NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

January 30, 2017

Weather Study

METEOROLOGY

ANC17FA009

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A. AIRCRAFT ACCIDENT

Location: Fairbanks, Alaska
Date: December 7, 2016
Time: 1043 Alaska Standard Time (AKST)
(1943Z Coordinated Universal Time (UTC))
Airplane: Bellanca 7GCBC; Registration: N88452

B. METEOROLOGIST

Don Eick
Group Chairman
Operational Factors Division (AS-30)
National Transportation Safety Board

C. SUMMARY

On December 7, 2016, about 1043 Alaska standard time, a tail-wheel, ski equipped Bellanca Citabria 7GCBC airplane, N88452, was substantially damaged after impacting terrain about 17 miles southeast of Fairbanks, Alaska, on Fort Wainwright property. The certificated airline transport pilot and sole occupant was fatally injured. The airplane was registered to the pilot and operated as a visual flight rules (VFR) personal flight conducted under Title 14 Code of Federal Regulations Part 91. A VFR flight plan was filed and activated. Visual meteorological conditions prevailed at the time of the accident. The flight departed Chena Marina Airport, Alaska, at 1026 destined for the Tanana Flats southern training area.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation from the Washington D.C. office, collecting data from official National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). All times are Alaska standard time (AKST) based upon the 24-hour clock, local time is +9 hours to 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 uses the International Civil Aviation Organization (ICAO) airport and station codes in their products which are documented in this report.

The accident site was located at latitude 64.548° North and longitude 147.773° West, at an elevation of approximately 507 feet.

E. FACTUAL INFORMATION

1.0 Synoptic Conditions

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

1.1 Surface Analysis Chart

The NWS Alaska Surface Analysis Chart for 0900 AKST (1800Z) on December 7, 2016 is included as figure 1 with the approximate accident site marked by a red star. The chart depicted a cold-core high pressure system over northeastern Alaska at 1054-hectopascals (hPa)[1] with a ridge of high pressure dominating over northern Alaska. To the south of the accident site over the Anchorage area the chart depicted a low pressure system at 1022-hPa along a stationary front which stretched southwestward and southeastward across the coastal sections of Alaska and the Alaska Range and Chugach Mountain ranges. A trough of low pressure also extended north and then northeastward from the low pressure system into the Fairbanks area, which is noted in the red circle. Further south in the Gulf of Alaska was another closed low pressure system at 1009-hPa with a cold front stretching southward with a defined cyclonic or counterclockwise wind flow in the northern hemisphere. The accident site was located under the cold air mass north of the front and near the trough of low pressure with a ridge of high pressure to the north producing an extensive area of clear and stable conditions.

[1] Hectopascal (hPa) is the new standard terminology in reporting pressure and is interchangeable with millibars (mb) and has the same units. The International Standard Atmosphere (ISA) is defined as a sea level pressure of 1013.25-hPa at 15° Celsius (C), with a lapse rate of 2° C per 1,000 feet.

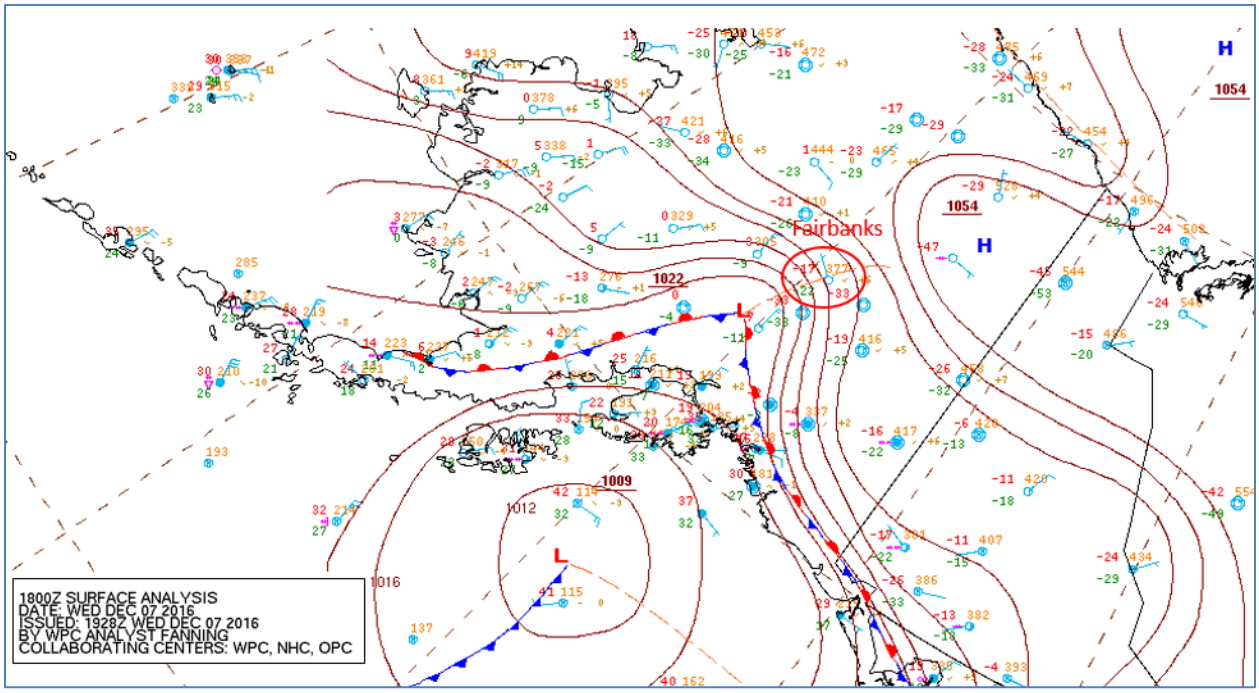

Figure 1 - Alaska Surface Analysis Chart for 0900 AKST

The station model for Fairbanks depicted wind as calm, clear skies, with a temperature of -17° Fahrenheit (F), dew point of -22° F, with a sea level pressure of 1039.3-hPa. No significant weather or clouds were depicted in the immediate area surrounding the accident site, even with the trough extending over the area. Further south along and north of the stationary front to the southeast of the area several stations reported light snow and overcast clouds.

2.0 Surface Observations

The official NWS Meteorological Aerodrome Reports (METARs) and special reports (SPECIs) from the surrounding airports were documented. The cloud heights are reported above ground level (agl) in the following section. The magnetic variation was approximately 19° East based on the sectional chart for the area.

2.1 Chena Marina Airport (AK28), Fairbanks, AK

The accident airplane departed from Chena Marina Airport (AK28) located 5 miles southwest of the city of Fairbanks, 1 ½ miles west of Fairbanks International Airport, and 16 ½ miles north-northwest of the accident site at an elevation of 427 feet. The airport does not have any weather reporting capability other than a wind indicator.

2.2 Fairbanks International Airport (PAFA), Fairbanks, AK

The closest weather reporting facility to the accident site was Fairbanks International Airport (PAFA), Fairbanks, which was located approximately 16 miles north of the accident site at an

elevation of 439 feet. The airport had an Automated Surface Observation System (ASOS) and reported the following conditions at the time of the accident:

Fairbanks International Airport weather at 1053 AKST (1953Z), wind from 010° at 5 knots, visibility 10 miles, sky clear below 12,000 feet, temperature -33° Celsius (C), dew point temperature -36° C, altimeter 30.63 inches of mercury (Hg). Remarks; automated observation system with a precipitation discriminator, sea level pressure 1039.6-hPa, temperature -32.8° C, dew point -35.6° C, visibility sensor northeast not operating and the required maintenance indicator was on.

The calculated density altitude was -6,576 feet. The raw observations in standard code and abbreviations surrounding the period were as follows:

METAR PAFA 071753Z 04003KT 10SM CLR M32/M35 A3062 RMK AO2 SLP393 13221350 11306 21339 53005 VISNO NE $=

METAR PAFA 071853Z 35003KT 10SM CLR M32/M35 A3063 RMK AO2 SLP395 T13221350 VISNO NE $=

Accident 1943Z

METAR PAFA 071953Z 01005KT 10SM CLR M33/M36 A3063 RMK AO2 SLP396 T13281356 VISNO NE $=

METAR PAFA 072053Z 00000KT 10SM CLR M30/M34 A3063 RMK AO2 SLP395 T13001339 51003 VISNO NE $=

METAR PAFA 072153Z 03005KT 10SM CLR M29/M32 A3064 RMK AO2 SLP397 T12941322 VISNO NE $=

METAR PAFA 072253Z 05005KT 10SM CLR M28/M32 A3064 RMK AO2 SLP397 T12831317 VISNO NE $=

SPECI PAFA 072256Z 05006KT 10SM CLR M28/M32 A3064 RMK AO2 T12831317 VISNO NE $=

SPECI PAFA 072258Z 05006KT 10SM CLR M28/M32 A3064 RMK AO2 T12831317 VISNO NE $=

METAR PAFA 072353Z 04004KT 10SM CLR M31/M33 A3063 RMK AO2 SLP395 T13111333 11283 21333 50001 VISNO NE $

METAR PAFA 080053Z 36003KT 10SM FEW180 M31/M34 A3063 RMK AO2 SLP393 T13111339 VISNO NE$

2.3 Ladd Army Airfield (PAFB), Fairbanks, AK

Ladd Army Airfield located within Fort Wainwright (PAFB) was located approximately 2 miles east of downtown Fairbanks and approximately 17 ½ miles north of the accident site at an elevation of 460 feet. The following conditions were reported at the approximate time of the accident:

Ladd Army Airfield weather at 1058 AKST, automated observation, wind from 070° at 4 knots, visibility 10 miles, sky clear below 12,000 feet, temperature -24° C, dew point -27° C, altimeter 30.64 inches of Hg.

The raw observation surrounding the period and the forecast current at the time were as follows:

METAR PAFB 071758Z 00000KT 10SM CLR M24/M27 A3062=

METAR PAFB 071858Z AUTO 04006KT 10SM CLR M24/M26 A3063 RMK AO2 SLP396 T12361263=

METAR PAFB NIL=

Accident 1943Z

METAR PAFB 071958Z AUTO 07004KT 10SM CLR M24/M27 A3064=

METAR PAFB 072058Z AUTO 07005KT 10SM CLR M23/M26 A3063=

METAR PAFB 072158Z AUTO 06007KT 10SM CLR M22/M25 A3064=

SPECI PAFB 072248Z 09006KT 10SM CLR M23/M26 A3064=

METAR PAFB 072258Z 09004KT 10SM CLR M23/M26 A3064=

METAR PAFB 072358Z 00000KT 9SM CLR M21/M25 A3064 RMK AO2A SLP399 4/008 T12131251 11212 21259 51002

METAR PAFB 080058Z 00000KT 10SM CLR M24/M27 A3063 RMK AO2A SLP396 T12411266

TAF PAFB 072010Z 0720/0902 05009KT 9999 FEW090 QNH3052INS TXM21/0800Z TNM28/0818Z=

2.4 Eielson Air Force Base (PAEI), Fairbanks, AK

Eielson Air Force Base (PAEI) was located approximately 19 miles east-northeast of the accident site at an elevation of 548 feet. The following conditions were reported at the time of the accident:

Eielson Air Force Base weather observation at 1058 AKST, automated observation, wind calm, visibility 10 miles, sky clear below 12,000 feet, temperature -35° C, dew point missing, altimeter 30.61 inches of Hg.

The raw observations surrounding the period were as follows:

METAR PAEI 071758Z 00000KT 10SM CLR M36/ A3060=

METAR PAEI 071858Z 00000KT 10SM CLR M35/ A3060=

Accident 1943Z

METAR PAEI 071958Z AUTO 00000KT 10SM CLR M35/ A3061=

METAR PAEI 072058Z AUTO 00000KT 10SM CLR M34/M34 A3061=

METAR PAEI 072158Z AUTO 00000KT 10SM CLR M33/M34 A3061=

METAR PAEI 072258Z AUTO 00000KT 10SM CLR M33/M34 A3061=

METAR PAEI 072358Z AUTO 00000KT 10SM CLR M32/M34 A3061 RMK AO2 SNB05E24 SLP394 P0000 60000 T13221344 11322 21357 58001 $

METAR PAEI 072358Z COR AUTO 00000KT 10SM CLR M32/M34 A3061 RMK AO2 SLP394 4/006 T13221344 11322 21357 58001 $

TAF PAEI 072010Z 0720/0902 16004KT 9999 FEW045 QNH3051INS TXM30/0802Z TNM35/0720Z=

A review of the reports from Eielson AFB and Fairbanks indicated that 6 to 8 inches of snow was already present on the ground during the period. Immediately after the accident between 1405 and 1424 AKST a period of light snow was reported at the airport, with no significant change in visibility or report of any lower clouds. While all the report sites surrounding the accident site indicated VFR conditions prevailed during the period, a slight shift in wind and change in pressure was noted with the passage of the weak trough of low pressure.

3.0 Upper Air Sounding

The closest upper air sounding or rawinsonde observation (RAOB) was from the NWS Fairbanks (PAFA) Forecast Office, Fairbanks, Alaska, site number 70261, location approximately 16 miles north of the accident site at the airport. The 1500 AKST Sounding (0000Z on December 8, 2016) was plotted on a standard Skew-T log P diagram[2] from the surface to 500-hPa or 18,000 feet utilizing RAOB software[3], and is included as figure 2.

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

[3] RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamopras, Pennsylvania.

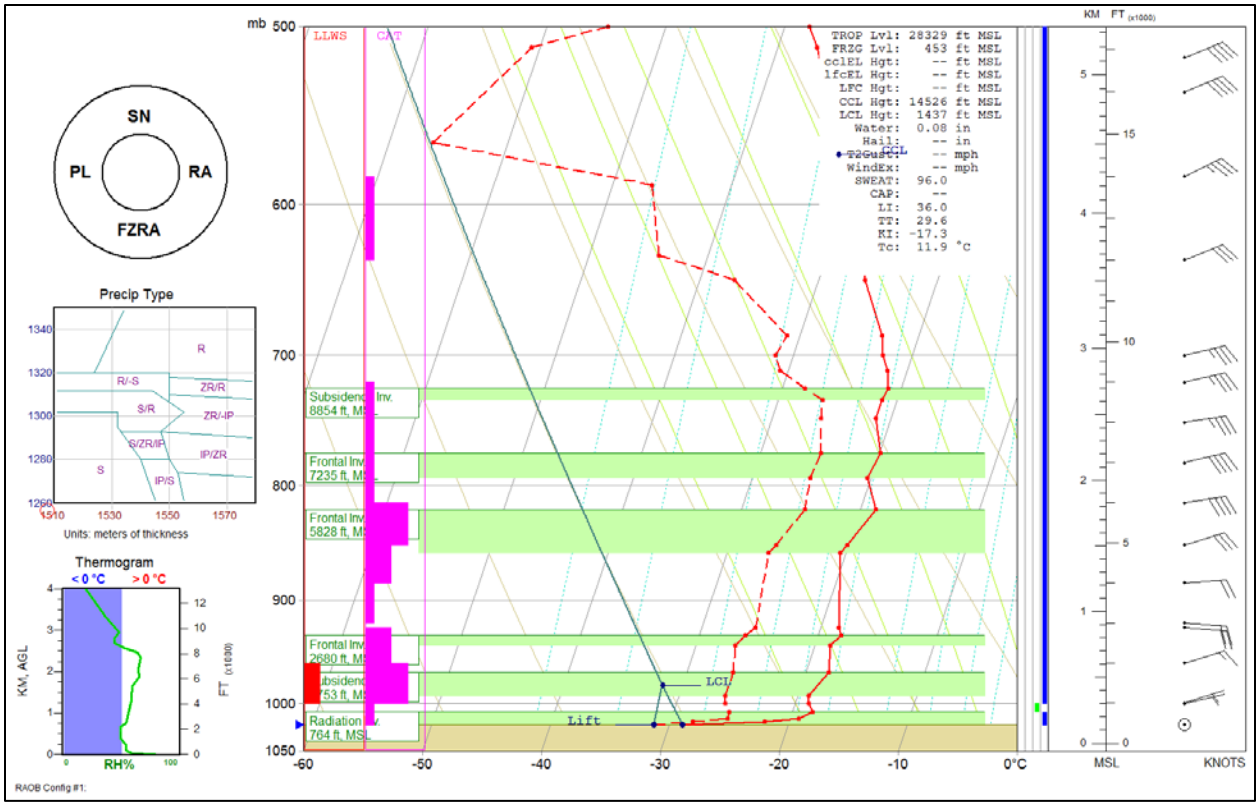

Figure 2 - NWS Fairbanks 1500 AKST sounding

The Fairbanks 1500 AKST sounding depicted a surface based temperature inversion with several other inversions or layers where there was an increase in temperature with altitude below 9,000 feet (shown in green shading on the diagram). The inversions resulted in a Lifted Index (LI)[4] value of 36.0, which indicated an absolutely stable atmosphere. The lifted condensation level (LCL)[5] was identified at 984 feet agl, and the convective condensation level (CCL)[6] at 14,073 feet. No layers were identified with a relative humidity greater than 80% to support clouds, and thus no structural icing conditions were identified.

The sounding wind profile indicated calm surface wind, with winds from the east increasing with height over 20 knots above 2,000 feet with a low-level wind maximum was identified near 6,000 feet with wind from 080° at 38 knots. The mean 0 to 6 kilometer or 18,000 feet wind was from 069° at 31 knots, with the maximum wind was identified at 060° at 52 knots at 24,000 feet with the tropopause height at approximately 28,300 feet.

[4] Lifted Index (LI) - A common measure of atmospheric instability. Its value is obtained by computing the temperature that air near the ground would have if it were lifted to 500-hPa or approximately 18,000 feet and comparing that temperature to the actual temperature at that level.

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

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

The sounding thermal and wind profiles depicted several layers of strong vertical wind shear between 1,700 and 3,000 feet and near the low-level wind maximum between 4,500 and 6,000 feet and indicated a high probability of 80% and greater for moderate and greater turbulence in these layers (indicted in pink bars on the left side of the diagram). In addition, due to the calm surface wind and increase in wind immediately above the surface based inversion, a slight low-level wind shear (LLWS) environment also existed (shown in red on left of the chart). The turbulence potential was not verified by any pilot reports surrounding the period (see section 4.0 below). The observed wind at 983 feet or approximately 1,000 feet was from 075° at 5 knots.

Figure 3 is a table of the observed and derived sounding parameters from the 1500 AKDT sounding from the surface through 10,000 feet.

Height (ft-MSL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD/FF (deg/kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)
453	1022	-28.9	-31.3	80	0/0			
523	1019	-22.1	-28.1	58				
595	1016	-19.3	-25.3	59				
764	1009	-18.3	-25.3	54		LGT		
983	1000	-18.9	-25.9	54	75/5			
1179	992	-19.1	-26.1	54				
1753	969	-18.1	-26.1	50		SVR	LIGHT	
2000	959				70/16			
2445	942	-18.7	-26.7	49				
2680	933	-18.1	-26.1	50		MDT		
2891	925	-18.5	-25.5	54	95/19			
3000	921				95/19	LGT		
4000	884				85/21			
4753	857	-20.5	-26.5	59		MDT		
4952	850	-20.1	-26.1	59	70/28			
5828	820	-18.7	-24.7	59		SVR		
6000	814				80/38			
6614	794	-20.3	-25.1	65		LGT		
7000	782				75/38			
7235	774	-19.9	-24.9	64		LGT		
8097	747	-21.3	-25.9	66	80/34			
8555	733	-21.3	-26.3	64				
8854	724	-21.1	-28.1	53		LGT		
9000	720				75/33			
9292	711	-21.7	-30.7	44				
9668	700	-22.5	-31.5	44	75/33			

Figure 3 - Fairbanks sounding data through 10,0000 feet

4.0 Pilot Reports

The following pilot reports or PIREPs were issued surrounding the period over the Fairbanks area on December 7, 2016. The reports are in standard code and abbreviations as received. The reports are as follows:

FAI UA /OV MLY /TM 1823 /FL000 /TP PA18 /RM STRONG WINDS TREES FLOPPING AROUND=

FAI UA /OV FAI045040 /TM 1852 /FL075 /TP C185 /SK SKC /WX FV99SM /TA M05 /WV 040030KT /TB NEG=

Accident 1943Z

FAI UA /OV FAI070010 /TM 1957 /FL080 /TP C208 /WV 05025KT /TB NEG=

FAI UA /OV 4AK /TM 2026 /FL095 /TP C208 /WV 07041KT /RM SMOOTH RIDE=

FAI UA /OV FAI-INR /TM 2027 /FL070 /TP C180 /SK SKC /WV 05015KT /RM SMOOTH RIDE=

FAI UA /OV RBY-FAI /TM 2029 /FLUNKN /TP C208 /TB LGT /RM LGT CHOP DOWN LOW=

FAI UA /OV FYU-FAI /TM 2149 /FLUNKN /TP C208 /TB NEG /RM SMOOTH RIDE CLEAR SKIES COLD=

TAL UA /OV TAL-FAI270028 /TM 2209 /FL035 /TP PA32 /TB NEG /RM 30KT HEADWIND=

The reports indicated winds from the northeast from 15 to 41 knots below 10,000 feet with no significant reports of any turbulence or LLWS, except from one aircraft (Cessna 208 single engine turboprop) that reported light chop "down low". Chop is defined as a slight rhythmic bumpiness without any appreciable changes in altitude or attitude. One report over Manley Hot Springs Airport (MLY) approximately 72 miles west of the accident site reported strong surface winds with trees flopping around; however, the aircraft was on the ground when the report was made and did not indicate any turbulence.

5.0 Satellite Imagery

The Geostationary Operational Environmental Satellite number 15 (GOES-15) 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) software. Both the infrared long wave and visible band imagery were obtained surrounding the time of the accident.

Figure 4 is the GOES-15 infrared image at 1030 AKST at 4X magnification with the accident site in red, with a resolution of 4 kilometers. The thermal image depicted clear skies over a snow covered terrain in the vicinity of the accident site, which is marked by the red square. Low to mid-level clouds were identified along and north of the stationary front along the coastal sections of Alaska with little clouds over central and northern Alaska.

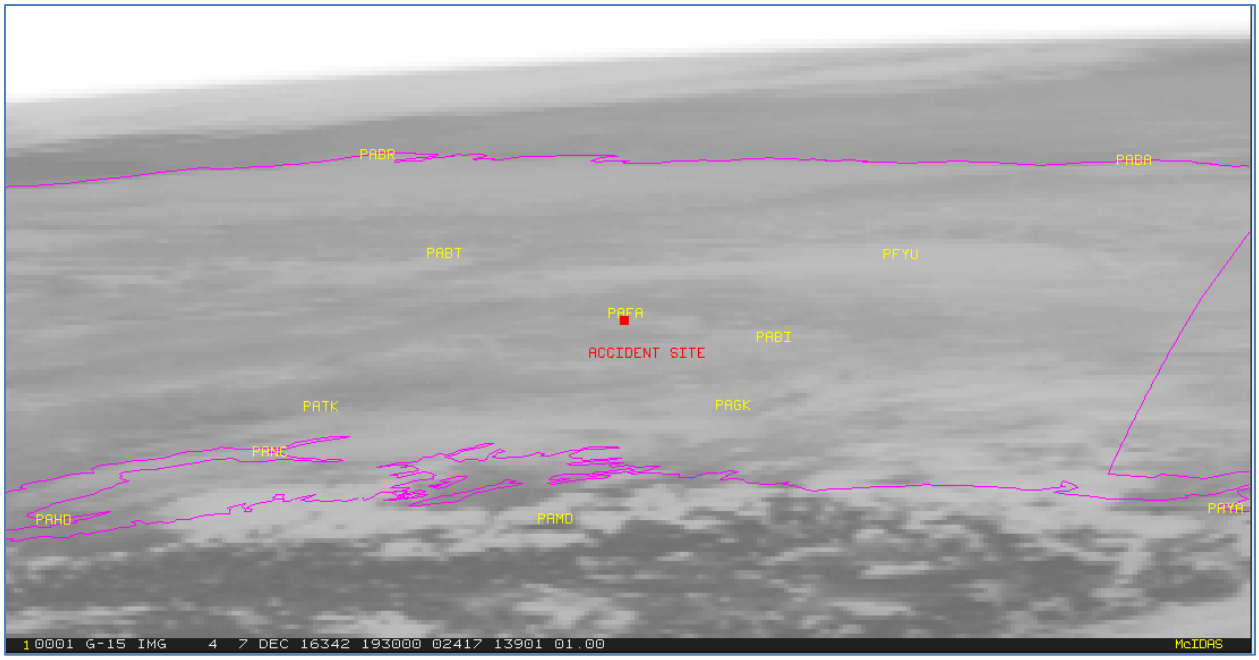

Figure 4 - GOES-15 infrared image at 1030 AKST

Figure 5 is the GOES-15 visible image at 2X magnification at 1030 AKST with a resolution of 1 kilometer and with the accident site noted. The image depicted clear skies over the accident site with snow covered terrain. The extreme north latitude and diminishing light conditions limited a more complete satellite analysis over the region during the period.

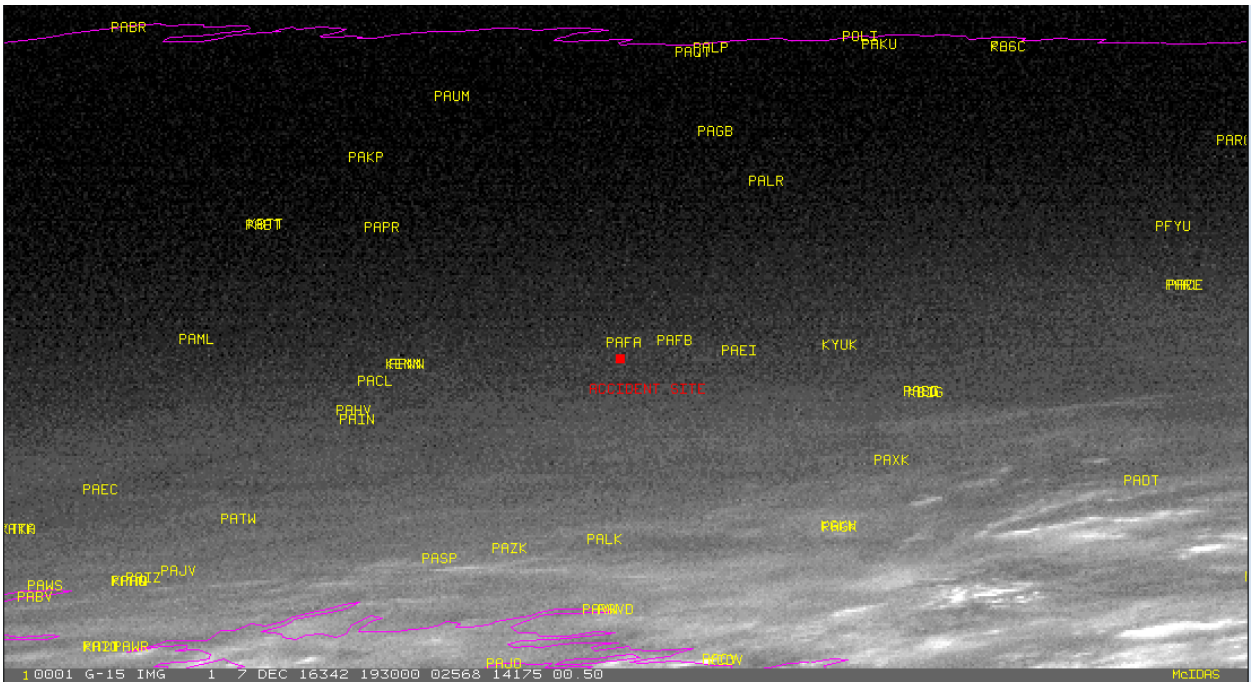

Figure 5 - GOES-15 visible image at 1030 AKST

6.0 Terminal Aerodrome Forecast

The closest Terminal Aerodrome Forecast or TAF to the accident site was issued by the NWS Fairbanks Weather Forecast Office at 0820 AKST and valid for the next 30 hours expected light and variable wind at 3 knots or less, visibility better than 6 miles, and sky clear below 12,000 feet. No significant weather was forecast during the period. The forecast was as follows in standard code:

TAF PAFA 071720Z 0718/0824 VRB03KT P6SM SKC=

7.0 Area Forecast Discussion

The NWS Fairbanks Area Forecast Discussion issued at 0227 AKST in plain language regarding the reasoning behind the forecast is included below. No specific hazards to aviation were identified.

FXAK69 PAFG 071127
AFDAFG

Northern Alaska Forecast Discussion
National Weather Service Fairbanks AK
227 AM AKST Wed Dec 7 2016

.DISCUSSION...

Models...Good run to run continuity in the short term and in a general way trend to similar solutions through the extended periods. Initialized well against the 07/06Z surface analysis. Temperature guidance is still lacking as models bounce all over. Will be using a blend of the solutions for all elements except temperatures where a more hands on approach will be used.

Aloft...At 500 hPa...a ridge extends from the north Pacific over the central Aleutians to the Gulf of Anadyr the northwest to a 556 dam center over the northwest coast this morning. The ridge remains stationary through Thursday morning as a 558 dam high center separates from the ridge and moves over the western arctic. By Friday morning the ridging over the central Bering Sea remains stationary with ridging extending northwest across the Chukotsk peninsula to the 558 dam center 300 nm north of Point Barrow. The pattern takes more of an omega signature as a 529 dam low develops over Bristol Bay Thursday evening, then moves south, with yet another 529 dam low developing over Bristol Bay in its wake. By Saturday morning the ridging over the arctic takes more of a west to east orientation as the troughing over Bristol Bay pushes west over the Pribilof Islands. At 850 hPa...The Fairbanks upper air sounding had 17.2 celsius below at 3 pm yesterday. This was around 4 degrees cooler than the 3 am observation. Models currently indicate temperatures will remain about the same through Thursday then a slow warming trend through the weekend.

Surface...Not much change since yesterday, a 1057 mb high center sits over the Northwest Territories with ridging extending west and south over the forecast area, and will persist into the weekend. A 1012 mb low that was over Kodiak Island yesterday has moved into the western Gulf of Alaska and will remain relatively stationary, then drift southwest before eventually merging with a low in the northeast Pacific. The local gusty winds that occur are really impacting the temperature forecasts, models continue to show some compacted pressure gradients in some of the drainages, and winds are gusting over the summits around the interior to around 30 mph. There are also some indications that the Tanana Valley jet may kick in around Delta Junction and that will also impact temperatures around Delta Junction.

Arctic Coast and Brooks Range...A pesky patch of stratus is easily identified on the NPP-VIIRS SPoRT nighttime Microphysics product at 07/0018Z. It extends from about 200 nm north of Point Barrow to point Barrow, then east over the coast to Harrison Bay. The patch is about 100 nm wide in some places and has been lingering in the area for the past 24 hours or so impacting the aviation forecasts. Another small patch is hanging around Nuiqsut impacting that site. Otherwise mostly clear skies will continue. Winds generally east to southeast at 5 to 15 mph. Low temperatures will range from around 20 below along the coast to around 35 below in some of the coastal plains locations, while highs will range from around 10 below to around 30 below.

West Coast and Western Interior...Quiet the next few days. Mostly clear conditions continue. Winds along the coast northeast to southeast at 5 to 15 mph, inland winds will generally be less than 10 mph. Temperatures warmer in the windier locations. Coldest temperatures will be in the middle Yukon Valley with lows around 25 below Thursday morning. Temperatures across the area will be slowly warming starting Thursday afternoon.

Central and Eastern Interior...The forecast challenge will be the winds. If they pick up temperatures will be warmer in the windy locations. Areas with light or no winds will generally stay cold. Will forecast worst scenario, but temperatures in some areas could be 20 degrees warmer than forecast again today. The coldest temperatures will continue to be in the upper Yukon Flats. Temperatures across the area will be warmer starting Friday. Some stratus has moved into the upper Tanana Valley and Fortymile country south of a line from Eagle to Chicken. Northway has been reporting light snow most of the last 24 hours and that will continue into the afternoon before tapering back to flurries. Accumulation will be less than an inch.

&&

Coastal Hazard Potential Days 3 and 4...None.

&&

.AFG WATCHES/WARNINGS/ADVISORIES...

Heavy Freezing Spray Warning for PKZ210-PKZ220-PKZ225.

Brisk Wind Advisory for PKZ245.

8.0 Area Forecast

The NWS Area Forecast issued for the Tanana Valley where the accident occurred was issued at 0415 AKST and was valid through the time of the accident to 1215 AKST. The forecast was as follows:

FAIH FA 071315
AK NRN HLF...
.
AIRMETS VALID UNTIL 072115
CB IMPLY POSSIBLE SEV OR GREATER TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HEIGHTS NOTED BY AGL OR CIG.
.
SYNOPSIS VALID UNTIL 080700
STG HI PRES WL PRST OVR NWRN CANADA. ASSOCD RDG EXTENDING W AND SW TO ST LAWRENCE ISLAND WL PRST. A DRY AND WK LEESIDE TROF WL PRST JUST N OF THE BROOKS RNG.

.
TANANA VLY FC...VALID UNTIL 080100
...CLOUDS/WX...
SE PABI SCT035 BKN050 TOP 100. OCNL BKN035 VIS 4SM -SN. ELSW SKC.
OTLK VALID 080100-080700...VFR. E PABI -SN.
PASSES...ISABEL...VFR. MENTASTA...MVFR CIG SN.
...TURB...
****AIRMET TURB***TIL 22Z VLYS SW PAML-PAIN LN OCNL MOD TURB BLW 040. WKN...*
OTRW VLYS PANN W ISOL MOD TURB BLW 040.
****AIRMET LLWS***NW PANN AREAS OF LLWS. NC...*
...ICE AND FZLVL...
NIL SIG. FZLVL SFC.
.

The forecast indicated high pressure ridge extended over the area with clear skies expected over the Tanana Valley. The significant clouds and weather included an area of occasional ceiling broken at 3,500 feet with visibility 4 miles in light snow southeast of Allen Army Airfield, Delta Junction/Fort Greeley, to the south-southeast of the area. The outlook expected VFR conditions to prevail over the region. With regards to hazards, the forecast included an AIRMET for turbulence over the extreme southwestern portion of the Tanana Valley below 4,000 feet, and an area of low-level wind shear in the vicinity northwest of Nenana (PANN). No icing was expected over the area.

9.0 Graphic Area Forecasts

The NWS Alaska Aviation Weather Unit (AAWU) graphic version of the area forecast are included below. Figure 6 is the AAWU Surface Forecast issued at 0500 AKST and valid for 0900 AKST (1800Z) with the approximate accident site marked by the red star. The chart depicted a high pressure ridge extending over the region with no significant weather over the Fairbanks area; however, an area of precipitation in the form of snow was expected to the south and southeast of the area associated with the trough of low pressure extending from the low pressure system in the Anchorage area northward and the stationary front along the coastal region.

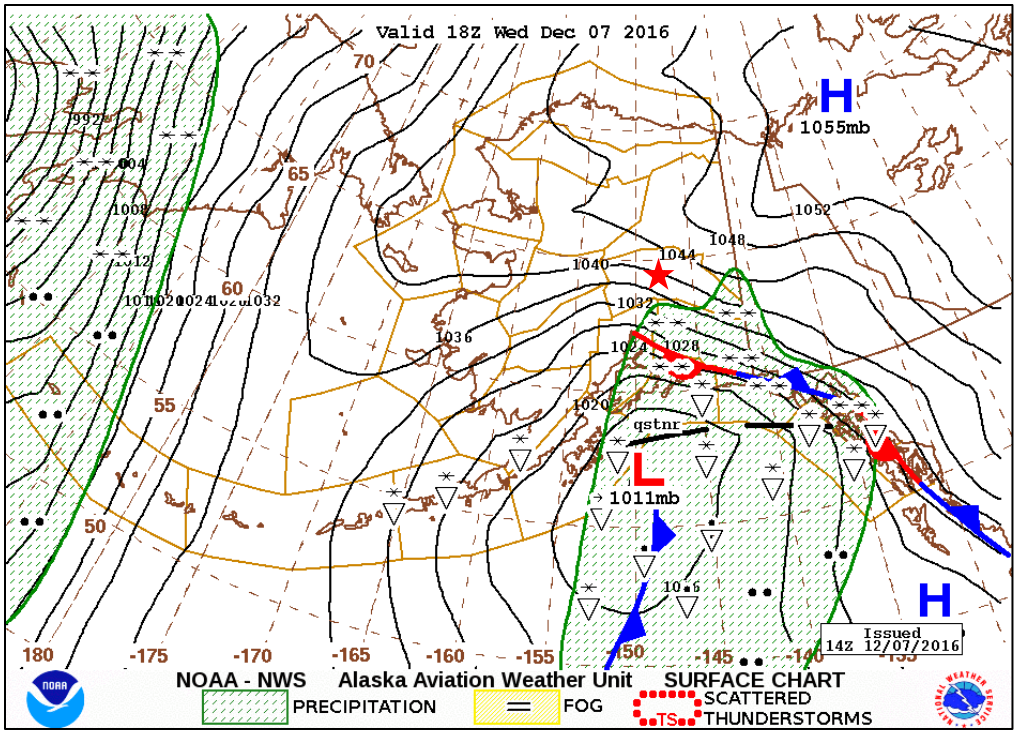

Figure 6 – AAWU Surface Forecast valid at 1000 AKST

Figure 7 is the AAWU Flying Weather Forecast providing the general flight category[7] and where strong surface winds of 30 knots or more are expected for the period from 1000 through 1600 AKST, which was issued at 0400 AKST. The chart depicted VFR conditions expected to prevail over the Fairbanks area with MVFR conditions to the south-southeast and extending along the southeast Alaska coastal region.

[7] 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 or lowest layer of clouds reported as broken, overcast or the vertical visibility into a surface based obscuration below 500 feet 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 feet agl and/or visibility 3 to 5 miles.
- Visual Flight Rules (VFR) – ceiling greater 3,000 feet agl and visibility greater than 5 miles.

* By definition, IFR is a ceiling less than 1,000 feet 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 feet agl and visibility greater than 5 miles while MVFR is a sub-category of VFR.

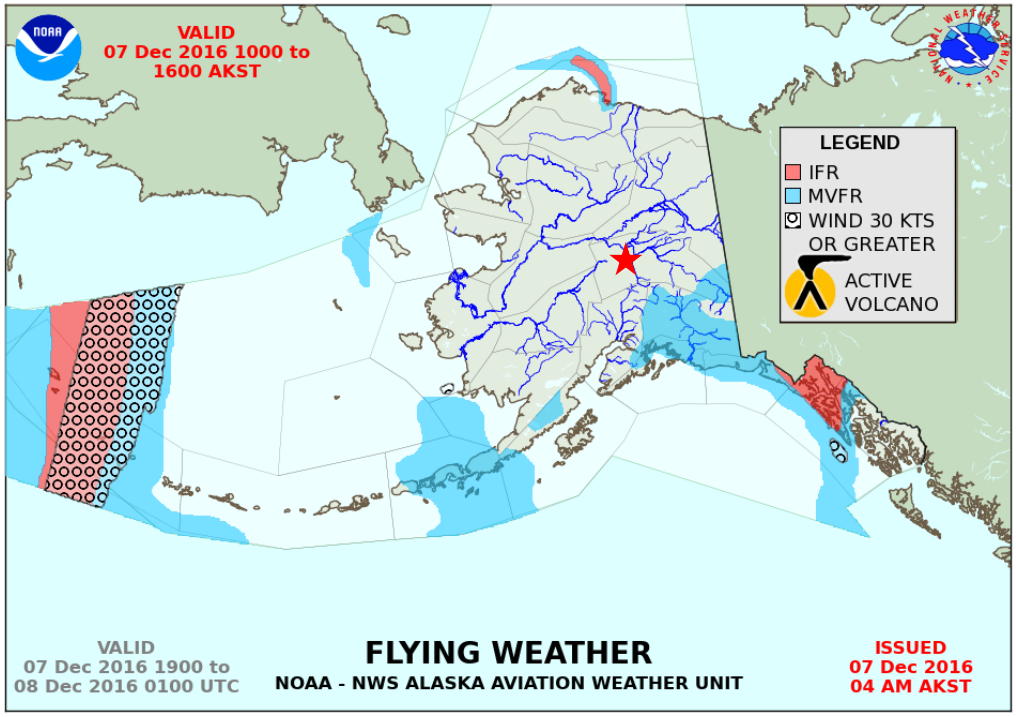

Figure 7 - AAWU Flying Weather forecast

The low-level turbulence forecast issued at 0400 AKST and valid for the period is included in figure 8. The morning forecast included a risk of low-level wind shear over the region and isolated moderate turbulence below 4,000 feet.

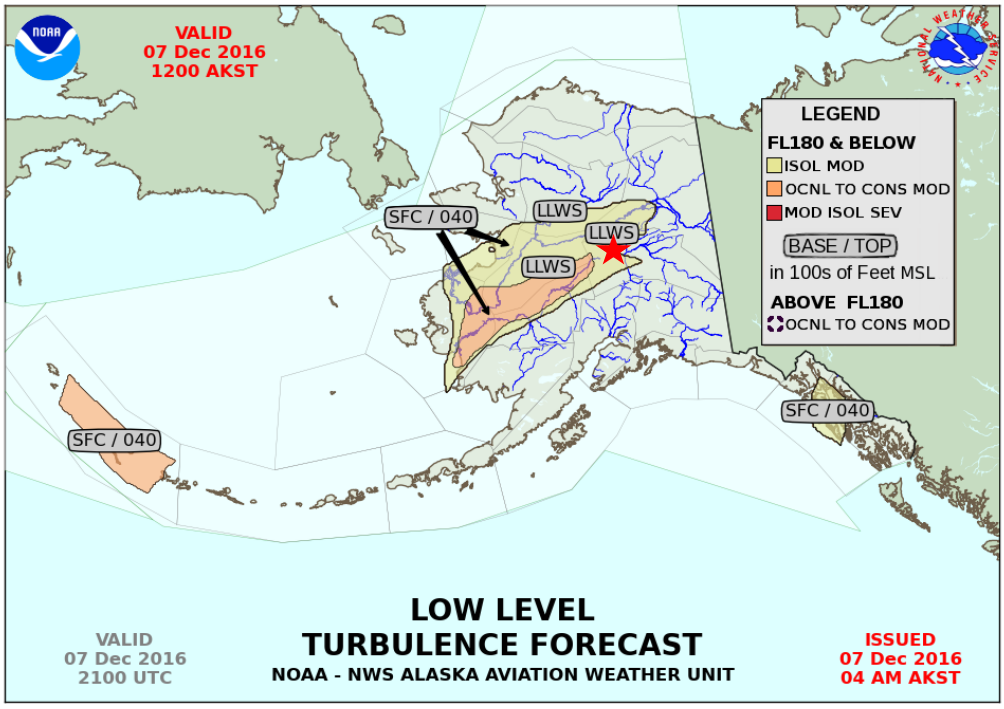

Figure 8 - Low-Level Turbulence Forecast valid for the period

10.0 Winds and Temperature Aloft Forecast

The NWS 6-hour Winds and Temperature Aloft forecast for the Fairbanks issued at 0456 AKST and valid for 0900 AKST and for use between 0900 and 1200 AKST is included below. The forecast for 3,000 feet expected an easterly wind or 090° at 17 knots, with wind speeds increasing with height with a slight backing or counterclockwise change in wind to the northeast with height. At 6,000 feet the wind was from 080° at 31 knots with a temperature of -19° C.

FBAK31 KWNO 071356 DATA BASED ON 071200Z VALID 071800Z FOR USE 1400-2100Z. TEMP NEGATIVE ABV 24000							
FB	3000	6000	9000	12000	18000	24000	30000
FAI	0917	0831-19	0735-22	0738-26	0647-37	0659-47	055255

The forecast was updated at 1100 AKST with little variation from the previous forecast.

FBAK31 KWNO 072000 DATA BASED ON 071800Z VALID 080000Z FOR USE 2000-03000Z. TEMP NEGATIVE ABV 24000							
FB	3000	6000	9000	12000	18000	24000	30000
FAI	0919	0832-18	0736-21	0734-27	0639-38	0654-47	054254

11.0 Astronomical Conditions

The United States Naval Observatory website provided the following astronomical data for Fairbanks, Fairbanks North Star Borough, Alaska on December 7, 2016.

Beginning civil twilight	0917 AKST
Sunrise	1037 AKST
Accident	1043 AKST
Sunset	1448 AKST
End of civil twilight	1608 AKST

At the approximate time of the accident the sun was 0.1°above the horizon at an azimuth of 153°.

Figure 9 - Approximate Sun location at the time of the accident

Submitted by:

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Don Eick
Senior Meteorologist