NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

June 3, 2021

Specialist's Factual Report

METEOROLOGY

ANC21LA020

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A. ACCIDENT

Location: Kodiak, Alaska
Date: March 2, 2021
Time: 1539 Alaska standard time
0039 Coordinated Universal Time (UTC) on March 3, 2021
Aircraft: Robinson Helicopter Company R66 helicopter; Registration: N1767

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 official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources and also from the National Centers for Environmental Information (NCEI). This specialist factual contains the meteorological factors pertinent to the weather surrounding the accident time. All times are Alaska standard time (AKST) on March 2, 2021, and are based upon the 24-hour clock, where local time is -9 hours from UTC, and UTC=Z. Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles. NWS station identifiers use the standard International Civil Aviation Organization 4-letter station identifiers versus the International Air Transport Association 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports and "P" for OCONUS[1] airports.

The accident site was located at approximate latitude 58.8725° N, Longitude 152.1376° W, with an elevation of sea level.

[1] Outside Continental United States – Overseas, refers to any country of place beyond CONUS. Alaska, Hawaii and the U.S. territories are considered overseas under the Space-A Regulation.

D. FACTUAL INFORMATION

1.0 Synoptic Situation

The synoptic or large-scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction 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.[2]

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart centered over Alaska for 1500 AKST is provided as figure 1 with the approximate location of the accident site within the red circle. The chart depicted two low pressure centers in the Gulf of Alaska with pressures of 984-hectopascals (hPa). The low-pressure center located just east of Kodiak Island had a surface trough[3] stretching southward into the northern Pacific Ocean. Along the Kenai Peninsula a stationary front was located that stretched eastward into northwestern Canada. Another low-pressure center and associated frontal boundaries were located near Dillingham, Alaska.

The station models around the accident site depicted air temperatures in the mid 20's degrees Fahrenheit (°F), dew point temperatures in the low 20's °F with temperature-dew point spreads of 4°F or less, an east wind at 10 knots, and overcast skies.

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[2] https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1030235

[3] Trough – An elongated area of relatively low atmospheric pressure or heights.

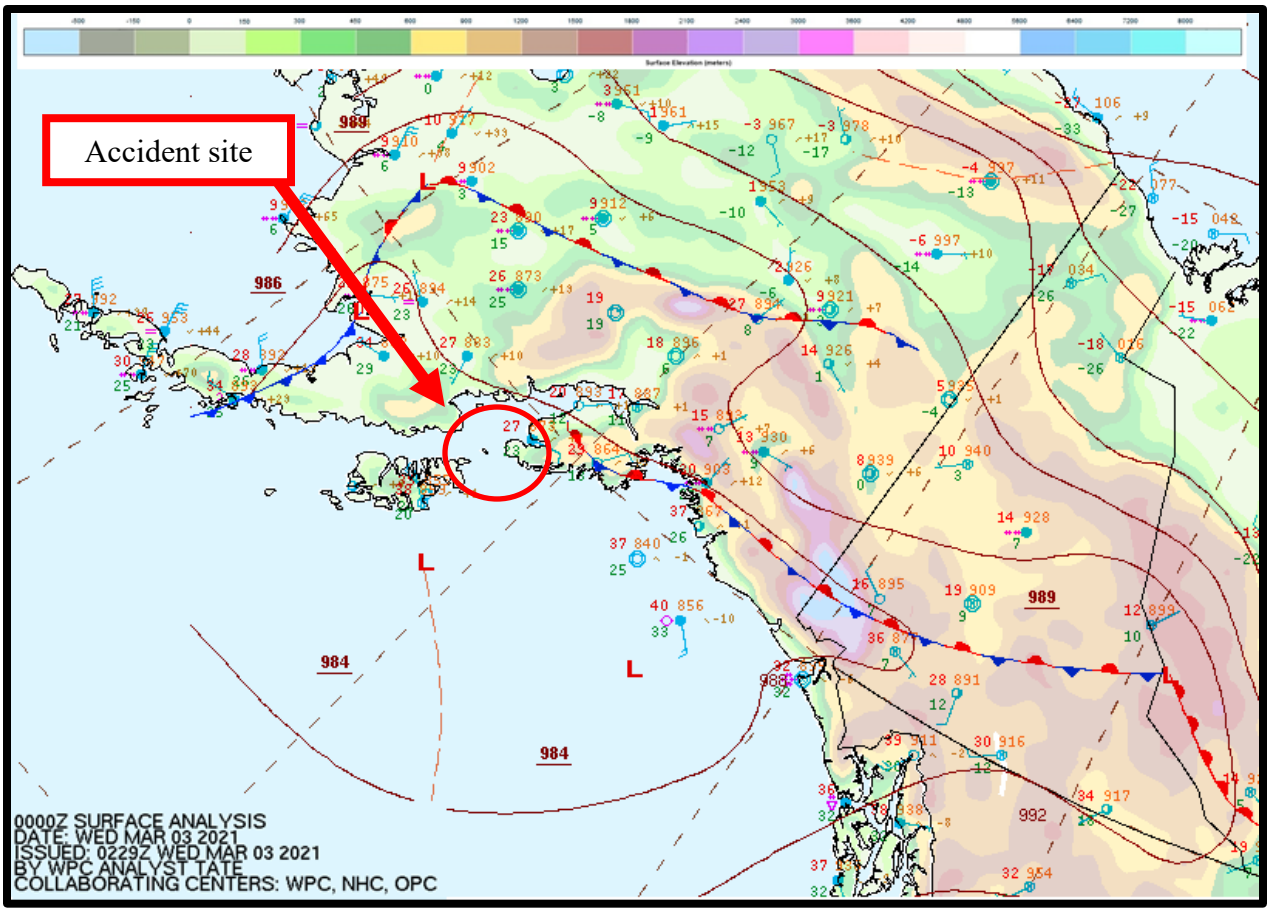

Figure 1 – NWS Surface Analysis Chart for 1500 AKST.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METARs) and Specials (SPECIs). The following observations were taken from standard code and are provided in plain language. In addition, National Data Buoy Center (NDBC) buoy observations were also documented over the area, which provided wind information. Figure 2 is a local sectional chart with the accident site and the closest weather reporting locations marked.

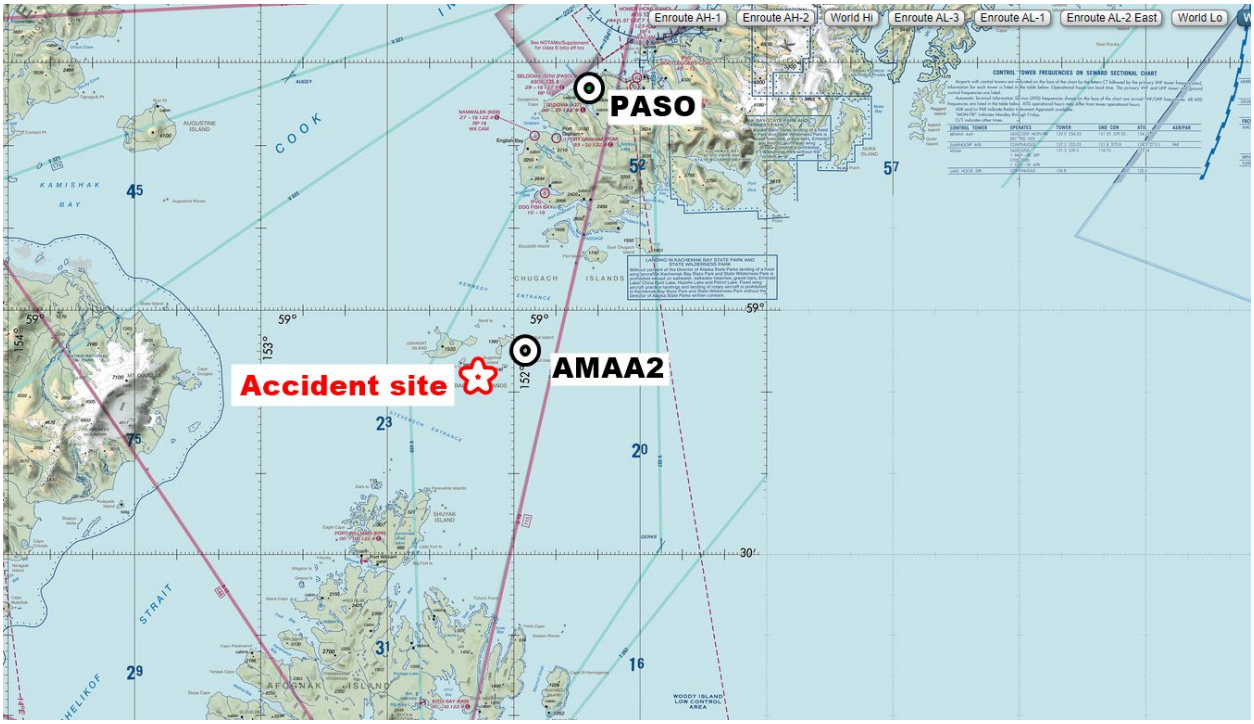

Figure 2 – Sectional map of the accident area with the location of the accident site and surface observation sites.

Seldovia Airport (PASO) had the closest official airport weather station to the accident site. PASO had an Automated Surface Observing System (ASOS[4]) whose longline[5] reports were not supplemented. PASO ASOS was located 37 miles north-northeast of the accident site, at an elevation of 29 feet (ft), and had a 15° easterly magnetic variation[6] (figure 2). The following automated longline observations were disseminated during the times surrounding the accident:[7]

[1309 AKST] SPECI PASO 022209Z AUTO 36006KT 10SM SCT009 OVC013 M02/M04 A2915 RMK AO2 T10221039 TSNO=

[1318 AKST] SPECI PASO 022218Z AUTO 36006KT 10SM BKN009 OVC013 M02/M04 A2915 RMK AO2 T10221044 TSNO=

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

[5] "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases (effectively, the whole world) and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline dissemination of weather observations is the primary vehicle through which the general global public has access to surface weather observations, particularly outside of the aviation community.

[6] Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from https://skyvector.com/

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

[1353 AKST] METAR PASO 022253Z AUTO VRB04KT 10SM OVC009 M02/M04 A2915 RMK AO2 SLP870 T10221039 TSNO=

[1453 AKST] METAR PASO 022353Z AUTO 01006KT 10SM OVC009 M03/M04 A2916 RMK AO2 SLP873 T10281044 11011 21028 51009 TSNO=

[1523 AKST] SPECI PASO 030023Z AUTO VRB04KT 10SM OVC010 M03/M05 A2916 RMK AO2 T10331050 TSNO=

ACCIDENT TIME 1539 AKST

[1553 AKST] METAR PASO 030053Z AUTO 01004KT 10SM OVC010 M03/M04 A2916 RMK AO2 SLP876 T10281044 TSNO=

[1653 AKST] METAR PASO 030153Z AUTO 02004KT 10SM OVC010 M02/M04 A2917 RMK AO2 SLP878 T10221044 TSNO=

PASO weather at 1523 AKST, automated, wind variable at 4 knots, visibility 10 miles or greater, overcast ceiling at 1,000 ft above ground level (agl), temperature of -3°Celsius (C), dew point temperature of -5°C, and an altimeter setting of 29.16 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator, temperature -3.3°C, dew point temperature -5.0°C, thunderstorm (lightning detection) sensor not operating.

PASO weather at 1553 AKST, automated, wind from 010° at 4 knots, visibility 10 miles or greater, overcast ceiling at 1,000 ft agl, temperature of -3°C, dew point temperature of -4°C, and an altimeter setting of 29.16 inHg. Remarks: automated station with a precipitation discriminator, sea level pressure 987.6 hPa, temperature -2.8°C, dew point temperature -4.4°C, thunderstorm sensor not operating.

Additional surface and marine observations were examined around the accident site. A marine station 6 miles east-northeast of the accident site (figure 2, AMAA2) owned and maintained by NDBC as a Coastal-Marine Automated Network (C-MAN) station provided wind and temperature information around the accident time (figure 3, time in UTC).[8] AMAA2 reported a wind from 320° to 330° between 12 and 18 knots with gusts to 27 knots, air temperatures of -1.3°C to -1.8°C, and dew point temperatures between -2.2° and -2.9°C around the accident time (figure 3).

[8] MM = month, DD = day, hh = hour (UTC), mm = minute, WDIR = wind direction, WSPD = wind speed in meters per second (m/s) 1 m/s = 1.94384 knots, GST = wind gust in m/s, PRES = pressure in hPa, ATMP = air temperature in °C, DEWP = dew point temperature in °C.

#YY	MM	DD	hh	mm	WDIR	WSPD	GST	WVHT	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS	PTDY	TIDE
#yr	mo	dy	hr	mn	degT	m/s	m/s	m	sec	sec	degT	hPa	degC	degC	degC	nmi	hPa	ft
2021	03	03	08	00	330	6.2	11.3	MM	MM	MM	MM	989.8	-1.6	MM	-2.5	MM	+1.9	MM
2021	03	03	07	30	320	7.2	12.9	MM	MM	MM	MM	989.4	-1.4	MM	-2.1	MM	MM	MM
2021	03	03	07	00	270	4.6	8.2	MM	MM	MM	MM	988.9	-1.2	MM	-2.1	MM	+1.7	MM
2021	03	03	06	30	310	6.7	13.4	MM	MM	MM	MM	988.5	-1.0	MM	-1.9	MM	MM	MM
2021	03	03	06	00	340	6.2	9.3	MM	MM	MM	MM	988.2	-0.9	MM	-1.8	MM	+2.0	MM
2021	03	03	05	30	320	5.7	9.3	MM	MM	MM	MM	988.2	-1.3	MM	-2.2	MM	MM	MM
2021	03	03	05	00	330	8.2	11.8	MM	MM	MM	MM	987.9	-1.3	MM	-2.1	MM	+1.5	MM
2021	03	03	04	30	330	4.1	8.2	MM	MM	MM	MM	987.7	-1.6	MM	-2.5	MM	MM	MM
2021	03	03	04	00	330	6.7	12.9	MM	MM	MM	MM	987.2	-1.9	MM	-2.8	MM	+1.2	MM
2021	03	03	03	30	330	6.2	12.4	MM	MM	MM	MM	986.8	-1.9	MM	-2.9	MM	MM	MM
2021	03	03	03	00	330	9.8	16.0	MM	MM	MM	MM	986.2	-1.9	MM	-2.9	MM	+0.5	MM
2021	03	03	02	30	330	10.3	14.4	MM	MM	MM	MM	986.0	-1.9	MM	-2.7	MM	MM	MM
2021	03	03	02	00	290	5.1	10.8	MM	MM	MM	MM	986.4	-1.9	MM	-2.9	MM	+1.1	MM
2021	03	03	01	30	310	6.7	13.9	MM	MM	MM	MM	986.2	-1.9	MM	-3.0	MM	MM	MM
2021	03	03	01	00	320	9.3	13.9	MM	MM	MM	MM	986.0	-1.8	MM	-2.9	MM	+0.7	MM
2021	03	03	00	30	330	6.2	10.8	MM	MM	MM	MM	986.0	-1.6	MM	-2.4	MM	MM	MM
2021	03	03	00	00	330	7.7	10.8	MM	MM	MM	MM	985.7	-1.3	MM	-2.2	MM	+0.6	MM
2021	03	02	23	30	330	6.7	12.9	MM	MM	MM	MM	985.5	-1.4	MM	-2.3	MM	MM	MM
2021	03	02	23	00	340	9.8	13.4	MM	MM	MM	MM	985.3	-1.2	MM	-2.4	MM	+0.6	MM
2021	03	02	22	30	340	9.8	11.8	MM	MM	MM	MM	985.4	-1.2	MM	-2.3	MM	MM	MM
2021	03	02	22	00	330	9.3	12.4	MM	MM	MM	MM	985.3	-0.7	MM	-2.0	MM	+0.8	MM
2021	03	02	21	30	330	9.3	11.3	MM	MM	MM	MM	985.1	-0.1	MM	-1.2	MM	MM	MM
2021	03	02	21	00	330	6.2	8.2	MM	MM	MM	MM	985.1	0.1	MM	-1.7	MM	+0.7	MM
2021	03	02	20	30	340	7.2	8.8	MM	MM	MM	MM	984.9	0.0	MM	-1.2	MM	MM	MM
2021	03	02	20	00	340	7.7	9.8	MM	MM	MM	MM	984.7	0.0	MM	-1.3	MM	+0.3	MM
2021	03	02	19	30	340	5.7	8.2	MM	MM	MM	MM	984.9	-0.2	MM	-1.6	MM	MM	MM
2021	03	02	19	00	340	7.7	9.3	MM	MM	MM	MM	984.5	0.0	MM	-1.3	MM	+0.0	MM
2021	03	02	18	30	340	5.7	8.2	MM	MM	MM	MM	984.6	0.3	MM	-1.6	MM	MM	MM
2021	03	02	18	00	340	6.2	8.2	MM	MM	MM	MM	984.4	0.5	MM	-0.8	MM	+0.0	MM
2021	03	02	17	30	320	4.1	7.2	MM	MM	MM	MM	984.5	0.6	MM	0.0	MM	MM	MM
2021	03	02	17	00	330	3.1	4.6	MM	MM	MM	MM	984.4	0.8	MM	0.5	MM	-0.5	MM
2021	03	02	16	30	250	1.5	2.1	MM	MM	MM	MM	984.5	0.6	MM	0.3	MM	MM	MM
2021	03	02	16	00	320	4.1	5.7	MM	MM	MM	MM	984.3	1.7	MM	-0.2	MM	-1.5	MM

Figure 3 – Additional AMAA2 observations.

The observations from PASO surrounding the accident time indicated MVFR to IFR[9] conditions prevailed with a northwest wind gusting to 27 knots reported at AMAA2.

[9] As defined by the NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories:

- Low Instrument Flight Rules (LIFR*) – ceiling below 500 ft above ground level (agl) and/or visibility less than 1 statute mile.
- Instrument Flight Rules (IFR) – ceiling between 500 to below 1,000 feet agl and/or visibility 1 to less than 3 miles.
- Marginal Visual Flight Rules (MVFR**) – ceiling from 1,000 to 3,000 ft agl and/or visibility 3 to 5 miles.
- Visual Flight Rules (VFR) – ceiling greater 3,000 ft agl and visibility greater than 5 miles.

* By definition, IFR is a ceiling less than 1,000 ft agl and/or visibility less than 3 miles while LIFR is a sub-category of IFR.

**By definition, VFR is a ceiling greater than or equal to 3,000 ft agl and visibility greater than 5 miles while MVFR is a sub-category of VFR.

3.0 Upper Air Sounding

A Global Data Assimilation System (GDAS) model sounding was created for the accident site for 1500 AKST with a sounding elevation of 10 ft.[10] The 1500 AKST GDAS sounding was plotted on a standard Skew-T Log P diagram[11] with the derived stability parameters included in figure 4 with data from the surface to 700-hPa (or approximately 10,000 ft msl). These data were analyzed using the RAOB[12] software package. The sounding depicted the lifted condensation level (LCL)[13] and the level of free convection (LFC)[14] at 1,223 ft agl, and the convective condensation level (CCL)[15] at 4,552 ft msl. It was below freezing at the surface. The precipitable water value was 0.27 inches.

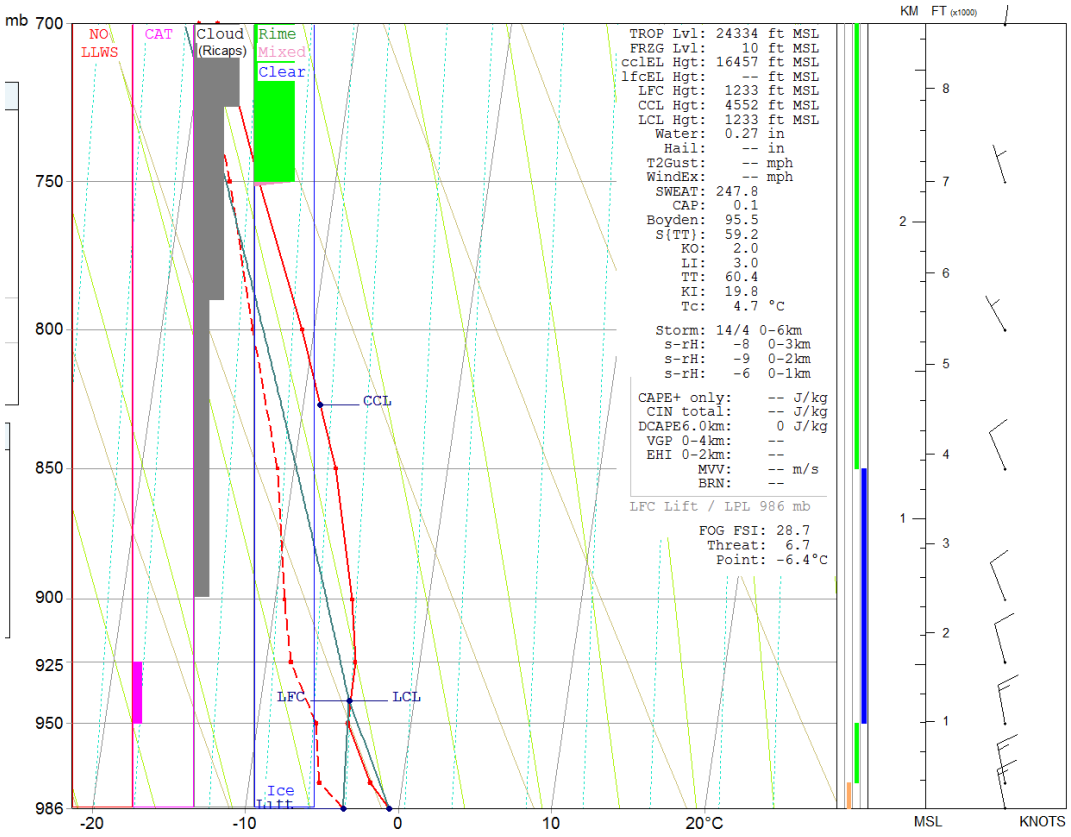

Figure 4 – 1500 AKST GDAS sounding.

[10] GDAS sounding was created using NOAA Air Resource Laboratory: https://ready.arl.noaa.gov/READYamet.php

[11] 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.

[12] RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Eosonde Research Services, The Villages, Florida.

[13] LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

[14] LFC – The level at which a parcel of saturated air becomes warmer than the surrounding air and begins to rise freely. This occurs most readily in a conditionally unstable atmosphere.

[15] CCL – The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.

The 1500 AKST GDAS sounding for the accident site indicated a conditional unstable environment from the surface through 1,000 ft agl, then a stable environment from 1,000 ft agl through 4,000 ft agl. Clouds were indicated by RAOB above 2,500 ft msl through 10,000 ft msl. RAOB indicated moderate rime icing above 7,000 ft msl.

The 1500 AKST GDAS sounding wind profile indicated a near surface wind from 349° at 15 knots with the wind remaining northwest to northerly through 10,000 ft msl. RAOB did not indicate the possibility of low-level wind shear (LLWS) between the surface and 2,000 ft msl. RAOB indicated the possibility of light clear-air turbulence between 1,000 ft and 1,750 ft msl.

4.0 Satellite Data

The Geostationary Operational Environmental Satellite number 17 (GOES-17) visible and infrared data were 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-17 bands 2 and 13) at wavelengths of 0.64 microns (µm) and 10.3 µm, respectively, were retrieved for the period from 1300 AKST through 1700 AKST and reviewed, and the closest images to the time of the accident were documented.

Figure 5 presents the GOES-17 visible imagery from 1540 AKST at 4X magnification with the accident site highlighted with a red square. There was broken cloud cover above the accident site with less cloud cover further south of the accident site at the accident time. Figure 6 presents the GOES-17 infrared imagery from 1540 AKST at 6X magnification with the accident site highlighted with a red square. The lower brightness temperatures (green colors; higher cloud tops) were located southeast of the accident site. Based on the brightness temperatures (about 266 Kelvin) above the accident site and the vertical temperature profile provided by the 1500 AKST GDAS sounding, the approximate cloud-top heights over the accident site were 3,500 ft above msl at 1540 AKST. It should be noted these figures have not been corrected for any parallax error.

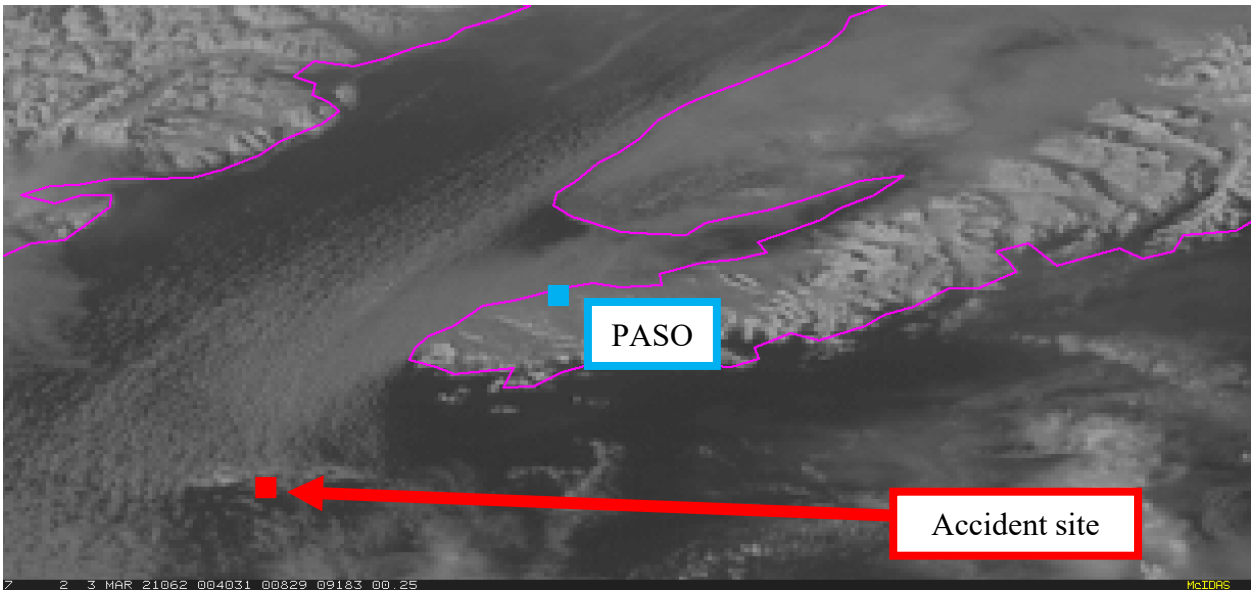

Figure 5 – GOES-17 visible image at 1540 AKST.

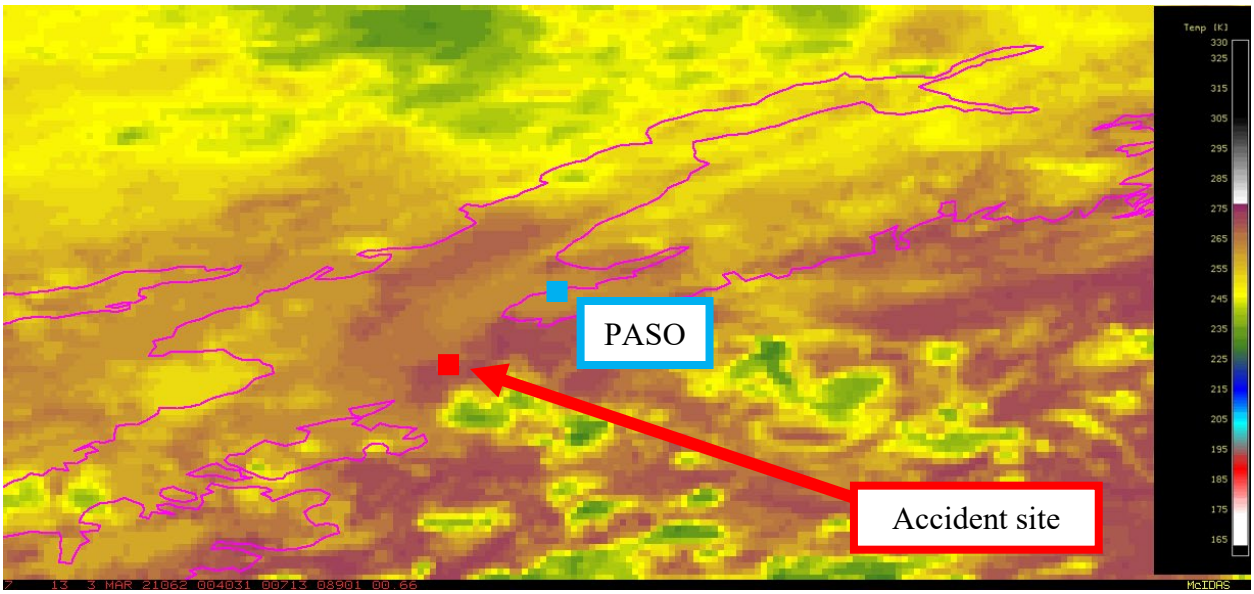

Figure 6– GOES-17 infrared image at 1540 AKST.

5.0 Regional Radar Imagery Information

The closest weather radar was along the Kenai Peninsula located near Nikiski, Alaska, 114 miles north-northeast of the accident site. The image depicted no precipitation echoes above the accident site at the accident time.

6.0 Pilot Reports

There were no publicly longline-disseminated pilot reports[16] (PIREPs) distributed into the national airspace (NAS) within 50 miles of the accident site below 18,000 ft msl for 3 hours either side of the accident time.

7.0 Significant Meteorological Information

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

8.0 Center Weather Service Unit Advisories

The Anchorage (ZAN) Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU) was responsible for the accident region. ZAN CWSU did not issue a Meteorological Impact Statement (MIS) or a Center Weather Advisory (CWA) for the accident site at the accident time.

[16] Only pilot reports with the World Meteorological Organization headers UBAK ** were considered. These do not include pilot reports broadcast over the radio.

9.0 Airmen's Meteorological Information

There were no Airmen's Meteorological Information (AIRMET) advisories valid for the accident site at the accident time.

10.0 Area Forecast

The Area Forecast valid for the accident site forecast few clouds at 2,500 ft msl and scattered clouds at 4,500 ft msl, with isolated conditions of broken ceiling at 2,500 ft msl, overcast skies at 4,500 ft msl, cloud tops at 8,000 ft msl, visibilities between 3 and 5 miles with light snow showers:

FAAK48 PAWU 022110
FA8H
ANCH FA 022115
AK SRN HLF EXCP SE AK...
.
AIRMETS VALID UNTIL 030515
CB IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HEIGHTS NOTED BY AGL OR CIG.
.
SYNOPSIS VALID UNTIL 031500
LARGE...MULTI-CENTERED 984 MB LOW VCY PAKH WILL DRIFT TO SE GULF
AK BY END OF PD. N-S RIDGE ACROSS PASY WILL EXTEND FM ST MATTHEW IS
TO PAAK AND S BY 15Z. VIGOROUS 993 MB LOW NR SRN TIP KAMCHATKA PEN
WILL MOVE QUICKLY N ALG E CST KAMCHATKA WITH CD FNT TRAILING S AND
APPROACHING WRN ALEUTIANS AT END OF PD.
.
COOK INLET AND SUSITNA VLY AB...VALID UNTIL 030900
...CLOUDS/WX...
AIRMET MT OBSCPATK-PAEN LN E MTS OCNL OBSC IN CLDS. NC...
PATK-PAEN LN E FEW005 SCT015.
OCNL BKN015 TOP 025.
TIL 00Z ISOL CIG BLW 010/VIS BLW 3SM BR.
AFT 06Z OCNL CIG BLW 010/VIS BLW 3SM BR.
ELSW MAINLY SKC.
AFT 06Z LOWLANDS/COOK INLET ISOL CIG BLW 010/VIS BLW 3SM BR.
ST/BR TOP 020.
OTLK VALID 030900-031500...COOK INLET/LOWLANDS IFR CIG BR. ELSW
VFR.
PASSES...
LAKE CLARK...MERRILL...RAINY...WRN APPROACHES MVFR CIG SHSN. ELSW
VFR.
WINDY...VFR.
PORTAGE...MVFR CIG. AFT 06Z IFR CIG/VIS BR.
...TURB...
NIL SIG.
...ICE AND FZLVL...
NIL SIG. FZLVL SFC.
.
COPPER RIVER BASIN AC...VALID UNTIL 030900
...CLOUDS/WX...
AIRMET IFRE THOMPSON PASS-ISABEL PASS LN ISOL CIG BLW 010/
OCNL VIS BLW 3SM -SHSN BR. NC...
AIRMET MT OBSCE THOMPSON PASS-ISABEL PASS LN MTS OCNL OBSC IN CLDS/PCPN. NC...

FEW025 SCT035 BKN-OVC060 TOP 150.
E THOMPSON PASS-ISABEL PASS LN OCNL BKN035 VIS BLW 3SM -SHSN BR.
ELSW LOWER CONDS ISOL.
OTLK VALID 030900-031500...MVFR CIG. VCY MTS SHSN.
PASS...
TAHNETA...VFR. ISOL SHSN.
...TURB...
NIL SIG.
...ICE AND FZLVL...
NIL SIG. FZLVL SFC.
.
CNTRL GLF CST AD...VALID UNTIL 030900
...CLOUDS/WX...
AIRMET MT OBSCPAVD E MTS OCNL OBSC IN CLDS/PCPN. NC...
PAVD-PAMD LN E SCT025 BKN045 TOP 070 WIDELY SEPD LYRS ABV TO FL250.
OCNL BKN025 VIS 3-5SM -SHSN.
ALG MTS ISOL CIG BLW 010/VIS BLW 3SM -SHSN BR.
ELSW GENLY SKC.
SE PAMD ISOL BKN025TCU TOP FL200 VIS 3-5SM -SHSN.
OTLK VALID 030900-031500...VFR. PAMD SE ISOL SHSN.
...TURB...
NIL SIG. EXC VCY TCU.
...ICE AND FZLVL...
NIL SIG. EXC VCY TCU. FZLVL BLW 010.
.
KODIAK IS AE...VALID UNTIL 030900
...CLOUDS/WX...
FEW025 SCT045.
ISOL BKN025 OVC045 TOP 080 VIS 3-5SM -SHSN.
SE PADQ-PAKH LN ISOL BKN025TCU TOP FL200 VIS 3SM -SHSN.
AFT 03Z SW CHIRIKOF IS SFC WND NW 20G30KT.
OTLK VALID 030900-031500...VFR ISOL SHSN.
...TURB...
NIL SIG. EXC VCY TCU.
...ICE AND FZLVL...
NIL SIG. EXC VCY TCU. FZLVL BLW 010.
.

11.0 Alaska Aviation Weather Unit Graphics

The Alaska Aviation Weather Unit (AAWU) produce graphical forecast information valid at the accident time and that information can be found in attachment 1.

12.0 Terminal Aerodrome Forecast

There was no NWS[17] Terminal Aerodrome Forecast (TAF) valid within 40 miles of the accident site.

[17] According to NWS Instruction 10-813: "An NWS TAF consists of the expected meteorological conditions significant to aviation at an airport for a specified time period. For the U.S., this is the area within five (5) statute miles (SM) of the center of an airport's runway complex." www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

13.0 NWS Area Forecast Discussion

The NWS office in Anchorage, Alaska, (WFO AFC) issued the following Area Forecast Discussion (AFD) at 0450 AKST and this was the AFD valid at the accident time:

FXAK68 PAFC 021350
AFDAFC

Southcentral and Southwest Alaska Forecast Discussion
National Weather Service Anchorage AK
450 AM AKST Tue Mar 2 2021

.ANALYSIS AND UPPER LEVELS...

Satellite imagery shows a weakening vertically stacked, complex low residing over the eastern Bering this morning, keeping the an active pattern stretched across the region. On the backside of this system, strong winds persists from the Pribilofs to the eastern Aleutians and AKPEN, which has dropped the visibility at times during periods of light snow. Over the Southwest mainland, snow showers continue as the front with the aforementioned low pushes farther inland. Snow has already started to taper off over the Kuskokwim Delta and will continue to weaken from west to east. Across Southcentral, a compact low is lifting into the North Gulf Coast. Relatively quiet conditions remain across the region as the northerly offshore pattern begins to set up.

&&

.MODEL DISCUSSION...

Models remain in good consensus with the active weather pattern across the Bering and mainland Alaska over the next few days. Thus, forecast confidence remains above average.

&&

.AVIATION...

PANC...MVFR conditions are possible early this morning, which will gradually improve to VFR with light winds by the afternoon. Fog and low stratus could develop Tuesday evening across Cook Inlet and at the airport.

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.SHORT TERM FORECAST SOUTHCENTRAL ALASKA (Days 1 and 2: Today through Wednesday Night)...

For most of Southcentral, the weather will be much quieter today, and the quiet weather will persist through Wednesday night. Light snow continues this morning in Cordova and points east, as the low that greatly assisted in causing the snow area-wide yesterday moves into the coastal Chugach and rapidly dissipates. Lingering moisture may cause light snow shower activity to persist throughout the day today in the Cordova area. Elsewhere, low cloud

cover is over much of Southcentral, however, most of it is not producing precipitation. The cloud cover should slowly diminish through today with solar heating.

The weak surface low/troughing over Southwest Alaska will shift east and consolidate into a low over the eastern Gulf by Wednesday morning. This will allow a renewed surge of Arctic air to move southward across Southcentral by Wednesday. In addition to falling temperatures, the most significant impact will be strengthening winds and freezing spray potential across all of the coastal waters north of Kodiak Island by Wednesday night. This surge of colder, drier air should result in continued dissipation of any remaining cloud cover. However, the resulting atmospheric inversion may support some limited freezing fog generation, especially in the upper Cook Inlet and the Arms. Even in these areas, the fog tonight is not expected to be dense due to the otherwise dry air mass around.

Looking ahead, the next round of inland and mountain snow with coastal rain/mix remains on track starting Thursday night, and may persist into Saturday. This feature is looking more substantial as compared with 24 hours ago, but the details that will determine how much accumulation occurs remain highly uncertain.

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

A broad surface low in the eastern Bering will continue to influence the sensible weather across Southwest Alaska today. Remnant moisture embedded in cyclonic flow will produce more showers today for portions of Southwest Alaska. As the low pushes south today, northerly flow will set up for most of the region. There will be a break between systems on Wednesday. Thursday the next Bering front will push inland bringing yet another batch of snow to the K-Delta, Bethel, Dillingham and King Salmon.

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

The remnants of a low over the Bering continues to yield snow showers, gusty conditions, and enhanced seas. The surface low will move out of the Eastern Bering and south of the Alaska Peninsula this afternoon. In its wake, northerly flow and a tight pressure gradient from the Pribilof Islands to Port Heiden. By Wednesday morning there will be a weak ridge over Atka and St. Paul. Additionally, there is a new surface low over Kamchatka with a surface pressure of 967 mb and the front at the door set of Attu Island. This front will rapidly push across the Aleutians Wednesday and early Thursday bringing another round of unsettled weather.

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.MARINE (Days 3 through 5: Thursday through Saturday)...

Bering: A well developed front moves into Western Alaska for Fri. Forecast confidence is good. Widespread high end southerly gale force winds and waves with areas of storm force gusts moves with the front. Waves building to 20 feet Fri. The associated well developed low and trailing front move across the Bering from the West through Fri, and brings widespread high end westerly gale force winds across the Aleutians/Bering through Sat. Waves building to 35 feet over the Central Bering subsiding to mid-20s over the remainder of the area through Sat.

Gulf of Alaska: A low slowly exits the Southern Gulf Fri, with outflow small craft winds off the Alaska Peninsula from the Barren Islands to the Shumagin Islands right behind. Models vary, but confidence is good. A new low and front move across the Gulf through Sat, bringing widespread southeasterly winds with the front through Fri. Northwest small craft winds with areas if gale force gusts follow after frontal passage Sat. Waves building to 12 feet across the Southern Gulf, subsiding Sat.

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.LONG TERM FORECAST (Days 4 through 7: Friday through Monday)...

Active weather is expected to makes its return to southern Alaska during the forecast period with the details of each individual system uncertain at this time. Model guidance keeps a rather strong Arctic/Siberian upper level low over northeast Russia while upper level ridging tries to push northward along the Alaska Peninsula into Southcentral and Southeast Alaska. The storm track will basically be from the western Bering eastward along the Aleutian Chain to Kodiak Island and then to somewhere near Prince William Sound as these ride the eastern periphery of the deep cold Arctic/Siberian air over northeast Russia. Overall, expect a milder pattern to ensue for this time period with temperatures still slightly below normal but closer to the normal values of where they typically are this time of the year which is near 32 degrees F for Anchorage. This pattern could potentially mean a snowier regime for Southcentral and in particular across the Anchorage Bowl. However, many factors have to come together for Anchorage to get the snow, though, the storm track looks favorable with model guidance mostly bringing lows near and into Prince William Sound with details of each uncertain.

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.AFC WATCHES/WARNINGS/ADVISORIES...
PUBLIC...Blizzard Warning 185 195
Winter Weather Advisory 155 181
High Wind Warning 185
MARINE...Storm Warning 170 178 411
Gales 130 131 150 155 160 165 171-77
179 180 185 412 413 414
Heavy Freezing Spray 160 165 179 180 185 412 414

FIRE WEATHER...NONE.

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14.0 Winds and Temperature Aloft Forecast

The NWS 1055 AKST Winds and Temperature Aloft forecast valid for the closest point to the accident site is included below:

```
FBAK31 KWNO 021955
FD1AK1
DATA BASED ON 021800Z
VALID 030000Z   FOR USE 2000-0300Z. TEMPS NEG ABV 24000

FT  3000    6000    9000   12000   18000   24000  30000  34000  39000
HOM 0308 3606-13 3505-20 3406-28 3305-39 9900-49 040657 310752 290850
```

The closest forecast point to the accident site was Homer (HOM), Alaska. The HOM forecast for use between 1100 AKST and 1800 AKST indicated a wind at 3,000 ft from 030° at 8 knots, a wind at 6,000 ft from 360° at 6 knots with a temperature of -13°C, and a wind at 9,000 ft from 350° at 5 knots with a temperature of -20°C.

15.0 Pilot Weather Briefing

The accident pilot did not request nor receive weather information[18] from Alaskan Flight Services[19]. A search of archived ForeFlight information indicated that the accident pilot did not request weather information via ForeFlight. There is no record of the accident pilot receiving or retrieving any other weather information before or during the accident flight.

16.0 FAA Web Camera Images

Images from the FAA's Aviation Weather Cameras were retrieved for Nanwalek and Ouzinkie and are contained in attachments 2 and 3. At the time when the accident aircraft passed near Nanwalek web camera[20] (around 1523 to 1526 AKST) between 460 and 500 ft msl, the south facing camera indicated cloud bases near or below 850 ft msl, while the southwest facing camera indicated cloud bases near but above 650 ft msl. Visibility below the cloud base was above 3 miles based on the south facing camera imagery.

[18] https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-92.pdf
[19] https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/fs/alaskan/alaska/
[20] For more information on the accident flight track and data please see the docket for this accident.

17.0 Astronomical Data

The astronomical data obtained for the accident site on March 2, 2021, indicated the following:

SUN	
Begin civil twilight	0720 AKST
Sunrise	0800 AKST
Sun transit	1321 AKST
Accident time	**1539 AKST**[21]
Sunset	1842 AKST
End civil twilight	1922 AKST

At the time of the accident the Sun was located at an altitude of 18.8° and azimuth of 216.6°.

E. LIST OF ATTACHMENTS

Attachment 1 – AAWU forecast information

Attachment 2 – FAA web camera data for Nanwalek

Attachment 3 – FAA web camera data for Ouzinkie

Submitted by:

_____
Paul Suffern
Senior Meteorologist

[21] Inserted accident time for reference and context.