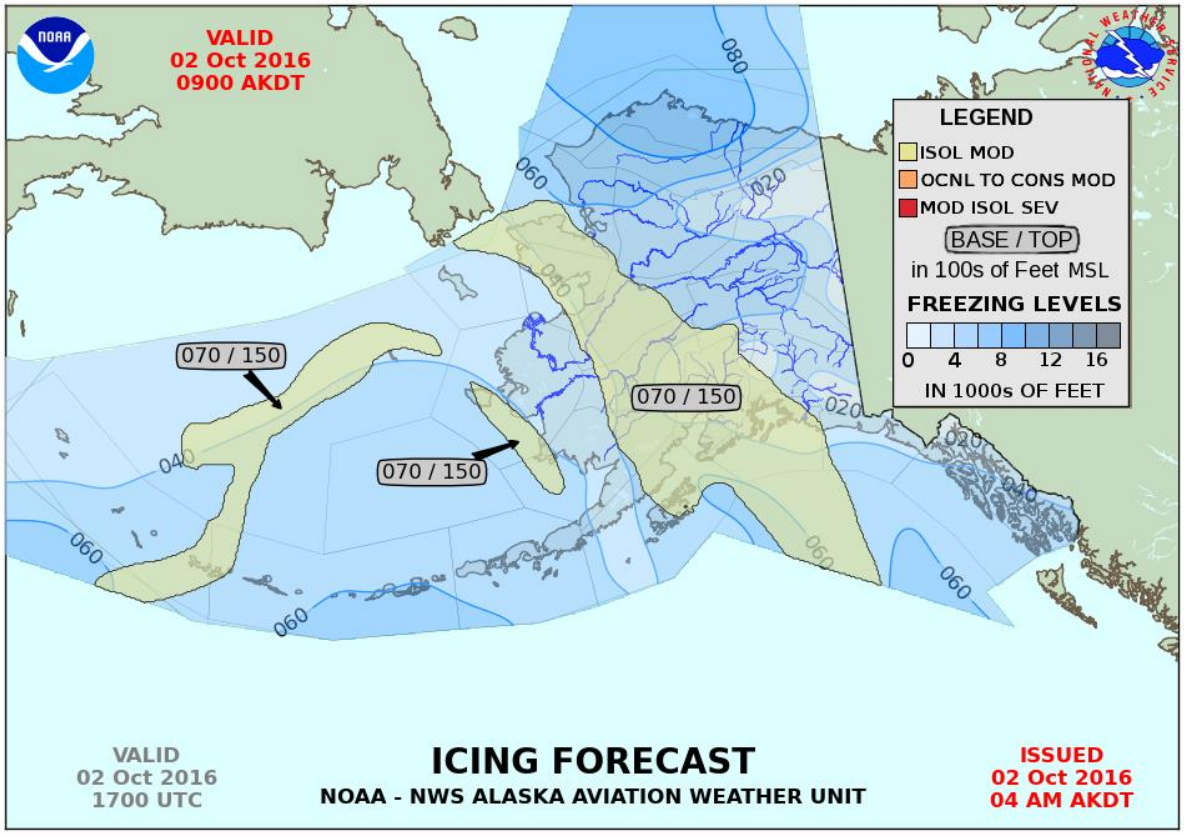

Figure 24 – AAWU icing forecast issued at 0400 AKDT and valid for 0900 AKDT.

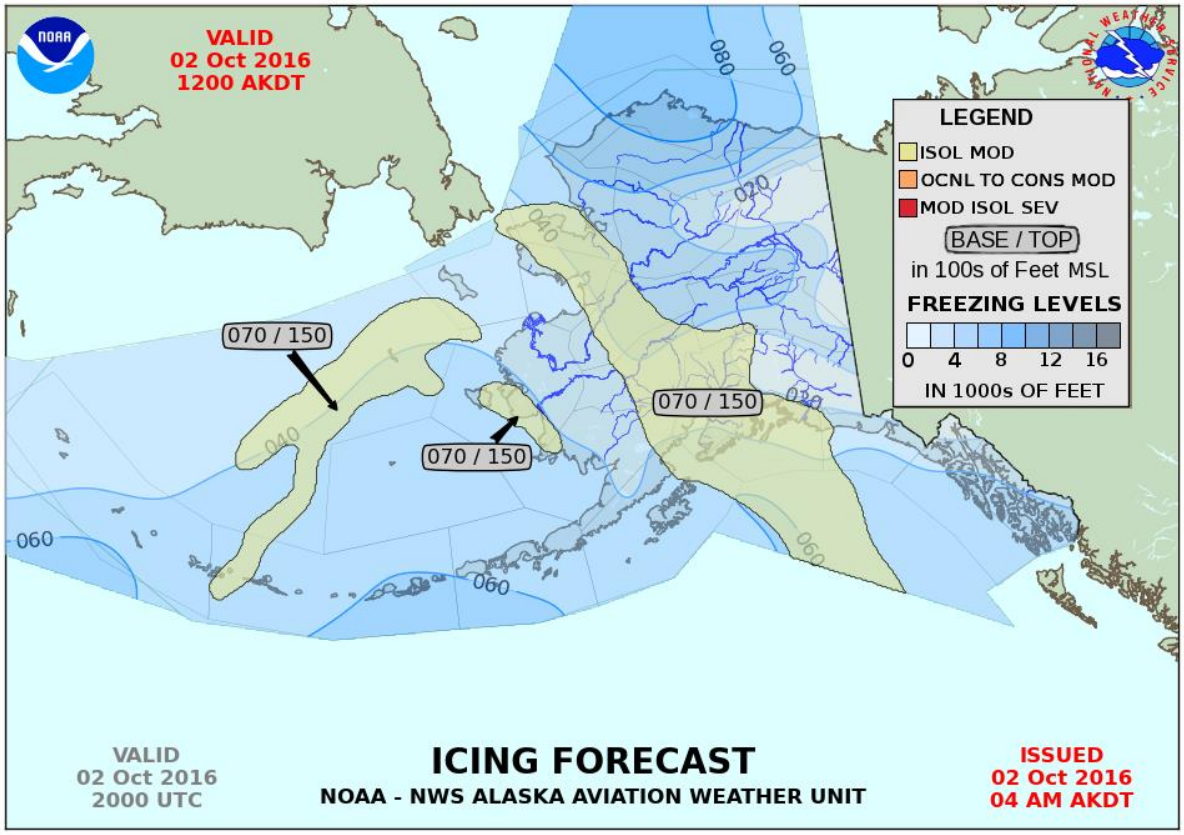

Figure 25 – AAWU icing forecast issued at 0400 AKDT and valid for 1200 AKDT.

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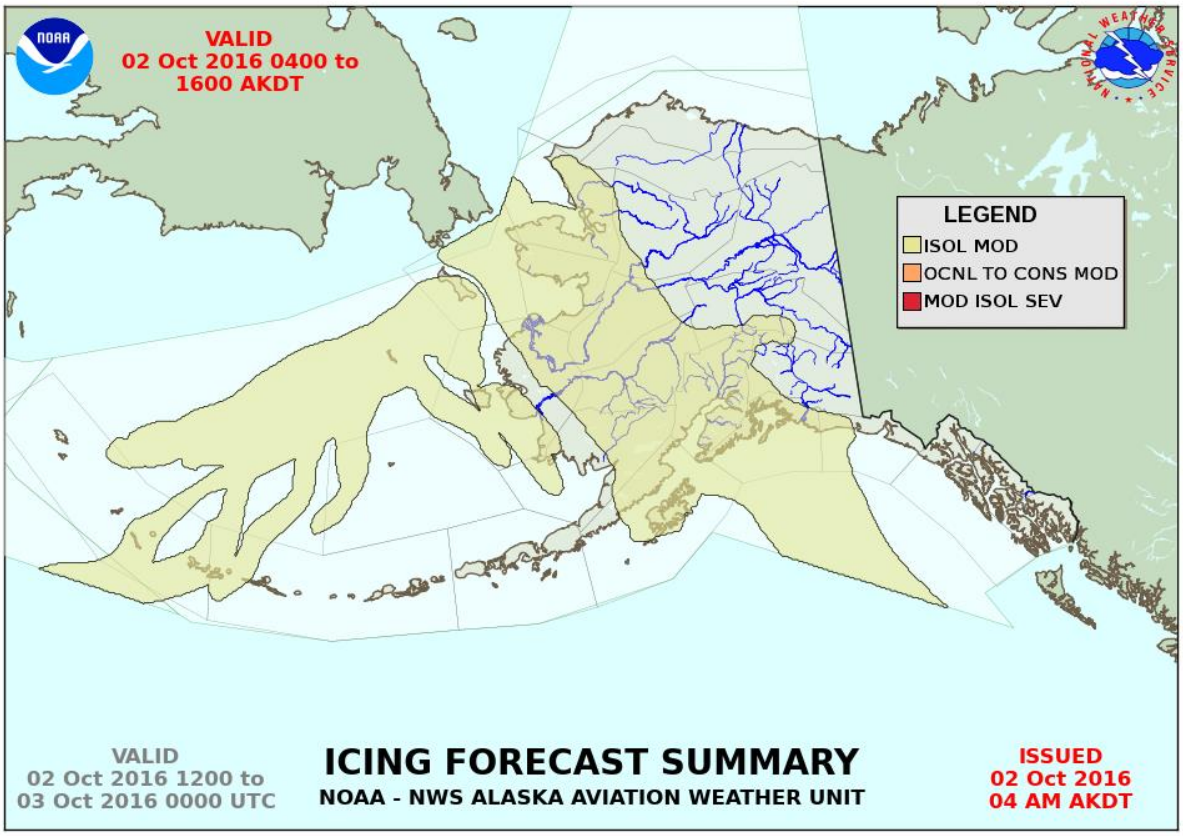

Figure 26 – AAWU icing forecast summary issued at 0400 AKDT and valid for the time period 0400 to 1600 AKDT.

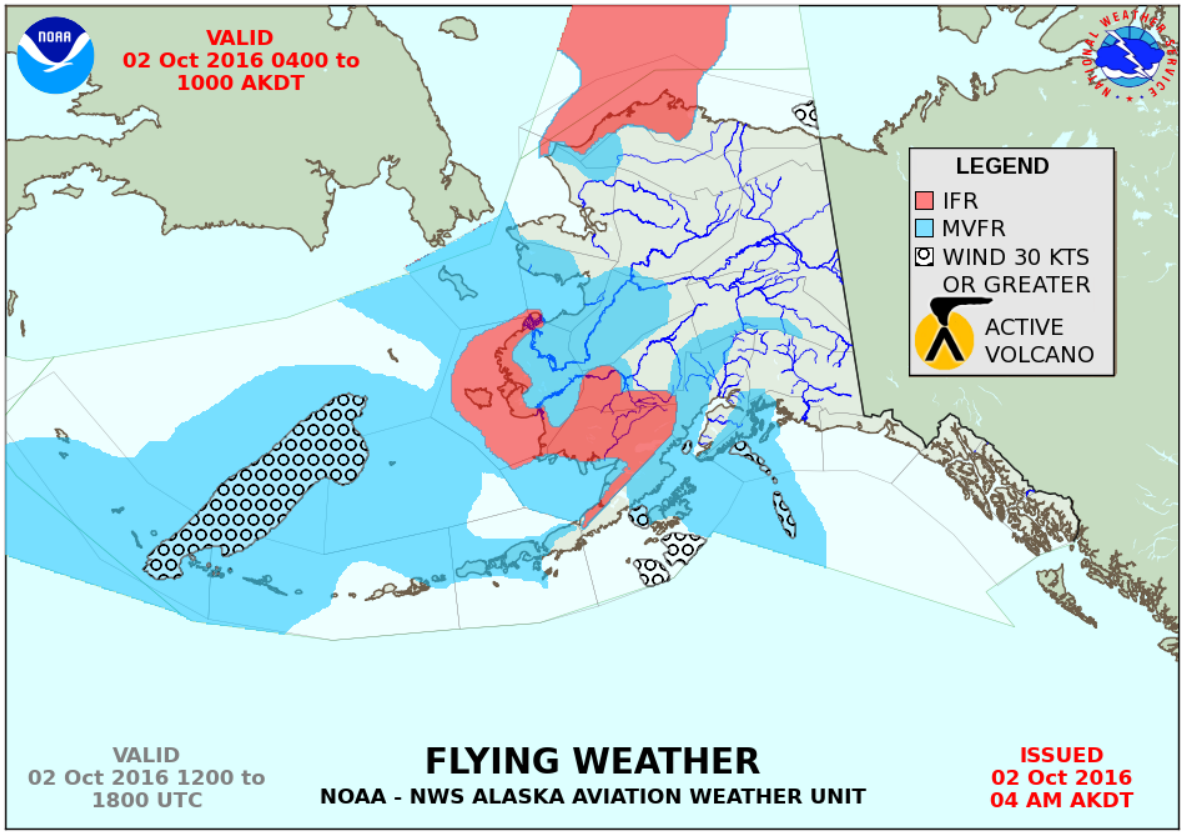

Figure 27 – AAWU Flying Weather forecast issued at 0400 AKDT and valid for the time period 0400 to 1000 AKDT.

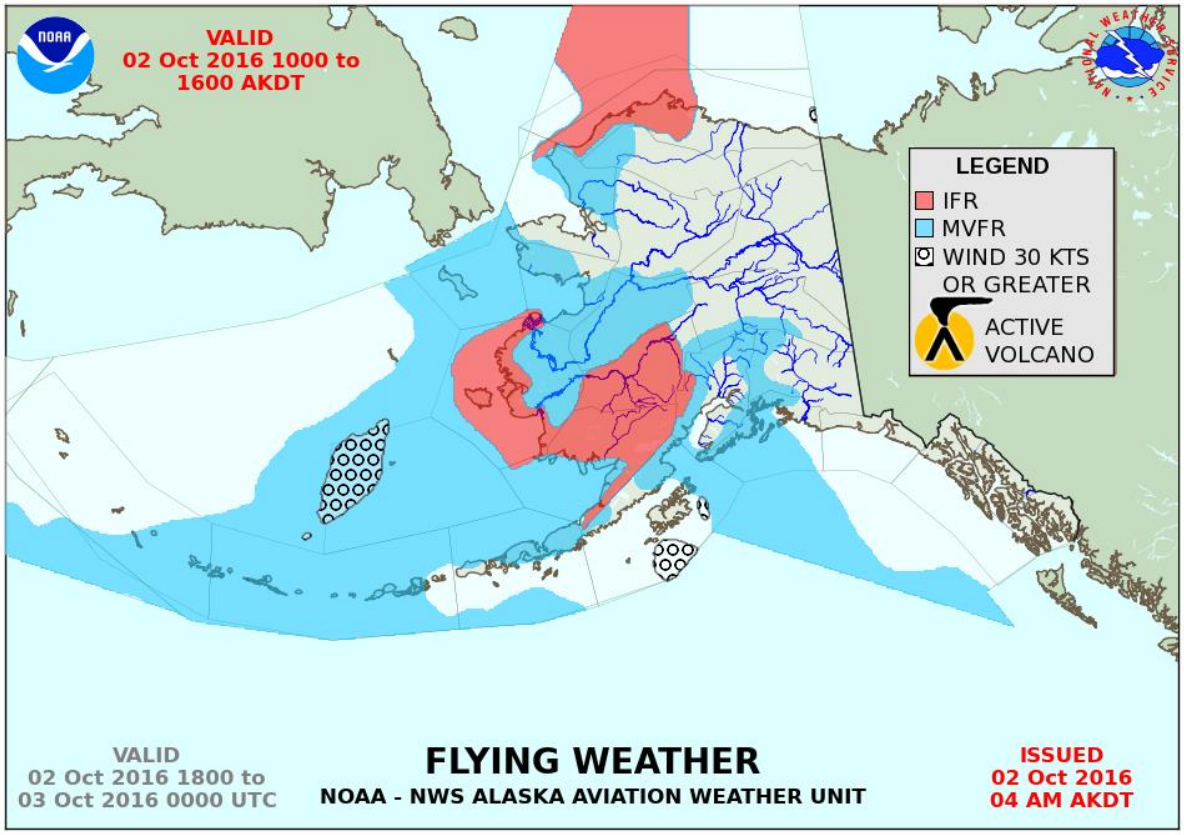

Figure 28 – AAWU Flying Weather forecast issued at 0400 AKDT and valid for the time period 1000 to 1600 AKDT.

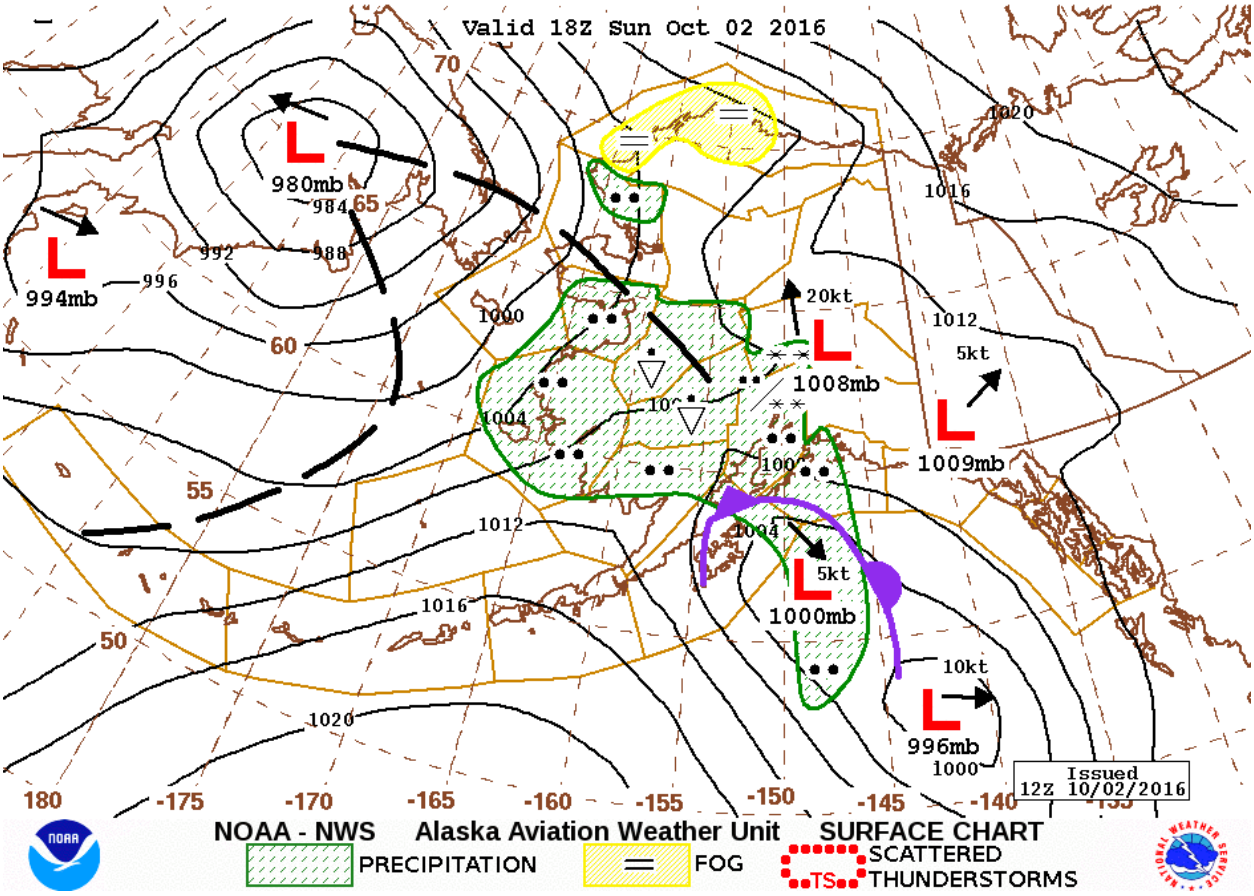

Figure 29 – AAWU Surface forecast issued at 0400 AKDT and valid for 1000 AKDT.

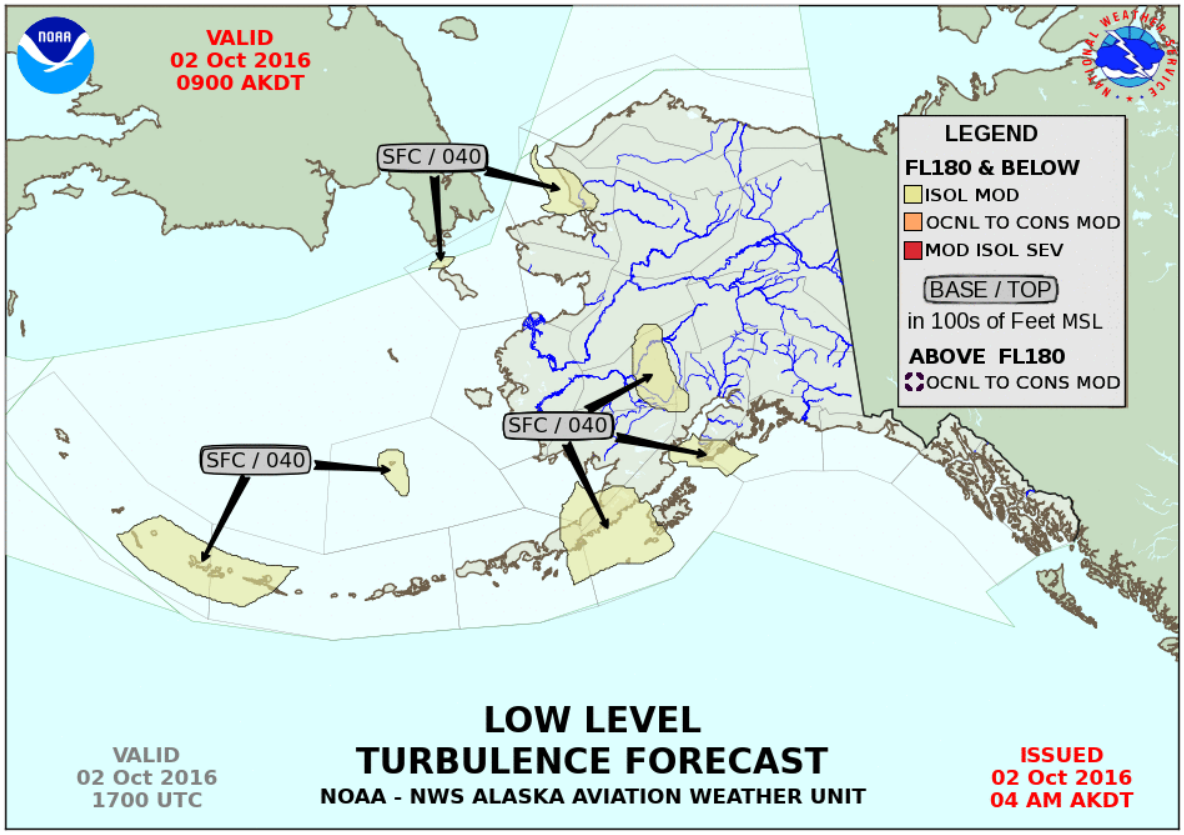

Figure 30 – AAWU Low Level Turbulence forecast issued at 0400 AKDT and valid for 0900 AKDT.

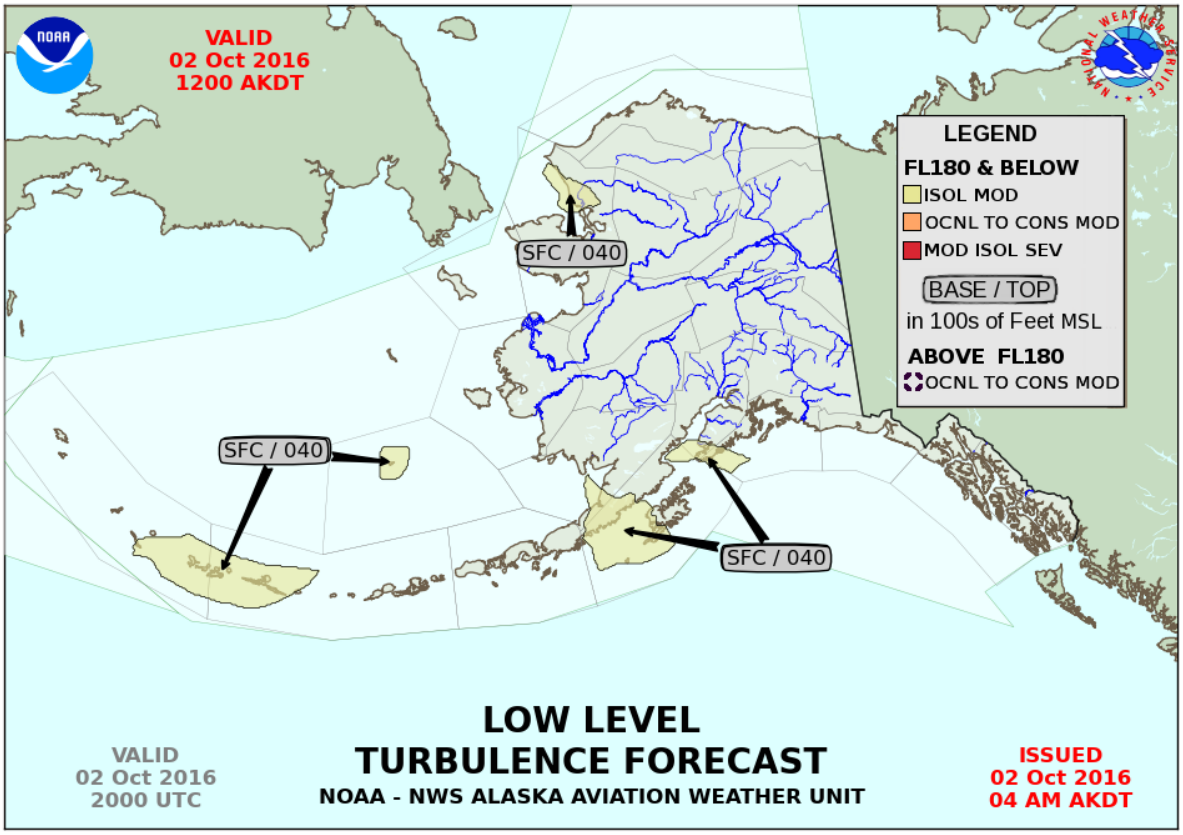

Figure 31 – AAWU Low Level Turbulence forecast issued at 0400 AKDT and valid for 1200 AKDT.

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 location at the accident time.

Submitted by:

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Mike Richards
Senior Meteorologist

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