



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

March 5, 2018

Weather Study

METEOROLOGY

CEN17FA362

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A. ACCIDENT

Location: Ainsworth, Nebraska
Date: September 23, 2017
Time: about 1028 central daylight time
1528 universal coordinated time (UTC)
Airplane: Mitsubishi MU-2B-40; registration: N73MA

B. METEOROLOGIST

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National Transportation Safety Board

C. SUMMARY

On September 23, 2017, about 1028 central daylight time, a Mitsubishi MU 2B-40 airplane, N73MA, was destroyed when it impacted terrain 3.5 miles northeast of the Ainsworth Regional Airport (ANW), Ainsworth, Nebraska. The private pilot was fatally injured. The personal flight was conducted under the provisions of 14 *Code of Federal Regulations* Part 91. Instrument meteorological conditions prevailed and a Federal Aviation Administration (FAA) flight plan had been filed for the flight. The airplane was originating at the time of the accident and was en route to Bottineau Municipal Airport (D09), Bottineau, North Dakota.

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 and the National Center for Environmental Information. All times are central daylight time (CDT) based upon the 24-hour clock on September 23, 2017, local time is +5 hours to UTC, and UTC=Z. The 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. Directions are referenced to true north and distances in nautical miles. Heights are in feet (ft) above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 42.536944° North and longitude 99.959167° West at an elevation of approximately 2,590 ft.

E. WEATHER 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 College Park, Maryland. 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 00-45H.

1.1 Surface Analysis Chart

The north central section of the NWS Surface Analysis Chart for 1000 CDT (1500Z) on September 23, 2017 is included as figure 1 with the approximate accident site marked by a red star. The chart depicted a low-pressure system at 1008-hectopascals¹ (hPa) over southwestern Nebraska along a frontal wave, with a stationary front extending northeastward over Nebraska, Iowa, into Minnesota and a cold front to the southwest across Kansas into Colorado. Two other low-pressure systems were located along the stationary front over Colorado with central pressures of 1004-hPa and 1005-hPa. A high-pressure system at 1023-hPa was located over the Montana and Canada border. The accident site was located north of the low-pressure system and stationary front on the cold air side of the front, in an area of favorable overrunning conditions for low cloud development.

The station models in the vicinity of the accident site north of the front indicated northerly winds of 5 to 10 knots, overcast cloud cover, visibility restricted in fog or mist, with temperatures in the upper 40’s to mid-50’s degrees Fahrenheit (F), with dew point temperatures a degree or two below the temperature.

¹ Hectopascals (hPa) is the new standard term for reporting sea level pressure and is interchangeable with the term millibar (mb) with the same units. Standard sea level pressure is 1013.25-hPa.

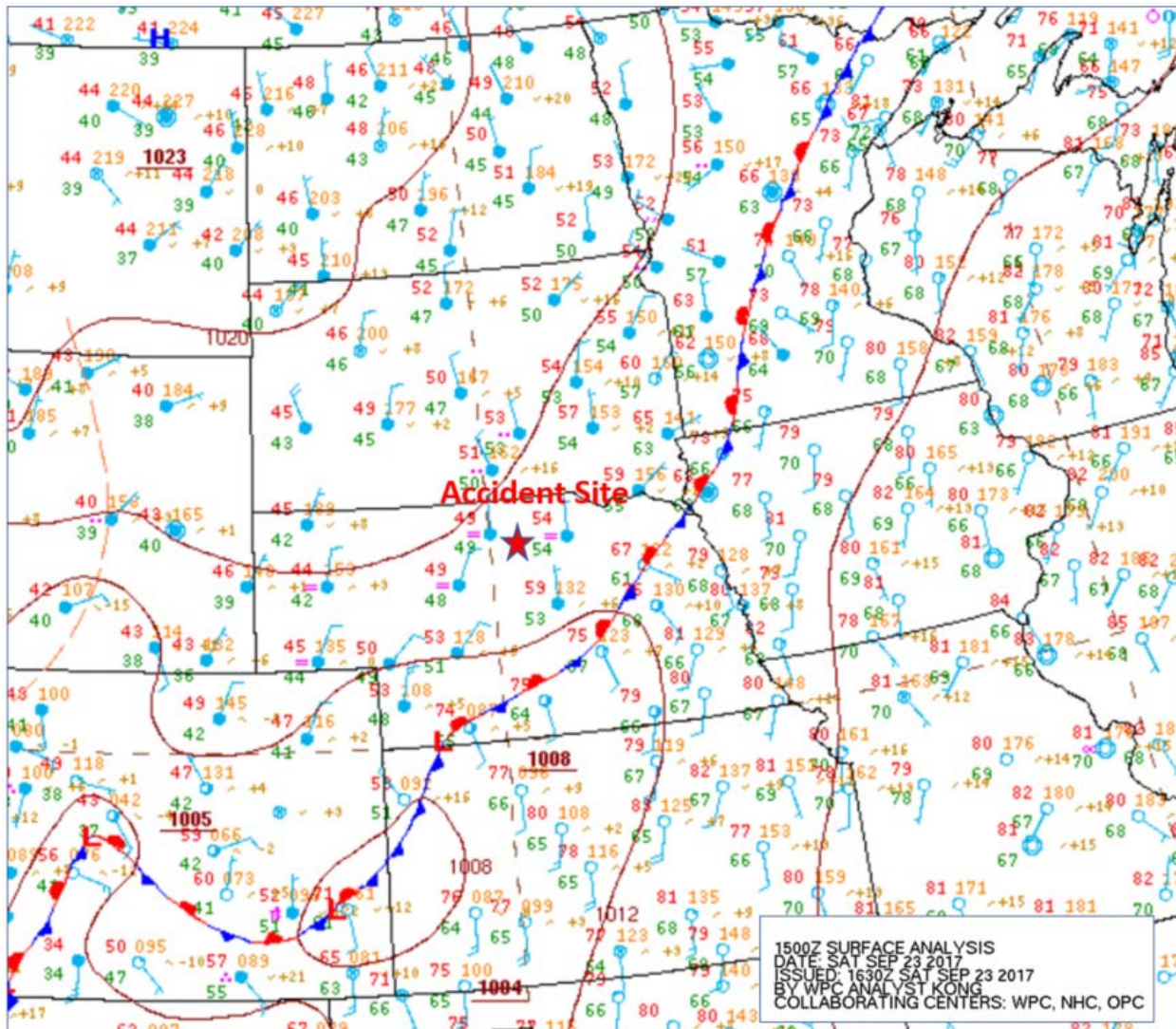


Figure 1 - NWS Surface Analysis Chart for 1000 CDT

1.2 National Composite Reflectivity Image

A review of the NWS National Composite Reflectivity image at 1025 CDT centered over the Ainsworth area is included as figure 2. The radar mosaic depicted an area of echoes north through east of the accident site, with several areas of very strong to intense echoes running north to south over South Dakota. Another area of light intensity echoes were noted about 20 miles west and 20 miles north-northeast of the Ainsworth area. No significant echoes were identified in the immediate vicinity of the accident site at the time of the accident.



Figure 2 - National Composite Reflectivity image at 1025 CDT

1.3 Weather Depiction Chart

The NWS Weather Depiction Chart for 0800 CST (1300Z) is included as figure 3 with the approximate accident site marked by a red star and depicted the general flight categories² prior to the accident airplane's departure. The chart depicted an extensive area of IFR conditions by a shaded contour over Nebraska, South Dakota, North Dakota, Wyoming, Minnesota, and into Canada along and north or west of the stationary fronts position. In the vicinity of the accident site IFR conditions were indicated with station models west and southeast reporting ceiling heights of 500 ft agl, with several stations over western Nebraska reporting light continuous rain.

² 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.

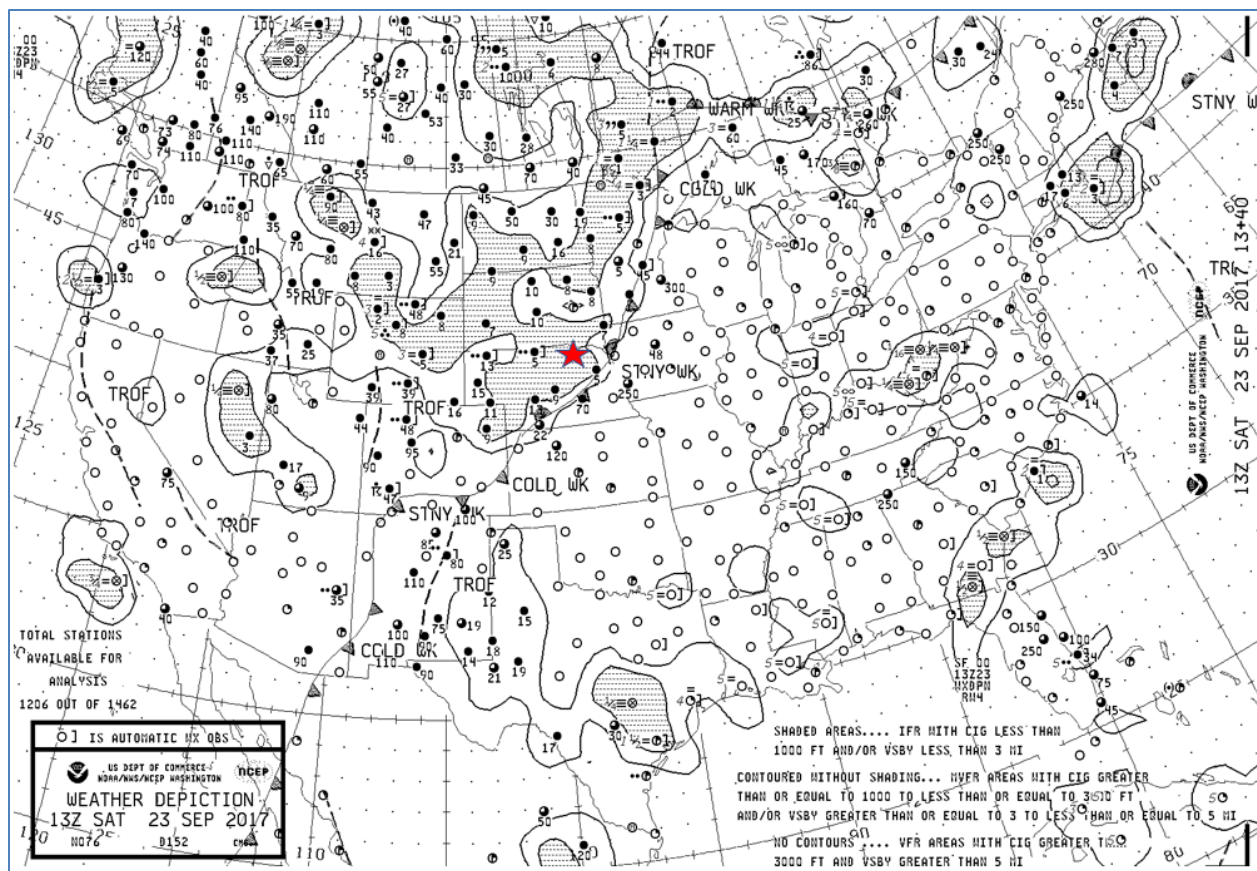


Figure 3 - NWS Weather Depiction Chart issued for 0800 CDT

1.4 12-hour Surface Prognostic Chart

The NWS NCEP 12-hour Surface Prognostic Chart current at the time of the accident and valid for 1900 CST is included as figure 4. The chart depicted the primary low-pressure system over Colorado at 1002-hPa with the stationary front extending eastward into Kansas to another low at 1004-hPa with the front extending northeast across Nebraska, Iowa into Minnesota to another low at 1010-hPa. A large area of precipitation with a greater than 55% probability of measurable precipitation (dark green) extended from western Texas and New Mexico northward through Nebraska, South and North Dakota, Minnesota, into Canada, mainly north and west of the stationary front and extended over the accident site and the proposed route of flight. Thunderstorms were also expected during the period (red hatched area) embedded within the precipitation area along and west of the front.

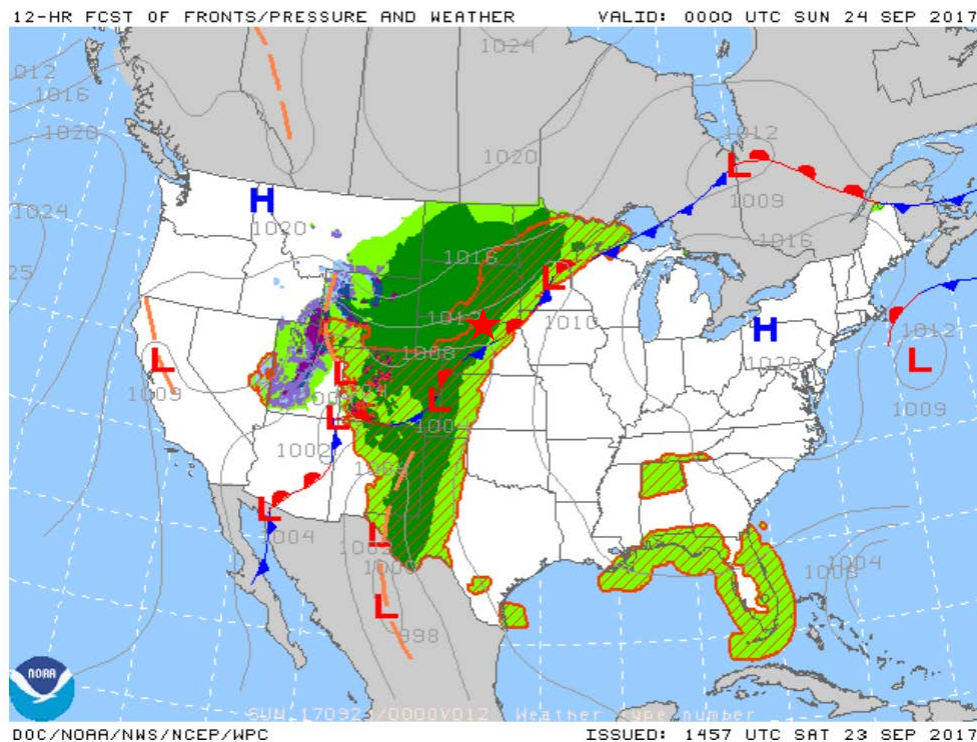


Figure 4 - 12-hour Surface Prognostic Chart valid for the period

1.5 Low-Level Significant Weather Prognostic Chart

The 12-hour (left side) and 24-hour (right side) Low-Level Significant Weather Prognostic Chart current at the time is included as figure 5 and depicted the general flight categories, low-level turbulence expected, and freezing level information.

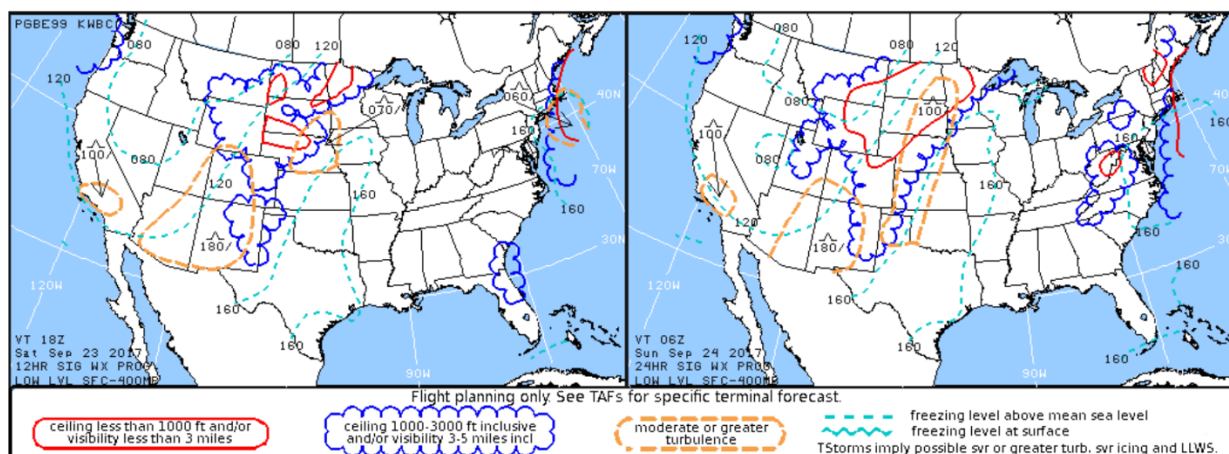


Figure 5 - Low-Level Significant Weather Prognostic Charts for 12- and 24-hours

The 12-hour chart valid for 1300 CDT (left side of figure 5) depicted an area of IFR conditions extending over Nebraska and South Dakota, which included the accident site with several other

areas over North Dakota and Minnesota by a red contour. A larger area of MVFR conditions extended from western Texas and eastern New Mexico northward through eastern Colorado, Wyoming, Nebraska, Minnesota, and South and North Dakota. An area of moderate turbulence from the surface to 7,000 ft was depicted over eastern Nebraska and South Dakota, western Iowa, and southwest Minnesota. The freezing level depicted by a blue dashed line was depicted above 12,000 ft over the area.

The 24-hour forecast (right side) valid for 0100 CDT continued to expect a large area of IFR conditions over western Nebraska, South and North Dakota, northwest Minnesota, Wyoming, and southeast Montana, with MVFR conditions extending over the accident site.

2.0 Observations

Ainsworth Regional Airport (KANW), Ainsworth, Nebraska at an elevation of 2,589 ft listed a magnetic variation of 6° East and had an Automated Weather Observation System (AWOS) installed, which issued observation every 20-minutes. Cloud heights are reported above ground level (agl) in this section. The following conditions were reported at the time of the accident:

KANW weather observation at 1015 CDT (1515Z), automated, wind from 360° at 10 knots, visibility 1 ¾ miles in mist, ceiling overcast at 500 ft agl, temperature 10° Celsius (C), dew point temperature 10 C, altimeter 30.02 inches of mercury (Hg). Remarks; automated observation system with a precipitation discriminator, temperature 9.5° C, dew point 9.5° C.

The following raw observations in standard code and abbreviations and the general flight categories surrounding the period from 0830 through 1100 CDT were as follows:

LIFR METAR KANW 231335Z AUTO 02005KT 10SM -TSRA OVC003 09/09 A2999 RMK AO2 LTG DSNT ALQS P0005 T00910091=

LIFR METAR KANW 231355Z AUTO 01011KT 10SM RA OVC003 09/09 A2999 RMK AO2 LTG DSNT N AND W P0007 T00910091=

LIFR METAR KANW 231415Z AUTO 01005KT 5SM -RA OVC003 09/09 A2999 RMK AO2 T00930093=

IFR METAR KANW 231435Z AUTO 35007KT 10SM OVC005 10/10 A3001 RMK AO2 P0001 T00950095=

IFR METAR KANW 231455Z AUTO 36010KT 3SM BR OVC005 09/09 A3001 RMK AO2 LTG DSNT NE P0001 60016 T00930093=

IFR METAR KANW 231515Z AUTO 36010KT 1 3/4SM BR OVC005 10/10 A3002 RMK AO2 T00950095=

Accident 1528Z

IFR METAR KANW 231535Z AUTO 36010KT 1 3/4SM BR OVC005 09/09 A3001 RMK AO2 T00940094=

IFR METAR KANW 231555Z AUTO 02009KT 2 1/2SM -DZ OVC005 10/10 A3001 RMK AO2 T00950095=

A review of the observations indicated that LIFR to IFR conditions prevailed during the morning and at the time of the accident. Figure 6 is a depiction of the weather conditions from the

NWS Aviation Weather Center's METAR display at 1000 CST (1500Z) prior to the accident and depicted IFR to LIFR conditions over northern Nebraska and South Dakota. The regional radar mosaic for the period was also overlaid and showed several small areas of light precipitation surrounding the KANW area.

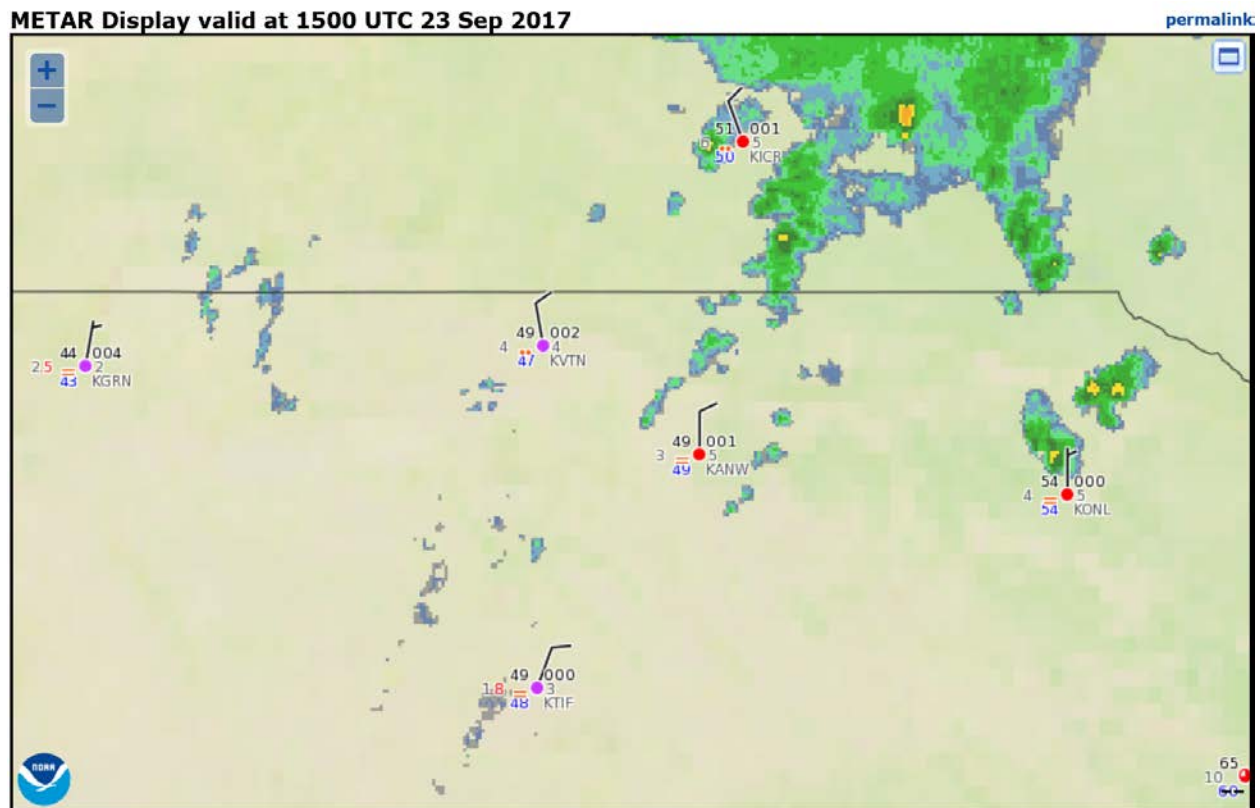


Figure 6 - NWS Aviation Weather Center METAR display at 1000 CDT

3.0 Sounding

A High Resolution Rapid Refresh (HRRR)³ numerical model data valid at 1000 CDT over KANW was obtained from the NOAA Air Resource Laboratory. The data was plotted on a standard skew T log P diagram⁴ using RAOB software⁵ from the surface to 500-hPa or approximately 18,000 ft and is included as figure 7.

³ HRRR – High-Resolution Rapid Refresh (HRRR) is a NOAA real-time 3-kilometer (km) resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by 3-km grids with 3-km radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a 1-hour period.

⁴ 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.

⁵ RAOB software – The complete Rawinsonde Observation program is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania, for plotting and analyzing upper air data.

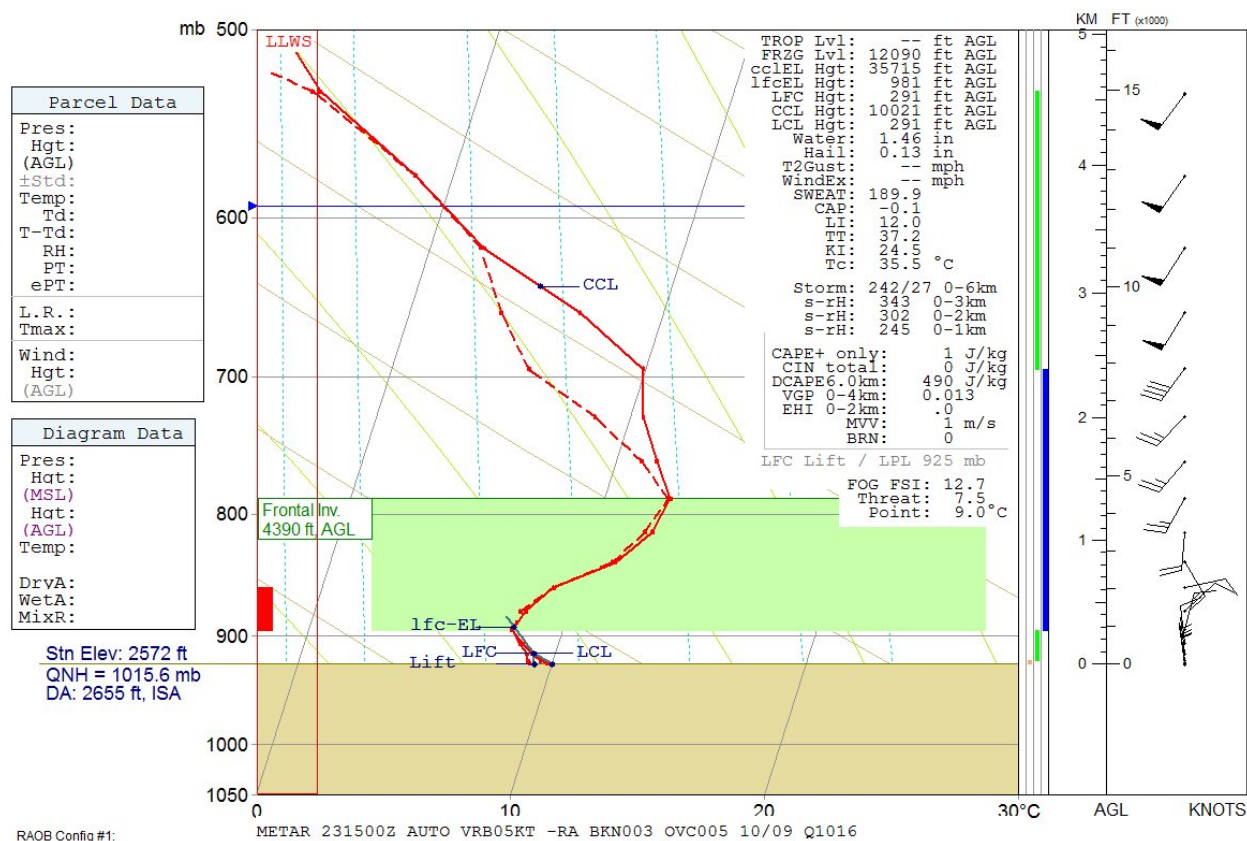


Figure 7 - HRRR numerical model over Ainsworth Airport at 1000 CDT

The HRRR 1000 CDT sounding expected a surface wind from 350° at 5 knots, a temperature of 10.0° C (50° F), a dew point temperature of 9.3° C (48.7° F), a relative humidity of 95%, and a sea level pressure of 925-hPa. The lifted condensation level (LCL)⁶ and level of free convection (LFC)⁷ were identified at 291 ft agl, with the sounding being saturated or a 100% relative humidity from the LCL through 4,390 ft which also corresponded with a frontal inversion, with temperatures increasing with height. A shallow layer of drier air was identified immediately above the inversion to 11,000 ft with saturated conditions again being indicated from 11,000 through 19,000 ft. The precipitable water content was 1.46 inches. The atmosphere was characterized as being stable below 8,000 ft and had a Lifted Index of +12.0, with conditional unstable conditions above 8,000 ft supporting elevated convection. The freezing level was identified immediately above 14,600 ft.

The HRRR wind profile indicated light northerly winds below 1,000 ft agl, which veered rapidly to the south-southwest through 4,000 ft agl, with wind speeds increasing to over 25 knots. The mean 0 to 6 kilometer or 18,000 ft winds were from 210° at 36 knots.

A table of the HRRR model data of height, pressure (Pres), temperature (T), dew point temperature (Td), relative humidity in percent (RH), wind direction (DD) and wind speed (FF),

⁶ Lifted Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

⁷ Level of Free Convection (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.

and RAOB derived intensity of clear air turbulence (CAT), low-level wind shear (LLWS), icing conditions and type, and mountain wave potential from the surface through 18,000 ft is included in figure 8.

Height (ft-MSL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD / FF (deg / kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)	Wave/x---W---Turb nm fpm max
2572	925	10.0	9.3	95	352 / 5				
2602	924	9.8	9.1	95	352 / 5				
2661	922	9.5	9.0	97	352 / 6				
2839	916	9.1	8.9	99	353 / 7				
3108	907	8.6	8.5	99	354 / 8	LGT			
3470	895	8.0	8.0	100	13 / 10	MDT	LIGHT		
3960	879	8.3	8.1	99	44 / 12	MDT	LIGHT		
4586	859	9.1	9.1	100	76 / 10	SVR			
5264	838	11.2	11.1	99	152 / 13	SVR			
6065	814	12.3	12.0	98	185 / 19	SVR			
6962	788	12.6	12.5	99	207 / 26	LGT			2.56 892 MD-SV
7960	760	11.6	11.0	96	219 / 23	LGT			
9142	728	10.5	8.6	88	222 / 27	SVR			3.51 486 LIGHT
10412	695	9.9	5.4	74	214 / 42	LGT			5.25 1302 MD-SV
11899	658	6.7	3.6	81	210 / 49				
13579	618	2.1	2.0	99	211 / 51				
15436	576	-1.5	-1.5	100	213 / 51			MDT Clear	
17547	531	-6.3	-6.6	98	214 / 48			LGT Rime	
19704	488	-9.5	-15.1	64	213 / 47				

Figure 8 - HRRR model parameters and RAOB derived turbulence, wind shear, and icing threat

The HRRR model indicated a probability of 90% or greater for moderate to severe turbulence between 3,400 and 6,400 ft agl due to strong vertical wind shears in the layer. There was also a moderate probability of icing conditions near the freezing level, with clear type icing expected between 14,500 and 15,500 ft. The accident airplane only reached approximately 1,000 ft altitude on the day of the accident.

4.0 Satellite Imagery

The Geostationary Operational Environmental Satellite number 13 (GOES-13) data was obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System (McIDAS) software. Both the infrared long wave, and visible band imagery were obtained surrounding the time of the accident. The infrared long wave imagery (band 4) at a wavelength of 10.7 microns (μm) provided standard satellite image with radiative cloud top temperatures or brightness with a resolution of 4 km. The visible imagery (band 1) at a wavelength of 0.65 μm provided a resolution of 1 km.

Figure 9 is the GOES-15 infrared image for 1015 CDT at 4X magnification with a standard MB temperature enhancement curve applied. The image depicted the KANW area between two bands of clouds with a radiative cloud top temperature of 255° Kelvin or -18° C over the accident site, which corresponded to cloud tops near 24,000 ft based on the HRRR sounding.

Figure 10 is the GOES-13 visible image at 1015 CDT at 2X magnification and depicts low stratiform clouds over the accident site.

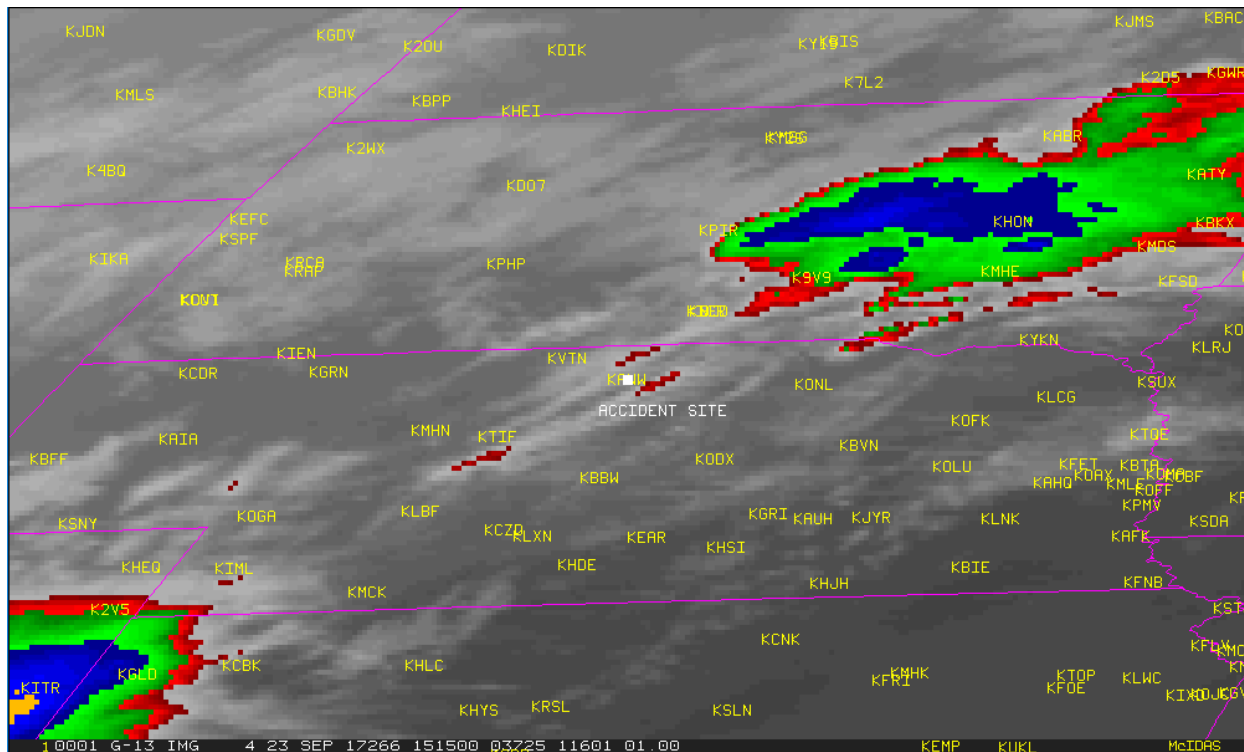


Figure 9 - GOES-13 infrared image at 1015 CDT

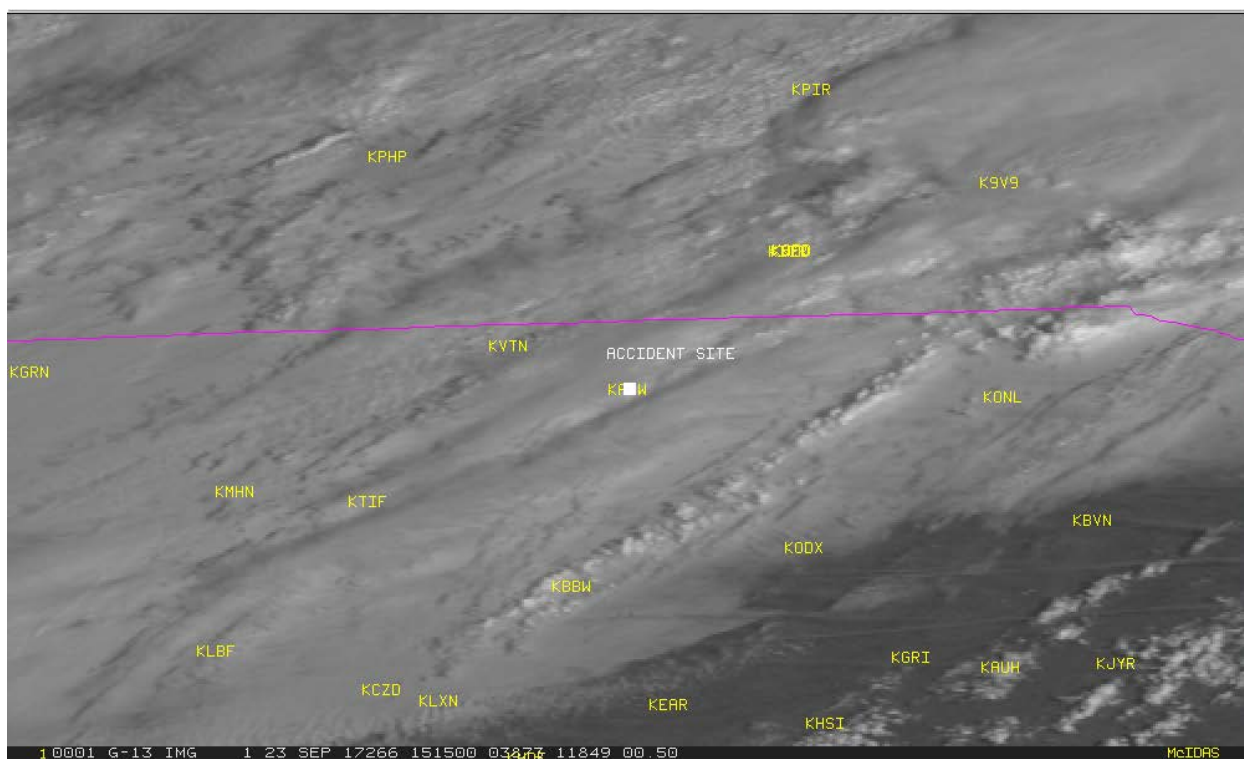


Figure 10 - GOES-13 visible image at 1015 CDT

5.0 Weather Surveillance Radar Imagery

The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D) was located at North Platte, NE about 45 miles southwest of the accident site. The level II archive data was obtained from the NCEI using the Hierarchical Data Storage System and displayed using the NWS NEXRAD Interactive Viewer and Data Exporter software.

Reflectivity in dBZ provides basic intensity information and is referenced for pilots in Advisory Circular AC 00-24C - "Thunderstorm". The following table provides the basic reflectivity (dBZ) and echo intensity values.

Reflectivity (dBZ) Ranges	Weather Radar Echo Intensity Terminology
< 30 dBZ	Light
30 – 40 dBZ	Moderate
>40 – 50 dBZ	Heavy
>50 dBZ	Extreme

The KLNK WSR-88D 0.5° base reflectivity image at 1023 CDT is included as figure 11 and depicted very light intensity echoes of 5 to 10 dBZ over the airport with several small areas of echoes of 25 to 35 dBZ associated with rain showers 15 miles northeast. Several intense cells of 50 dBZ or more are also identified between 55 and 75 miles east-northeast of KANW. The radar imagery detected no convective hazards near KANW immediately surrounding the time of the accident.

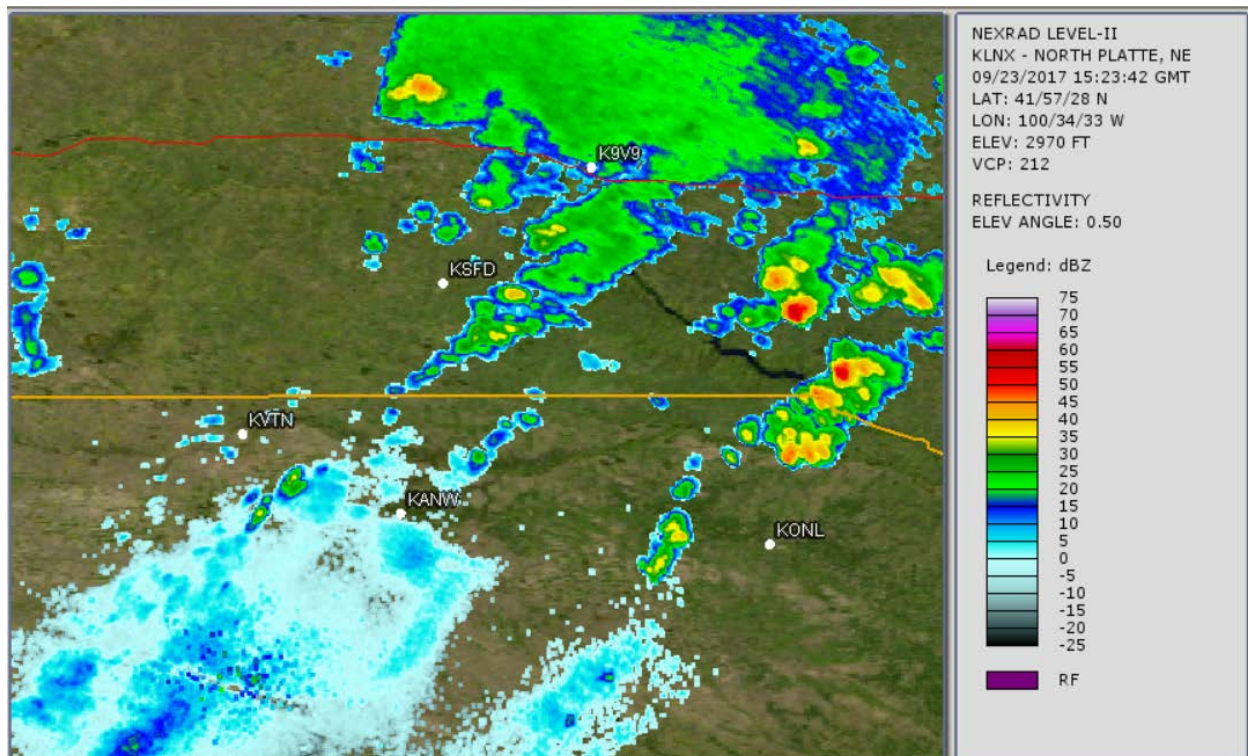


Figure 11 - North Platte, NE WSR-88D 0.5° base reflectivity image at 1023 CDT

6.0 Pilot Reports

A search of disseminated pilot reports or PIREPs within a 100-mile radius of the accident site from 0600 through 1200 CDT below 18,000 ft provided the following reports:

ONL UA /OV ONL/TM 1300/FL080/TP BE99/SK OVC025-TOP040/RM DURD

LBF UA /OV LBF/TM 1454/FL035/TP BE65/SK 035 BASES/IC NEG ICE/RM ZDV

The two available reports over the region reported cloud cover with bases from 2,500 to 3,500 ft with one pilot reporting tops near 4,000 ft. There was no mention of any significant turbulence, icing, or wind shear encountered in either report.

7.0 Area Forecast

The NWS AWC issued an amendment to the Area Forecast (FA) at approximately 0800 CDT for Nebraska, which was as follows:

FA3W

CHIC FA 231305 AMD

SYNOPSIS AND VFR CLDS/WX

SYNOPSIS VALID UNTIL 240400

CLDS/WX VALID UNTIL 232200...OTLK VALID 232200-240400

ND SD NE KS MN IA MO WI LM LS MI LH IL IN KY

.

SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.

TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.

NON MSL HGTS DENOTED BY AGL OR CIG.

.

SYNOPSIS...10Z CDFNT NERN MN-NERN NE-LOW PRES ECNTRL CO BECMG STNR 18Z. HI

PRES RDG NW PA-SRN IN-SE MO. 04Z STNR FNT FM LOW PRES SW MN-NERN NE-NW KS-

LOW PRES SE CO. WRMFNT SW MN-NERN MN-NRN LS. HI PRES NW PA-KY-SE TX.

.

NE...UPDT

PNHDL...SCT050 BKN130 TOP FL220. WDLY SCT -SHRA. 11Z OVC050-060. 18Z VIS 5SM IN

SCT -SHRA. OTLK...MVFR CIG SHRA.

NCNTRL...OVC035-045 TOP FL250. SCT EMBD -TSRA. CB TOP FL450. 15Z OVC040-050.

SCT -SHRA. 18Z OVC035. VIS 5SM IN SCT -SHRA. OTLK...IFR CIG RA BR.

SCNTRL...SCT045 BKN090 TOP FL250. SCT -TSRA. CB TOP FL450. 13Z SCT080 BKN120.

ISOL -SHRA. 18Z BKN080. SCT -SHRA/-TSRA. CB TOP

FL400. OTLK...VFR SHRA TSRA 00Z MVFR CIG SHRA TSRA.

NERN...BKN020-030 TOPS 050. 16Z SCT040 BKN140 TOP FL250. OTLK...VFR.

SE...SKC. 17Z WND S G25KT. OTLK...VFR TIL 01Z WND.

.

The header warned users to see AIRMET Sierra for IFR conditions and indicated that heights are reported in msl unless otherwise noted. The forecast for north central Nebraska was for overcast clouds with bases at 3,500 to 4,500 ft with tops to 25,000 ft, with scattered embedded thunderstorms and light rain. Cumulonimbus cloud tops to 45,000 ft. After 1000 CDT, overcast clouds from 4,000 to 5,000 ft with scattered light rain showers. After 1300 CDT, overcast clouds at 3,500 ft with visibility 5 miles in scattered light rain showers. The general outlook from 1700

through 2300 CDT was for IFR conditions to prevail due to low ceilings and visibilities in rain and mist.

8.0 Terminal Aerodrome Forecast

The NWS does not issue a Terminal Aerodrome Forecast (TAF) for KANW. The closest TAF was issued by the North Platte (KLBF), Nebraska, Weather Forecast Office (WFO) for Miller Field Airport (KVTN), Valentine, Nebraska located approximately 30 miles northwest of accident site at an elevation of 2,595 ft. While a TAF is only valid for a 5-mile radius of the airport center, it provides a time specific breakdown of forecast wind, visibility, precipitation and clouds than other forecasts such as the FA. The forecast for KVTN that was current at the time of the accident was as follows:

*KVTN 231139Z 2312/2412 01007KT P6SM VCSH OVC008
FM231900 02008KT 5SM -SHRA OVC010
FM240000 35009KT 5SM -SHRA OVC007=*

The forecast expected from 0700 to 1400 CDT IFR conditions to prevail with a wind from 010° at 7 knots, visibility better than 6 miles, with rain showers in the vicinity or between 5 and 10 miles of the airport, ceiling overcast at 800 ft agl. After 1400 CDT, wind from 020° at 8 knots, visibility 5 miles in light rain showers, ceiling overcast at 1,000 ft agl. After 1900 CDT, wind from 350° at 9 knots, visibility 5 miles in light rain showers, ceiling overcast at 700 ft agl.

9.0 In-Flight Weather Advisories

A review of the NWS inflight weather advisories indicated that the NWS had three advisories current for the route of flight; a Convective SIGMET⁸ for an area of embedded thunderstorms, a Center Weather Advisory (CWA) issued by the Minneapolis Center Weather Service Unit for an area of heavy rain showers, and AIRMET⁹ Sierra advisory for an extensive area of IFR conditions. Figure 12 depicts the Convective SIGMETs current for the central United States at the time followed by the text of the advisories, and figure 13 presents the AIRMET Sierra for IFR conditions followed by the text of all the advisories.

Convective SIGMET

⁸ SIGMET – Significant Meteorological Information is an advisory of hazardous weather conditions pertinent to all airmen or aircraft.

⁹ AIRMET - Airmen's Meteorological Information is an advisory for weather conditions that may affect aircraft safety. Compared to SIGMETs, AIRMETs cover less severe weather conditions such as moderate turbulence, icing, strong winds, mountain obscuration and IFR conditions.

chart created at 1456 UTC Sat 23 Sep 2017
SIGMETs expire at or before 1655z/23rd

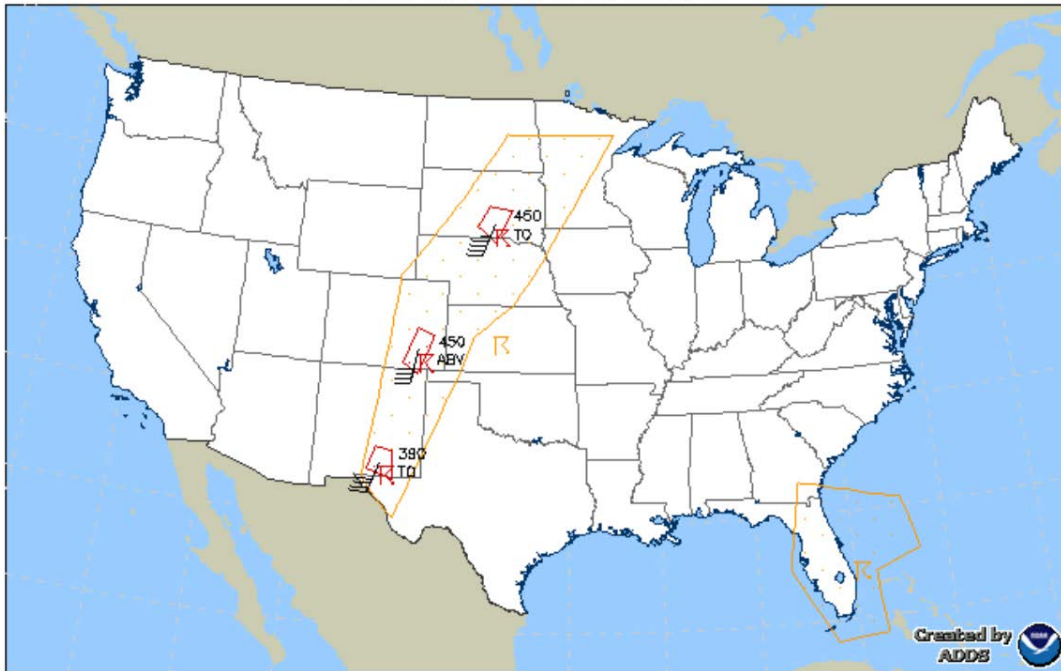


Figure 12 - Convective SIGMETs current at 0955 CDT

WSUS32 KPCI 231455

SIGC

-MKCC WST 231455

CONVECTIVE SIGMET 51C

VALID UNTIL 1655Z

CO NM

FROM 50NE PUB-20N LAA-30S TBE-40W TBE-50NE PUB
AREA TS MOV FROM 19040KT. TOPS ABV FL450.

CONVECTIVE SIGMET 52C

VALID UNTIL 1655Z

NE SD

**FROM 20E PIR-70S ABR-30ENE ANW-60NNW ANW-20E PIR
DMSHG AREA EMBD TS MOV FROM 20045KT. TOPS TO FL450.**

CONVECTIVE SIGMET 53C

VALID UNTIL 1655Z

TX NM

FROM 10SSW CME-70W INK-30NNE ELP-50W CME-10SSW CME
AREA TS MOV FROM 20040KT. TOPS TO FL390.

OUTLOOK VALID 231655-232055

FROM 70WSW GFK-40N DLH-70NNW SLN-40NNE GCK-30WSW

MRF-ELP-CYS-70WSW GFK

WST ISSUANCES EXPD. REFER TO MOST RECENT ACUS01 KWNS FROM STORM
PREDICTION CENTER FOR SYNOPSIS AND METEOROLOGICAL DETAILS.

Center Weather Advisory

FAUS21 KZMP 231519

ZMP1 CWA 231518

ZMP CWA 101 VALID UNTIL 231600

FROM 55WNN FSD-25NNE ONL-5NNW ONL

DVLPG LINE TS WITH MOD/HVY RAIN 10NM WIDE MOV FROM 20040KT.

TOPS TO FL380.

AIRMET

SIERRA 2017-09-23 15:00:00

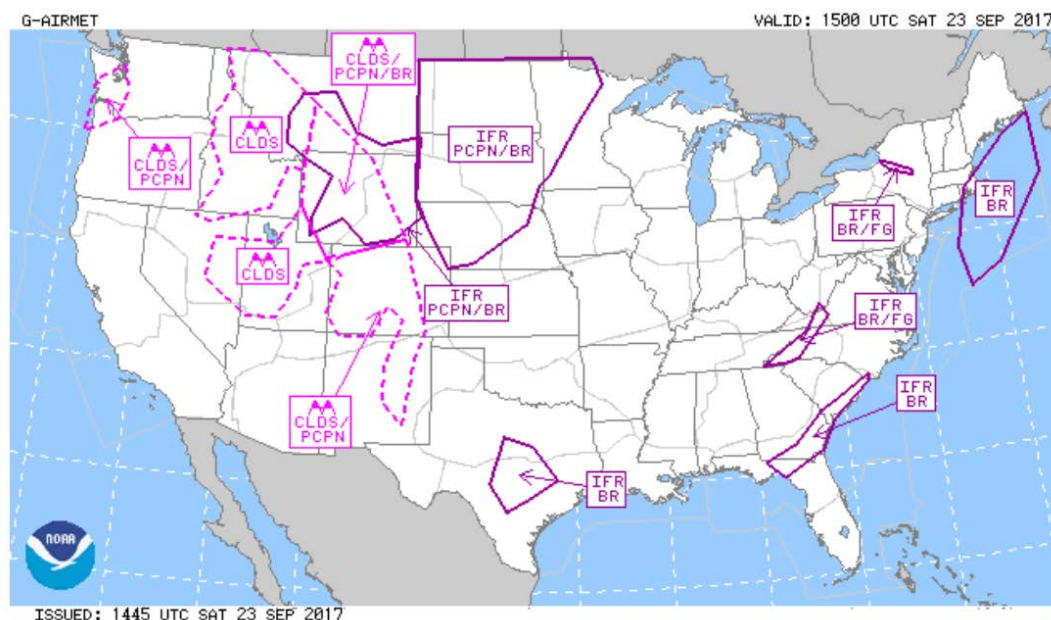


Figure 13 - AIRMET Sierra series for IFR conditions

WAUS43 KKCI 231445

WA3S

-CHIS WA 231445

AIRMET SIERRA UPDT 3 FOR IFR VALID UNTIL 232100

.

AIRMET IFR...ND SD NE KS MN IA

FROM 30N INL TO 60ENE INL TO 40NNE DLH TO 40NE OBH TO MCK TO 40E

AKO TO BFF TO 70SW RAP TO 50NNW ISN TO 30N INL

CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

....

WAUS43 KKCI 231445

WA3T

-CHIT WA 231445

AIRMET TANGO UPDT 2 FOR TURB VALID UNTIL 232100

.

NO SGFNT TURB EXP OUTSIDE OF CNVTV ACT.

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OTLK VALID 2100-0300Z...TURB ND SD NE KS
BOUNDED BY 60NE MOT-ANW-HLC-GLD-70SW RAP-50NNW ISN-60NE MOT
MOD TURB BTN FL260 AND FL390. CONDS DVLPG 21-00Z. CONDS CONTG
THRU 03Z.

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WAUS43 KPCI 231445

WA3Z

-CHIZ WA 231445

AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 232100

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NO SGFNT ICE EXP OUTSIDE OF CNVTV ACT.

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OTLK VALID 2100-0300Z...ICE ND SD NE

BOUNDED BY 60NE MOT-30WNW ANW-40WNW LBF-BFF-70SW RAP-50NNW
ISN-60NE MOT

MOD ICE BTN FRZLVL AND FL220. FRZLVL 090-140. CONDS DVLPG 21-00Z.
CONDS CONTG THRU 03Z.

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FRZLVL...RANGING FROM 060-165 ACRS AREA

MULT FRZLVL 060-120 BOUNDED BY 50N MOT-20W BIS-60WSW DIK-

50NNW ISN-50N MOT

080 ALG 50SSW ISN-30SSE ISN-50NNW MOT

120 ALG 50WNW RAP-70SW YWG

160 ALG 50NNE MMB-60WNW ICT-20NNW DSM-50NW IOW-30WSW IOW-40W

COU-30NW RZC

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10.0 Winds and Temperature Aloft Forecast

The NWS Winds and Temperature Aloft Forecast current for the route of flight for the time was as follows:

WINDS ALOFT FORECAST

DATA BASED ON 231200Z

VALID 231800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
ONL		1815+17	1921+13	2030+05	2136-08	2051-20	216335	216845	224369
PIR		1314+11	1817+09	2136+05	2252-10	2170-21	218136	218547	228356
ABR	0416	1809+11	2015+10	2430+05	2251-10	2270-20	217536	228047	213765
DIK		0905+02	2120+05	1924-01	2252-14	2172-25	219639	710748	721257
MOT		9900+03	2414+03	2223+00	2144-14	2273-24	229639	720648	721357

The forecast for O'Neill, NE (ONL) for the first reporting level of 6,000 ft was for wind from 180° at 15 knots with a temperature of 17° C, at 9,000 ft wind from 190° at 21 knots with a temperature of 13° C. The forecast for Pierre, SD (PIR) for 6,000 ft was for wind from 130° at 14 knots with a temperature of 11° C, at 6,000 ft from 180° at 17 knots and a temperature of 9° C. The freezing level was above 12,000 ft for both stations.

11.0 Astronomical Conditions

The United States Naval Observatory's website provided the following astronomical conditions for Ainsworth, Brown County, Nebraska on September 23, 2017.

Begin civil twilight	0700 CDT
Sunrise	0728 CDT
Accident	1028 CDT
Sun transit	1332 CDT
Sunset	1934 CDT
End civil twilight	2002 CDT

At the time of the accident the Sun was 31° above the horizon at an azimuth of 123° but was likely obscured by the thick clouds over the area.

Submitted by:

Don Eick
Senior Meteorologist

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