

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN24LA144

METEOROLOGY

Specialist's Factual Report

April 30, 2024

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A. ACCIDENT

Location: Muncie, Indiana
Date: April 1, 2024
Time: 1027 eastern daylight time
1427 coordinated universal time (UTC)
Airplane: Piper Dakota PA-28-236; Registration: N8438B

B. METEOROLOGY SPECIALIST

Donald Eick
Senior Meteorologist
National Transportation Safety Board
Washington, D.C.

C. SUMMARY

On April 1, 2024, about 1027 eastern daylight time, a Piper PA-28-236 airplane, N8438B, sustained substantial damage when it was involved in an accident near Muncie, Indiana. The pilot sustained serious injuries and two pedestrians on the ground sustained serious injuries. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight on an instrument flight plan.

The flight had departed from Monroe County Airport (BMG), Bloomington, Indiana, about 0937 EDT with the planned destination of Muncie Delaware County Airport (MIE), Muncie, Indiana.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's Senior Meteorologist conducted most of the meteorology phase of the investigation remotely, collecting data from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the Weather Prediction Center (WPC), and the National Center for Environmental Information (NCEI). While another NTSB meteorologist was embedded with the Air Traffic Control investigation and supported that portion of the investigation. This report documents the general weather products and forecasts over the region during the period and documents the pertinent meteorological parameters to the accident. All times are reported as eastern daylight time (EDT) based upon the 24-hour clock, local time is -4 hours from UTC, and UTC=Z. Airport and 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. continental 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 estimated on the coordinates of latitude 40.235157° N and longitude 85.405945° W, at an elevation of 935 ft.

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) and the WPC 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 and other products can be found in the Federal Aviation Administration (FAA) "Aviation Weather Handbook", FAA-H-8083-28¹.

1.1 Surface Analysis Chart

A regional view of the NWS Surface Analysis Chart for 1100 EDT (1500Z) is included as figure 1 with the approximate accident site marked by a red star and the general route by a red dashed line. The chart depicted a low-pressure system at 1011-hectopascals over western Maryland with a stationary front extending westward across West Virginia, southern Ohio, Indiana, Illinois, central Missouri to another low-pressure system at 1001-hPa. A trough was depicted north of the stationary front across Ohio, Indiana, and Illinois. A high pressure system at 1023-hPa was located over Ontario, Canada with a ridge extending southward. The accident site was located north of the stationary front and trough on the cool air side of the front.

The station models surrounding the accident site indicated winds from the east-northeast at about 10 knots, overcast clouds with a temperature of 49°F, and a dew point temperature of 46°F. Multiple station east of the accident site over Ohio reported visibility restricted in mist.

¹ <https://www.faa.gov/regulationspolicies/handbooksmanuals/aviation/faa-h-8083-28-aviation-weather-handbook>

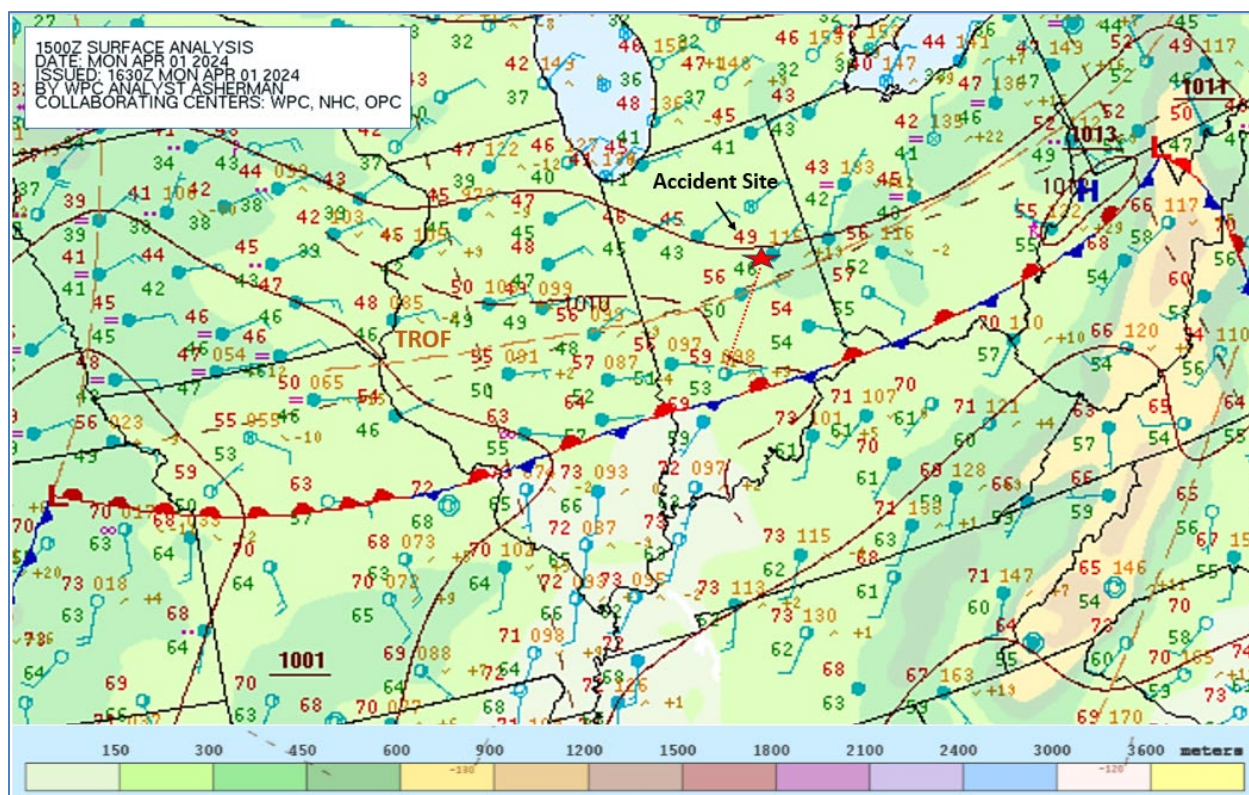


Figure 1 - NWS Surface Analysis Chart for 1100 EDT with the accident site and route indicated.

1.2 Regional Radar Mosaic

The NWS National Composite Radar Mosaic for 1030 EDT was obtained and is included as figure 2, with the approximate accident site marked by a red star. The radar mosaic showed a few scattered echoes over Indiana with two narrow east-to-west bands of reflectivity of 40 decibels (dBZ)² or less over southern Ohio, with no appreciable echoes over the general route of flight or accident site.

² Reflectivity is a measure of the efficiency of a target in intercepting and returning radio energy. Reflectivity is normally displayed in decibels or dBZ, which is a nondimensional "unit" of radar reflectivity which represents a logarithmic power ratio (in decibels, or dB) with respect to radar reflectivity factor, Z.

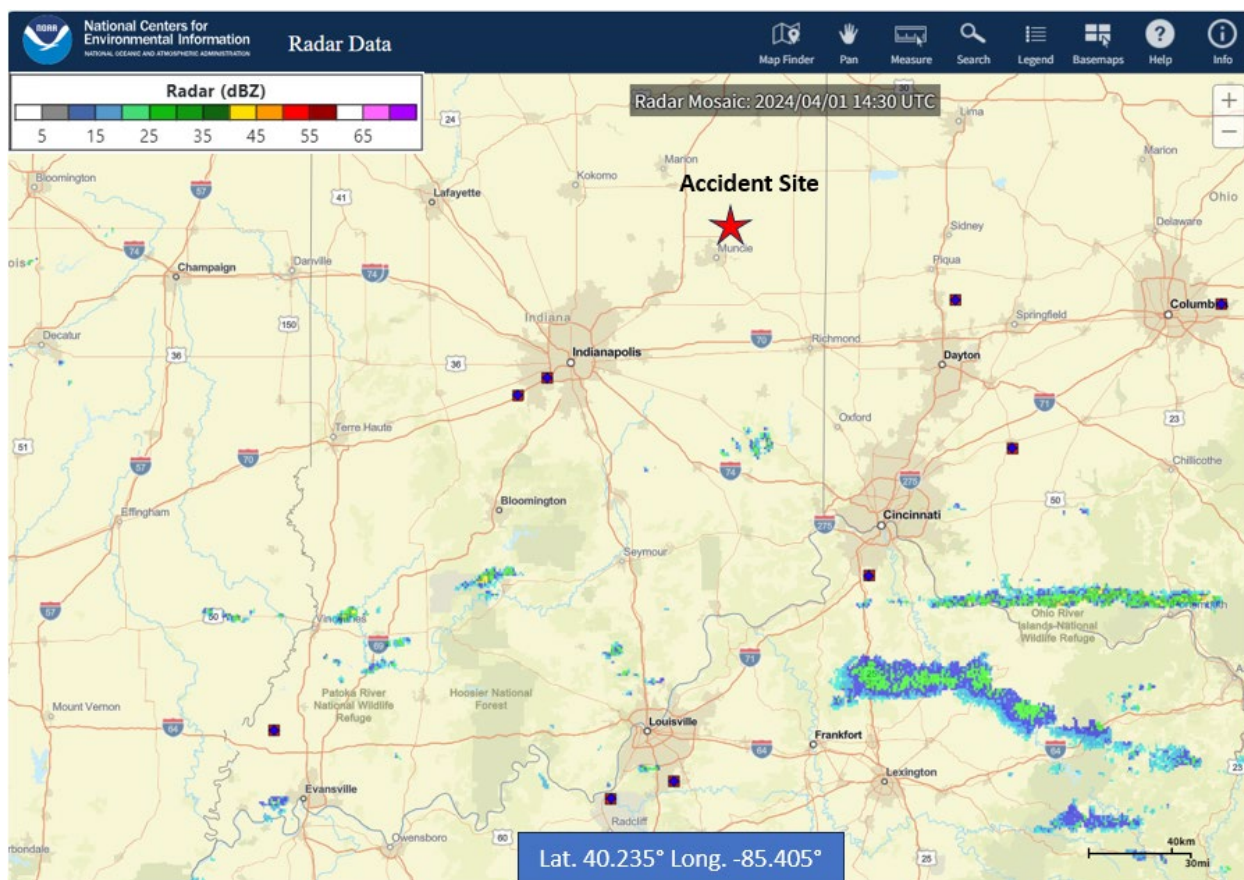


Figure 2 - NWS Regional Composite radar Mosaic for 1030 EDT over the area with accident site.

1.3 Short Term Weather Prognostic Chart

The NWS 6-hour Surface Prognostic Chart current for the period and valid for 1400 EDT is included as figure 3, with the approximate accident marked by a red star. The chart depicted the primary low-pressure system over eastern Kansas with a warm front now depicted extending eastward across Missouri, Illinois, Indiana, and a stationary front over Indiana and southern Ohio and West Virginia. The accident site remained north of the frontal boundary. The chart depicted an extensive area of precipitation along and north of the frontal boundary with the accident site under a chance of rain and thunderstorms.

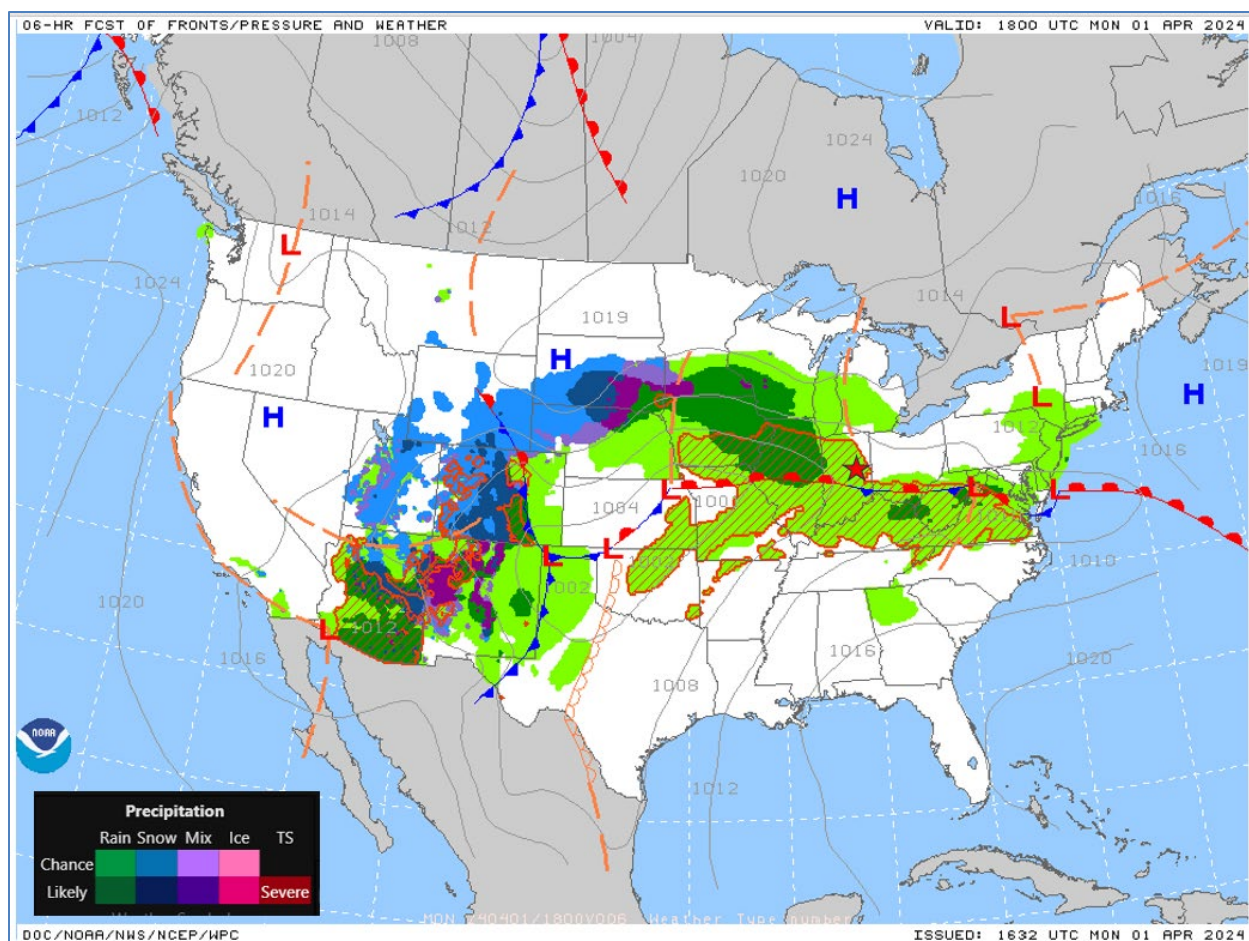


Figure 3 - NWS 6-hour Surface Prognostic Chart valid for 1400 EDT with the accident site marked depicting expected frontal positions and precipitation during the period.

1.4 Ceiling and Visibility Forecast

The NWS Aviation Weather Center's (AWC) Graphic forecast for Aviation (GFA) 2-hour flight category³ forecast from 0900 EDT or prior to the flight's departure and valid for 1100 EDT is included as figure 4. The chart depicted a large area of MVFR conditions extending over the region, with an east-to-west band of IFR conditions

³ 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 subcategory of IFR. ** MVFR is a subset of VFR.

extending from Pennsylvania westward across central Ohio, Indiana, Illinois, northern Missouri, and Iowa, and included the accident site.

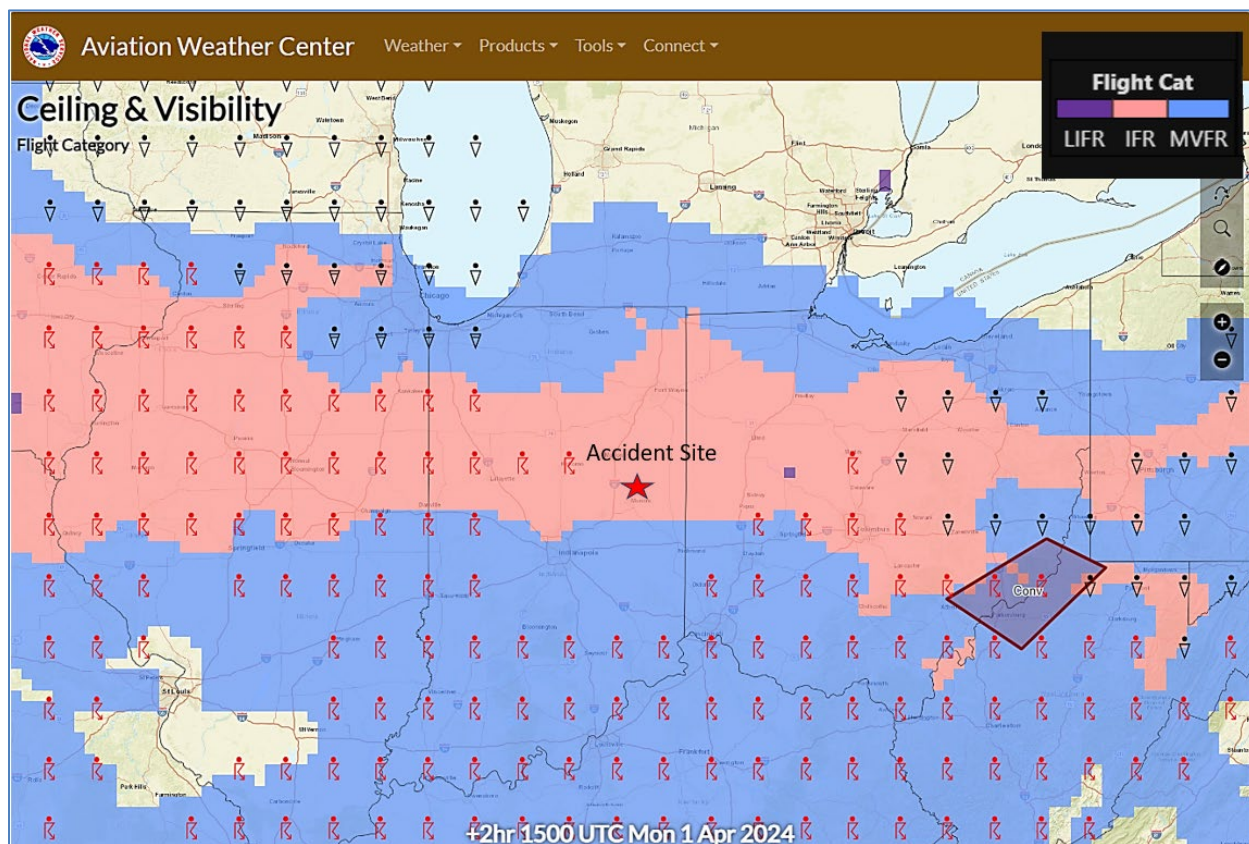


Figure 4 - NWS Aviation Weather Center's Flight Category Forecast for 1100 EDT.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METAR⁴) and Aviation Selected Special Weather Reports (SPECI). Cloud heights are reported above ground level (agl) in the following section. The magnetic variation over the area was estimated at 6° West based on the latest sectional chart for the area.

2.1 Muncie, Indiana

The accident occurred about 1/2 mile west of Delaware County Regional Airport-Johnson Field (KMIE), Muncie, Indiana, which lists an elevation of 937 ft. The airport has an Automated Surface Observation System (ASOS) which broadcasts locally

⁴ Abbreviation for METeorological Aerodrome Report, the international code for reporting surface weather conditions.

or line of site on 114.4 VFH and is augmented by air traffic control personnel through a Limited Aviation Weather Reporting System (LAWRS) agreement during normal operating hours between 0600 and 2200 EDT. The observations issued surrounding the time of the accident were as follows.

Weather observation for KMIE at 0953 EDT, wind from 050° at 10 knots, visibility 10 miles or more, ceiling broken at 700 ft agl, temperature 10° C (50°F), dew point temperature 8° C (46°F), altimeter setting 29.87 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator, ceiling 500 ft variable 1,100 ft, sea level pressure 1011.2-hPa, temperature 10.0°C, dew point 7.8°C.

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Special weather observation⁵ for KMIE at 1037 EDT, wind from 050° at 10 knots, visibility 5 miles in mist, ceiling overcast at 400 ft agl, temperature 9° C (49°F), dew point temperature 8° C (46°F), altimeter setting 29.88 inHg. Remarks: automated station with a precipitation discriminator, temperature 9.4°C, dew point 7.8°C.

The general flight categories and observations transmitted surrounding the period were as follows:

MVFR SPECI KMIE 011100Z 07012KT 6SM -RA BR SCT006 BKN010 OVC032 07/06 A2986 RMK AO2 P0000 T00720056=

VFR SPECI KMIE 011105Z 02006KT 7SM -RA SCT006 SCT025 OVC035 07/06 A2990 RMK AO2 LTG DSNT W P0000 T00720056=

MVFR SPECI KMIE 011141Z 10007KT 4SM VCTS RA BR FEW036 OVC060 07/06 A2987 RMK AO2 LTG DSNT SW P0009 T00720056=

VFR METAR KMIE 011153Z 13012G18KT 8SM VCTS -RA BKN060 07/06 A2983 RMK AO2 LTG DSNT SE AND S PRESFR SLP096 P0009 60013 70053 T00720056 10089 20072 50005=

VFR SPECI KMIE 011200Z 13013KT 10SM SCT060 07/06 A2982 RMK AO2 LTG DSNT SE AND S RAE1155 P0000 T00720056=

VFR METAR KMIE 011253Z 13006KT 10SM CLR 10/07 A2984 RMK AO2 RAE1155 SLP100 P0000 T01000072=

⁵ A special report or SPECI is an unscheduled report taken when any of the special criteria have been observed. The criteria for SPECIs can be found in the Federal Meteorological Handbook Number 1, Surface Weather Observations and Reports. With regards to ceilings, a SPECI is required when cloud cover of 5/8 or more forms, or dissipates, decreases to less than or, if below increases to or exceeds the following values: 3,000 ft, 1,500 ft, 1,000 ft, 500 ft agl or the lowest standard instrument approach procedure minimum.

VFR SPECI KMIE 011331Z 04009KT 10SM SCT009 11/08 A2986 RMK AO2 T01110083=

Departed KBMG at 1337Z

IFR SPECI KMIE 011351Z 05011KT 10SM BKN007 BKN010 10/08 A2987 RMK AO2 CIG 005V009=

IFR METAR KMIE 011353Z 05010KT 10SM BKN007 10/08 A2987 RMK AO2 CIG 005V011 SLP112 T01000078=

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LIFR SPECI KMIE 011437Z 05010KT 5SM BR OVC004 09/08 A2988 RMK AO2 T00940078=

LIFR METAR KMIE 011453Z 06011KT 8SM OVC004 09/08 A2988 RMK AO2 SLP115 60000 T00940078 51013=

LIFR METAR KMIE 011553Z 07010KT 6SM BR OVC004 10/08 A2988 RMK AO2 SLP115 T01000078=

IFR SPECI KMIE 011612Z 08012KT 8SM OVC005 10/08 A2988 RMK AO2 T01000078=

IFR METAR KMIE 011653Z 08012KT 7SM OVC005 10/08 A2987 RMK AO2 SLP112 T01000078=

2.1.1 Muncie 5-minute data

The NWS 5-minute observations were retrieved surrounding the hour of the accident to help define when the low ceiling and IFR conditions were first observed. The observations follow and indicate the time of IFR conditions was first observed was at 0945 EDT. The local time is included in the beginning bracket. The 5-minute data includes additions fields after the altimeter setting for pressure altitude, relative humidity, density altitude, and magnetic wind direction and wind speed. The data from 0830 through 1000 EDT were as follows.

[08:30:31] 5-MIN KMIE 011330Z 04008KT 10SM SCT009 11/08 A2987 990 83 800 050/08 RMK AO2 T01110083

[08:35:31] 5-MIN KMIE 011335Z 06008KT 10SM SCT009 11/08 A2986 1000 86 700 070/08 RMK AO2 T01060083

[08:40:31] 5-MIN KMIE 011340Z 04009KT 10SM SCT007 11/08 A2986 990 86 700 050/09 RMK AO2 T01060083

[08:45:31] 5-MIN KMIE 011345Z 04010KT 10SM BKN007 11/08 A2986 990 86 700 050/10 RMK AO2 CIG 006V011 T01060083

[08:50:31] 5-MIN KMIE 011350Z 04010KT 10SM BKN007 10/08 A2987 990 86 700 050/10 RMK AO2 CIG 005V011

[08:55:31] 5-MIN KMIE 011355Z 05010KT 10SM BKN007 10/08 A2987 990 89 700 060/10 RMK AO2 CIG 005V011 T01000083

[09:00:31] 5-MIN KMIE 011400Z 05009KT 10SM BKN005 BKN009 10/08 A2987 990 89 700 050/09 RMK AO2 T01000083

[09:05:31] 5-MIN KMIE 011405Z 04011KT 10SM BKN005 10/08 A2987 980 86 700 050/11 RMK AO2 CIG 005V008 T01000078

[09:10:31] 5-MIN KMIE 011410Z 04011KT 10SM BKN005 BKN009 10/08 A2988 980 86 700 050/11 RMK AO2 CIG 005V008 T01000078

[09:15:31] 5-MIN KMIE 011415Z 04012KT 10SM BKN005 10/08 A2988 980 86 700 050/12 RMK AO2 CIG 004V008 T01000078

[09:20:31] 5-MIN KMIE 011420Z 04010KT 9SM OVC005 10/08 A2988 980 86 700 040/10 RMK AO2 CIG 004V009 T01000078

[09:25:31] 5-MIN KMIE 011425Z 04013KT 6SM BR OVC005 09/08 A2988 980 89 600 050/13 RMK AO2 T00940078

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[09:30:31] 5-MIN KMIE 011430Z 05011KT 5SM BR OVC005 09/08 A2988 980 89 600 050/11 RMK AO2 T00940078

[09:35:31] 5-MIN KMIE 011435Z 04011KT 5SM BR OVC004 09/08 A2988 980 89 600 050/11 RMK AO2 T00940078

[09:40:31] 5-MIN KMIE 011440Z 05009KT 5SM BR OVC004 09/08 A2988 980 89 600 060/09 RMK AO2 T00940078

[09:45:31] 5-MIN KMIE 011445Z 07011KT 5SM BR OVC004 09/08 A2988 980 89 600 070/11 RMK AO2 T00940078

[09:50:31] 5-MIN KMIE 011450Z 06009KT 7SM OVC004 09/07 A2988 980 86 600 060/09 RMK AO2 SLP115 60000 T00940072 50005

[09:55:31] 5-MIN KMIE 011455Z 05010KT 8SM OVC004 09/07 A2988 970 86 600 060/10 RMK AO2 T00940072

[10:00:31] 5-MIN KMIE 011500Z 06010KT 8SM OVC004 09/07 A2988 970 86 600 070/10 RMK AO2 T00940072

2.1.2 Muncie ASOS and Wind Displays

The KMIE ASOS was located on the south side of the airport about 1,000 ft southeast of the touchdown point of runway 3, and 1,000 ft south-southwest of runway 32, surrounded by a corn field. The ASOS was located about 3,500 ft east of the accident site. Figure 5 is an image of the ASOS looking north, with the wind sensor at the standard height of 10 meters (32.8 ft). The ASOS's Operator Interface Device (OID) terminal is in the control tower cab. The KMIE tower also had a separate wind indicator⁶ for instantaneous wind readouts mounted on the tower at 60 ft agl. Both the wind gauge for instantaneous wind direction and speed and the ASOS OID are shown in figure 6.

⁶ Wind system using a cup anemometer with no archive capability or wind gust and provides instantaneous wind direction and speed at a non-standard height.



Figure 5 - KMIE ASOS system located on the south side of the airport.



Figure 6 - Photo of tower wind gauge (left) and the ASOS OID display (right) in the KMIE tower.

2.2 Fort Wayne, Indiana

The next closest weather reporting facility to the accident site was from Fort Wayne International Airport (KFWE), Fort Wayne, IN, located 44 miles north of the accident site at an elevation of 815 ft. The airport had an Automated Surface Observation System (ASOS) and was augmented by human observers. Around the time of the accident the following conditions were being reported.

Weather observation for KFWA at 1054 EDT, wind from 070° at 11 knots, visibility 8 miles, ceiling overcast at 700 ft agl, temperature 7°C (44°F), dew point temperature 5°C (41°F), altimeter setting 29.93 inHg. Remarks: automated station with a precipitation discriminator, sea level pressure 1013.7-hPa, overcast variable broken sky cover, 6-hour precipitation less than 0.01 inches, temperature 6.7°C, dew point 5.0°C, 3-hour pressure tendency risen 1.0-hPa.

The general flight category and raw observations surrounding the period were as follows.

IFR SPECI KFWA 011104Z 04011KT 3SM RA BR BKN005 OVC048 06/05 A2988 RMK AO2 P0002 T00610050 \$=

LIFR SPECI KFWA 011125Z 09011KT 3SM -RA BR OVC004 06/05 A2984 RMK AO2 PRESFR P0004 T00610050 \$=

LIFR SPECI KFWA 011151Z 04011KT 6SM -RA BR OVC004 06/04 A2990 RMK AO2 WSHFT 1131 P0005 \$=

LIFR METAR KFWA 011154Z 03009KT 6SM -RA BR OVC004 06/04 A2990 RMK AO2 WSHFT 1131 SLP126 P0005 60092 70147 T00610044 10061 20056 50015 \$=

IFR SPECI KFWA 011225Z 04010KT 6SM BR OVC006 06/04 A2991 RMK AO2 RAE1158 P0000 T00610044=

IFR METAR KFWA 011254Z 05010KT 6SM BR OVC006 06/05 A2991 RMK AO2 RAE1158 SLP132 P0000 T00610050=

IFR METAR KFWA 011354Z 05013KT 7SM OVC006 06/05 A2992 RMK AO2 SLP134 T00610050=

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IFR METAR KFWA 011454Z 07011KT 8SM OVC007 07/05 A2993 RMK AO2 SLP137 OVC V BKN 60000 T00670050 51010=

IFR METAR KFWA 011554Z 07012KT 7SM OVC007 07/06 A2993 RMK AO2 SLP139 T00720056=

IFR METAR KFWA 011654Z 08010KT 6SM BR OVC007 08/06 A2991 RMK AO2 SLP133 T00780056=

2.3 NWS Aviation Weather Center METAR Display

A depiction of the observations from the NWS AWCs METAR display for 1030 EDT is included as figure 7, with the fronts and regional mosaic radar overlaid. No significant meteorological echoes were observed in the vicinity of the accident site. The image depicted an extensive area of IFR to LIFR conditions generally over central Indiana and Ohio, with MVFR conditions as you moved southward towards the front.

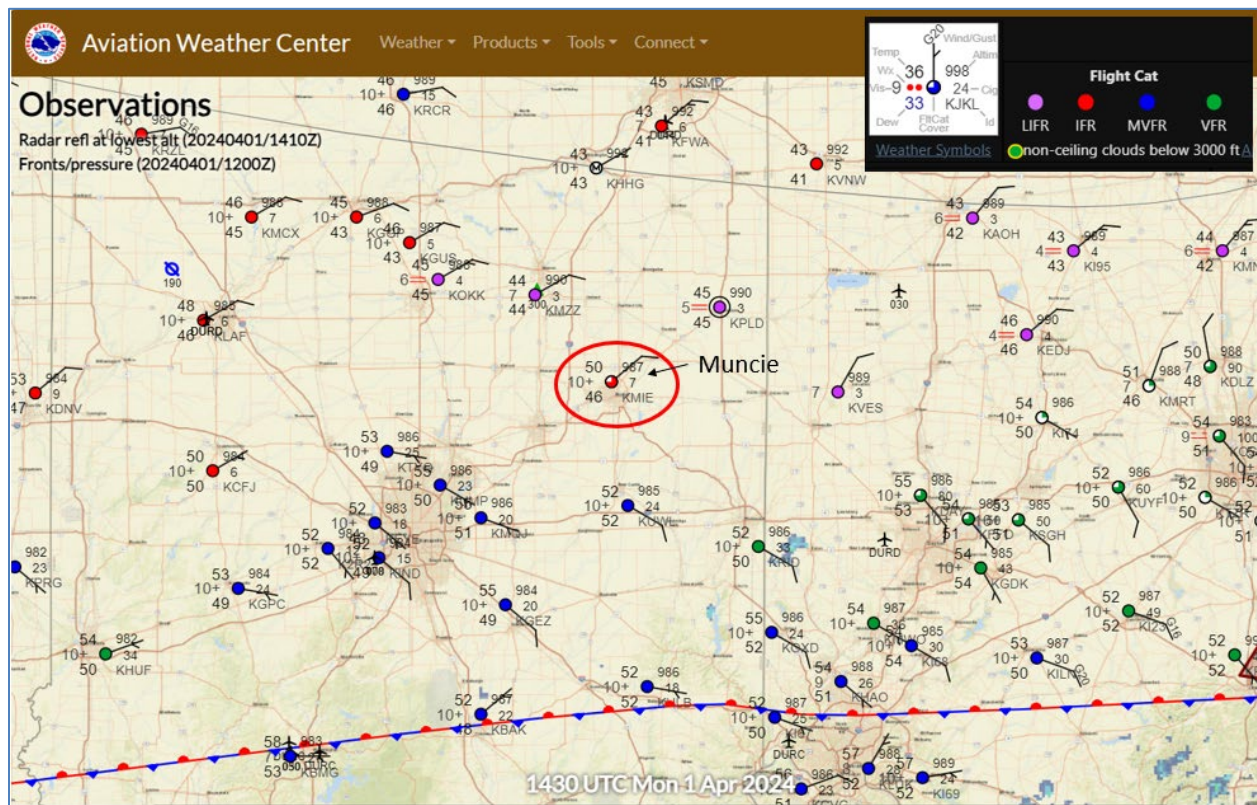


Figure 7 - NWS Aviation Weather Center's METAR display for 1030 EDT with fronts and radar overlaid. A red circle encloses Muncie and the accident site.

3.0 Atmospheric Sounding

A High-Resolution Rapid Refresh (HRRR) numerical model was obtained from the NOAA Air Resource Laboratory for 1100 EDT over the closest grid point to the accident site. The model data was then plotted on a standard Skew T/log P diagram using the RAOB Analysis software from the surface to 450-hectopascals or about 20,000 ft and is depicted as figure 8. The sounding depicted an elevation of 945 ft over the grid point with a near surface temperature of 10°C (50°F), a dew point temperature of 9°C (48°F), with a relative humidity of 93%, and an altimeter setting of 29.87 inHg. The calculated density altitude was 762 ft. The lifted condensation level (LCL)⁷ and level of free convection (LFC)⁸ was identified at 417 ft agl, and the convective condensation level (CCL)⁹ at 530 ft agl. The sounding depicted an inversion

⁷ The lifted condensation level (LCL) is the level at which a lifted parcel becomes saturated. The LCL height corresponds to cloud base height for forced ascent.

⁸ The level of free convection (LFC) is the level where a parcel becomes buoyant, or "warmer" than the environmental temperature at the same level. The LFC represents the bottom of the layer containing CAPE.

⁹ The convective condensation level (CCL) is the height at which a parcel of air, when heated sufficiently from below, rises and becomes saturated. It is where newly forming convective clouds should form

immediately above the CCL at 1,800 ft through about 4,000 ft msl (shaded area in green across sounding), where the temperature increased with altitude. The freezing level was identified at about 11,000 ft (blue horizontal line). The lifted index (LI)¹⁰ was 9.5 and the convective available potential energy (CAPE) was only 5 Joules/kilogram (j/kg) and indicated a general stable atmosphere. The RAOB analysis program indicated a broken layer of stratiform clouds from the LCL or about 500 ft agl with tops to 1,300 ft agl (2,200 ft msl). A second layer of broken clouds were also indicated between 3,700 ft to 6,600 ft agl. The precipitable water content was 0.90 inches. No structural icing conditions were depicted below 11,000 ft.

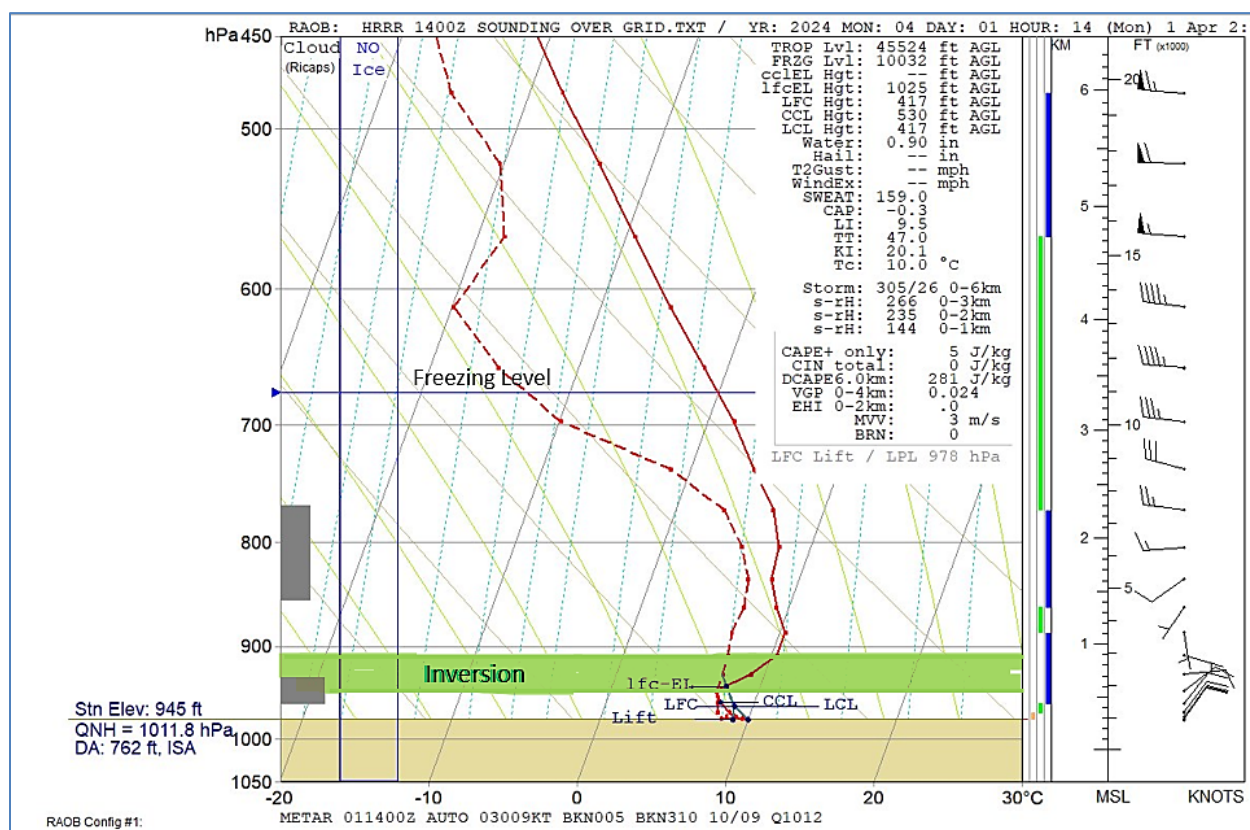


Figure 8 - High-Resolution Rapid Refresh (HRRR) numerical model sounding over the accident site for 1100 EDT depicting the vertical structure of temperature, moisture, wind, and other significant levels.

The HRRR sounding wind profile indicated a surface wind of 030° at 9 knots, with winds shifting to the south and then veering to the west with height with increasing

bases.

¹⁰ 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. Negative values indicate instability - the more negative, the more unstable the air is, and the stronger the updrafts are likely to be with any developing thunderstorms.

winds speeds. The mean 0 to 6 kilometers (km)¹¹ or approximately 18,000 ft wind was from 275° at 35 knots. The RAOB analysis program depicted a layer between 5,000 and 9,000 ft with strong vertical wind shear and a high probability of moderate or greater turbulence (see table below).

A table of the RAOB parameters of height, pressure (Pres), temperature (T), dew point temperature (Td), relative humidity (RH%), wind direction and speed, and derived clear air turbulence (CAT), Low-Level Wind Shear (LLWS), and icing potential from the surface through 12,000 ft was as follows.

Height (ft-msl)	Pres (hPa)	T (C°)	Td (C°)	RH (%)	Wind (dir-kts)	CAT (FAA)	LLWS (FAA)	Icing-Type (USAF)
945	978	10.0	9.0	93	032/ 9			
973	977	9.6	8.2	91	032/ 9		LIGHT	
1029	975	9.1	8.5	96	033/ 11			
1169	970	8.6	7.8	95	034/ 12			
1450	960	7.8	7.6	99	035/ 12			
1819	947	7.2	7.2	100	049/ 11	MDT	LIGHT	
2340	929	9.1	7.2	88	084/ 9	LGT		
2934	909	10.4	7.1	80	108/ 6	LGT		
3635	886	10.4	6.8	78	172/ 5	LGT		
4417	861	9.2	7.0	86	212/ 6	LGT		
5284	834	8.2	6.6	90	232/ 9	SVR		
6278	804	7.9	5.4	84	265/ 17	MDT		
7412	771	6.6	3.3	79	278/ 24	LGT		
8660	736	4.3	-1.3	67	287/ 29	MDT		
10108	697	1.8	-9.9	41	278/ 37	LGT		

4.0 Satellite Imagery

The NOAA Geostationary Operational Environmental Satellite number 16 (GOES-16) infrared, water vapor, and visible imagery were obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System (McIDAS) software. The infrared band 13 at a wavelength of 10.3 microns (μ m) provided a resolution of 2 km. While the visible (band 2) at a wavelength of 0.64 μ m provided a resolution of 0.5 km.

Figures 9 and 10 are the GOES-16 infrared and visible imagery for 1026 EDT, which depicted multiple layers of low and mid-level clouds obscuring the accident site. The infrared image for 1026 EDT depicted a radiative cloud top temperature of 272 Kelvin or -1°C over the accident site, which corresponded to cloud tops near 11,000 ft based on the HRRR sounding. While the visible image depicted low clouds obscuring the accident site with a few breaks in the clouds to the southeast and southwest.

¹¹ The 0 to 6 km wind represents the mean atmospheric wind and the general steering level wind.

Figure 9 - GOES-16 infrared image for 1026 EDT at 4X magnification with a standard MB enhancement curve applied to highlight the higher and colder cloud tops.

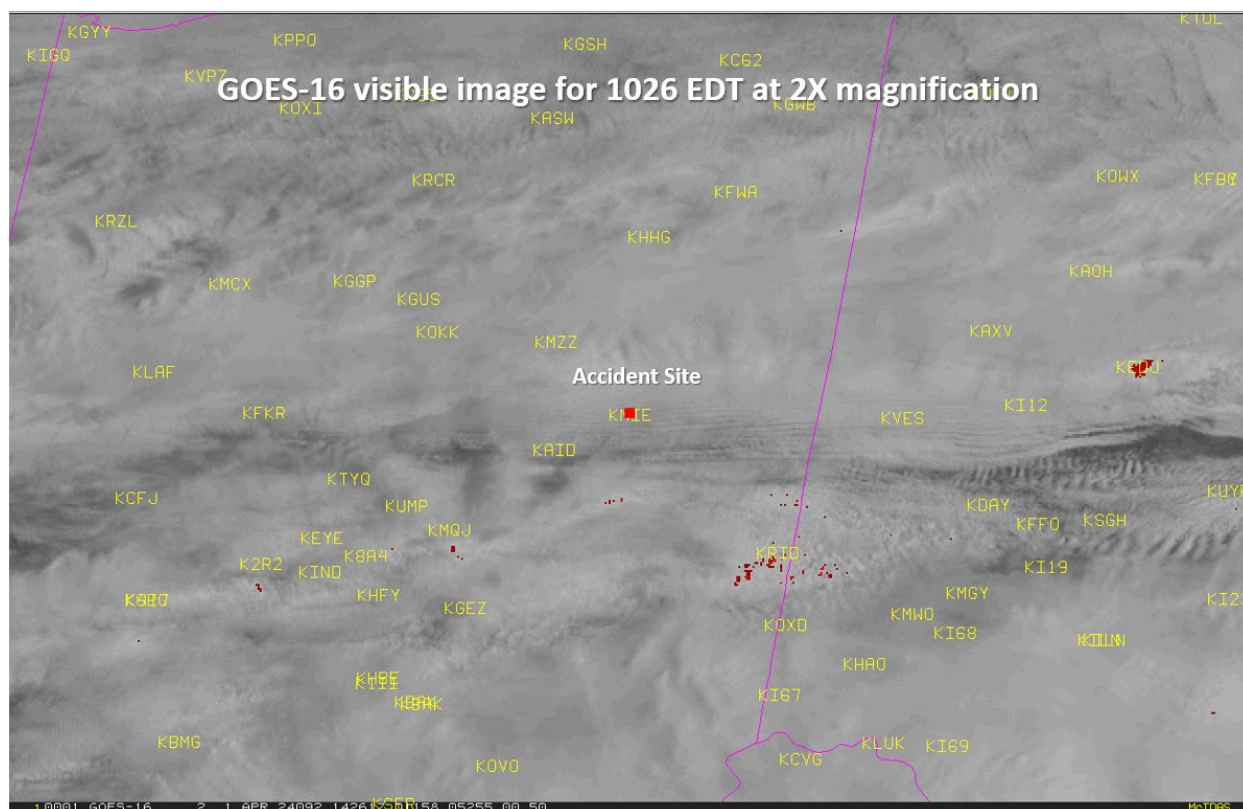


Figure 10 - GOES-16 visible image for 1026 EDT at 2X magnification.

5.0 Pilot Reports

The following pilot reports (PIREPs) were recorded within 50 miles of the accident site between 0730 through 1230 EDT. The reports above 18,000 ft have been eliminated. The reports are in standard code and abbreviations with time referenced to UTC.

IND UA /OV VHP160010/TM 1153/FLDURGD/TP C310/SK 017BKNUNKN
 IND UA /OV IND/TM 1308/FL025/TP B737/SK 023OVCUNKN/RM DURC
 IND UA /OV VHP160010/TM 1310/FLDURGD/TP A20N/SK UNKNBKN047
 IND UA /OV VHP160009/TM 1313/FL020/TP A20N/SK 020BKN047
IND UA /OV IND/TM 1400/FL070/TP P28B/SK 024OVC070
 IND UA /OV IND/TM 1403/FL008/TP CRJ9/SK 017BKNUKN/RM DURGD
Accident 1428Z
 IND UA /OV MIE160015/TM 1501/FL150/TP CRJ9/TB NEG
 IND UA /OV VHP060016/TM 1527/FL048/TP BE40/SK UNKNBKN050/RM DURD
 IND UA /OV VHP100020/TM 1617/FL080/TP E75S/SK UNKN BKN 050

According to the ATC Field Notes, the accident aircraft provided a report of flight conditions to the local approach controller at 0951 EDT of cloud bases at 2,400 ft with tops of 7,000 ft. The controller then inquired if the flight was experiencing icing, to which the pilot responded in the negative. That PIREP is believed to be the report

in bold blue type above. An additional report provided to the local air traffic controller at KMIE and not entered into the national database was obtained on site. The report from a PC-12 that landed at 1101 EDT (1501Z) when asked about the flight conditions, the pilot responded, “we popped-out right at minimums”.

6.0 NWS Forecasts

The NWS Indianapolis (KIND), Indiana, Weather Forecast Office (WFO) was responsible for issuing weather alerts and warnings for the Muncie area, while the NWS AWC was responsible for the aviation enroute forecasts and advisories.

6.1 Terminal Aerodrome Forecast

The NWS KIND WFO does not issue a Terminal Aerodrome Forecast for KMIE. While a TAF is valid for a 5 statute mile radius from the airport’s center point, pilots, briefers, and flight planning systems will often refer to the closest TAF for a more time and specific weather breakdown. The closest civilian airport with a TAF was from Fort Wayne International Airport (KFWA) located about 44 miles north of the accident site at an elevation of 814 ft. The TAF current during the period was as follows.

*TAF KFWA 011120Z 0112/0212 06010KT 4SM -SHRA BR SCT005 OVC007
TEMPO 0112/0114 2SM SHRA BR BKN005
FM011400 08011KT 5SM BR OVC007
FM011800 09013KT P6SM OVC015
FM012300 08011KT 5SM -SHRA BR VCTS OVC007CB
PROB30 0123/0203 2SM -TSRA BR OVC007CB
FM020700 06010KT 2SM SHRA BR OVC005=*

The forecast for KFWA was issued at 0720 EDT, and for the period of 1000 through 1400 EDT expected IFR conditions to prevail with winds from 080 at 11 knots, visibility 5 miles in mist, with a ceiling overcast at 700 ft agl. After 1900 EDT rain showers and thunderstorms were expected with continued IFR conditions through the period.

6.2 Area Forecast Discussion

The NWS Area Forecast Discussions (AFD) are issued by each WFO to describe the short-term weather conditions within their region with an aviation section that includes the general conditions as it relates to the creation of the TAF. These are useful for additional aviation-related issues that cannot be encoded into the TAF and provide some reasoning behind the forecast. These are generated roughly every 6 hours and corresponds to the release of the latest TAFs for that office. While KIND does not issue a TAF for KMIE, the AFD issued at 0547 EDT for the period was as follows.

FXUS63 KIND 010947
AFDIND

Area Forecast Discussion
National Weather Service Indianapolis IN
547 AM EDT Mon Apr 1 2024

.KEY MESSAGES...

- Scattered to widespread showers and thunderstorms this afternoon through tonight. Severe storms and flooding are possible.
- Severe weather possible again on Tuesday, mainly across S/SE portions of the area
- A significant temperature drop is expected post frontal passage on Tuesday evening. Potential impacts in the cold sector include scattered snow showers and overnight frost/freeze.
- Early forecast thoughts on the April 8th eclipse covered in the CLIMATE section at the bottom

.FORECAST UPDATE...

Issued at 547 AM EDT Mon Apr 1 2024

Lowered PoPs the rest of the overnight based on radar and CAMs trends. Currently, areas near and south of I-70 should stay dry through daybreak. After that, should see no more than a stray shower before the atmosphere retools this afternoon, setting the stage for more widespread convection including severe potential.

.SHORT TERM (Today and tonight)...

Issued at 309 AM EDT Mon Apr 1 2024

Rest of the Overnight...

HRRR and radar trends suggest the bulk of the convection the remainder of the overnight will be north of central Indiana with more scattered benign cells over areas north of Noblesville and well north of the warm front that was extending from just north of Terre Haute to around North Vernon per surface analysis.

Today...

Good confidence in a morning lull in the showers with convection redeveloping and or moving into the area from Illinois this afternoon as an upper wave, currently over eastern Colorado rides eastward and nudges the quasi-stationary front northeastward. Moderate instability with CAPE up to 1500 J/kg south of the front along with 50+ knot deep shear, frontal forcing and upper impulses will result in widespread and rapid thunderstorm development with all modes of severe on the table but primarily large hail, north of the front and damaging winds south of the front. The tornado threat would be greatest from any storm that can ride the front.

Pinning down the front will continue to be problematic regarding temperatures in addition to greatest severe concern. Highest confidence in temperatures over far southwestern and northeastern sections, where the front is not expected to be. Despite little breaks in the cloud cover, warm advection will support well above normal afternoon highs in the middle to upper 70s southwest. Meanwhile, northeastern sections will struggle to reach the lower 60s.

Tonight...

Severe threat will continue into the night but be greatest in the evening. Highest concentration will start off over northeastern sections as 305K isentropic lift rides over the front but then shifts to southern sections overnight as an MCS likely forms upstream on the nose of an approaching low level jet. Greater threat overnight will be rain. DESI suggests 24 hour rainfall totals will be from 1.5 to 2.5 inches. This would likely cause at least some localized flooding.

Temperatures overnight will drop to the upper 40s or lower over northern sections but only to the lower 60s over southern sections that reside in the warm sector.

.AVIATION (06Z TAF Issuance)..

Issued at 524 AM EDT Mon Apr 1 2024

Impacts:

- Scattered to numerous convection*
- Widespread thunderstorms, some strong or severe, by afternoon*
- Mostly IFR ceilings at KLAF and mostly MVFR ceilings elsewhere*
- ENE winds at KLAF, otherwise winds be variable depending on the frontal location*

Discussion:

The quasi-stationary front will continue to oscillate and result in variable winds through the TAF period, except at KLAF, where winds will primarily be northeast. Convection will reignite this afternoon as instability increases and the front lifts slightly northeast. Strong to severe storms are possible with the afternoon and evening storms with wind gusts to 50 knots and large hail possible. Flying conditions will be mostly IFR at KLAF and MVFR at the other sites. The visibility will also at times deteriorate in convection.

.IND WATCHES/WARNINGS/ADVISORIES...

None.

6.3 Graphic Forecast for Aviation

The NWS Graphic Forecast for Aviation (GFA) is a graphical depiction of surface wind, thunderstorms, precipitation, color-coded general flight categories, and cloud cover bases and tops reported in msl heights, from graphical output from the NWS National Digital Forecast Database (NDFD) with the Graphic-Airmen's Meteorological Information (G-AIRMET) for IFR conditions, mountain obscuration, icing conditions, and strong surface wind overlaid. The GFA provides a forecast for the enroute phase of flight and for locations without a TAF, such as in this case at KHSP. The GFA is available at the NWS AWC website and through other weather briefing services.

The GFA 3-hour Surface and Cloud Forecasts issued for the period was valid at 1100 EDT are included as figures 11 and 12 respectively, with the approximate accident site marked by the red star. The GFA surface forecast depicted general easterly winds of 10 to 15 knots over the area, an area of MVFR to IFR conditions were

AVIATION SURFACE FORECAST

VALID AT 1500 UTC MON 01 APR 2024

FORECASTED POINTS MAY NOT REPRESENT CONDITION IN PROXIMITY

OBSURATIONS:

- Haze
- Fog
- Smoke
- Dust/Sand

WEATHER:

- Rain
- Snow
- Mix
- Ice

T-STORM:

- Isolated
- Scattered
- Numerous

VISIBILITY (SM)

0 1 3 5

SURFACE WINDS/GUSTS(RED) AIRMETS:

- IFR
- SEC WHO

AVIATION WEATHER CENTER (NOAA/NWS/NCEP)

ISSUED AT 1301 UTC MON 01 APR 2024

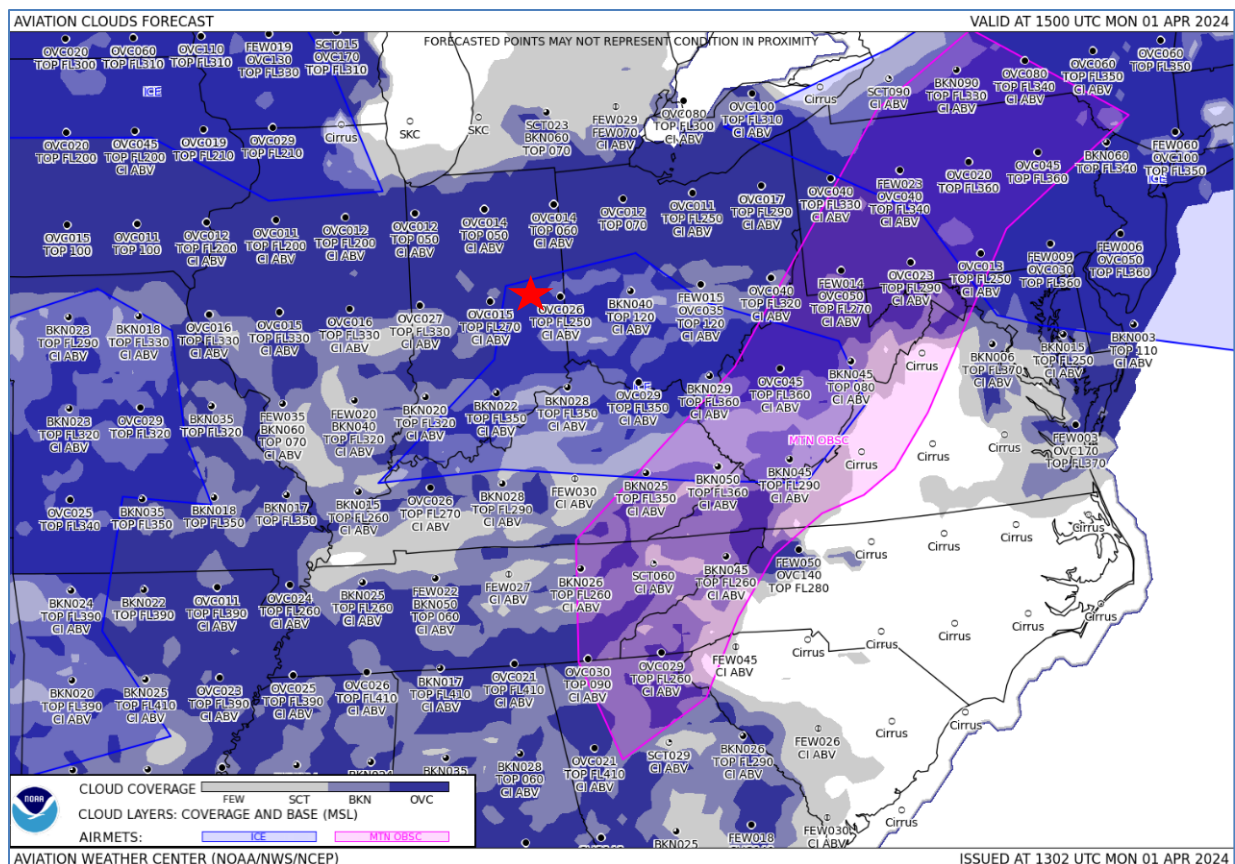


Figure 12 - GFA 3-hour Cloud Forecast valid for 1100 EDT with accident site.

7.0 NWS Inflight Weather Advisories

In-flight Aviation Weather Advisories are forecasts that advise en route aircraft of the development of potentially hazardous weather. Inflight aviation weather advisories in the conterminous U.S. are issued by the NWS AWC, as well as from the Center Weather Service Units (CWSU) at the various Air Route Traffic Control Centers (ARTCCs). There are four basic types of inflight aviation weather advisories: the Significant Meteorological Information (SIGMET), the Convective SIGMET, the G-AIRMETS, and the Center Weather Advisory (CWA). Inflight advisories serve to notify en-route pilots of the possibility of encountering hazardous flying conditions that may not have been forecast at the time of the preflight briefing. Whether or not the condition described is potentially hazardous to a particular flight is for the pilot to evaluate based on experience and the operational limits of the aircraft. Once issued they are broadcast by FAA air traffic controllers upon issuance and available on inflight weather broadcasts.

During the period of the accident flight, there were no SIGMETs, Convective SIGMETs, Center Weather Advisories (CWA's) current over the route or the accident site. The NWS did have a series of Graphic-AIRMETS current for IFR conditions, and

high altitude icing conditions¹² (from the freezing level between 10,000 ft and 14,000 ft through 25,000 ft) above the accident airplanes cruising level. A depiction of G-AIRMET for IFR conditions included as figure 13.

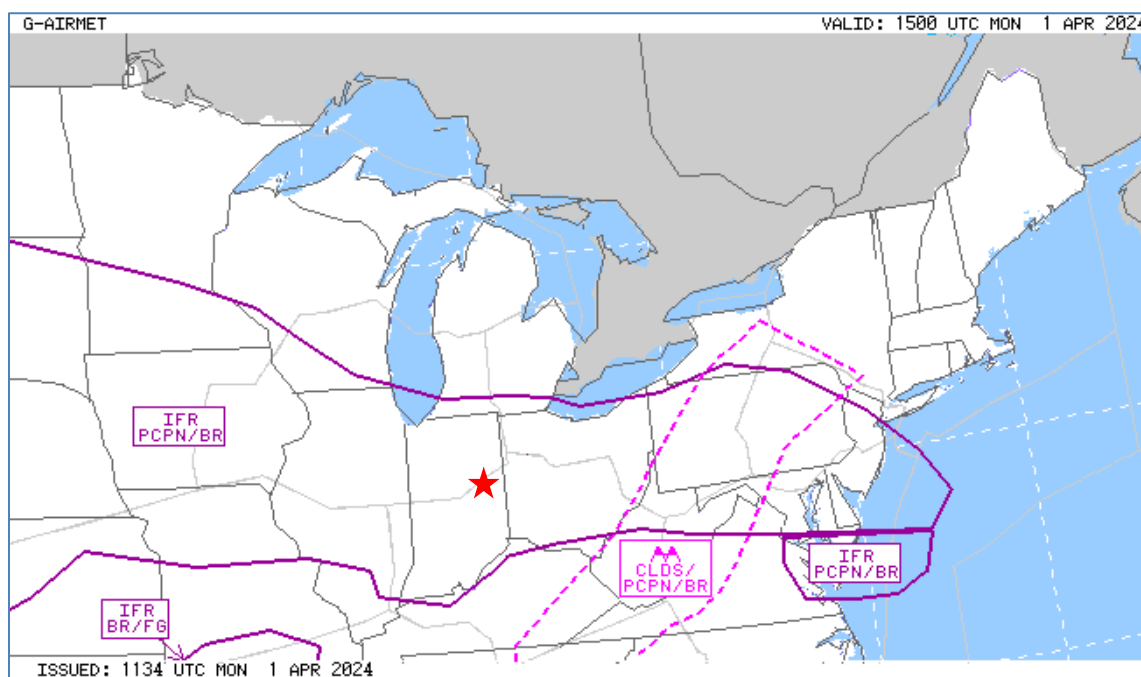


Figure 13 - NWS AWC G-AIRMET for IFR and mountain obscuration conditions.

8.0 Preflight Weather Briefing

A search of the FAA contract Automated Flight Service Station (AFSS) provider Leidos and Flt.Plan.com indicated that they had no contact from the accident pilot during the period for any flight plans or weather briefing. A separate search from ForeFlight indicated a VFR flight plan was filed through their system at 0852 EDT, with a departure time of 0920 EDT with an enroute time of 40-minutes. That was later updated at 0909 EDT to an IFR flight plan with a departure time of 0930 EDT. A route briefing generated with the flight plan is included as attachment 2.

9.0 Witness Statement

The two individual who were injured on the ground from the accident provided statements. They indicated the sky was overcast with foggy like conditions aloft and only saw the accident airplane briefly near tree level immediately before it impacted the ground.

¹² G-AIRMET Zulu was current for occasional moderate icing conditions from the freezing level between 10,000 ft and 14,000 ft over the region to 24,000 ft. The accident airplane's flight track remained below the freezing level, and thus not a factor.

10.0 Astronomical Conditions

The United States Naval Observatory's website¹³ provided the following astronomical data for Muncie, Indiana on April 1, 2024.

<u>SUN</u>	<u>Time (EDT)</u>
Begin civil twilight	0657
Sunrise	0724
Accident time	1027
Sun transit	1345
Sunset	2007
End civil twilight	2034

At the time of the accident the Sun was at an altitude of 33.27° and azimuth of 114.92°. Daytime conditions prevailed at the time of the accident.

F. LIST OF ATTACHMENTS

Attachment 1 - Animation of the GOES-16 visible satellite imagery

Attachment 2 - ForeFlight Route Briefing

Submitted by:

Donald Eick
Weather Group Chairmen

Paul Suffern
Weather Group

¹³ <https://aa.usno.navy.mil/data/index>