



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

January 7, 2021

Specialist's Factual Report

METEOROLOGY

CEN21LA044

Table Of Contents

A. ACCIDENT	3
B. METEOROLOGIST	3
C. DETAILS OF THE INVESTIGATION	3
D. FACTUAL INFORMATION	4
1.0 Synoptic Situation	4
1.1 Surface Analysis Chart	4
1.2 Upper Air Charts	5
2.0 Surface Observations	8
3.0 Upper Air Data	12
4.0 Satellite Data	14
5.0 Regional Radar Imagery Information	14
6.0 Pilot Reports	15
7.0 SIGMET	15
8.0 CWSU Advisories	15
9.0 AIRMETs	15
10.0 Graphical Forecasts for Aviation	16
11.0 Terminal Aerodrome Forecast	16
12.0 NWS Area Forecast Discussion	17
13.0 Winds and Temperature Aloft Forecast	19
14.0 Pilot Weather Briefing	19
15.0 Witness Information	20
16.0 Astronomical Data	20
E. LIST OF ATTACHMENTS	20

A. ACCIDENT

Location: Dunn Center, North Dakota
Date: November 7, 2020
Time: 1918 central standard time
0118 Coordinated Universal Time (UTC) November 8, 2020
Airplane: Piper PA-22-135; Registration: N3606A

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 including the National Centers for Environmental Information (NCEI). This specialist factual contains the meteorological factors perinate to the weather surrounding the accident time. All times are central standard time (CST) on November 7, 2020, and are based upon the 24-hour clock, where local time is -6 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 airport and 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.

The accident site was located at latitude 47.2272° N, Longitude 102.5167° W, with an approximate elevation of 2,395 feet (ft).

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.¹

1.1 Surface Analysis Chart

A northcentral section of the NWS Surface Analysis Chart for 2100 CST is provided as figure 1 with the approximate location of the accident site marked by the red circle. The 2100 CST chart depicted a frontal boundary stretching across northern Minnesota through northern South Dakota and into southern Montana. A trough² was located in central Montana. A series of low pressure systems were located in southern Montana, western Minnesota, and northern Wisconsin, with pressures of 989-, 1001-, and 1011-hectopascals (hPa), respectively. The accident site was located north of the frontal boundary.

The station models depicted air temperatures in the low to mid 30’s Fahrenheit (°F), dew point temperatures in the low 30’s°F with temperature-dew point spreads of 2°F or less, an east to northeast wind of 5 to 10 knots, and cloudy skies with mist and fog in central and northwestern North Dakota and clear skies in southwestern North Dakota.

¹

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

² Trough – An elongated area of relatively low atmospheric pressure or heights.

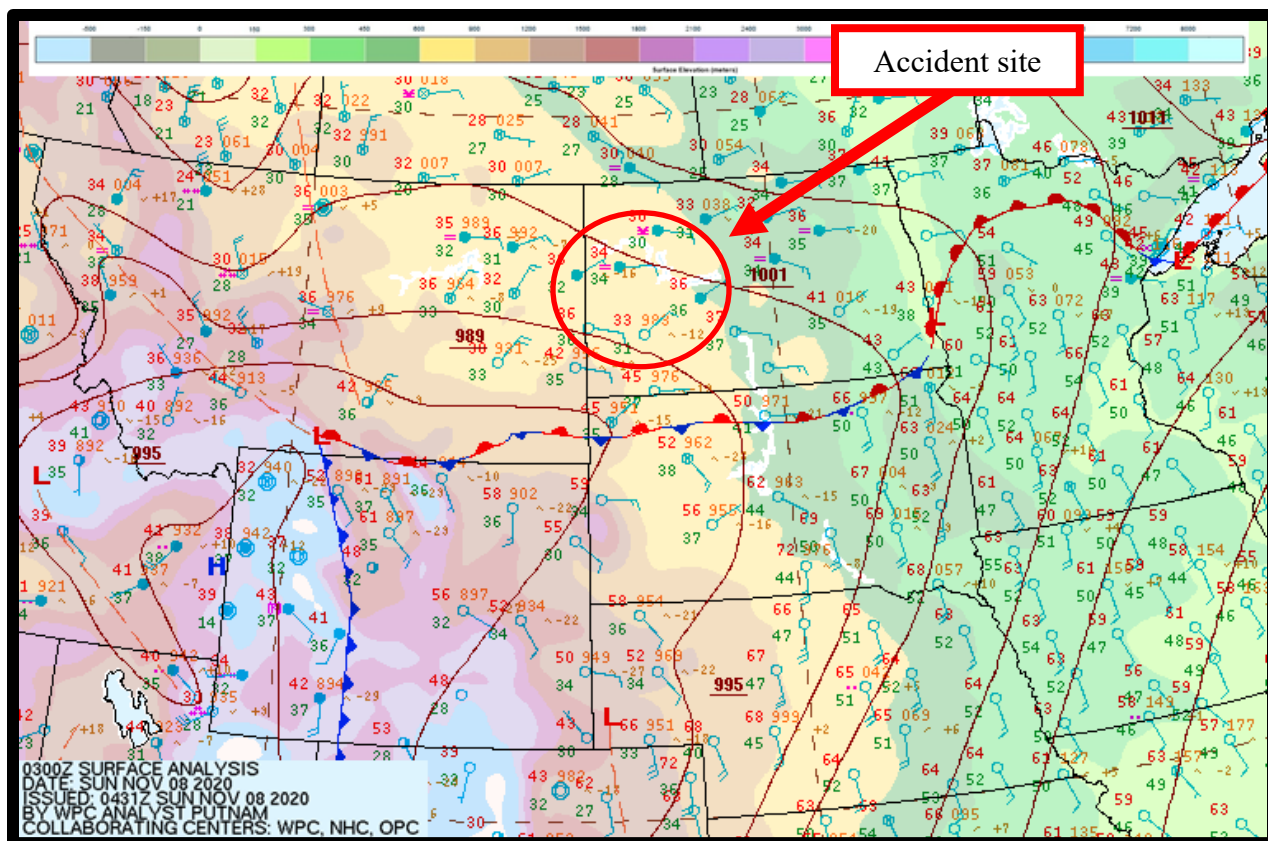


Figure 1 – NWS Surface Analysis Chart for 2100 CST

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 1800 CST at 850-, 700- and 500-hPa are presented in figures 2 through 4. A trough was located above the accident site at 700-hPa (figure 3). Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present. There was a south wind around 20 knots at 850-hPa (figure 2) with the wind becoming southwesterly by 700-hPa (figure 3). The wind speed increased from the surface to 35 knots by 700-hPa and to 45 knots by 500-hPa (figure 4).

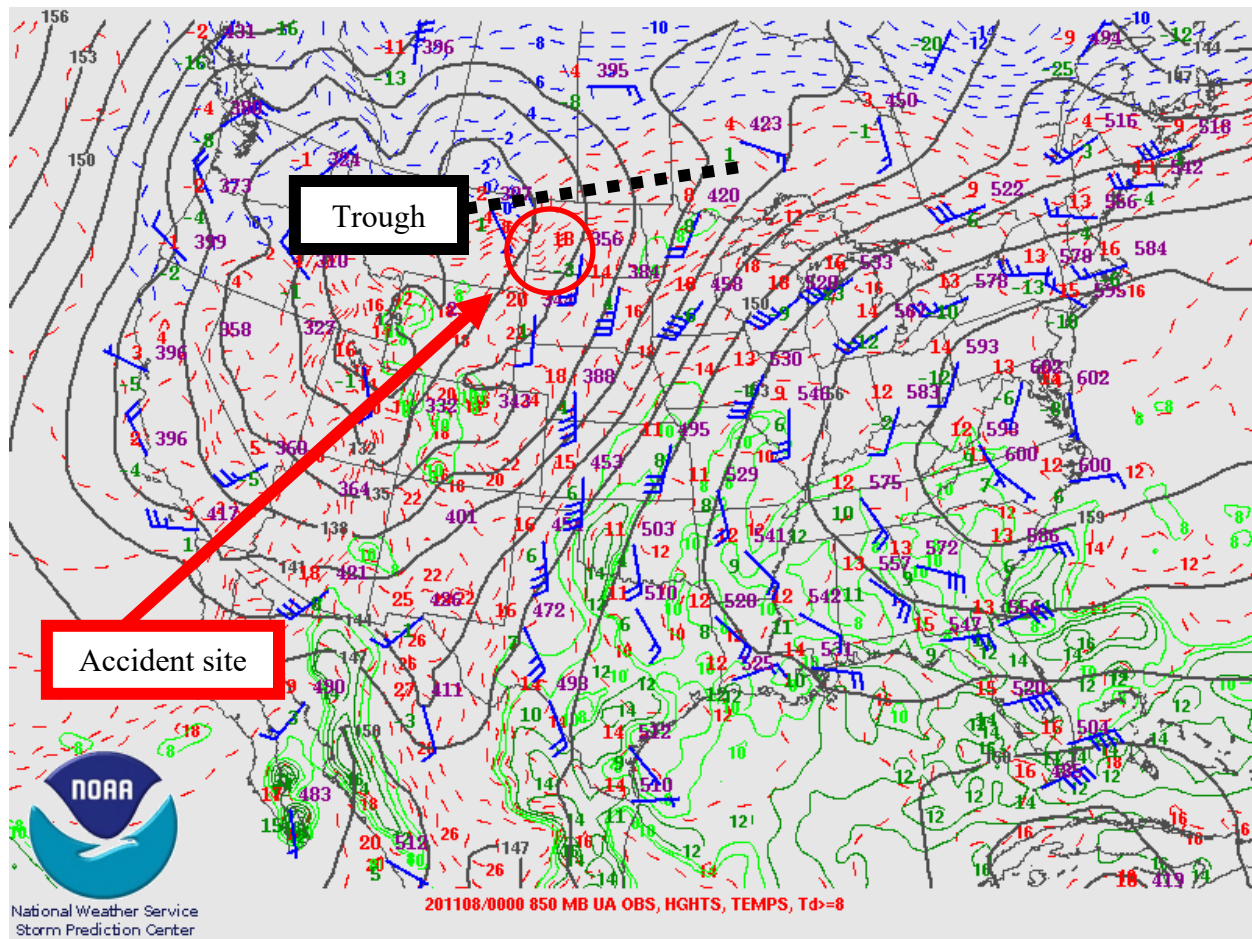


Figure 2 – 850-hPa Constant Pressure Chart for 1800 CST

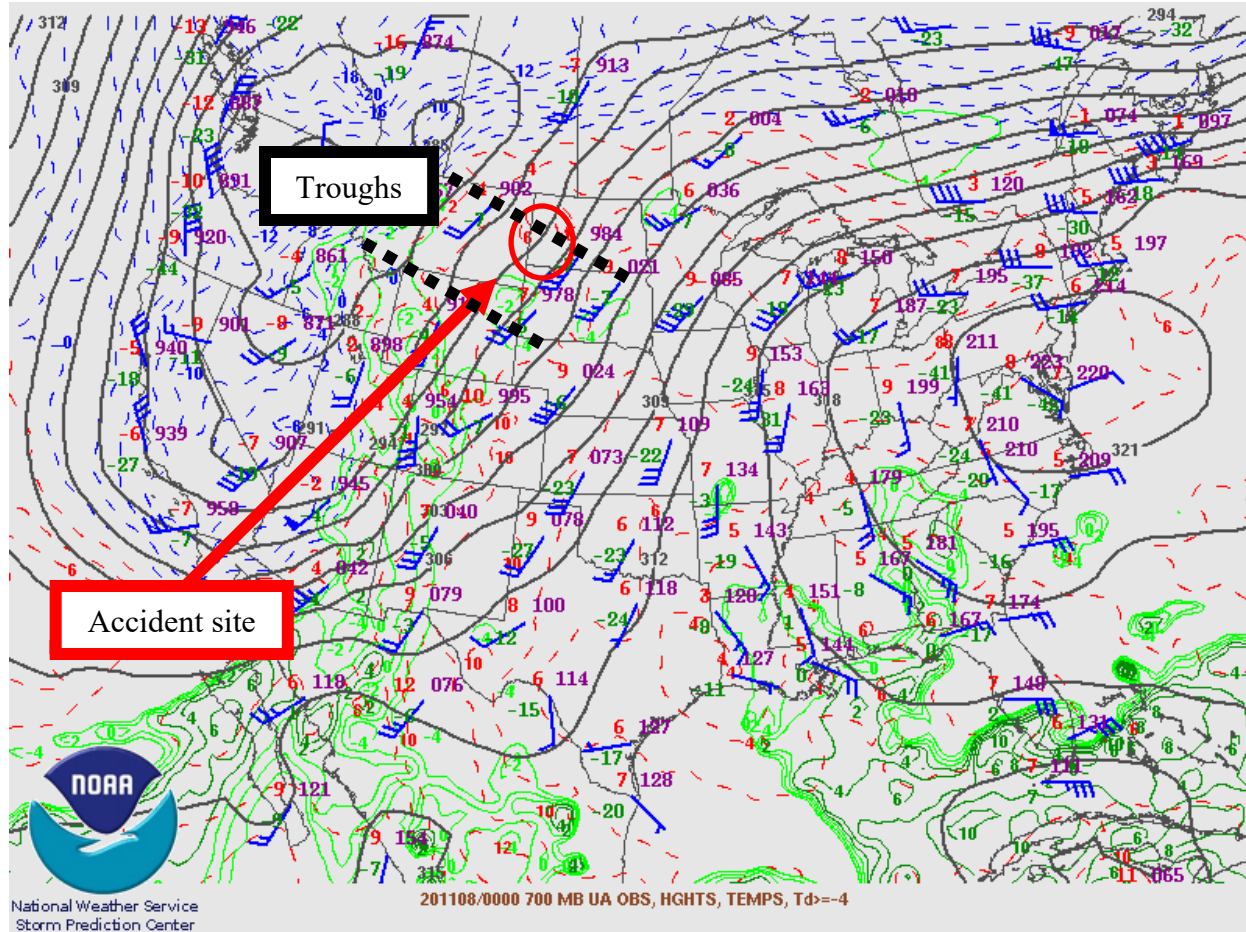


Figure 3 – 700-hPa Constant Pressure Chart for 1800 CST

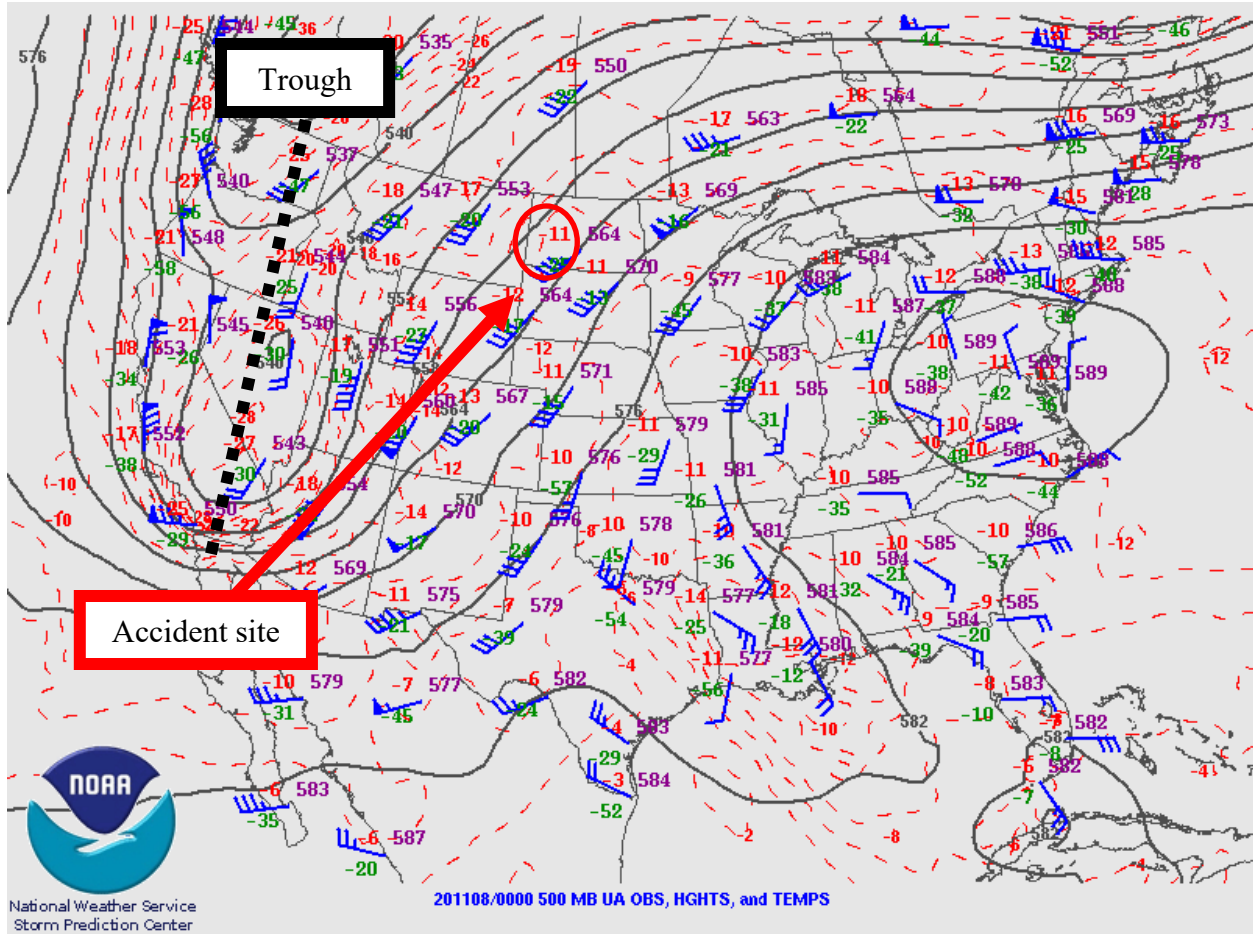


Figure 4 – 500-hPa Constant Pressure Chart for 1800 CST

2.0 Surface Observations

The area surrounding the accident site was documented using official Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). The following observations were taken from standard code and are provided in plain language. Figure 5 is a local sectional chart with the accident site and the closest weather reporting locations marked.



Figure 5 – Sectional map of the accident area with the location of the accident site and surface observation sites

Dickinson – Theodore Roosevelt Regional Airport (KDIK) had the closest official weather station to the accident site. KDIK had an Automated Surface Observing System (ASOS³) whose longline⁴ reports were not supplemented. The KDIK ASOS site was located 28 miles south-southwest of the accident site, at an elevation of 2,592 ft, and had an 7° easterly magnetic variation⁵ (figure 5). The following observations were taken and disseminated during the times surrounding the accident:⁶

[1509 CST] SPECI KDIK 072109Z AUTO 12011KT 10SM SCT010 05/01 A2949 RMK
AO2 T00500006=

[1556 CST] METAR KDIK 072156Z AUTO 11013KT 10SM CLR 06/01 A2947 RMK
AO2 SLP997 T00560006=

³ ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, ceiling, temperature, dewpoint, altimeter, and barometric pressure.

⁴ “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.

⁵ Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>

⁶ The bold sections in this NWS product and the rest of the 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 this section next to the METARs are provided for quick reference between UTC and local times around the accident time.

[1656 CST] METAR KDIK 072256Z AUTO 10010KT 10SM CLR 04/00 A2945 RMK
AO2 SLP992 T00390000=

[1756 CST] METAR KDIK 072356Z AUTO 09009KT 10SM CLR 02/M01 A2945 RMK
AO2 SLP994 T00221006 10061 20000 56012=

***[1856 CST] METAR KDIK 080056Z AUTO 09011KT 10SM CLR 02/00 A2944 RMK
AO2 SLP992 T00170000=***

ACCIDENT TIME 1918 CST

***[1956 CST] METAR KDIK 080156Z AUTO 09010KT 10SM CLR 02/00 A2943 RMK
AO2 SLP989 T00170000=***

[2056 CST] METAR KDIK 080256Z AUTO 05008KT 8SM CLR 01/M01 A2941 RMK
AO2 SLP983 T00061006 58012=

KDIK weather observation at 1856 CST, automated, wind from 090° at 11 knots, visibility 10 miles or greater, clear skies below 12,000 ft above ground level (agl), temperature of 2° Celsius (C), dew point temperature of 0°C, and an altimeter setting of 29.44 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator, sea level pressure 999.2 hPa, temperature 1.7°C, dew point temperature 0.0°C.

KDIK weather observation at 1956 CST, automated, wind from 090° at 10 knots, visibility 10 miles or greater, clear skies below 12,000 ft agl, temperature of 2°C, dew point temperature of 0°C, and an altimeter setting of 29.43 inHg. Remarks: automated station with a precipitation discriminator, sea level pressure 998.9 hPa, temperature 1.7°C, dew point temperature 0.0°C.

Mercer County Regional Airport (KHZE) had the next closest official weather station to the accident site. KHZE had an Automated Weather Observing System (AWOS⁷) whose reports were not supplemented. The KHZE AWOS site was located 38 miles east of the accident site, at an elevation of 1,814 ft, and had an 6° easterly magnetic variation⁸ (figure 5). The following observations were taken and disseminated during the times surrounding the accident:⁹

[1815 CST] METAR KHZE 080015Z AUTO 07005KT 10SM OVC011 03/02 A2955 RMK
AO2=

⁷ AWOS – Automated Weather Observing System is equipped with meteorological instruments to observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to 12,000 feet, and altimeter setting.

⁸ Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>

⁹ The bold sections in this NWS product and the rest of the 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 this section next to the METARs are provided for quick reference between UTC and local times around the accident time.

[1835 CST] METAR KHZE 080035Z AUTO 08006KT 10SM OVC011 02/02 A2954 RMK AO2=

[1855 CST] METAR KHZE 080055Z AUTO 08008KT 10SM OVC010 02/02 A2954 RMK AO2=

[1915 CST] METAR KHZE 080115Z AUTO 08007KT 10SM BKN010 02/02 A2954 RMK AO2=

ACCIDENT TIME 1918 CST

[1935 CST] METAR KHZE 080135Z AUTO 08009G14KT 10SM BKN009 02/02 A2952 RMK AO2=

[1955 CST] METAR KHZE 080155Z AUTO 08006G12KT 10SM OVC007 02/02 A2952 RMK AO2=

[2015 CST] METAR KHZE 080215Z AUTO 08005KT 10SM OVC007 02/02 A2952 RMK AO2=

KHZE weather observation at 1915 CST, automated, wind from 080° at 7 knots, visibility 10 miles or greater, broken ceiling at 1,000 ft agl, temperature of 2°C, dew point temperature of 2°C, and an altimeter setting of 29.54 inHg. Remarks: automated station with a precipitation discriminator.

KHZE weather observation at 1935 CST, automated, wind from 080° at 9 knots with gusts to 14 knots, visibility 10 miles or greater, broken ceiling at 900 ft agl, temperature of 2°C, dew point temperature of 2°C, and an altimeter setting of 29.52 inHg. Remarks: automated station with a precipitation discriminator.

The observations from KDIK surrounding the accident time indicated VFR¹⁰ conditions while observations from KHZE indicated IFR conditions.

¹⁰ 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 Data

A High-Resolution Rapid Refresh (HRRR)¹¹ model sounding was created for the accident site for 2000 CST with a station elevation of 2,274 ft.¹² The HRRR sounding was plotted on a standard Skew-T Log P diagram¹³ with the derived stability parameters included in figure 6 with data from the surface to 700-hPa (or approximately 10,000 ft msl). These data were analyzed using the RAOB¹⁴ software package. The sounding depicted the lifted condensation level (LCL)¹⁵ at 2,604 ft msl (~330 ft agl) and the convective condensation level (CCL)¹⁶ at 13,909 ft msl. The freezing level was located at 12,098 ft msl. The precipitable water value was 0.64 inches.

¹¹ The HRRR is a NOAA real-time three-kilometer resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by three-kilometer grids with three-kilometer radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a one hour period.

¹² HRRR sounding was created using NOAA Air Resource Laboratory: <https://ready.arl.noaa.gov/READYamet.php>

¹³ 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.

¹⁴ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Eosonde Research Services (ERS) previously known as Environmental Research Services, The Villages, Florida.

¹⁵ LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹⁶ 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.

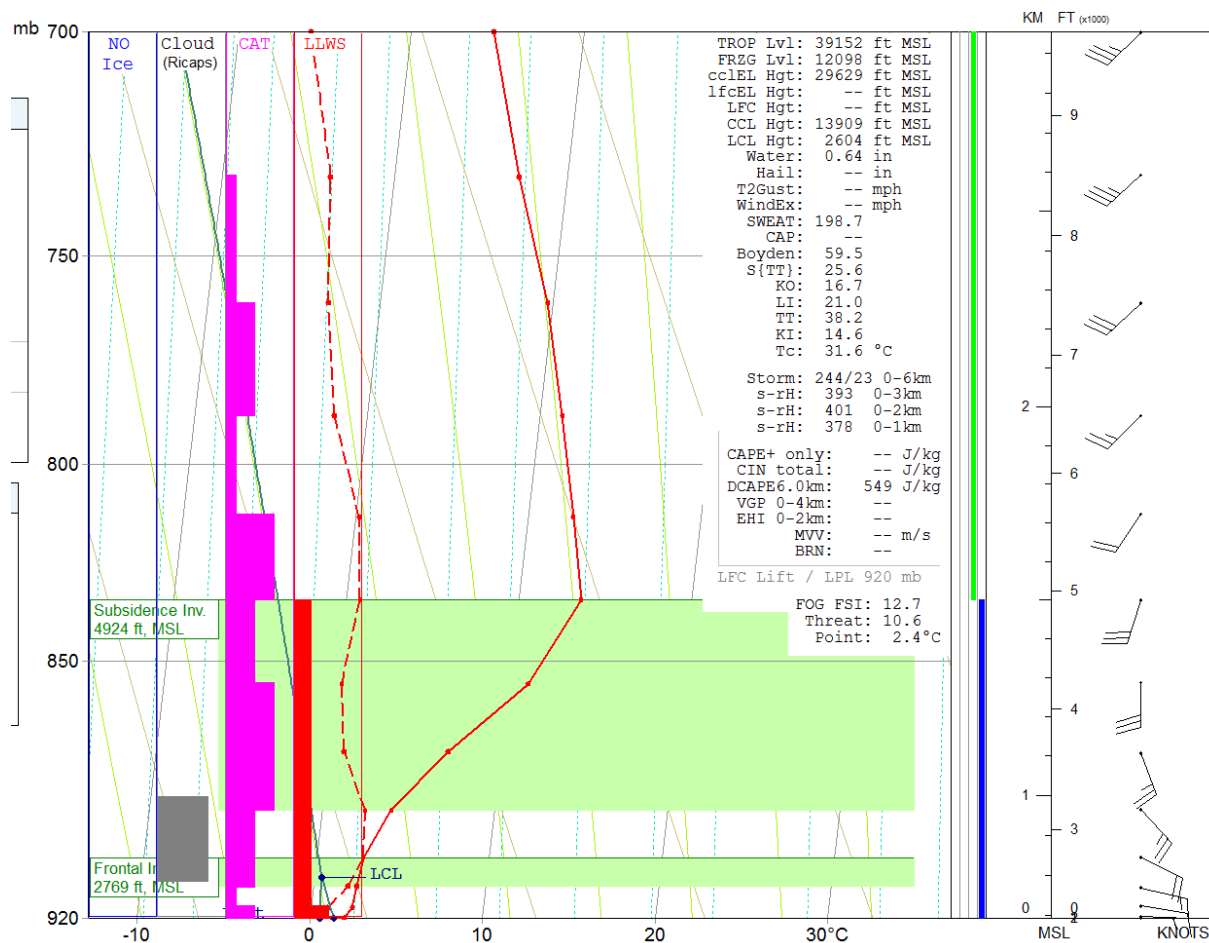


Figure 6 – 2000 CST HRRR sounding

The 2000 CST HRRR sounding for the accident site indicated a stable environment from the surface through 5,000 ft above msl with a frontal inversion¹⁷ at 2,769 ft above msl and a subsidence inversion at 4,924 ft above msl. RAOB identified the possibility of clouds between 2,700 and 3,500 ft above msl.

The 2000 CST HRRR sounding wind profile indicated a near surface wind from 090° at 6 knots with the wind remaining easterly through 3,000 ft above msl. The wind speed increased to 20 knots by 3,000 ft above msl (~700 ft agl). The wind veered¹⁸ to the southwest by 5,500 ft above msl and the wind increased in speed to 35 knots by 10,000 ft above msl. RAOB indicated the possibility of moderate low-level wind shear (LLWS) between the surface and 5,000 ft above msl. RAOB algorithm also indicated that moderate or greater clear-air turbulence existed in several layers between the surface and 10,000 ft above msl.

¹⁷ Inversion – A departure from the usual decrease of the value of an atmospheric property with increasing altitude; also, the layer through which this departure occurs (the "inversion layer"), or the lowest altitude at which the departure is found (the "base of the inversion").

¹⁸ A clockwise turning of the wind with height in the northern hemisphere.

4.0 Satellite Data

The Geostationary Operational Environmental Satellite number 16 (GOES-16) 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-16 bands 2 and 13) at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period from 1600 CST through 2200 CST and reviewed, and the closest images to the time of the accident were documented. Given the sun angle the visible imagery (band 2) did not provide useful information.

Figure 7 presents the GOES-16 infrared imagery from 1920 CST at 4X magnification with the accident site highlighted with a red square. The lower brightness temperatures (green colors; higher cloud tops) were located above and to the northeast through southwest of the accident site. Based on the brightness temperatures above the accident site and the vertical temperature profile provided by the 2000 CST HRRR sounding, the approximate cloud-top heights over the accident site were 27,000 ft above msl at 1920 CST (238 Kelvin, not shown). It should be noted these figures have not been corrected for any parallax error.

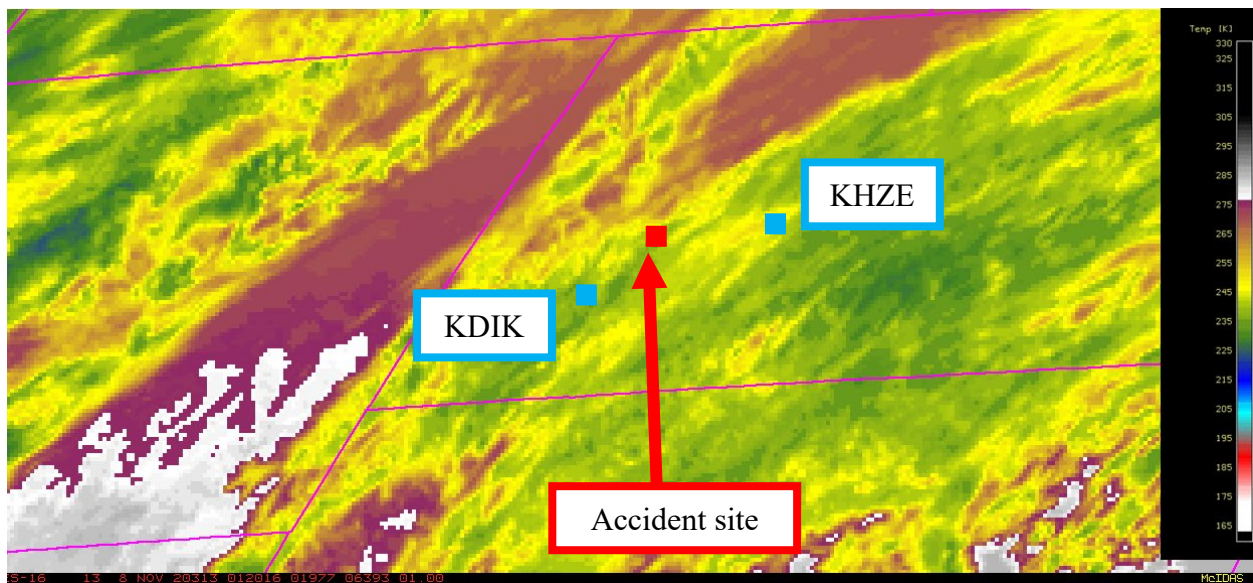


Figure 7 – GOES-16 infrared image at 1920 CST

5.0 Regional Radar Imagery Information

A regional view of the NWS National Composite Radar Mosaic is included as figure 8 for 1920 CST with the approximate location of the accident site marked by the red circle. The image did not depict any precipitation echoes above the accident site.

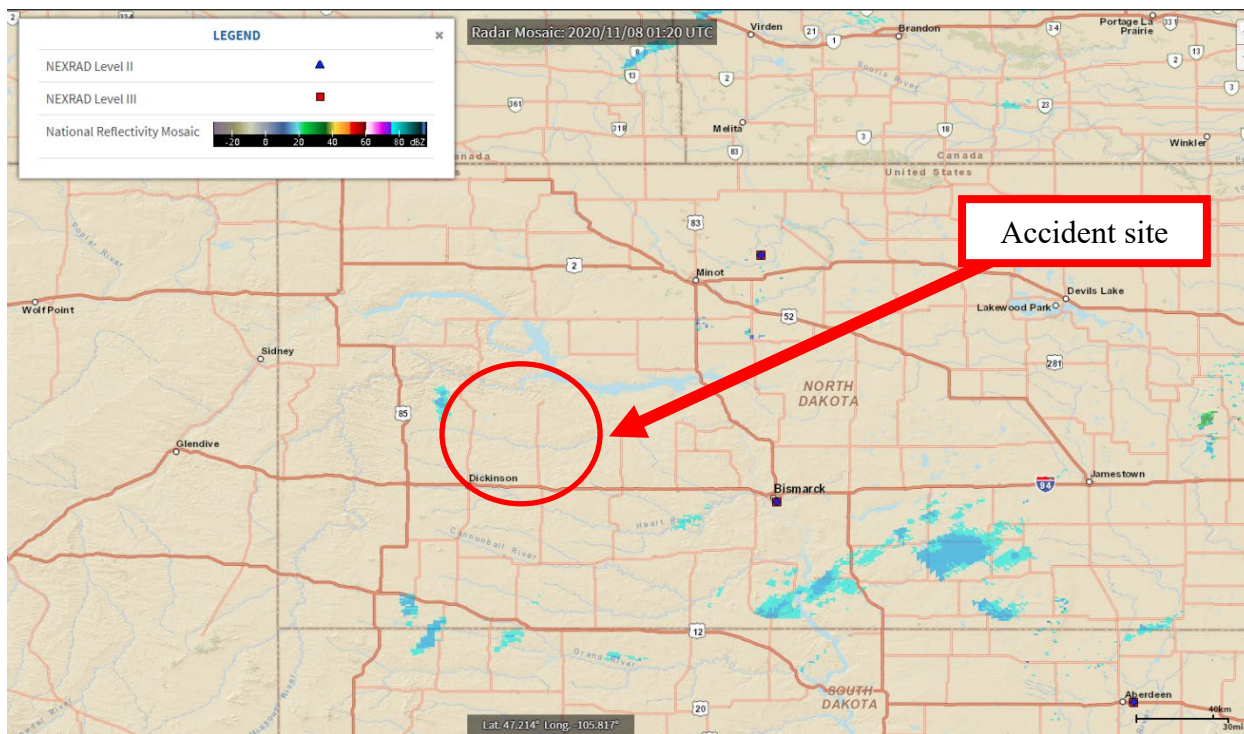


Figure 8 – Regional Composite Reflectivity image for 1920 CST

6.0 Pilot Reports

There were no publicly longline-disseminated pilot reports¹⁹ (PIREPs²⁰) distributed into the national airspace (NAS) within 100 miles of the accident site from about two hours prior to the accident time to two hours after the accident time for below 18,000 ft above msl.

7.0 SIGMET

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

8.0 CWSU Advisories

There were no Center Weather Service Unit (CWSU) Meteorological Impact Statements (MIS) or Center Weather Advisories (CWA) valid at the accident site at the accident time.

9.0 AIRMETs

An Airmen's Meteorological Information (AIRMET) advisory Sierra was valid for the accident site at the accident time. The AIRMET warned of IFR conditions due to mist and fog:

¹⁹ These do not include pilot reports only broadcast via radio.

²⁰ Only pilot reports with the World Meteorological Organization headers UBMT**, UBND**, and UBSD** were considered.

WAUS43 KKCI 080002 AAA
 WA3S
 -CHIS WA 080002 AMD
 AIRMET SIERRA UPDT 9 FOR IFR VALID UNTIL 080300
 .
 AIRMET IFR...MN WI LS MI
 FROM 60W YQT TO 40ESE YQT TO 80SSW YQT TO 20NNE DLH TO 60W YQT
 CIG BLW 010/VIS BLW 3SM BR. CONDS ENDG 21-00Z.
 .
AIRMET IFR...ND SD MN...UPDT
FROM 30N INL TO 40E INL TO 30WNW BJI TO 40SSE FAR TO 40SW FAR TO
30NW ABR TO 30SE BIS TO 50W DPR TO 70W DIK TO 50NNW ISN TO 30N
INL
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 03Z THRU 09Z.
 .
 OTLK VALID 0300-0900Z...IFR MO IL KY AR TN MS AL
 BOUNDED BY 60WNW PXV-30NW BNA-40NE MSL-20E MEI-20N MHZ-30SSE FSM-
 20SSW SGF-50SW STL-60WNW PXV
 CIG BLW 010/VIS BLW 3SM BR. CONDS DVLPG 03-06Z. CONDS CONTG THRU
 09Z.

10.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products made available before the accident flight and valid at 2100 CST are shown in attachment 1. The GFA surface forecast products indicated VFR to IFR surface visibilities and mist, and a surface wind from the east at 10 knots. A graphical-AIRMET (G-AIRMET)²¹ was valid for IFR conditions at 2100 CST. The 1602 CST GFA cloud forecast valid at 2100 CST indicated scattered clouds at 3,000 ft above msl. The 1902 CST GFA cloud forecast valid at 2100 CST indicated overcast skies at 2,200 ft above msl with cloud tops at 4,000 ft above msl. For more information please see attachment 1.

11.0 Terminal Aerodrome Forecast

KDIK was the closest airport to the accident site with an NWS²² Terminal Aerodrome Forecast (TAF). The KDIK TAF valid at the time of the accident was issued at 1736 CST and was valid for a 24-hour period beginning at 1800 CST. The TAF for KDIK was as follows:

TAF KDIK 072336Z 0800/0824 **11011KT P6SM SCT200**
 FM080600 09008KT 3SM BR OVC007
 FM080900 08008KT 1SM BR OVC003
 FM081600 15015KT P6SM VCSH OVC009
 FM081800 21022G33KT P6SM VCSH BKN030
 FM082100 24026G40KT P6SM BKN045=

The forecast expected a wind from 110° at 11 knots, greater than 6 miles visibility, and scattered clouds at 20,000 ft agl.

²¹ <https://aviationweather.gov/gairmet>

²² According to NWS Instruction 10-813: "A 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

12.0 NWS Area Forecast Discussion

The NWS office in Bismarck, North Dakota, (WFO BIS) issued the following Area Forecast Discussion (AFD) at 1821 CST (closest AFD to the accident time with an aviation section). The aviation section of the AFD discussed IFR and LIFR conditions:

FXUS63 KBIS 080021
AFDBIS

Area Forecast Discussion
National Weather Service Bismarck ND
621 PM CST Sat Nov 7 2020

.UPDATE...
Issued at 621 PM CST Sat Nov 7 2020

The most significant changes for this update were to increase sky cover through tonight and add areas of fog across western and northern North Dakota into tomorrow afternoon. These changes were made based on observed and rapid-refresh model trends. If both the values and areal extend of visibility in the HRRR and RAP turn out accurate, a Dense Fog Advisory will likely be needed. Will wait to monitor observed trends before issuing one. All other hazards associated with the strong low pressure system remain on track.

&&

.SHORT TERM...(This evening through Sunday)
Issued at 310 PM CST Sat Nov 7 2020

A complex weather system will impact North Dakota tonight through Sunday. Currently, dry southwest flow aloft is starting to erode fog and lower clouds across the south. This trend should continue through the evening from south to north. As a result will let the Dense Fog Advisory expire at 3 PM. A surface low then forms overnight tonight across Wyoming, and pushes eastward into the Dakotas. As this happens moist northeast flow will be found near the surface while dry southerly flow continues aloft. The result looks to be more low clouds, perhaps some patchy fog, and the potential for widespread drizzle across northern and western areas. Temperatures will be key tonight as below freezing temps will result in some areas of freezing drizzle. Current thinking is these below freezing dips look to come across north central to northwestern areas. Here a light coating of ice is possible. There is still some uncertainty not only on precip types but surface temperatures. As a result will hold off on any winter products for tonight, although travelers and those outdoors should prepare for potential slick conditions.

Sunday then continues to be complex as the low become more developed and stacked aloft. Flow aloft becomes quite strong and generally south to southeastward. This brings warm and somewhat dryer air to the region. This briefly ends any sort of wintry mix

during the day, while bringing increased winds to the state. As a result have enough confidence to issue a Wind Advisory across the CWA. As a cold front swings through the state throughout the day Sunday, scattered to widespread rain showers look to develop. There is some weak instability and a lot of shear across the region. This could lead to some low topped thunderstorms across the region. Main threat will be strong winds from these storms, as pulling down strong winds aloft could easily create severe/high wind criteria gusts. Temperatures for the most part will be mild for one more day on Sunday in this southerly flow. The exception will be in the northwest where near normal temps are expected.

.LONG TERM...(Sunday night through Saturday)
Issued at 310 PM CST Sat Nov 7 2020

Active weather looks to start the long term, then conditions become cool. Sunday night still looks to see a period of rain changing to snow, with perhaps some freezing rain during the transition. Best chances for accumulating snow still looks to come in the northwest where 1 to 3 inches look possible Sunday night through the end of the day Monday. Today's forecast may have slightly lowered snow accumulations as the overall low track has shifted slightly westward. There still remains uncertainty to track and precip types, so have held off on any winter products at this time. This snow could linger in the northwest during the day Monday. There are some indications as the trough and cold front move eastward Monday there could be some rain or snow across eastern portions of the CWA. This is a bit of a change and confidence in this is low at this point, and for the most part not in the forecast. Breezy conditions may also continue for Monday.

Precipitation ends Monday evening. The rest of the long term looks to be in a general trough pattern, although with limited chances for snow. The main story for the remainder of the long term will be the return of near to below normal temperatures. Low temperatures look to be in the teens while highs look to only be in the 20s to 30s, with perhaps a slight increase in temperatures by the end of the long term period.

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.AVIATION...(For the 00Z TAFS through 00Z Sunday evening)
Issued at 621 PM CST Sat Nov 7 2020

There are multiple aviation hazards through this forecast period as a strong low pressure system moves from southwest to north central North Dakota on Sunday.

This evening through tonight, IFR to LIFR ceilings and visibility are expected to continue at KXWA and KMOT, and will likely redevelop at KDIK. There will likely be a slow improvement in conditions throughout the day Sunday. Drizzle is also possible at KXWA and KMOT Sunday morning. Chances for rain and snow will then increase at KXWA Sunday afternoon. Elsewhere, expect a chance of light rain with a few thunderstorms possible Sunday afternoon.

Strong winds are expected on Sunday, with sustained speeds reaching 25 kts and gusts to 45 kts at times. Wind direction will vary greatly as the center of the low crosses the state. There are low level wind shear concerns at KBIS and KJMS tonight until late Sunday morning.

&&

.BIS WATCHES/WARNINGS/ADVISORIES...

Wind Advisory from 9 AM CST /8 AM MST/ Sunday to midnight CST /11 PM MST/ Sunday night for NDZ019>023-025-034>037-042-045>048-050-051.

Wind Advisory from 3 PM CST /2 PM MST/ Sunday to midnight CST /11 PM MST/ Sunday night for NDZ001>005-009>013-017-018-031>033-040-041-043-044.

&&

\$\$

13.0 Winds and Temperature Aloft Forecast

The NWS 1355 CST Winds and Temperature Aloft forecast valid for the closest point to the accident site is included below:

```
FBUS31 KWNO 071955
FD1US1
DATA BASED ON 071800Z
VALID 080000Z    FOR USE 2000-0300Z. TEMPS NEG ABV 24000

FT  3000    6000    9000   12000   18000   24000   30000   34000   39000
DIK      2231+13 2234+07 2239+01 2241-13 2353-26 228441 219249 219656
```

The accident site was located closest to the Dickinson, North Dakota, (DIK) forecast point. The 1355 CST DIK forecast for use between 1400 CST and 2100 CST indicated a wind at 6,000 ft from 220° at 31 knots with a temperature of 13°C and a wind at 9,000 ft from 220° at 34 knots with a temperature of 7°C.

14.0 Pilot Weather Briefing

The accident pilot did not request a weather briefing from Flight Service provider Leidos.

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.

15.0 Witness Information

A witness provided information that while traveling southbound on highway 22 in the Manning, North Dakota, area that foggy conditions persisted after 1838 CST. For more information please see attachment 2.

16.0 Astronomical Data

The astronomical data obtained for the accident site on November 7, 2020, indicated the following:

SUN

Begin civil twilight	0611 CST
Sunrise	0643 CST
Sun transit	1134 CST
Sunset	1624 CST
End civil twilight	1656 CST
Accident time	1918 CST²³

MOON

Accident time	1918 CST²⁴
Moonrise	2202 CST
Moon culmination	0504 CST on November 8
Moon set	1305 CST on November 8

At the time of the accident for an observer at the accident location the Moon was below the horizon.

E. LIST OF ATTACHMENTS

Attachment 1 – GFA products valid for the accident flight

Attachment 2 – Witness Information

Submitted by:

²³ Inserted accident time for reference and context.

²⁴ Inserted accident time for reference and context.

Paul Suffern
Senior Meteorologist