



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

March 17, 2016

Group Chairman's Weather Study Report

METEOROLOGY

ANC15FA049

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A. ACCIDENT

Location: 28 miles west-northwest of Juneau, Alaska
Date: July 17, 2015
Time: approximately 1320 Alaska daylight time (2120 UTC¹)
Aircraft: Cessna 207, registration: N62AK

B. METEOROLOGY GROUP

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C. SUMMARY

For a summary of the accident, refer to the *Accident Summary* report, which is available in the docket for this investigation.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Meteorologist was not on scene for this investigation and gathered all the weather data for this investigation from the NTSB's Washington D.C. office and from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Climatic Data Center (NCDC). All times are Alaska daylight time (AKDT) on July 17, 2015, and are based upon the 24-hour clock, where local time is -8 hours from UTC, and UTC=Z (unless otherwise noted). Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 58.34° N, longitude 135.07° W, approximately elevation: 1,275 feet.

¹ UTC – is an abbreviation for Coordinated Universal Time.

E. FACTUAL INFORMATION

1.0 Synoptic Situation

The synoptic or large scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction (NCEP), and the Weather Prediction Center (WPC) located in College Park, Maryland. These are the base products used in describing synoptic weather features and in the creation of forecasts and warnings for the NWS. Reference to these charts can be found in the, joint NWS and Federal Aviation Administration (FAA) Advisory Circular “Aviation Weather Services”, AC-0045G CHG 1.

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart for 1300 AKDT is provided as figure 1 with the approximate location of the accident site marked. The chart depicted a surface trough² to the north of the accident site located in the Yukon stretching northward into eastern Alaska. A stationary front was located in the central Gulf of Alaska stretch westward south of the Aleutian Island chain. A surface high pressure center with a pressure of 1038-hectopascals (hPa) was located off the west coast of North America well southwest of southeastern Alaska in the northeastern Pacific Ocean. The station models around the accident site depicted air temperatures in the upper 50’s to low 60’s Fahrenheit (F), with temperature-dew point spreads of 4° F or less, a southwest to southeast wind between 5 and 15 knots, cloudy skies, and areas of light rain. With surface high pressure located off the coast of southeastern Alaska and lower pressure inland (in the Yukon near the surface trough), this would have promoted onshore flow conditions with the wind flowing towards the mountainous terrain of southeastern Alaska, favoring the development of continued widespread cloudy conditions and precipitation.

² Trough – An elongated area of relatively low atmospheric pressure or heights.

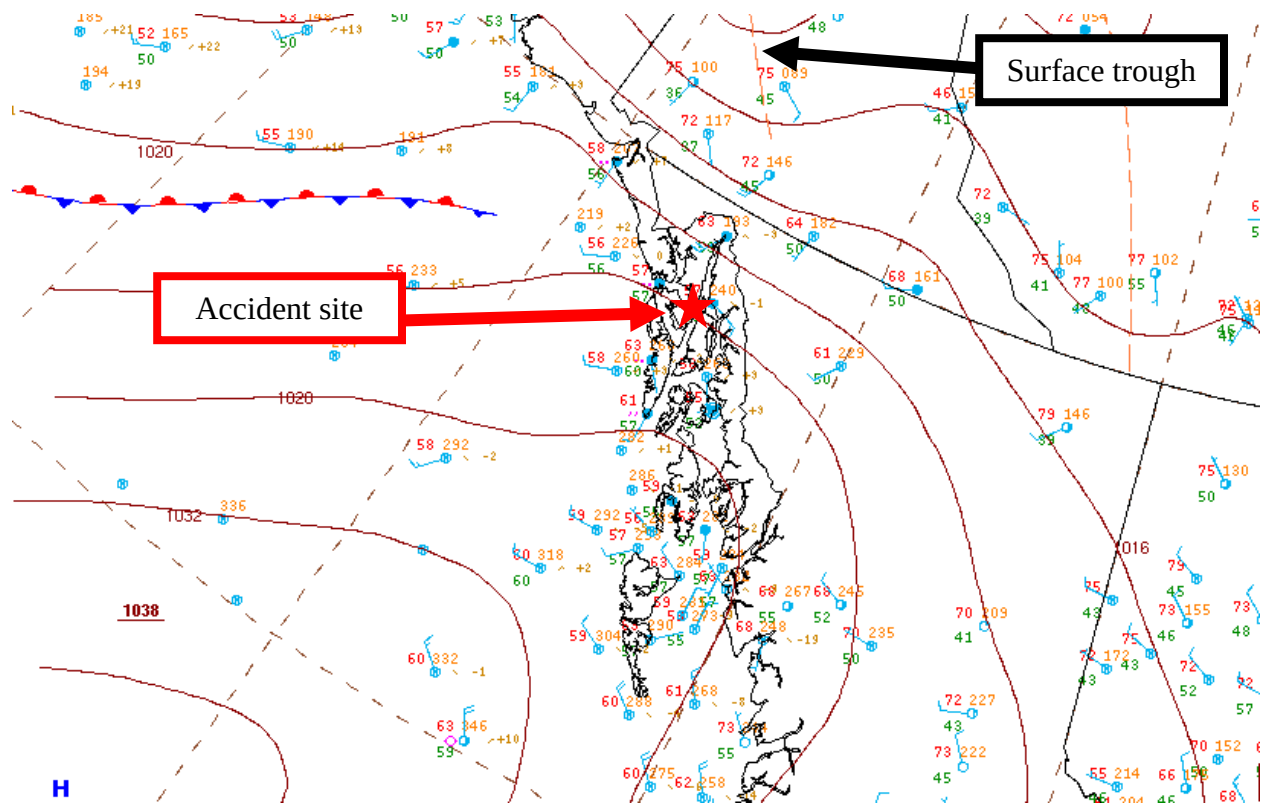


Figure 1 – NWS Surface Analysis Chart for 1300 AKDT

2.0 Storm Prediction Center Products

There was no SPC Day 1 Convective Outlook issued for the accident site at the accident time.

3.0 Surface Observations

The area surrounding the accident site was documented utilizing official NWS Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). The following observations were taken from standard code and are provided in plain language.

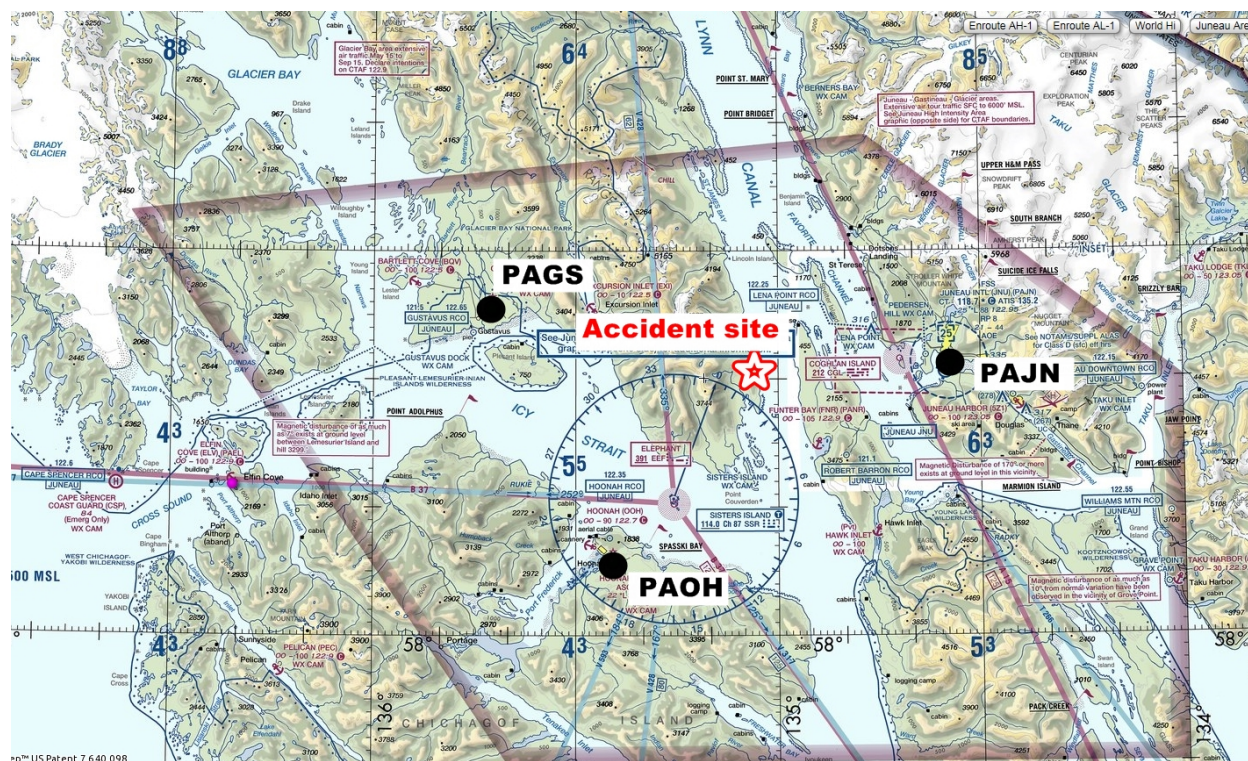


Figure 2 – Map of Alaska with the location of the accident site and surface observation sites

Hoonah Airport (PAOH) was the closest official weather station to the accident site along with being the destination airport. PAOH was located 1 mile southeast of Hoonah, Alaska and had an Automated Surface Observing System (ASOS³) whose reports were not supplemented. PAOH was located 16 miles south-southwest of the accident site, at an elevation of 22 feet, and had a 20° easterly magnetic variation (figure 2). The following observations were taken and disseminated during the times surrounding the accident: ⁴

[1125 AKDT] PAOH 171925Z AUTO 00000KT 10SM FEW021 SCT028 OVC034
17/15 A3022 RMK AO2 TSNO \$=

[1156 AKDT] PAOH 171956Z AUTO 05003KT 10SM FEW022 OVC034 18/16
A3021 RMK AO2 TSNO T01770155 SLP230 \$=

**[1225 AKDT] PAOH 172025Z AUTO 08004KT 10SM BKN022 OVC033 17/15
A3021 RMK AO2 TSNO BKN V SCT \$=**

**[1256 AKDT] PAOH 172056Z AUTO 00000KT 10SM FEW024 OVC034 18/16
A3021 RMK AO2 TSNO 55001 T01770155 OVC V BKN SLP232 \$=**

³ ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, ceiling, temperature, dewpoint, altimeter, and barometric pressure.

⁴ The bold sections in this NWS product and the rest of products in the weather study report are to highlight the individual sections that directly reference the weather conditions that are or will affect the accident location around the accident time.

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***[1356 AKDT] PAOH 172156Z AUTO VRB04KT 10SM BKN036 18/15 A3021 RMK
AO2 TSNO T01770150 SLP231 \$=***

***[1456 AKDT] PAOH 172256Z AUTO VRB04KT 10SM OVC036 18/14 A3022 RMK
AO2 TSNO T01830144 SLP234 \$=***

***[1556 AKDT] PAOH 172356Z AUTO VRB05KT 10SM FEW021 BKN036 BKN070
18/14 A3021 RMK AO2 TSNO 58002 T01880138 10188 20161 SLP232 \$=***

***[1656 AKDT] PAOH 180056Z AUTO 26008KT 10SM BKN036 BKN065 BKN080
18/14 A3020 RMK AO2 TSNO T01830138 BKN V SCT SLP228 \$=***

PAOH weather at 1225 AKDT, wind from 080° at 4 knots, 10 miles visibility, a broken ceiling at 2,200 feet above ground level (agl), overcast skies at 3,300 feet agl, temperature of 17° Celsius (C), dew point temperature of 15° C, and an altimeter setting of 30.21 inches of mercury. Remarks: automated station with a precipitation discriminator, lightning detection system sensor not operating, broken variable scattered skies, maintenance is needed on the system.

PAOH weather at 1256 AKDT, wind calm, 10 miles visibility, few clouds at 2,400 feet agl, an overcast ceiling at 3,400 feet agl, temperature of 18° C, dew point temperature of 16° C, and an altimeter setting of 30.21 inches of mercury. Remarks: automated station with a precipitation discriminator, lightning detection system sensor not operating, 3-hourly pressure decrease of 0.1 hPa, temperature 17.7° C, dew point temperature 15.5° C, overcast variable broken skies, sea level pressure 1023.2 hPa, maintenance is needed on the system.

PAOH weather at 1356 AKDT, variable wind at 4 knots, 10 miles visibility, a broken ceiling at 3,600 feet agl, temperature of 18° C, dew point temperature of 15° C, and an altimeter setting of 30.21 inches of mercury. Remarks: automated station with a precipitation discriminator, lightning detection system sensor not operating, temperature 17.7° C, dew point temperature 15.0° C, sea level pressure 1023.1 hPa, maintenance is needed on the system.

PAOH weather at 1456 AKDT, variable wind at 4 knots, 10 miles visibility, an overcast ceiling at 3,600 feet agl, temperature of 18° C, dew point temperature of 14° C, and an altimeter setting of 30.22 inches of mercury. Remarks: automated station with a precipitation discriminator, lightning detection system sensor not operating, temperature 18.3° C, dew point temperature 14.4° C, sea level pressure 1023.4 hPa, maintenance is needed on the system.

Gustavus Airport (PAGS) was the next closest official site to the accident site, located in Gustavus, Alaska. PAGS had an Automated Weather Observing System (AWOS⁵) whose reports were not supplemented. PAGS was located 17 miles west-northwest of the accident site, at an elevation of 35 feet, and had a 20° easterly magnetic variation (figure 2). The following observations were taken and disseminated during the times surrounding the accident:

[1156 AKDT] PAGS 171956Z AUTO 13011KT 7SM FEW018 BKN027 OVC036
14/12 A3020 RMK AO1 PNO=

[1216 AKDT] PAGS 172016Z AUTO 14009KT 10SM SCT020 BKN027 OVC034
15/13 A3020 RMK AO1 PNO=

[1236 AKDT] PAGS 172036Z AUTO 13010KT 9SM BKN022 OVC030 15/12 A3020
RMK AO1 PNO=

***[1256 AKDT] PAGS 172056Z AUTO 13009KT 9SM SCT022 OVC031 15/13 A3020
RMK AO1 54000 PNO=***

***[1316 AKDT] PAGS 172116Z AUTO 12009KT 9SM BKN020 BKN029 OVC041
15/12 A3020 RMK AO1 PNO=***

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***[1336 AKDT] PAGS 172136Z AUTO 14009KT 10SM BKN018 BKN024 OVC033
15/13 A3020 RMK AO1 PNO=***

***[1356 AKDT] PAGS 172156Z AUTO 13007KT 9SM FEW018 SCT024 BKN032
15/12 A3020 RMK AO1 PNO=***

[1416 AKDT] PAGS 172216Z AUTO 13006KT 4SM SCT017 BKN032 OVC038
15/13 A3020 RMK AO1 PNO=

[1436 AKDT] PAGS 172236Z AUTO 13003KT 4SM BKN015 BKN028 OVC100
15/12 A3020 RMK AO1 PNO=

[1456 AKDT] PAGS 172256Z AUTO 12004KT 5SM FEW009 OVC013 15/13 A3020
RMK AO1 PNO=

[1516 AKDT] PAGS 172316Z AUTO 14005KT 5SM BKN009 OVC013 15/13 A3020
RMK AO1 PNO=

⁵ AWOS – Automated Weather Observing System is equipped with meteorological instruments to observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to twelve thousand feet, and altimeter setting.

PAGS weather at 1256 AKDT, wind from 130° at 9 knots, 9 miles visibility, scattered clouds at 2,200 feet agl, an overcast ceiling at 3,100 feet agl, temperature of 15° C, dew point temperature of 13° C, and an altimeter setting of 30.20 inches of mercury. Remarks: automated station without a precipitation discriminator, 3-hourly pressure change of 0.0 hPa, tipping bucket rain gauge sensor not operating.

PAGS weather at 1316 AKDT, wind from 120° at 9 knots, 9 miles visibility, a broken ceiling at 2,000 feet agl, broken skies at 2,900 feet agl, overcast skies at 4,100 feet agl, temperature of 15° C, dew point temperature of 12° C, and an altimeter setting of 30.20 inches of mercury. Remarks: automated station without a precipitation discriminator, tipping bucket rain gauge sensor not operating.

PAGS weather at 1336 AKDT, wind from 140° at 9 knots, 10 miles visibility, a broken ceiling at 1,800 feet agl, broken skies at 2,400 feet agl, overcast skies at 3,300 feet agl, temperature of 15° C, dew point temperature of 13° C, and an altimeter setting of 30.20 inches of mercury. Remarks: automated station without a precipitation discriminator, tipping bucket rain gauge sensor not operating.

PAGS weather at 1356 AKDT, wind from 130° at 7 knots, 9 miles visibility, few clouds at 1,800 feet agl, scattered clouds at 2,400 feet agl, a broken ceiling at 3,200 feet agl, temperature of 15° C, dew point temperature of 12° C, and an altimeter setting of 30.20 inches of mercury. Remarks: automated station without a precipitation discriminator, tipping bucket rain gauge sensor not operating.

Juneau International Airport (PAJN) was the departure airport, located 7 miles northwest of Juneau, Alaska. PAJN had an ASOS whose reports were supplemented by an official weather observer. PAJN was located 19 miles east of the accident site, at an elevation of 25 feet, and had a 20° easterly magnetic variation (figure 2). The following observations were taken and disseminated during the times surrounding the accident:

[0853 AKDT] PAJN 171653Z 10009KT 3SM -RA BR FEW004 OVC033 13/12
A3024 RMK AO2 SLP241 P0001 T01280122=

[0953 AKDT] PAJN 171753Z 09011KT 6SM -RA BR FEW002 OVC031 13/12
A3024 RMK AO2 SLP241 P0002 60006 T01330122 10133 20122 53004=

[1053 AKDT] PAJN 171853Z 11014G19KT 5SM -RA BR FEW002 OVC030 13/12
A3024 RMK AO2 RAE21B41 SLP240 P0000 T01330122=

**[1153 AKDT] PAJN 171953Z 10012KT 5SM -RA BR FEW003 OVC033 14/13
A3024 RMK AO2 SLP241 P0000 T01390128=**

**[1253 AKDT] PAJN 172053Z 11014KT 7SM -RA FEW002 OVC035 14/13 A3024
RMK AO2 SLP240 P0000 60000 T01390128 56001=**

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**[1353 AKDT] PAJN 172153Z 10012KT 3SM -RA BR FEW002 OVC033 14/13
A3024 RMK AO2 SLP240 P0001 T01390128=**

**[1453 AKDT] PAJN 172253Z 11012KT 4SM -RA BR FEW003 OVC034 14/13
A3023 RMK AO2 SLP237 P0002 T01390128=**

[1553 AKDT] PAJN 172353Z 11015G20KT 4SM -RA BR FEW003 OVC034 14/13
A3023 RMK AO2 SLP235 P0000 60003 T01440128 10144 20133 58005=

[1653 AKDT] PAJN 180053Z 10012KT 4SM -RA BR SCT004 OVC032 14/13
A3022 RMK AO2 SLP234 P0001 T01440128=

[1753 AKDT] PAJN 180153Z 09012KT 4SM -RA BR SCT003 OVC029 14/13
A3020 RMK AO2 SLP226 P0001 T01390128=

[1853 AKDT] PAJN 180253Z 09009KT 7SM -RA FEW003 OVC028 14/13 A3019
RMK AO2 SLP223 FEW V SCT P0000 60002 T01390128 58012=

PAJN weather at 1153 AKDT, wind from 100° at 12 knots, 5 miles visibility, light rain, mist, few clouds at 300 feet agl, an overcast ceiling at 3,300 feet agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 30.24 inches of mercury. Remarks: automated station with a precipitation discriminator, sea-level pressure 1024.1 hPa, one-hourly precipitation of a trace, temperature 13.9° C, dew point temperature 12.8° C.

PAJN weather at 1253 AKDT, wind from 110° at 14 knots, 7 miles visibility, light rain, few clouds at 200 feet agl, an overcast ceiling at 3,500 feet agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 30.24 inches of mercury. Remarks: automated station with a precipitation discriminator, sea-level pressure 1024.0 hPa, one-hourly precipitation of a trace, 6-hourly precipitation of a trace, temperature 13.9° C, dew point temperature 12.8° C, 3-hourly pressure decrease of 0.1 hPa.

PAJN weather at 1353 AKDT, wind from 100° at 12 knots, 3 miles visibility, light rain, mist, few clouds at 200 feet agl, an overcast ceiling at 3,300 feet agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 30.24 inches of mercury. Remarks: automated station with a precipitation discriminator, sea-level pressure 1024.0 hPa, one-hourly precipitation of 0.01 inches, temperature 13.9° C, dew point temperature 12.8° C.

PAJN weather at 1453 AKDT, wind from 110° at 12 knots, 4 miles visibility, light rain, mist, few clouds at 300 feet agl, an overcast ceiling at 3,400 feet agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 30.23 inches of mercury. Remarks: automated station with a precipitation discriminator, sea-level pressure 1023.7 hPa, one-hourly precipitation of 0.02 inches, temperature 13.9° C, dew point temperature 12.8° C.

The observations from PAOH, PAGS, and PAJN surrounding the accident time indicated MVFR⁶ ceilings with close to IFR⁷ visibilities at PAJN. All the observation points at these airports were relatively far away from the higher terrain that the accident flight flew near and therefore lower visibilities and ceilings would have been likely along the accident flight path. In addition, there was likely drizzle or light rain falling along the accident flight path as indicated by the surface observations from PAJN and the weather radar observations (section 6.4). Combining the above observations along with the FAA's Aviation Web Camera images surrounding the accident time near the accident flight (section 13.0), the accident flight likely encounter instrument meteorological conditions along the accident flight with restrictions in visibility and ceilings due to mist, clouds, and precipitation.

4.0 Upper Air Data

A Global Data Assimilation System (GDAS) computer model upper air sounding for the accident site was generated for 1300 AKDT. The 1300 AKDT sounding was plotted on a standard Skew-T log P diagram⁸ with the derived stability parameters included in figure 3 (with data from the surface to 700-hPa, or 10,000 feet msl.) This data was analyzed utilizing the RAOB⁹ software package. The sounding depicted the Lifted Condensation Level (LCL)¹⁰ at 1,147 feet msl and a Convective Condensation Level (CCL)¹¹ of 3,110 feet. The freezing level was located at 11,709 feet. The precipitable water value was 1.32 inches.

⁶ Marginal Visual Flight Rules – Refers to the general weather conditions pilots can expect at the surface. MVFR criteria means a ceiling between 1,000 and 3,000 feet agl and/or 3 to 5 miles visibility.

⁷ Instrument Flight Rules – Refers to the general weather conditions pilots can expect at the surface. IFR criteria means a ceiling below 1,000 feet agl and/or less than 3 miles visibility.

⁸ Skew T log P diagram – is a standard meteorological plot using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

⁹ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania.

¹⁰ Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹¹ Convective Condensation Level (CCL) – The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.



The sounding wind profile indicated a surface wind from 141° at 7 knots with the wind increasing to 15 knots by 2,000 feet msl while remaining out of the southeast. The wind continued to increase through 10,000 feet to near 25 knots with the wind slowly becoming more south and then westerly. No low-level wind shear (LLWS) was identified by RAOB between the surface and 10,000 feet msl, but there was a layer of clear air turbulence possible from 4,000 feet through 10,000 feet. Given the vertical environment of the lowest 2,000 feet msl, some gusty wind conditions could be expected at the accident site at the accident time (section 3.0).

5.0 Satellite Data

Visible and infrared data from the Geostationary Operational Environmental Satellite number 15 (GOES-15) data was obtained from the NCDC and processed with the NTSB's Man-computer Interactive Data Access System (McIDAS) workstation. Visible and infrared imagery (GOES-15 band 1 and 4) at wavelengths of 0.65 microns (μm) and 10.7 μm retrieved brightness temperatures for the scene. Satellite imagery surrounding the time of the accident, from 1800 AKDT through 2300 AKDT at approximately 15-minute intervals, were reviewed and the closest images to the time of the accident are documented here.

Figures 4 and 5 present the GOES-15 visible imagery from 1300 and 1330 AKDT at 2X magnification with the accident site marked by a red square. The visible imagery indicated abundant cloud cover over and around the accident site at the accident time with that cloud cover moving from west to east. Figure 6 presents the GOES-15 infrared imagery from 1330 AKDT at 6X magnification. Inspection of the infrared imagery indicated the more enhanced bands (yellows and greens, higher cloud tops) were located to the east of the accident site into northern British Columbia. Based on the brightness temperatures above the accident site and the vertical temperature profile provided by the 1300 AKDT GDAS sounding, the approximate cloud-top heights over the accident site were 16,500 feet at 1330 AKDT.

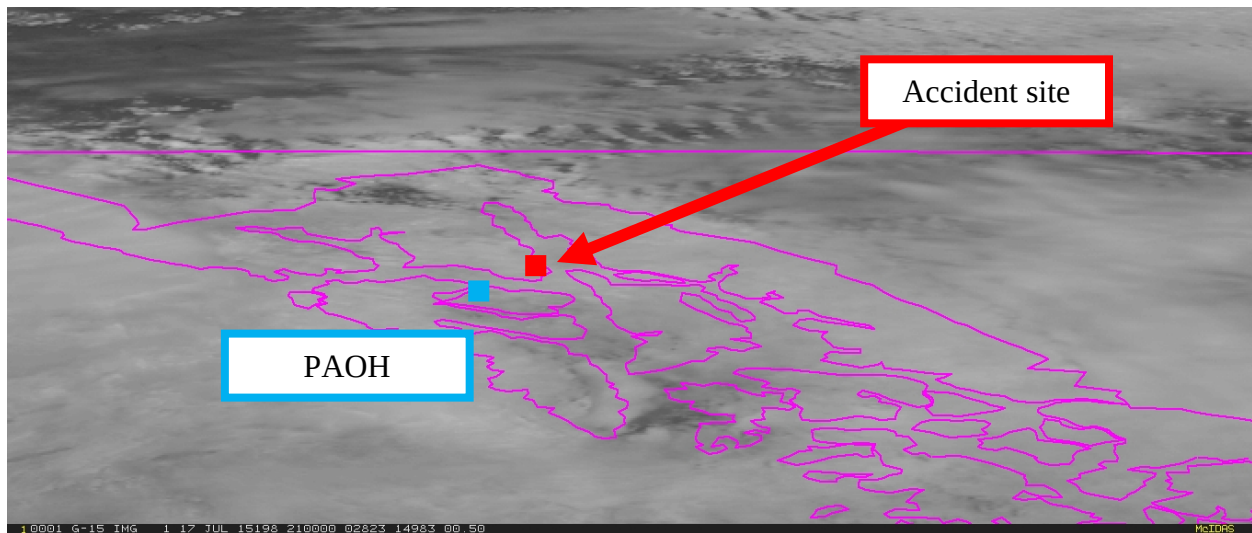


Figure 4 – GOES-15 visible image at 1300 AKDT

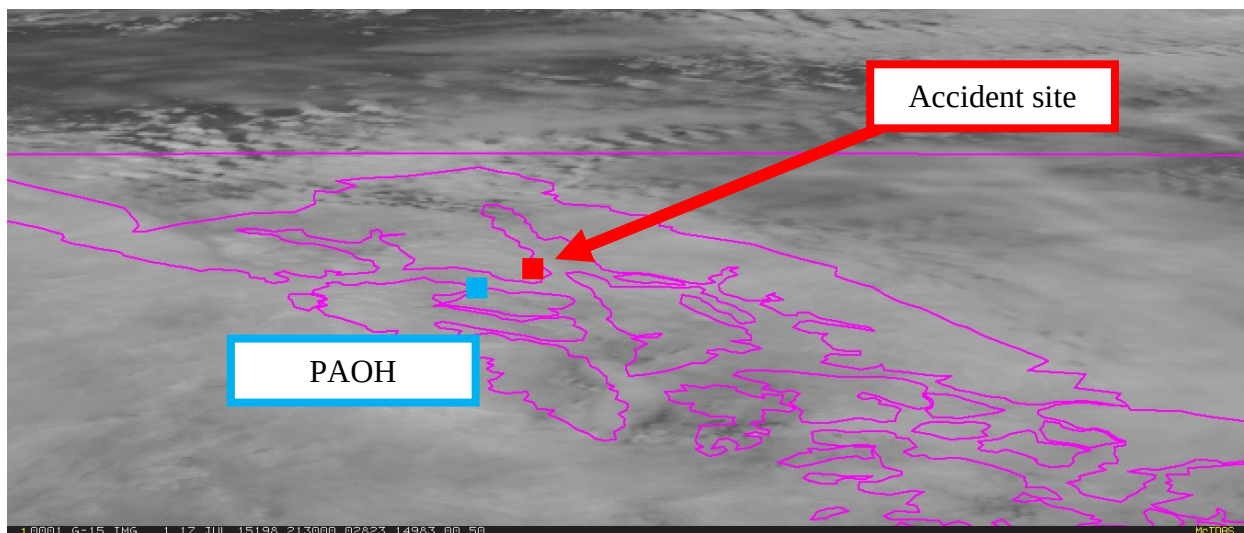


Figure 5 – GOES-15 visible image at 1330 AKDT

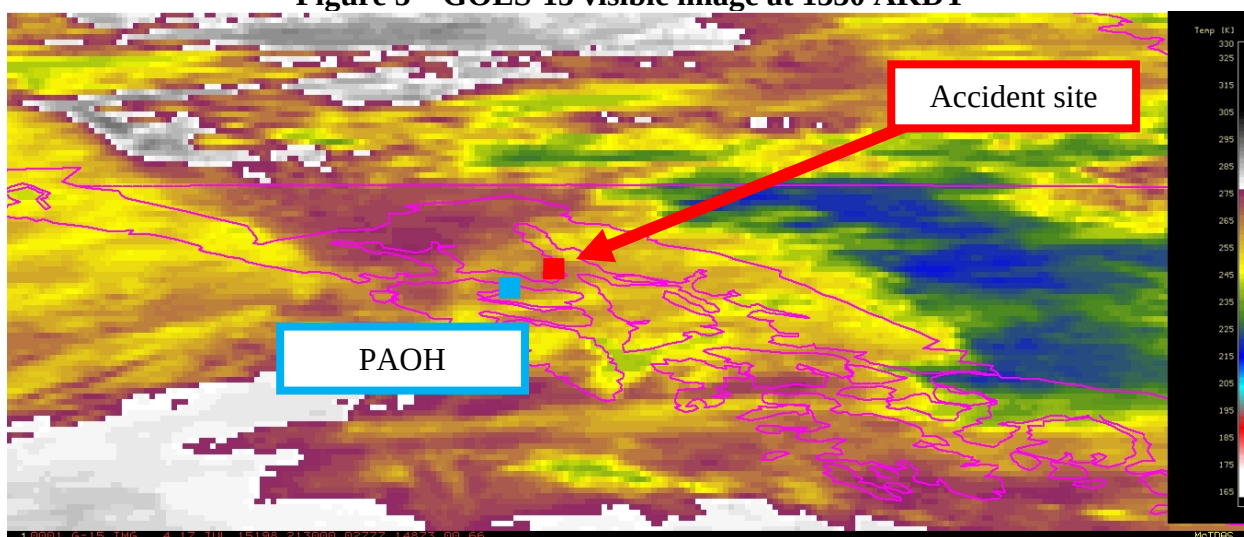


Figure 6 – GOES-15 infrared image at 1330 AKDT

6.0 Radar Imagery Information

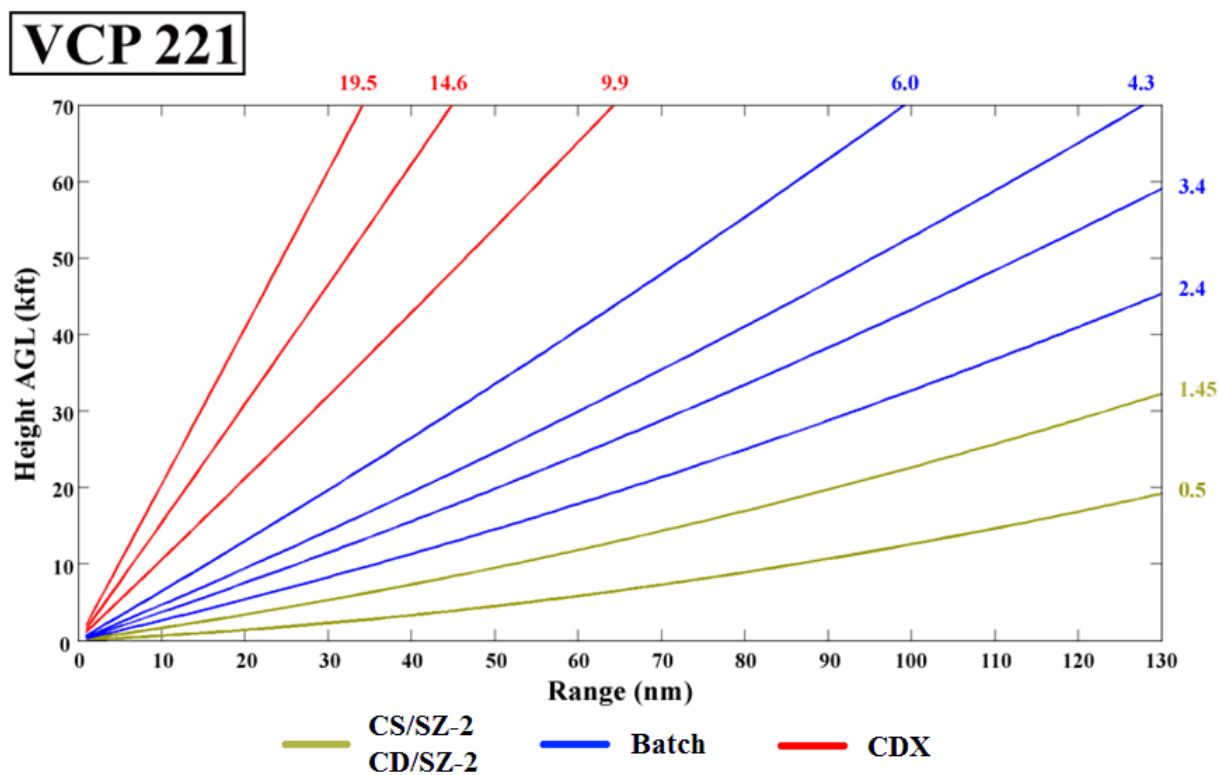
The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D)¹² was from near Sitka, Alaska (PACG), located 90 miles south-southwest of the accident site with an elevation of 270 feet. Level II and III archive radar data was obtained from the NCDC utilizing the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software.

¹² The WSR-88D is an S-band 10-centimeter wavelength radar with a power output of 750,000 watts, and with a 28-foot parabolic antenna that concentrates the energy between a 0.87° and 0.96° beam width. The radar produces three basic types of products: base reflectivity, base radial velocity, and base spectral width.

6.1 Volume Scan Strategy

The WSR-88D is a computer-controlled radar system, which automatically creates a complete series of specific scans in a specific sequence known as a volume scan. Individual elevation scans are immediately available on the WSR-88D's Principle Users Processor (PUP). Products that require data from multiple elevation scans are not available until the end of the five to ten minute volume scan.

The WSR-88D operates in several different scanning modes, identified as Mode A and Mode B. Mode A is the precipitation scan and has two common scanning strategies. The most common is where the radar makes 9 elevation scans from 0.5° to 19.5° about every six minutes. This particular scanning strategy is documented as volume coverage pattern 221 (VCP-221). Mode B is the clear-air mode, where the radar makes 5 elevation scans during a ten minute period (VCP-32). During the period surrounding the accident, the PACG WSR-88D radar was operating in the precipitation mode (Mode A, VCP-221). The following chart provides an indication of the different elevation angles in this VCP, and the approximate height and width of the radar beam with distance from the radar site.



VCP-221 Precipitation Mode Scan Strategy

6.2 Beam Height Calculation

Assuming standard refraction¹³ of the WSR-88D 0.95° wide radar beam, the following table shows the approximate beam height and width¹⁴ information¹⁵ of the radar display over the site of the accident. The heights have been rounded to the nearest 10 feet.

ANTENNA ELEVATION	BEAM CENTER	BEAM BASE	BEAM TOP	BEAM WIDTH
0.5°	10,920 feet	6,480 feet	15,360 feet	8,880 feet

Based on the beam heights, the 0.5° elevation scan depicted the conditions between 6,480 feet and 15,360 feet msl over the accident site and these are the closest altitudes¹⁶ to the accident flight level before the accident occurred.

¹³ Standard Refraction in the atmosphere is when the temperature and humidity distributions are approximately average, and values set at the standard atmosphere.

¹⁴ Beam width – A measure of the angular width of a radar beam.

¹⁵ Beamwidth values are shown for legacy resolution products. Super resolution products would an effective beamwidth that would be approximately half these values.

¹⁶ For more information please see the ATC data.

6.3 Reflectivity

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors¹⁷ it is a function of the drop size distribution, number of particles per unit volume, physical state (ice or water), shape, and aspect. Reflectivity is normally displayed in decibels (dBZ¹⁸), and is a general measure of echo intensity. The chart below relates the NWS video integrator and processor (VIP) intensity levels versus the WSR-88D's display levels, precipitation mode reflectivity in decibels, and rainfall rates.

NWS VIP/DBZ CONVERSION TABLE

NWS VIP	WSR-88D LEVEL	PREC MODE DBZ	RAINFALL
0	0	< 5	
	1	5 to 9	
	2	10 to 14	
1 Very Light	3	15 to 19	.01 in/hr
	4	20 to 24	.02 in/hr
	5	25 to 29	.04 in/hr
2 Light to Moderate	6	30 to 34	.09 in/hr
	7	35 to 39	.21 in/hr
3 Strong	8	40 to 44	.48 in/hr
4 Very Strong	9	45 to 49	1.10 in/hr
5 Intense	10	50 to 54	2.49 in/hr
6 Extreme	11	55 to 59	>5.67 in/hr
	12	60 to 64	
	13	65 to 69	
	14	70 to 74	
	15	> 75	

¹⁷ Hydrometeors are any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at the earth's surface; also, any water particles blown by the wind from the earth's surface. Hydrometeors are classified as; (a) Liquid or solid water particles suspended in the air: cloud, water droplets, mist or fog. (b) Liquid precipitation: drizzle and rain. (c) Freezing precipitation: freezing drizzle and freezing rain. (d) Solid (frozen) precipitation: ice pellets, hail, snow, snow pellets, and ice crystals. (e) Falling particles that evaporate before reaching the ground: virga. (f) Liquid or solid water particles lifted by the wind from the earth's surface: drifting snow, blowing snow, blowing spray. (g) Liquid or solid deposits on exposed objects: dew, frost, rime, and glazed ice.

¹⁸ dBZ – A non-dimensional “unit” of radar reflectivity which represents a logarithmic power ratio (in decibels , or dB) with respect to radar reflectivity factor, Z.

The Federal Aviation Administration (FAA) Advisory Circular AC 00-24B titled “Thunderstorms” dated January 2, 1983, also defines the echo intensity levels and potential weather phenomena associated with those levels. If the maximum VIP Level is 1 “weak” and 2 “moderate”, then light to moderate turbulence is possible with lightning. VIP Level 3 is “strong” and severe turbulence is possible with lightning. VIP Level 4 is “very heavy” and severe turbulence is likely with lightning. VIP Level 5 is “intense” with severe turbulence, lightning, hail likely, and organized surface wind gusts. VIP Level 6 is “extreme” with severe turbulence, lightning, large hail, extensive surface wind gusts and turbulence.

6.4 Base Reflectivity

Figure 7 presents the PACG WSR-88D base reflectivity images for the 0.5° elevation scan initiated at 1320 AKDT with a resolution of 0.5° X 250 m. There were no reflectivity targets above the accident site at the accident time. Given that there was decreased moisture above 11,000 feet msl (freezing level), it was not surprising no reflectivity targets were observed above the accident site, as there was not enough moisture in the atmosphere to create large rain droplets. Given the observations from PAJN and the upper air sounding (section 4.0) light rain and drizzle were still likely at the accident site at the accident time. Attachment 1 is PACG base reflectivity imagery from 1203 through 1343 AKDT and there was an area of reflectivity values between 5 and 20 dBZ there were moving towards the accident site west of PAOH between 1226 and 1306 AKDT. These reflectivity values would have likely indicated precipitation at the surface with lower visibilities, mist, and light rain, which would have arrived at the accident site at the accident time. The FAA’s Aviation Web Camera imagery will further show the lower visibility conditions (section 13.0). There were no lightning strikes at or near the accident site at the accident time.

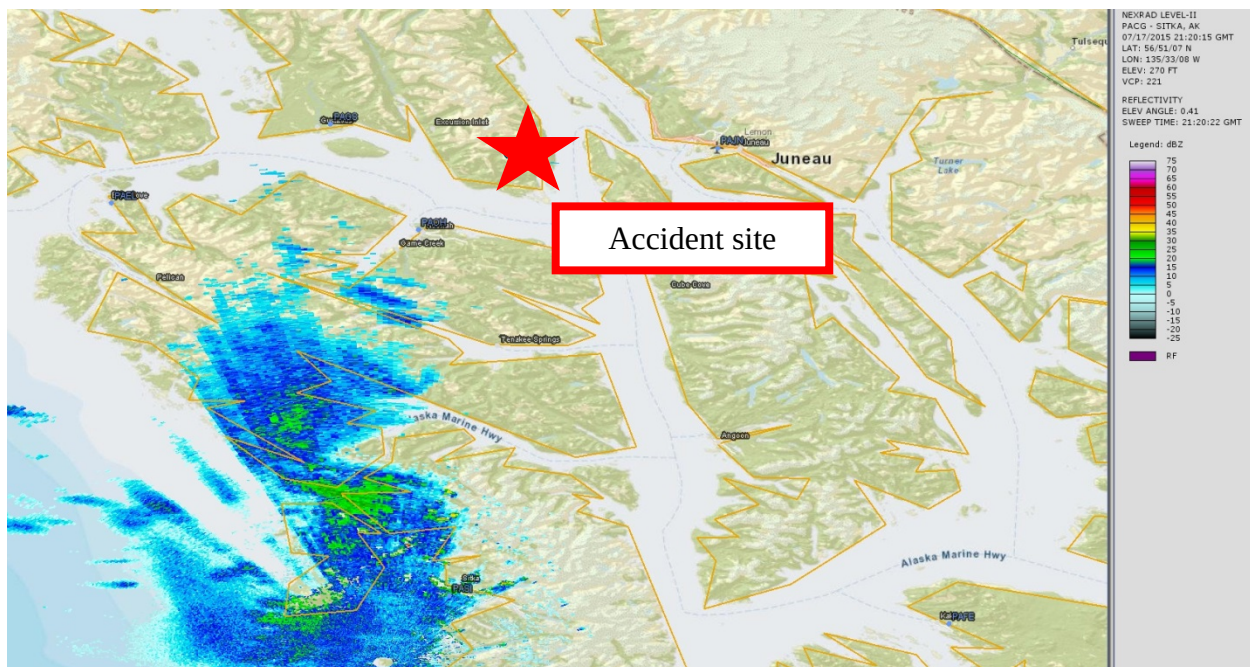


Figure 7 – PACG WSR-88D reflectivity for the 0.5° elevation scan initiated at 1320 AKDT

7.0 Pilot Reports

All pilot reports (PIREPs) were reviewed close to the accident site from around three hours prior to the accident time to around three hours after the accident time and no PIREPs were reported.

8.0 SIGMET and CWSU Advisory

No SIGMET was valid for the accident site at the accident time.

No meteorological impact statement (MIS) or CWSU Advisory (CWA) was valid for the accident site at the accident time.

9.0 AIRMETs and Area Forecast

The Area Forecast issued by the NWS Alaska Aviation Weather Unit (AAWU) at 1210 AKDT included an AIRMET for mountain obscuration due to clouds and precipitation and the AIRMET was valid at the accident site at the accident time. The Area Forecast mentioned scattered clouds at 1,200 feet msl with broken to overcast ceiling at 2,000 feet msl with clouds top to FL250¹⁹, and an occasional broken ceiling at 1,200 feet msl with 5 miles visibility and light rain. Isolated IFR conditions were also forecast with rain and mist. The AAWU weather charts produced at 1200 AKDT indicated the accident site on the boundary of the MVFR to IFR conditions with isolated moderate low-level turbulence between the surface and 6,000 feet msl (figures 8, 9, and 10). Isolated moderate icing conditions were forecast above 16,000 feet msl:

FAAK47 PAWU 172010

FA7H

JNUH FA 172015

EASTERN GULF COAST AND SE AK...

.
AIRMETS VALID UNTIL 180415

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

.
SYNOPSIS VALID UNTIL 181400

ONSHR FLOW WILL CONTINUE FOR PANHANDLE/ERN GULF CST DURG FCST PD.
OTRW A HI PRES RIDGE WILL PRST OVR SRN SE PANHANDLE THRU PD.

.
LYNN CANAL AND GLACIER BAY JB...VALID UNTIL 180800

...CLOUDS/WX...

*****AIRMET MT OBSC***MTS OCNL OBSC IN CLDS/PCPN. NC...**

SCT012 BKN-OVC020 TOP FL250. OCNL BKN012 VIS 5SM -RA. ISOL CIG BLW 010/VIS 3SM RA BR.

CHNLD AREAS/HIR TRRN SFC WND SW 20G30KT.

OTLK VALID 180800-181400...MVFR CIG RA.

PASSES...WHITE...CHILKOOT...IFR CIG RA BR.

¹⁹ Flight Level – A Flight Level (FL) is 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 inHg), the average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above mean sea level or above ground level.

...TURB...

AIRMET TURBAFT 02Z N PAGY OCNL MOD TURB FL270-FL370. INTSF...

ISOL MOD TURB BLW 060.

...ICE AND FZLVL...

ISOL MOD ICEIC 160-FL240. FZLVL 120.

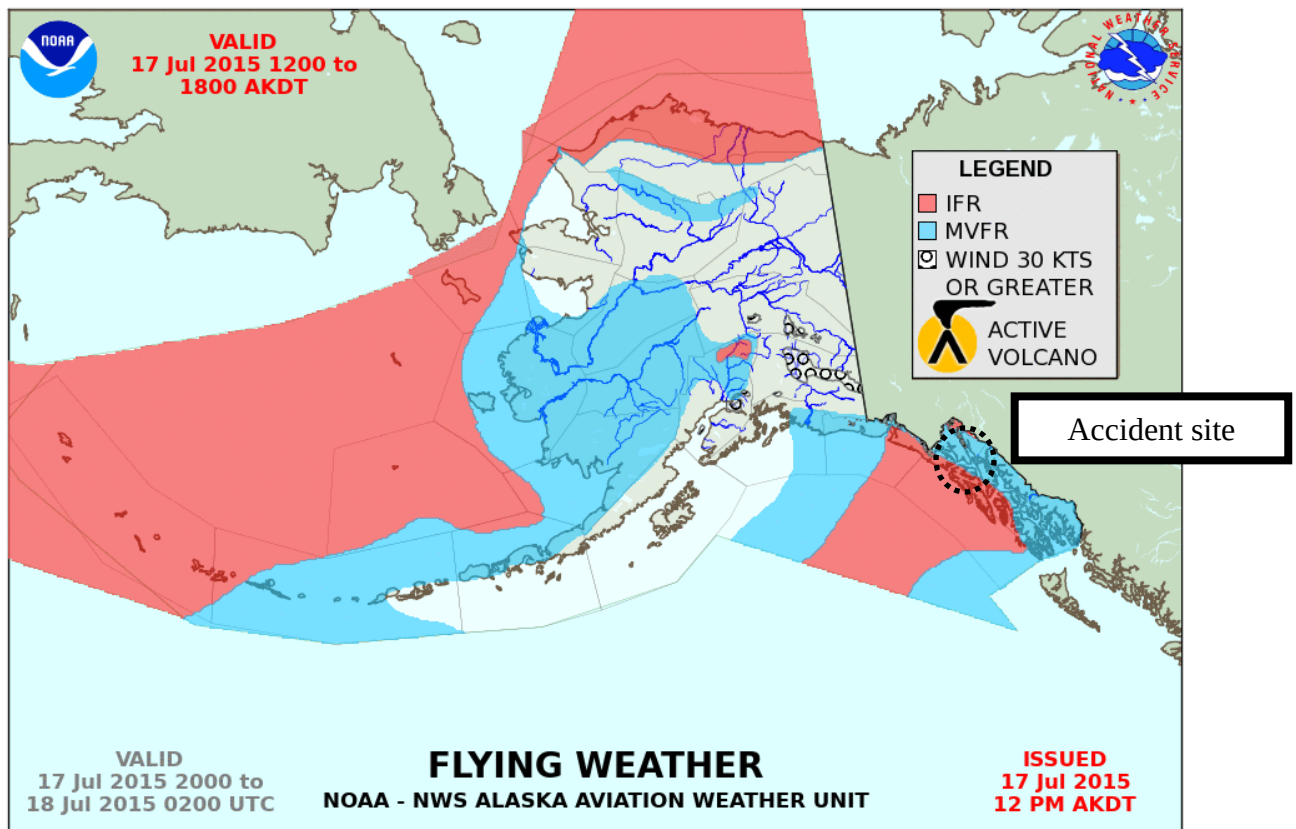


Figure 8 – AAWU IFR and MVFR weather chart issued at 1200 AKDT valid through 1800 AKDT

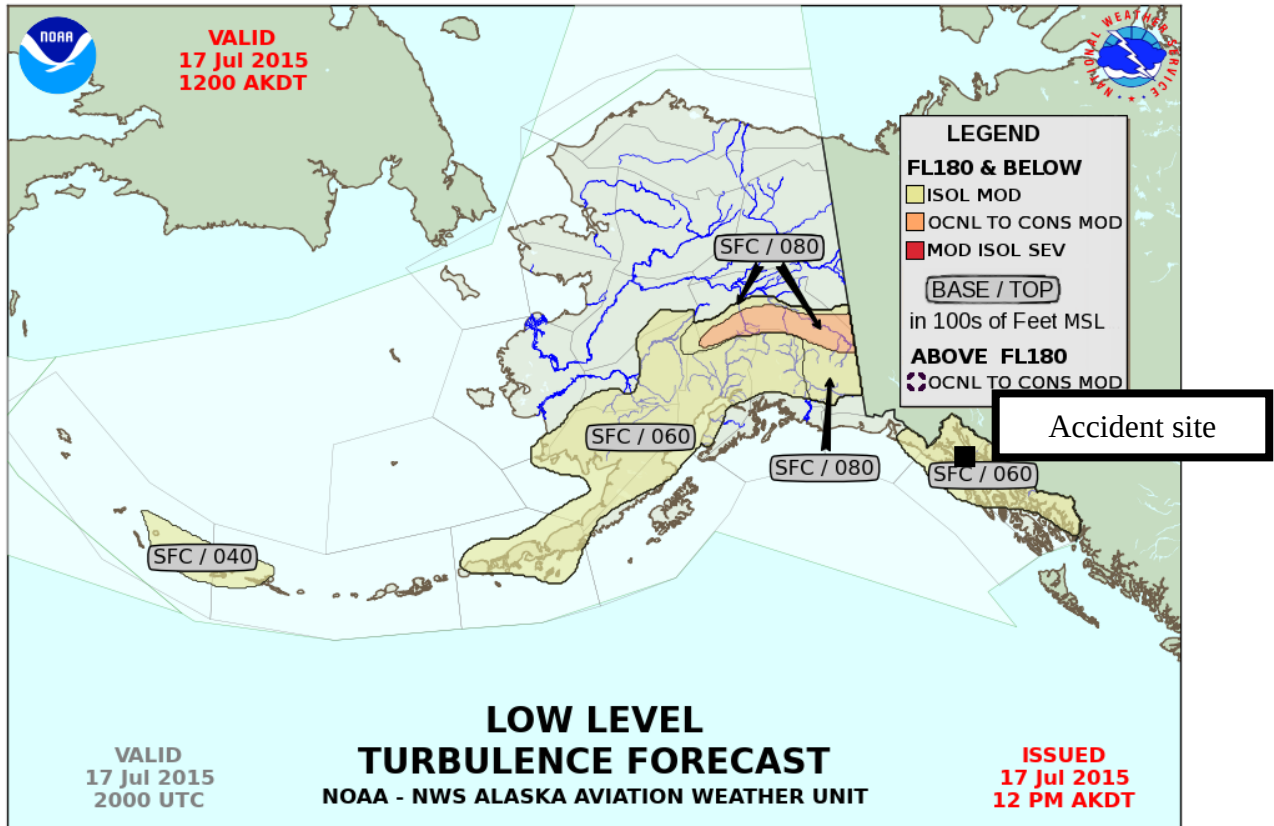


Figure 9 – AAWU low-level turbulence forecast issued at 1200 AKDT valid for 1200 AKDT

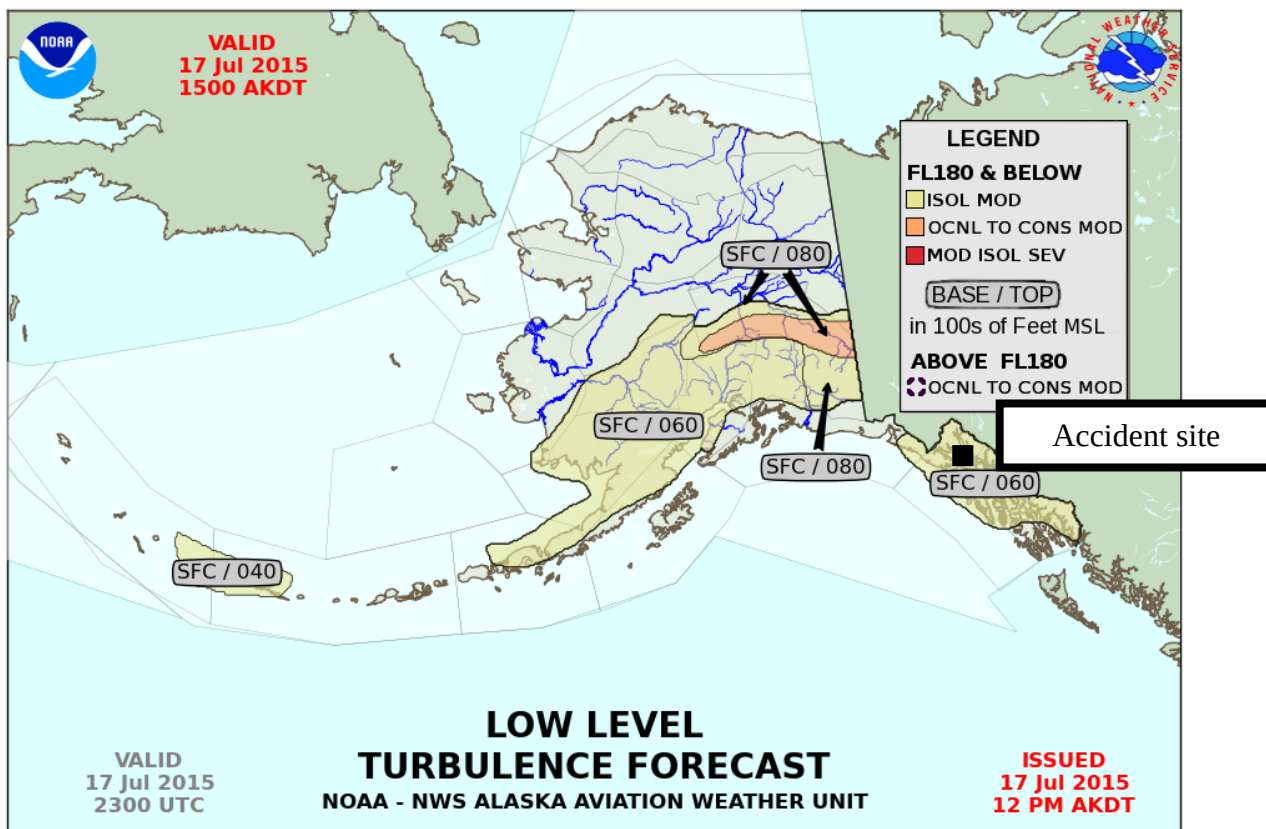


Figure 10 – AAWU low-level turbulence forecast issued at 1200 AKDT valid for 1500 AKDT

10.0 Terminal Aerodrome Forecast

PAGS was the closest site with a NWS TAF. The TAF valid at the time of the accident was issued at 0941 AKDT and was valid for a 24-hour period beginning at 1000 AKDT. The TAF for PAGS was as follows:

TAF PAGS 171741Z 1718/1818 13010KT P6SM -RA SCT025 OVC035
 TEMPO 1718/1720 6SM -RA BR OVC025
FM172000 14008KT 6SM -RA BR SCT015 OVC025
 FM180200 15006KT 3SM RA BR BKN007 OVC012
 AMD LTD TO CLD VIS AND WIND=

The forecast expected wind from 140° at 8 knots, 6 miles visibility, light rain and mist, scattered clouds at 1,500 feet agl, and an overcast ceiling at 2,500 feet agl. This TAF was close to the MVFR conditions that persisted at PAGS around the accident time.

PAJN was the departure airport and the TAF valid at the time of the accident was issued at 0941 AKDT and was valid for a 24-hour period beginning at 1000 AKDT. The TAF for PAJN was as follows:

TAF PAJN 171741Z 1718/1818 **10012KT 5SM -RA BR FEW004 OVC035**
TEMPO 1718/1722 3SM -RA BR SCT004 OVC025
FM172200 10010KT 4SM -RA BR BKN025 OVC035
FM181000 13010KT 3SM -RA BR BKN015 OVC025=

The forecast expected wind from 100° at 12 knots, 5 miles visibility, light rain and mist, few clouds at 400 feet agl, and an overcast ceiling at 3,500 feet agl. Temporary conditions were forecast between 1000 and 1400 AKDT of 3 miles visibility, light rain and mist, scattered clouds at 400 feet agl, and an overcast ceiling at 2,500 feet agl. This TAF was close to the MVFR conditions that persisted at PAJN around the accident time. However, both PAJN and PAGS airports reside in valley locations away from the mountainous terrain, therefore it was likely the ceiling and visibility conditions were locally IFR near the mountainous terrain.

11.0 National Weather Service Area Forecast Discussion

The National Weather Service Office in Juneau, Alaska, issued the following Area Forecast Discussion at 0600 AKDT (closest AFD to the accident time), which discussed IFR to MVFR cloud ceiling conditions across much of southeastern Alaska during the morning hours with visibilities and ceilings expected to improve into the afternoon. Gusty winds were only expected up near Haines and Skagway, north of the accident site:

FXAK67 PAJK 171400

AFDAJK

SOUTHEAST ALASKA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE JUNEAU AK

600 AM AKDT FRI JUL 17 2015

.SHORT TERM...WARM RIDGE OF HIGH PRESSURE CONTINUES TO MOVE EAST OVER THE SOUTHERN PANHANDLE WHILE THE TRIPLE POINT OF A SURFACE FRONT OVER WESTERN ALASKA MOVES NORTHEAST OVER THE GULF AND WILL MOVE TO NORTHERN BRITISH COLUMBIA BY LATE FRIDAY AFTERNOON. THE TRAILING COLD FRONT WILL EXTEND TO THE SOUTHWEST OVER A 1000 MILES TO THE NORTH CENTRAL PACIFIC. THERE LOOKS TO BE A SMALL WAVE ON THIS FRONT THAT WILL MOVE TO ABOUT 600 SOUTH SOUTHWEST OF KODIAK ISLAND BY LATE FRIDAY NIGHT. **AM EXPECTING HEAVIER RAINS THROUGH THIS AFTERNOON AND TAPERING OFF OVER THE EARLY EVENING HOURS. HOWEVER EXPECT MOISTURE TO CONTINUE TO STREAM ONSHORE OVER THE PANHANDLE INTO FRIDAY NIGHT.**

STRONG SOUTH WINDS OVER THE NORTHERN LYNN CANAL AND SKAGWAY ARE GALE FORCE TODAY OVER THE NORTHERN LYNN CANAL MARINE ZONE AND UP TO 25 MPH WITH GUSTS TO 35 MPH AT SKAGWAY. OTHERWISE ONLY SMALL CRAFT LEVEL WINDS FOR MUCH OF THE PANHANDLE ON FRIDAY AND FRIDAY NIGHT. OUTER WATER COASTAL SEAS RISING TO 8 TO 10 FEET AND WILL SEE THAT PERSIST TO SATURDAY.

GENERALLY FORECAST IS AS EXPECTED WITH LITTLE IN WAY OF THE UNEXPECTED AS SOLUTIONS CONTINUE TO PLAY OUT AS WE WERE THINKING. RAINFALL AMOUNTS FOR THE FRONTAL SYSTEM ARE EXPECTED TO BE 2 TO 3 INCHES FOR THE NORTHEAST GULF COAST AND 1 TO 2 INCHES FOR THE

NORTHERN PANHANDLE. HIGHER VALUES IN THE HIGHER TERRAIN AREAS. FOR MOST PART STREAMS AND RIVERS LOW TO MODERATE FLOWS AND WILL BE ABLE TO HANDLE THE RUN OFF AND STAY WITH IN BANKFULL LEVELS. .LONG TERM...WEAK COLD FRONT WILL SWING ACROSS THE AREA BY LATE SAT AFTERNOON. A WEAK LOW WILL MOVE NE INTO THE FAR SRN GULF SUN...THEN LIKELY TURN SE SUN NIGHT AND MON. SOME UPPER RIDGING WILL BUILD OVER THE WRN AND CENTRAL GULF SUN INTO EARLY NEXT WEEK. LOOKS LIKE AN UPPER TROF WILL MOVE SE THRU THE ERN GULF AND SE AK SUN INTO MON...BUT MODELS DIFFER SOME ON THIS. THEN IT APPEARS THAT A FAIRLY POTENT UPPER TROF WILL MOVE E INTO THE GULF BY THE LATTER PART OF NEXT WEEK. AGAIN...MODELS DIFFER SOME ON TIMING OF THIS TROF BUT GENERALLY AGREE IT WILL BE OVER THE GULF SOMETIME THU- FRI.

AS COLD FRONT SWEEPS SE THRU THE AREA...RAIN WILL DIMINISH FROM THE NW ACROSS THE PANHANDLE BY EARLY SAT EVENING. A WEAK SFC RIDGE WILL TRY TO BUILD INTO THE NRN GULF SAT...BUT WEAK UPPER TROF WILL KEEP SPOTTY SHOWER ACTIVITY OVER THE NE GULF INTO SAT NIGHT. LOOKS LIKE THE SFC RIDGE WILL THEN STRENGTHEN SUN INTO MON OVER THE ERN GULF...WHICH WILL TRY TO TURN FLOW MORE NWLY. HOWEVER...SOME LOW LEVEL MOISTURE WILL BE TRAPPED BELOW DEVELOPING SUBSIDENCE INVERSION...WHICH WILL LIKELY TRAP SOME STRATOCU OVER MOST OF THE AREA THRU SUN MORNING. THINK SOME BREAK WILL DEVELOP SUN AFTERNOON AS DAYTIME HEATING WILL CAUSE CUMULUS CLOUDS TO DEVELOP...OVER THE MTNS AT FIRST...AND THESE WILL HELP ENTRAIN SOME DRIER AIR FROM ABOVE. BY SUN NIGHT...LOOKS LIKE LOW LEVEL FLOW WILL BECOME MORE NLY...WHICH SHOULD HELP DRY OUT LOWER LEVELS...BUT UPPER TROF DROPPING SE ACROSS THE AREA MAY BRING IN HIGHER LEVEL CLOUDS. ONCE THE UPPER TROF MOVES PAST THOUGH...A BETTER CHANCE TO SEE MORE CLEARING WILL DEVELOP MON INTO MON NIGHT. SHOULD BE A BIT WARMER MON-TUE WITH A BIT MORE SUNSHINE EXPECTED. SOME MINOR SHORTWAVE ENERGY MAY BRUSH PAST THE AREA MON NIGHT AND TUE WHICH COULD TRY TO TRIGGER SOME SHOWER ACTIVITY ALONG THE COAST MTNS THOUGH. AFTER TUE...WITH UPPER TROF LIKELY TO MOVE IN FOR LATE WEEK...BETTER CHANCES FOR PRECIP WILL MOVE IN ALONG WITH COOLER TEMPS ESPECIALLY THU-FRI.

&&

.AVIATION...IFR TO MVFR CLOUD CEILINGS ACROSS MUCH OF SOUTHEAST ALASKA FRIDAY MORNING WITH INCOMING FRONTAL SYSTEM. VISIBILITIES VARYING BETWEEN 1 MILE AND NO VISIBILITY RESTRICTIONS. GUSTY OVER NORTHERN LYNN CANAL A POTENTIAL PROBLEM FOR HAINES AND SKAGWAY REGION TO NO MENTION OF LOW LEVEL WIND SHEER. STRONGER WINDS ABOVE 4000 FEET IS LEADING TO SOME TURBULENCE NEAR THE EAST SIDE OF TERRAIN RIDGES. CONDITIONS SHOULD IMPROVE DURING THE DAY TO AS THE CEILINGS LIFT.

&&

.AJK WATCHES/WARNINGS/ADVISORIES...
PUBLIC...NONE.

MARINE...GALE WARNING FOR PKZ012.

SMALL CRAFT ADVISORY FOR PKZ031.

SMALL CRAFT ADVISORY DUE TO SEAS FOR PKZ022-041>043-051>053.

&&

\$\$

12.0 Pilot Weather Briefing and Company Dispatch Information

The accident pilot did not receive an archived weather briefing, however, the accident pilot did receive briefing from the dispatcher when she dutied on. There is a company computer that pilots are able to review weather information before flights, however, it is not known if the accident pilot reviewed any weather information on this computer before the accident flight. There is no record of the accident pilot receiving or retrieving any weather information before the accident flight.

During the interview with the flight coordinator who briefed the accident flight on the weather, the flight coordinator mentioned that typically they talked about weather to the pilot in command of each of their dispatch flights once during the day usually before the first flight of the day for each pilot. If weather conditions changed then the flight coordinator would update the pilot in command. On the day of the accident, the flight coordinator briefed the accident pilot on the weather and that every flight in the early morning to Hoonah, Alaska, had been cancelled. The flight coordinator told the accident pilot to discuss the weather with a pilot that had just returned from Hoonah. The accident pilot voiced no concerns and the flight coordinator did not look at the weather cameras with the accident pilot. But the accident pilot told the flight coordinator she would go back and look at the weather cameras prior to departure. This flight coordinator then departed for the day 40 minutes prior to the accident flight takeoff. When describing the weather on the day of the accident this flight coordinator stated that the weather was “a little low” and that company flights could only get into Skagway. Most of the Hoonah flights had cancelled with one pilot turning back due to weather. The weather started lifting around 1000 AKDT and the first flight for Hoonah departed around 1045 AKDT that morning. The flight coordinator used several weather products including METARs, TAFs, weather cameras, and they would obtain information from the Aviation Weather Center website. There was no training on weather when this flight coordinator began work at the accident company besides reviewing icing charts. This flight coordinator had been at the accident company almost 2 years. When the flight coordinator was asked if weather was printed for the pilots, they said the DUATs report to include NOTAMs were printed off when they visited the Alaska operation for 10 days. The printed weather information should be signed off per the Medallion program, but only the pilots signoff on the information. It is usually placed on the wall in the operations area but never sent to the Dispatchers for verification.

During the interview with the flight coordinator who released the accident flight, the flight coordinator remembered the weather being lower, but not out of the ordinary. He remembered one of the weather cameras being cloudy, but that one was normally cloudy. All the other flights had been flying so he didn't see anything worth noting to the accident pilot (about the weather). The flight coordinator does not discuss the weather prior to each flight with the pilots unless there is something worth noting in the weather. This was consistent with the general operation manual from the accident company. If the weather is questionable for any of their dispatch flights then the flight coordinator will check cameras and METARs. If the weather is not looking good on the cameras then will call the station managers a lot of the times, and the station managers give good information about the weather. Pilots are only updated on the weather if there is a change in the weather or a concern. This flight coordinator uses weather products such as METAR/TAF information, radar, a NOAA website, and PIREP information. The flight coordinators do not officially file any PIREPs from their company into the national airspace system (NAS) nor are they required to do anything with inter-company PIREPs. For more information on the flight coordinators please see the interviews summaries located in the docket of this accident.

Per the general operations manual valid at the time of the accident, company dispatch was there to assist pilots in flight preparation by gathering and disseminating pertinent information for all stations regarding weather or runway conditions and any information deemed necessary for the safety of flight. From the flight locating section of the general operations manual the accident company had specifically approved weather sources for IFR flights, but for VFR operations in Alaska several additional sources were available:

Weather Reports and Forecasts²⁰

SeaPort Airlines, Inc. will use weather sources approved by the FAA for all flight planning and any other service that has been specifically approved by the FAA for IFR operations.

The following services have been approved for IFR/VFR operations:

- ☐ FAA FSS
- ☐ DTC DUAT
- ☐ CSC DUATS
- ☐ Aviation Weather Center
- ☐ FltPlan.com

SeaPort Airlines, Inc. may use the following weather sources for VFR only operations in Alaska:

- ☐ Web Cams
- ☐ Word of mouth information from company pilots and operations personnel current on the subject.
- ☐ Word of mouth information from any other available source.

Weather observations made and furnished to pilots to conduct IFR operations at an airport must be taken at the airport where those IFR operations are conducted, unless the FAA issues OpsSpecs allowing the use of weather observations taken at a location not at the airport where the IFR operations are conducted.

²⁰ See attachment 2

13.0 Web Camera Images

Images from the FAA's Aviation Weather Cameras are shown in figures 11 through 26 along with attachments 3 through 6 providing images of the weather conditions surrounding the accident site at the accident time. The weather camera from Sisters Island, 10 miles south-southwest of the accident site, at an elevation of 53 feet showing the northeast facing camera are provided in figures 11 through 17 with times from 1235 AKDT through 1325 AKDT. The ceiling and visibility conditions are relatively high from 1235 through 1305 AKDT with visibilities above 5 miles. From 1305 through 1325 AKDT the visibilities drop below 5 miles with a lower ceiling as the island in the foreground disappears from view (figures 11, 15, 16, and 17). Attachment 3 provides an animation of the Sisters Island northeasterly view camera from 1105 to 1405 AKDT with the worst visibility and ceiling conditions between 1305 and 1335 AKDT. The weather camera images from Lena Point located 14 miles east-northeast of the accident site at an elevation of 170 feet southwest and west facing views are provided in figures 18 through 26. The west facing camera from Lena Point showed the top of Shelter Island (2 miles west of the camera site) obscured by clouds between 1306 and 1326 AKDT (figures 20, 21, and 22). The hilly terrain on Shelter Island ranged in height from 700 to 1,100 feet msl, with the terrain height portion of Shelter Island directly across from the Lena Point west facing camera between 700 and 800 feet msl. The southwest facing camera view showed similar conditions (figures 24, 25, and 26) with the visibility below 6.5 miles between 1307 and 1327 AKDT and visibility and ceiling restrictions in, around, and south of Shelter Island. Attachments 4 and 5 provide animations of the weather camera images from the west facing Lena Point camera (attachment 4) and from the southwest facing Lena Point camera (attachment 5) between 1106 and 1407 AKDT. The ceilings and visibilities remain restricted throughout the entire timeframe between 1106 and 1407 AKDT with the worst conditions between 1200 and 1230 AKDT and 1306 and 1345 AKDT. Finally, the animated images from the Pederson Hill web camera west facing camera are provided in attachment 6 from 1102 to 1402 AKDT, with the Pederson Hill web camera located 17 miles east of the accident site at an elevation of 476 feet. The Pederson Hill west facing web camera indicated less than 2 miles visibility between 1242 and 1402 AKDT with ceilings at or below 700 feet msl. The FAA's Aviation Weather Cameras surrounding the accident site show MVFR to IFR conditions with the worst conditions along and near the terrain at the accident time. There was more variability to the ceiling and visibility conditions south and west of the accident site as indicated on the northeast facing camera from Sisters Island (attachment 3 and figures 11 through 17).

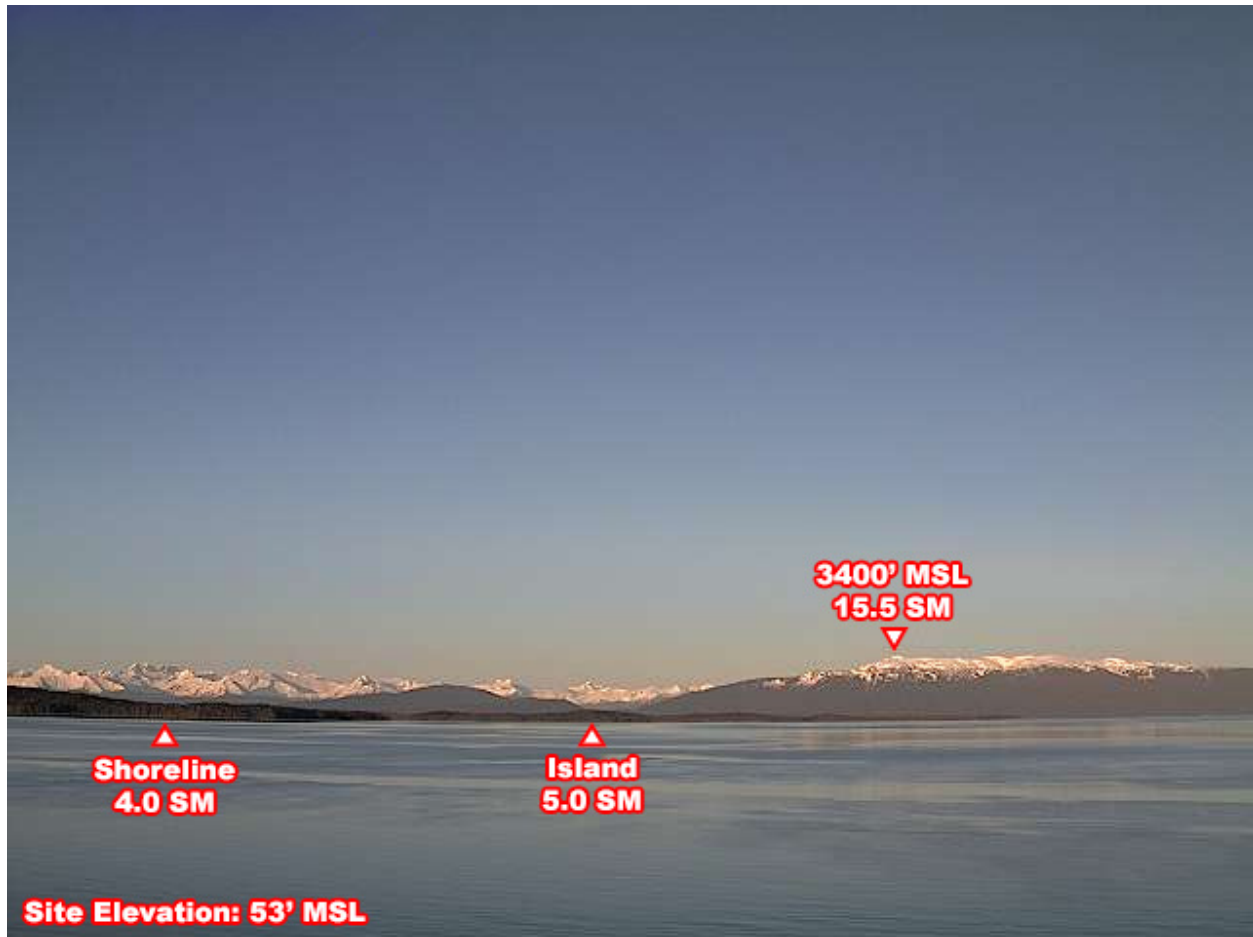


Figure 11 – FAA weather camera from Sisters Island northeast looking view from a standard clear sky weather day

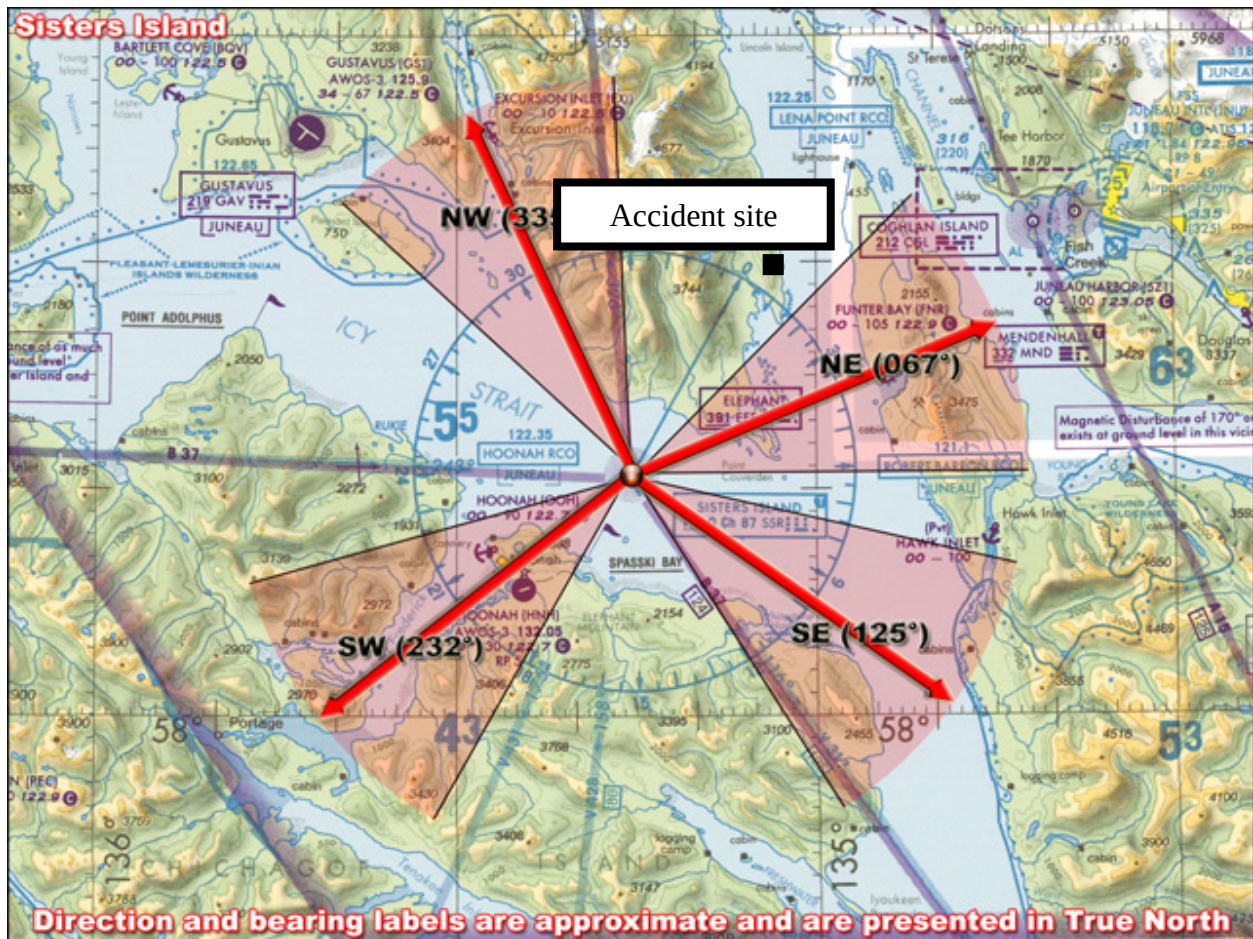


Figure 12 – FAA weather camera Sisters Island location on sectional chart with the direction the different camera angles face with the accident site marked

Fri 17 Jul 2015 20:35:12 UTC
Fri 17 Jul 2015 12:35:12 AKDT

Sisters Island - NorthEast
See <http://avcams.faa.gov> for more information



Figure 13 – FAA weather camera from Sisters Island northeast looking view from 1235 AKDT

Fri 17 Jul 2015 20:55:12 UTC
Fri 17 Jul 2015 12:55:12 AKDT

Sisters Island - NorthEast
See <http://avcams.faa.gov> for more information



Figure 14 – FAA weather camera from Sisters Island northeast looking view from 1255 AKDT

Fri 17 Jul 2015 21:05:08 UTC
Fri 17 Jul 2015 13:05:08 AKDT

Sisters Island - NorthEast
See <http://avcams.faa.gov> for more information



Figure 15 – FAA weather camera from Sisters Island northeast looking view from 1305 AKDT

Fri 17 Jul 2015 21:15:09 UTC
Fri 17 Jul 2015 13:15:09 AKDT

Sisters Island - NorthEast
See <http://avcams.faa.gov> for more information



Figure 16 – FAA weather camera from Sisters Island northeast looking view from 1315 AKDT

Fri 17 Jul 2015 21:25:13 UTC
Fri 17 Jul 2015 13:25:13 AKDT

Sisters Island - NorthEast
See <http://avcams.faa.gov> for more information



FAA advisory weather product

**Figure 17 – FAA weather camera from Sisters Island northeast looking view from 1325
AKDT**

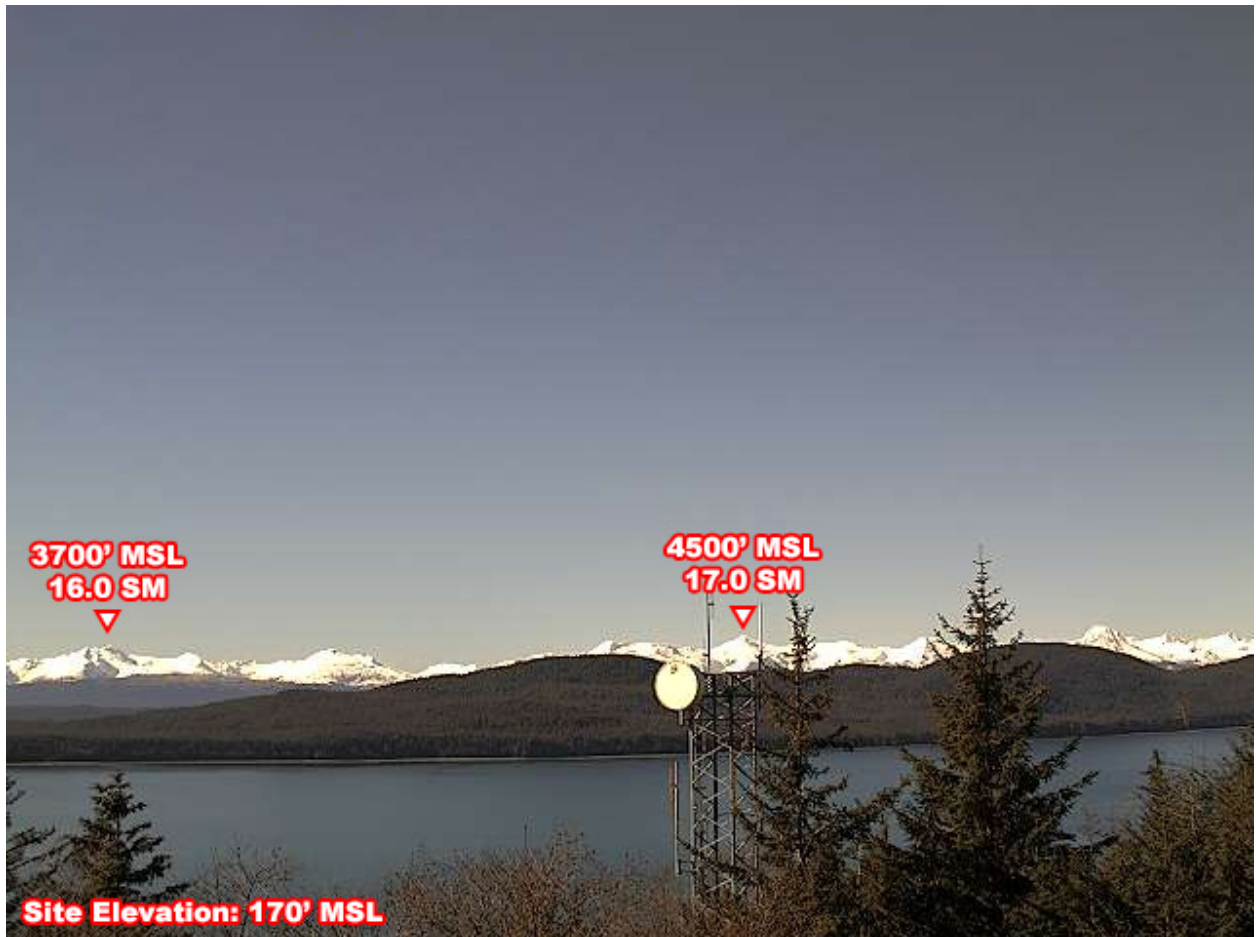


Figure 18 – FAA weather camera from Lena Point west looking view from a standard clear sky weather day

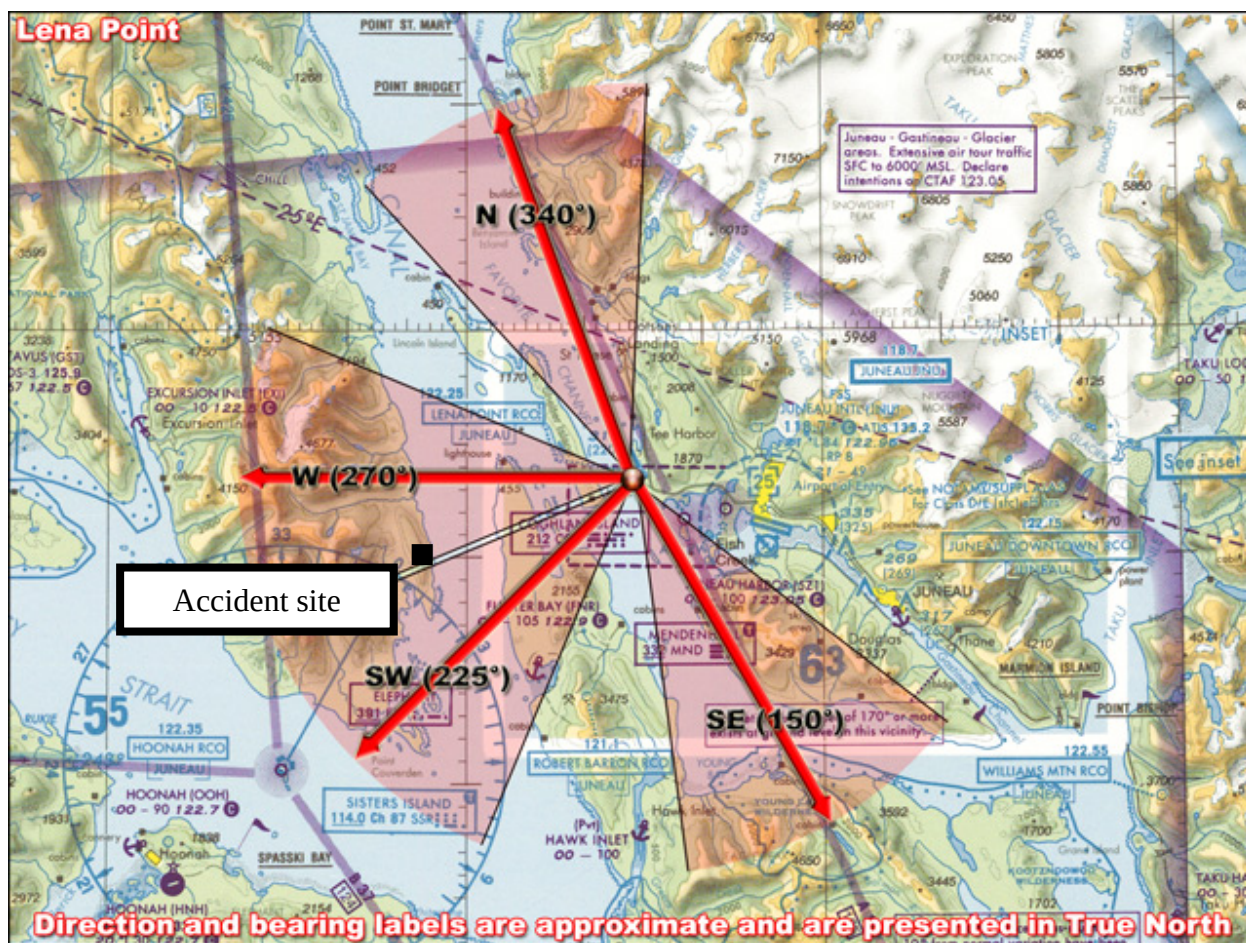


Figure 19 – FAA weather camera Lena Point location on sectional chart with the direction the different camera angles face with the accident site marked

Fri 17 Jul 2015 21:06:06 UTC
Fri 17 Jul 2015 13:06:06 AKDT

Lena Point - West
See <http://avcams.faa.gov> for more information



Figure 20 – FAA weather camera from Lena Point west looking view from 1306 AKDT

Fri 17 Jul 2015 21:16:06 UTC
Fri 17 Jul 2015 13:16:06 AKDT

Lena Point - West
See <http://avcams.faa.gov> for more information



Figure 21 – FAA weather camera from Lena Point west looking view from 1316 AKDT

Fri 17 Jul 2015 21:26:05 UTC
Fri 17 Jul 2015 13:26:05 AKDT

Lena Point - West
See <http://avcams.faa.gov> for more information



Figure 22 – FAA weather camera from Lena Point west looking view from 1326 AKDT

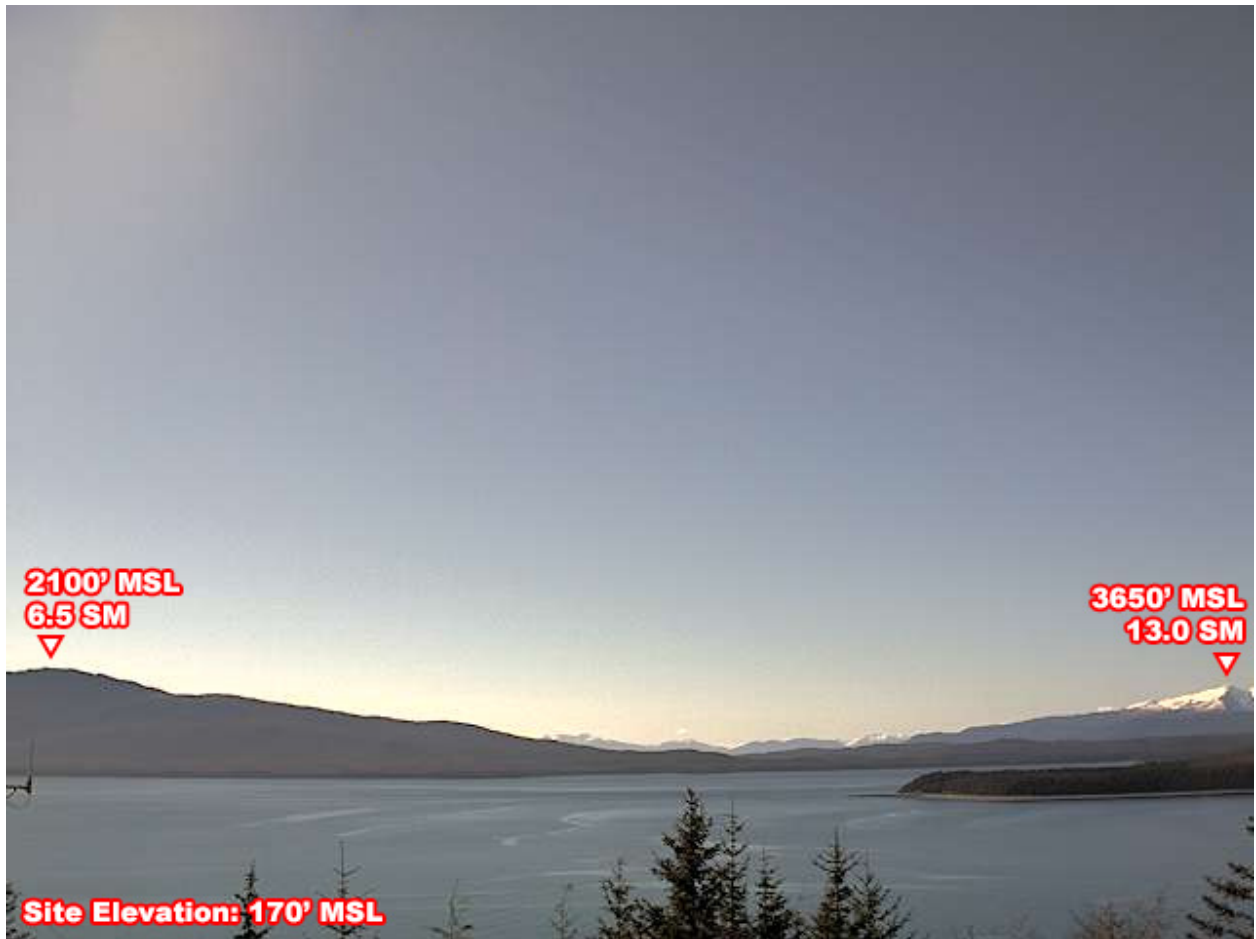


Figure 23 – FAA weather camera from Lena Point southwest looking view from a standard clear sky weather day

Fri 17 Jul 2015 21:07:05 UTC
Fri 17 Jul 2015 13:07:05 AKDT

Lena Point - SouthWest
See <http://avcams.faa.gov> for more information



Figure 24 – FAA weather camera from Lena Point southwest looking view from 1307 AKDT

Fri 17 Jul 2015 21:17:06 UTC
Fri 17 Jul 2015 13:17:06 AKDT

Lena Point - SouthWest
See <http://avcams.faa.gov> for more information



Figure 25 – FAA weather camera from Lena Point southwest looking view from 1317 AKDT

Fri 17 Jul 2015 21:27:05 UTC
Fri 17 Jul 2015 13:27:05 AKDT

Lena Point - SouthWest
See <http://avcams.faa.gov> for more information



Figure 26 – FAA weather camera from Lena Point southwest looking view from 1327 AKDT

14.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for the accident site on July 17, 2015, indicated the following:

SUN	
Begin civil twilight	0317 AKDT
Sunrise	0422 AKDT
Sun transit	1307 AKDT
Sunset	2150 AKDT
End civil twilight	2255 AKDT

15.0 National Weather Service Marine Forecast

The National Weather Service Office in Juneau, Alaska, issued the following coastal waters forecast for Southeast Alaska at 1234 AKDT. Many pilots in Alaska review the marine forecast before takeoff given that the surface wind conditions across the inner channels and mountainous terrain can be represented by the marine forecast. In between Juneau and Hoonah, the accident flight would have passed through 3 separate marine areas of Stephens Passage (northern portion), southern Lynn Canal, and Icy Strait. The northern portion of the Stephens Passage forecast indicated a small craft advisory for the area with an east wind of 30 knots and seas to 6 feet. The southern Lynn Canal forecast from 1234 AKDT warned of small craft advisory conditions through tonight with a southerly surface wind of 25 knots, seas at 4 feet, and rain. The Icy Strait forecast from 1234 AKDT had a southeasterly wind at 15 knots, with seas at 3 feet, rain, and west of Point Adolphus a southwesterly wind at 15 knots. Attachment 6 contains the hourly marine observations from Point Retreat around the accident time with Point Retreat located 10 miles east-northeast of the accident site at an elevation of 118 feet. The Point Retreat observations had southerly to southeasterly winds around the accident time with wind gusts between 25 and 30 knots:

FZAK51 PAJK 172034 AAC

CWFAJK

COASTAL WATERS FORECAST FOR SOUTHEAST ALASKA...UPDATED

NATIONAL WEATHER SERVICE JUNEAU AK

1234 PM AKDT FRI JUL 17 2015

SOUTHEAST ALASKA INSIDE WATERS FROM DIXON ENTRANCE TO SKAGWAY

WIND FORECASTS REFLECT THE PREDOMINANT SPEED AND DIRECTION

EXPECTED. SEA FORECASTS REPRESENT THE AVERAGE OF THE HIGHEST

ONE-THIRD OF THE COMBINED WINDWAVE AND SWELL HEIGHT.

PKZ098-180100-

1234 PM AKDT FRI JUL 17 2015

.SYNOPSIS FOR SOUTHEAST ALASKA INNER CHANNELS COASTAL WATERS...

A RIDGE OF HIGH PRESSURE ACROSS THE SOUTHERN PANHANDLE WILL MOVE

SOUTHEAST BY SAT. A WEATHER FRONT MOVING NORTHEAST OVER THE

NORTHERN GULF WILL MOVE INLAND OVER THE NORTHEAST GULF COAST

FRI.

\$\$

PKZ011-180100-

GLACIER BAY-

1234 PM AKDT FRI JUL 17 2015

.TODAY...SE WIND 20 KT BECOMING S IN THE AFTERNOON. SEAS 4 FT.

RAIN. AREAS OF FOG IN THE AFTERNOON.

.TONIGHT...S WIND 20 KT DIMINISHING LATE. SEAS 4 FT. RAIN IN THE

EVENING. AREAS OF FOG.

.SAT...S WIND 15 KT. SEAS 3 FT.

.SAT NIGHT...NW WIND 15 KT. SEAS 3 FT.

.SUN...NW WIND 15 KT. SEAS 3 FT.

.MON...NW WIND 15 KT. SEAS 3 FT.

.TUE...NW WIND 15 KT. SEAS 3 FT.

\$\$

PKZ012-180100-

NORTHERN LYNN CANAL-

1234 PM AKDT FRI JUL 17 2015

UPDATED

...GALE WARNING THROUGH TONIGHT...

.REST OF TODAY...S WIND 35 KT. SEAS 7 FT. RAIN.
.TONIGHT...S WIND 35 KT DIMINISHING TO 25 KT LATE. SEAS 7 FT
SUBSIDING TO 5 FT LATE. AREAS OF FOG. RAIN.
.SAT...S WIND 25 KT. SEAS 5 FT. RAIN IN THE MORNING.
.SAT NIGHT...S WIND 25 KT. SEAS 5 FT.
.SUN...S WIND 20 KT. SEAS 4 FT.
.MON...N WIND 20 KT. SEAS 4 FT.
.TUE...N WIND 15 KT. SEAS 3 FT.

\$\$

PKZ013-180100-

SOUTHERN LYNN CANAL-

1234 PM AKDT FRI JUL 17 2015

...SMALL CRAFT ADVISORY THROUGH TONIGHT...

.TODAY...S WIND 25 KT. SEAS 4 FT. RAIN.

.TONIGHT...S WIND 25 KT DIMINISHING LATE. SEAS 5 FT. AREAS OF
FOG. RAIN.

.SAT...S WIND 20 KT. SEAS 4 FT. RAIN IN THE MORNING.

.SAT NIGHT...S WIND 15 KT. SEAS 3 FT.

.SUN...S WIND 15 KT. SEAS 3 FT.

.MON...N WIND 15 KT. SEAS 3 FT.

.TUE...N WIND 15 KT. SEAS 3 FT.

\$\$

PKZ021-180100-

ICY STRAIT-

1234 PM AKDT FRI JUL 17 2015

UPDATED

**.TODAY...SE WIND 15 KT. WEST OF POINT ADOLPHUS...SW WIND 15 KT.
SEAS 3 FT. RAIN.**

.TONIGHT...SE WIND 15 KT BECOMING SW LATE. SEAS 3 FT. RAIN. AREAS
OF FOG LATE.

.SAT...W WIND 15 KT. SEAS 3 FT.

.SAT NIGHT...W WIND 15 KT. SEAS 3 FT.

.SUN...W WIND 15 KT. SEAS 3 FT.

.MON...NW WIND 15 KT. SEAS 3 FT.

.TUE...NW WIND 15 KT. SEAS 3 FT.

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PKZ022-180100-

CROSS SOUND-

1234 PM AKDT FRI JUL 17 2015

UPDATED

...SMALL CRAFT ADVISORY THROUGH TONIGHT...

.TODAY...SW WIND 25 KT. SEAS 5 FT BUILDING TO 8 FT IN THE
AFTERNOON. RAIN. AREAS OF FOG IN THE AFTERNOON.

.TONIGHT...SW WIND 20 KT. SEAS 10 FT. AREAS OF FOG. RAIN.

.SAT...W WIND 20 KT. SEAS 7 FT.

.SAT NIGHT...W WIND 20 KT. SEAS 7 FT.

.SUN...W WIND 15 KT. SEAS 5 FT.

.MON...NW WIND 15 KT. SEAS 3 FT.

.TUE...NW WIND 15 KT. SEAS 3 FT.

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PKZ031-180100-

STEPHENS PASSAGE-

1234 PM AKDT FRI JUL 17 2015

...SMALL CRAFT ADVISORY TODAY...

**.TODAY...BACK SIDE OF DOUGLAS ISLAND...E WIND 30 KT. SEAS 6 FT.
ELSEWHERE...S WIND 20 KT. SEAS 4 FT.**

.TONIGHT...S WIND 20 KT DIMINISHING LATE. SEAS 4 FT. AREAS OF FOG.
RAIN.
.SAT...S WIND 20 KT BECOMING NW 15 KT IN THE AFTERNOON. SEAS 4 FT.
RAIN IN THE MORNING.
.SAT NIGHT...NW WIND 15 KT. SEAS 3 FT.
.SUN...NW WIND 15 KT. SEAS 3 FT.
.MON...NW WIND 15 KT. SEAS 3 FT.
.TUE...N WIND 15 KT. SEAS 3 FT.

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PKZ032-180100-
NORTHERN CHATHAM STRAIT-
1234 PM AKDT FRI JUL 17 2015
UPDATED

.TODAY...S WIND 20 KT. STRONGEST WINDS NORTHERN AREA. SEAS 4 FT.
RAIN.
.TONIGHT...S WIND 15 KT. SEAS 3 FT. RAIN.
.SAT...S WIND 15 KT BECOMING NW IN THE AFTERNOON. SEAS 3 FT.
.SAT NIGHT...NW WIND 15 KT. SEAS 3 FT.
.SUN...NW WIND 15 KT. SEAS 3 FT.
.MON...N WIND 10 KT. SEAS 2 FT OR LESS.
.TUE...N WIND 15 KT. SEAS 3 FT.

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PKZ033-180100-
SOUTHERN CHATHAM STRAIT-
1234 PM AKDT FRI JUL 17 2015

.TODAY...S WIND 15 KT. SEAS 3 FT. NEAR OCEAN ENTRANCES...SEAS
8 FT.
.TONIGHT...S WIND INCREASING TO 20 KT LATE. SEAS 4 FT...EXCEPT
8 FT NEAR OCEAN ENTRANCES.
.SAT...S WIND 15 KT BECOMING NW IN THE AFTERNOON. SEAS
3 FT...EXCEPT 6 FT NEAR OCEAN ENTRANCES.
.SAT NIGHT...NW WIND 20 KT. SEAS 4 FT.
.SUN...NW WIND 20 KT. SEAS 4 FT.
.MON...NW WIND 15 KT. SEAS 3 FT.
.TUE...NW WIND 10 KT. SEAS 2 FT OR LESS.

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PKZ034-180100-
FREDERICK SOUND-
1234 PM AKDT FRI JUL 17 2015
UPDATED

.TODAY...S WIND 15 KT. SEAS 3 FT. RAIN.
.TONIGHT...S WIND 15 KT. SEAS 3 FT.
.SAT...SW WIND 15 KT BECOMING NW IN THE AFTERNOON. SEAS 3 FT.
.SAT NIGHT...NW WIND 15 KT. SEAS 3 FT.
.SUN...NW WIND 15 KT. SEAS 3 FT.
.MON...NW WIND 15 KT. SEAS 3 FT.
.TUE...NW WIND 10 KT. SEAS 2 FT OR LESS.

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PKZ035-180100-
SUMNER STRAIT-
1234 PM AKDT FRI JUL 17 2015
UPDATED

.TODAY...SE WIND 15 KT. SEAS 3 FT. RAIN.
.TONIGHT...SW WIND 15 KT. SEAS 3 FT.
.SAT...W WIND INCREASING TO 20 KT IN THE AFTERNOON. SEAS 4 FT. RAIN
IN THE MORNING.

.SAT NIGHT...W WIND 20 KT. SEAS 4 FT.
 .SUN...W WIND 20 KT. SEAS 4 FT.
 .MON...W WIND 15 KT. SEAS 3 FT.
 .TUE...W WIND 10 KT. SEAS 2 FT OR LESS.
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 PKZ036-180100-
 CLARENCE STRAIT-
 1234 PM AKDT FRI JUL 17 2015
 UPDATED
 .TODAY...SE WIND 15 KT. SEAS 3 FT.
 .TONIGHT...SE WIND 15 KT. SEAS 3 FT.
 .SAT...W WIND 15 KT BECOMING NW 20 KT IN THE AFTERNOON. SEAS 4 FT.
 .SAT NIGHT...NW WIND 20 KT. SEAS 4 FT.
 .SUN...NW WIND 20 KT. SEAS 4 FT.
 .MON...NW WIND 15 KT. SEAS 3 FT.
 .TUE...NW WIND 10 KT. SEAS 2 FT OR LESS.
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F. LIST OF ATTACHMENTS

Attachment 1 – Base reflectivity weather radar loop from PACG between 1203 and 1343 AKDT for the 0.5° elevation scan

Attachment 2 – General Operations Manual valid at the accident time from the accident company pages A-12, A-13, and L-3

Attachment 3 – Animation loop of FAA’s Aviation Web Camera images from Sisters Island northeast facing view camera from 1105 to 1405 AKDT

Attachment 4 – Animation loop of FAA’s Aviation Web Camera images from Lena Point west facing view camera from 1106 to 1406 AKDT

Attachment 5 – Animation loop of FAA’s Aviation Web Camera images from Lena Point southwest facing view camera from 1107 to 1407 AKDT

Attachment 6 – Animation loop of FAA’s Aviation Web Camera images from Pederson Hill west facing view camera from 1102 to 1402 AKDT

Attachment 7 – A list of hourly marine observations from Point Retreat from July 16th through July 18th

Paul Suffern
 NTSB, AS-30