



NATIONAL TRANSPORTATION SAFETY BOARD

**Office of Aviation Safety
Washington, D.C. 20594**

March 10, 2015

Meteorology Factual Report

ERA15FA088

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A. ACCIDENT

Location: near Kuttawa, Kentucky
Date: January 2, 2015
Time: About 1755 central standard time (2355 UTC¹)
Airplane: Piper Seneca PA-34; registration N81291

B. METEOROLOGY GROUP

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C. SUMMARY

On January 2, 2015, about 1755 central standard time, a Piper PA-34-200T, N81291, was substantially damaged when it impacted trees and terrain during a forced landing near Kuttawa, Kentucky. The commercial pilot, and three passengers were fatally injured, and another passenger was seriously injured. Night instrument meteorological conditions prevailed and an instrument flight rules (IFR) flight plan was filed for the personal flight which was conducted under the provisions of Title 14 Code of Federal Regulations Part 91. The flight departed Tallahassee Regional Airport (TLH), Tallahassee, Florida, around 1600 eastern standard time, with the intended destination of Mount Vernon Airport (MVN), Mount Vernon, Illinois.

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 Climatic Data Center (NCDC). All times are central standard time (CST) based upon the 24 hour clock, local time +6 hours to UTC, and UTC=Z. Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles. NWS airport and station identifiers use standard International Civil Aviation Organization (ICAO) 4-letter station identifiers versus International Air Transport Association (IATA) 3-letter identifiers which deletes the initial country code designator "K" for U.S. airports. Both codes are both used intermittently in this report as reported by the issuer of the report.

The accident site was located at latitude 37.03368° N and longitude 88.1688° W at an elevation of approximately 490 feet.

¹ UTC – is an abbreviation for Coordinated Universal Time.

E. 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 (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 joint NWS and Federal Aviation Administration (FAA) Advisory Circular “Aviation Weather Services”, AC 00-45G.

1.1 Surface Analysis Chart

A section of the NWS Surface Analysis Chart for 1800 CST on January 2, 2015 (0000Z on January 3, 2015) for the eastern half of the United States is included as figure 1, with the approximate accident site indicated by a red star. The chart depicted a low pressure center off the South Carolina coast at 1024-hectopascals (hPa) along a cold front, which stretched southwestward and dissipated over Florida. A warm front was depicted off the Florida panhandle into southern Mississippi and Louisiana, and along the Texas coast. High pressure was located over West Virginia at 1031-hPa. No frontal boundaries or other boundaries were identified over the route.

The station models on the chart depicted light easterly winds over the route of flight, with overcast clouds, and with numerous stations reporting mist or fog. The temperature depicted in the immediate vicinity of the accident site was 38° Fahrenheit (F), and the dew point temperature of 37° F.

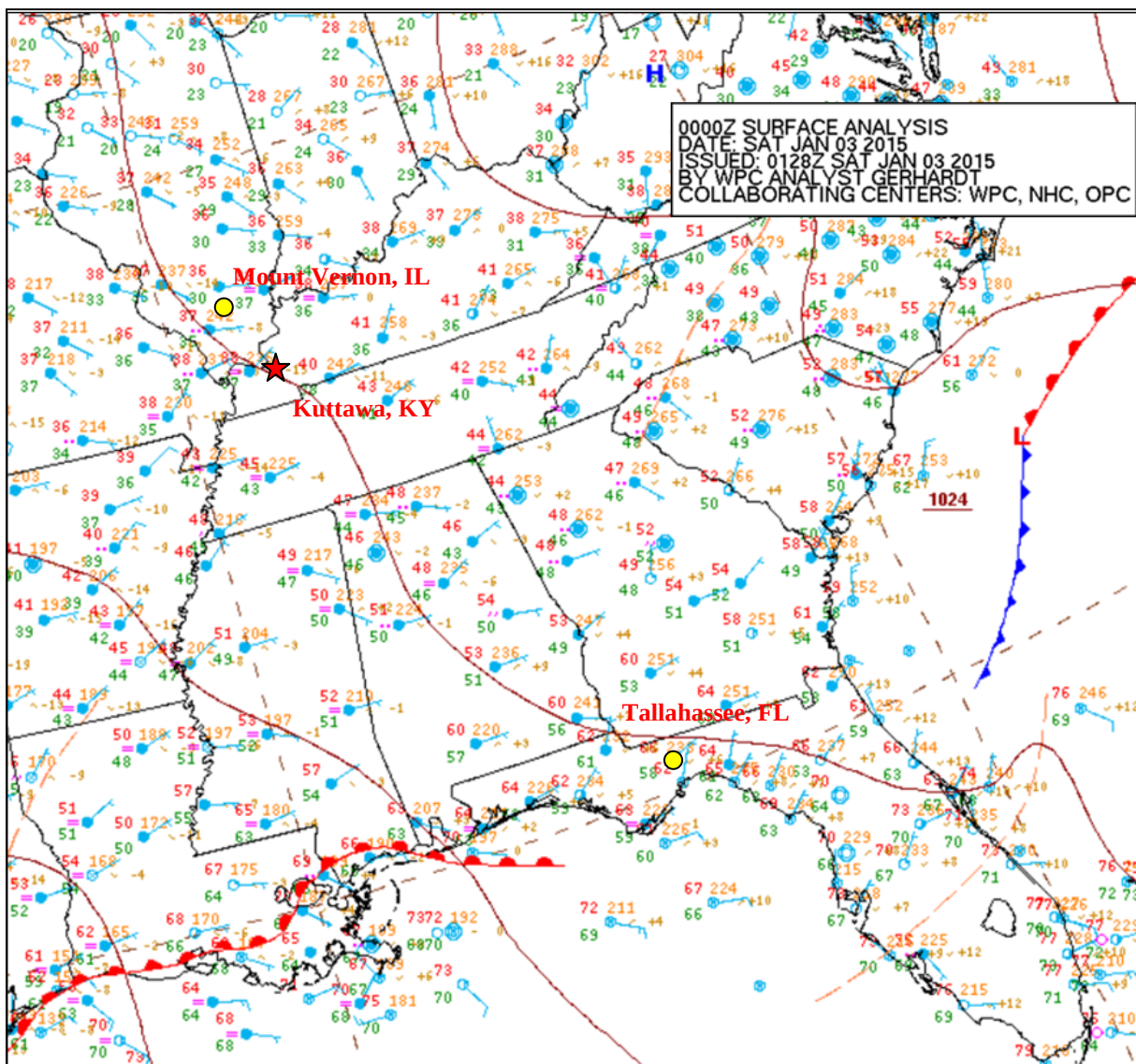


Figure 1 - NWS Surface Analysis Chart for 1800 CST on January 2, 2015 (0000Z)

1.2 Weather Depiction Chart

The eastern half of the NWS Weather Depiction Chart for 1600 CST on January 2, 2015 is included as figure 2, with the approximate accident site marked by a red star. The chart depicted the general flight categories² across the region as defined in. The chart depicted an extensive

² As defined by the NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories:

- Instrument Flight Rules (IFR) – ceiling or lowest layer of clouds reported as broken, overcast or the vertical visibility into a surface based obscuration below 1,000 feet above ground level (agl) and/or visibility less than 3 statute miles.
- Marginal Visual Flight Rules (MVFR*) – ceiling from 1,000 to 3,000 feet agl and/or visibility 3 to 5 miles.
- Visual Flight Rules (VFR) – ceiling greater 3,000 feet agl and visibility greater than 5 miles.

area of instrument flight rule (IFR) conditions by a shaded contour line from southern Illinois and Missouri, western Kentucky, most of Tennessee, western Georgia, Alabama, Mississippi, Arkansas, Louisiana, Texas, and eastern Oklahoma. The IFR conditions extended over the accident site, to immediately south of the destination area. An unshaded contour depicted marginal visual flight rule (MVFR) conditions which surrounded the IFR area and extended over central Illinois, Missouri, and Indiana, and also extended over the Florida panhandle and included the Tallahassee area. The closest visual flight rule (VFR) conditions were depicted over northern Illinois, without any contour line.

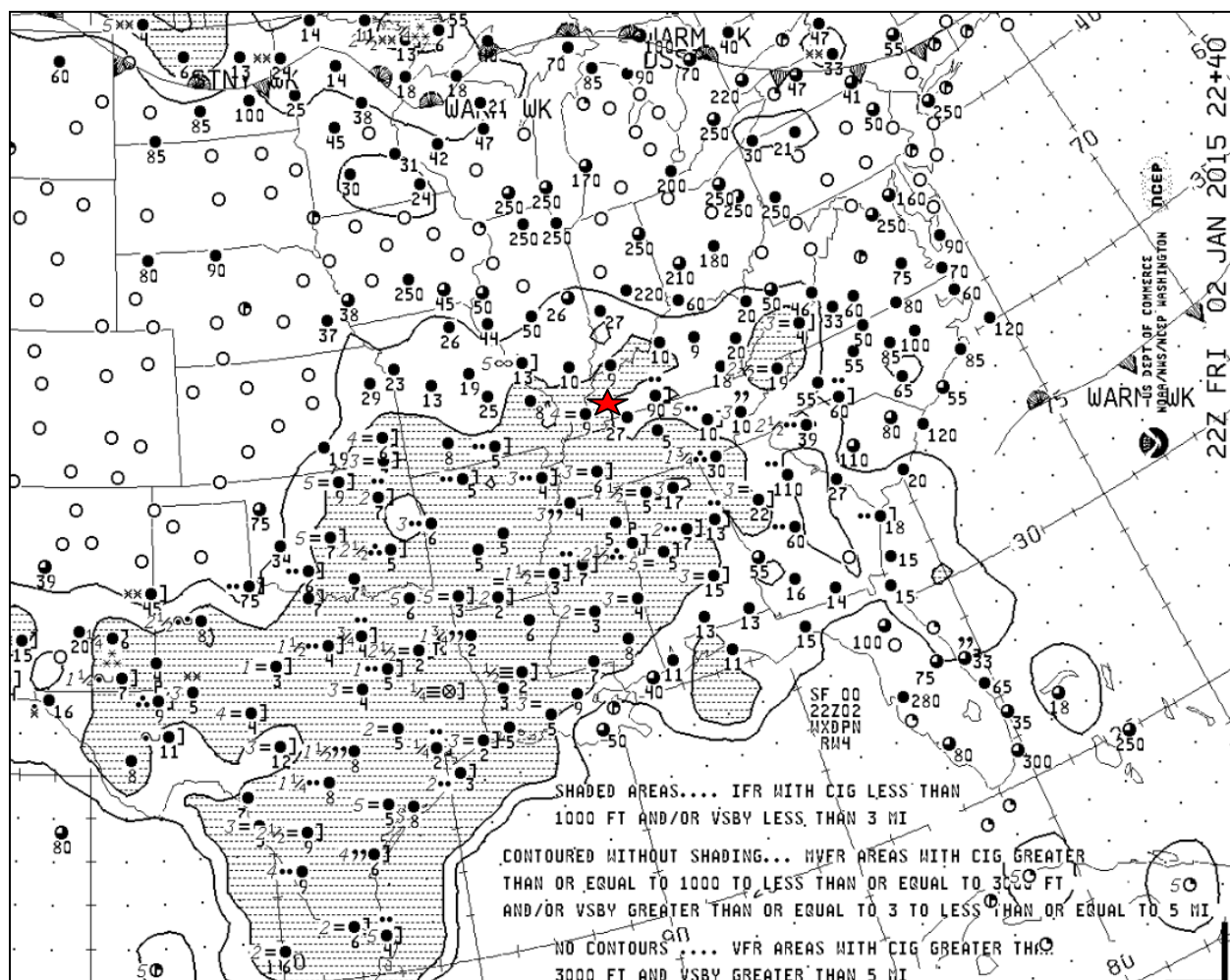


Figure 2 - NWS Weather Depiction Chart for 1600 CST (2200Z)

The closest station model to the accident site indicated IFR conditions with a ceiling overcast at 900 feet agl, and visibility of 4 miles in mist.

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

1.3 Weather Radar Mosaic

The NOAA National Climatic Data Center (NCDC) National radar mosaic for 1755 CST (2355Z) is included as figure 3. The image depicted a band of echoes associated with rain showers extended over western Kentucky into southern Missouri and Illinois, and into northern Arkansas. The image depicted very light intensity echoes in the vicinity of the accident site, and rain showers between the accident site and the destination airport.



Figure 3 - NWS National radar mosaic for 1755 CST (2355Z)

The closest NWS weather radar will be further documented in section 5.0 of this report, to further identify if any significant weather echoes were identified along the flight track and accident site.

1.4 Low-Level Significant Weather Prognostic Chart

The NWS 12- and 24-hour Low-Level Significant Weather Prognostic Chart valid for the period is included as figure 4, and graphically depicted the expected frontal boundaries, precipitation, general flight categories, freezing level, and turbulence potential from the surface to 24,000 feet. The left portion of the chart was the 12-hour forecast valid for 1800 CST (0000Z) or the conditions expected at the approximate time of the accident, and right portion of the chart the 24-hour conditions valid for 0600 CST on January 3, 2015.

The 12-hour forecast indicated that light to moderate rain showers with a coverage greater than 50% was expected north of the frontal boundary along the Gulf of Mexico coast over the route from Alabama, Tennessee and Kentucky, with the precipitation ending over central Illinois. Top left portion of the chart indicated that IFR conditions were expected over northern Alabama

northward through the western Tennessee and Kentucky, into southern Illinois and Missouri. The freezing level ranged from 14,000 feet over Tallahassee to near 8,000 feet in the destination area. No significant turbulence, outside of convective activity was expected along the route of flight.

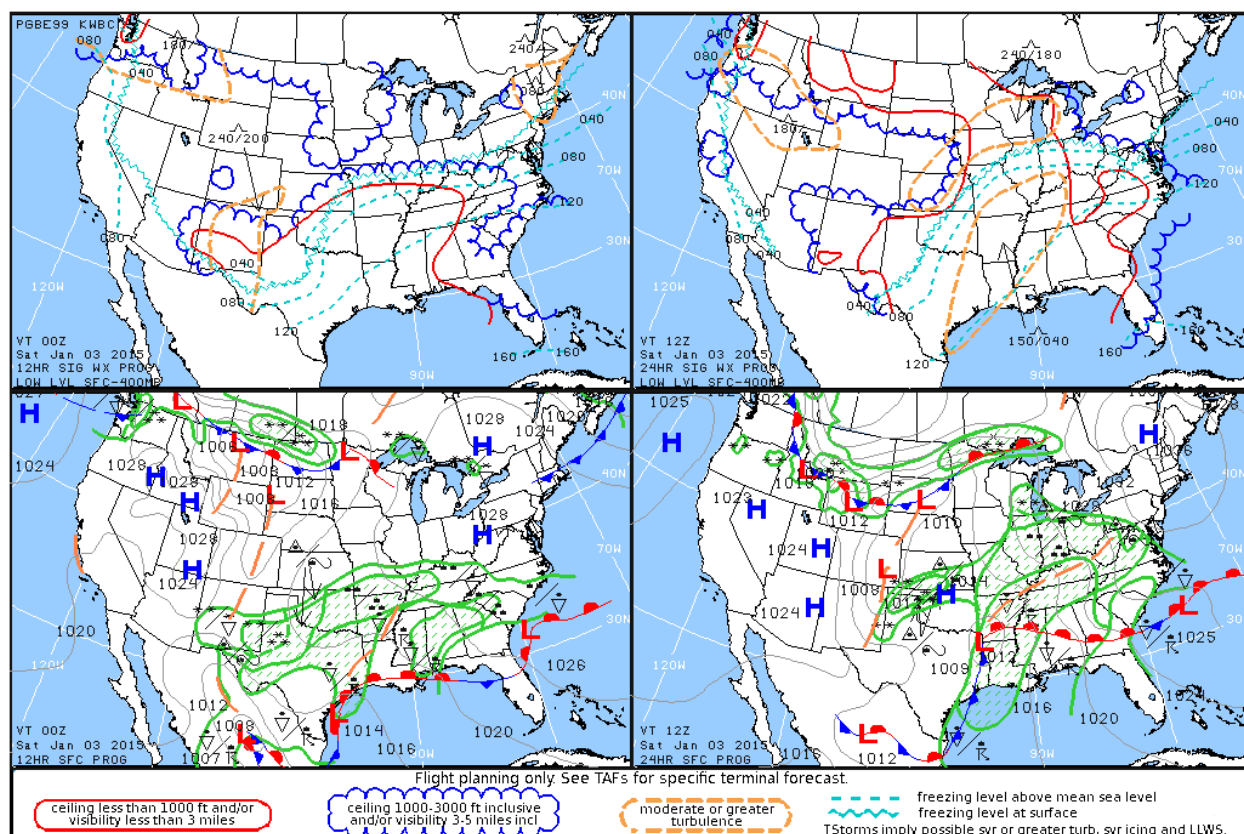


Figure 4 - NWS 12- and 24-hour Low-Level Significant Weather Prognostic Chart

2.0 Surface Observations

The official NWS Meteorological Aerodrome Reports (METARs) and special reports (SPECIs) surrounding the accident site were documented. The cloud heights are reported above ground level (agl).

2.1 Marion-Crittenden County Airport (K5M9), Marion, Kentucky

The closest weather reporting location was from Marion-Crittenden County Airport (K5M9), Marion, Kentucky, located approximately 18 miles north of the accident site, at an elevation of 650 feet. The airport had an Automated Weather Observation System (AWOS), which issued observations every 20 minutes. The following conditions were reported at the approximate time of the accident:

Marion-Crittenden County Airport weather at 1755 CST, automated, wind from 080° at 6 knots, visibility 4 miles in mist, ceiling overcast at 500 feet agl, temperature and dew point 2° Celsius (C), altimeter 30.23 inches of mercury (Hg).

The raw observations in standard code and the approximate flight category surrounding the period were as follows:

LIFR METAR K5M9 021655Z AUTO 12004KT 4SM BR OVC002 01/01 A3032 AO2 T00140012

LIFR METAR K5M9 021715Z AUTO 11005KT 5SM BR OVC004 02/01 A3031 AO2 T00150013

LIFR METAR K5M9 021735Z AUTO 11005KT 5SM -DZ OVC004 02/01 A3029 AO2 T00170014

LIFR METAR K5M9 021755Z AUTO 11005KT 5SM BR OVC004 02/02 A3029 AO2 T00170015 10019 20000

LIFR METAR K5M9 021815Z AUTO 00000KT 5SM BR OVC004 02/02 A3027 AO2 T00210018

LIFR METAR K5M9 021835Z AUTO 12005KT 5SM -RA OVC004 02/02 A3027 AO2 T00200016

LIFR METAR K5M9 021855Z AUTO 11004KT 7SM -DZ OVC004 02/02 A3027 AO2 T00200017

IFR METAR K5M9 021915Z AUTO 14007KT 7SM OVC006 02/02 A3027 AO2 T00230018

IFR METAR K5M9 021935Z AUTO 00000KT 10SM OVC006 02/02 A3027 AO2 T00260019

IFR METAR K5M9 021955Z AUTO 08004KT 10SM BKN006 OVC011 03/02 A3026 AO2 T00260018

MVFR METAR K5M9 022015Z AUTO 11005KT 10SM SCT006 BKN011 OVC040 03/02 A3025

IFR METAR K5M9 022035Z AUTO 10006KT 10SM BKN007 OVC037 03/02 A3026 AO2 T00260017

VFR METAR K5M9 022055Z AUTO 12005KT 10SM SCT007 OVC037 03/02 A3025 AO2 T00270017

IFR METAR K5M9 022115Z AUTO 10003KT 5SM -RA BKN009 BKN029 OVC037 03/02 A3027AO2
T00280021

IFR METAR K5M9 022135Z AUTO 00000KT 7SM RA BKN009 OVC013 03/02 A3028 AO2 T00260020

IFR METAR K5M9 022155Z AUTO 10003KT 5SM DZ BKN009 OVC013 03/02 A3027 AO2 T00260021

IFR METAR K5M9 022215Z AUTO 08004KT 5SM -DZ OVC009 03/02 A3026 AO2 T00250022

IFR METAR K5M9 022235Z AUTO 09003KT 4SM -DZ OVC009 03/02 A3026 AO2 T00250022

IFR METAR K5M9 022255Z AUTO 09003KT 4SM BR BKN005 OVC010 02/02 A3026 AO2 T00230021

IFR METAR K5M9 022315Z AUTO 09006KT 4SM -DZ OVC005 02/02 A3025 AO2 T00230021

IFR METAR K5M9 022335Z AUTO 09007KT 3SM BR OVC005 02/02 A3023 AO2 T00230021

Accident 2355Z

IFR METAR K5M9 022355Z AUTO 08006KT 4SM BR OVC005 02/02 A3023 AO2 T00220020 10028 20017

IFR METAR K5M9 030015Z AUTO 07006KT 5SM -DZ OVC005 02/02 A3023 AO2 T00230021

IFR METAR K5M9 030035Z AUTO 09007KT 5SM BR OVC005 02/02 A3022 AO2 T00230021

IFR METAR K5M9 030055Z AUTO 09008G14KT 7SM OVC005 02/02 A3021 AO2 T00230021

2.2 Kyle-Oakley Field Airport (KCEY), Murray, Kentucky

The next closest weather reporting location to the accident site was from Kyle-Oakley Field Airport (KCEY), Murray, Kentucky, located approximately 24 miles south of the accident site at an elevation of 577 feet. The airport had an Automated Weather Observation System (AWOS) and issued observations every 20 minutes. The following conditions were reported near the time of the accident:

Kyle-Oakley Field Airport weather at 1755 CST, automated, wind from 100° at 8 knots, visibility 7 miles, ceiling broken at 600 feet agl, broken at 5,000 feet, overcast at 10,000 feet, temperature and dew point 3° C, altimeter 30.21 inches of Hg. Remarks; automated observation system without a precipitation discriminator.

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

MVFR METAR KCEY 021715Z AUTO 11005KT 9SM FEW007 SCT016 BKN027 02/02 A3031 RMK AO1=

MVFR METAR KCEY 021735Z AUTO 12004KT 10SM SCT007 OVC025 02/02 A3030 RMK AO1=

MVFR METAR KCEY 021755Z AUTO 10007KT 8SM FEW006 BKN015 OVC025 03/02 A3028 RMK AO1=

MVFR METAR KCEY 021815Z AUTO 10006KT 10SM FEW008 BKN015 OVC023 03/02 A3027 RMK AO1=

MVFR METAR KCEY 021835Z AUTO 07006KT 10SM FEW008 FEW015 OVC023 03/02 A3026 RMK AO1=

MVFR METAR KCEY 021855Z AUTO 10005KT 10SM OVC025 03/02 A3026 RMK AO1=

MVFR METAR KCEY 021915Z AUTO 11005KT 10SM BKN027 BKN075 03/02 A3025 RMK AO1=

MVFR METAR KCEY 021935Z AUTO 11010KT 10SM BKN027 03/02 A3024 RMK AO1=

MVFR METAR KCEY 021955Z AUTO 10005KT 10SM SCT009 OVC027 03/02 A3024 RMK AO1=

IFR METAR KCEY 022015Z AUTO 12004KT 5SM BKN009 BKN025 03/02 A3024 RMK AO1=

MVFR METAR KCEY 022035Z AUTO 12004KT 10SM FEW007 BKN023 03/03 A3025 RMK AO1=

IFR METAR KCEY 022055Z AUTO 09006KT 10SM BKN009 BKN013 OVC023 03/03 A3025 RMK AO1=

MVFR METAR KCEY 022115Z AUTO 09004KT 10SM SCT009 BKN013 OVC019 03/03 A3025 RMK AO1=

MVFR METAR KCEY 022135Z AUTO 06005KT 10SM OVC017 03/03 A3025 RMK AO1=

MVFR METAR KCEY 022155Z AUTO 10007KT 10SM OVC021 03/03 A3024 RMK AO1=

MVFR METAR KCEY 022215Z AUTO 06006KT 10SM FEW010 OVC021 03/03 A3024 RMK AO1=
 MVFR METAR KCEY 022235Z AUTO 06005KT 10SM BKN010 OVC021 03/03 A3025 RMK AO1=
 MVFR METAR KCEY 022255Z AUTO 08006KT 10SM OVC010 03/03 A3022 RMK AO1=
 MVFR METAR KCEY 022315Z AUTO 07008KT 10SM BKN010 OVC080 03/03 A3021 RMK AO1=
 IFR METAR KCEY 022335Z AUTO 07007KT 7SM BKN005 OVC012 03/03 A3021RMK AO1=
 Accident 2355Z
 IFR METAR KCEY 022355Z AUTO 10008KT 7SM BKN006 BKN050 OVC100 03/03 A3021 RMK AO1=
 MVFR METAR KCEY 030015Z AUTO 11008KT 7SM FEW005 BKN014 OVC050 03/03 A3021 RMK AO1=
 MVFR METAR KCEY 030035Z AUTO 10006KT 7SM OVC014 03/03 A3021 RMKAO1=
 MVFR METAR KCEY 030055Z AUTO 10006KT 7SM OVC012 03/03 A3021 RMK AO1=
 IFR METAR KCEY 030115Z AUTO 11006KT 5SM BKN007 OVC012 04/03 A3020 RMK AO1=
 IFR METAR KCEY 030135Z AUTO 10005KT 2SM OVC006 04/04 A3020 RMK AO1=
 LIFR METAR KCEY 030155Z AUTO 10005KT 3SM OVC003 04/04 A3020 RMK AO1=
 LIFR METAR KCEY 030215Z AUTO 09005KT 4SM OVC003 04/04 A3019 RMK AO1=
 LIFR METAR KCEY 030235Z AUTO 11005KT 4SM BKN003 OVC009 04/04 A3018 RMK AO1=

2.3 Barkley Regional Airport (KPAH), Paducah, Kentucky

Approximately 29 miles west of the accident site was Barkley Regional Airport (KPAH), Paducah, Kentucky, at an elevation of 410 feet. The airport had a federally installed and maintained Automated Surface Observation System (ASOS), and was augmented by NWS certified weather observers. The following weather conditions were reported at the approximate time of the accident:

Barkley Regional Airport weather observation at 1753 CST, wind from 060° at 6 knots, visibility 6 statute miles in mist, ceiling overcast at 600 feet agl, temperature and dew point 3° C, altimeter setting 30.22 inches of Hg. Remarks; automated observation system, rain began at 1725 and ended at 1747, sea level pressure 1023.5-hPa, hourly precipitation 0.01 inches, 6-hour precipitation 0.04 inches, temperature 3.3° C, dew point 2.8° C, 3-hour pressure tendency fallen 1.5-hPa.

A review of the observation prior to the accident indicated a period of unknown freezing precipitation (UP) occurred at the station between 1000 and 1140 CST. The raw observations surrounding the period with the general flight categories were as follows:

IFR SPECI KPAH 021620Z 12005KT 2 1/2SM UP BR OVC005 02/02 A3034 RMK AO2 UPE05B16
 RAB05E16 P0001 T00220017=

IFR METAR KPAH 021653Z 09006KT 3SM BR OVC005 03/02 A3032 RMK AO2 UPE05B16E26RAB05E16
SLP269 P0001 T00280017=

IFR METAR KPAH 021653Z 09006KT 3SM BR OVC005 03/02 A3032 RMK AO2 UPE05B16E26RAB05E16
SLP269 P0001 00280017=

IFR METAR KPAH 021753Z 11005KT 3SM -RA BR OVC006 03/02 A3029 RMK AO2 RAB10UPB34E36
SLP258 P0001 60002 T00330022 10033 20011 58016=

IFR METAR KPAH 021853Z 11003KT 5SM BR BKN007 OVC018 03/02 A3027 RMK AO2 RAE1756B17E26
CIG 005V012 SLP252 P0000 T00330017=

MVFR SPECI KPAH 021926Z 08005KT 7SM BKN011 OVC016 04/02 A3025 RMK AO2 CIG 007V012
T00390017=

MVFR METAR KPAH 021953Z 07005KT 7SM SCT010 BKN016 OVC032 04/02 A3024 RMK AO2 SLP244
T00390022=

MVFR SPECI KPAH 022002Z 09007KT 6SM BR BKN010 OVC016 04/02 A3025 RMK AO2 T00390017=

IFR SPECI KPAH 022034Z 08005KT 4SM -RA BR BKN008 BKN035 OVC095 04/02 A3024 RMK AO2
RAB24 P0000 T00390022=

IFR METAR KPAH 022053Z 10004KT 4SM -RA BR OVC009 03/02 A3026 RMK AO2 RAB24 CIG 007V012
SLP249 P0002 60002 T00330022 55003=

IFR METAR KPAH 022153Z 09005KT 4SM BR OVC009 04/02 A3025 RMK AO2 RAE29 SLP247 P0001
T00390022=

IFR METAR KPAH 022253Z 07006KT 5SM BR OVC006 03/02 A3023 RMK AO2 SLP238 T00330022=

IFR METAR KPAH 022353Z 06006KT 6SM BR OVC006 03/03 A3022 RMK AO2 RAB25E47 SLP235 P0001
60004 T00330028 10039 20028 58015=

Accident 2355Z

IFR METAR KPAH 030053Z 10008KT 6SM BR OVC006 04/02 A3021 RMK AO2 SLP231 T00390022=

IFR METAR KPAH 030153Z 09004KT 5SM BR OVC007 04/03 A3021 RMK AO2 SLP232 T00390028=

2.4 Mount Vernon Airport (KMVN), Mount Vernon, Illinois

The planned destination was Mount Vernon Airport (KMVN), Mount Vernon, Illinois, located approximately 48 miles north-northwest of the accident site, at an elevation of 480 feet. The airport had an AWOS without a precipitation discriminator, thus could not report current weather or precipitation type. The following conditions were reported at the time of the accident:

Mount Vernon Airport weather at 1755 CST, automated, wind from 100° at 5 knots, visibility 1 ½ miles, scattered clouds at 1,000 feet agl, ceiling broken 4,700 feet, overcast at 6,500 feet, temperature 2° C, dew point -1° C, altimeter 30.25 inches of Hg. Remarks:

automated observation system without a precipitation discriminator, 6-hour maximum temperature 3.0° C, 6-hour minimum temperature 2.0° C, 3-hour pressure tendency fallen 1.0-hPa.

The AWOS did not have a precipitation discriminator and thus could not report the current weather phenomena impacting the airport at the time of the accident. Based on the review of the closest weather radar, and the temperature and dew points at the time, rain showers were likely occurring at the time.

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

MVFR METAR KMVN 022035Z AUTO 11004KT 9SM OVC012 03/M01 A3027 RMK AO1=

MVFR METAR KMVN 022055Z AUTO 12005KT 9SM OVC012 03/M01 A3028 RMK AO1 57003=

MVFR METAR KMVN 022115Z AUTO 12004KT 9SM OVC012 03/M01 A3028 RMK AO1=

MVFR METAR KMVN 022135Z AUTO 11005KT 8SM OVC010 03/M01 A3027 RMK AO1=

MVFR METAR KMVN 022155Z AUTO 10003KT 8SM OVC010 03/M01 A3028 RMK AO1=

MVFR METAR KMVN 022215Z AUTO 11005KT 6SM OVC010 03/M01 A3028 RMK AO1=

IFR METAR KMVN 022235Z AUTO 10004KT 2 1/2SM OVC008 02/M01 A3027 RMK AO1=

MVFR METAR KMVN 022255Z AUTO 10004KT 4SM OVC010 02/M01 A3027 RMK AO1=

MVFR METAR KMVN 022315Z AUTO 09004KT 5SM SCT012 BKN026 OVC047 02/M01 A3026 RMK AO1=

IFR METAR KMVN 022335Z AUTO 09006KT 2SM SCT012 BKN045 OVC050 02/00 A3025 RMK AO1=

Accident 2355Z

*IFR METAR KMVN 022355Z AUTO 10005KT 1 1/2SM SCT010 BKN047 OVC065 02/M01 A3025 RMK AO1
10030 20020 57010=*

*IFR METAR KMVN 030015Z AUTO 10005KT 2 1/2SM SCT005 BKN047 OVC065 02/M01 A3024 RMK AO1
P0001=*

*MVFR METAR KMVN 030035Z AUTO 09007KT 4SM SCT004 BKN044 OVC070 02/M01 A3023 RMK AO1
P0001=*

*MVFR METAR KMVN 030055Z AUTO 09005KT 4SM SCT006 BKN037 OVC085 02/M01 A3022 RMK AO1
P0001=*

IFR METAR KMVN 030115Z AUTO 09004KT 5SM BKN005 BKN029 OVC085 02/M01 A3023 RMK AO1=

IFR METAR KMVN 030155Z AUTO 09005KT 3SM OVC005 02/00 A3023 RMK AO1 P0002=

IFR METAR KMVN 030215Z AUTO 11006KT 2 1/2SM OVC005 02/M01 A3021 RMK AO1 P0002=

LIFR METAR KMVN 030235Z AUTO 09006KT 3SM OVC004 02/00 A3019 RMK AO1 P0004=

A screen capture of the NWS Aviation Weather Center (AWC) display of observation at 1755 CST is included as figure 5, with the approximate accident site marked. The station models are color coded with pink being LIFR conditions³, red for IFR conditions, blue for MVFR conditions, green for unknown conditions, and black for VFR conditions.

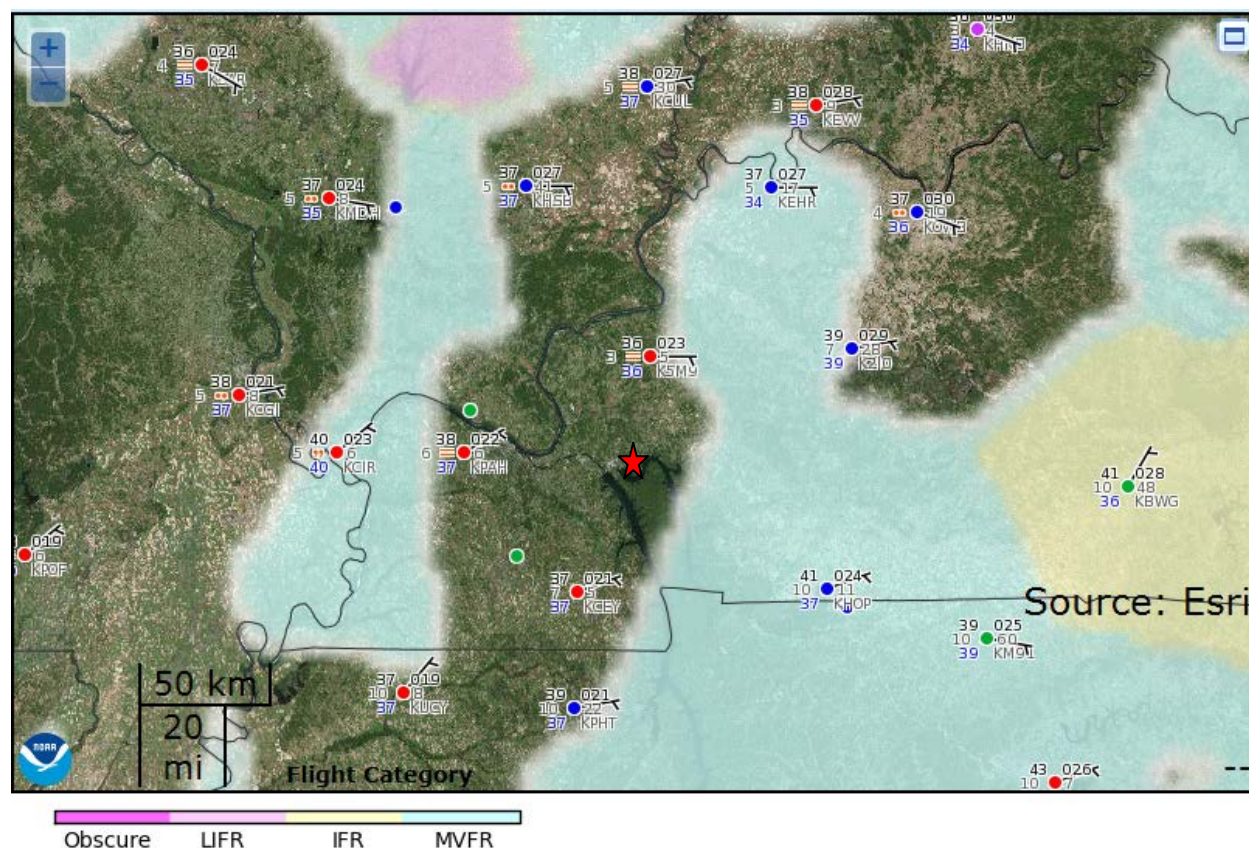


Figure 5 - Surface Observations at 1755 CST

3.0 Upper Air Data

The closest upper air sounding or rawinsonde observation (RAOB) was from the NWS Nashville (KBNA), Tennessee, site number 72327, located approximately 92 miles southeast of the accident site at an elevation of 591 feet. The 1800 CST (0000Z on January 3, 2015) sounding from the surface to 500-hPa or 18,000 feet was plotted on a standard Skew-T log P diagram⁴ utilizing RAOB⁵ software is included as figure 6.

³ LIFR conditions – are a subset of IFR conditions, and is defined as a ceiling less than 500 feet agl and/or visibility less than 1 statute mile.

⁴ 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

The Nashville sounding depicted a moist low-level environment with the lifted condensation level (LCL)⁶ at 985-hPa or at 495 feet agl, and the relative humidity greater than 90% from the surface through 11,500 feet. The precipitable water value was 1.17 inches, and most likely precipitation type was light rain at the surface. Two defined temperature inversions were noted immediately above the LCL to approximately 3,800 feet, where temperature increased with altitude. The Lifted Index (LI)⁷ was 20.0, and indicated an absolutely stable atmosphere. The freezing level (blue line) was identified at approximately 11,300 feet, and supported light icing-in-clouds above that level. The sounding moisture and temperature profile indicated a severe risk of carburetor icing from the surface to 11,200 feet (green bar on chart).

of the atmosphere.

⁵ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania.

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

⁷ 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.

Height (ft-MSL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD/FF (deg/kts)	CAT (AF)	LLWS	Icing - Type (S-F clouds)
591	1003	5.4	4.2	92	50/3		LIGHT	
671	1000	5.2	4.0	92	55/4			
1404	973	4.0	3.9	99				
1597	966	4.8	4.6	99				
2000	952				145/9			
2415	937	5.6	5.5	99				
2705	927	7.8	6.7	93				
2764	925	7.8	6.7	93	225/10			
3000	917				220/12			
3447	902	7.8	6.9	94				
3811	890	9.0	7.9	93		L-M		
4000	884				210/19			
4119	880	9.0	7.9	93		L-M		
5061	850	7.6	6.6	93	220/11			
5510	836	6.4	6.0	97				
6000	821				220/14			
7068	789	5.4	5.3	99	220/17			
8000	762				225/17			
8282	754	2.8	1.7	92				
9000	734				215/21	L-M		
10000	707				240/24			
10217	701	1.6	1.3	98		LGT		
10255	700	1.6	1.3	98	250/27	L-M		
11000	681				260/37			
11216	675	0.2	-0.2	97				
11727	662	-1.3	-5.4	74		L-M		TRC Clear
12085	653	-1.1	-9.1	55	260/45			
12246	649	-0.9	-6.9	64				
12734	637	-2.1	-3.5	90				LGT Clear
13147	627	-2.3	-6.1	75				TRC Rime
13272	624	-2.5	-5.6	79				TRC Rime

Figure 7 - Nashville sounding parameters

4.0 Satellite Data

The Geostationary Operational Environmental Satellite number 13 (GOES-13) data was obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison (UW) in Madison, Wisconsin, and processed using the Safety Board's Man-computer Interactive Data Access System (McIDAS) software. The infrared long wave imagery (band 4) at a wavelength of 10.7 microns (μm) provided standard satellite image with radiative cloud top temperatures with a resolution of 4 km.

Figure 8 is the GOES-13 infrared image at 1745 CST at 2X magnification with a standard MB temperature enhancement curve applied to highlight the higher and colder cloud tops associated with deep convection and high cirriform clouds. The image depicts multiple layers of clouds extending over the route of flight and the accident site, from low overcast clouds and a higher band of cirriform clouds immediately over the accident site and extending over the destination area. The radiative cloud top temperature over the accident site was 240° Kelvin or -33.16° C, which corresponded to cloud tops near 27,500 feet.

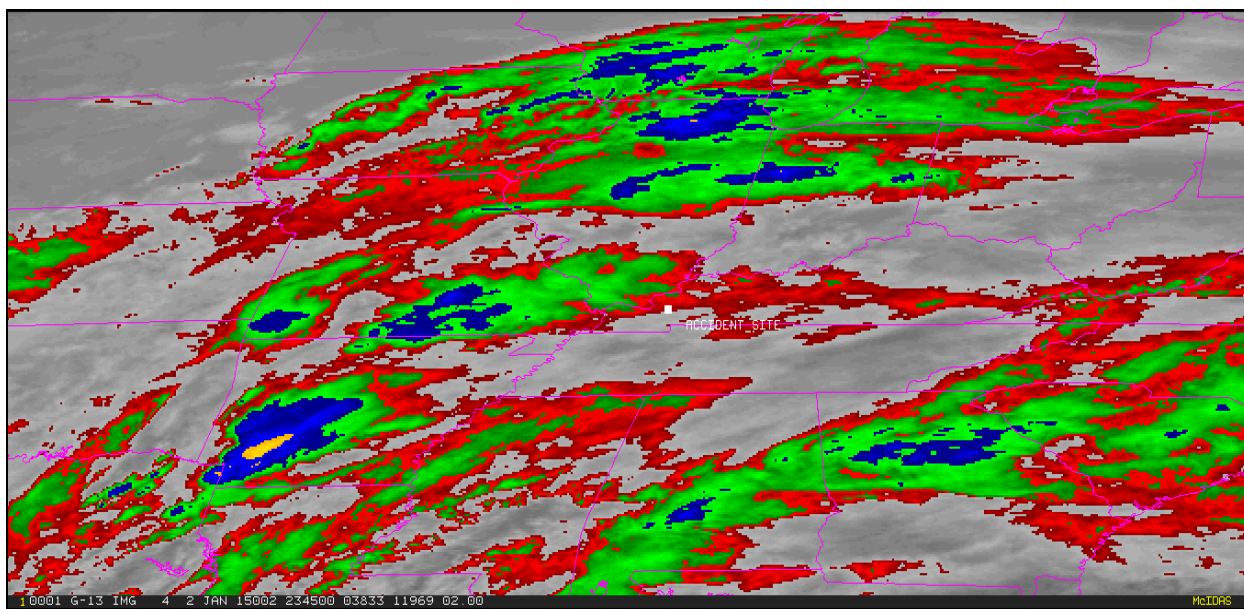


Figure 8 - GOES-13 infrared image at 1745 CST

5.0 Weather Radar Information

The closest Weather Surveillance Radar-1988, Doppler (WSR-88D) to the accident site was from the NWS Paducah (KPAH) site located approximately 29 miles west of the accident site. The level II and III archive data was obtained from the National Climatic Data Center (NCDC) utilizing the Hierarchical Data Storage System (HDSS) and displayed using the NWS NEXRAD Interactive Viewer and Data Exporter software.

The WSR-88D is a S-band 10 centimeter wavelength radar with a power output of 750,000 watts, with a 28-foot parabolic antenna concentrating the energy into a 0.95° beam width. The radar produces three basic types of products reflectivity, radial velocity, and spectral width.

5.1 Volume Scan Strategy

The WSR-88D is a computer controlled radar system, which automatically creates a complete series of specific scans in a specific sequence known as a volume scan. Individual elevation scans are immediately available on the WSR-88D's Principle Users Processor (PUP). Products that require data from multiple elevation scans are not available until the end of the six minute volume scan.

The WSR-88D operates in several different scanning modes, identified as Mode A and Mode B. Mode A is the precipitation scan and has three common scanning strategies. The most common is the non-severe convective mode where the radar makes 9 elevation scans from 0.50° to 19.5° every six minutes. This particular scanning strategy is documented as volume coverage pattern 21 (VCP-21). Mode B is the clear air mode, where the radar makes 5 elevation scans during a ten minute period. During the period surrounding the accident the KPAH WSR-88D radar was operating in the precipitation mode VCP-21 where the radar makes 9 different

elevation scans in 6 minutes. This mode is typically used by the NWS during periods when non-severe convective precipitation events are expected. The following chart provides an indication of the different elevation angles in this VCP, and the approximate height and width of the radar beam with distance from the radar site.

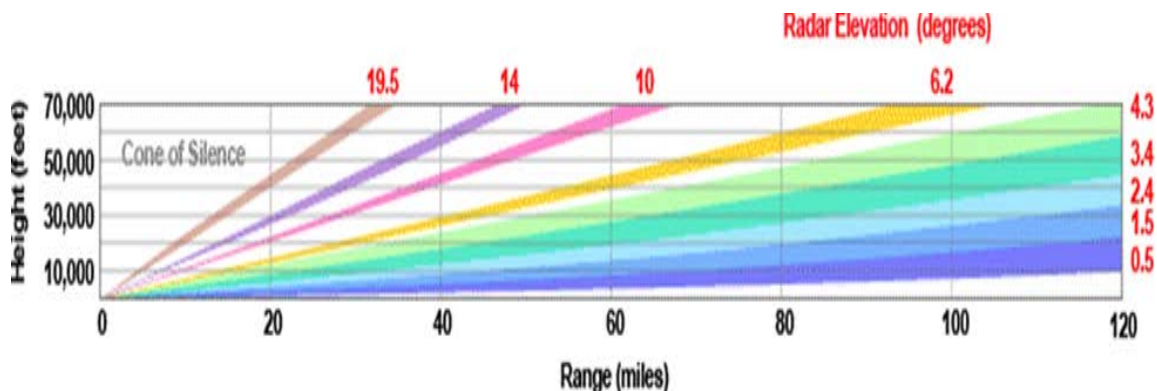


Figure 9- VCP-21 scanning mode

5.2 Beam Height Calculation

Assuming standard refraction⁸ of the 0.95° radar beam of the KPAH WSR-88D with an antenna height of 506 feet and a distance of 29 miles, the following table shows the approximate beam height and width information of the radar display over the site of the accident. The heights have been rounded to the nearest 10 feet.

ANTENNA ELEVATION	BEAM CENTER	BEAM BASE	BEAM TOP	BEAM WIDTH
0.49°	2,570 feet	1,110 feet	4,030 feet	2,920 feet
1.47°	5,520 feet	4,060 feet	6,980 feet	2,920 feet
3.38°	11,450 feet	9,990 feet	12,910 feet	2,920 feet

5.3 Reflectivity

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors⁹ it is a function of the drop size distribution, number of particles per

⁸ Standard Refraction in the atmosphere is when the temperature and humidity distributions are approximately average, and values set at the standard atmosphere.

⁹ Hydrometeors are any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at the earth's surface; also, any water particles blown by the wind from the earth's surface. Hydrometeors are classified as; (a) Liquid or solid water particles suspended in the air: cloud, water droplets, mist or fog. (b) Liquid precipitation: drizzle and rain. (c) Freezing precipitation: freezing drizzle and freezing rain. (d) Solid (frozen) precipitation: ice pellets, hail, snow, snow pellets, and ice crystals. (e) Falling particles that evaporate before reaching the ground: virga. (f) Liquid or solid water particles lifted by the wind from the earth's surface:

unit volume, physical state (ice or water), shape, and aspect. Reflectivity is normally displayed in decibels (dBZ¹⁰), and is a general measure of echo intensity. The chart below relates the NWS video integrator and processor (VIP) intensity levels versus the WSR-88D's display levels, precipitation mode reflectivity in decibels, and rainfall rates.

NWS VIP/DBZ CONVERSION TABLE

NWS VIP	WSR-88D LEVEL	PREC MODE DBZ	RAINFALL
0	0	< 5	
	1	5 to 9	
	2	10 to 14	
1 Very Light	3	15 to 19	.01 in/hr
	4	20 to 24	.02 in/hr
	5	25 to 29	.04 in/hr
2 Light to Moderate	6	30 to 34	.09 in/hr
	7	35 to 39	.21 in/hr
3 Strong	8	40 to 44	.48 in/hr
4 Very Strong	9	45 to 49	1.10 in/hr
5 Intense	10	50 to 54	2.49 in/hr
6 Extreme	11	55 to 59	>5.67 in/hr
	12	60 to 64	
	13	65 to 69	
	14	70 to 74	
	15	> 75	

Air traffic control (ATC) weather display systems also use radar weather processors with the ability to determine precipitation intensity, with controllers instructed to describe the intensity to pilots based on the following scale:

- (a) "Light" (< 30 dBZ, NWS VIP level 1)
- (b) "Moderate" (30 to 40 dBZ, NWS VIP level 2)
- (c) "Heavy" (> 40 to 50 dBZ, NWS VIP level 3 and 4)
- (d) "Extreme" (> 50 dBZ, NWS VIP level 5 and 6)

5.4 Base Reflectivity

Figure 10 is the NWS Paducah WSR-88D 0.49 base reflectivity image completed at 1753 CST with the flight track of N81291 overlaid. The image depicts the accident airplane having descended through an area of light intensity echoes, with maximum reflectivity of 25 dBZ at

drifting snow, blowing snow, blowing spray. (g) Liquid or solid deposits on exposed objects: dew, frost, rime, and glaze ice.

¹⁰ dBZ - 10 log Ze

approximately 1749 CST, exited the echoes and entered into another area of very light intensity echoes of less than 15 dBZ immediately before the accident. No significant echoes associated with convection were identified over the flight path, and only light intensity echoes associated with light precipitation or drizzle at the time of the accident.

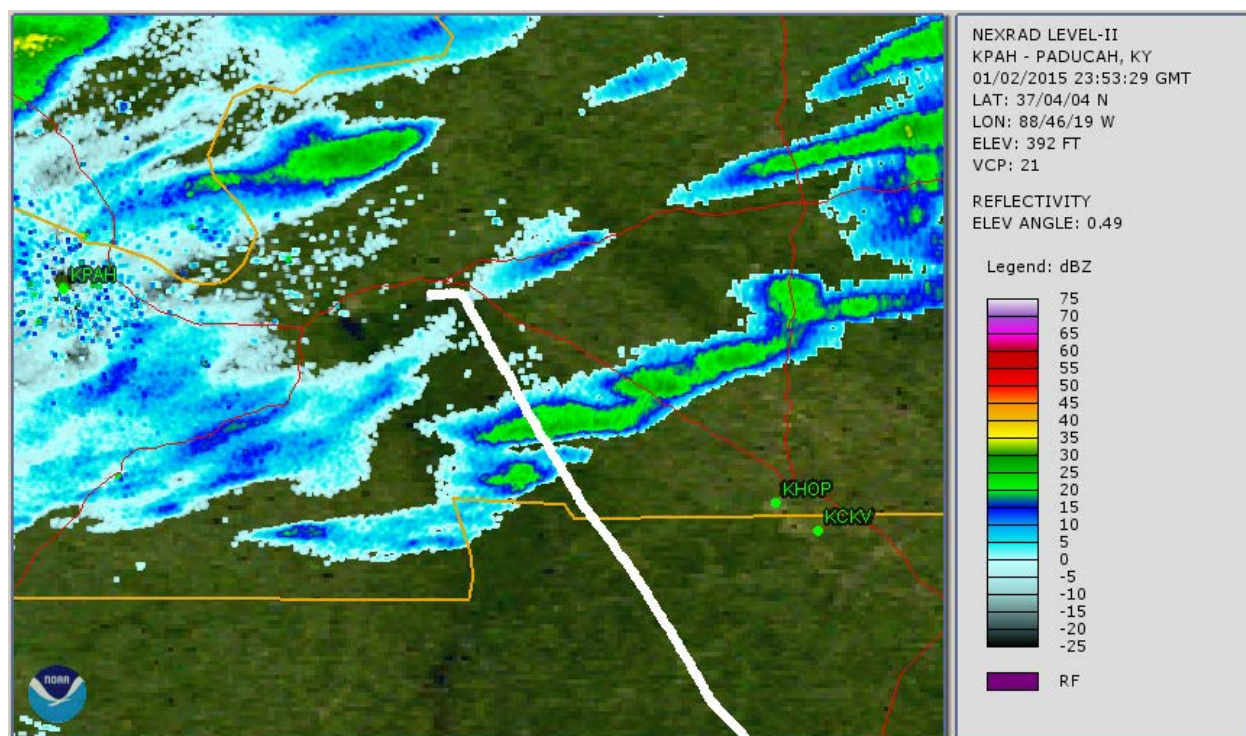


Figure 10 - KPAH WSR-88D 0.5° base reflectivity image at 1753 CST

6.0 Pilot Reports

The following pilot reports (PIREPs) were recorded over the region during the period from 1200 and 2000 CST on January 2, 2015. The reports are in plain language taken from standard code and abbreviations, with time converted to local. The reports were as follows:

Louisville International Airport (KSDF) routine pilot report; Over – New Hope (EWO), KY, VORTAC¹¹; Time – 1200 CST; Flight level – 19,500 feet; Type aircraft – Embraer EMB-135 regional air carrier jet; Temperature – minus 20° C; Icing – light rime icing between 19,500-20,000 feet.

Barkley Regional Airport (KPAH), Paducah, KY, routine pilot report; Over – Cunningham VORTAC (CNG), Paducah, KY; Time – 1225 CST; Flight level – 15,000 feet; Type aircraft – Cessna Golden Eagle multiengine airplane; Temperature – minus 4° C; Icing – rime icing.

¹¹ VORTAC – is an abbreviation for VHF omnidirectional range (VOR) beacon and a tactical air navigation system (TACAN) beacon for distance measuring. The system provides both azimuth and distance for air navigation. Unless otherwise noted, the name of the facility is also the city location.

London-Corbin Airport (KLOZ) routine pilot report; Over – London VORTAC (LOZ); Time – 1228 CST; Flight level – 2,800 feet; Type aircraft – Beechcraft Bonanza single engine airplane; Sky cover – overcast clouds at 2,800 feet.

Louisville International Airport (KSDF) routine pilot report; Over – Frankfort VOR (FFT); Time – 1229 CST; Flight level – 20,000 feet; Type aircraft – Hawker business jet; Temperature – minus 10° C; Icing – light rime icing between 21,000-20,000 feet.

Nashville International Airport (KBNA), Nashville, TN, routine pilot report; Over – 2 miles south of Nashville VORTAC (BNA); Time – 1300 CST; Flight level – 1,000 feet; Type aircraft – Boeing 737 air carrier jet; Sky cover – overcast clouds at 1,000 feet with tops at 5,500 feet; Remarks – during climb.

Louisville International Airport (KSDF) routine pilot report; Over – Louisville VORTAC (IIU); Time – 1318 CST; Flight level – 12,000 feet; Type aircraft – Embraer EMB-145 regional air carrier jet; Sky cover – cloud tops 10,000 feet, in instrument meteorological conditions (IMC); Turbulence – negative.

Williamson County Regional Airport (KMWA), Marion, IL, routine pilot report; Over – Marion VORTAC; Time – 1322 CST; Flight level – 7,000 feet; Type aircraft – Beechcraft Super King Air multiengine turboprop; Sky cover – 900 feet overcast with tops at 4,000 feet; Icing – negative; Remarks – entered by Kansas City Center.

Nashville International Airport (KBNA), Nashville, TN, routine pilot report; Over – 5 miles west of Nashville VORTAC; Time – 1418 CST; Flight level – unknown; Type aircraft – Boeing 737 air carrier jet; Sky cover – overcast clouds at 1,000 feet with tops at 3,000 feet; Turbulence – negative; Remarks – during climb, smooth conditions.

Owensboro-Daviess County Airport (KOWB), Owensboro, KY routine pilot report; Over – Owensboro VORTAC (OWB); Time – 1424 CST; Flight level – during descent; Type aircraft – Beechcraft Twin bonanza multiengine airplane; Sky cover – 1,100 overcast with tops at 8,000 feet, with high layers above; Remarks – in and out of layers above 8,000 feet during descent to runway 18.

Warren County Memorial Airport (KRNA), Mc Minnville, TN, routine pilot report; Over – 30 miles southeast of Nashville VORTAC (BNA); Time – 1440 CST; Flight level – 6,000 feet; Type aircraft – Beechcraft Bonanza single engine airplane; Sky cover – overcast with tops at 5,000 feet, overcast at 10,000 feet; Wind – from 243° at 16 knots; Remarks – between layers.

Bowling Green-Warren County Regional Airport (KBWG), Bowling Green, KY, routine pilot report; Over – 37 miles east of Bowling Green VORTAC (BWG); Time – 1441 CST; Flight level – 11,000 feet; Type aircraft – Piper Navajo multiengine airplane; Temperature – minus 2° C; Icing – light rime icing; Remarks – out of icing conditions at 10,300 feet.

Nashville International Airport (KBNA), Nashville, TN, routine pilot report; Over – 40 miles southeast of Nashville VORTAC; Time – 1452 CST; Flight level -14,500 feet; Type aircraft –

Pilatus single engine turboprop; Temperature – minus 10° C; Icing – light rime icing between 14,500-17,500 feet.

Barkley Regional Airport (KPAH), Paducah, KY, routine pilot report; Over – 25 miles south of Central City VORTAC (CCT); Time – 1515 CST; Flight level – 18,000 feet; Type aircraft – Embraer EMB-170 air carrier jet; Temperature – minus 12° C; Icing – light clear icing.

Louisville International Airport (KSDF) routine pilot report; Over – KSDF; Time – 1543 CST; Flight level – 7,700 feet; Type aircraft – Boeing 737 air carrier jet; Sky cover – cloud bases at 2,500 feet with tops at 7,000 feet.

7.0 Terminal Aerodrome Forecast

The closest NWS Terminal Aerodrome Forecast (TAF) to the accident site was issued for Barkley Regional Airport (KPAH), Paducah, Kentucky. The forecast available at the time of departure was issued at 1126 CST and expected IFR to LIFR conditions to prevail with visibility 2 to 3 miles light rain and mist, and ceiling overcast between 300 to 500 feet agl during the period. The forecast was amended at 1407 CST or approximately an hour prior to N81291's departure from Tallahassee. The forecast still expected IFR conditions to prevail with light rain and mist. The forecasts were as follows:

*TAF KPAH 021726Z 0218/0318 10005KT 3SM -RA BR OVC005
TEMPO 0222/0302 2SM -RA BR OVC003
FM030300 12007KT 2SM -RA BR OVC004
TEMPO 0305/0309 1SM -RA BR OVC002
FM031300 16010KT 3SM -RA BR OVC004=*

*TAF AMD KPAH 022007Z 0220/0318 09005KT 5SM -RA BR BKN008 OVC015
TEMPO 0222/0302 3SM -RA BR OVC006
FM030300 12007KT 2SM -RA BR OVC004
TEMPO 0305/0309 1SM -RA BR OVC002
FM031300 16010KT 3SM -RA BR OVC004=*

8.0 Area Forecast

The Area Forecast (FA) is a forecast of visual Flight Rules (VFR) clouds and weather conditions over an area as large as the size of several states. It must be used in conjunction with the AIRMET Sierra (IFR) bulletin for the same area in order to get a complete picture of the weather. The area forecast together with the AIRMET Sierra bulletin are used to determine forecast enroute weather and to interpolate conditions at airports which do not have a terminal forecast (TAF) issued. The NWS Aviation Weather Center (AWC) located in Kansas City, Missouri, issues the FA at regular intervals and issues specials reports as necessary usually in the form of an AIRMET. The Chicago (KCHI) regional forecast that was current at the time of the accident was issued at 1417 CST and valid through 0200 CST on January 3, 2015. The forecast expected enroute conditions across western Kentucky as broken ceilings near 2,000 feet with layered tops to 25,000 feet, with visibility 3 to 5 miles in scattered light rain showers and mist.

The outlook from 0200 through 0800 CST on January 3, 2015, expected IFR conditions to prevail due to low ceilings and visibility in light rain and mist. The forecast was as follows:

FAUS43 KKCI 022017 AAA

2015002 2017

FA3W

CHIC FA 022017 AMD

SYNOPSIS AND VFR CLDS/WX

SYNOPSIS VALID UNTIL 031400

CLDS/WX VALID UNTIL 030800...OTLK VALID 030800-031400

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...20Z CDFNT NRN MN-NERN MT. TROF OVR NEB PNHDL. 14Z

CDFNT NRN LS-CNTRL MN-SW SD. TROF N CNTRL NEB-NERN CO.

. IL

NRN...BKN CI. 04Z BKN060 LYRD FL250. OTLK...MVFR CIG SHSN BR BECMG 09Z IFR CIG FZRASN BR.

CNTRL...BKN050 LYRD FL250. BECMG 2201 BKN030. ISOL -SHRA. BECMG 0205 VIS 3-5SM -FZRASN

BR. OTLK...IFR CIG FZRASN BR.

SRN...BKN020 LYRD FL250. VIS 3-5SM BR. ISOL -SHRA. BECMG 0003 VIS 3-5SM -RA BR. OTLK...IFR CIG RA BR.

. KY

W...BKN020 LYRD FL250. VIS 3-5SM SCT -SHRA BR. OTLK...IFR CIG SHRA BR.

CNTRL...BKN025 LYRD FL250. VIS 3-5SM SCT -SHRA BR. OTLK...IFR CIG SHRA BR.

E...BKN030 LYRD FL250. VIS 3-5SM SCT -SHRA BR. OTLK...MVFR CIG SHRA BR.

....

The Dallas Worth (KDFW) section of the area forecast was as follows:

TN

W...BKN020 LYRD FL250. VIS 3-5SM BR. ISOL -SHRA. BECMG 2201 VIS 3-5SM SCT -SHRA BR.

OTLK...IFR CIG SHRA BR.

MID...BKN025 LYRD FL250. VIS 3-5SM BR. ISOL -SHRA. BECMG 2201 VIS 3-5SM SCT -SHRA BR.

OTLK...IFR CIG SHRA BR.

E...BKN030 LYRD FL250. VIS 3-5SM BR. ISOL -SHRA. BECMG 2302 OCNL VIS 3-5SM -RA BR.

OTLK...MVFR CIG SHRA BR.

*.
. AL*

N HLF...BKN025 LYRD FL250. VIS 3-5SM SCT -SHRA BR/ISOL -TSRA. CB TOP FL380. OTLK...IFR CIG SHRA BR.

S HLF...BKN030 LYRD FL250. OCNL VIS 3-5SM SCT -SHRA BR/ISOL -TSRA. CB TOP FL380. OTLK...IFR CIG SHRA BR.

9.0 In-Flight Weather Advisories

The NWS issues in-flight weather advisories designated as Severe Weather Forecast Alerts (AWW), Convective SIGMETs (WST), SIGMETs (WS), Center Weather Advisories (CWA), and AIRMETs (WA). In-flight advisories serve to notify en route pilots of the possibility of

encountering hazardous flying conditions, which 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 on the basis of experience and the operational limits of the aircraft.

During the period the NWS had issued a series of AIRMET advisories for IFR conditions, mountain obscuration, and icing conditions. The advisories were as follows:

WAUS43 KPCI 022045 2015002 2044
WA3S
CHIS WA 022045
AIRMET SIERRA UPDT 4 FOR IFR AND MTN OBSCN VALID UNTIL 030300

.
AIRMET IFR...KS MO IL IN KY
FROM 60S JOT TO 30SSW IND TO CVG TO HMV TO RZC TO OSW TO 50SW ICT TO 50S PWE TO 60S JOT
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z. .

.
AIRMET MTN OBSCN...KY TN
FROM HNN TO HMV TO GQO TO 50WSW LOZ TO HNN
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

.
WAUS43 KPCI 022045 2015002 2037
WA3Z
CHIZ WA 022045
AIRMET ZULU UPDT 3 FOR ICE AND FRZLVL VALID UNTIL 030300

.
AIRMET ICE...ND SD MN WI LS MI
FROM 30N INL TO YQT TO 60WNW SSM TO 60SE BRD TO 20NW DPR TO 80SW DIK TO 50NNW ISN TO 30N INL
MOD ICE BLW FL180. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET ICE...NE KS IA MO IL IN KY OK TX AR
FROM 50S MCW TO 50SE IOW TO 50WNW IIU TO RZC TO 50NE JCT TO 50ESE MRF TO 90S MRF TO ELP TO INK TO 50NNE TCC TO 40N AMA TO 50S MCW
MOD ICE BTN FRZLVL AND FL200. FRZLVL SFC-110. CONDS CONTG BYD 03Z THRU 09Z.

.
AIRMET ICE...MO IL IN KY OK TX AR TN LA MS AL
FROM CVG TO HNN TO HMV TO GQO TO 40S LGC TO 20SSW MHZ TO 20NNW IAH TO 60SSE SAT TO 30WNW LRD TO DLF TO 90S MRF TO 50ESE MRF TO 50NE JCT TO RZC TO 50WNW IIU TO CVG
MOD ICE BTN FRZLVL AND FL220. FRZLVL 040-120. CONDS CONTG BYD 03Z THRU 09Z.

WAUS44 KPCI 022045 2015002 2044
WA4S
DFWS WA 022045
AIRMET SIERRA UPDT 3 FOR IFR AND MTN OBSCN VALID UNTIL 030300

.
AIRMET IFR...OK TX AR TN LA MS AL AND CSTL WTRS
FROM 50SW ICT TO OSW TO RZC TO HMV TO GQO TO 40SSE LGC TO 40ENE CEW TO 40W CEW TO 120ESE LEV TO 120SSW LCH TO 80E BRO TO 90W BRO TO DLF TO 90S MRF TO ELP TO INK TO 50SSW TXO TO 50SW ICT
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

WAUS44 KKEI 022045 2015002 2038
WA4Z
DFWZ WA 022045
AIRMET ZULU UPDT 3 FOR ICE AND FRZLVL VALID UNTIL 030300

AIRMET ICE...OK TX AR TN LA MS AL MO IL IN KY
FROM CVG TO HNN TO HNV TO GQO TO 40S LGC TO 20SSW MHZ TO 20NNW IAH TO 60SSE SAT TO
30WNW LRD TO DLF TO 90S MRF TO 50ESE MRF TO
50NE JCT TO RZC TO 50WNW IJU TO CVG
MOD ICE BTN FRZLVL AND FL220. FRZLVL 040-120. CONDS CONTG BYD 03Z THRU 09Z.

ERA15FA088

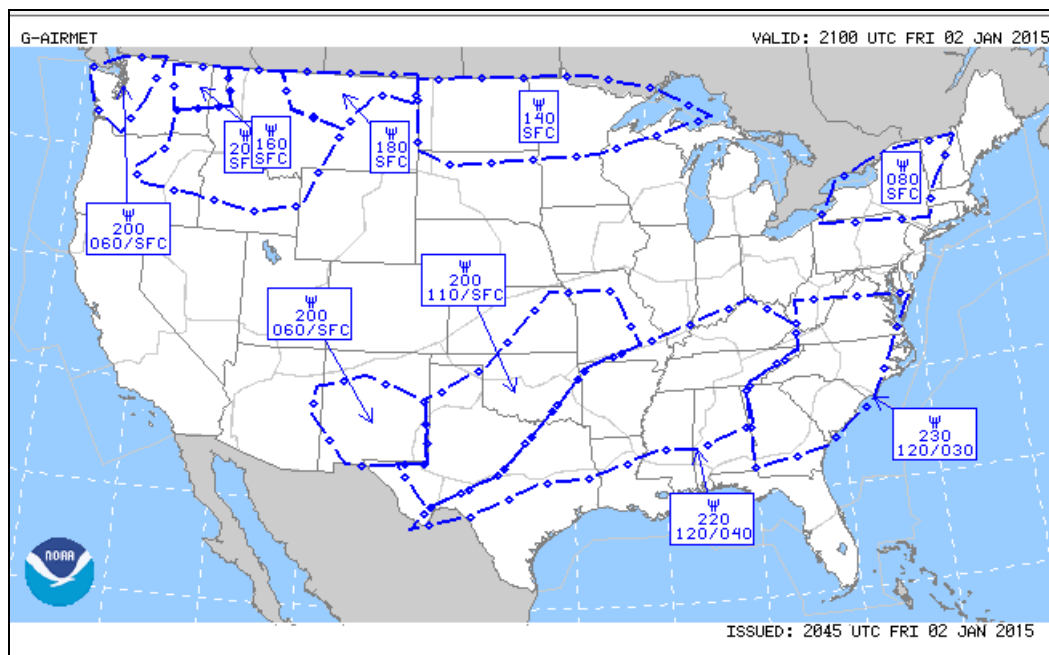


Figure 12 - G-AIRMET for icing conditions

10.0 Winds and Temperature Aloft

The NWS winds and temperature aloft forecast available at the time of preflight planning was as follows:

DATA BASED ON 021800Z
VALID 030000Z FOR USE 2000-0300Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
TLH	1907	2010+13	1814+08	2025+03	2339-09	2440-23	246538		
PFN	1907	1911+13	1818+08	2028+03	2240-09	2343-23	246638		
CSG	1814	2023+12	2223+07	2330+01	2338-11	2450-25	256638		
MGM	2117	2217+12	2321+06	2228+01	2239-11	2350-24	256938		
ATL	1614	2131+11	2326+06	2526+02	2438-12	2553-25	255740		
BHM	2021	2222+11	2324+06	2324+01	2238-12	2352-25	245940		
HSV	1917	2326+11	2426+06	2432+00	2340-13	2452-26	246341		
BNA	1711	2112+06	2331+05	2445+00	2448-14	2559-27	247242		
EVV	1709	2526+06	2426+02	2539-03	2659-15	2571-27	258444		
CGI	1611	2117+06	2123+01	2435-02	2463-15	2473-27	247843		
STL	1813	2328+03	2220+00	2434-05	2572-16	2487-27	249644		
SPI	1813	2314+01	2629+00	2537-06	2554-17	2582-28	740244		

11.0 Astronomical Data

The United States Naval Observatory website provided the following astronomical data for Paducah, McCracken County, Kentucky on January 2, 2015:

SUN

Beginning of civil twilight	0639 CST
Sunrise	0708 CST
Sun transit	1158 CST
Sunset	1649 CST
End of civil twilight	1718 CST
Accident	1755 CST

MOON

Moonrise	1506 CST
Moonset	0531 CST on January 3, 2015

At the time of the accident the Sun was more than 12° below the horizon and the moon was at an elevation of 31° above the horizon at an azimuth of 90°, with the phase of the moon a waxing gibbous with 95% of the moon's visible disk illuminated.

12.0 Weather Briefing

The pilot of N81291 filed an IFR flight plan using the Direct Users Access Terminal System (DUATS) for the flight from Tallahassee, FL, to Mount Vernon, IL. The route was direct at a requested altitude of 10,000 feet, with no alternate airport listed. There was no record of any weather briefing with this request. It is therefore not known what other weather information the pilot had available, or the extent of the IFR conditions he was aware of.

Submitted by:

Donald Eick
NTSB Senior Meteorologist