



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

September 12, 2017

Weather Study

METEOROLOGY

ANC17LA025

Table Of Contents

A. AIRCRAFT ACCIDENT	3
B. METEOROLOGIST	3
C. SUMMARY	3
D. DETAILS OF THE INVESTIGATION	3
E. FACTUAL INFORMATION	4
1.0 Synoptic Situation	4
1.1 Surface Analysis Chart	4
1.2 Alaska Surface Prognostic Chart	5
1.3 Alaska AAWU Forecasts Graphics	5
2.0 Surface Observations	8
2.1 Juneau International Airport	8
2.1.1 5-Minute ASOS Observations	9
3.0 FAA Weather Camera Imagery	10
3.1 Lena Point Weather Camera Images	12
4.0 Sounding	16
5.0 Aircraft Sounding	17
6.0 Satellite Imagery	18
7.0 Weather Radar Imagery	20
8.0 Pilot Reports	21
9.0 Terminal Forecast	21
10.0 Area Forecast	22
11.0 Flat Light and White Out Conditions	22
12.0 Dog Sled Camp Observations	23
13.0 Witness Statements and Photographs	24

A. AIRCRAFT ACCIDENT

Location: Near Juneau, Alaska

Date: May 22, 2017

Time: About 1805 Alaska daylight time

0205 coordinated universal time on May 23, 2017

Airplane: Airbus AS-350-B2; Registration: N207CH

B. METEOROLOGIST

Don Eick

Meteorologist Specialist

Operational Factors Division (AS-30)

National Transportation Safety Board

C. SUMMARY

On May 22, 2017, about 1805 Alaska daylight time, an Airbus (formerly Eurocopter) AS-350-B2 helicopter, N207CH, sustained substantial damage during a collision with remote mountainous snow-covered terrain while en route to Juneau, Alaska, about 21 miles northwest of Juneau. Of the seven occupants on board, the commercial pilot and three passengers sustained minor injuries, and three passengers were not injured. The helicopter was registered to, and operated by, Coastal Helicopters, Inc., Juneau, as a day, visual flight rules (VFR) flight under the provisions of 14 *Code of Federal Regulations* Part 135 as an on-demand sightseeing tour flight. Degraded visual meteorological conditions were reported on the Herbert Glacier at the time of the accident, and company flight following procedures were in effect. The flight originated from the Juneau International Airport, Juneau at 1743.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation from the Washington D.C. office, collecting data from official National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). All times are Alaska daylight time (AKDT) based upon the 24 hour clock, local time is +8 hours to UTC¹, and UTC=Z. 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 58.5825° N and longitude 134.628889° W, at an estimated elevation of 3,258 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) located in Camp Springs, Maryland, and the Alaska Aviation Weather Unit (AAWU) in Anchorage, Alaska. These are the base products used in describing weather features and in the creation of forecasts and warnings. Reference to these charts can be found in the joint NWS and Federal Aviation Administration (FAA) Advisory Circular “Aviation Weather Services”, AC 00-45H.

1.1 Surface Analysis Chart

Figure 1 is the NWS Alaska Surface Analysis Chart issued prior to the accident for 1600 AKDT indicated a stationary front immediately west of the Juneau area extending south-southwestward off the southeast Alaska Coast, with another stationary front to the east across eastern British Columbia and western Alberta. A low pressure system was located about 350 miles west-southwest of the accident site in the Gulf of Alaska at 1010-hectopascals² with a trough of low pressure extending southward. To the south a high pressure system at 1027-hPa was located off northern California with a ridge of high pressure extending northward immediately south of the Juneau area.

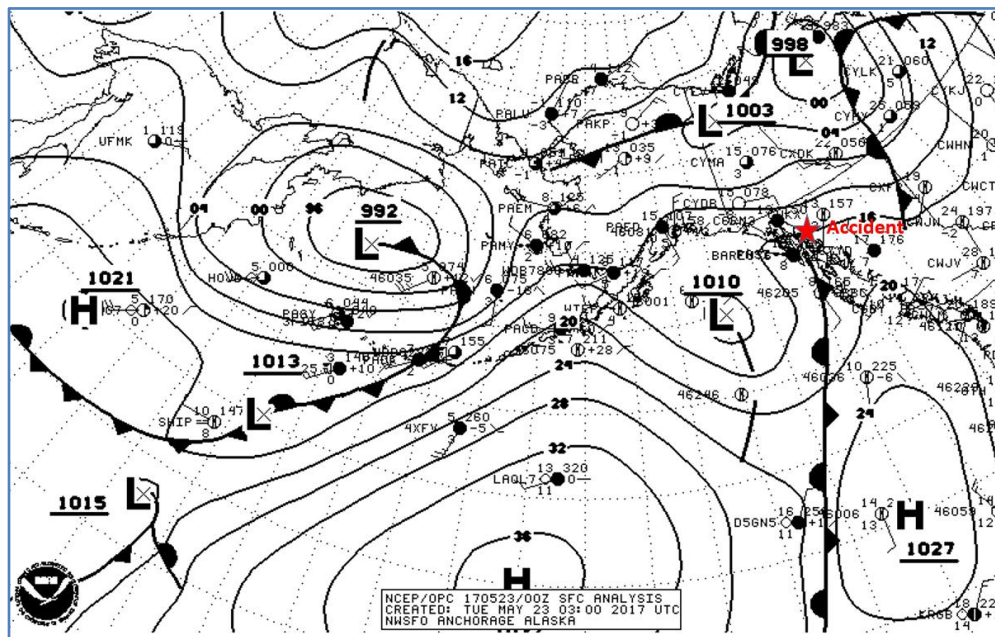


Figure 1 - NWS Alaska Surface Analysis Chart for 1600 AKDT

² Hectopascals (hPa) is the new standard term for reporting sea level pressure and replaces millibars (mb) with the same units. Standard sea level pressure is 1013.25-hPa.

The station model for Juneau, AK indicated light winds, overcast sky cover with light continuous rain, with a temperature of 52° Fahrenheit (F), and a dew point of 50° F. The other surrounding stations also reported light rain in temperatures in the 50's °F with temperature dew points spreads of 4° F or less.

1.2 Alaska Surface Prognostic Chart

Figure 2 is the AAWU issued Surface Prognostic Chart valid for 1600 AKDT on May 22, 2017 for expected areas of precipitation and thunderstorms across Alaska during the period. The chart depicted most of all of southeast Alaska expecting rain showers and mist during the period.

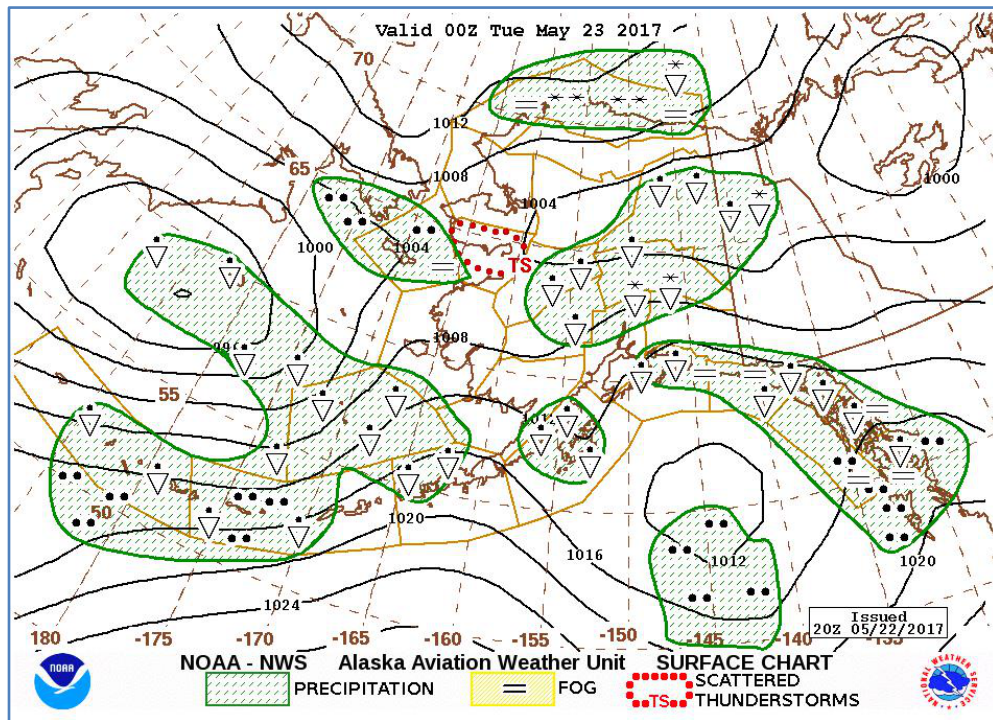


Figure 2 - AAWU Surface Prognostic Chart for 1600 AKDT

1.3 Alaska AAWU Forecasts Graphics

The AAWU issued the following aviation graphical forecasts at 1200 AKDT and valid for 1800 AKDT on May 22, 2017 for Alaska; the Alaska Convective Outlook, Flight Weather Conditions, Low-Level Turbulence Forecast, and Icing Forecast and are included as figures 3 through 6 respectively.

The Alaska Convective Outlook valid for the period (figure 3) depicted no significant convective activity or thunderstorm development was expected for southeast Alaska during the period. The Alaska Flying Weather Chart (figure 4) depicted VFR conditions³ over the Juneau

³ VFR Conditions – are defined as no ceiling or a ceiling greater than 3,000 ft agl and visibility greater than 5 statute

and Glacier Bay areas, with marginal flight rule (MVFR) conditions⁴ to the west and south, with no large areas of instrument flight rule (IFR) conditions⁵ over land. The chart also depicts areas where wind of 30 knots or greater are expected and volcanic activity in which none were expected for the region. The Low-Level Turbulence (figure 5) and Icing Forecast (figure 6) depicted no significant areas of turbulence or icing over the region, with the freezing level depicted at about 4,000 ft over the region.

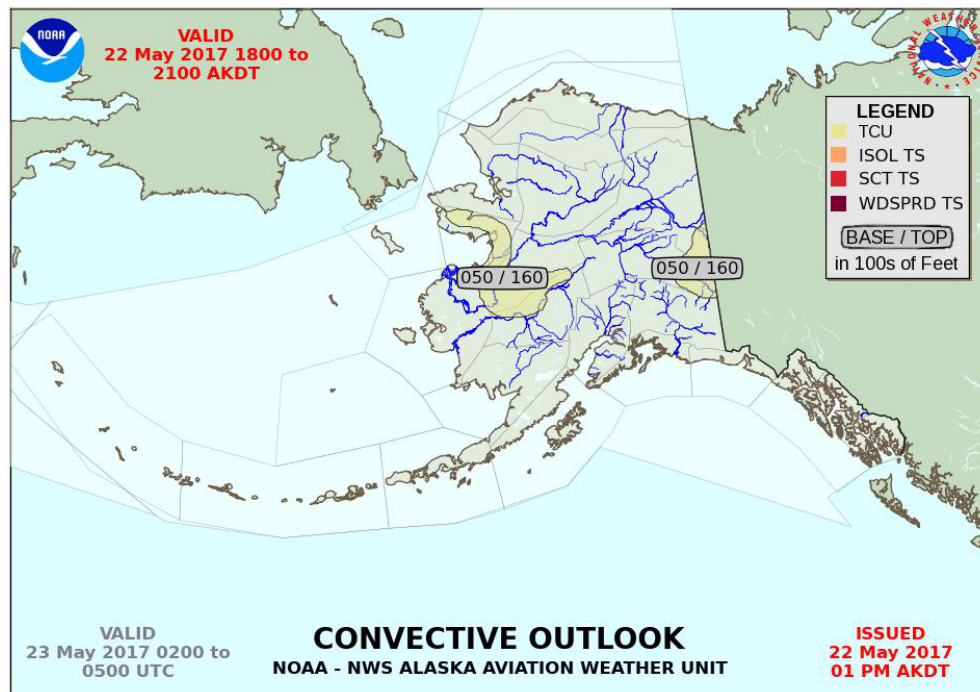


Figure 3 – NWS AAWU Convective Outlook

miles.

⁴ MVFR conditions – are defined as a ceiling between 3,000 and 1,000 ft agl inclusive and/or visibility 3 to 5 miles inclusive.

⁵ IFR conditions – are defined as a ceiling less than 1,000 ft agl and/or visibility less than 3 miles.

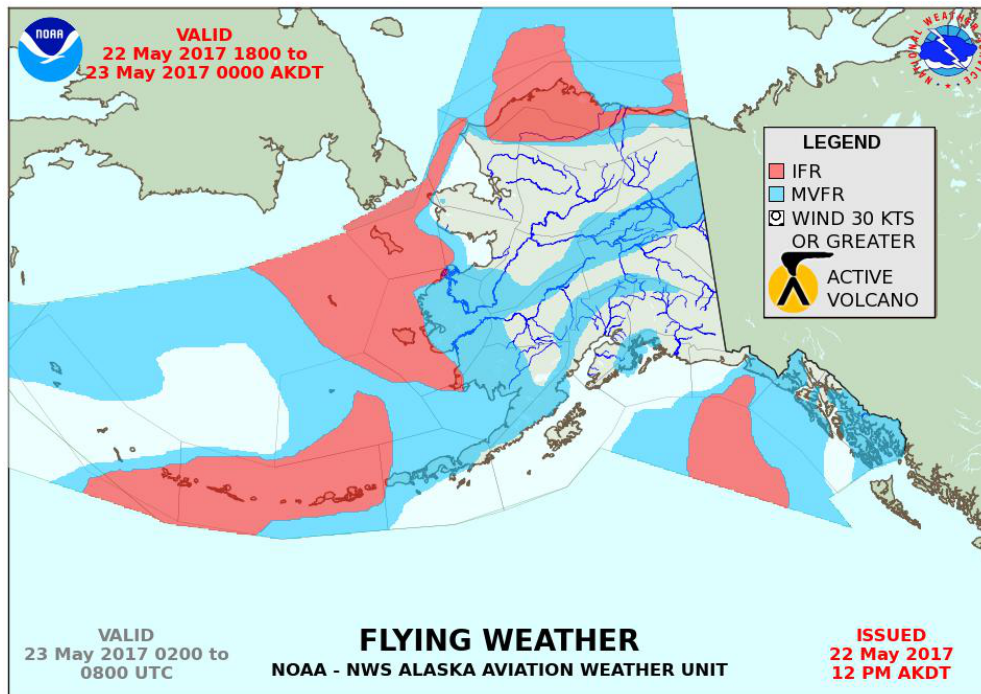


Figure 4 - NWS AAWU Flying Weather Graphic

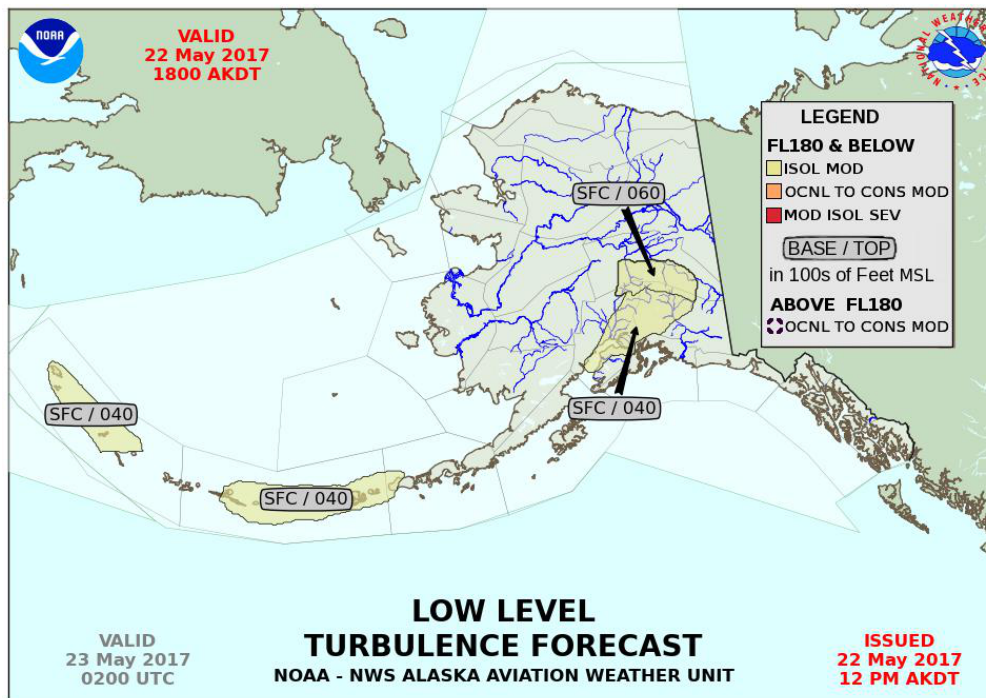


Figure 5 - NWS AAWU Low-Level Turbulence Forecast

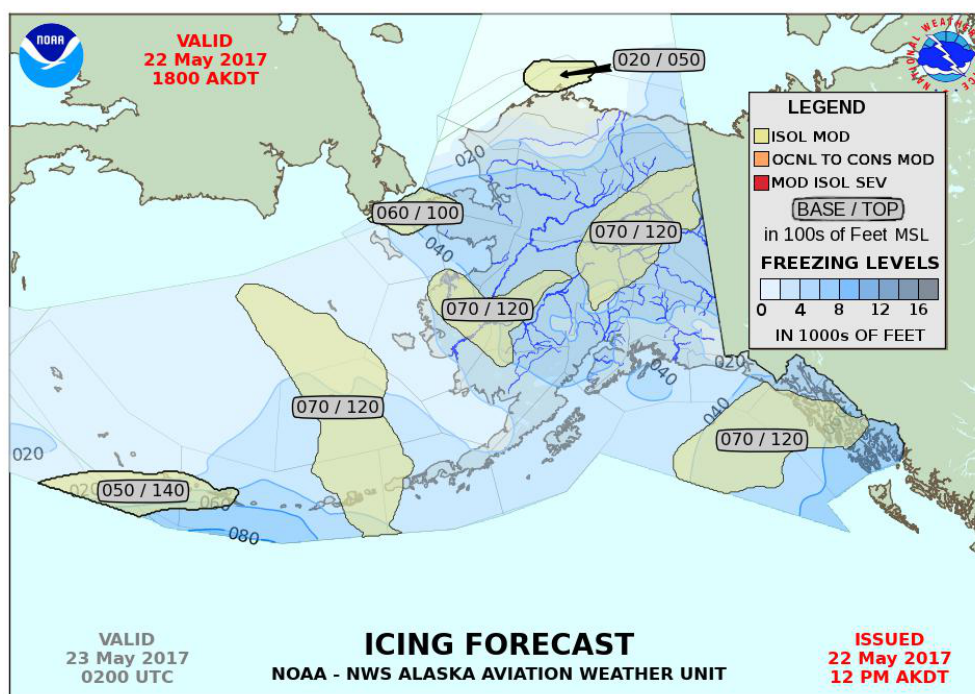


Figure 6 - NWS AAWU Icing Forecast

2.0 Surface Observations

The official NWS Meteorological Aerodrome Reports (METARs) and special reports (SPECIs) sites surrounding the period were documented for the area. The cloud heights are reported in feet (ft) above ground level (agl) in the following section. The estimated magnetic variation across the region was 20° East based on the Federal Aviation Administration (FAA) sectional chart for the region.

2.1 Juneau International Airport

The closest official weather reporting location to the accident site was from Juneau International Airport (PAJN), Juneau, Alaska located about 14 miles south (173° azimuth), at an elevation of 25 ft. The airport had an Automated Surface Observation System (ASOS) and observations were augmented by NWS certified observers. About the time of the accident PAJN was reporting the following conditions:

PAJN routine weather observation at 1753 AKDT, wind from 090° at 5 knots, visibility 10 miles or more in light rain, a few clouds at 1,400 ft agl, ceiling broken at 3,400 ft, overcast at 7,000 ft, temperature 12° Celsius (C), dew point temperature 11° C, altimeter 29.97 inches of mercury (Hg). Remarks: automated observation system with a precipitation discriminator, sea level pressure 1014.7-hPa, precipitation very light, breaks in overcast, hourly precipitation less than 0.01 inches or a trace, temperature 11.7° C, dew point 10.6° C.

The raw observations surrounding the period and general flight categories were as follows:

VFR METAR PAJN 22253Z 08005KT 10SM FEW013 BKN043 OVC070 12/10 A3001 RMK AO2 RAE42 SLP163
OCNL BINOVC P0002 T01220100

VFR METAR PAJN 22253Z 09005KT 10SM -RA SCT017 BKN040 OVC070 12/10 A3000 RMK AO2 RAB19
SLP158 P0000 60003 T01170100 10128 20111 58010

VFR METAR PAJN 230053Z 06006KT 7SM RA FEW019 BKN035 OVC065 12/11 A2998 RMK AO2 SLP153
P0006 T01170106

VFR METAR PAJN 230153Z 09005KT 10SM -RA FEW014 BKN034 OVC070 12/11 A2997 RMK AO2 SLP147
PCPN VRY LGT BINOVC P0000 T01170106

Accident 0205Z

VFR METAR PAJN 230253Z 06003KT 10SM FEW013 SCT035 OVC065 12/11 A2995 RMK AO2 RAE35 SLP143
P0002 60008 T01170106 56015

VFR METAR PAJN 230353Z 07003KT 10SM FEW010 SCT035 OVC100 11/11 A2994 RMK AO2 SLP137
BINOVC T01110111

2.1.1 5-Minute ASOS Observations

A review of the 5-minute data being issued from the PAJN ASOS for the 30 minutes either side of the accident were as follows:

5-MIN PAJN 230135Z 09006KT 10SM RA FEW032 BKN044 OVC070 12/11 A2997 -20 89 -300 070/06 RMK AO2
P0000 T01220106

5-MIN PAJN 230140Z 09005KT 10SM RA FEW034 BKN046 OVC070 12/11 A2997 -20 96 -300 060/05 RMK AO2
P0000 T01170111

5-MIN PAJN 230145Z 08004KT 10SM RA SCT034 BKN048 OVC065 12/11 A2997 -20 89 -300 060/04 RMK AO2
P0000 T01220106

5-MIN PAJN 230150Z 09005KT 10SM RA FEW014 BKN034 OVC070 12/11 A2997 -20 93 -300 070/05 RMK AO2
SLP147 P0000 T01170106

5-MIN PAJN 230155Z 09005KT 10SM -RA BKN034 BKN046 OVC060 12/11 A2996 -10 96 -300 070/05 RMK AO2
P0000 T01170111

5-MIN PAJN 230200Z 08004KT 10SM -RA BKN032 OVC043 12/11 A2996 -10 93 -300 060/04 RMK AO2 P0000
T01170106

5-MIN PAJN 230205Z 07005KT 10SM BKN034 OVC044 12/11 A2996 -10 93 -300 050/05 RMK AO2 RAE05
P0000 T01170106

5-MIN PAJN 230210Z 07003KT 10SM -RA BKN032 OVC042 12/11 A2996 -10 93 -300 040/03 RMK AO2 P0000
T01170106

5-MIN PAJN 230215Z 07003KT 10SM -RA BKN030 OVC037 12/10 A2996 -10 89 -300 050/03 RMK AO2 P0000
T01170100

5-MIN PAJN 230220Z 08004KT 6SM -RA BR BKN030 OVC035 12/11 A2996 -10 93 -300 060/04 RMK AO2 P0001

T01170106

5-MIN PAJN 230225Z 06006KT 5SM -RA BR SCT028 OVC035 12/11 A2996 -10 93 -300 040/06 RMK AO2 P0002
T01170106

5-MIN PAJN 230230Z 06005KT 9SM -RA SCT028 OVC035 12/11 A2996 -10 93 -300 040/05 RMK AO2 P0002
T01170106

5-MIN PAJN 230235Z 07005KT 10SM SCT028 BKN035 OVC055 12/11 A2996 -10 93 -300 050/05 RMK AO2
RAE35 P0002 T01170106

The 5-minute PAJN observation at the time of the accident was as follows:

PAJN 5-minutes observation at 1805 AKDT, wind from 070° at 5 knots, visibility 10 miles or more, ceiling broken at 3,400 ft agl, overcast at 4,400 ft, temperature 12° C, dew point temperature 11° C, altimeter 29.96 inches of Hg, pressure altitude -10 ft, relative humidity 93%, density altitude -300 ft, magnetic wind 050° at 5 knots. Remarks: automated observation system with a precipitation discriminator, rain ended at 1805 AKDT, hourly precipitation less than 0.01 inches, temperature 11.7° C, dew point temperature 10.6° C.

3.0 FAA Weather Camera Imagery

The FAA had a weather camera at Lena Point, identifier QLT, located about 12.5 miles south or at an 198° azimuth from the accident site, at an elevation of 170 ft. Figure 7 is a depiction of the Lena Point camera views with the approximate location of the accident site marked. The north camera was centered on 340° azimuth and viewed the conditions over the Favorite Channel out to the Lynn Channel area west of the Glacier. A depiction of the visibility references for the North camera from Lena Point on a clear day is included as figure 8. The terrain at 2,800 ft located 13.5 statute miles north was located immediately west near the base of the glacier with the accident site off to the right of the image. Figure 9 is the southeast camera reference markers looking towards the PAJN and the Lynn Channel.

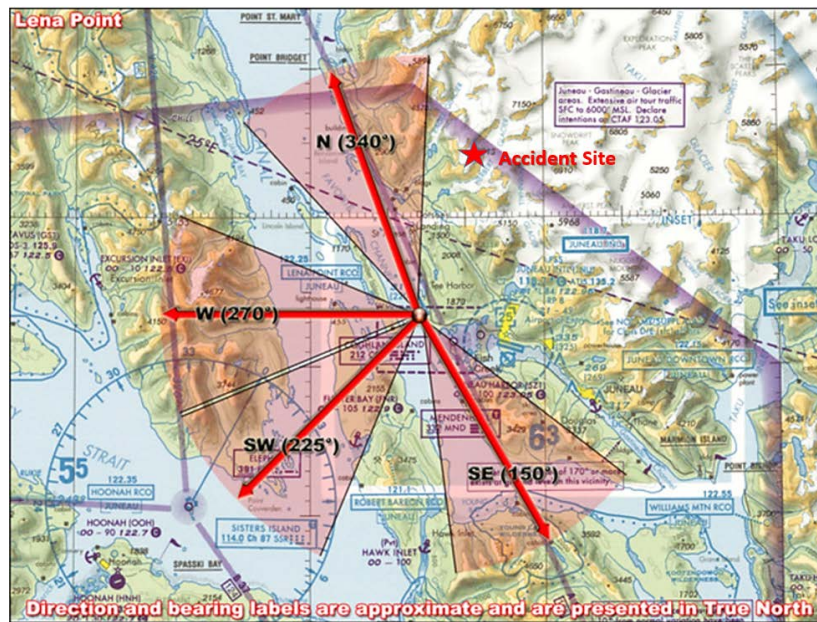


Figure 7 - Lena Point Weather Camera

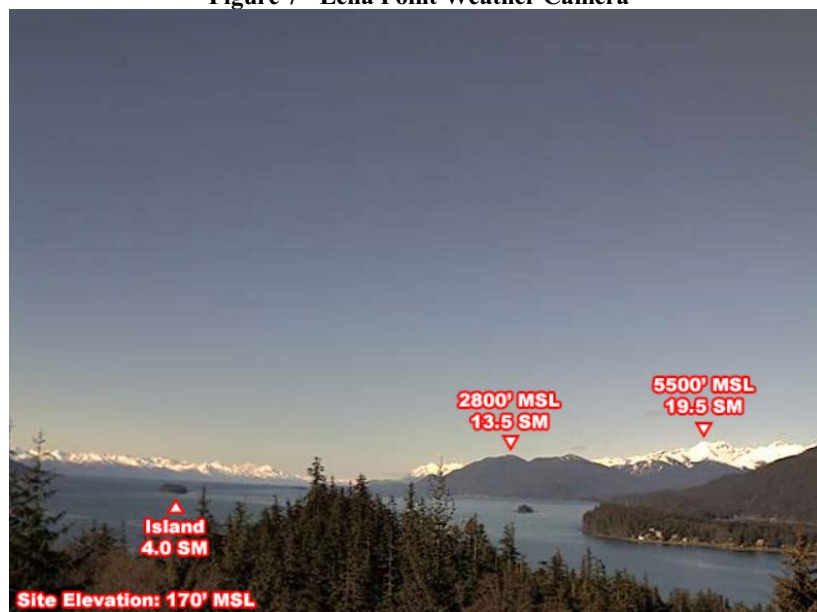


Figure 8 - Lena Point - North camera reference markers

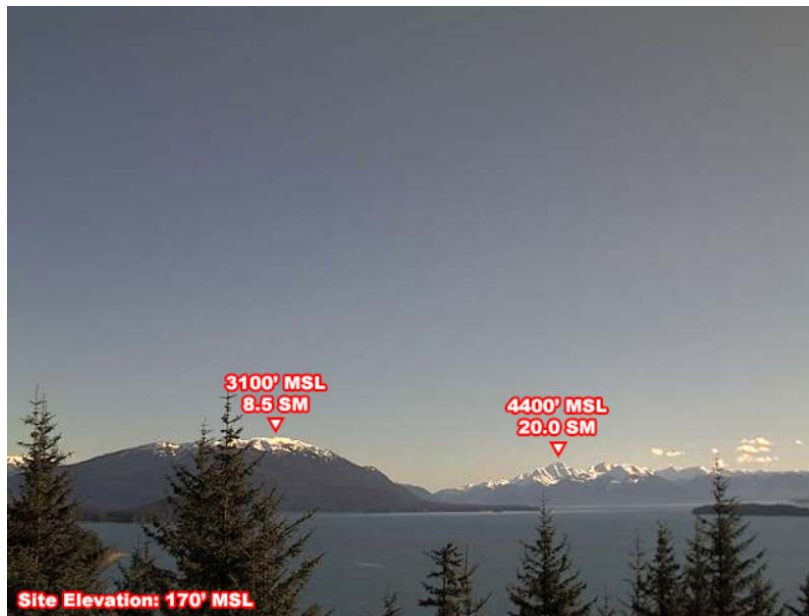


Figure 9 - Lena Point - Southeast camera reference markers

3.1 Lena Point Weather Camera Images

Figures 10 through 14 are the Lena Point north camera images from 1749 through 1829 AKDT, at 10-minute intervals viewing the conditions immediately west of the accident site. The images show two to three layers of clouds; one below 2,000 ft in the valley, another obscuring the high peaks, and the other a band of altocumulus to stratocumulus type clouds, with some nimbostratus clouds in the distance. No indications of precipitation was evident over the camera site; however, dark clouds to the northwest indicated possible precipitation beyond 15 miles. The high terrain 19.5 miles north at 5,500 ft was totally obscured by clouds surrounding the entire period with no clear depiction of the terrain or peaks beyond 14 miles. The higher terrain at 13.5 miles away at 2,800 ft was at first identifiable but becomes obscured by clouds with time, the lower band of clouds extend in the valley leading to the glacier. No significant wind was noted by any trees swaying or indications in the water.

Figure 15 is the Lena Point southeast camera view at 1800 AKDT which showed the higher terrain also obscured by clouds about the time of the accident.

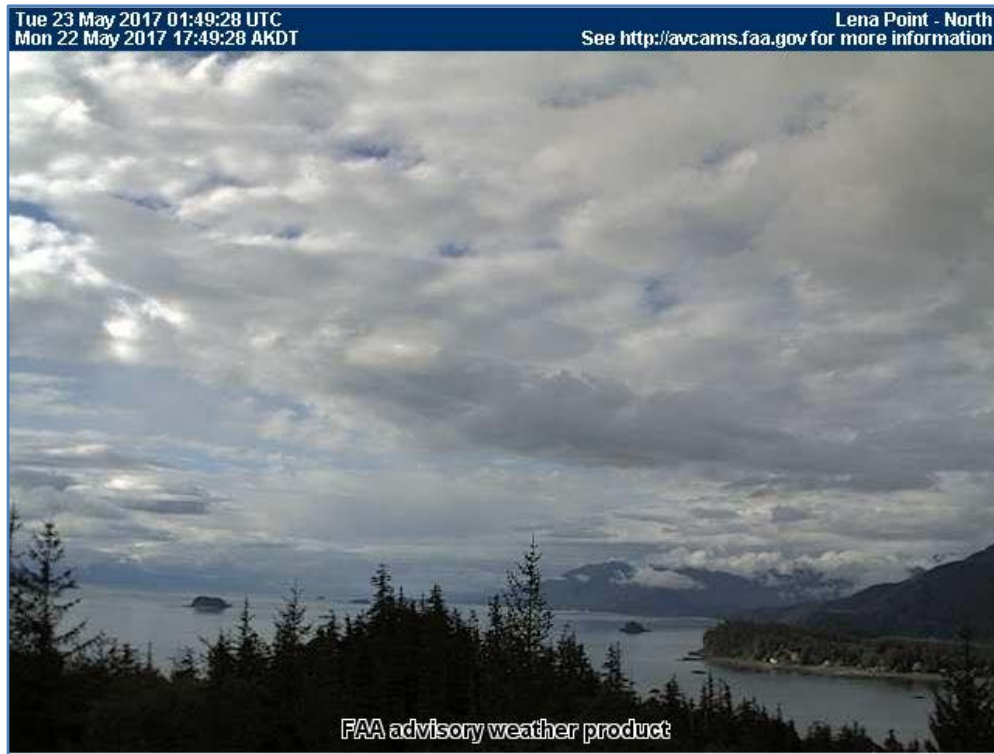


Figure 10 - Lena Point North camera view at 1749 AKDT



Figure 11 - Lena Point North camera view at 1759 AKDT



Figure 12 – Lena Point North camera view at 1809 AKDT



Figure 13 - Lena Point North camera view at 1819 AKDT



Figure 14 - Lena Point North camera view at 1829 AKDT

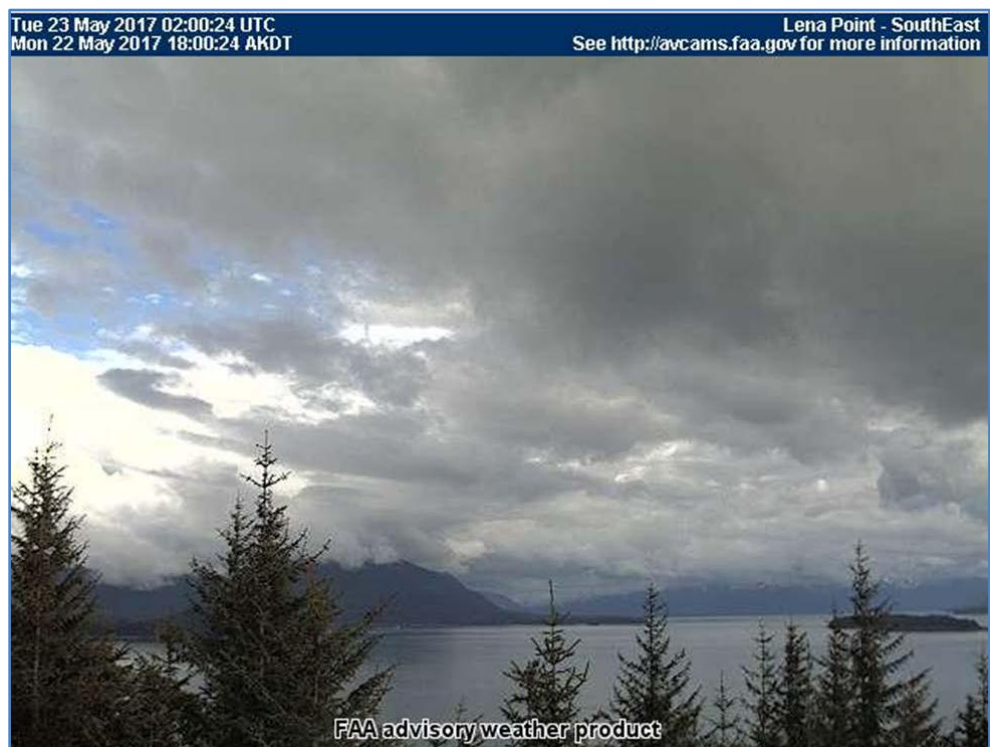


Figure 15 - Lena Point Southeast camera view at 1800 AKDT

A Global Data Assimilation System (GDAS) numerical model sounding was obtained from archive data from the National Oceanic and Atmospheric Administration’s (NOAA) Air Resource Laboratory database and plotted on a Skew-T log P diagram⁶ from the surface to 500-hPa or 18,000 ft utilizing RAOB software⁷. The numerical model sounding was plotted over the accident site with a 0.5° resolution, with an initial run at 1600 AKDT (0000Z May 23, 2017) and is included in figure 16.

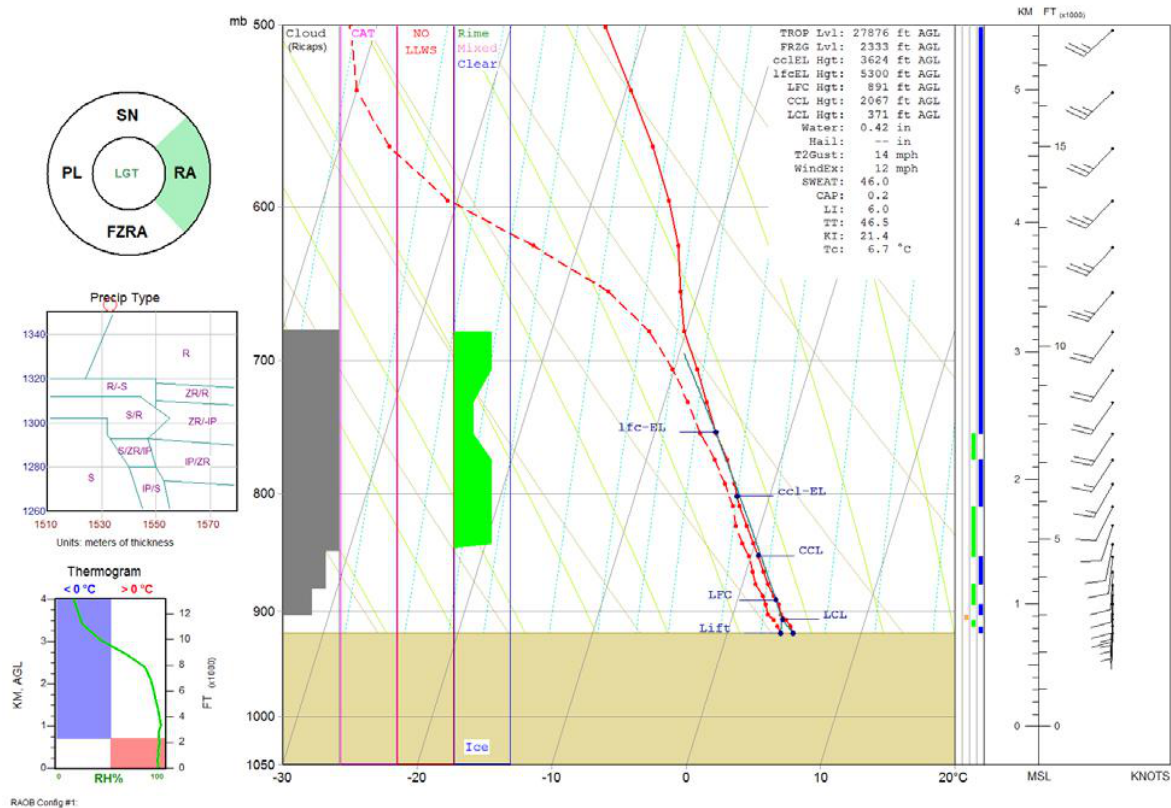


Figure 16 - GDAS numerical model sounding for 1600 AKDT over the accident site

The model sounding estimated the elevation at 2,500 ft with a surface temperature of 5° C, a dew point temperature of 4° C, and a relative humidity of 93%, and the surface wind from the south at 180° at 6 knots. The sounding indicated a lifted condensation level (LCL)⁸ at about 370

⁶ Skew T log P diagram – is a standard meteorological plot or thermodynamic diagram 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.

⁷ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania.

⁸ Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

ft agl, a level of free convection (LFC)⁹ at 890 ft agl, and a convective condensation level (CCL)¹⁰ at 2,070 ft agl with the estimated top of the clouds at 10,420 ft based on the relative humidity greater than 85%. The atmosphere was classified as stable based on the lifted index (LI)¹¹ of 6.0, with the layer below 8,000 ft showing general conditional unstable conditions (indicated by green on the far right side of diagram, blue being stable) and supported several layers of low to mid-level clouds with stratocumulus to nimbostratus type clouds with light precipitation. The freezing level was at 4,830 feet and the sounding supported icing in clouds and precipitation above that level. The wind profile indicated southerly winds veering to the southwest with height. No strong vertical shears were noted to indicate any potential turbulence or low-level wind shear.

5.0 Aircraft Sounding

In-situ aircraft reports were also reviewed from the NOAA Aircraft Meteorological Data Relay (AMDAR) observations. An aircraft identified as #10461 landed at PAJN at 1932 AKDT and provided a descent sounding, which is included as figure 17 with the observed data. The freezing level was near 5,000 ft with light winds below 3,000 ft.

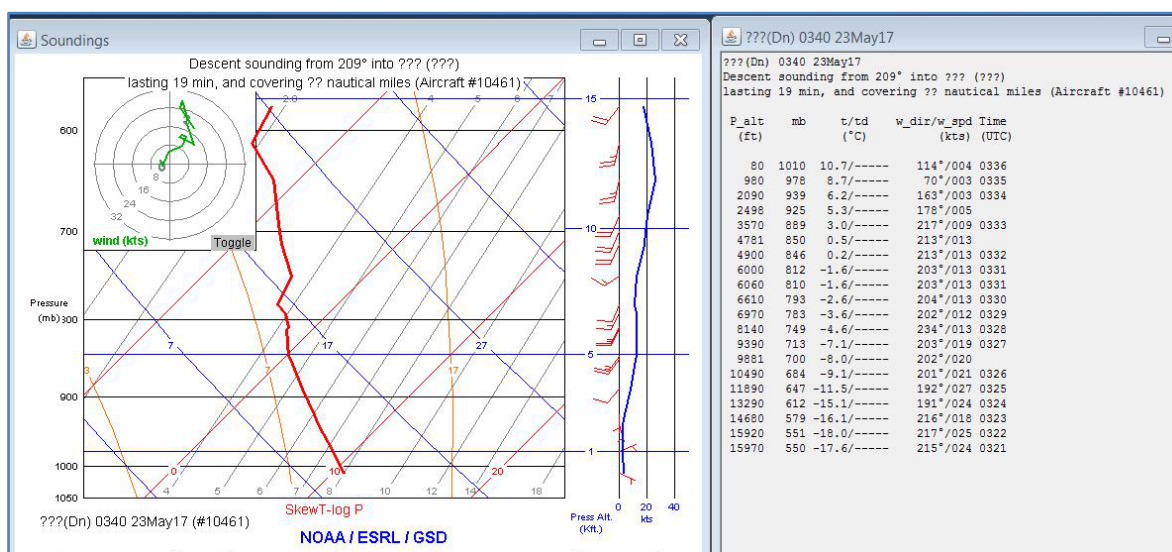


Figure 17 - AMDAR descent sounding into PAJN at 1936 AKDT

⁹ Level of Free Convection (LFC) -The level at which a parcel of saturated air becomes warmer than the surrounding air and begins to rise freely. This occurs most readily in a conditionally unstable atmosphere.

¹⁰ Convective Condensation Level (CCL) - The height to which a parcel of air, if heated sufficiently from below, will rise adiabatically until condensation starts. This is typically used to identify the base of cumuliform clouds, which are normally produced from surface heating and thermal convection.

¹¹ Lifted Index (LI) - A common measure of atmospheric instability. Its value is obtained by computing the temperature that air near the ground would have if it were lifted to 500-hPa or approximately 18,000 feet and comparing that temperature to the actual temperature at that level. Negative values indicate instability - the more negative, the more unstable the air is, and the stronger the updrafts are likely to be with any developing thunderstorms.

6.0 Satellite Imagery

The Geostationary Operational Environmental Satellite number 15 (GOES-15) data was obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System (McIDAS) software. Both the infrared long wave and visible band imagery were obtained surrounding the time of the accident. The infrared long wave imagery (band 4) at a wavelength of 10.7 microns (μm) provided standard satellite image with radiative cloud top temperatures with a resolution of 4 km. The visible imagery (band 1) at a wavelength of 0.65 μm provided a resolution of 1 km.

Figure 18 is the GOES-15 infrared image at 1800 AKDT at 7X magnification with a temperature enhancement curve applied. The image depicted an extensive area of low to mid-level clouds over the region, with several breaks in the clouds indicated by the reddish-brown areas. The accident site is marked by a red square and PAJN by a blue square. The image depicted a radiative cloud top temperature of 267° Kelvin or -6.16° C over the accident site, which corresponded to a cloud tops near 8,200 ft based on the GDAS sounding.

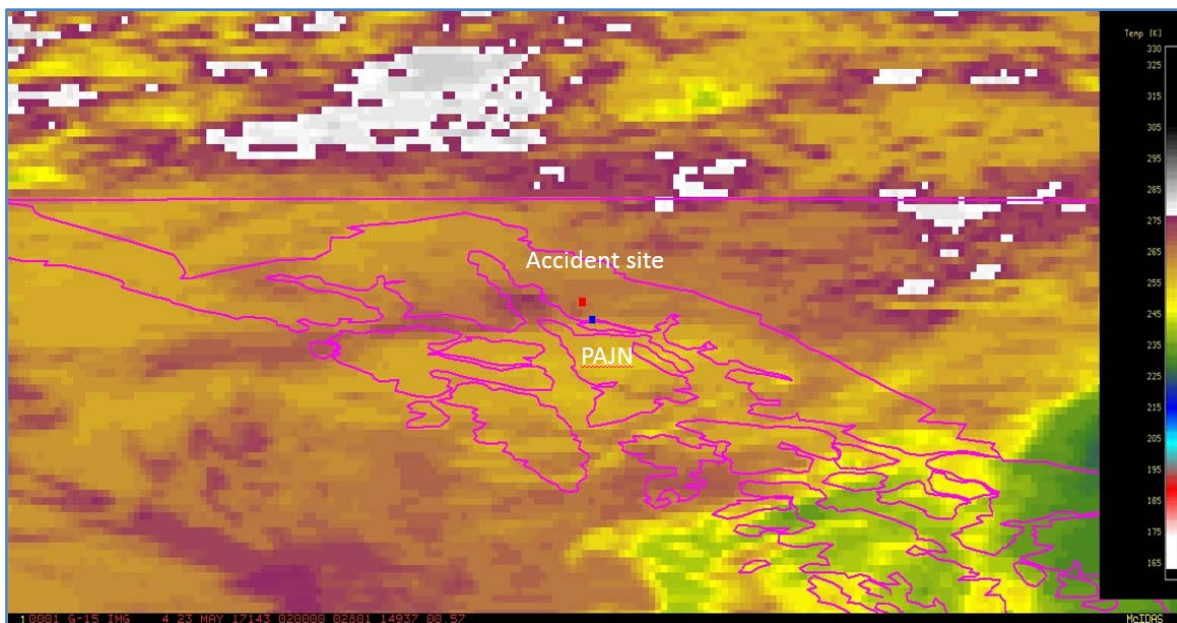


Figure 18 - GOES-15 infrared red image at 1800 AKDT at 7X magnification

Figures 19 through 22 are the GOES-15 visible images at 1730, 1745, 1800, and 1815 AKDT at 3X magnification, with the accident site indicated by the red and PAJN by the blue square. The images show an overcast layer of clouds over the accident site during the period with a broken coverage between the accident site and PAJN between 1730 and 1745 AKDT. A break in cloud cover was evident over Lynn Channel to the west, as confirmed by the Lena Point weather camera images.

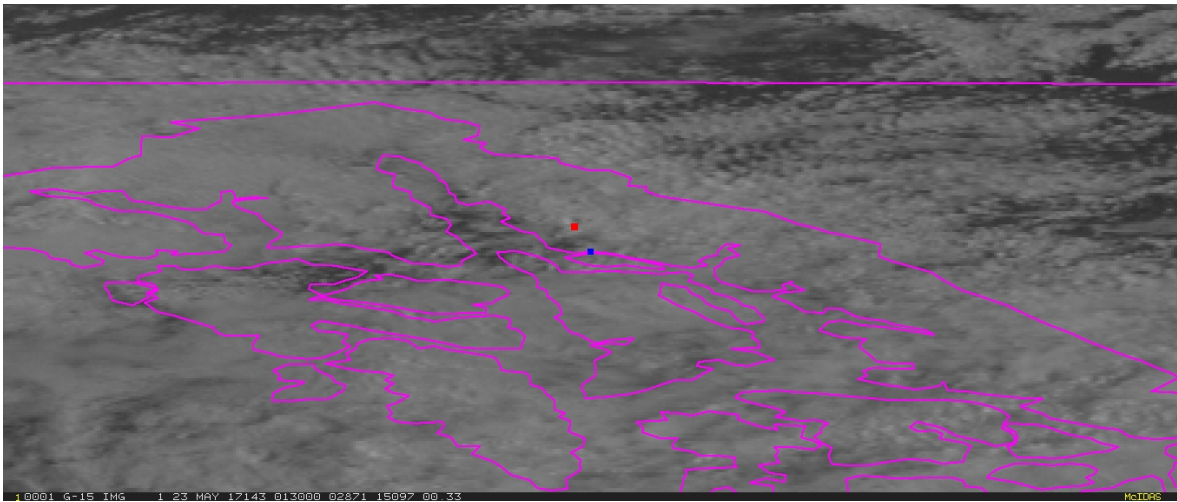


Figure 19 - GOES-15 visible image at 1730 AKDT

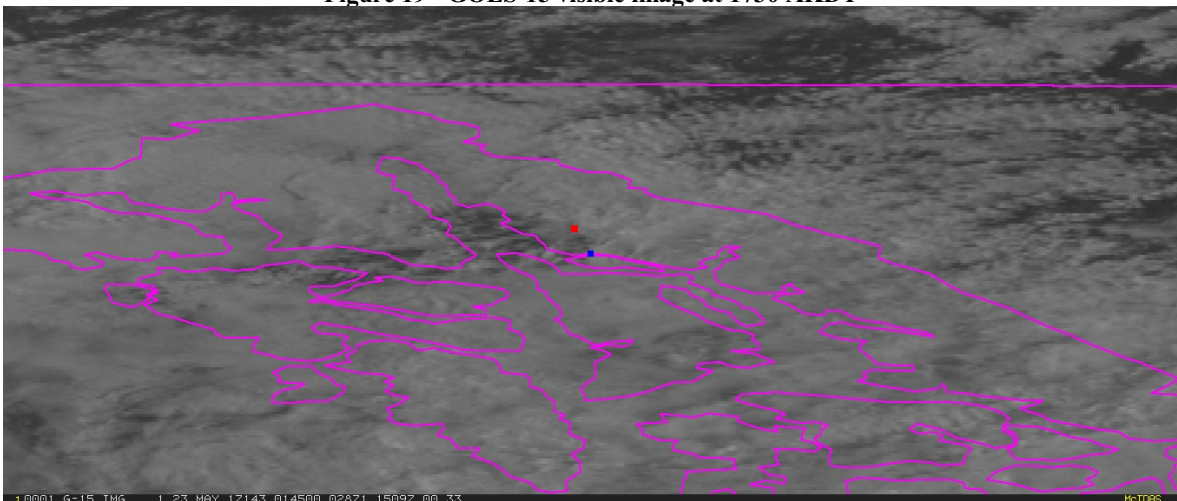


Figure 20 - GOES-15 visible image at 1745 AKDT

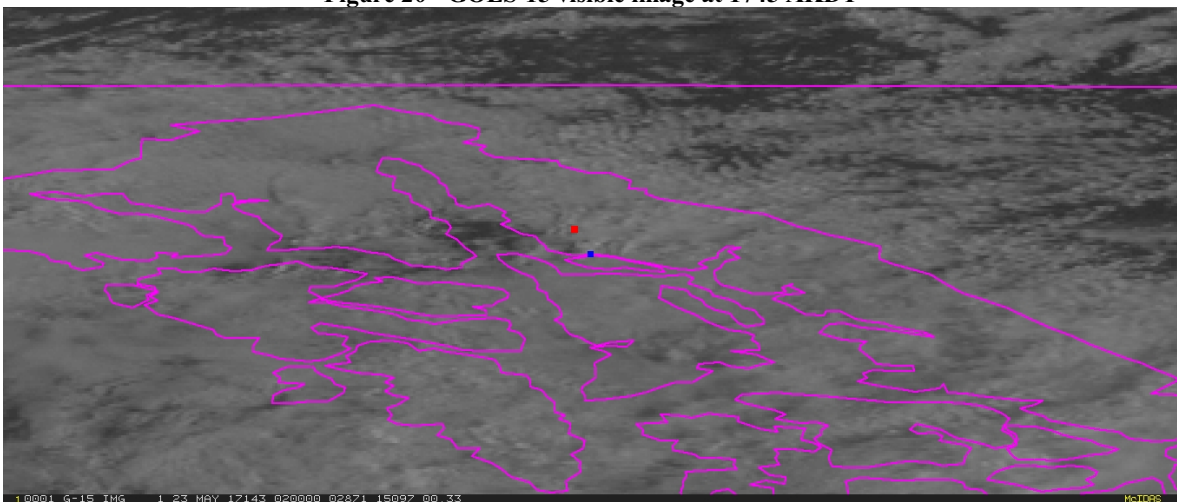


Figure 21 - GOES-15 visible image at 1800 AKDT

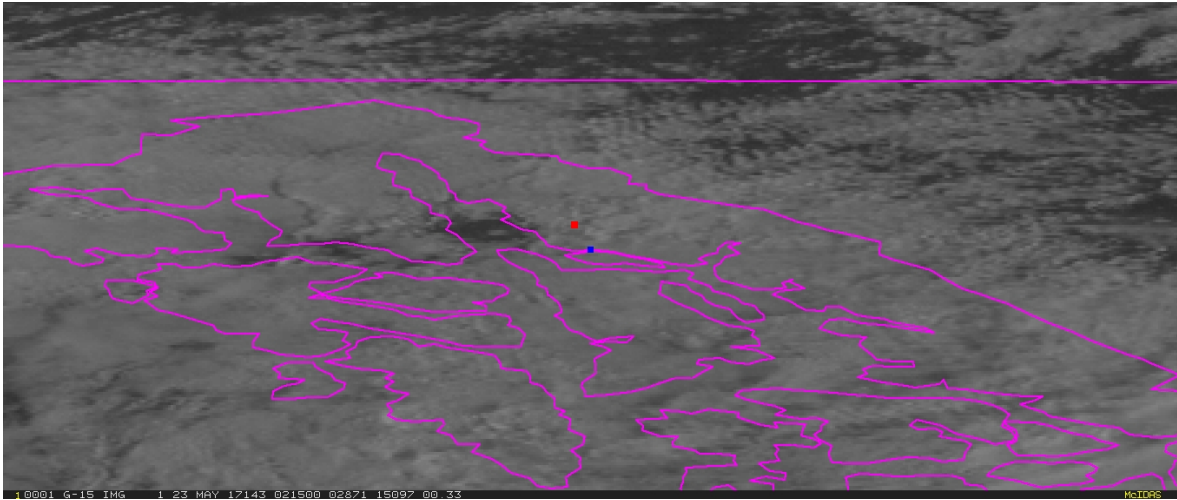


Figure 22 - GOES-15 visible image at 1815 AKDT

7.0 Weather Radar Imagery

The closest Weather Surveillance Radar-1988 Doppler (WSR-88D) to the accident site was from the FAA Biorka Island/Sitka site (PACG) located 108 miles south-southwest of the accident site, with an antenna height of 272 ft. Assuming a standard refraction of the radar beam, the lowest 0.5° elevation beam would have been centered at 14,880 ft over the accident site, and the 1.4° beam at 24,180 ft. Therefore, the radar was out of range to depict any low-level echoes in the area or specifically in the observed clouds below 10,000 feet over the accident site.

Figure 23 is the PACG WSR-88D 1.4° base reflectivity image at 1803 AKDT which depicted echoes extending out to 60 miles from the radar site, but due to range limitations and potential beam blockage due to higher terrain in the area was unable to see any low-level echoes over the accident site.

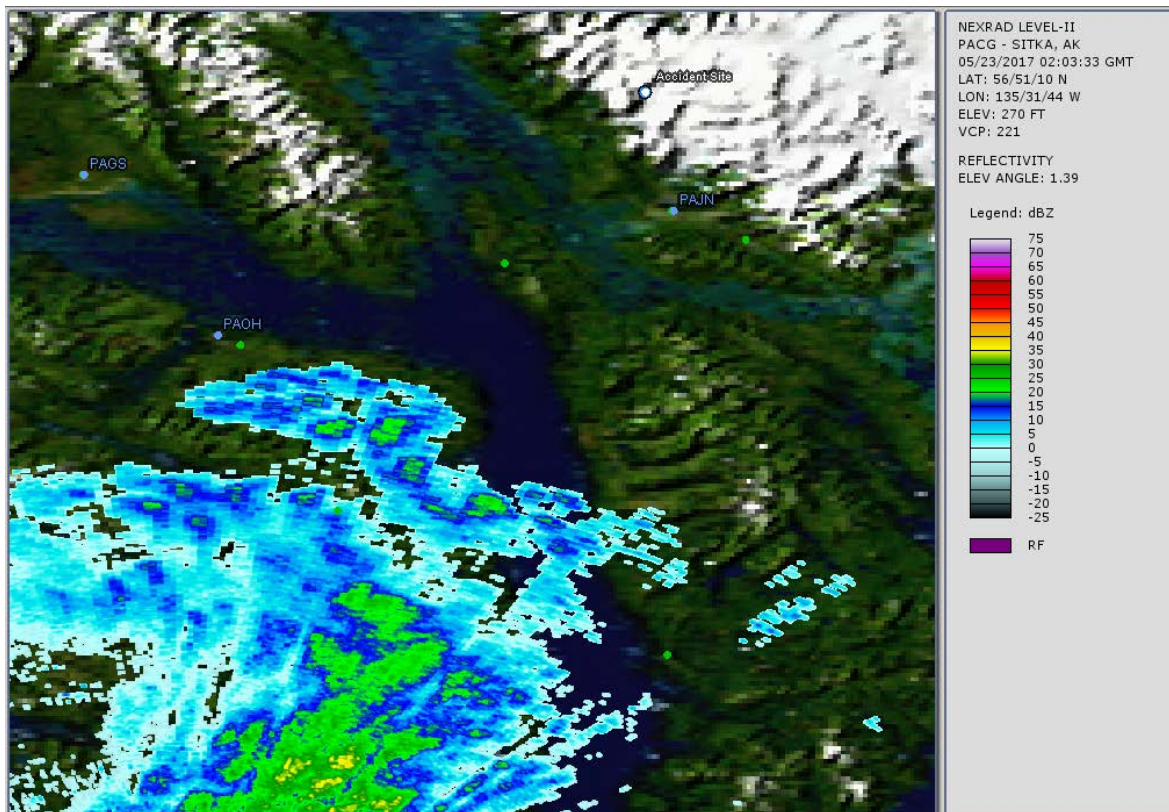


Figure 23 - FAA Sitka WSR-88D image at 1803 AKDT

8.0 Pilot Reports

The following pilot reports or PIREPs were recorded over the region between 0800 through 2300 AKDT surrounding the period of the accident:

SIT UA /OV SIT-BNF /TM 1625 /FL003 /TP DHC6 /RM REWX=

JNU UA /OV SSR027016 /TM 1647 /FL030 /TP B737 /SK OVC030 /RM DURD BROKE OUT 030 OVR BARLO=

JNU UA /OV SSR /TM 1647 /FL084 /TP B737 /TA M04 /IC LGT RIME /RM DURD RWY 08=

SIT UA /OV SIT /TM 1728 /FL011 /TP C208 /SK BKN011-TOPUNKN /TA UNKN /TB NEG /IC NEG=

9.0 Terminal Forecast

The NWS Juneau Weather Forecast Office issued the PAJN Terminal Aerodrome Forecast or TAF at 1537 AKDT and was valid for a 24-hour period beginning at 1800 AKDT, and was current for a 5 mile radius around the airport. The forecast was as follows:

*TAF PAJN 222337Z 2300/2324 10005KT P6SM -SHRA SCT018 OVC040
FM230700 11006KT P6SM VCSH SCT020 OVC030*

FM231600 VRB04KT P6SM SCT030 BKN040=

The forecast expected VFR conditions to prevail through 2300 AKDT, with wind from the east or from 100° at 5 knots, visibility better than 6 miles with light rain showers, scattered clouds at 1,800 ft agl, and a ceiling overcast at 4,000 ft.

10.0 Area Forecast

The NWS AAWU issued the following Area Forecast for the region at 1412 AKDT:

*FAAK47 PAWU 222012
FA7H
JNUH FA 222015
EASTERN GULF COAST AND SE AK...
.
AIRMETS VALID UNTIL 230415
CB IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HEIGHTS NOTED BY AGL OR CIG.
.
SYNOPSIS VALID UNTIL 231400
1010MB WEAK LOW PRES OVR CNTRL GULF MVS EWD TO 100NM W PAHY
DURG PD. HI PRES DVLPS OVR WRN AND CNTRL GULF AFT 09Z.
.
LYNN CANAL AND GLACIER BAY JB...VALID UNTIL 230800
...CLOUDS/WX...
AIRMET MT OBSCMTS OCNL OBSC IN CLDS/PCPN. NC...
SCT025 BKN050 TOP 120. OCNL BKN025 VIS 3-5SM -SHRA BR.
OTLK VALID 230800-231400...VFR SHRA.
PASSES...WHITE...CHILKOOT...MVFR CIG SHRA.
...TURB...
NIL SIG.
...ICE AND FZLVL...
TIL 05Z S PAHN ISOL MOD ICEIC 070-120. FZLVL 050.
.*

The forecast indicated that an AIRMET was current for mountain obscuration conditions due to clouds and precipitation. The forecast expected generally scattered clouds at 2,500 ft, broken at 5,000 ft with cloud tops to 12,000 ft, with occasional MVFR conditions with broken clouds at 2,500 ft and visibility 3 to 5 miles in light rain showers and mist. The outlook after 0000 AKDT expected VFR conditions to prevail with rain showers. No significant turbulence was expected and the freezing level was at 5,000 ft and isolated moderate icing-in-clouds between 7,000 to 12,000 ft was expected.

11.0 Flat Light and White Out Conditions

The FAA defines “Flat Light” conditions as an optical illusion, and is also known as “sector or partial white out”. It is not as severe as “white out” conditions but the condition causes pilots to lose their depth-of-field and contrast in vision. Flight light conditions are usually accompanied by overcast clouds inhibiting any good visual clues and are most common over snow covered areas

or over regions with little contrast such as deserts or glassy water. Flat light can completely obscure features of the terrain, creating an inability to distinguish distance and closure rates. As a result of this reflected light, it can give pilots the illusion of ascending or descending when they are actual flying in level flight.

White out conditions in meteorological terms, is when a person becomes engulfed in a uniform white glow. The white glow may be as a result of blowing snow, dust, sand, mud, or water. There are no shadows, no horizon or clouds and all depth-of-field and orientation is lost. A white out situation is severe in that there aren't any visual references, and VFR flight in complete white out conditions is not recommended, according to the FAA Safety Bulletin "Flying in Flat Light & White Out Conditions", dated 2002.

12.0 Dog Sled Camp Observations

An observer at the dog camp made regular hourly observations and transmitted them back to Coastal Helicopter Services. Figure 24 is a copy of the observations and pilot reports noted prior to the accident.

0703 Dog camp cel 015 unlimited vis 0 wind 0 pricep
 0758 Dog camp cel 015 unlimited vis 0 wind 0 pricep
 0857 Dog camp cel 015 5 miles vis w @ 5 0 pricep fog forming at the toe
 0955 Dog Camp cel 015 5 miles vis 5miles down gl 0 pricep fog at the toe
 growing creeping up glaicer.
 1030 207/SS fog on 2200 & 1800 level
 1055 Dog Camp cel 015 1 mile vis fog moving in
 1127 360/JM Sct layer 018 ft level Better thay when he was on his way to HNS
 1156 - Dog Camp - CIG010 1/2SM CALM -RA fog at the ice falls
 1230 - Airboat - CIG 035 10mph down
 1248 Dog Camp Lower 010 2 1/2 SM 5 mile down glaicer 0 pricep
 1248 Dog Camp middle camp 010 cel 4 S/M 0 wind 0 pricep
 1300 - PIREP - 724/JM - herbert 015 cel at the 018 ft level 5 S/M
 1305 - PIREP - 724/JM - Dog camp middle camp 009-010 cel unlimited vis
 1320 - Airboat - CIG 035 10mph down
 1350 - Airboat - 15mph up
 1355 Dogs 012 cel 5 miles vis calm wind -R
 1428 - PIREP - 207/JM - Rain cloud over 1800' lvl CIG varies from 600' - 1500' @
 1800' lvl, WX nicer at dogs CIG012
 1455 - Dog Camp - 1000' ceiling, 3 mi vis, light rain, 5 mph down glacier wind
 1519 - PIREP - 203/PL - over spaulding 2300' possibly 200' in parts, bit of a tight
 squeeze
 1551 - Dog Camp - CIG012 5SM CALM 0 precip
 1611 - Airboat 025 CIG, Light wind
 1654 - Dog Camp - CIG012 2 1/2SM DOWN@05 0 precip, fog developing at the toe,
 keeping an eye on it
 1701 - Dog Camp - Upper camp CIG012 2 1/2SM Lower RA HZ and fog developing
 1707 - Dog Camp - UP@15 wind is bringing up the fog
 1725 - PIREP - 207/AM - Starting to get worse.. at 1500' level CIG006 less and less
 as you get up to dog camp
 1725 - PIREP - 204/LF - starting to get worse, few hundred feet above
 1729 - Dog Camp - Rolling up patchy 1 1/2SM CIG015 w side CIG008-010 E side
 1747 - Dog Camp - fog haze, 1 1/2SM CIG015+ CALM 0 precip

Figure 24 - Dog Camp weather observations and pilot reports

The observer making the observations, Erik Hanson provided a statement, and indicated that a few minutes after making his hourly report, he observed a strong up glacier wind, which he reported twice at 1725 AKDT. Subsequent helicopter pilots inbound to the dog camp also reported the upslope winds and impending fog and reduced visibility. Those pilots decided to return to

Juneau due to the deteriorating weather conditions. Two subsequent “pick up” pilots with more instrument time were mustered to pick up the passengers and return them to Juneau.

According to Mr. Hanson the whiteout conditions were thickening while the helicopters were in flight, and the helicopters pilots followed the landing markers into the camp, picked up the passengers and departed. The first helicopter made a 180° turn, gained altitude and proceeded southeast to the Medial Moraine, where he lost visual contact with the helicopter. The accident helicopter was the second helicopter to depart, the helicopter lifted off and headed slow and low on a north-northwesterly course towards the rock wall, and then turned south, and hung close to the wall proceeding southbound. The observer then lost sight of the helicopter in the fog. A short time later he heard, the accident pilot make a call on the radio, obviously shaken that she had crashed into the snow.

He then made contact with her and gained her approximate position and status and departed on snow mobiles to the site, and arrived on the site within 5 minutes. He then ferried the passengers back to the dog camp by snow mobile and assessed the passengers for any trauma, keep them warmed, and comforted them in the camps galley. Additional helicopters arrived at the camp within the hour; by that time the weather conditions had improved.

13.0 Witness Statements and Photographs

Figures 25 and 26 are pictures taken by one of the passengers on board the helicopter approaching Herbert Glacier and the dog sled camp on the day of the accident. The image shows another company helicopter immediately ahead and below the flight path (within the red circle) near the side of the mountain and under a layer of clouds, which is beginning to obscure the higher mountain tops.

Upon reaching the Glacier at 1525 AKDT the couple indicated that the helicopter was scheduled to come back and pick them up after the dog sled camp and take to another glacier later that day, but due to worsening weather conditions, that portion of the trip was cancelled. They further indicated that intermittent rain was occurring during the entire period at the dog camp and while dog sledding. Figure 27 is a picture of the couple and the low clouds looking back towards the departure route from the glacier, with figure 28 one of the helicopters looking back towards the way they flew in and the low clouds.

Figures 29 and 30 were taken during the dog sled run looking at the glacier and the low overhanging clouds.



Figure 25 - Approaching Herbert Glacier at 1224 AKDT



Figure 26 - View from helicopter over Hebert Glacier approaching dog sled camp



Figure 27 - low clouds towards the departure route off the glacier.



Figure 28 - Dog sled camp looking back towards the way they flew in



Figure 29 - Pictures of the clouds over the area during the dog sled run



Figure 30 - Low clouds over the glacier

When their dog sled ride was completed and they waited back at camp for the helicopter to return. As they waited, they saw a helicopter break out of the clouds, and then immediately turn around and they assumed headed back to the Juneau Airport. According to the passengers, they were advised that the pilot was more of a visual flyer and because of the worsening weather he was called back and another more instrument rated pilot would return. Figure 31 is the image immediately prior to the helicopter breaking out of the clouds and returning to Juneau at approximately 1740 AKDT.

The next photographs taken were immediately after the accident at approximately 1820 AKDT. Figures 32 through 33 are of the accident site with the terrain obscured by clouds and fog, and general flat light conditions at the site.



Figure 31 - Back at dog camp prior to their return to Juneau



Figure 32 - Weather conditions immediately after the accident



Figure 33 - Accident site with obscured sky cover and flat light conditions

Another passenger on board the helicopter indicated in her statement that there was a completed whiteout situation when they took off, with no visibility at all in all directions. She indicated that after lift off, she felt forward motion, then like a stall, a shudder, then hitting something and flipping over. She landed face down on the roof of the helicopter and crawled out with her daughter. She recalled the pilot making a radio call back to the dog camp, and that they sent snow mobiles out to take them back to the camp.

Submitted by:

Don Eick
Senior Meteorologist