



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

September 14, 2017

Weather Study

METEOROLOGY

ANC17FA039

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A. ACCIDENT

Location: Near Port Alsworth, Alaska
Date: July 27, 2017
Time: 0923 Alaska daylight time
1723 Coordinated Universal Time (UTC)
Airplane: Cessna U206G, registration: N1749R

B. METEOROLOGIST

Paul Suffern
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Meteorologist did not travel for this investigation and gathered the weather data for this investigation from the NTSB's Washington D.C. office and from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Centers for Environmental Information (NCEI). All times are Alaska daylight time (AKDT) on July 27, 2017, and are based upon the 24-hour clock, where local time is -8 hours from UTC, and UTC=Z (unless otherwise noted). Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 60.3714° N, longitude 154.2422° W, at an approximate elevation of 970 feet (ft).

D. WEATHER INFORMATION

1.0 Synoptic Situation

The synoptic or large scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction (NCEP) and the Weather Prediction Center, located in College Park, Maryland. These are the base products used in describing synoptic weather features and in the creation of forecasts and warnings for the NWS. Reference to these charts can be found in the joint NWS and Federal Aviation Administration (FAA) Advisory Circular "Aviation Weather Services", AC 00-45H.

1.1 Surface Analysis Chart

The NWS NCEP/Ocean Prediction Center (OPC) Surface Analysis Chart for 1000 AKDT is provided as figure 1 with the approximate location of the accident site marked within the red circle. The chart depicted two surface low pressure centers in the southern Gulf of Alaska to the south-southeast of the accident site with a pressure of 1010- and 1009-hPa, respectively. Further to the north, a stationary front stretched from northwestern Alaska, east-southeastward into the Yukon and northern Canada. A high pressure center at 1038-hPa was located south of the Aleutian Islands with a ridge¹ of high pressure extending northeastward towards the accident site.

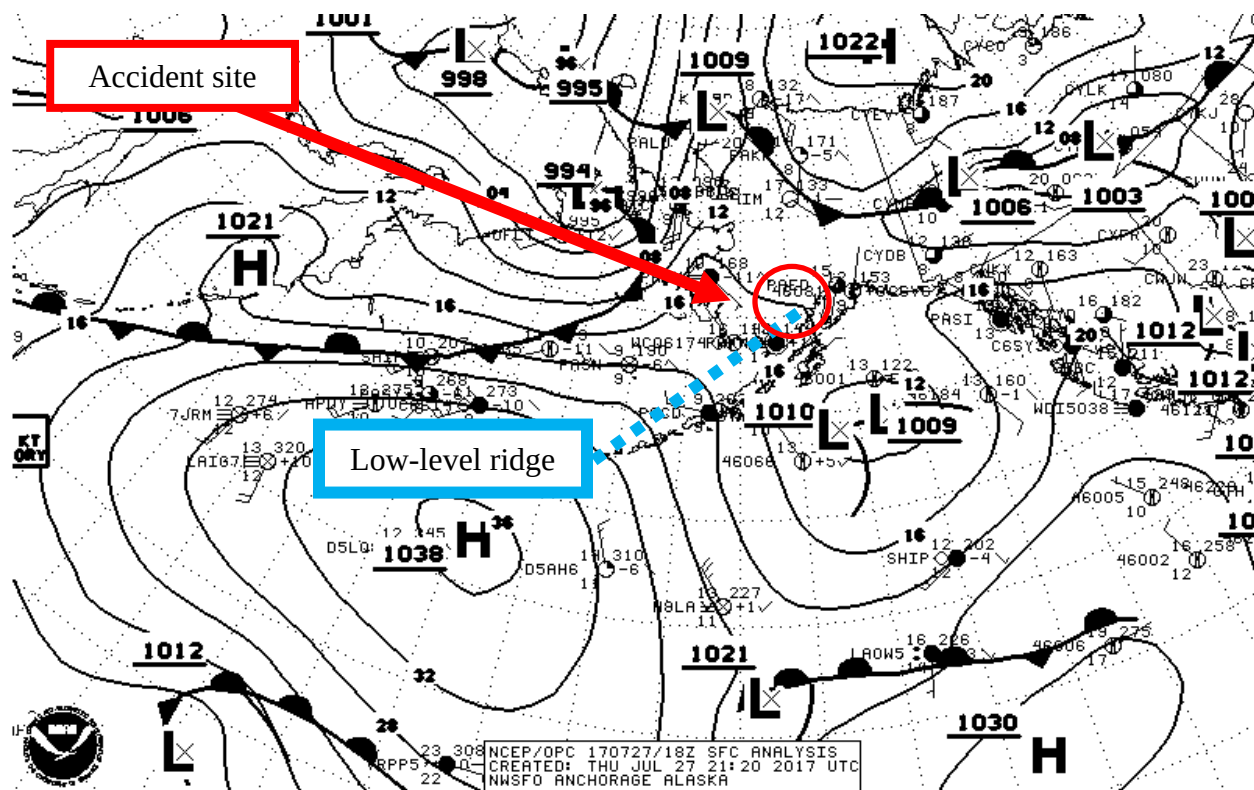


Figure 1 – NCEP/OPC Surface Analysis Chart for 1000 AKDT

1.2 Upper Air Charts

The NCEP/OPC Constant Pressure Charts for 0400 AKDT at 500-hPa is presented in figure 2. A mid-level low pressure center was located southeast of the accident site in the southwestern Gulf of Alaska associated with the surface low pressure centers (figure 1). A mid-level ridge was located across western Alaska. This ridge would have acted to suppress any mid- or high-level cloud cover and precipitation; however, low-cloud cover and fog would have still been possible in the mountainous terrain, especially in light wind conditions with close surface temperature and dew point temperatures.

¹ Ridge – An elongated area of relatively high atmospheric pressure or heights.

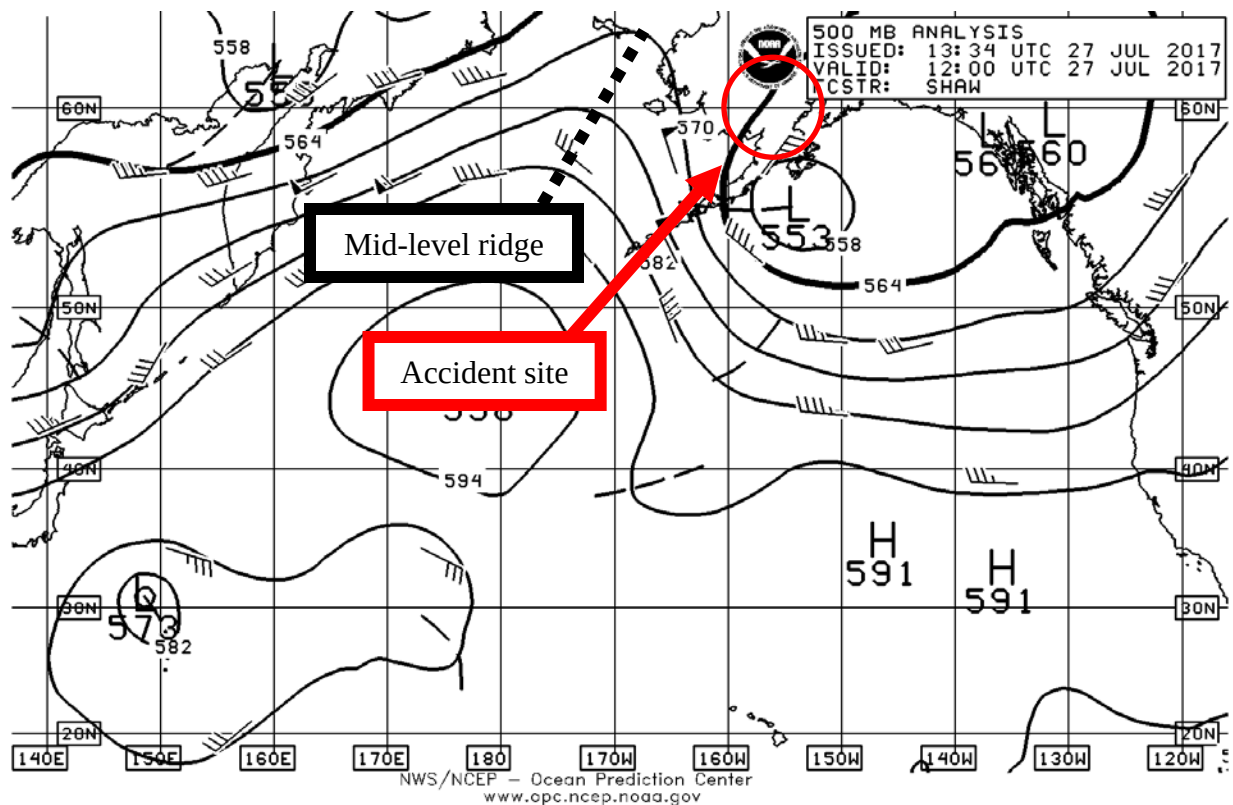
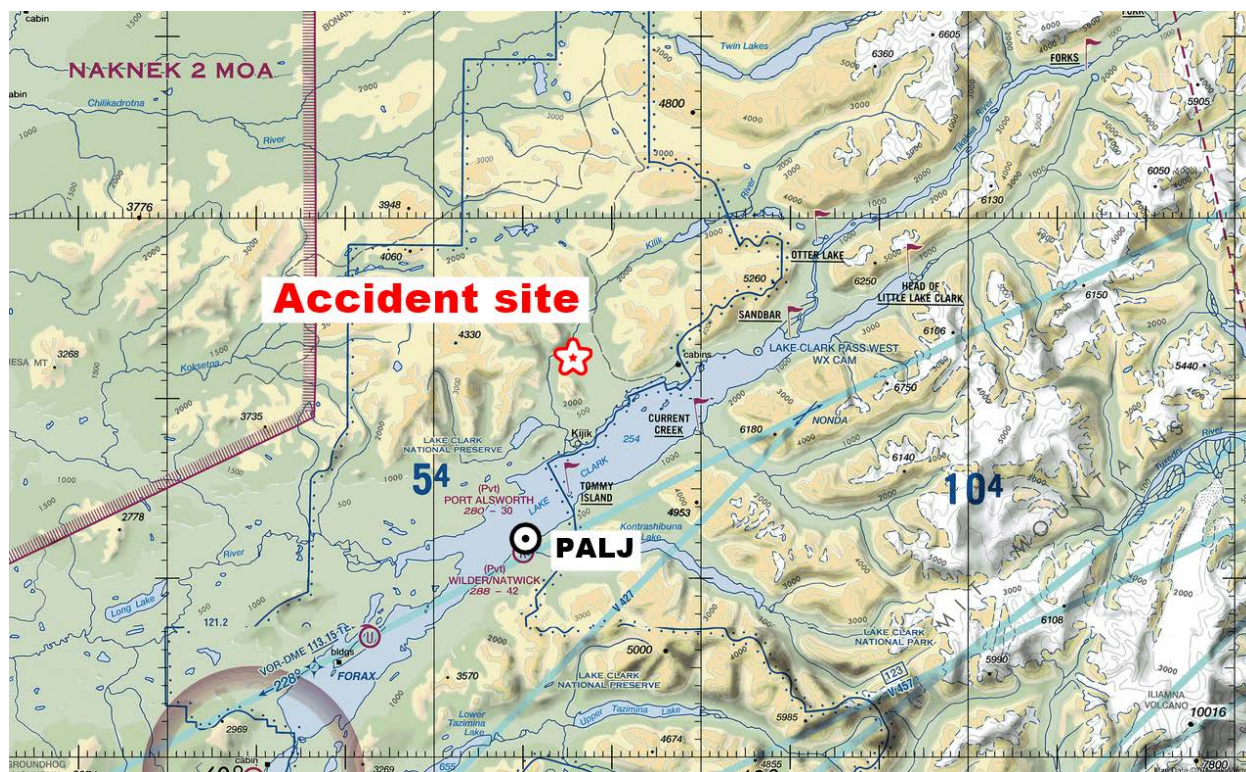


Figure 2 – NWS 500-hPa Constant Pressure Chart for 0400 AKDT

2.0 Surface Observations

The area surrounding the accident site was documented utilizing official Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). Figure 3 is a sectional chart with the accident site and the closest weather reporting location marked.



Port Alsworth Airport (PALJ) was the closest official weather station to the accident site. PALJ had an Aviation Paid Weather Observer (A-Paid) who provided weather observations on the accident day. PALJ was located 10 miles south-southwest of the accident site, at an elevation of 280 feet, and had a 22° easterly magnetic variation² (figure 3). The following observations were taken and disseminated during the times surrounding the accident:³

**[0650 AKDT] METAR PALJ 271450Z 00000KT 10SM FEW003 BKN015 13/12 A2994
RMK FIRST EST PASS CLSD NOSPECI=**

ACCIDENT TIME 0923 AKDT

**[0959 AKDT] METAR PALJ 271758Z 00000KT 15SM BKN005 OVC020 14/13 A2996
RMK EST PASS CLSD NOSPECI=**

**[1055 AKDT] METAR PALJ 271855Z 000000KT 15SM BKN015 OVC050 16/15 A2997
RMK EST PASS CLSD NOSPECI=**

² Magnetic variation – The angle (at a particular location) between magnetic north and true north. 1985, latest measurement taken from <http://www.airnav.com/airport/PALJ>

³ The bold sections in this NWS product and the rest of products in this report are intended to highlight the sections that directly reference the weather conditions that affected the accident location around the accident time. The local times in section 3.0 next to the METARs are provided for quick reference between UTC and local times around the accident time.

[1255 AKDT] METAR PALJ 272055Z 24006KT 25SM BKN035 BKN060 19/16 A2997
RMK EST PASS OPN NOSPECI=

[1455 AKDT] METAR PALJ 272255Z 22010KT 30SM SCT035 21/16 A2995 RMK EST
PASS OPN NOSPECI=

PALJ weather at 0650 AKDT, wind calm, 10 miles visibility, few clouds at 300 ft above ground level (agl), broken ceiling at 1,500 ft agl, temperature of 13° Celsius (C), dew point temperature of 12° C, and an altimeter setting of 29.94 inches of mercury. Remarks; first observation (of the day), estimate pass closed, no specials.

PALJ weather at 0959 AKDT, wind calm, 15 miles visibility, broken ceiling at 500 ft agl, overcast skies at 2,000 feet agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 29.96 inches of mercury. Remarks; estimate pass closed, no specials.

PALJ weather at 1055 AKDT, wind calm, 15 miles visibility, broken ceiling at 1,500 ft agl, overcast skies at 5,000 feet agl, temperature of 16° C, dew point temperature of 15° C, and an altimeter setting of 29.97 inches of mercury. Remarks; estimate pass closed, no specials

The observations from PALJ surrounding the accident time indicated MVFR⁴ to IFR⁵ conditions with the lowest cloud ceiling at 780 ft msl.

3.0 Upper Air Data

A Global Data Assimilation System (GDAS) computer model upper air sounding for the accident site was generated for 0700 AKDT with the upper air sounding base elevation at 2,008 ft. The 0700 AKDT sounding was plotted on a standard Skew-T log P diagram⁶ with the derived stability parameters included in figure 4 (with data from the surface to 500-hPa, or 18,500 ft msl.) This sounding data was analyzed utilizing the RAOB⁷ software package. The sounding depicted the lifted condensation level (LCL)⁸ at 2,299 ft msl and a convective condensation level (CCL)⁹ of 4,986 ft. The freezing level was located at 8,989 ft. The precipitable water value was 0.80 inches.

⁴ Marginal Visual Flight Rules – Refers to the general weather conditions pilots can expect at the surface. MVFR criteria means a ceiling between 1,000 and 3,000 ft agl and/or 3 to 5 miles visibility.

⁵ Instrument Flight Rules – Refers to the general weather conditions pilots can expect at the surface. IFR criteria means a ceiling below 1,000 ft agl and/or less than 3 miles visibility.

⁶ Skew T log P diagram – is a standard meteorological plot using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

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.

⁹ Convective Condensation Level (CCL) – The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.

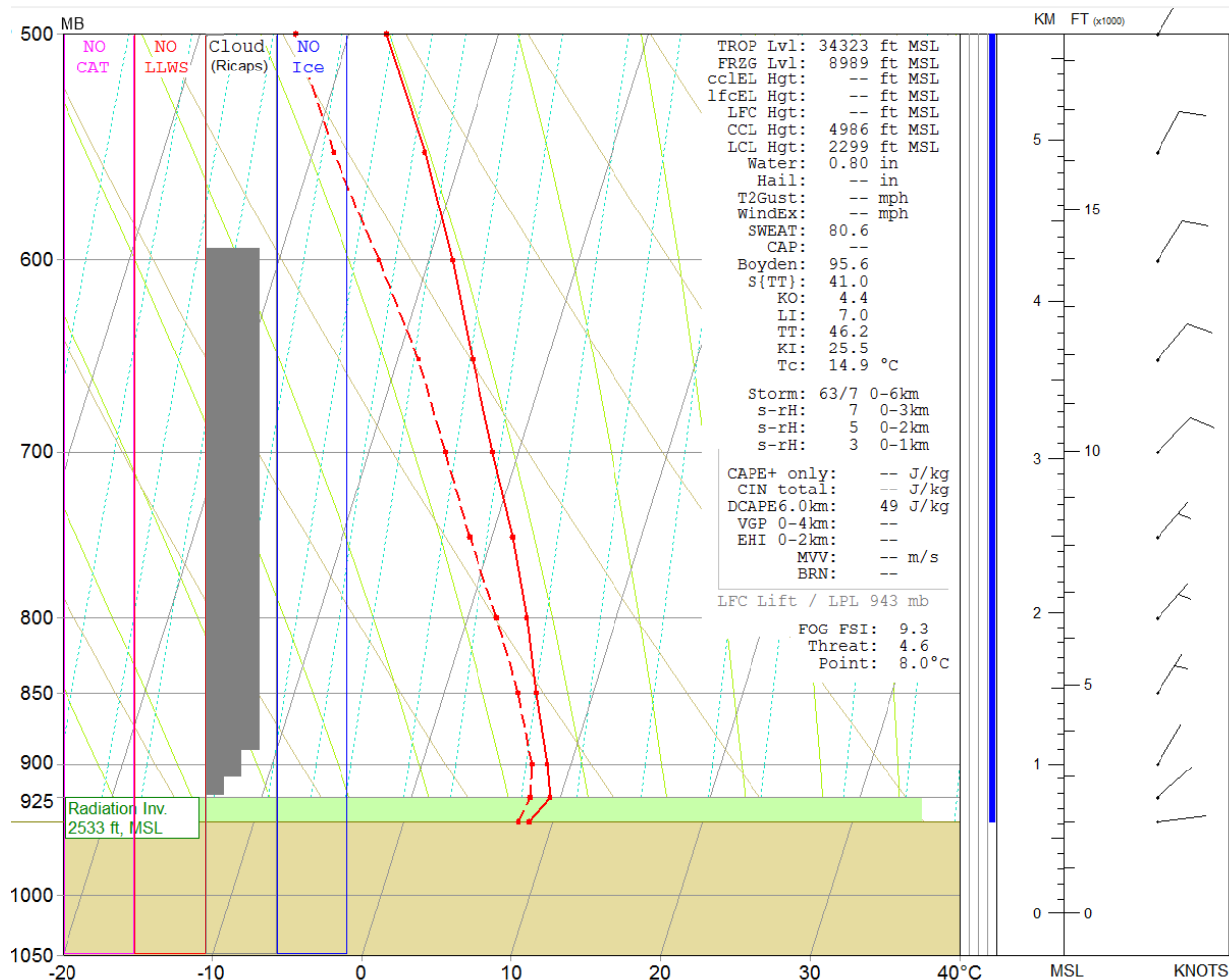


Figure 4 – 0700 AKDT GDAS sounding

The 0700 AKDT GDAS sounding indicated a stable layer between the surface and 18,500 ft. An inversion (warming of temperature with height) was located between the surface and 2,533 ft msl. This inversion would have acted to allow for any low clouds or fog that formed to remain in place for the morning hours in the mountainous terrain. RAOB indicated that clouds were likely from 2,300 ft msl (~300 ft agl) through 14,000 ft msl. No icing conditions were indicated by RAOB through 18,500 ft.

The 0700 AKDT GDAS sounding wind profile indicated a surface wind from 082° at 1 knot with the wind remaining northeasterly through 18,500 ft between 5 and 10 knots. RAOB did not indicate the possibility of any low-level wind shear or turbulence.

4.0 Satellite Data

Visible and infrared data from 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 software. Visible and infrared imagery (GOES-15 bands 1 and 4) at wavelengths of 0.65 microns (μm) and 10.7 μm , respectively, were retrieved. Satellite imagery surrounding the time of the accident from 1100 AKDT through 1600 AKDT, at approximately 15-minute intervals were reviewed, and the closest images to the time of the accident were documented.

Figures 5 and 6 present the GOES-15 visible imagery from 0915 and 0930 AKDT at 2X magnification with the accident site highlighted with a red square. Inspection of the visible imagery indicated overcast cloud cover over the accident site at the accident time with mountain obscuration conditions likely. The cloud cover near the accident site and mountainous terrain moved little between 0900 and 0945 AKDT (attachment 1).

Figure 7 presents the GOES-15 infrared imagery from 0930 AKDT at 5X magnification with the accident site highlighted with a red square. Inspection of the infrared imagery indicated cloud cover over the accident site at the accident time. The lower brightness temperatures (green and yellow colors, higher cloud tops) were located northwest of the accident site over the Bering Sea and southeast of the accident site over the Gulf of Alaska. The brightness temperature above the accident site at the accident time was -3°C and with the vertical temperature profile provided by the 0700 AKDT GDAS sounding, the approximate cloud-top heights over the accident site would have been 10,500 ft. It should be noted these figures have not been corrected for any parallax error.

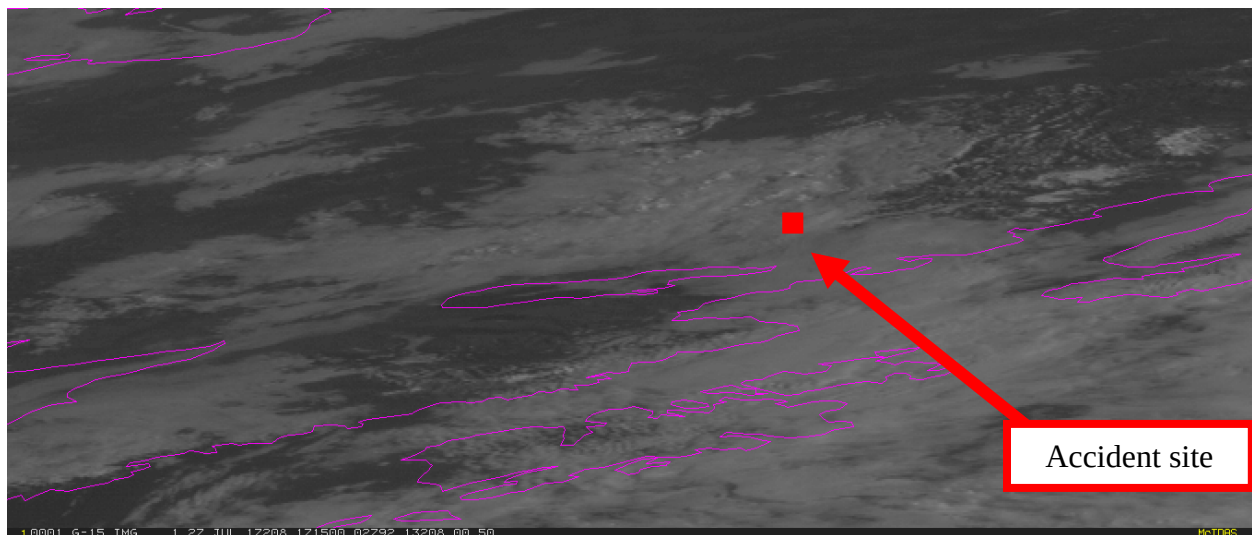


Figure 5 – GOES-15 visible image at 0915 AKDT

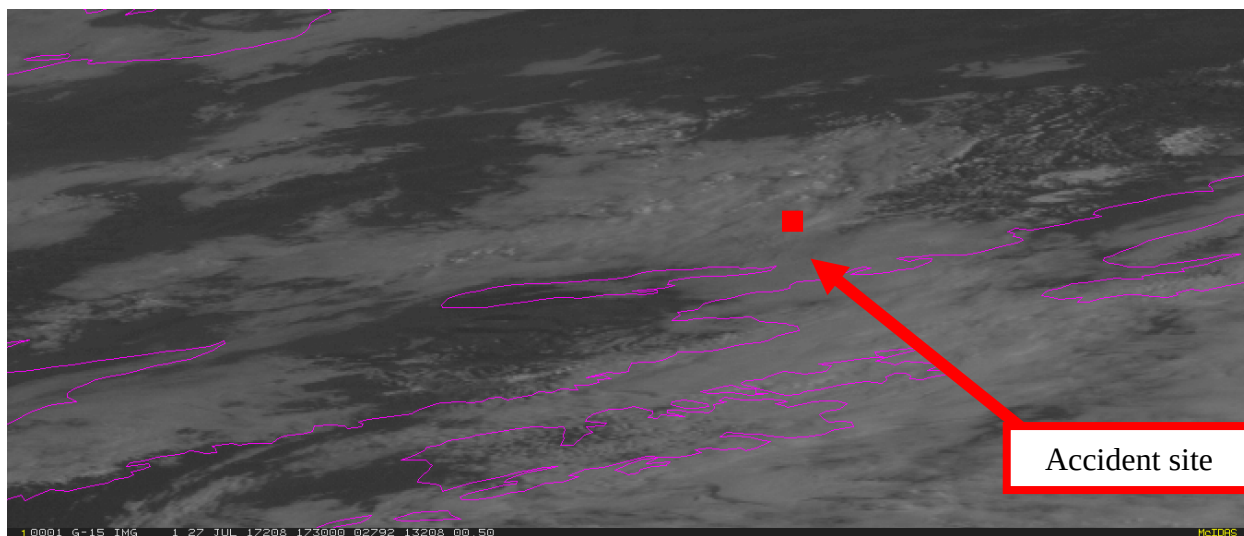


Figure 6 – GOES-15 visible image at 0930 AKDT

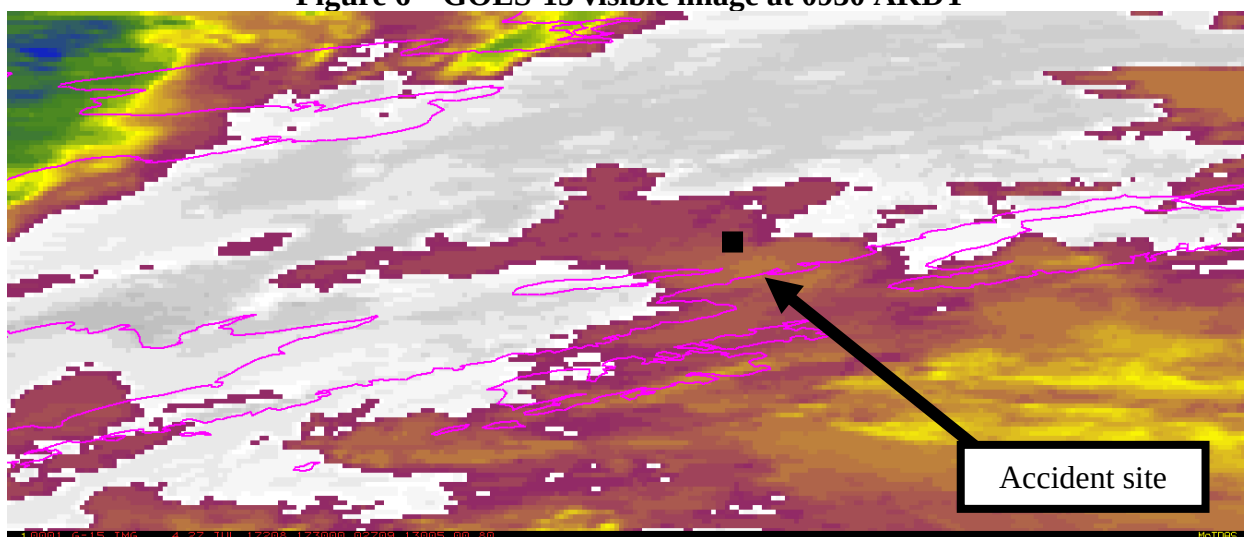


Figure 7 – GOES-15 infrared image at 0930 AKDT

5.0 Radar Imagery Information

The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D)¹⁰ to the accident site was the Anchorage/Nikiski, Alaska, radar (PAHG), which was located 88 miles east-northeast of the accident site at an elevation of 243 ft. Level II and III archive radar data were obtained from the NCEI using the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software. No reflectivity targets were located above the accident site at the accident time.

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

6.0 Pilot Reports¹¹

All pilot reports (PIREPs) for the state of Alaska from about three hours prior to the accident time to about three hours after the accident time were reviewed. Only the PIREPs below FL180¹² and within 100 miles of the accident site are provided below in raw code and decoded:

PAEN UA /OV ENA/TM 1515/FLDURGC/TP C208/RM TOPS OF FOG 009

PAEN UA /OV ENA/TM 1600/FLDURD/TP DHC6/TB NEG/IC NEG/RM SAY THE RWY RIIGHT AT MIN=

PAEN UA /OV ENA/TM 1717/FLDURGC/TP DHC6/SK 003 OVC 011/IC NEG

PAEN UA /OV ENA/TM 1815/FLDURGC/TP BE99/SK 003OVC013/RM CLR ABOVE

PAEN UA /OV ENA/TM 1818/FLDURGC/TP BE99/SK 003OVC013/RM CLR ABOVE

ENA UA /OV ENA/TM 1901/FLDURGD/TP C208/SK 004 OVC/RM ILS RY20R

Routine pilot report (UA); Over Kenai, Alaska; Time – 0715 AKDT (1515Z); Altitude – During climb; Type aircraft – Cessna 208; Remarks – Tops of fog at 900 ft.

Routine pilot report (UA); Over Kenai, Alaska; Time – 0800 AKDT (1600Z); Altitude – During descent; Type aircraft – de Havilland Canada DHC-6 Twin Otter; Turbulence – Negative; Icing – Negative; Remarks – “Saw” (coded as “Say”) the runway right at minimums.

Routine pilot report (UA); Over Kenai, Alaska; Time – 0917 AKDT (1717Z); Altitude – During climb; Type aircraft – de Havilland Canada DHC-6 Twin Otter; Sky – 300 ft to 1,100 ft overcast; Icing - Negative.

Routine pilot report (UA); Over Kenai, Alaska; Time – 1015 AKDT (1815Z); Altitude – During climb; Type aircraft – Beechcraft Model 99; Sky – 300 ft to 1,300 ft overcast; Remarks – Clear above.

Routine pilot report (UA); Over Kenai, Alaska; Time – 1018 AKDT (1818Z); Altitude – During climb; Type aircraft – Beechcraft Model 99; Sky – 300 ft to 1,300 ft overcast; Remarks – Clear above.

Routine pilot report (UA); Over Kenai, Alaska; Time – 1101 AKDT (1901Z); Altitude – During descent; Type aircraft – Cessna 208; Sky – Overcast at 400 ft; Remarks – ILS into runway 20R.

7.0 SIGMET and CWSU Advisories

No SIGMETs valid for the accident site at the accident time.

¹¹ Only pilot reports with the WMO header UBAK** identifier were considered.

¹² Flight Level – A Flight Level (FL) is a standard nominal altitude of an aircraft, in hundreds of ft. This altitude is calculated from the International standard pressure datum of 1013.25 hPa (29.92 inHg), the average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above mean sea level or above ground level.

No Center Weather Service Unit (CWSU) Center Weather Advisories (CWA)s were valid for the accident site at the accident time. No CWSU Meteorological Impact Statements (MIS)s were valid for the accident site at the accident time.

8.0 AIRMETs

The Alaska Aviation Weather Unit (AAWU) issued AIRMET Sierra for mountain obscuration at 0424 AKDT which forecast mountains obscured by clouds and precipitation east of the intended destination of Koliganek, Alaska (PAJZ):

WAAK48 PAWU 271224

WA80

ANCS WA 271215

AIRMET SIERRA FOR IFR AND MT OBSC VALID UNTIL 272015

.

COOK INLET AND SUSITNA VLY AB

TIL 18Z PAEN S OCNL CIG BLW 010/ISOL VIS BLW 3SM BR/-RA BR. IMPR.

.

COOK INLET AND SUSITNA VLY AB

MTS OCNL OBSC BY CLDS/PCPN. IMPR.

.

COPPER RIVER BASIN AC

MTS OCNL OBSC BY CLDS/PCPN. NC.

.

CNTRL GLF CST AD

S PAWR OCNL CIG BLW 010/ISOL VIS BLW 3SM BR/FG. NC.

.

CNTRL GLF CST AD

MTS OBSC BY CLDS/PCPN. NC.

.

KODIAK IS AE

MTS OCNL OBSC BY CLDS/PCPN. NC.

.

KODIAK IS AE

NE EXPOSURES OCNL CIG BLW 010/VIS BLW 3SM -RA BR. IMPR.

.

YKN-KUSKOKWIM DELTA AG

OCNL CIGS BLW 010/VIS BLW 3SM BR. IMPR INLAND.

.

BRISTOL BAY AH

E PAJZ MTS OBSC IN CLDS/PCPN. NC.

.

AK PEN AI

BERING SIDE OCNL CIG BLW 010/VIS BLW 3SM BR/-DZ BR. NC.

.

AK PEN AI

MTS OCNL OBSC BY CLDS/PCPN. NC.

.

UNIMAK PASS TO ADAK AJ

MTS OBSC BY CLDS/PCPN. NC.

.

PRIBILOF ISLANDS AND SOUTHEAST BERING SEA AL

OCNL CIG BLW 010/VIS BLW 3SM BR/-RA BR. NC.

.
=ANCT WA 271215
AIRMET TANGO FOR TURB/STG SFC WINDS VALID UNTIL 272015
.
KUSKOKWIM VLY AF
AFT 18Z VCY PANI OCNL MOD TURB FL300-FL360. INTSF.
.
YKN-KUSKOKWIM DELTA AG
OCNL MOD TURB FL300-FL360. NC.
.
PRIBILOF ISLANDS AND SOUTHEAST BERING SEA AL
AFT 18Z NE PASN OCNL MOD TURB FL300-FL360. NC.
.
=ANCZ WA 271215
AIRMET ZULU FOR ICING VALID UNTIL 272015
.
NONE
.
RDE JUL 2017 AAWU

9.0 AAWU Graphics

The AAWU convective outlook, icing forecast, flying weather, low-level turbulence, and surface chart forecast graphics valid around the accident time are provided in figures 8 through 12. The AAWU graphics depicted that no convective weather, icing, or turbulence conditions were forecast around the accident time for the accident area (figures 8, 9, and 11). General MVFR conditions were forecast (figure 10) for the mountainous terrain including the accident site. The AAWU surface chart valid at 1000 KDT (figure 12) forecast areas of fog for the Bristol Bay and Cook Inlet forecast areas.

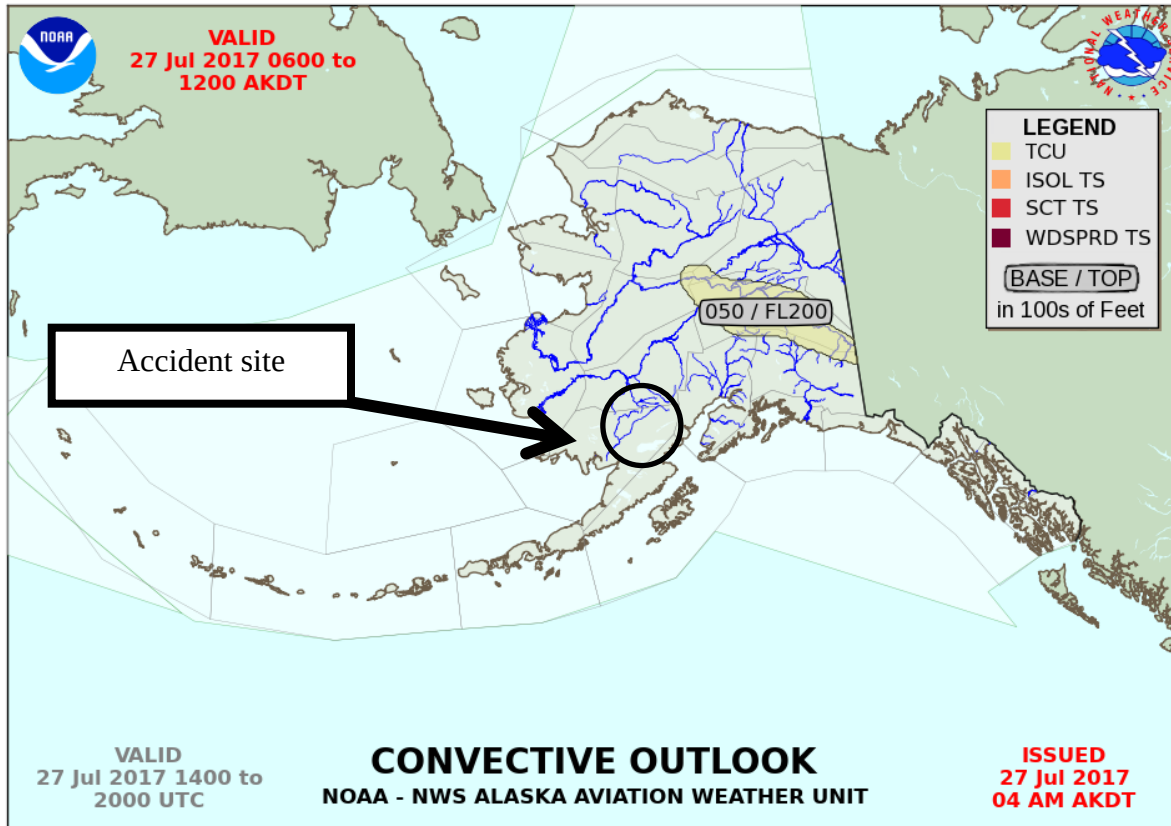


Figure 8 – Convective Outlook graphic from the AAWU valid between 0600 and 1200 AKDT and graphic was issued at 0400 AKDT

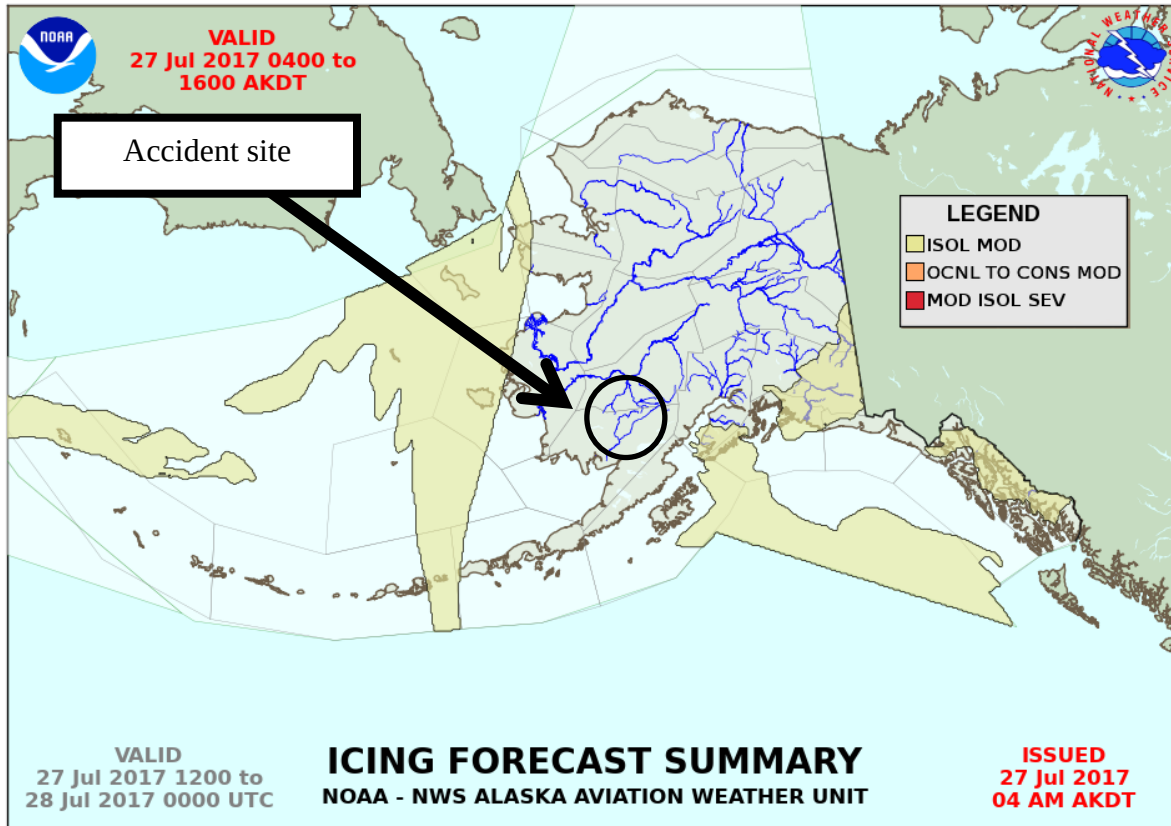


Figure 9 – Icing Forecast Summary graphic from the AAWU valid between 0400 and 1600 AKDT and graphic was issued at 0400 AKDT

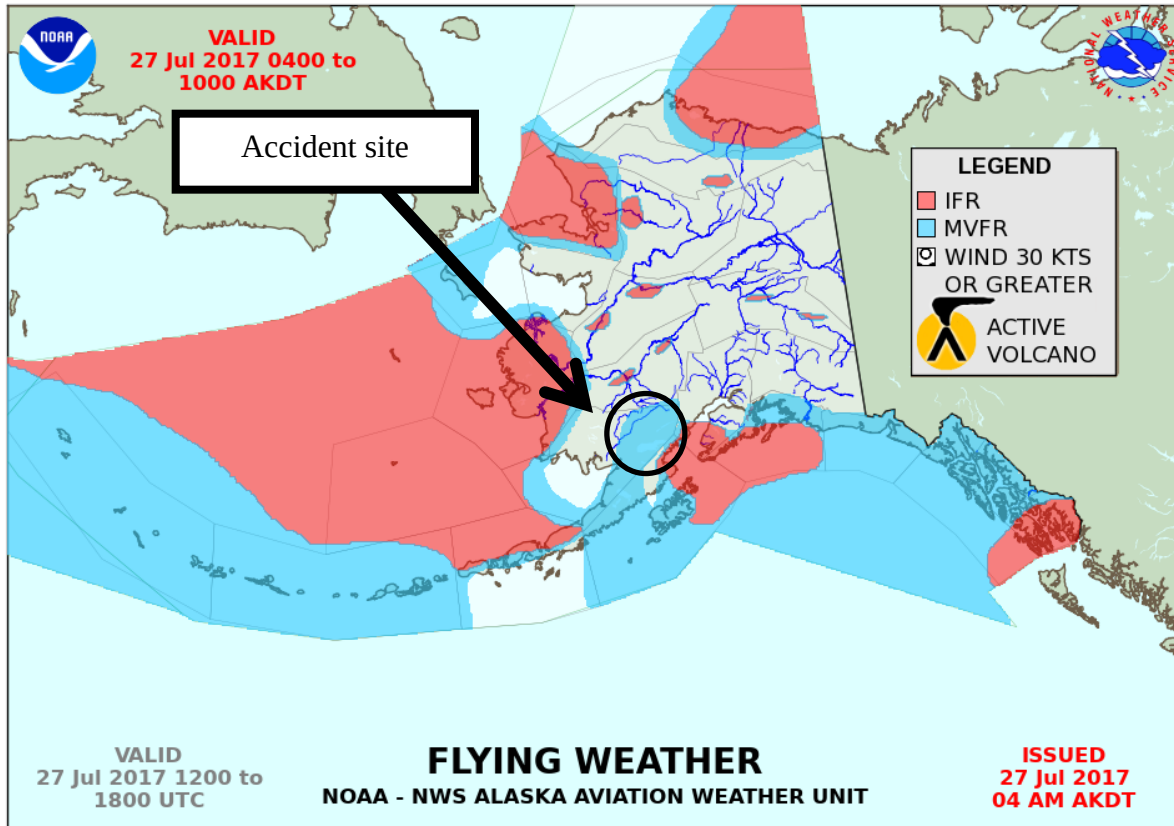


Figure 10 – Flying Weather graphic from the AAWU valid between 0400 and 1000 AKDT and graphic was issued at 0400 AKDT

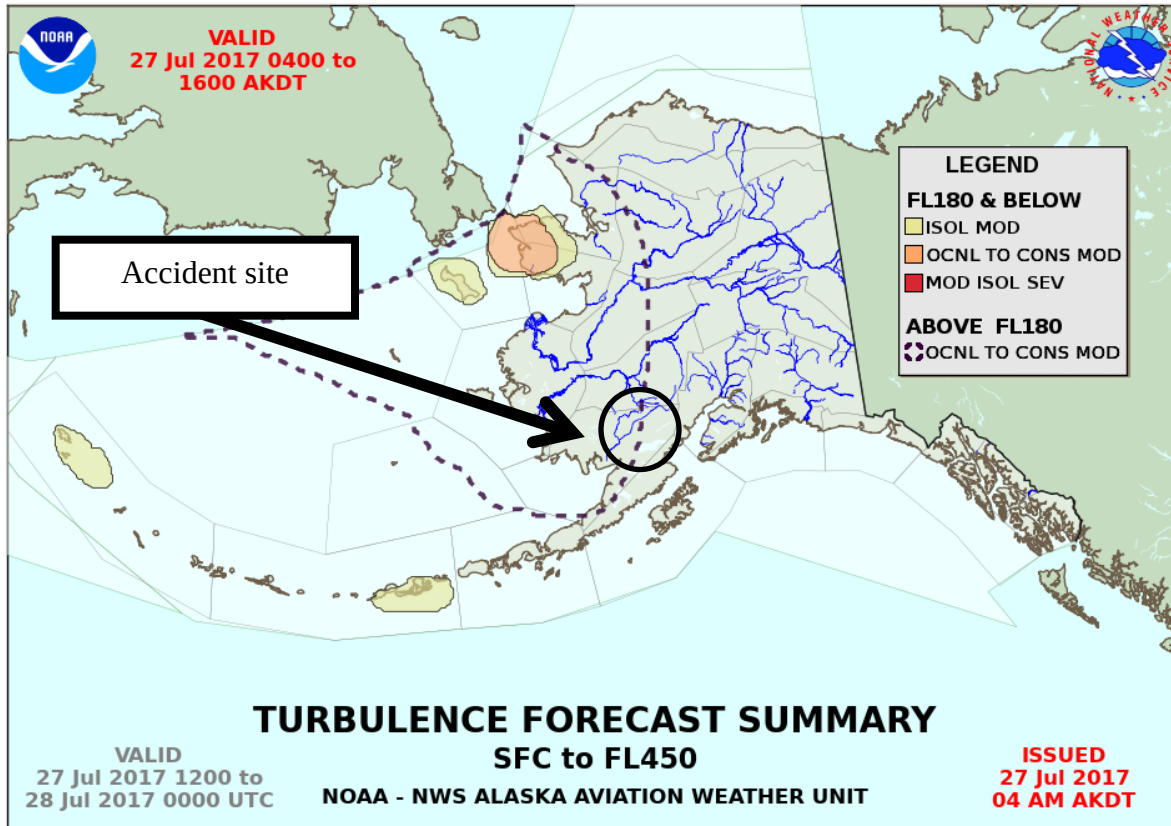


Figure 11 – Turbulence Forecast Summary graphic from the AAWU valid between 0400 and 1600 AKDT and graphic was issued at 0400 AKDT

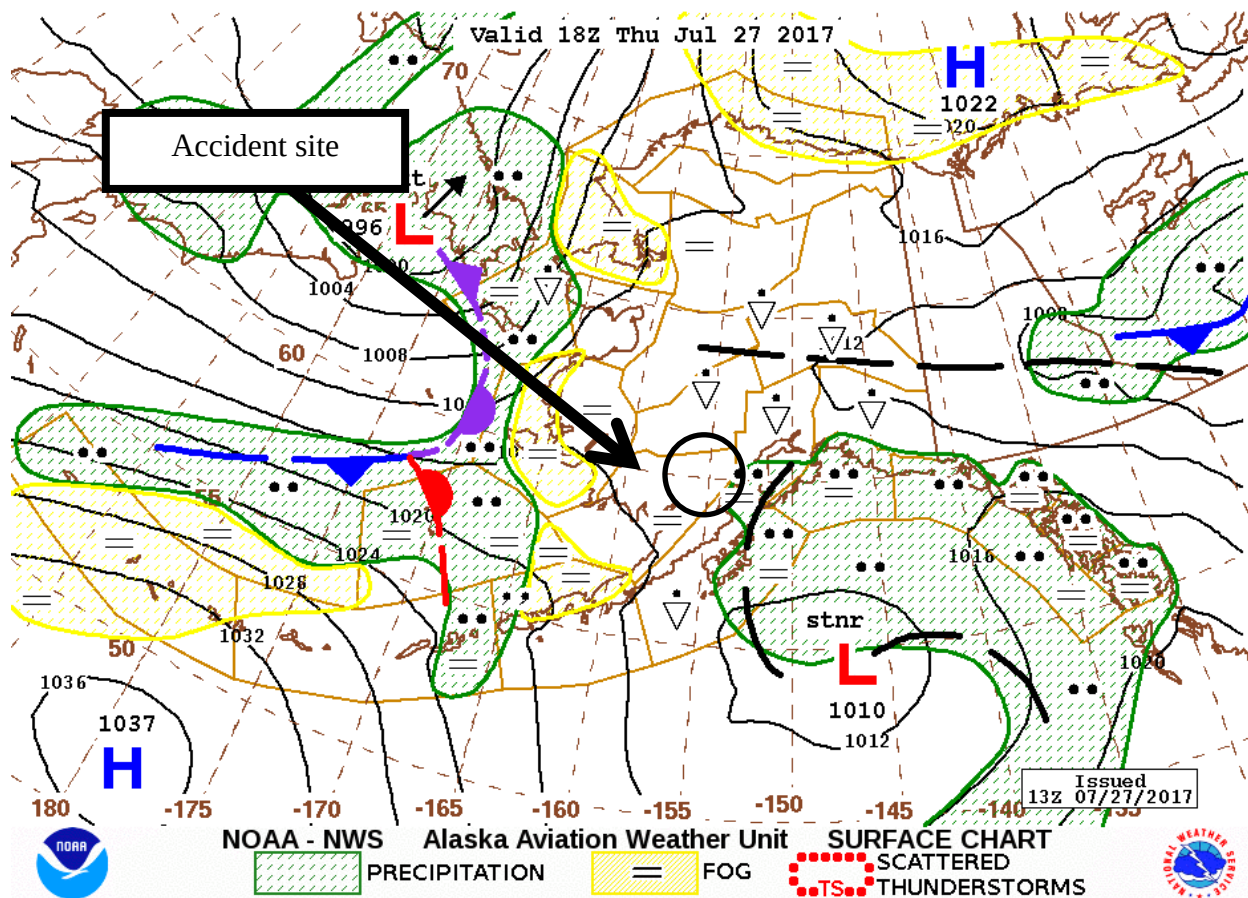


Figure 12 – AAWU Surface Chart valid at 1000 AKDT and graphic was issued at 0500 AKDT

10.0 Area Forecast

The Area Forecast issued at 0420 AKDT, valid at the accident time, forecasted an AIRMET (section 8.0), scattered clouds at 2,500 ft, a broken ceiling at 5,000 ft, cloud tops at 8,000 ft, with few cloud layers to 15,000 ft. East of PAJZ an occasional broken to overcast ceiling at 2,500 ft was forecast:

FAAK58 PAWU 271220

FA8W

ANCC FA 271215

AK SRN HLF EXCP SE AK...

AIRMETS VALID UNTIL 272015

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

KUSKOKWIM VLY AF...VALID UNTIL 280000

...CLOUDS/WX...

FEW025 SCT050 SCT100. ISOL BKN050 TOPS 080.

TIL 16Z VLYS ISOL CIGS BLW 010/VIS BLW 3SM BR.

AFT 20Z E PAMC ISOL BKN050CB TOP FL300 -TSRA.

VCY PAMC ISOL BKN050TCU TOP FL200 -SHRA.

OTLK VALID 280000-280600...VFR SHRA.
...TURB...
AIRMET TURBAFT 18Z VCY PANI OCNL MOD TURB FL300-FL360. INTSF...
...ICE AND FZLVL...
NIL SIG. EXC VCY CB/TCU. FZLVL 100.

.
YKN-KUSKOKWIM DELTA AG...VALID UNTIL 280000
...CLOUDS/WX...
AIRMET IFROCNL CIGS BLW 010/VIS BLW 3SM BR. IMPR INLAND...
CST/OFSHR SCT-BKN005 TOP ST EST 015 VIS 3-5SM BR.
AFT 15Z INCRG LYRS ABV 150 SPRDG SLOWLY EWD.
INLAND FEW035 SCT-BKN050 TOPS 080.
ISOL CIGS BLW 010/VIS BLW 3SM BR. IFR CONDS OCNL BTN 14Z-18Z.
OTLK VALID 280000-280600...CST/OFSHR IFR CIG BR. INLAND VFR.
...TURB...
AIRMET TURBOCNL MOD TURB FL300-FL360. NC...
...ICE AND FZLVL...
AFT 15Z OFSHR ISOL MOD ICEIC 160-FL220. FZLVL 110.

.
BRISTOL BAY AH...VALID UNTIL 280000
...CLOUDS/WX...
AIRMET MT OBSCE PAJZ MTS OBSC IN CLDS/PCPN. NC...
SCT025 BKN050 TOPS 080 FEW LYRS TO 150.
E PAJZ OCNL BKN-OVC025.
VCY ALUTN MTS ISOL CIGS BLW 010/VIS BLW 3SM BR.
OTLK VALID 280000-280600...ALUTN MTS MVFR CIG. ELSW VFR.
...TURB...
AFT 21Z PADL-PAKN LN S OCNL MOD TURB FL300-FL360.
...ICE AND FZLVL...
NIL SIG. FZLVL 100.

.
AK PEN AL...VALID UNTIL 280000
...CLOUDS/WX...
AIRMET IFRBERING SIDE OCNL CIG BLW 010/VIS BLW 3SM BR/-DZ BR.
NC...
AIRMET MT OBSCMTS OCNL OBSC BY CLDS/PCPN. NC... OTRW
BERING SIDE SCT004 OVC012 TOP 050. OCNL VIS 5SM BR/-DZ BR.
PAC SIDE SCT025 BKN035 TOP 050.
VCY GAPS/PASSES SFC WND NW G25KT...DCRG.
OTLK VALID 280000-280600...BERING SIDE IFR CIG RA BR.
ELSW VFR OCNL MVFR CIG RA.
...TURB...
NIL SIG.
...ICE AND FZLVL...
NIL SIG. FZLVL 080 E TO 110 W.

.
UNIMAK PASS TO ADAK AJ...VALID UNTIL 280000
...CLOUDS/WX...
AIRMET MT OBSCMTS OBSC BY CLDS/PCPN. NC... OTRW
E PAKO SCT005 BKN015 OVC025 TOP FL220. OCNL VIS 5SM -RA/BR.
ELSW FEW015 BKN025 TOP 050. OCNL BKN015.
SFC WND W-NW G25KT.
OTLK VALID 280000-280600...IFR CIG BR.
...TURB...
PAC SIDE E PAKO ISOL MOD TURB SFC-040. OTRW NIL SIG.
...ICE AND FZLVL...

PADU E ISOL MOD ICEIC 160-FL220. ELSW NIL SIG.
FZLVL 110 E TO 140 W.
.
RDE/TRENT JUL 2017 AAWU

11.0 Terminal Aerodrome Forecast

Iliamna Airport, (PAIL), located 42 miles southwest of the accident was the closest site with a NWS Terminal Aerodrome Forecast (TAF). The TAF valid at the time of the accident was issued at 0524 AKDT and was valid for a 23-hour period beginning at 0500 AKDT. The TAF for PAIL was as follows:

TAF PAIL 271324Z 2713/2812 **VRB04KT P6SM OVC012**
TEMPO 2713/2715 BKN006
FM280000 30002KT P6SM SCT020 OVC030=

The forecast expected a variable wind at 4 knots, greater than 6 miles visibility, and an overcast ceiling at 1,200 ft agl.

12.0 NWS Area Forecast Discussion

The NWS Office in Anchorage, Alaska, issued the following Area Forecast Discussion (AFD) at 0459 AKDT (closest AFD to the accident time). The AFD discussed a saturated air mass over the southern mainland with low stratus and fog in the weak flow regime. A few thunderstorms across the mountainous terrain were forecast for the afternoon hours due to warmer surface temperatures and partial clearing after the morning clouds:

FXAK68 PAFC 271259
AFDAFC

Southcentral and Southwest Alaska Forecast Discussion
National Weather Service Anchorage AK
459 AM AKDT Thu Jul 27 2017

.ANALYSIS AND UPPER LEVELS...

The fronts that brought rain across the southern mainland over the last 24 hours are rapidly diminishing as the potent upper low over the southwest continues a southward dive to the North Pacific. Energy rotating around the broad upper level trough over the southern tier of the state and the gulf are bringing a few showers early this morning. A ridge to west spans across the Bering with the center residing just south of the central Aleutians. The air mass over the southern mainland and surrounding waters is saturated bringing low stratus and fog across the forecast area under a weak flow regime. Across the Bering, winds are northerly along the eastern Bering and west to southwest across the central and western waters.

&&

.MODEL DISCUSSION...

Operational models are in good agreement with the synoptic

pattern through the end of the week. The main challenge in the short range forecast is defining precipitation areas along the weak disturbances that propagate toward southern Alaska from the northern Bering and the low that tracks just south of the gulf.

&&

.AVIATION...

PANC...MVFR ceilings are possible this morning with VFR conditions expected this afternoon into Friday morning. Light winds shift to the west late morning into the evening, however winds remain under 10 kts as a weak surface pattern remains across Southcentral.

&&.SHORT TERM FORECAST SOUTHCENTRAL ALASKA (Days 1 and 2)...

The upper low south of Kodiak Island will continue to move south today, ending up in the far southwest Gulf by this afternoon. An upper level ridge will build into south central Alaska. Conditions will be drier over most of the area, though considerable cloud cover will remain. The one area that will still see plenty of precipitation today is the eastern Copper River basin, where moisture is spilling in from Canada. There enough instability inland that increases the risk for isolated thunderstorms from the Susitna valley into the western Copper River basin this afternoon and evening. Some of the moisture from the Copper River basin will push west over the rest of south central Alaska tonight and Friday, for an increase in shower activity.

&&

.SHORT TERM FORECAST SOUTHWEST ALASKA (Days 1 and 2)...

Any remaining light shower activity across Bristol Bay will taper off by later this morning as the upper low continues to move south of the area and a weak transient ridge moves in from the west. Temperatures will likely climb 5-10 degrees higher than in previous days with a combination of rising heights and partial clearing. This will also allow instability to build during the afternoon across the Kuskokwim Valley and interior Bristol Bay, potentially touching off a few thunderstorms late this afternoon into the evening. Meanwhile, the next system will begin to push into the Delta region from the west during the afternoon, bringing a quick return of cooler and wetter conditions to the area as it spreads eastward through Friday.

&&

.SHORT TERM FORECAST BERING SEA/ALEUTIANS (Days 1 and 2)...

The Bering will largely remain locked in a westerly flow pattern atop the stout Pacific ridge to the south, keeping extensive fog and stratus over the region into the weekend. A front pushing southward through the region will bring another round of rain to the Pribilofs this afternoon and then spread to the chain tonight, with another disturbance dropping through the area from the northwest on Friday.

&&

.LONG TERM FORECAST (Days 3 through 7)...

The extended period begins on Saturday afternoon with the current low pressure over the Alaska Peninsula having migrated into the eastern Gulf of Alaska. The low is part of a broad longwave trough encompassing much of the Gulf. The other long-wave feature over the Mainland is high pressure over the Interior, part of the western North America ridge. Out west, the upper level pattern will be controlled by a stout high pressure over the central Northern Pacific and low pressure near the pole. The flow between these two features will be pretty zonal with disturbances propagating through the flow. Model guidance in this timeframe is generally in the same camp. Uncertainty arises from energy from the polar troughing digging southward and interacting with whatever is left of the Gulf trough.

What does all this mean for the sensible weather forecast? Around the southern Mainland, we look to be in a diurnal mountain convection pattern. Afternoon showers and thunderstorms generating on elevated terrain. Upper level forcing looks to be weak at this point so mainly on and around higher terrain. Cloud cover will be variable with moisture from the Gulf system in easterly flow, anywhere from partly to mostly cloudy. Temperatures should be right around normal for late summer. As troughing digs into the southwest Mainland early to middle next week, widespread precipitation will increase in that area. The digging low will bring the Southcentral into a more stormy pattern with widespread cloud cover and periodic rain from frontal systems.

&&

.AFC WATCHES/WARNINGS/ADVISORIES...

PUBLIC...NONE.

MARINE...NONE.

FIRE WEATHER...NONE.

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13.0 Winds and Temperature Aloft Forecast

The NWS 0601 AKDT Winds and Temperature Aloft forecast valid for the closest points to the accident site are included below:

FBAK31 KWN0 271401
 FD1AK1
 DATA BASED ON 271200Z
 VALID 271800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

 FT 3000 6000 9000 12000 18000 24000 30000 34000 39000

 AKN 0209 0311+05 0410+01 0312-04 0316-17 3625-29 363843 366247 355447

 ANC 9900 0205+05 0306+00 0307-05 0507-17 0710-30 061545 041753 011549

 HOM 9900 9900+05 0206-01 0411-06 0611-17 0512-29 041345 041752 012448

The accident site was closest to the AKN (King Salmon), ANC (Anchorage), and HOM (Homer), Alaska forecast points. The 0601 AKDT AKN forecast indicated a wind from 020° at 9 knots at 3,000 ft, a wind from 030° at 11 knots at 6,000 ft with a temperature of 5° C, and a wind from 040° at 10 knots at 9,000 ft with a temperature of 1° C. The 0601 AKDT ANC forecast indicated a calm wind at 3,000 ft, a wind at 6,000 ft from 020° at 5 knots with a temperature of 5° C, and a wind from 030° at 6 knots at 9,000 ft with a temperature of 0° C. The 0601 AKDT HOM forecast indicated a calm wind at 3,000 ft, a calm wind at 6,000 ft with a temperature of 5° C, and a wind from 020° at 6 knots at 9,000 ft with a temperature of -1° C.

14.0 Pilot Weather Briefing

The accident pilot did not receive an official weather briefing from sources, such as the FAA's Flight Service Station (FSS) or any Direct User Access Terminal Service. It is unknown if the accident pilot checked or received anymore weather information before or during the accident flight.

15.0 Witness Information

A pilot operating in the Lake Clark region, located about 8 miles east-southeast of the accident site provided a statement of the weather conditions during the period. The pilot stated that the morning was very foggy with a half mile visibility until around 0800 to 0830 AKDT. The fog started to break up by 0930 AKDT with the sun breaking through the clouds over the lake. The pilot departed the Lake Clark region for Anchorage at about 1000 AKDT in sunshine and climbed to 4,500 ft to get over the remainder of the fog and scattered clouds in the Lake Clark Pass area. The pilot further stated that when he departed, he estimated that there may have been 300 ft agl ceilings in Lake Clark Pass, and indicated there was still extensive fog over Cook Inlet. For more information please see attachment 2.

16.0 Web Camera Images

Images from the FAA's Aviation Weather Cameras are shown in figures 14 through 25 along with attachment 3 providing images of the weather conditions surrounding the accident site at the accident time. Figure 13 indicates the web camera locations included in attachment 3. The weather cameras (figures 14 through 20) from Lake Clark Pass West, located 10 miles east of the accident site at an elevation of 261 ft (figure 15), showed the weather conditions surrounding the accident time with the southwest facing camera images provided in figures 16 and 17 with times at 0919 AKDT and 0929 AKDT. The southwest facing camera images depicted ceilings below 3,800 ft msl with visibilities less than 3 miles below the cloud layer. The images suggest complete mountain obscuration conditions prevailed.

The northeast facing weather camera from Lake Clark Pass West (figures 18 through 20) indicated complete mountain obscuration conditions, similar to the southwest facing camera, with visibilities between 1 and 7.5 miles underneath the overcast cloud layer with all the higher terrain references obscured by the clouds at 0922 and 0932 AKDT (figures 19 and 20).

The northeast facing weather camera from Nondalton (figures 21 through 25) indicated complete mountain obscuration conditions with visibilities under 8 miles underneath the clouds and cloud ceilings below 2,150 ft msl between 0912 and 0932 AKDT (figures 23 and 25). The northeast facing weather camera from Nondalton also observed several different cloud layers as reported in sections 2.0 and 14.0.

The Lake Clark Pass RCO, Lake Clark Pass East, and Trading Bay weather cameras (figure 13 and attachment 3) indicated mountain obscuration conditions further southwest towards the accident site and fog, low clouds, and mountain obscuration conditions east of the Lake Clark Pass East camera and over Cook Inlet and Trading Bay.

The weather camera observations, surface observations (section 2.0), and upper air observations (section 3.0), indicated a high probability the accident airplane encountered an area of reduced visibility in mountain obscuration conditions that likely led to instrument meteorological conditions at the accident time.

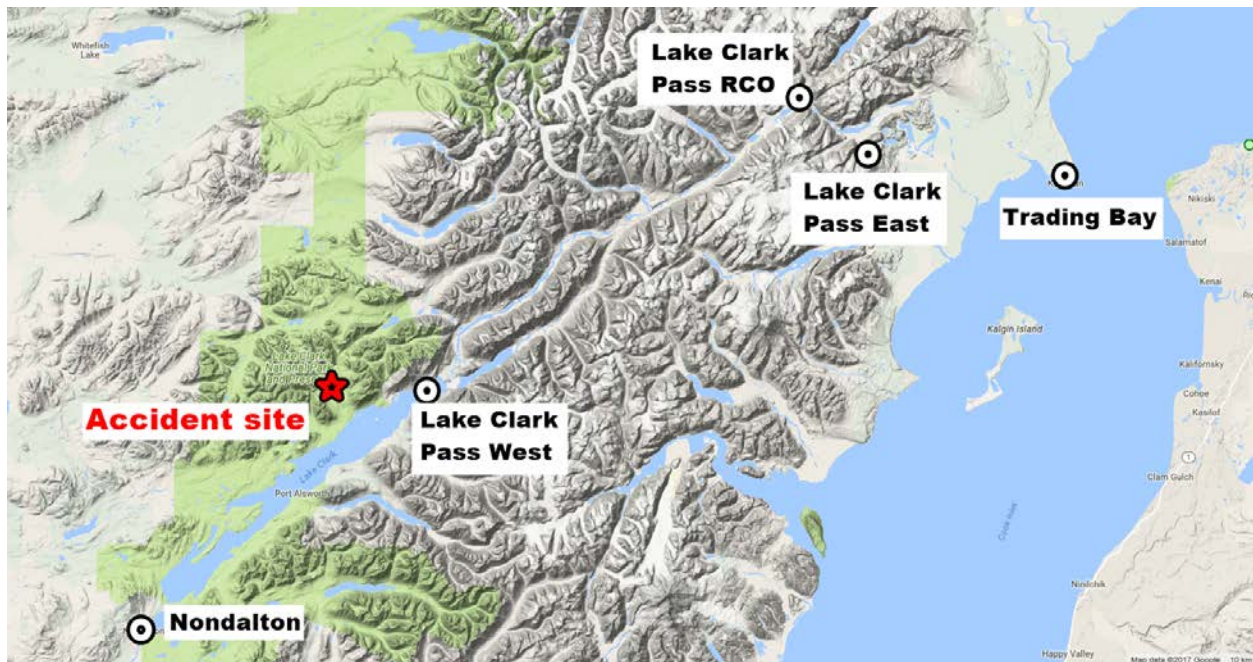


Figure 13 – Map of the closest FAA weather camera sites and the accident site

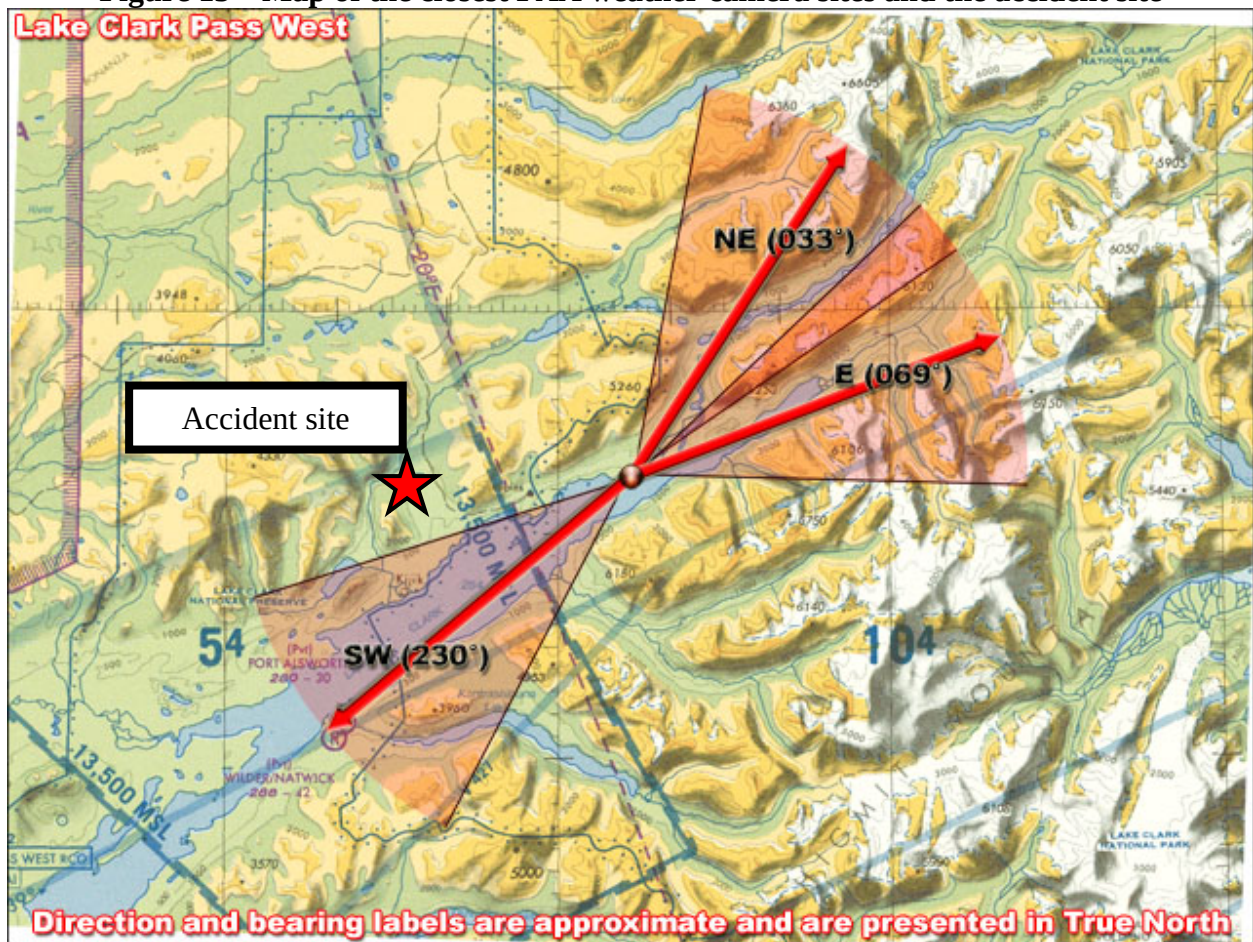


Figure 14 – FAA weather camera Lake Clark Pass West location on sectional chart with the direction the different camera angles face with the accident site marked

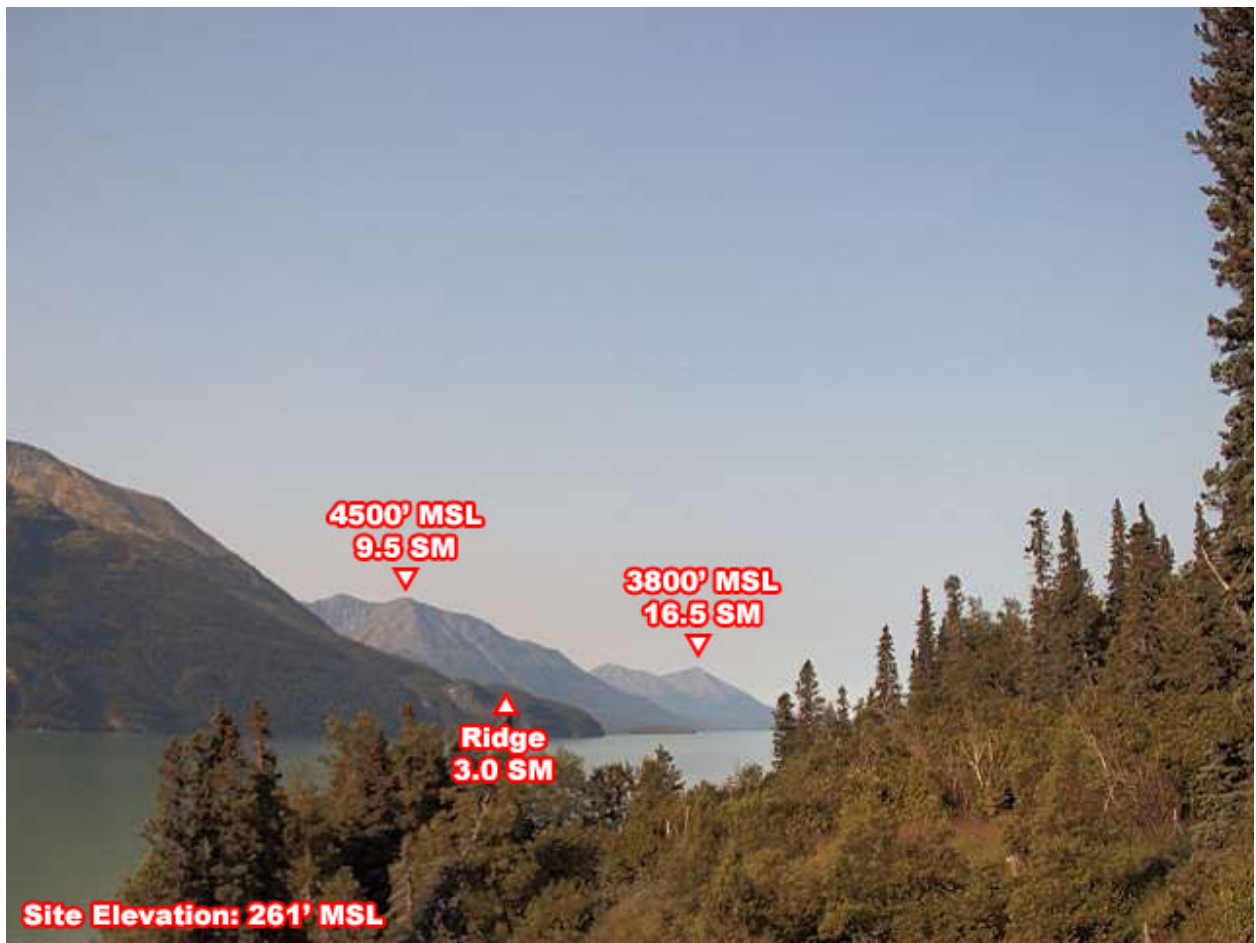


Figure 15 – FAA weather camera from Lake Clark Pass West southwest view from a standard clear sky weather day

Thu 27 Jul 2017 17:18:44 UTC
Thu 27 Jul 2017 09:18:44 AKDT

Lake Clark Pass West - South
See <http://avcams.faa.gov> for more information



Figure 16 – FAA weather camera from Lake Clark Pass West southwest view from 0919 AKDT

Thu 27 Jul 2017 17:28:45 UTC
Thu 27 Jul 2017 09:28:45 AKDT

Lake Clark Pass West - South
See <http://avcams.faa.gov> for more information



Figure 17 – FAA weather camera from Lake Clark Pass West southwest view from 0929 AKDT

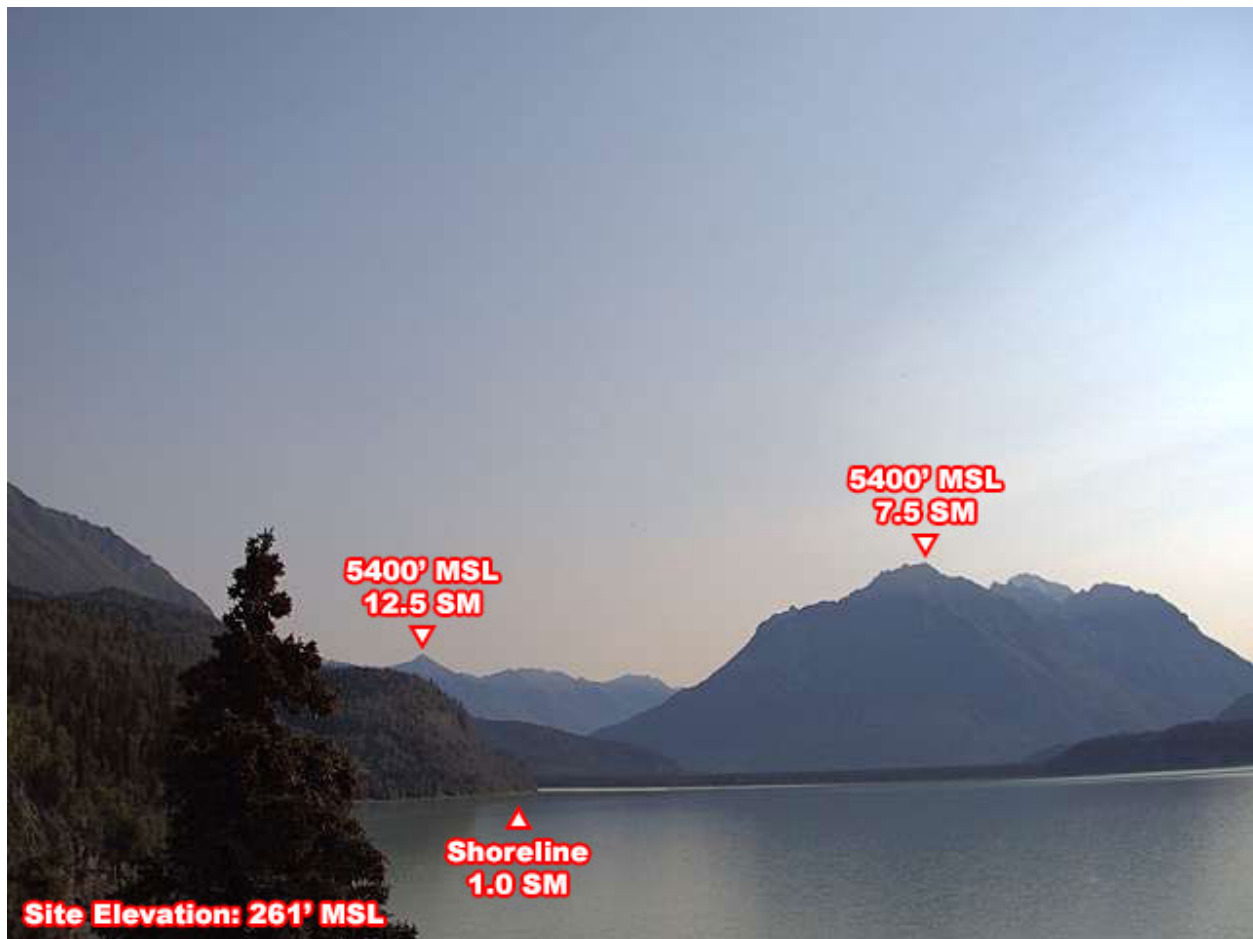


Figure 18 – FAA weather camera from Lake Clark Pass West northeast view from a standard clear sky weather day

Thu 27 Jul 2017 17:21:49 UTC
Thu 27 Jul 2017 09:21:49 AKDT

Lake Clark Pass West - NorthEast
See <http://avcams.faa.gov> for more information



**Figure 19 – FAA weather camera from Lake Clark Pass West northeast view from 0922
AKDT**

Thu 27 Jul 2017 17:31:50 UTC
Thu 27 Jul 2017 09:31:50 AKDT

Lake Clark Pass West - NorthEast
See <http://avcams.faa.gov> for more information



FAA advisory weather product

**Figure 20 – FAA weather camera from Lake Clark Pass West northeast view from 0932
AKDT**

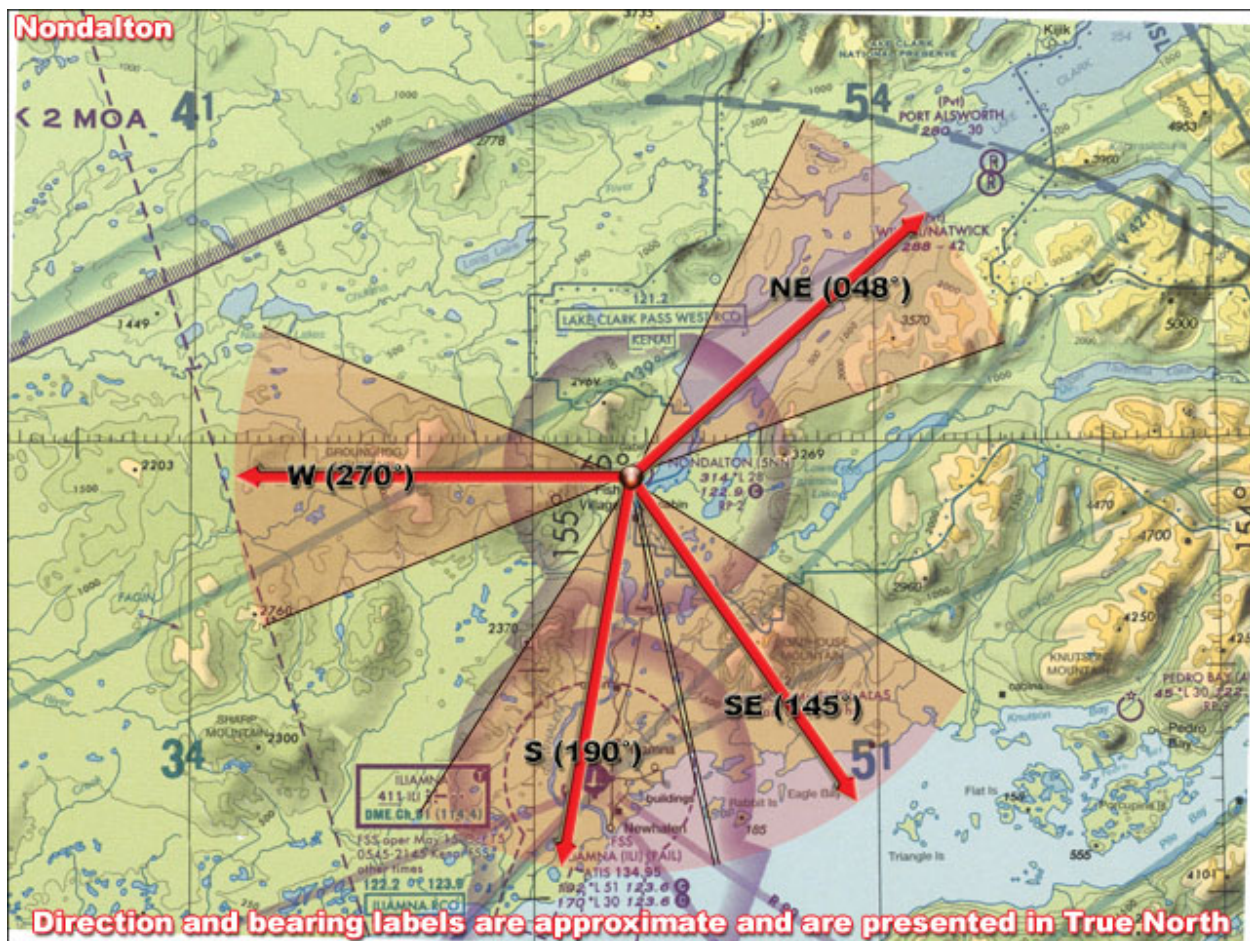


Figure 21 – FAA weather camera Nondalton location on sectional chart with the direction the different camera angles face

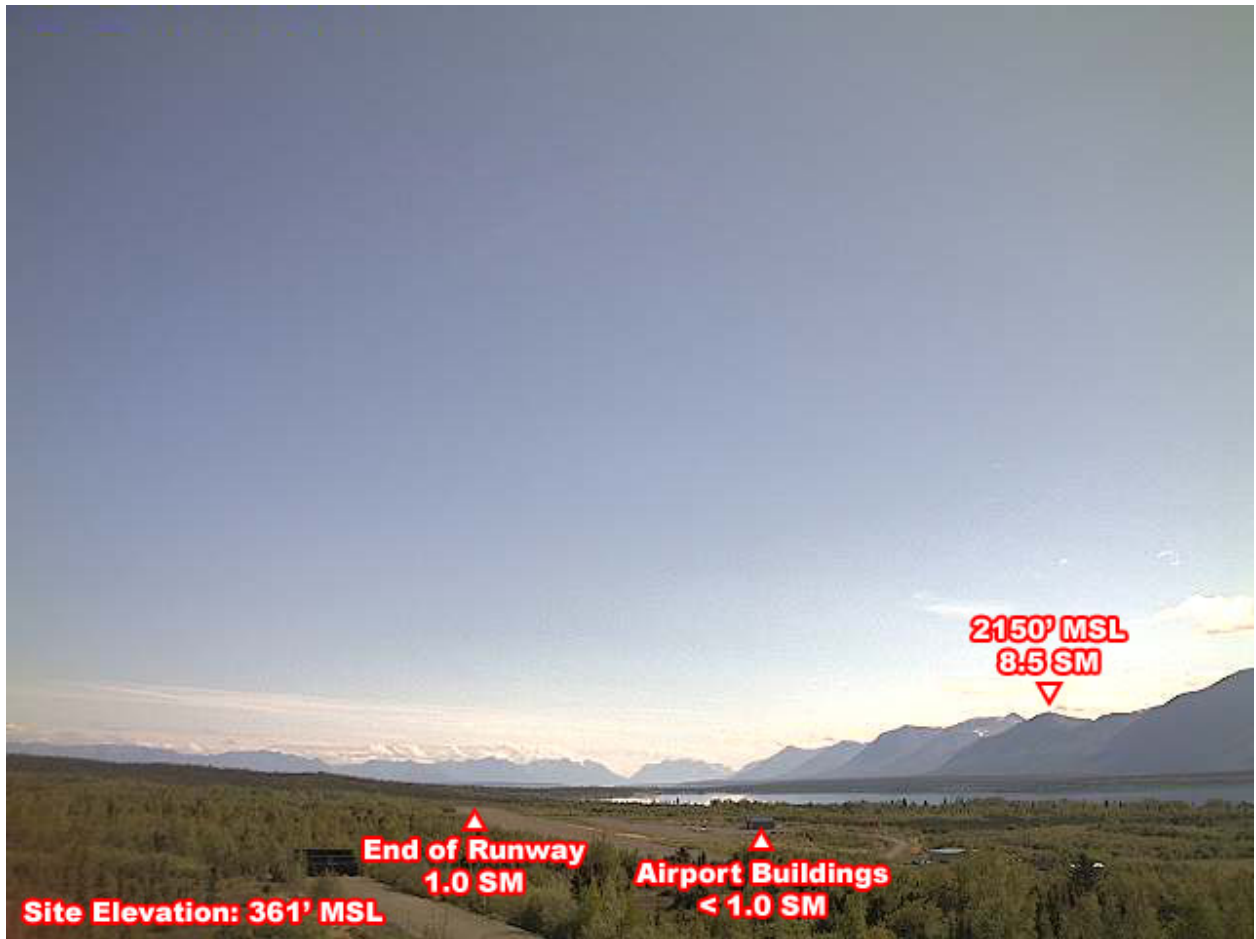


Figure 22 – FAA weather camera from Nondalton northeast view from a standard clear sky weather day

Thu 27 Jul 2017 17:11:49 UTC
Thu 27 Jul 2017 09:11:49 AKDT

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



Figure 23 – FAA weather camera from Nondalton northeast view from 0912 AKDT

Thu 27 Jul 2017 17:21:48 UTC
Thu 27 Jul 2017 09:21:48 AKDT

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



Figure 24 – FAA weather camera from Nondalton northeast view from 0922 AKDT

Thu 27 Jul 2017 17:31:53 UTC
Thu 27 Jul 2017 09:31:53 AKDT

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



Figure 25 – FAA weather camera from Nondalton northeast view from 0932 AKDT

17.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for the accident site on July 27, 2017, indicated the following:

SUN

Begin civil twilight	0438 AKDT
Sunrise	0545 AKDT
Accident	0923 AKDT
Sun transit	1424 AKDT
Sunset	2301 AKDT
End civil twilight	0006 AKDT on the following day

E. LIST OF ATTACHMENTS

Attachment 1 – GOES-15 visible imagery from 0900 to 0945 AKDT with the accident site marked

Attachment 2 – Witness Correspondence

Attachment 3 – FAA’s Aviation Web Camera images from web cameras (locations seen in figure 13) surrounding the accident site

Submitted by:

Paul Suffern
Senior Meteorologist

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