National Transportation Safety Board

Office of Aviation Safety
Washington, D.C. 20594-2000
February 15, 2011

METEOROLOGICAL FACTUAL REPORT

ANC10MA068

A. Accident

Location: 10 miles northeast of Aleknagik, Alaska
Date: August 9, 2010
Time: About 1442 Alaska daylight time (2242 UTC[1])
Aircraft: de Havilland DHC-3T, registration: N455A

B. Meteorological Specialist

Mike Richards
Meteorologist
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Operational Factors Division, AS-30
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C. Summary

On August 9, 2010, about 1442 Alaska daylight time (ADT), a single engine, turbine-powered, amphibious float-equipped de Havilland DHC-3T airplane, N455A, impacted mountainous tree-covered terrain about 10 miles northeast of Aleknagik, Alaska. Of the nine people aboard, the airline transport pilot and four passengers died at the scene, and four passengers sustained serious injuries. The airplane sustained substantial damage. The flight was operated by GCI Communication Corp., Anchorage, Alaska, under the provisions of 14 *Code of Federal Regulations* (CFR) Part 91. The flight originated at a GCI-owned remote fishing lodge on the southwest shoreline of Lake Nerka about 1427 and was en route to a remote sport fishing camp on the banks of the Nushagak River, about 52 miles southeast of the GCI lodge. At the time of the accident, marginal visual meteorological conditions were reported at the Dillingham Airport,

[1] UTC – abbreviation for Coordinated Universal Time

about 18 miles south of the accident site; however, the weather conditions at the accident site at that time are not known. No flight plan was filed.

D. Details of Investigation

The National Transportation Safety Board's (NTSB) meteorological specialist was dispatched for this accident and gathered weather data for this investigation from Dillingham and Anchorage, Alaska, and the NTSB's Washington D.C. office. All times are reported in ADT for August 9, 2010, except where noted, and are based upon the 24-hour clock. Local time is -8 hours from UTC, and UTC=Z. Directions are referenced to true north (except where noted) and distances are in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles (sm) and fractions of sm. Distances along surface of the earth are calculated using the "Great Circle" formula.

Coordinates used for the accident location: 59.33242° North latitude, 158.3817° West longitude.

1.0 Synoptic Conditions

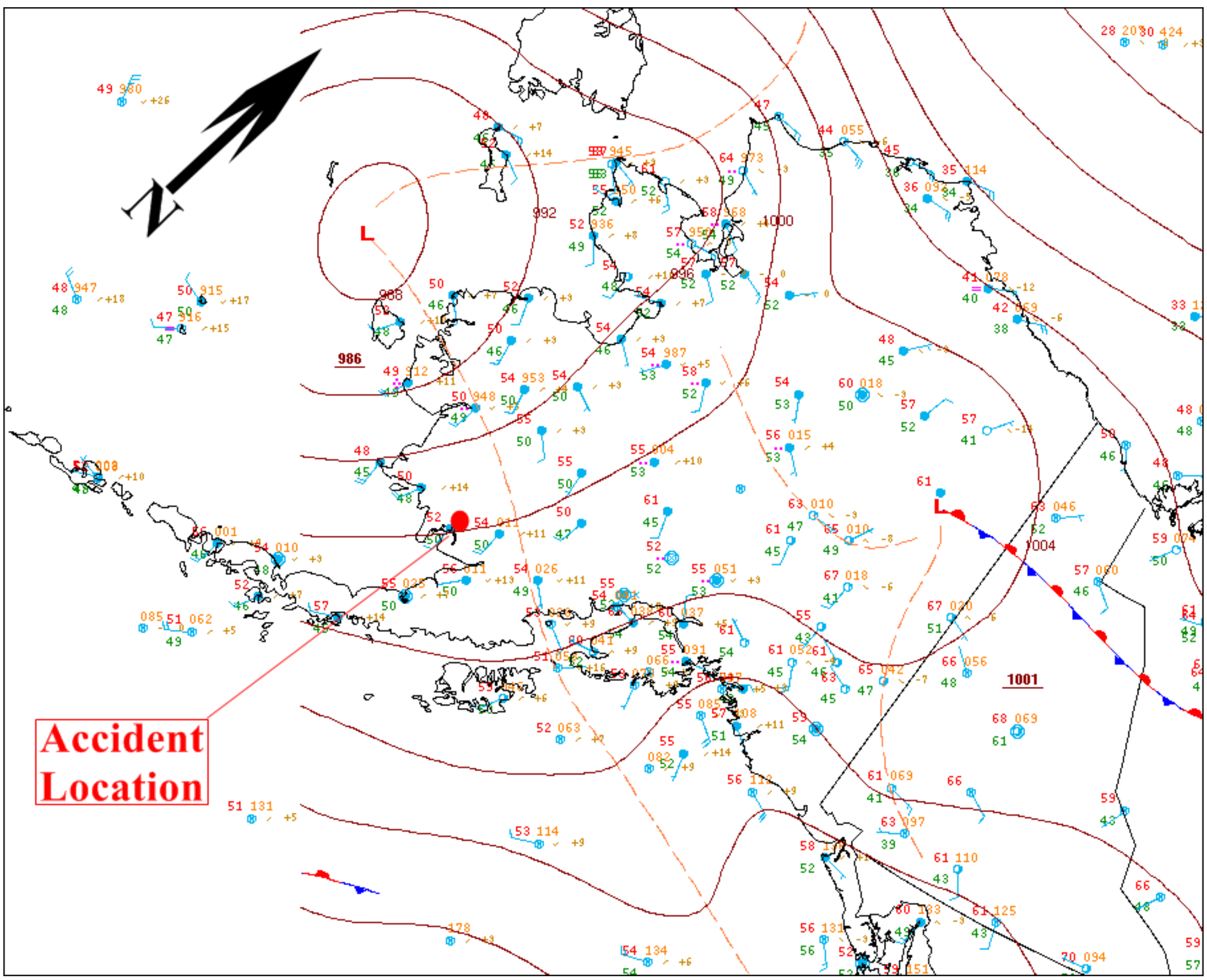

Figure 1 – NWS Surface Analysis Chart for 1300.

The National Weather Service (NWS) Surface Analysis Chart for 1300 is included as figure 1. The chart depicted a low pressure center off the west coast of Alaska in the Bering Sea to the west-northwest of the accident site with a central pressure of 986-hectopascals (hPa). A trough of low pressure extended from the low eastward across southwestern Alaska and through the Gulf of Alaska, to the north of the accident site. Station models indicated overcast conditions dominated southwestern Alaska, with winds in this region generally out of the south to southeast at 10 to 20 knots. Surface temperatures averaged around 50° Fahrenheit (F) and dew point depressions ranged from 2° to 5° F. Rain was reported at numerous locations across the state.

2.0 Aviation Routine Weather Reports

Surface observations from the area surrounding the accident site, which included meteorological aerodrome reports (METARs) and special (SPECI) reports issued, as well as high-temporal resolution data from an automated observation system, were documented for the period surrounding the accident time. Cloud heights in this section are reported above ground level (agl).

2.0.1 Dillingham Airport Observations

Dillingham Airport (PADL) in Dillingham, Alaska, was located about 18 miles to the south-southwest of the accident site at an elevation of 81 feet, and was equipped with an Automated Weather Observing System (AWOS-3). According to the Federal Aviation Administration (FAA) Air Traffic Manager, Kenai Flight Service Station (FSS), during open hours at the Dillingham FSS, official PADL observations are made by Dillingham FSS personnel[2] utilizing a stand-alone weather sensor[3], the AWOS-3 information, and their own human observations of local conditions. There was a positive magnetic declination of 15° at PADL. Presented here are some of the publically disseminated surface observations from PADL from August 9, 2010.

SPECI PADL 091730Z 18015KT 5SM -RA BR BKN006 OVC012 11/09 A2952

METAR PADL 091745Z 18015KT 5SM -RA BR BKN006 OVC012 11/09 A2952

SPECI PADL 091815Z 18015KT 5SM -RA BR FEW006 SCT008 OVC014 11/09 A2952 RMK SCT V BKN

METAR PADL 091848Z 17015G23KT 3SM -RA BR SCT005 OVC010 11/09 A2953 RMK SCT V BKN

METAR PADL 091949Z 17011G17KT 7SM VCSH SCT006 OVC013 11/09 A2954

METAR PADL 092049Z 17008G16KT 10SM VCSH SCT007 OVC013 11/10 A2955

METAR PADL 092149Z 18010G16KT 10SM SCT013 BKN017 OVC025 11/09 A2956

[2] These personnel were certified weather observers.
[3] The stand-alone weather sensor operational at PADL on the day of the accident was an F-420-type sensor.

METAR PADL 092222Z 17010G17KT 3SM -RA BR SCT008 OVC013 11/09 A2957 RMK SCT V BKN

METAR PADL 092255Z 18012G23KT 3SM -RA BR SCT006 OVC010 11/09 A2958 RMK SCT V BKN

METAR PADL 092348Z 18015G20KT 3SM -RA BR SCT006 OVC012 11/09 A2959 RMK SCT V BKN CIG LWR N

At 1422, PADL reported wind from 170° at 10 knots gusting to 17 knots, visibility of 3 miles in light rain with mist, scattered clouds at 800 feet, ceiling overcast at 1,300 feet, temperature 11° Celsius (C), dew point temperature 9°C, altimeter setting 29.57 inches of Mercury. Remarks: lowest cloud layer varying between scattered and broken.

At 1455, PADL reported wind from 180° at 12 knots gusting to 23 knots, visibility of 3 miles in light rain with mist, scattered clouds at 600 feet, ceiling overcast at 1,000 feet, temperature 11°C, dew point temperature 9°C, altimeter setting 29.58 inches of Mercury. Remarks: lowest cloud layer varying between scattered and broken.

A "scattered" cloud layer indicates 3/8-4/8 of the sky is obscured, while a broken layer indicates 5/8-7/8 of the sky is obscured[4]. The remark of "scattered variable broken" would therefore mean that the lowest cloudy layer was alternating between these classifications.

One-minute resolution data was retrieved from the PADL AWOS-3 and data from 1415-1455 is presented here. Wind directions are referenced to magnetic north.

PADL 221 2215 140/ 11G 15 8 MM BKN009 BKN017 OVC025 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2216 140/ 11G 15 8 MM BKN009 BKN017 OVC025 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2217 140/ 11G 15 8 MM BKN009 BKN017 OVC025 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2218 140/ l0G 15 7 MM BKN009 BKN017 OVC025 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2219 140/ l0G 15 7 MM BKN009 BKN013 OVC022 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2220 140/ l0G 17 7 MM BKN009 BKN013 OVC022 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2221 140/ 12G 17 7 MM BKN009 BKN013 OVC022 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2222 140/ 11G 17 7 MM BKN009 BKN013 OVC022 11/ 9 2957 031 D LTG DATA MISG 001000000@

[4] Office of the Federal Coordinator for Meteorology (OFCM) Federal Meteorological Handbook #1 (2005)

PADL 221 2223 140/ l0G 17 6 MM BKN009 BKN013 OVC024 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2224 140/ 11G 17 6 MM BKN009 BKN013 OVC024 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2225 140/ 11G 17 6 MM BKN009 BKN013 OVC024 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 2212226 140/ 12G 17 6 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2227 140/ l0G 17 6 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2228 140/ l0G 17 6 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2229 140/ 12G 17 6 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2230 140/ 12G 17 6 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2231 140/ 12G 18 7 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2232 130/ 12G 18 7 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2233 130/ 12G 18 7 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2234 130/ 13G 18 8 MM BKN009 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2235 130/ 14G 18 9 MM BKN007 OVC015 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2236 130/ 13G 18 9 MM BKN007 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2237 140/ 12G 18 9 MM BKN007 OVC015 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2238 140/ 13G 18 9 MM BKN007 OVC015 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2239 130/ 13G 18 9 MM BKN007 OVC015 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2240 140/ 11G 18 9 MM BKN007 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2241 140/ 11G 18 8 MM BKN007 OVC015 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2242 140/ 13G 18 8 MM BKN007 OVC013 11/ 9 2957 031 D LTG DATA MISG 001000000@

PADL 221 2243 140/ 13G 18 8 MM BKN007 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@PADL 221 2244 140/ 11G 18 8 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2245 140/ l0G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2246 140/ 12G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2247 140/ 12G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2248 140/ 11G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2249 140/ 11G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2250 140/ 11G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2251 140/ 11G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2252 140/ 11G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2253 140/ 10G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2254 140/ 11G 17 7 MM BKN006 OVC013 11/ 9 2958 031 D LTG DATA MISG 001000000@

PADL 221 2255 140/ 12G 17 8 MM BKN008 OVC015 11/ 9 2958 031 D LTG DATA MISG 001000000@

At 1420, which was near the time of the 1422 PADL human observation, the AWOS-3 reported[5]: wind direction of 140° (2-minute average, referenced to magnetic north), a wind speed of 10 knots (2-minute average), wind gust of 17 knots (peak over previous 10 minutes), visibility of 7 miles (10-minute average), thunderstorm information missing, broken cloud base at 900 feet agl (30-minute average with weighting to last 10 minutes), broken cloud base at 1,300 feet agl (30-minute average with weighting to last 10 minutes), overcast cloud base at 2,200 feet agl (30-minute average with weighting to last 10 minutes), temperature of 11°C (5-minute average), dew point temperature of 9°C (5-minute average), altimeter setting of 29.57 inches of mercury (1-minute average), 3-minute precipitation 31 hundredths of an inch, daytime, not receiving lightning data, no errors flags for system aside from missing thunderstorm/lightning information.

At the time of the accident at 1442, the system (using aforementioned reporting time standards) reported: wind direction of 140° (magnetic), wind speed of 13 knots, wind gust of 18 knots, visibility of 8 miles, thunderstorm information missing, broken cloud base at 700 feet agl, overcast cloud base at 1,300 feet, temperature of 11°C, dew point temperature of 9°C, altimeter setting of 29.57 inches of mercury, 3-minute precipitation 31 hundredths of an inch, daytime, not receiving lightning data, no errors flags for system aside from missing thunderstorm/lightning information. Maintenance logs for the PADL AWOS-3 were provided by the Federal Aviation

[5] Translation of automated AWOS-3 high-resolution reports was provided by the FAA.

Administration (FAA) and were reviewed. No deficiencies were noted at the time of the accident. In addition, according to the FAA, no biases were noted with the F-420 wind instrument. The wind direction of 180° true reported in the 1455 METAR is greater than the 15° variation that would have been expected based on the consistent 140° magnetic wind direction retrieved from the AWOS-3, as well as the magnetic wind direction broadcast on the Automatic Fight Information Service (AFIS; see section 17.0). An inquiry submitted to the FAA regarding this discrepancy did not return any definitive answer.

2.0.2 New Stuyahok Airport Observations

New Stuyahok Airport (PANW) in New Stuyahok, Alaska, was located about 32 miles to the east-northeast of the accident site at an elevation of 364 feet, and was equipped with an Automated Weather Sensor System (AWSS). These reports were automated and did not involve a human observer. The "$" symbol at the end of each report indicated that maintenance was needed on the system. Information retrieved from the FAA indicated the likely cause of the "maintenance needed" flag being appended to the surface report was the present weather sensor on the AWSS being turned off. The sensor would have been turned off to mitigate erroneous reporting by the sensor, which is a technical issue known to the FAA. A review of the maintenance form for the PANW AWSS written on August 4, 2010 (Attachment 1 to this report), identified no other deficiencies with the system, and the lack of the ceilometer window being inspected and cleaned is not believed to have been a cause for a maintenance flag.

In addition to the aforementioned deficiency with the present weather sensor, there is also a known issue with the ceilometers on the AWSS systems. In the presence of rain, the ceilometers have been known to output conservative (lower) ceiling values than what actually existed.

SPECI PANW 091712Z AUTO 19009KT 9SM OVC003 10/09 A2954 RMK AO2 PWINO TSNO CIG 001V007 $=

SPECI PANW 091742Z AUTO 18008KT 2SM BR BKN003 OVC008 10/09 A2954 RMK AO2 PWINO TSNO CIG 001V005 $=

METAR PANW 091756Z AUTO 18007KT 3SM BR OVC003 10/09 A2955 RMK AO2 PWINO TSNO 53012 60002 T01000088 10105 20094 CIG 001V007 SLP982 $=

SPECI PANW 091812Z AUTO 18009G15KT 1 3/4SM BR OVC003 10/09 A2955 RMK AO2 PWINO TSNO CIG 001V006 $=

SPECI PANW 091849Z AUTO 18009KT 1 1/4SM BR BKN003 OVC008 10/09 A2956 RMK AO2 PWINO TSNO CIG 001V006 $=

METAR PANW 091856Z AUTO 18008KT 1 1/4SM BR BKN003 BKN008 OVC080 10/09 A2956 RMK AO2 PWINO TSNO T01000094 CIG 001V006 SLP988 $=

SPECI PANW 091916Z AUTO 18008KT 1SM BR BKN003 OVC008 11/09 A2956 RMK AO2 PWINO TSNO CIG 001V005 $=

SPECI PANW 091925Z AUTO 19008G15KT 3/4SM BR BKN003 OVC008 11/09 A2957 RMK AO2 PWINO TSNO $=

SPECI PANW 091938Z AUTO 18009KT 1 1/4SM BR OVC003 11/09 A2957 RMK AO2 PWINO TSNO $=

SPECI PANW 091942Z AUTO 17007KT 2SM BR BKN003 OVC006 11/09 A2957 RMK AO2 PWINO TSNO CIG 001V004 $=

METAR PANW 091956Z AUTO 17008KT 10SM BKN003 OVC023 11/10 A2957 RMK AO2 PWINO TSNO T01110100 CIG 001V009 SLP990 $=

SPECI PANW 092003Z AUTO 16010KT 10SM BKN005 OVC028 11/09 A2957 RMK AO2 PWINO TSNO CIG 001V009 $=

SPECI PANW 092028Z AUTO 18010KT 4SM BR BKN007 BKN015 OVC034 11/10 A2957 RMK AO2 PWINO TSNO CIG 004V011 $=

SPECI PANW 092033Z AUTO 17009G15KT 1 3/4SM BR BKN007 BKN015 OVC032 11/10 A2958 RMK AO2 PWINO TSNO CIG 004V011 $=

SPECI PANW 092041Z AUTO 16006G15KT 2SM BR BKN005 BKN009 OVC015 11/10 A2958 RMK AO2 PWINO TSNO CIG 003V007 VIS 1 1/2V3 $=

METAR PANW 092056Z AUTO 18010G16KT 10SM BKN005 BKN011 OVC065 11/10 A2958 RMK AO2 PWINO TSNO 51010 T01110100 CIG 003V007 SLP993 $=

SPECI PANW 092128Z AUTO 18010KT 6SM BR BKN007 OVC012 11/10 A2958 RMK AO2 PWINO TSNO $=

METAR PANW 092156Z AUTO 18011G18KT 10SM BKN007 OVC015 12/10 A2959 RMK AO2 PWINO TSNO T01160100 CIG 001V010 SLP996 $=

SPECI PANW 092226Z AUTO 19011KT 10SM BKN010 OVC015 12/09 A2959 RMK AO2 PWINO TSNO CIG 007V011 $=

SPECI PANW 092247Z AUTO 19014G17KT 3SM BR BKN008 OVC018 12/09 A2960 RMK AO2 PWINO TSNO CIG 007V013 $=

METAR PANW 092256Z AUTO 21012KT 1 1/2SM BR BKN008 BKN016 OVC095 11/10 A2960 RMK AO2 PWINO TSNO T01110100 CIG 001V012 SLP000 $=

SPECI PANW 092259Z AUTO 21011KT 1 1/4SM BR SCT004 BKN012 OVC090 11/10 A2960 RMK AO2 PWINO TSNO CIG 009V018 P0001 $=

SPECI PANW 092305Z AUTO 21010KT 1 1/4SM BR BKN004 OVC012 11/10 A2960 RMK AO2 PWINO TSNO CIG 001V005 P0001 $=

SPECI PANW 092310Z AUTO 21013G17KT 2SM BR BKN004 OVC023 11/10 A2960 RMK AO2 PWINO TSNO CIG 001V011 P0001 $=

SPECI PANW 092317Z AUTO 22010KT 10SM SCT004 BKN009 OVC020 12/10 A2960 RMK AO2 PWINO TSNO CIG 007V013 P0001 $=

SPECI PANW 092335Z AUTO 20011KT 2SM BR BKN006 BKN014 OVC026 11/09 A2961 RMK AO2 PWINO TSNO CIG 002V009 P0001 $=

SPECI PANW 092343Z AUTO 20013KT 8SM SCT006 BKN017 OVC033 11/10 A2961 RMK AO2 PWINO TSNO CIG 010V026 P0001 $=

Special observation at 1426, PANW reported wind from 190° at 11 knots, visibility of 10 miles or greater, ceiling broken at 1,000 feet, overcast at 1,500 feet, temperature 12°C, dew point temperature 9°C, altimeter setting 29.59 inches of mercury. Remarks: automated weather observation system, station with precipitation discriminator, precipitation identifier information not available, thunderstorm sensor information not available, ceiling variable between 700 and 1,000 feet agl, maintenance needed on the system.

Special observation at 1447, PANW reported wind from 190° at 14 knots with gusts to 17 knots, visibility of 3 miles in mist, ceiling broken at 800 feet, overcast at 1,800 feet, temperature 12°C, dew point temperature 9°C, altimeter setting 29.60 inches of mercury. Remarks: automated station with precipitation discriminator, precipitation identifier information not available, thunderstorm sensor information not available, ceiling variable between 700 and 1,300 feet agl, maintenance needed on the system.

At 1456, PANW reported wind from 210° at 12 knots, visibility of 1 1/2 miles in mist, ceiling broken at 800 feet, broken at 1,600 feet, and overcast at 9,500 feet, temperature 11°C, dew point temperature 10°C, altimeter setting 29.60 inches of mercury. Remarks: automated weather observation system, precipitation discriminator and thunderstorm sensor information not available, temperature of 11.1°C, dew point temperature of 10.0°C, ceiling variable between 100 and 1,200 feet agl, maintenance needed on the system.

3.0 Upper Air Reports

3.0.1 Rawinsondes

Atmospheric data retrieved from a rawinsonde launch at 1600 (0000Z August 10, 2010) from King Salmon, Alaska (PAKN), station identifier 70326, located approximately 67 miles east-southeast of the accident site at an elevation of 46 feet, is presented in figure 2.

The PAKN sounding indicated the lifted condensation level (LCL) was 968-hPa. The lowest 2,000 feet of the atmosphere was unstable to conditionally unstable with stable conditions above 2,000 feet through about 6,000 feet. An inversion was noted at 10,000 feet. The relative humidity was greater than 75 percent from the surface through approximately 9,700 feet. Assessments of this atmosphere made by the Universal RAwinsonde OBservation program (RAOB) yielded the potential for scattered/broken cumulonimbus clouds from the surface to 1,600 feet, with overcast stratus from 1,600 to 3,400 feet. Above 3,400 scattered clouds were possible up to about 10,000 feet. Radiation fog indices indicated a low to moderate likelihood of radiation fog. The freezing level was identified at about 6,700 feet agl, with potential of icing in clouds above the freezing level.

The PAKN wind profile indicated a surface wind from 210° at 6 knots with winds increasing with height with little directional variation except between 2,200 feet, where the wind *backed*[6] slightly to 195° through 4,500 feet. Above 4,500 feet, the wind direction remained generally southwest and increased in magnitude to 50 knots through 10,000 feet. Calculations by RAOB

[6] A “backing” wind is a wind that turns counter-clockwise with increasing height.

indicated no significant turbulence in the lower part of the atmosphere and no areas of significant low-level wind shear (LLWS) were identified.

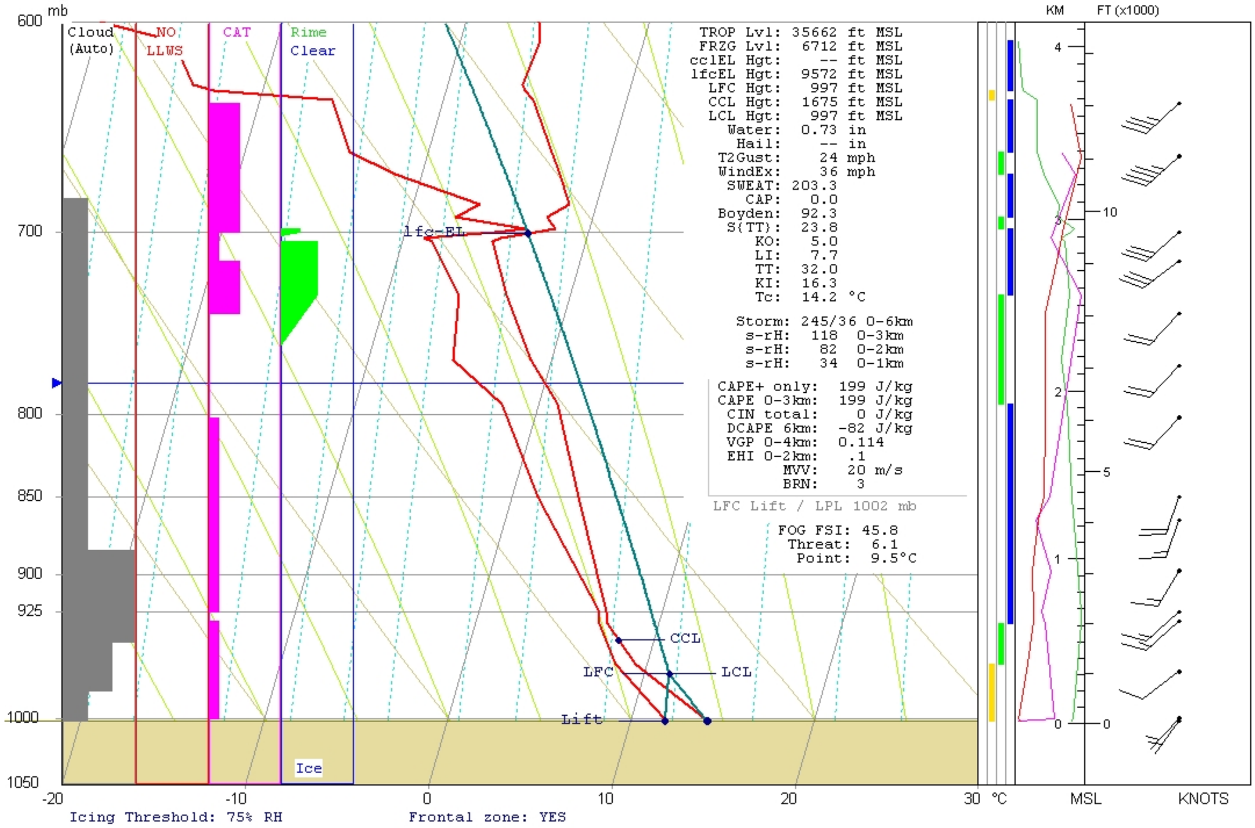

Figure 2 – Rawinsonde sounding from KAKN in SkewT/LogP[7] format for 1600, surface to 600mb.

3.0.2 Model data

A high-resolution weather model reanalysis[8] using a very tight assimilation window was conducted using the Advanced Research version of the Weather Research and Forecasting System (WRF-ARW) in conjunction with the WRF Data Assimilation System (WRFDA). The lateral boundary conditions and the background initial conditions were provided by the North American Regional Reanalysis (NARR), which used an older version of the North American (NAM) model (specifically, the ETA version) for assimilation code. Figure 3 presents the synoptic-scale graphical model output for southern Alaska at 1300. Terrain data was provided by the U.S. Geological Survey 10 meter-resolution Digital Elevation Model. The model grid was scaled down from 32km to 12km to 4km and finally to 1km, and observations were re-assimilated on each nest to test the WRFDA sensitivity to topographic variation. Because this was a reanalysis and not a forecast model run, observation assimilation and "nudging" was applied throughout the process. In addition, this model run was completely independent of observations retrieved by any Tropospheric Airborne Meteorological Data Reporting (TAMDAR) instrument.

[7] SkewT/LogP - A thermodynamic diagram, using the temperature and the logarithm of pressure as coordinates, which allows the plotting of the vertical profile of the temperature, humidity, and atmosphere above a particular point on the earth's surface.

[8] The model data was provided courtesy of Dr. Neil Jacobs at AirDat, LLC, in Morrisville, North Carolina, USA.

The closest data point in space and time to the accident site retrieved from the model output was located approximately 2,000 feet to the southwest of the accident site at an altitude of about 1,000 feet and provided at 1500 a wind direction and wind magnitude of 198° and 18 knots, respectively.

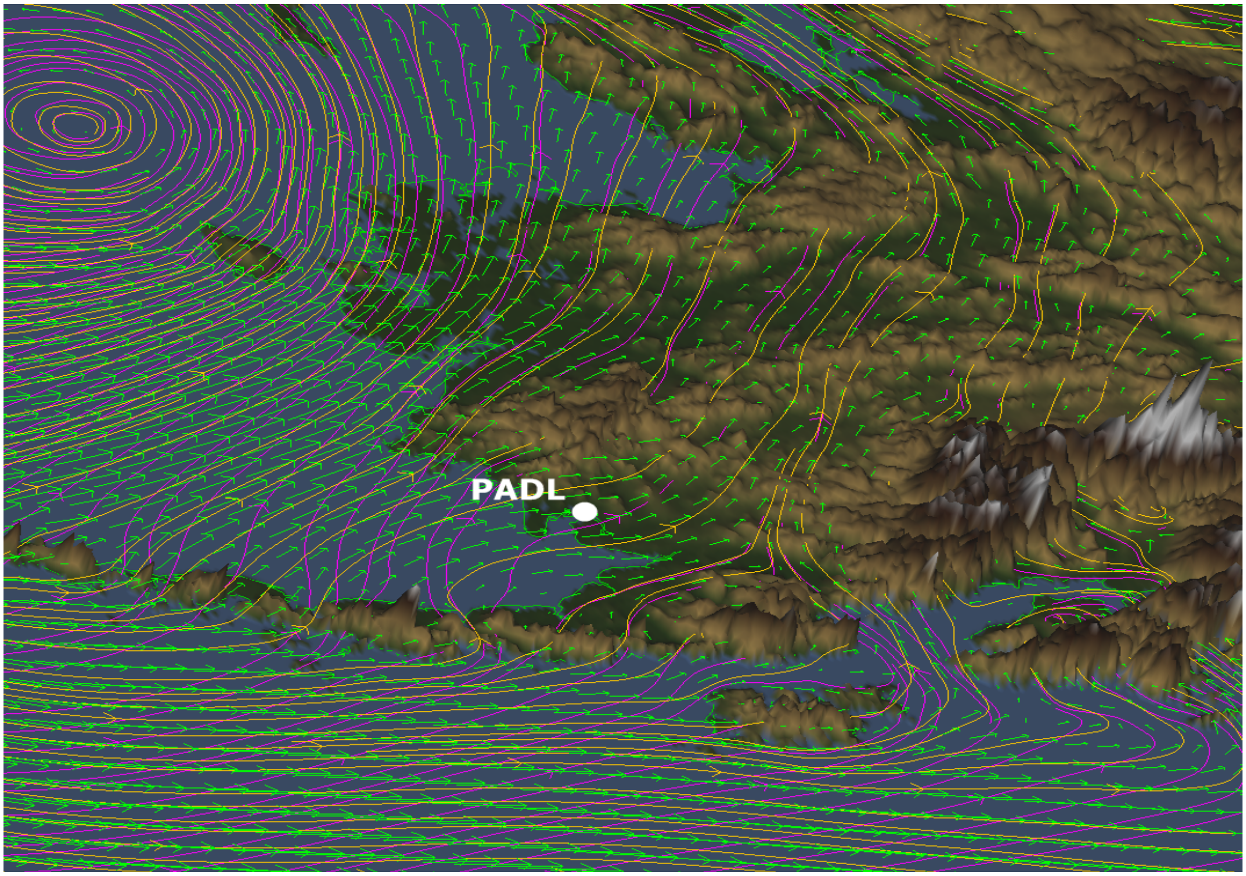

Figure 3 – Synoptic-scale graphical model output for southern Alaska at 1300.

3.0.3 TAMDAR Aircraft

Meteorological data[9] from a TAMDAR[10]-equipped commercial aircraft flying in and out of PADL near the time of the accident is presented in tables 1 and 2. These data originated from a PenAir Saab 340B aircraft (registration number N365PX), and its flight path and data reporting points are depicted in Figure 4. Data retrieved from below 3,000 feet from the TAMDAR sensor on this aircraft is presented here, which includes time and position information, Global Positioning System (GPS) altitude, temperature and moisture retrievals, as well as wind direction and magnitudes. The data from this aircraft have been quality controlled.

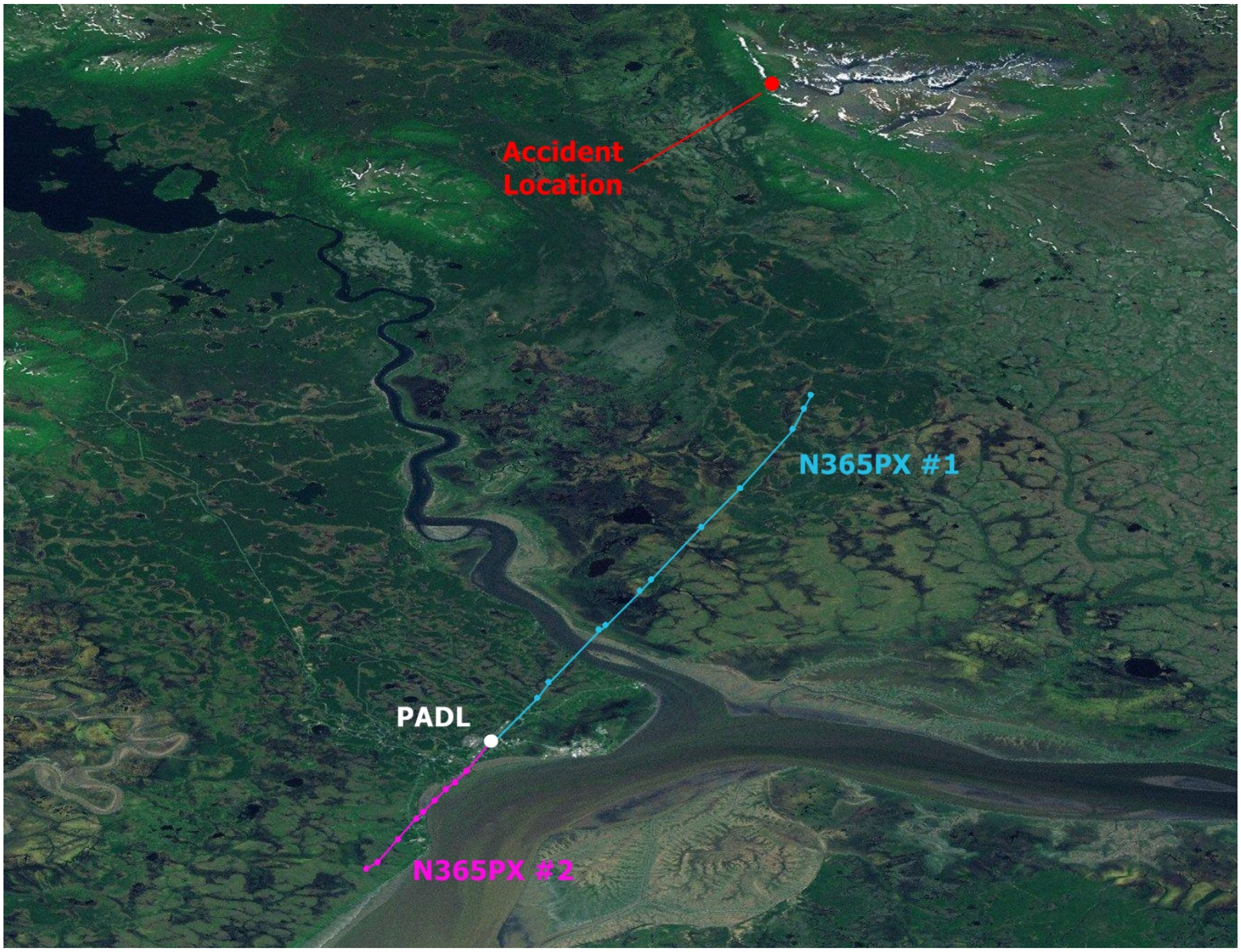

Figure 4 – Flight paths for the TAMDAR-equipped PenAir Saab 340B aircraft near PADL on August 9, 2010.

[9] The TAMDAR data presented in this report was provided courtesy of Dr. Neil Jacobs at AirDat, LLC, in Morrisville, North Carolina, USA.

[10] The TAMDAR sensor collects atmospheric observations via a multi-function in-situ sensor on aircraft. These observations include humidity, pressure, temperature, winds aloft, icing, and turbulence, along with the corresponding location, time, and altitude from built-in GPS, and are relayed via satellite in real-time to a ground-based network operations center.

N365PX arrived at PADL (flight #1) at 1308, approximately 95 minutes prior to the accident time. On approach to PADL below 3,000 feet, N365PX experienced wind magnitudes between 16-28 knots, with wind directions ranging between 174° and 211°. The atmosphere below 3,000 feet was saturated with relative humidity retrievals consistently reaching 100 percent and temperatures remained above 0°C. During N365PX's ascent from PADL (flight #2), approximately 40 minutes following its arrival and 55 minutes prior to the accident time, the aircraft experienced wind magnitudes between 22 and 26 knots and wind directions between 200°-218° through 3,000 feet. The atmosphere remained close to saturation with relative humidity values greater than 93% through 3,000 feet. N365PX's arrival and departure routes were not identical.

Time(Z)	Altitude(ft.)	Temp(°C)	RH(%)	Wind Dir.	Wind Speed(kts)	Latitude	Longitude
2104:16	2,950	3.5	100.0	211°	28	59.196	-158.365
2104:25	2,750	4.1	100.0	169°	21	59.190	-158.368
2104:35	2,570	4.8	100.0	174°	21	59.181	-158.373
2105:13	2,130	5.3	100.0	190°	22	59.155	-158.396
2105:40	1,900	6.0	100.0	197°	22	59.138	-158.413
2106:24	1,560	6.3	100.0	199°	23	59.115	-158.435
2106:35	1,340	7.0	100.0	202°	21	59.110	-158.440
2107:08	900	7.9	100.0	200°	21	59.095	-158.455
2107:12	820	8.5	100.0	198°	20	59.093	-158.458
2108:02	430	8.9	100.0	197°	19	59.070	-158.480
2108:13	330	9.6	100.0	200°	16	59.063	-158.485

Table 1 – TAMDAR data collected from N365PX flight #1 on descent into PADL on August 9, 2010. Altitude is GPS altitude in feet with a margin of error of 20-30 feet. Flight path is depicted in figure 4.

Time(Z)	Altitude(ft.)	Temp(°C)	RH(%)	Wind Dir.	Wind Speed(kts)	Latitude	Longitude
2149:45	670	10.5	97.5	201°	22	59.031	-158.516
2149:53	910	9.8	97.5	201°	22	59.026	-158.521
2149:59	1,090	9.1	98.5	200°	24	59.023	-158.525
2150:07	1,340	8.8	98.0	207°	25	59.018	-158.530
2150:19	1,710	8.5	93.5	209°	26	59.013	-158.535
2150:23	1,850	7.8	96.0	212°	26	59.010	-158.538
2150:39	2,270	7.0	95.5	216°	25	59.001	-158.546
2150:54	2,650	6.3	97.0	218°	26	58.991	-158.555
2151:02	2,870	5.5	98.0	215°	26	58.988	-158.560

Table 2 – TAMDAR data collected from N365PX flight #2 on ascent out of PADL on August 9, 2010. Altitude is GPS altitude in feet with a margin of error of 20-30 feet. Flight path is depicted in figure 4.

3.0.4 Pilot Reports

Pilot reports made between 1200 and 1600 operating into Dillingham, Alaska, (DLG) are presented below.

> DLG UUA /OV DLG /TM 2315 /FLUNKN /TP C207 /RM LLWS -10KT 001 DURD RWY 19=
>
> DLG UUA /OV DLG /TM 2316 /FLUNKN /TP C207 /RM LLWS -15KT 013-010 DURD RWY 19=
>
> DLG UUA /OV DLG /TM 2318 /FLUNKN /TP C207 /RM LLWS -15KT 001 DURD RWY19=
>
> DLG UUA /OV DLG /TM 2339 /FLUNKN /TP PA31 /RM LLWS -10KT 002-001 DURD RWY 19=

Urgent pilot reports from a pilot operating a single engine Cessna Stationair (C207) and a Piper Navajo (PA31) multiengine airplane into Dillingham reported low-level wind shear on approach to runway 19 with a 10 to 15 knot loss of airspeed between 100 and 200 feet.

4.0 Weather Radar

WSR-88D Level-III 0.50° tilt base reflectivity imagery from King Salmon (PAKC[11]), Alaska, located approximately 67 miles east-southeast of the accident site, is presented in figures 7-10. PAKC was operating in Volume Coverage Pattern (VCP) 32 at the time of the accident. VCP-32 (also known as "clear air mode") consists of 5 elevation scans and takes approximately 10 minutes to complete, limiting retrievals from the 0.50° sweep to once every 10 minutes for a specific location.

Scan				Surveillance		Doppler PRF No.				
Angle (°)	AZ Rate (°/sec)	Period (sec)	WF Type	PRF No.	# Pulses	4 #Pulse	5 #Pulse	6 #Pulse	7 #Pulse	8 #Pulse
0.5	4.961	72.97	CS	1	64	--	--	--	--	--
0.5	4.544	79.66	CD	--	--	188	<u>220</u>	238	256	278
1.50	4.961	72.96	CS	1	64	--	--	--	--	--
1.50	4.544	79.66	CD	--	--	188	<u>220</u>	238	256	278
2.50	4.060	89.15	B	2	11	188	<u>220</u>	238	256	278
3.50	4.061	89.13	B	2	11	188	<u>220</u>	238	256	278
4.50	4.063	89.10	B	2	11	188	<u>220</u>	238	256	278

Figure 5 – Characteristics of VCP 32, Short Pulse.[12]

[11] Note: identifier PAKC for King Salmon radar is different from rawindsonde identifier for same location. Both are valid for their respective instruments – antenna site determines identifier location.

[12] Office of the Federal Coordinator for Meteorological Services and Supporting Research: Federal Meteorological Handbook NO. 11, Doppler Radar Meteorological Observations, Part C, WSR-88D Products and Algorithms, 2006. (FCM-H11C-2006)

Due primarily to the curvature of the earth, and assuming standard atmospheric refraction, the radar sweeps from PAKC operating in VCP-32 would have observed altitudes well above ground level (figure 6) in the vicinity of the accident site. Table 3 presents the approximate altitudes the radar would have "seen" above the accident site and nearby weather observing stations given an antenna tilt of 0.50° and a 0.95° radar beam width[13].

Location	**Location Elevation**	**Center beam Height**	**Lower Beam Boundary**[11]	**Higher Beam Boundary**[14]
Accident Site	~915 ft.	6,670 ft.	3,295 ft.	10,045 ft.
PADL	81 ft.	5,980 ft.	2,855 ft.	9,100 ft.
PANW	364 ft.	4,695 ft.	2,071 ft.	7,312 ft.

Table 3 – Approximate altitudes of 0.50° tilt PAKC radar beam (0.95° beam width) above specified ground locations, assuming standard atmospheric refraction. All altitudes are above msl.

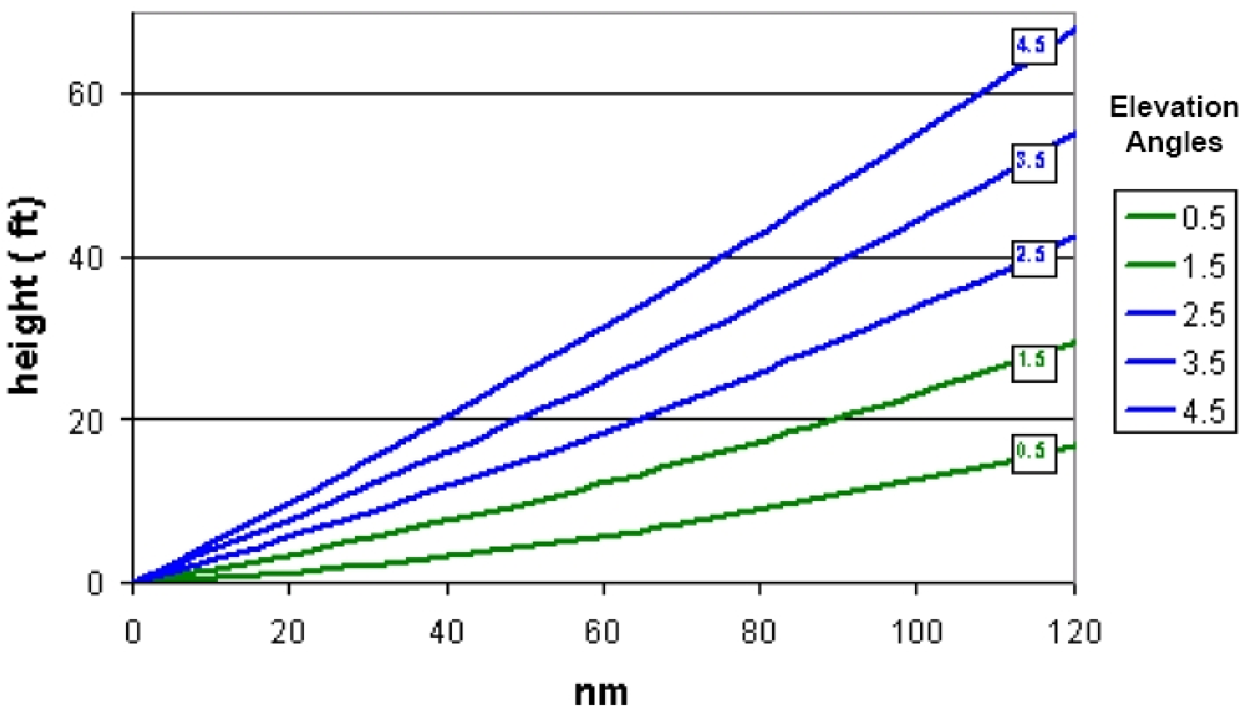

Figure 6 – VCP 32 center beam elevation with height as a function of range assuming standard atmospheric refraction.[9]

[13] Beam width - the angular separation between the half power points on the antenna radiation pattern, where the gain is one half the maximum value.
[14] The beam boundary is defined as the point of the beam where half-power is realized.

PAKC 0.50° base reflectivity imagery between 1416 and 1443 identified an extensive area of relatively weak reflectivity[15] values in the region. These areas of reflectivity (values generally ranging from 0-25 dBZ) extended south and east from the accident site and covered a majority of the area between the departure location and the accident aircraft's destination. During this time period, the radar-retrieved reflectivities values for the volume above the departure area were less than zero.

Imagery for 1416 (figure 7), 1425 (figure 8), 1432 (figure 9) and 1443 (figure 10) all indicate the immediate vicinity of the accident site was under a volume with reflectivity values ranging between 1-16 dBZ prior to the accident. Imagery from 1416 indicates the area between the accident site and the destination was under higher values of reflectivity with regions of 15-25 dBZ. By 1432, PAKC radar indicated the area of 15-25 dBZ became slightly more extensive and areas of weaker reflectivity had appeared alongside the heavier areas. At this point, the accident aircraft was identified to have just departed and was still well northwest of the accident location. By 1443 (immediately after accident time), values of 15-25 dBZ had developed closer to the accident site and the region between the accident site and the destination location had experienced slight intensification overall. Flight paths presented in figures 9 and 10 are approximate routes (straight lines) between known points.

Reflectivity values of 15-20 dBZ are generally considered to define the point where very light liquid precipitation[16] begins (surface locations underneath reflectivity values less than this would not experience precipitation). A table relating reflectivity value to precipitation intensity is provided as table 4. These precipitation intensity estimates do not, however, consider the height of the sensed area above ground level. In addition, a radar beam may partially or completely overshoot the altitude of heaviest precipitation for a location, leading to underestimation of precipitation at the ground. There are additional complications that arise as beam height above the surface increases. Radar imagery sensing a specific altitude cannot account for horizontal drift of the precipitation as it falls to the surface, which can lead to radar-indicated areas of precipitation not being collocated with the ground "truth" locations of the precipitation. As height increases and assuming constant hydrometeor size and vertical wind magnitudes, more time is given to raindrops to move with the ambient horizontal wind flow.

[15] Reflectivity - The sum of all backscattering cross-sections (eg, precipitation particles) in a pulse resolution volume divided by that volume. In order for the radar to calculate the reflectivity, it sends out a small burst of energy. This energy strikes the particles located in the volume. For simplification sake, it is assumed that these particles are evenly spread throughout the volume. The more of these particles located in the volume, the greater the return of energy returned back to the radar. One will see a greater reflectivity return from heavy rain than light rain.
[16] Precipitation - Any and all forms of water, liquid or solid, that falls from clouds and reaches the ground.

NWS VIP	WSR-88D LEVEL	PREC MODE DBZ	RAINFALL
0	0 1 2	< 5 5 to 9 10 to 14	
1 Very Light	3 4 5	15 to 19 20 to 24 25 to 29	.01 in/hr .02 in/hr .04 in/hr
2 Light to Moderate	6 7	30 to 34 35 to 39	.09 in/hr .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 12 13 14 15	55 to 59 60 to 64 65 to 69 70 to 74 > 75	>5.67 in/hr

Table 4 – Table relating NWS/VIP level, WSR-88D level, reflectivity intensity and rainfall rate.

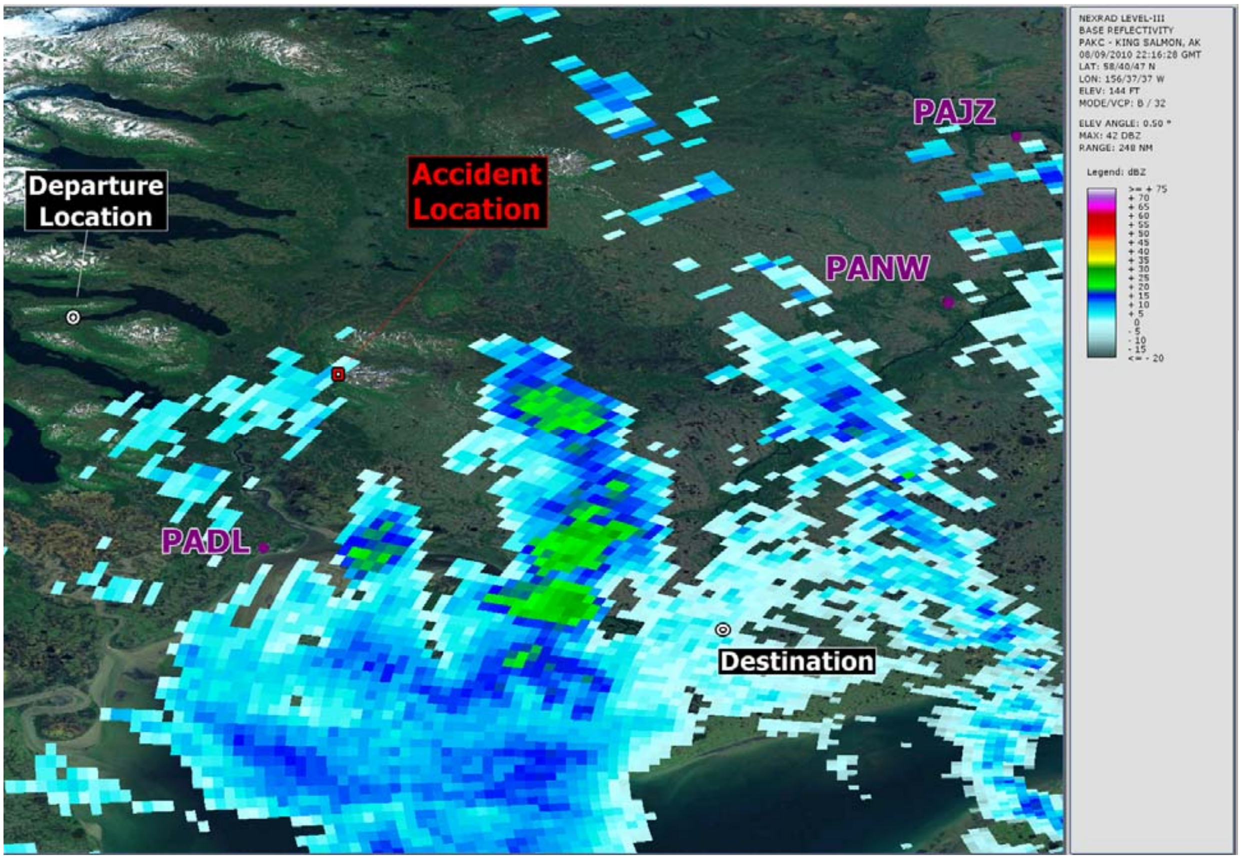

Figure 7 – PAKC 0.50° elevation base reflectivity image from 1416:28.

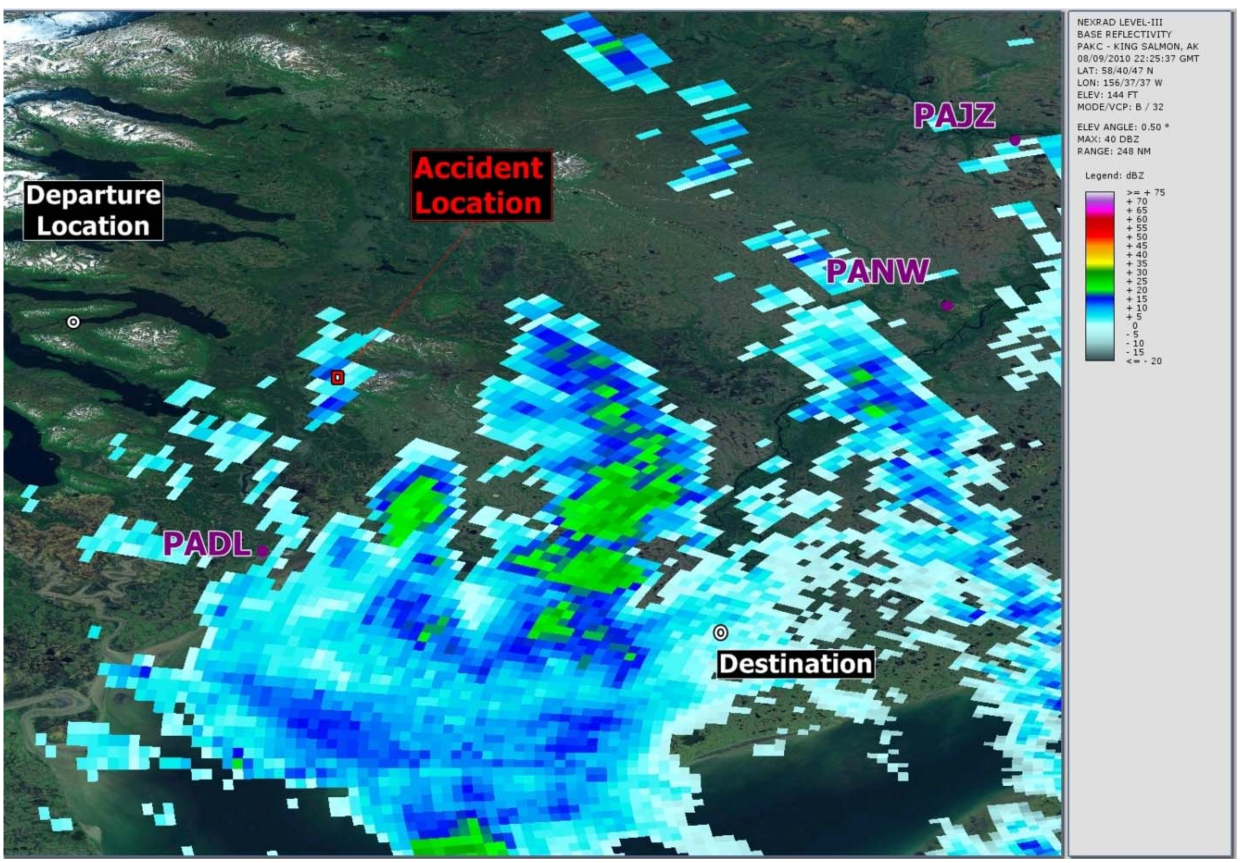

Figure 8 – PAKC 0.50° elevation base reflectivity image from 1425:37.

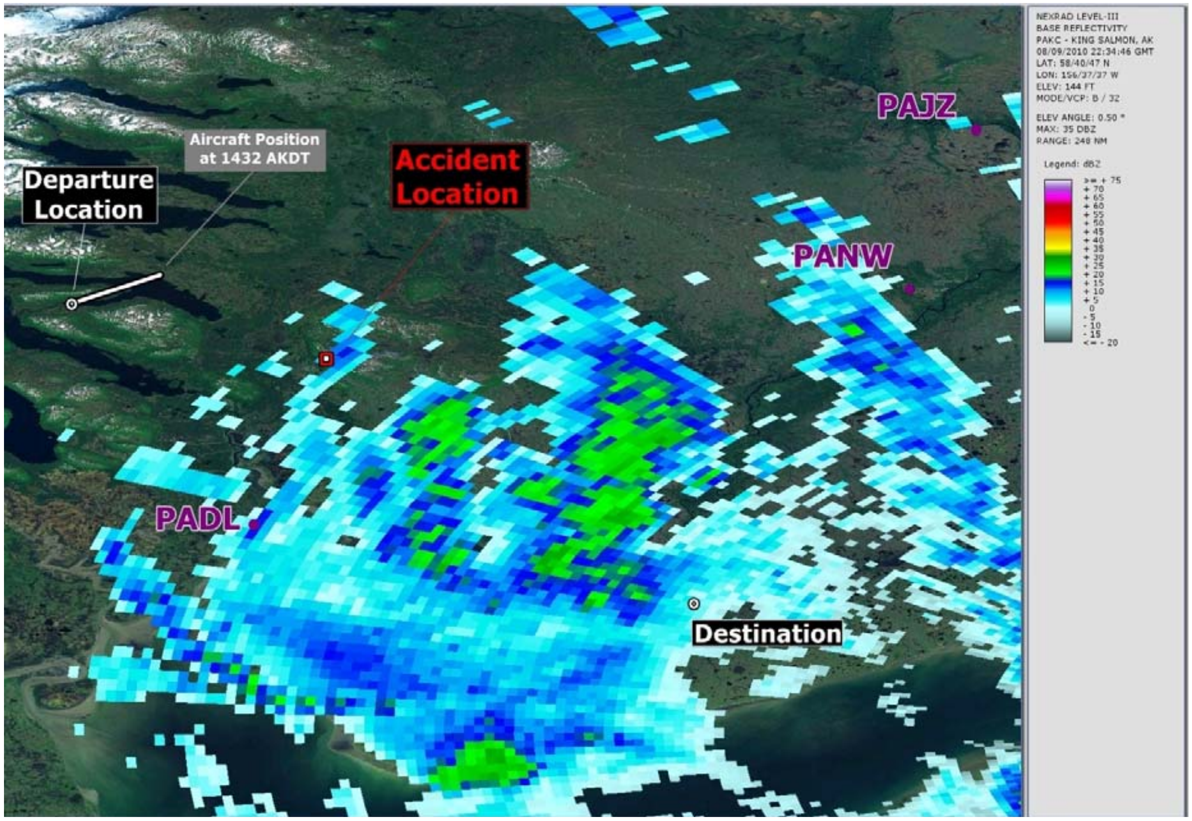

Figure 9 – PAKC 0.50° elevation base reflectivity image from 1434:46. Aircraft flight positions though 1432:44 shown in white (see text for explanation).

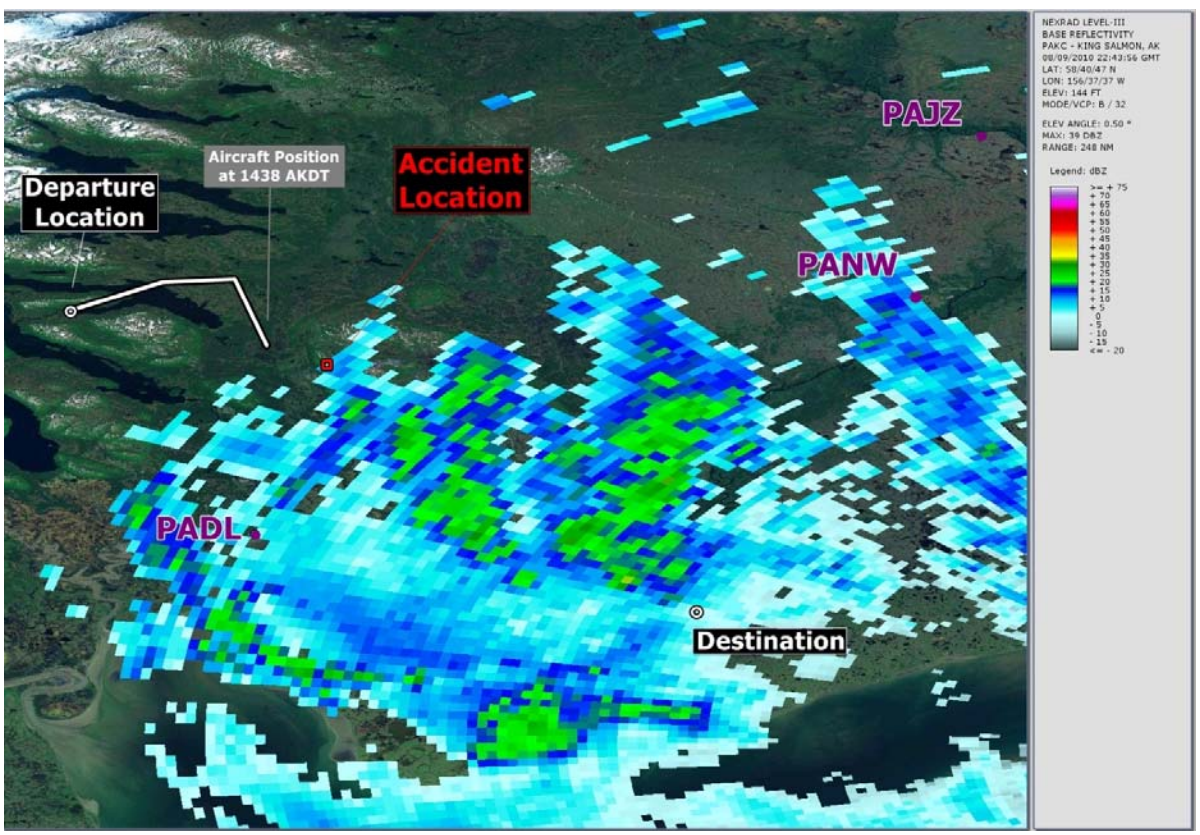

Figure 10 – PAKC 0.50° elevation base reflectivity image from 1443:56. Aircraft flight positions through 1438:59 shown in white (see text for explanation).

5.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-11 visible (0.65µm) and infrared (10.7µm) data was obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison (UW) in Madison, Wisconsin, and processed using the Man computer Interactive Data Access System (McIDAS). The 1446 (nominal time) GOES-11 visible imagery (figure 11) indicates the majority of southwestern Alaska was under extensive cloud cover at the time of the accident. The spatial resolution for the visible imagery is 1km by 1km at nadir and the instrument cannot resolve cloud features smaller than its field-of-view. This resolution decreases (becomes worse, field-of-view increases) with increasing distance from the sub-satellite point. In addition, high viewing angle increases the potential for smaller, clear areas to be hidden from view by higher cloud features. Cloud-top temperatures in the immediate vicinity of the accident site were retrieved from the GOES-11 infrared data (figures 12 and 13) and were approximately -7°C, corresponding to cloud-top heights of approximately 14,500 feet based on the KAKN 1600 sounding. These images are not corrected for parallax error and features at this height are shifted in the imagery about 8 miles north-northwest from their true location.

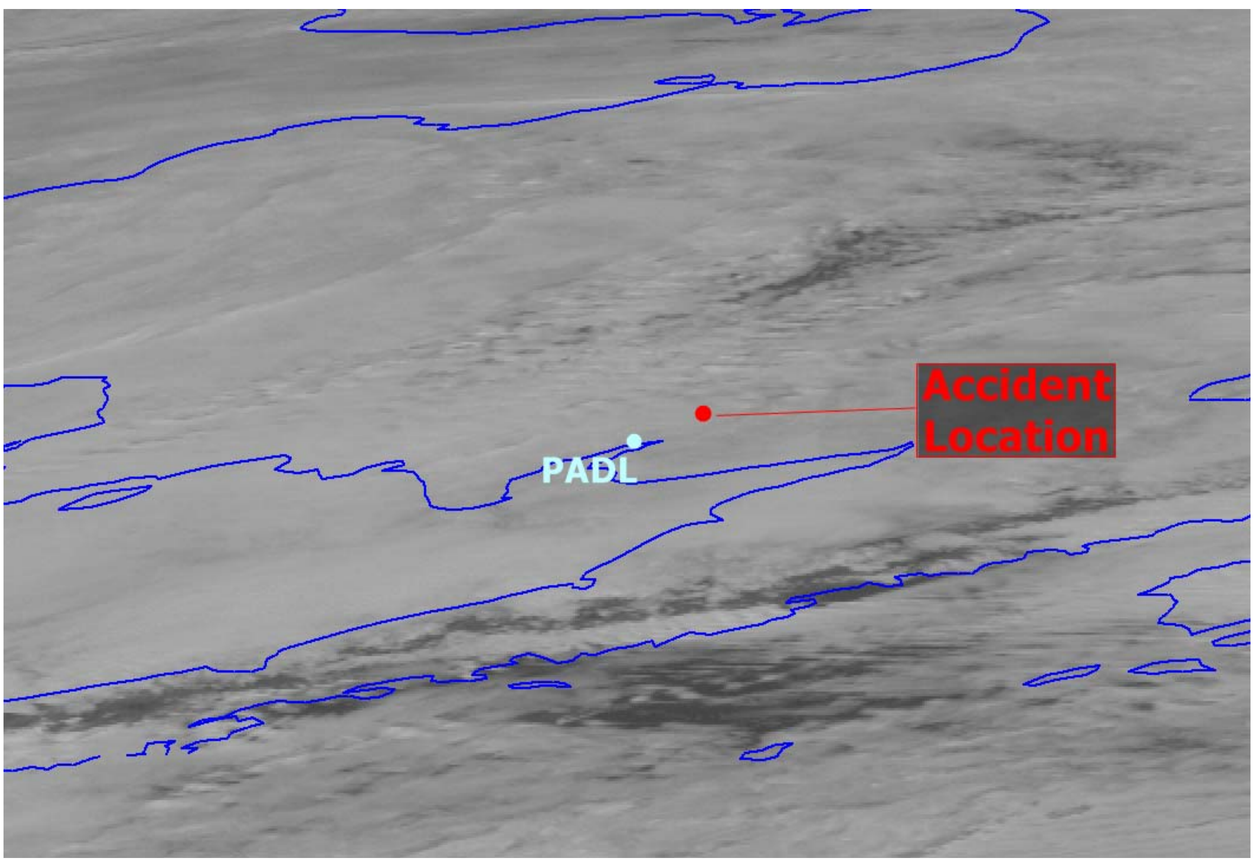

Figure 11 – GOES-11 channel 1 (0.65µm) scan at 1446.

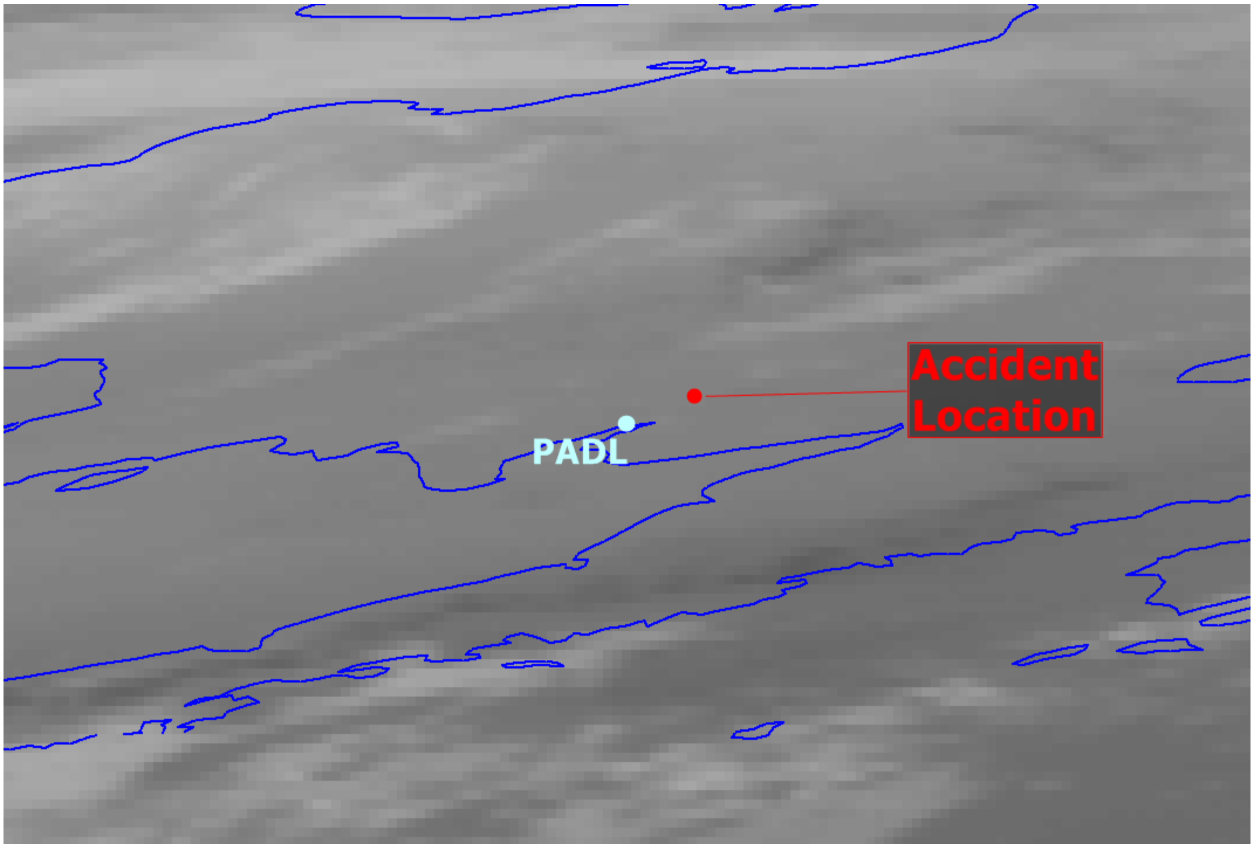

Figure 12 – GOES-11 channel 4 (10.7µm) scan at 1446. Grayscale.

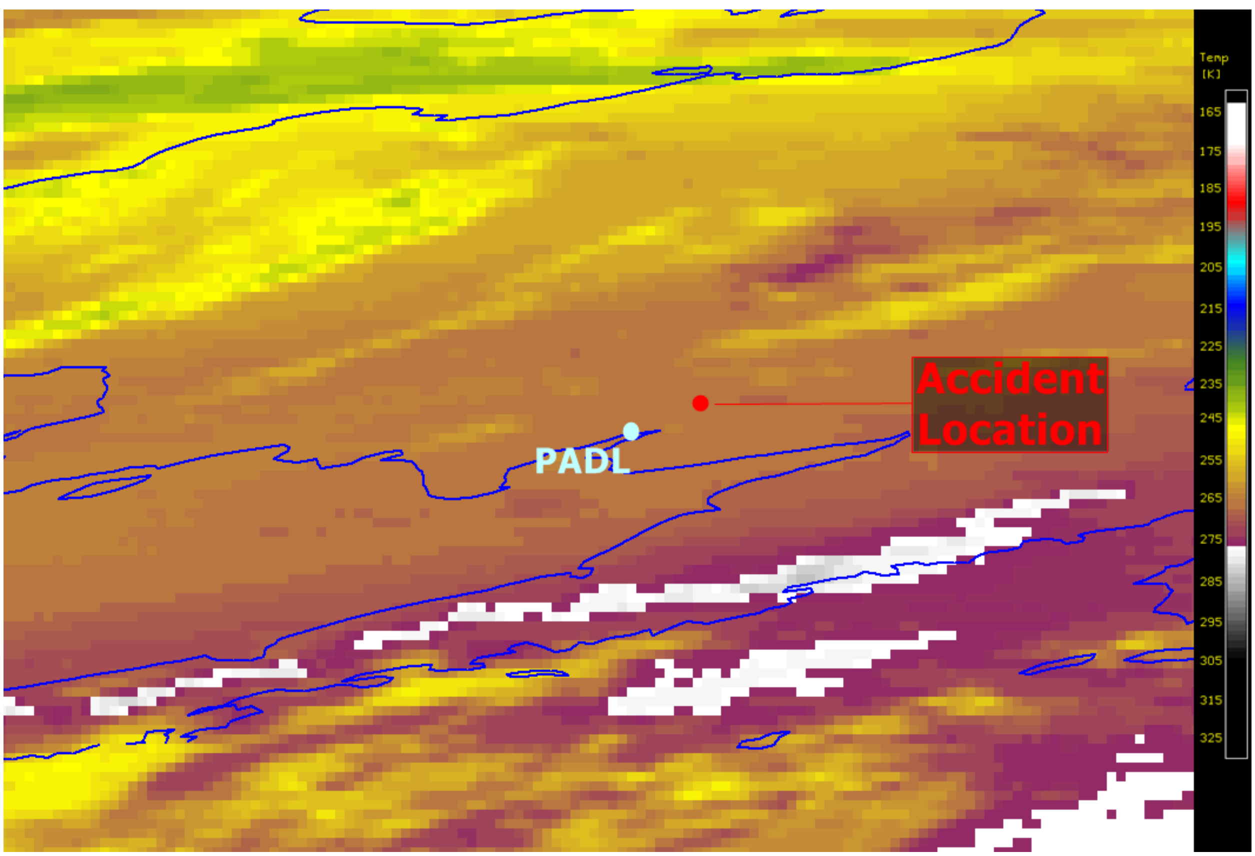

Figure 13 – GOES-11 channel 4 (10.7µm) scan at 1445. Color-enhanced.

Information retrieved from the Advanced Very High Resolution Radiometer **(**AVHRR**)** onboard polar-orbiting satellites NOAA-17 and NOAA-18 was also acquired from the SSEC at UW and processed using McIDAS. Figures 14 and 15 present imagery from AVHRR's visible (0.63µm) and "clean window" infrared (10.8µm) bands, as well as a visible/infrared RGB composite image. The RGB composites are comprised of the 0.63µm information projected in the red and green colors and the 10.8µm information projected as blue. The resultant imagery visually separates higher-topped (colder) cloud features (look whiter) from lower-topped (warmer) clouds (look more yellow). All bands onboard these instruments have a spatial resolution of about 1km by 1km at nadir and have a lower viewing angle of the accident area than GOES-11. In general, these AVHRR images provide a "clearer" look at the scene as compared to GOES-11; however they are not as timely. The AVHRR imagery is not corrected for parallax error and the exact error is unknown.

Imagery from the AVHRR onboard NOAA-17 from 1342 (figure 14), retrieved approximately one-hour before accident time, indicated the majority of southwestern Alaska was under cloudy skies. Cloud tops of the lower visible cloud layer (more yellow clouds in Panel C of figure 14) in the vicinity of the accident location were not uniform, and infrared brightness temperatures varied between -6°C and 4°C, which, when considering the KANK 1600 sounding, corresponded to cloud top heights of approximately 13,500 feet and 4,500 feet, respectively. A cloud-free or near cloud-free area was observed northwest of the accident site (near the top border of each panel) where 10.8µm brightness temperatures approached PADL surface temperatures of about 11°C. It cannot be determined from the AVHRR imagery if cloud-free areas existed closer to the accident site.

Imagery from the AVHRR onboard NOAA-18 from 1537 (figure 15), retrieved approximately 55 minutes after the accident time, indicated the majority of southwestern Alaska continued to be under cloudy skies. Cloud tops of the lower visible cloud layer in the vicinity of the accident location remained non-uniform, and infrared brightness temperatures varied between -6°C and 6°C, which, when considering the KANK 1600 sounding, corresponded to cloud top heights of approximately 13,500 feet and 3,000 feet, respectively. Cloud-free or near cloud-free areas appear to be present in the vicinity of the accident location in the RGB composite imagery; however there is no brightness temperature information that supports these features being present at the accident location.

At 1445, within approximately 5 minutes of the accident time, the Moderate-resolution Imaging Spectroradiometer (MODIS) onboard the polar-orbiting satellite TERRA passed over the southwestern portion of Alaska. One of MODIS' strengths is its 250 meter by 250 meter resolution in the red visible band (0.65µm). Due to the accident site being located near the edge of MODIS' swath during this pass, an "oversampling" effect was present in the imagery, which makes authoritative analysis difficult. The MODIS imagery is therefore not presented in this report, but should be noted as a source of limited space-based information.

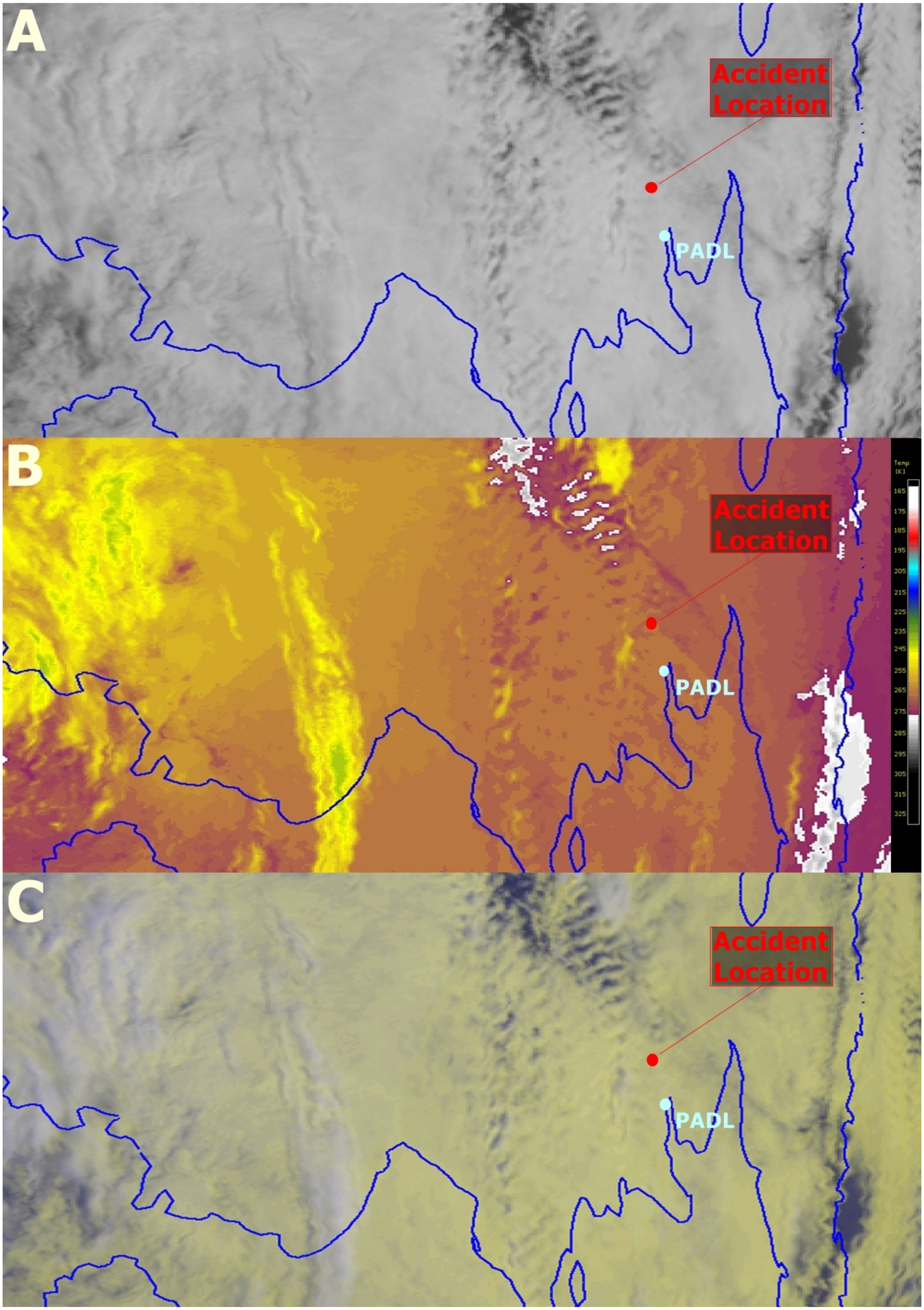

Figure 14 – NOAA-17 AVHRR imagery from 1342. Panel A: 0.63µm (visible). Panel B: 10.8µm. Panel C: RGB composite of AVHRR 0.63µm and 10.8µm imagery.

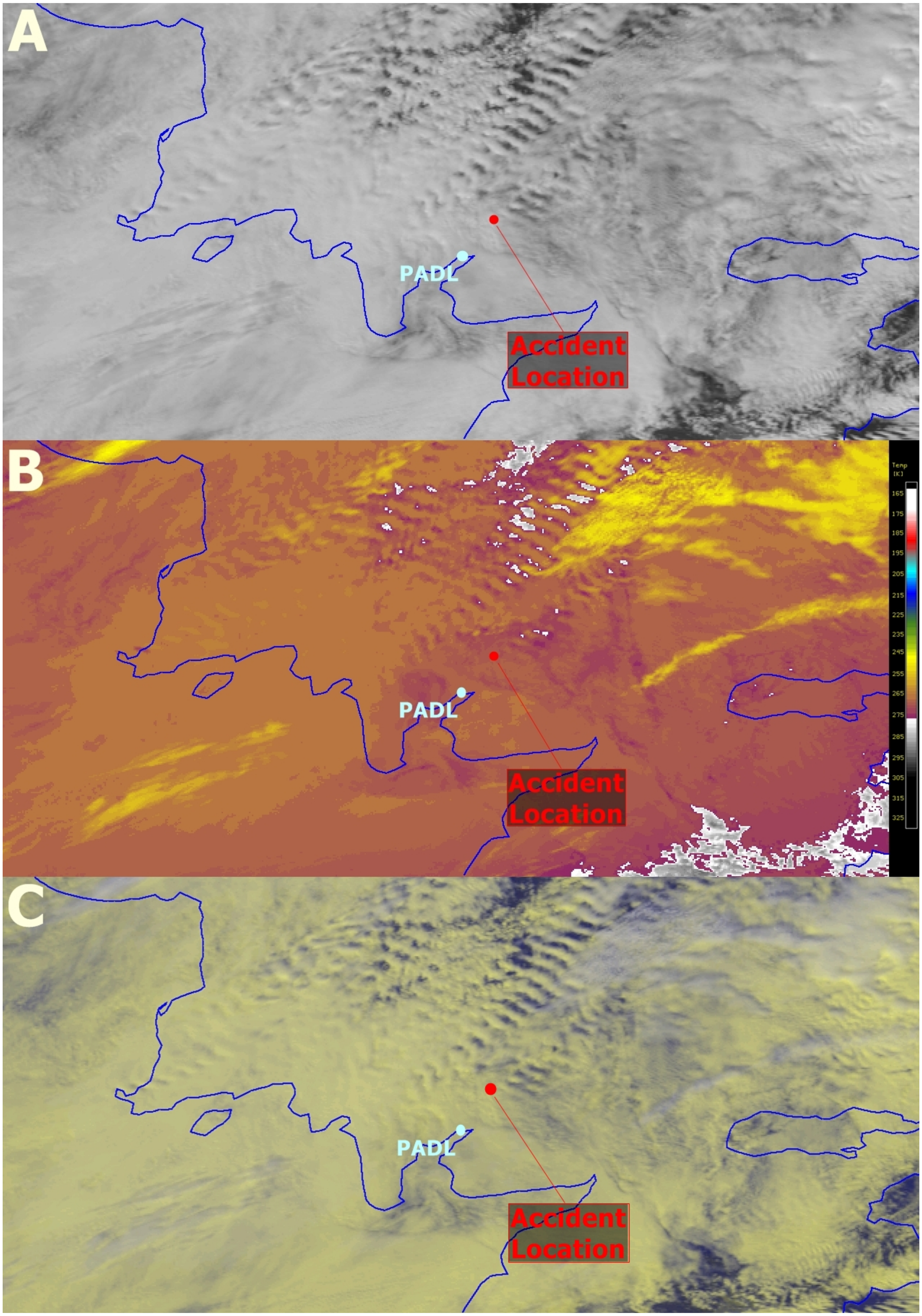

Figure 15 – NOAA-18 AVHRR imagery from 1537. Panel A: 0.63µm (visible). Panel B: 10.8µm. Panel C: RGB composite of AVHRR 0.63µm and 10.8µm imagery.

6.0 Weather Cameras

Images taken approximately every 10 minutes from weather cameras in Dillingham and New Stuyahok, Alaska, were obtained from the FAA and are presented here for the times surrounding the accident. Imagery from a weather camera located near Lake Aleknagik, Alaska, was provided by Nushagak Electric & Telephone Cooperative and is also presented here.

Camera images and additional information can be found in Attachment 2 to this report.

7.0 Witness Reports

A pilot flying a Cessna 206 floatplane flew near Aleknagik, Alaska, about 8 miles west of the accident site, approximately 15 minutes prior to the accident time. His written statement is provided as Attachment 3 to this report. This pilot estimated that conditions along his flight path were: a ceiling of 600 feet msl with a visibility greater than 5 miles, with a wind from the southwest at 10 to 15 miles per hour. The pilot indicated that conditions could have been slightly better than this estimate.

Interviews with the passengers of the accident flight were conducted by the Group Chairman for Survival Factors and portions of these interviews related to the accident flight weather conditions are presented here. The reader is referred to the Survival Factors Group Chairman's Factual Report for the complete interviews.

Passenger #1 was located in the co-pilot's seat: He remembered that it had been raining all day but had let up before the trip to the fish camp. He had made the trip to the fish camp five times before and on this trip, the pilot went a different direction during takeoff. The pilot said it was to avoid "wind and weather." They took off over the lake, then after about 10 minutes, turned right and flew over land. The visibility was "fine." It was cloudy above with light turbulence. They did not fly into clouds, they kept below them. He noticed water "running across" the outside of the windshield. He indicated the weather had been worse the day before and so turbulent that he got "nauseous."

Passenger #2: He did not know if the pilot checked the weather before the flight on the Internet or by telephone, but the pilot left the room for a while, and when he came back, he seemed to have "more information" about the weather. The weather was bad the morning of the accident, so there was no trip to the fish camp. Passenger #2 and Passenger #8 fished on the river in front of the lodge. By about noon they had caught one rainbow trout each, so they went in for lunch. "Someone" said that the weather had cleared enough to fly to the fish camp. Passenger #2 thought that the accident pilot checked weather prior to their departure, but he was not certain. No one on the aircraft expressed any concern about the weather immediately prior to take-off or during the accident flight. During the flight, the cabin was cool and condensation formed on the inside of his window, so he could not see well through the window. He did not have any indication of weather. The flight was not turbulent, but was not particularly smooth.

Approximately three months following the first interview, Passenger #2 revised his statement regarding the weather conditions during the flight. Passenger #2 indicated he had periodically looked out the window next to him, trying to catch a glimpse of wildlife on the ground. Once airborne, he could not see the ground, and could only see white-out conditions outside the airplane. He did not know if the airplane had climbed into clouds initially or if it had entered clouds at some point along the way. He did not recall condensation on the windows that inhibited his view, but he could not see anything but white through his window.

Passenger #3: There was fog present on the morning of the accident. At approximately 1130-1200 local time, the party decided to not fly to the Nushagak River; however, an hour later the weather cleared, and at approximately 1345-1400 local time, Passenger #3 and his father were summoned from their room. They immediately dressed and went to the aircraft. At the time of departure the weather was "nice," with no rain and visibility clear enough to see the mountains. The takeoff was normal. During the flight, Passenger #3 could see approximately 50 yards forward. Some fog was present beneath the aircraft, but he could still see water. Passenger #3 does not think they penetrated any clouds. There was minor turbulence, but no rain.

Passenger #4: Passenger #4 has traveled to Alaska once a year for the past 30 years. He has gained a lot of experience flying as a passenger on general aviation aircraft in Alaska and has experienced flight in marginal weather conditions. On the day of the accident, the weather was overcast with rain falling intermittently throughout the morning until approximately 1300 local time. These conditions were similar to those experienced the previous two days at the lodge, and were not remarkable or particularly risky based on his prior experiences flying in Alaska. There is a room at the main lodge where the accident pilot checked weather during the trip, but Passenger #4 does not know if he checked weather before the accident flight. The flight departed between 1500-1530 hours local time, with a ceiling estimated at 1,000 feet. Passenger #4 indicated that he has read the NTSB Preliminary Report[17] and believed the departure time and weather conditions indicated in the report to be accurate. During the 10-15 minute flight, the weather was not remarkable or notable in any way. The pilot remained below the cloud ceiling flying along the tree line, following streams, and executing several turns to avoid terrain.

An image captured and emailed by one of the accident aircraft's passengers prior to the accident aircraft's departure was provided by the email recipient. The image (figure 16), taken at the departure location and directed generally northwest, shows a local hill top (elevation approximately 1,500 feet) clear of clouds. The image was captured at approximately 1356, about 30 minutes prior to departure.

[17] From the NTSB Preliminary Report: *"At 1455 ADT, about 10 minutes after the presumed time of the accident, the Dillingham weather observation reported, in part: wind, 180° (true) at 12 knots, gusting to 23 knots; visibility, 3 statute miles with light rain and mist; clouds and sky condition, 600 feet scattered, 1,000 feet overcast; temperature, 52° Fahrenheit (F); dew point, 48° F; altimeter, 29.58 inches of Mercury."*

Figure 16 – Image captured by one of the accident aircraft's passengers prior to the accident aircraft's departure.

8.0 Terminal Aerodrome Forecasts

The closest Terminal Aerodrome Forecasts (TAF) to the accident site was PADL.

PADL 091902Z 0919/1018 16010KT 5SM -SHRA BR SCT005 OVC012
TEMPO 0919/0921 17012G20KT 3SM -RA BR BKN005
FM092100 16012KT 6SM -SHRA BR OVC015
FM100700 15005KT 5SM -SHRA BR OVC003=

The amended TAF issued for PADL at 1102 forecasted between 1300 and 2300: wind from 160° at 12 knots, visibility 6 miles in light rain showers and mist, ceiling overcast at 1,500 feet agl.

9.0 AIRMETs

An AIRMET SIERRA for IFR conditions and Mountain Obscuration was issued at 1136 for the Bristol Bay zone. This AIRMET advised of occasional ceilings below 1,000 feet and visibility below 3 miles in light rain and mist for the area southwest of a line between PAJZ and PAIG. For the entire zone, this AIRMET advised of mountains being occasionally obscured in clouds and precipitation.

WAAK48 PAWU 091936
WA8O
ANCS WA 091945
AIRMET SIERRA FOR IFR AND MT OBSC VALID UNTIL 100200
.
BRISTOL BAY AH
SW PAJZ-PAIG LN OCNL CIGS BLW 010/VIS BLW 3SM -RA BR. NC.
.
BRISTOL BAY AH
MTS OCNL OBSC IN CLDS/PCPN. NC.

Prior to the 1136 AIRMET, an AIRMET SIERRA for IFR conditions and Mountain Obscuration was issued at 0530 for the Bristol Bay zone. This AIRMET advised of occasional ceilings below 1,000 feet and visibility below 3 miles with light rain and mist for the area west of PAKN (King Salmon). For the entire zone, this AIRMET advised of mountains being occasionally obscured in clouds and precipitation.

WAAK48 PAWU 091330
WA8O
ANCS WA 091345
AIRMET SIERRA FOR IFR AND MT OBSC VALID UNTIL 092000
.
BRISTOL BAY AH
W PAKN OCNL CIG BLW 010/VIS BLW 3SM -RA BR. NC.
.
BRISTOL BAY AH
MTS OCNL OBSC IN CLDS/PCPN. NC.

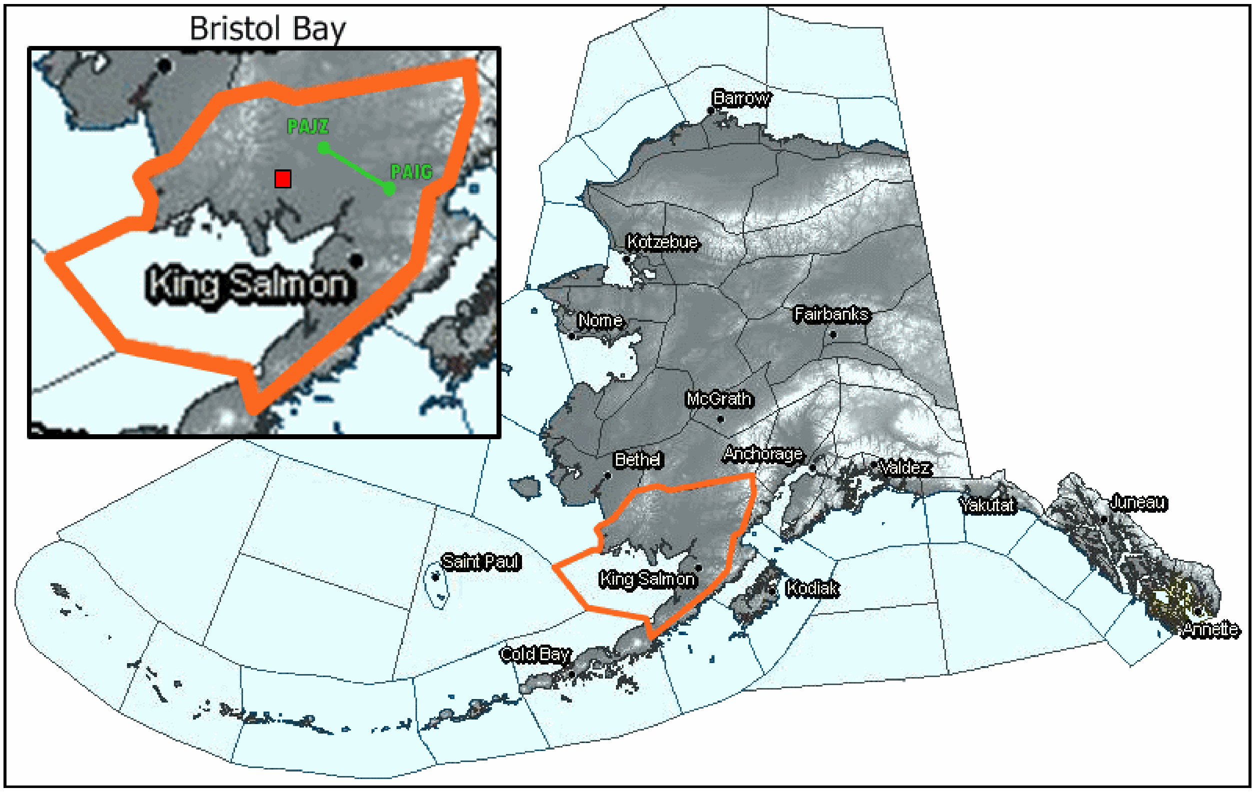

Figure 17 – National Weather Service forecast zones for Alaska. Bristol Bay forecast zone highlighted in orange. Insert: Bristol Bay forecast zone with PAJK-PAIG line in green with accident location at red square.

10.0 SIGMETs

No SIGMETs were in effect for the times surrounding the accident near the accident location.

11.0 Area Forecast

An Area Forecast for the Bristol Bay zone that was issued at 1137 and was valid until 0000 on August 10, 2010, reiterated the 1136 AIRMET conditions, with conditions at the accident site otherwise forecasted as: scattered clouds at 800 feet, broken ceiling at 1,500 feet, overcast cloud base at 2,500 feet, cloud tops to 12,000 feet with few cloud layers above up to 20,000 feet, visibility 3-5 miles with light rain and mist, isolated areas of scattered clouds at 1,500 feet and broken ceilings at 2,500 feet with rain and mist, isolated moderate turbulence below 5,000 feet.

FAAK58 PAWU 091937
FA8W
ANCC FA 091945
AK SRN HLF EXCP SE AK...
.
AIRMETS VALID UNTIL 100200
TS IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR CONDS. NON MSL HEIGHTS NOTED BY AGL OR CIG.
.

BRISTOL BAY AH...VALID UNTIL 100800
...CLOUDS/WX...
AIRMET IFRSW PAJZ-PAIG LN OCNL CIGS BLW 010/VIS BLW 3SM –RA BR. NC...
AIRMET MT OBSCMTS OCNL OBSC IN CLDS/PCPN. NC... **OTRW SW PAJZ-PAIG LN SCT008 BKN015 OVC025 TOP 120 FEW LYRS ABV TO FL200.**
VIS 3-5SM -RA BR. ISOL SCT015 BKN025 -RA BR.
PAJZ-PAIG LN NE SCT015 BKN045 TOP 120.
ISOL BKN015/VIS 5SM -RA BR.
OTLK VALID 100800-101400...SW PAJZ-PAIG LN IFR CIG RA BR.
PAJZ-PAIG LN NE MVFR CIG SHRA.
ELSW...MVFR CIG RA.
...TURB...
W PAKN ISOL MOD TURB BLW 050. ELSW NIL SIG.
...ICE AND FZLVL...
NIL SIG. FZLVL 075.

Prior to the 1137 Area Forecast, an Area Forecast for the Bristol Bay zone that was issued at 0530 reiterated the 0530 AIRMET conditions, with conditions at the accident site otherwise forecasted as: scattered clouds at 500 feet, broken ceiling at 1,500 feet, cloud tops to 10,000 feet with cirrus above, visibility 3 miles with light rain and mist, isolated moderate turbulence below 5,000 feet.

FAAK58 PAWU 091330
FA8W
ANCC FA 091345
AK SRN HLF EXCP SE AK...
.
AIRMETS VALID UNTIL 092000
TS IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HEIGHTS NOTED BY AGL OR CIG.
.
BRISTOL BAY AH...VALID UNTIL 100200
...CLOUDS/WX...
AIRMET IFRW PAKN OCNL CIG BLW 010/VIS BLW 3SM -RA BR. NC...
AIRMET MT OBSCMTS OCNL OBSC IN CLDS/PCPN. NC...
OTRW W PAKN...SCT005 BKN015 TOP 100 CI ABV 3SM -RA BR.
ELSW...SCT025 BKN040 TOP 100 CI ABV OCNL BKN025 5SM -RA.
OTLK VALID 100200-100800...PADL NW...IFR CIG RA BR.
ELSW...MVFR CIG RA.
...TURB...
ISOL MOD TURB BLW 050.
...ICE AND FZLVL...
NIL SIG. FZLVL 090.
.

12.0 Area Forecast Discussion

An Area Forecast Discussion for the Bristol Bay zone that was issued at 1353 for southcentral and southwestern Alaska.

FXAK68 PAFC 092153
AFDAFC
AREA FORECAST DISCUSSION
SOUTHCENTRAL AND SOUTHWEST ALASKA
200 PM AKDT MON AUG 9 2010
.ANALYSIS AND UPPER LEVELS...A LARGE REGION OF LOW PRESSURE CENTERED OVER NUNIVAK ISLAND CONTINUES TO DOMINATE MUCH OF THE FORECAST REGION. ALTHOUGH THIS LOW IS SLOWLY WEAKENING...IT STILL CONTAINS A GOOD AMOUNT OF VORTICITY AND IS SUPPORTING STEADY RAIN IN NORTHERN PORTIONS OF THE KUSKOKWIM DELTA AND SHOWERS ACROSS SOUTHWEST MAINLAND ALASKA. A BROAD RIDGE ACROSS THE GULF OF ALASKA IS HELPING TO SUPPORT STRONG SOUTHWESTERLY FLOW ALONG THE ALASKA PENINSULA AND INTO THE GULF OF ALASKA. THIS IS ALLOWING SHOWERS TO FORM ACROSS SOUTHCENTRAL IN SPITE OF THE RELATIVELY WEAK UPPER LEVEL FORCING.
.AT THE SURFACE...A 989 MB LOW BENEATH THE UPPER LEVEL BERING LOW COVERS MUCH OF THE BERING. A WEAK FRONT STRETCHES FROM THE LOW AND ALONG THE EASTERN GULF OF ALASKA. ALTHOUGH THIS FRONT IS ONLY GENERATING LIGHT RAIN ACROSS PRINCE WILLIAM SOUND ITS ASSOCIATED ONSHORE FLOW IS HELPING TO GENERATE A SURFACE PRESSURE GRADIENT ACROSS TURNAGAIN ARM. THIS GRADIENT HAS SUPPORTED WIND GUSTS GREATER THAN 50 MPH ALONG TURNAGAIN ARM AND HIGHER ELEVATIONS.
.MODEL DISCUSSION...MODELS ARE IN DECENT AGREEMENT ON THE POSITION AND INTENSITY OF THE BERING LOW AND ASSOCIATED LOWS OVER THE SHORT TERM. BY THURSDAY MODELS ARE SHOWING MUCH MORE DISAGREEMENT ON THE POSITION AND DEVELOPMENT OF A SURFACE LOW. HOWEVER...ALL MODELS INDICATE MOIST SOUTHWESTERLY FLOW AND SHOWERS ACROSS MUCH OF SOUTHERN MAINLAND ALASKA.
.SHORT TERM FORECAST...
.SOUTHCENTRAL ALASKA...THE FRONT THAT HAS BROUGHT RAIN TO PRINCE WILLIAM SOUND AND STRONG WINDS ALONG TURNAGAIN ARM IS EXPECTED TO CONTINUE TO PROGRESS EASTWARD. AS A RESULT...WINDS SHOULD BEGIN TO WEAKEN ACROSS TURNAGAIN ARM AND HIGHER ELEVATIONS THIS AFTERNOON AND INTO THIS EVENING. ALTHOUGH NO STRONG SYSTEM IS EXPECTED TO IMPACT THE AREA OVER THE NEXT FEW DAYS...SHOWERS WILL CONTINUE ACROSS THE SOUTHCENTRAL AREA. WEAK UPPER LEVEL SHORTWAVES WILL CONTINUE TO ROTATE AROUND A LOW THAT WILL LINGER IN THE BERING. IN

ADDITION...BROAD SOUTHWESTERLY FLOW WILL CONTINUE ACROSS THE AREA AND PROVIDING PLENTY OF MOISTURE.
.SOUTHWEST ALASKA...A LOW NEAR NUNIVAK ISLAND WILL CONTINUE TO SLOWLY MOVE INLAND TO THE NORTHEAST. HOWEVER...THIS LOW IS LARGE ENOUGH THAT IT WILL CONTINUE TO SUPPORT SHOWERS ACROSS MUCH OF THE SOUTHWEST MAINLAND FOR THE NEXT FEW DAYS. BROAD SOUTHWESTERLY FLOW WILL TRANSPORT SUFFICIENT MOISTURE FOR SHOWERS AND AN UPPER LEVEL WAVE WILL APPROACH THE REGION BY TUESDAY.
.BERING SEA...A BROAD LOW NEAR NUNIVAK WILL KEEP THE CHANCE FOR THE EAST AND CENTRAL ALEUTIANS FOR THE NEXT FEW DAYS. THIS SYSTEM CONTINUES TO WEAKEN AT THE SURFACE AND NO STRONG WINDS ARE EXPECTED TO IMPACT THE AREA.
.LONG TERM FORECAST...WHILE BROAD SOUTHWESTERLY FLOW WILL KEEP MUCH OF THE FORECAST AREA SOGGY FOR THE REST OF THE WEEK...MODELS ARE HINTING AT IMPROVING CONDITIONS FOR THE WEEKEND. A BROAD RIDGE COULD BUILD ACROSS SOUTH MAINLAND ALASKA SATURDAY...WHICH WOULD HELP THINGS TO DRY OUT A LITTLE.
.AER/ALU...WATCH/WARNING SUMMARY
PUBLIC...NONE.
MARINE...NONE.
FIRE WEATHER...NONE.
ELN AUG 10

Prior to the 2200 Area Forecast Discussion, an Area Forecast Discussion for the Bristol Bay zone was issued at 0200 for southcentral and southwestern Alaska.

FXAK68 PAFC 091000
AFDAFC
AREA FORECAST DISCUSSION
SOUTHCENTRAL AND SOUTHWEST ALASKA
200 AM AKDT MON AUG 9 2010
.ANALYSIS AND UPPER LEVELS...
A 983 MB LOW IS LOCATED BETWEEN SAINT PAUL AND NUNIVAK ISLAND THIS MORNING...MOVING NORTHEAST AND CONTINUING TO WEAKEN. CIRCULATION AROUND THIS LOW ENCOMPASSES BASICALLY ALL OF ALASKA. THE LOW IS WEAKENING BECAUSE IT IS BEGINNING TO LOSE ITS UPPER LEVEL JET SUPPORT AS THE JET IS NOW DETACHED FROM THE LOW AND MOVING NORTHEAST THROUGH BRISTOL BAY AND SOUTHCENTRAL ALASKA. SEVERAL WEAK SHORTWAVES ARE EMBEDDED IN THE FLOW AROUND THE LOW WITH SCATTERED TO NUMEROUS RAIN SHOWERS. A DECAYING OCCLUDED FRONT IS HUNG UP RIGHT ALONG THE NORTH GULF COAST.
.MODEL DISCUSSION...
MODELS ARE IN GOOD AGREEMENT THROUGH ABOUT WEDNESDAY NIGHT BUT THEN FALL APART. FOR NEXT WEEKEND...ECMWF HAS A FURTHER WEST POSITION OF THE RIDGE AXIS OVER THE GULF OF

ALASKA (IE MOST OPTIMISTIC FOR THE WEATHER IN SOUTHCENTRAL)...BUT WAS NOT GENERALLY USED SINCE THE GFS...CANADIAN...NOGAPS...AND FIM MODELS WERE FURTHER EAST WITH THE RIDGE AXIS.

.SHORT TERM FORECAST...

SOUTHCENTRAL...MOIST UPPER LEVEL SOUTHWEST FLOW CONTINUES THROUGH WEDNESDAY FOR SOUTHCENTRAL. EXPECT GENERALLY SCATTERED TO NUMEROUS SHOWER ACTIVITY THROUGH TUESDAY MORNING...THEN AN INCREASE IN RAINFALL TUESDAY AFTERNOON AND NIGHT AS A MORE PRONOUNCED UPPER LEVEL SHORTWAVE TROUGH MOVES THROUGH. THE NAM ACTUALLY DEVELOPS A SURFACE LOW IN THE NORTHERN GULF TUESDAY AFTERNOON MOVING INTO PRINCE WILLIAM SOUND TUESDAY NIGHT. THIS IS A NEW FEATURE SO HAVE NOT GONE WITH IT YET...BUT WOULDN'T BE SURPRISED IF THIS HAPPENS. ALL THIS SOUTHWEST FLOW IS THE RESULT OF THE VERTICALLY STACKED SLOW MOVING LOW IN THE NORTHEAST BERING SEA.

SOUTHWEST MAINLAND...

A LARGE VERTICALLY STACKED LOW PRESSURE SYSTEM BETWEEN SAINT PAUL AND NUNIVAK ISLAND WILL MOVE TO AROUND WESTERN NORTON SOUND TUESDAY MORNING...BECOMING NEARLY STATIONARY AND CONTINUING TO WEAKEN. MULTIPLE WEAK SHORTWAVES WILL CONTINUE TO ROTATE NORTHEAST THROUGH THE SOUTHWEST MAINLAND AND AROUND THE LOW...WITH NUMEROUS RAIN SHOWERS AND COOL TEMPERATURES CONTINUING THROUGH ABOUT WEDNESDAY. LONG FETCH WESTERLY FLOW WILL BRING A MINOR STORM SURGE TO THE WEST COAST TODAY...BUT SEA LEVELS WILL ONLY BE NEAR MAX ASTRONOMICAL TIDE SO ADVISORIES/WARNINGS ARE NOT NEEDED.

BERING SEA/ALEUTIANS/ALASKA PENINSULA... WINDS OUT WEST WILL GRADUALLY WEAKEN AS THE LOW MOVES NORTHEAST TOWARD NORTON SOUND AND ITSELF CONTINUES TO WEAKEN. SHOWER ACTIVITY HAS PRETTY MUCH ENDED OVER THE WESTERN BERING/ALEUTIANS...AND WILL CONTINUE TO TAPER OFF FROM WEST TO EAST THROUGH TUESDAY. A WEAK LOW PRESSURE SYSTEM WILL MOVE SOUTHEAST TOWARD THE WESTERN ALEUTIANS ON WEDNESDAY...BRINGING A RETURN TO RAIN THERE.

.LONG TERM FORECAST...

RIDGING DEVELOPS THE WESTERN GULF AND NOSES INTO SOUTHCENTRAL ALASKA LATE THURSDAY INTO FRIDAY...BRINGING A BIT OF A BREAK TO THE DELUGE. FOR THE WEEKEND...MODELS AREN'T NECESSARILY IN BAD AGREEMENT...BUT SUBTLE POSITIONS IN THE GULF OF ALASKA RIDGE OF HIGH PRESSURE MEANS BIG DIFFERENCES FOR THE FORECAST FOR SOUTHCENTRAL. THE GULF RIDGE IS EXPECTED TO REALLY AMPLIFY AND DEEP MOISTURE WILL BE DRAWN NORTH ON THE WEST SIDE OF THE RIDGE FROM ABOUT 35N LATITUDE. THE ECMWF KEEPS THE RIDGE AXIS OVER THE COPPER RIVER BASIN FOR THE WEEKEND...WHICH WOULD KEEP THE HEAVY RAIN FROM BRISTOL BAY/KUSKOKWIM VALLEY WEST

INTO THE EASTERN BERING. HOWEVER...ALL OTHER MODELS BRING THE DEEP SLUG OF MOISTURE RIGHT INTO SOUTHCENTRAL...WHICH COULD MEAN HEAVY RAIN AND FLOODING FOR PLACES SUCH AS SEWARD. TENTATIVELY FAVORING THE WETTER SOLUTION FOR THE WEEKEND...BUT WOULD LIKE TO SEE THE ECMWF COME INTO LINE TO BE TOTALLY CONVINCED.
.AER/ALU...WATCH/WARNING SUMMARY
PUBLIC...NONE.
MARINE...GALE WARNING ZONES 185 AND 412.
FIRE WEATHER...NONE.
FOISY AUG 10

13.0 Zone Forecast

A Zone Forecast for Bristol Bay was issued at 0500 and forecasted increasing showers with patchy fog.

FPAK52 PAFC 091201
ZFPALU
ALASKA ZONE WEATHER FORECASTS FOR ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE AK
500 AM AKDT MON AUG 9 2010
SPOT TEMPERATURES AND PROBABILITIES OF MEASURABLE PRECIPITATION
ARE FOR TODAY...TONIGHT...AND TUESDAY.
AKZ161-100000-
BRISTOL BAY-
INCLUDING...KING SALMON...DILLINGHAM...NAKNEK...PILOT POINT
500 AM AKDT MON AUG 9 2010
.TODAY...SCATTERED SHOWERS BECOMING MORE NUMEROUS THIS MORNING. PATCHY FOG. HIGHS IN THE 50S. SOUTH WIND 10 TO 20 MPH. LOCAL GUSTS TO 30 MPH.
.TONIGHT...NUMEROUS SHOWERS. PATCHY FOG. LOWS IN THE MID 40S TO LOWER 50S. SOUTH WIND 10 TO 20 MPH. LOCAL GUSTS TO 30 MPH.
.TUESDAY...NUMEROUS SHOWERS. PATCHY FOG. HIGHS IN THE 50S. SOUTH WIND 10 TO 15 MPH.
.TUESDAY NIGHT...CLOUDY WITH SCATTERED SHOWERS. LOWS IN THE MID 40S TO LOWER 50S. SOUTH WIND 10 TO 15 MPH WITH GUSTS TO 30 MPH.
.WEDNESDAY...CLOUDY WITH SCATTERED SHOWERS. HIGHS IN THE 50S. SOUTHWEST WIND 10 TO 15 MPH.
.WEDNESDAY NIGHT...MOSTLY CLOUDY WITH ISOLATED SHOWERS. LOWS 45 TO 55.
.THURSDAY...MOSTLY CLOUDY WITH A CHANCE OF RAIN. HIGHS IN THE 50S.

.THURSDAY NIGHT AND FRIDAY...PARTLY CLOUDY. LOWS 45 TO 55. HIGHS 55 TO 65.
.FRIDAY NIGHT THROUGH SUNDAY...CLOUDY WITH A CHANCE OF RAIN. LOWS 45 TO 55. HIGHS 55 TO 65.
&&

	TEMPERATURE			/	PRECIPITATION		
KING SALMON	58	48	55	/	60	60	60
DILLINGHAM	55	47	54	/	80	70	60
ILIAMNA	57	49	56	/	60	60	60

$$

14.0 Graphical Forecast Products

The NWS Alaska Aviation Weather Unit (AAWU) in Anchorage, Alaska, issued supplementary graphical forecast products for the southern portion of Alaska prior to the accident time. These products are supplementary to the text products, which are the official forecast products. At 1300, the AAWU issued an IFR/MVFR forecast chart (figure 18), a Graphical Forecast surface chart (figure 19) and a Turbulence chart (figure 20).

The 1300 IFR/MVFR[18,19] forecast chart identified expected areas of IFR and MVFR regions in Alaska. The accident location was not covered by either the IFR or MVFR forecast area, however it fell very close to the border of an area of forecast IFR. Personal communication with an AAWU manager regarding this forecast chart indicated that IFR/MVFR conditions came in a bit faster than expected during the valid forecast period.

The 1300 Graphical Forecast surface chart identified rain, drizzle, and light rain showers in the region surrounding the accident site. The accident area was not forecast to experience precipitation at the chart valid time of 1600, however it was close to the forecasted precipitation boundary.

The 1300 turbulence chart did not forecast significant turbulence for the accident area.

Prior to the issuance of the 1300 forecast charts, IFR/MVFR, Graphical Forecast and turbulence charts were issued at 0700 (figures 21-23). The 0700 IFR/MVFR forecast chart forecasted the accident location to be under IFR conditions, with the Graphical Forecast chart putting the accident location under light rain. Significant turbulence was not forecast for this area.

The 36-hour Significant Weather chart (figure 24), issued at 1000 August 8, 2010, and valid beginning 1600 August 9, 2010, forecasted MVFR conditions with some significant turbulence for the accident location.

[18] IFR – Instrument Flight Rules: Ceilings less than 1,000 feet agl and/or visibility less than 3 miles.
[19] MVFR – Marginal Visual Flight Rules: A sub-category of VFR (Visual Flight Rules). Ceilings between 1,000 and 3,000 feet agl and/or visibility between 3 and 5 miles.

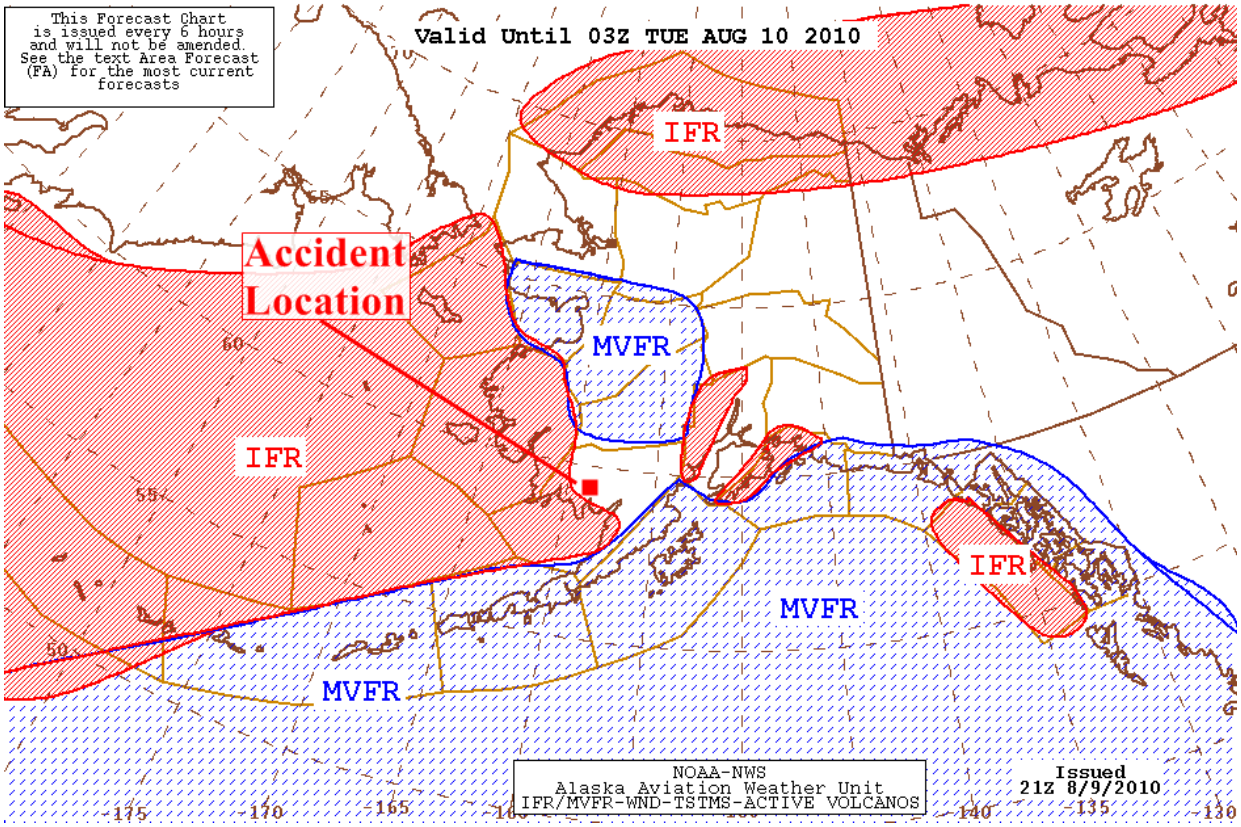

Figure 18 – IFR/MVFR forecast chart issued at 1300. Supplemental to official forecast text products.

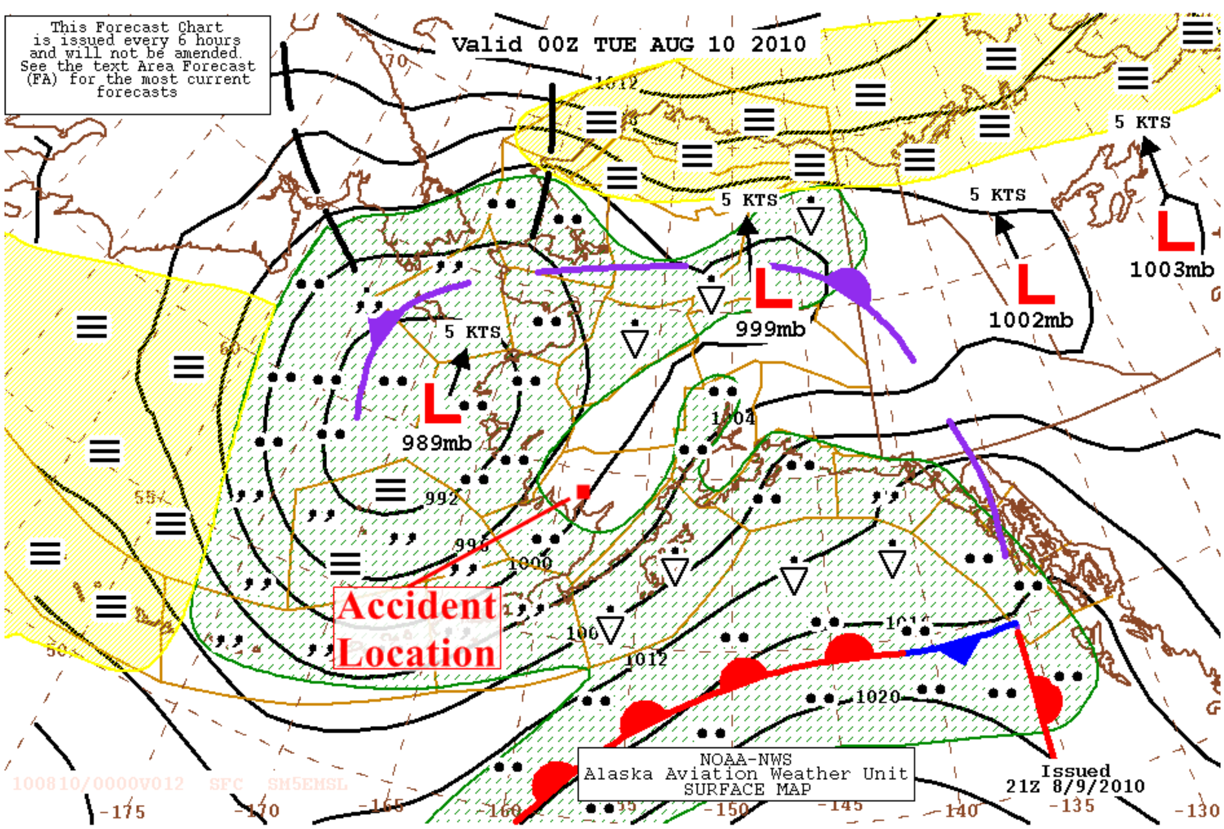

Figure 19 – Graphical Forecast surface chart issued at 1300. Supplemental to official forecast text products.

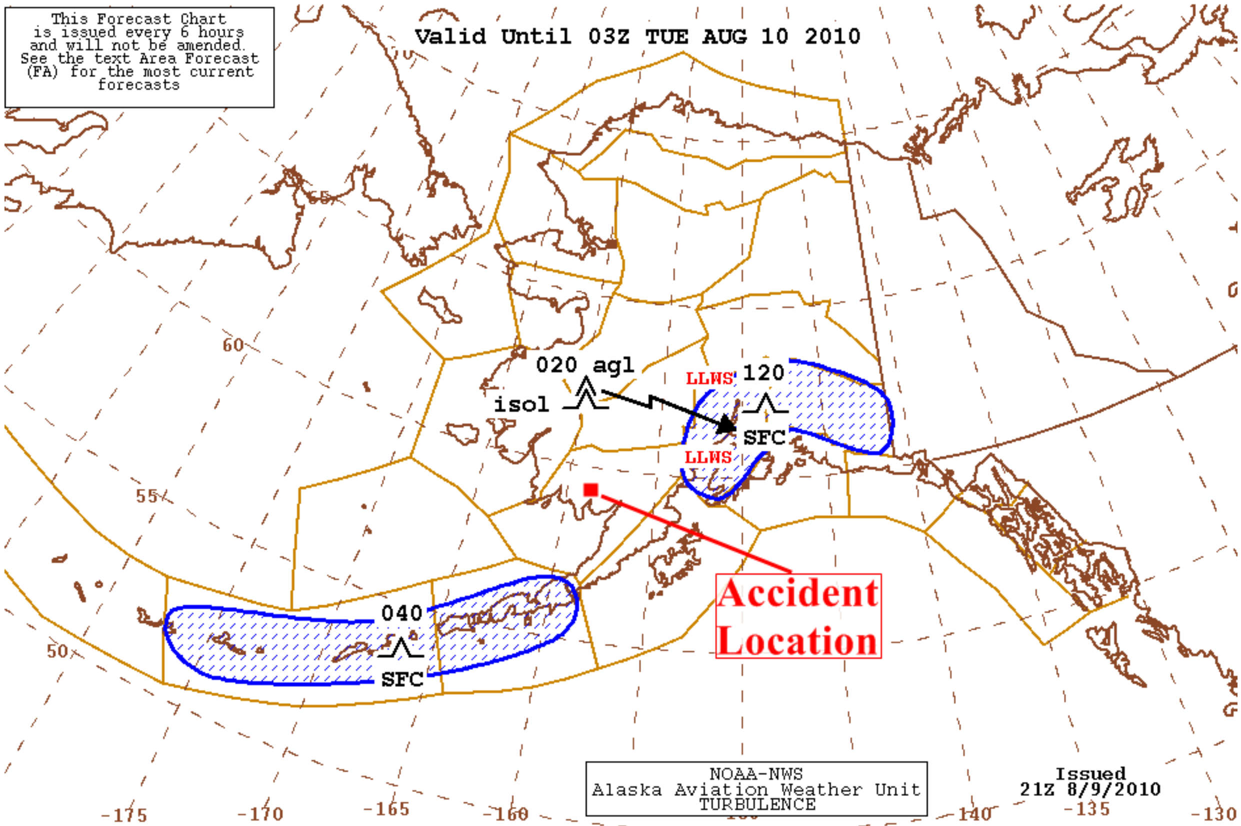

Figure 20 – Turbulence chart issued at 1300. Supplemental to official forecast text products.

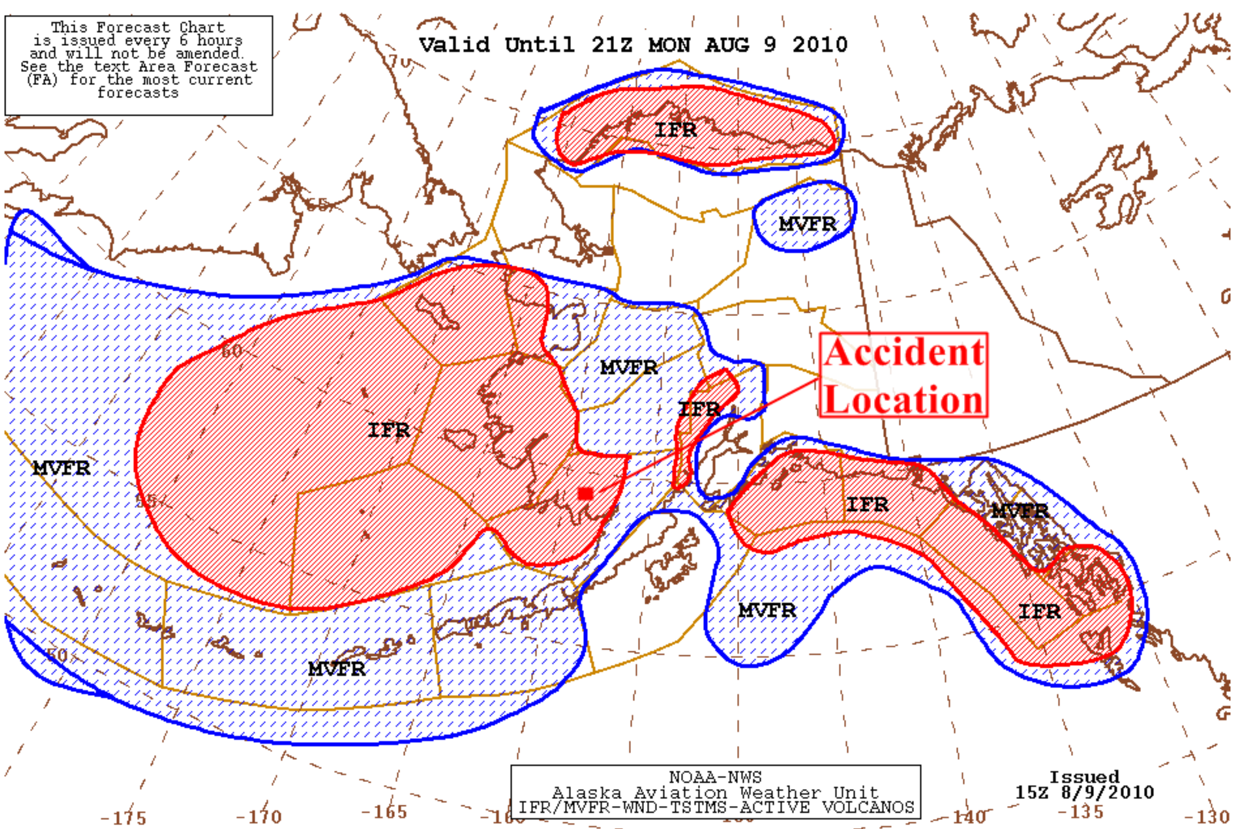

Figure 21 – IFR/MVFR forecast chart issued at 0700. Supplemental to official forecast text products.

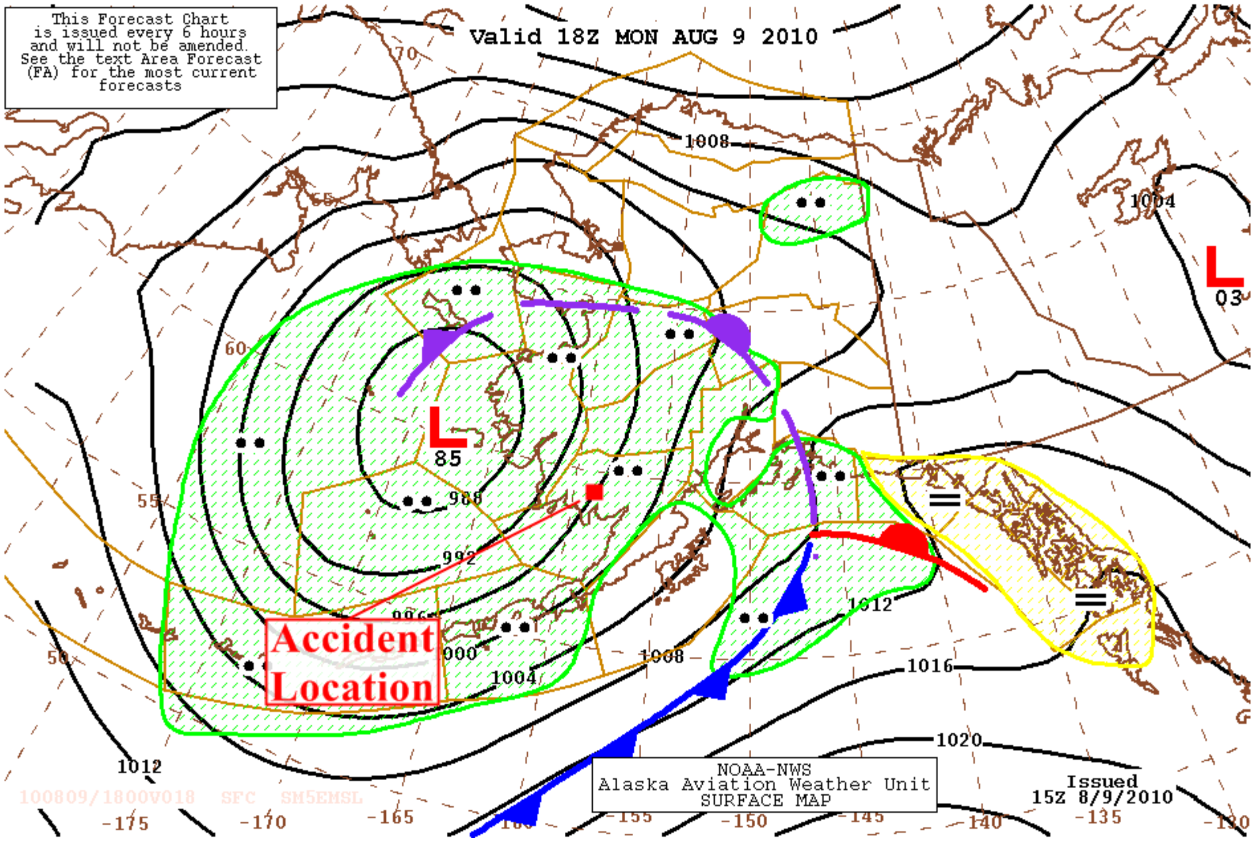

Figure 22 – Graphical Forecast surface chart issued at 0700. Supplemental to official forecast text products.

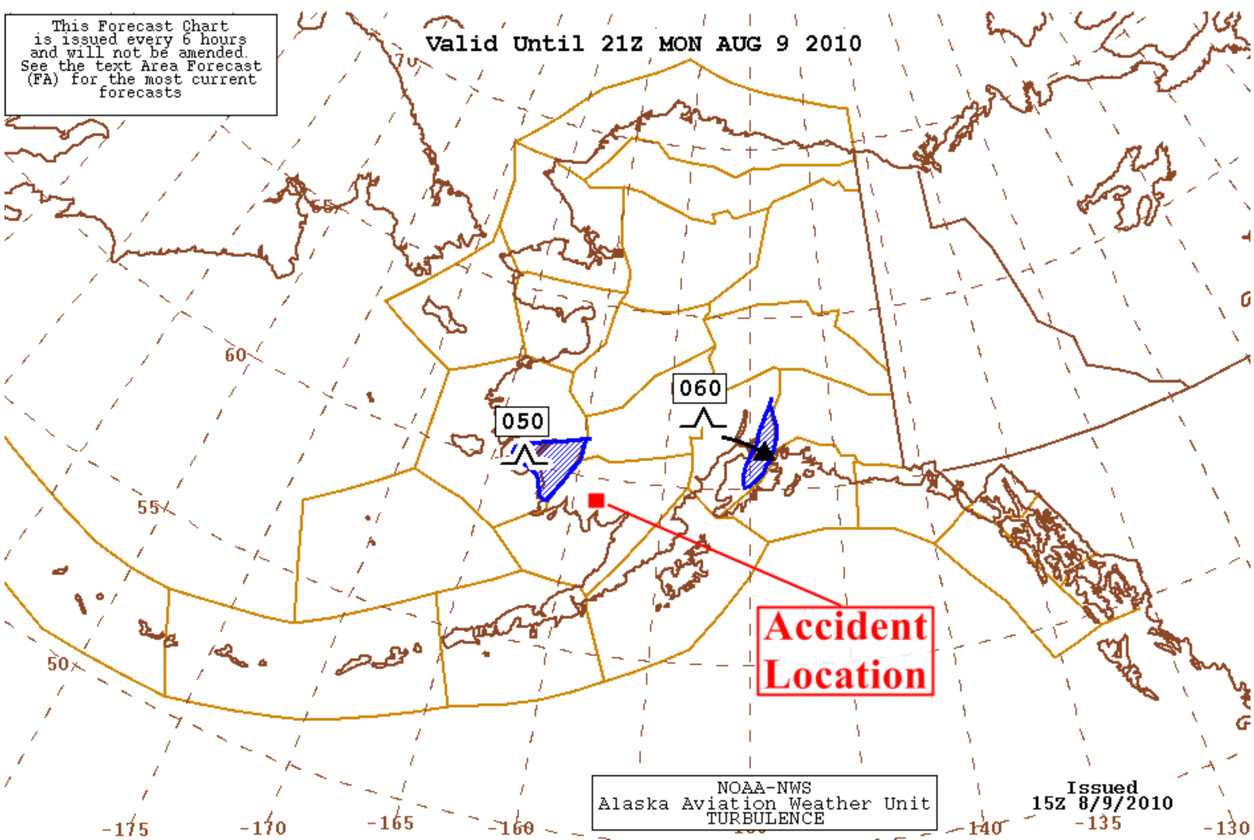

Figure 23 – Turbulence chart issued at 0700. Supplemental to official forecast text products.

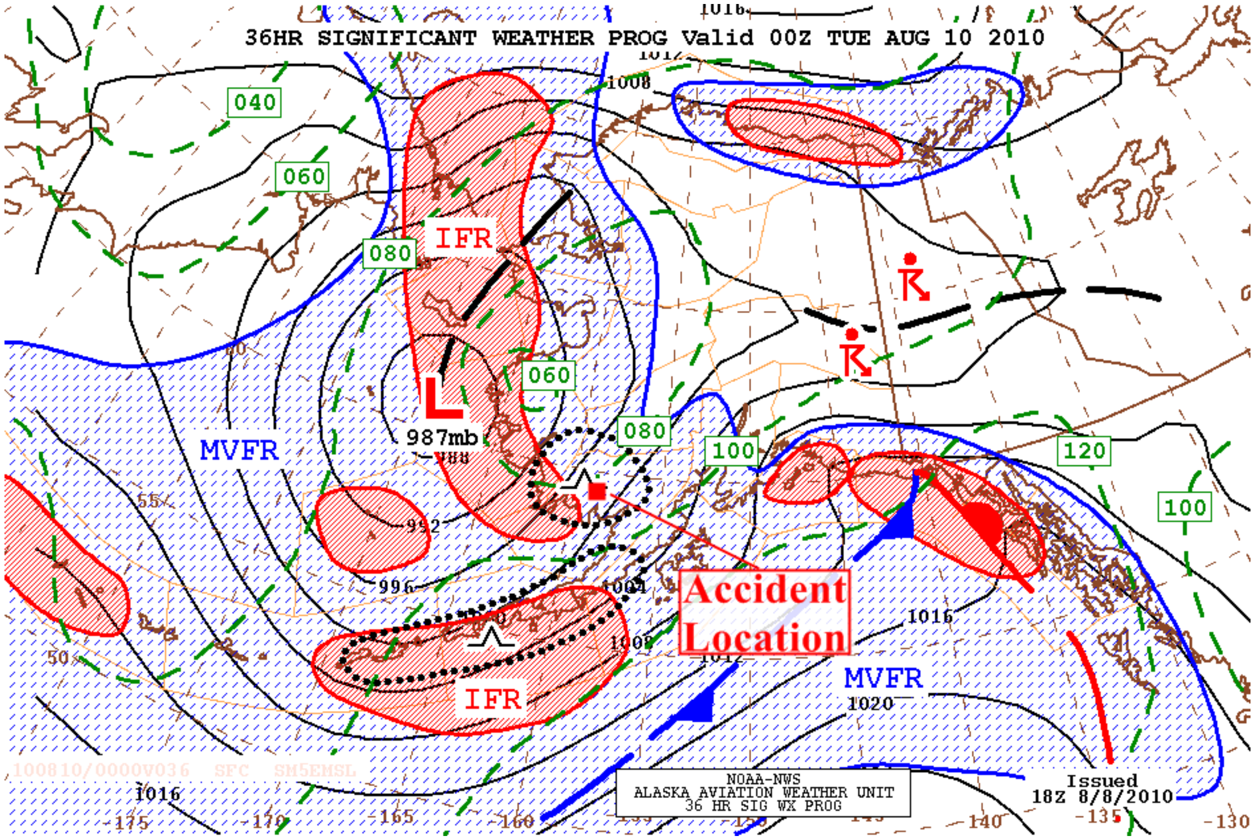

Figure 24 – 36hr Significant Weather chart issued at 1000 on August 8, 2010, and valid at 1600 August 9, 2010. Supplemental to official forecast text products.

15.0 Meteorological Impact Statements/Center Weather Advisories

No Meteorological Impact Statements or Center Weather Advisories were issued for the accident location prior to accident time.

16.0 Pilot Weather Briefing

The accident pilot did not receive a FAA weather briefing prior to the accident flight.

Two desktop computers were obtained from the accident aircraft's departure location and internet activity from the day of the accident was retrieved. The reader is referred to the Computer Data Factual Report for a discussion of the retrieval process.

Internet sites that provided weather information for Alaska that were accessed prior to the accident time on both desktop computers are presented here, along with the time of each visit. It is not known who specifically was accessing this information.

Activity from the "Dining Hall" computer

(0740:01 AM) **http://aawu.arh.noaa.gov/**

(0740:19 AM) **http://aawu.arh.noaa.gov/clickmap/bristol.html**

(0740:25 AM) **http://pafc.arh.noaa.gov/obs.php?stnid=PADL**

(0741:23 AM) **http://pafc.arh.noaa.gov/obs.php?stnid=PAMB**

(0741:44 AM) **http://pafc.arh.noaa.gov/obs.php?stnid=PALV**

(0741:52 AM) **http://pafc.arh.noaa.gov/tafobs.php?stnid=PADL**

(0742:28 AM) **http://pafc.arh.noaa.gov/obs.php?stnid=PALV**

(0745:01 AM) **http://pafc.arh.noaa.gov/obs.php?stnid=PADL**

Activity from "Bergts Cabin" computer

(1132:13 AM) **aawu.arh.noaa.gov**

(1132:59 AM) **pafc.arh.noaa.gov**

(1132:59 AM) **http://pafc.arh.noaa.gov/home_sfcmap.php?Z=12**

(1133:25 AM) **http://aawu.arh.noaa.gov/surface.php**

(1133:26 AM) **http://aawu.arh.noaa.gov/index.php**

Between 0740 and 0745, accessed weather information consisted mainly of surface observations and a TAF. From one of the sites, a forecast surface chart (Figure 22) and the confirmation of active AIRMETs may have been viewable. Products current at the time of visit were:

METAR PADL 091536Z 16008KT 6SM SCT005 OVC014 10/09 A2950 RMK AO1 PNO TSNO

METAR PADL 091545Z 18012KT 5SM -RA BR SCT005 OVC014 10/09 A2950 RMK SCT V BKN FIRST

SPECI PAMB 091516Z AUTO 19009KT 2 1/2SM BR OVC006 09/09 A2944 RMK AO2 PWINO TSNO CIG 003V011 $=

PALV 091450Z 00000KT 2SM RA OVC008 11/11 A2961 RMK EST PASS CLSD NOSPECI=

TAF AMD
PADL 091409Z 0914/1012 16010KT 5SM -SHRA BR OVC004
FM091900 16011KT 5SM -SHRA BR OVC009
FM100700 15005KT 5SM -SHRA BR OVC003 AMD LTD TO CLD VIS AND WIND TIL 091600=

Between 1132 and 1133, from one of the sites, a forecast surface chart (Figure 22) and the confirmation of active AIRMETs may have been viewable. At 1132:59 the following chart (figure 25) was viewed:

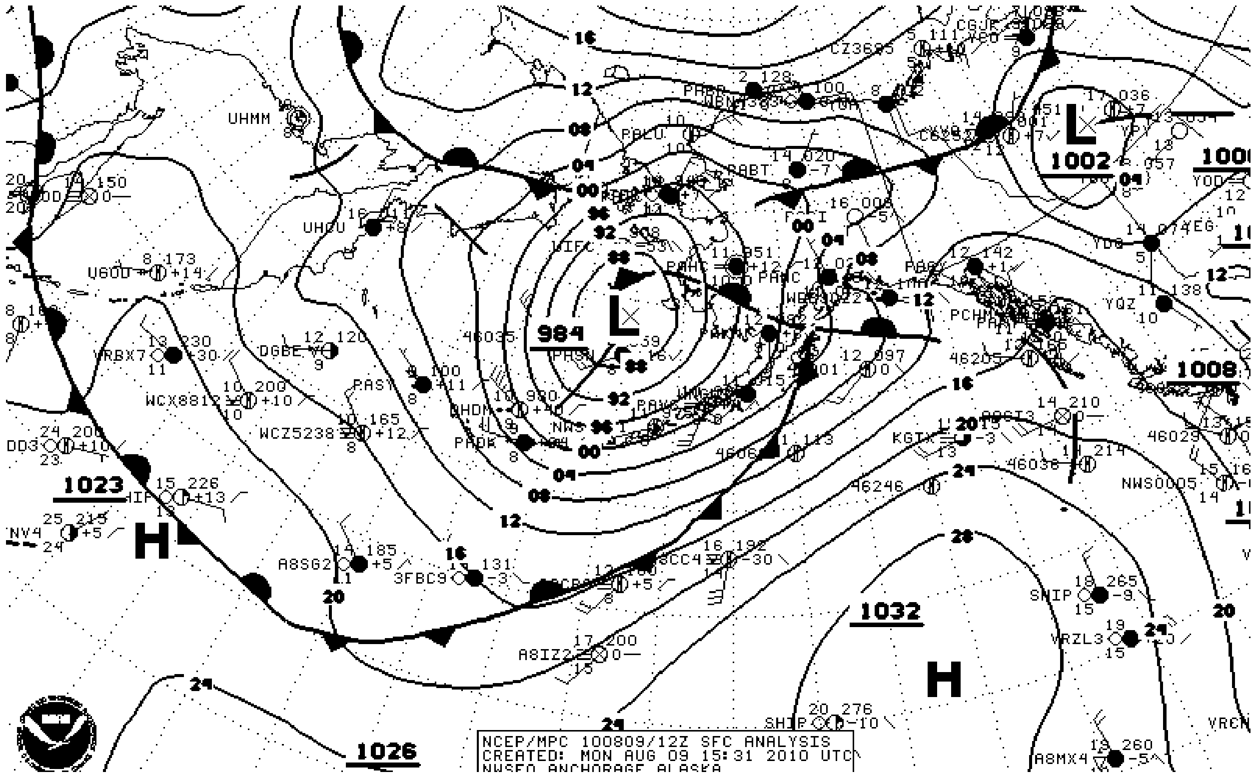

Figure 25 – NWS surface analysis valid at 0400.

17.0 Broadcast Weather Information

Weather information was broadcast from the Dillingham, Alaska, FSS via the AFIS. The AFIS broadcast disseminates weather information on a designated radio frequency in a similar fashion to the Automatic Terminal Information System (ATIS) program. During the hours surrounding the accident, the PADL AFIS weather broadcast consisted of human voice recordings relaying current weather conditions, weather advisories, and other pertinent airport information. Relayed weather conditions were based off of the publically disseminated METARs, with the only difference being a broadcasting of wind directions referenced to magnetic north, which were collected for the METARs via the F-420 wind instrument.

The human recording broadcast via the AFIS prior to the accident aircraft's departure, which remained current until after accident time, was as follows:

> *"Dillingham Airport information JULIET time two two two six Zulu…wind one four zero at one zero, gusts one seven, visibility three, light rain, mist, eight hundred scattered, ceiling one thousand three hundred overcast, temperature one one, dew point niner, altimeter two niner five seven, scattered variable broken…favored runway one niner, right traffic…NOTAMs, birds in the vicinity of the airport, a couple of cranes near the north end of the runway west side in the low grassy area, seagulls and eagles to the south end…personnel equipment working sweeping on all airport surfaces…runway conditions patchy thin water, taxiways and apron thin water, runway one niner DME out of service, KEMUK RCO out of service…AIRMETs for IFR and mountain obscuration, VFR flight not recommended, forecasts for isolated moderate turbulence, pilot reports requested…contact*

Dillingham radio one two two point three for clearances flight plans and information, one two three point six for traffic advisories, advise initial contact you have JULIET"

18.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for 59.3°N and 158.4°W on Friday, August 9, 2010, indicated the following:

SUN	
Begin civil twilight	0545
Sunrise	0638
Sun transit	1439
Sunset	2239
End civil twilight	2331

MOON	
Moonrise	0615
Moonset	1506

19.0 Past Weather Observations

The following observations from PADL corresponded to some of the previous flights flown by the accident pilot leading up to the accident flight. Cloud heights in this section are agl.

METAR PADL 060045Z 17007KT 10SM -RA OVC010 10/08 A2980

At 1645 on August 5, PADL reported wind from 170° at 7 knots, visibility of 10 miles in light rain, ceiling overcast at 1,000 feet, temperature 10°C, dew point temperature 8°C, altimeter setting 29.80 inches of Mercury.

METAR PADL 060145Z 17008KT 10SM -RA OVC012 10/08 A2979

At 1745 on August 5, PADL reported wind from 170° at 8 knots, visibility of 10 miles in light rain, ceiling overcast at 1,200 feet, temperature 10°C, dew point temperature 8°C, altimeter setting 29.79 inches of Mercury.

METAR PADL 061750Z 22012KT 15SM BKN010 OVC050 11/09 A2971

At 0950 on August 6, PADL reported wind from 220° at 12 knots, visibility of 15 miles, broken ceiling at 1,000 feet, overcast cloud base at 5,000 feet, temperature 11°C, dew point temperature 9°C, altimeter setting 29.71 inches of Mercury.

METAR PADL 062145Z 23015G22KT 10SM OVC007 10/08 A2976

At 1345 on August 6, PADL reported wind from 230° at 15 knots gusting to 22 knots, visibility of 10 miles, ceiling overcast at 700 feet, temperature 10°C, dew point temperature 8°C, altimeter setting 29.76 inches of Mercury.

METAR PADL 072150Z 21006KT 10SM VCSH SCT007 OVC030 11/09 A2978 RMK VCSH ALQDS

At 1350 on August 7, PADL reported wind from 210° at 6 knots, visibility of 10 miles, rain showers in the vicinity, scattered clouds at 700 feet, ceiling overcast at 3,000 feet, temperature 11°C, dew point temperature 9°C, altimeter setting 29.78 inches of Mercury. Remarks: rain showers in the vicinity in all quadrants.

PADL 080052Z 15013KT 15SM BKN015 OVC025 13/11 A2977

At 1652 on August 7, PADL reported wind from 150° at 13 knots, visibility of 15 miles, ceiling broken at 1,500 feet, overcast cloud base at 2,500 feet, temperature 13°C, dew point temperature 11°C, altimeter setting 29.77 inches of Mercury.

PADL 080149Z 20011KT 20SM BKN017 OVC025 13/10 A2978

At 1749 on August 7, PADL reported wind from 200° at 11 knots, visibility of 20 miles, ceiling broken at 1,700 feet, overcast cloud base at 2,500 feet, temperature 13°C, dew point temperature 10°C, altimeter setting 29.78 inches of Mercury.

PADL 082347Z 14012G17KT 2SM -RA BR OVC005 13/12 A2944

At 1547 on August 8, PADL reported wind from 140° at 12 knots gusting to 17 knots, visibility of 2 miles in light rain with mist, ceiling overcast at 500 feet, temperature 13°C, dew point temperature 12°C, altimeter setting 29.44 inches of Mercury.

PADL 091848Z 17015G23KT 3SM -RA BR SCT005 OVC010 11/09 A2953 RMK SCT V BKN

At 1048 on August 9, PADL reported wind from 170° at 15 knots gusting to 23 knots, visibility of 3 miles in light rain and mist, scattered clouds at 500 feet, ceiling overcast at 1,000 feet, temperature 11°C, dew point temperature 9°C, altimeter setting 29.53 inches of Mercury. Remarks: lowest cloud layer varying between scattered and broken.

Mike Richards
NTSB Meteorologist