**NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety
Washington, D.C. 20594

October 6, 2017

**Group Chairman's Factual Report**

# METEOROLOGY

DCA17FA109

## Table Of Contents

## A. ACCIDENT

Location: Yeager Airport, Charleston, West Virginia
Date: May 5, 2017
Time: 0651 Eastern daylight time
1051 Coordinated Universal Time (UTC)
Airplane: Shorts SD3-30, N334AC

## B. METEOROLOGIST

Paul Suffern
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

## C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Meteorologist did not travel for this investigation and gathered the weather data for this investigation from the NTSB's Washington D.C. office and from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Centers for Environmental Information (NCEI). All times are Eastern daylight time (EDT) on May 5, 2017, and are based upon the 24-hour clock, where local time is -4 hours from UTC, and UTC=Z (unless otherwise noted). 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.

The final wreckage location was located at latitude 38.373° N, longitude 81.599° W, at an approximate elevation of 850 feet (ft). The first impact point was an approximate elevation of 947 ft.

## D. FACTUAL INFORMATION

### 1.0 Synoptic Situation

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

## 1.1 Surface Analysis Chart

The NWS Surface Analysis Chart for 0800 EDT is provided as figure 1 with the approximate location of the accident site marked within the red circle. The chart indicated an occluded frontal band above the accident site at 0800 EDT with a surface low pressure center located just west of the accident site at the borders of Ohio, West Virginia, and Kentucky, with the surface low pressure center having a pressure of 995-hectopascals (hPa). A stationary front stretched from central Tennessee northeastward through central Ohio and into southern Canada. A warm front stretched from western Virginia eastward into the western Atlantic Ocean. A cold front stretched southward from western Virginia into central North Carolina and central South Carolina. The station models around the accident site depicted air temperatures in the mid to upper 50's degrees Fahrenheit (°F), dew point temperatures in the mid to upper 50's °F with temperature-dew point spreads of 2° F or less, an east or southeast wind of 5 knots or less, and mostly cloudy skies.

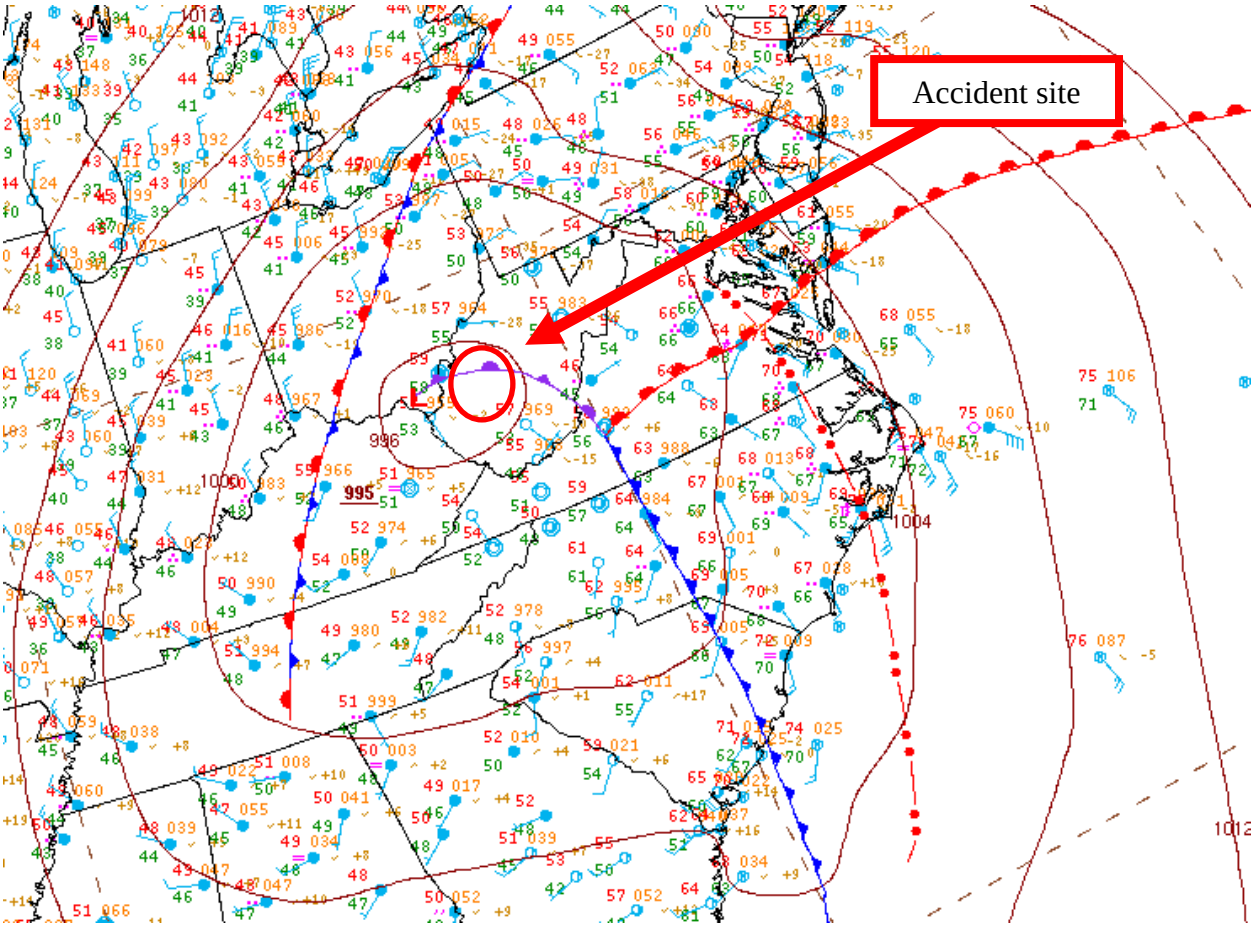



**Figure 1 – NWS Surface Analysis Chart for 0800 EDT**

## 1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 0800 EDT at 925-, 850-, 700-, 500-, and 300-hPa are presented in figures 2 through 6. There was a vertically stacked low pressure system located at the border of Ohio, Kentucky, and West Virginia, located above the surface low pressure center (section 1.1), and located just west of the accident site. There was a low-level trough[1] located above the accident site (figures 2 and 3) at 925- and 850-hPa. Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present. There was an east to south wind of 5 to 25 knots at 925- and 850-hPa (figures 2 and 3) above the accident site. The wind became southerly by 700-hPa with a wind speed of 25 to 40 knots (figure 4). The southerly wind at 700-hPa increased in speed to 80 knots by 300-hPa (figure 6).

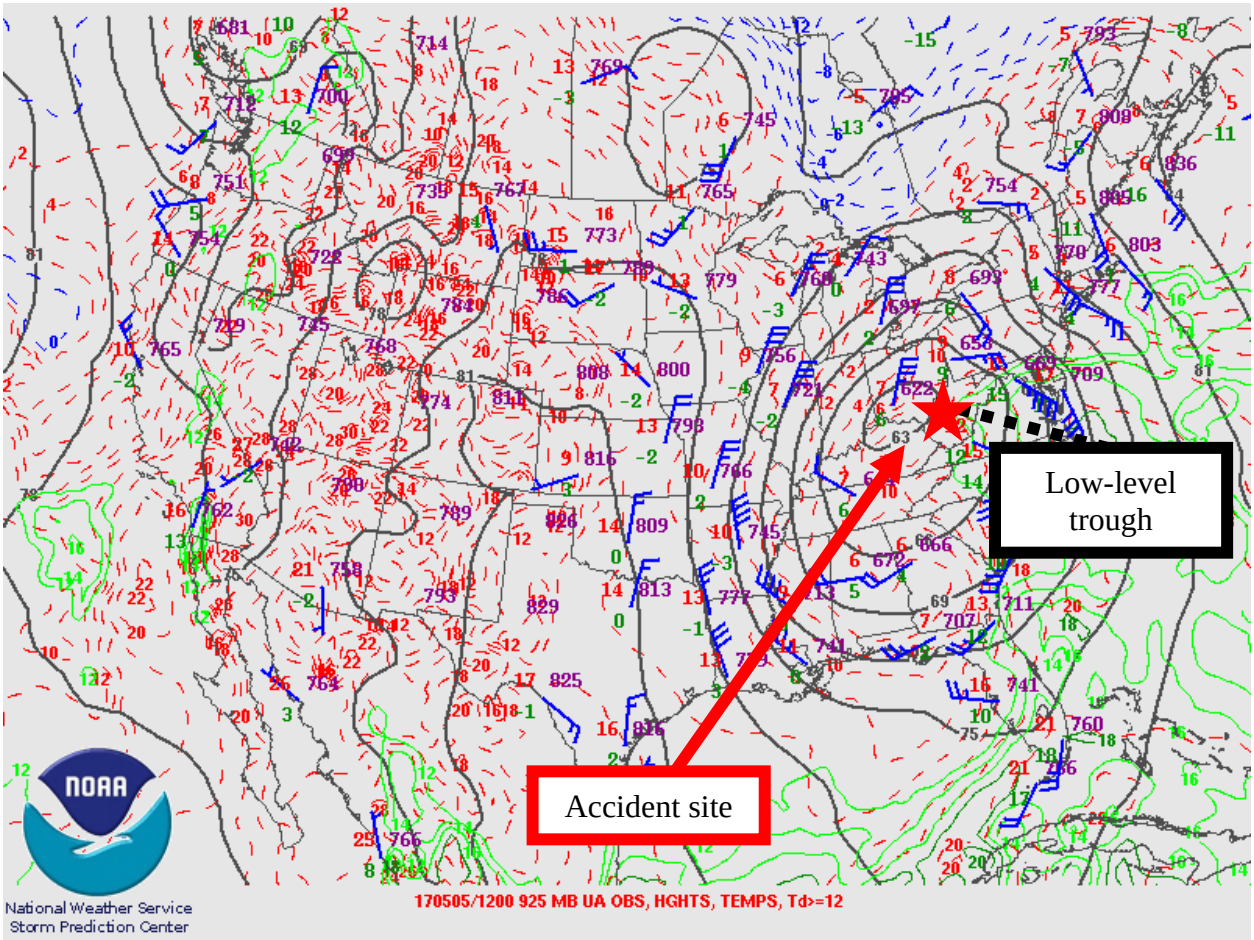



**Figure 2 – 925-hPa Constant Pressure Chart for 0800 EDT**

[1] Trough – An elongated area of relatively low atmospheric pressure or heights.

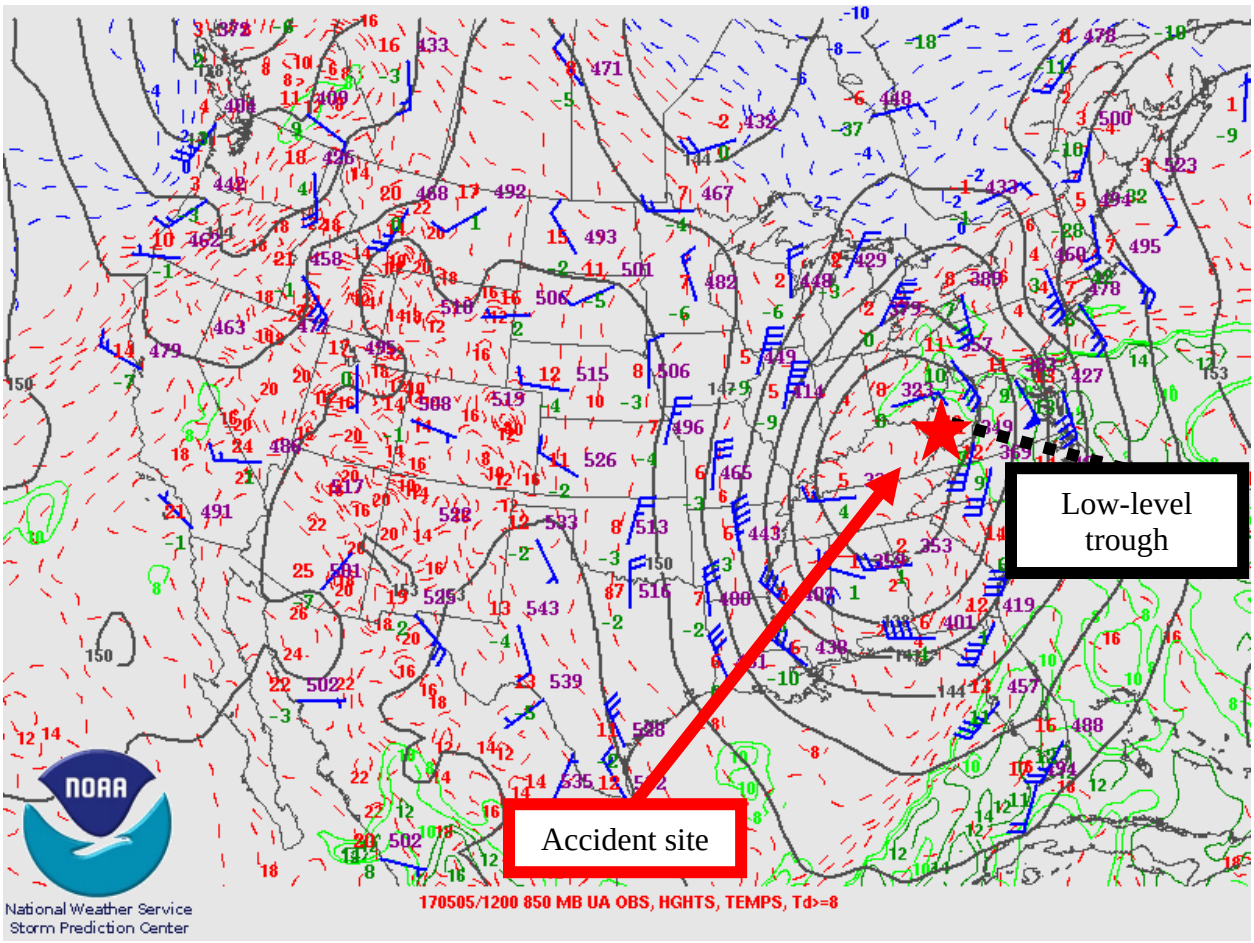



**Figure 3 – 850-hPa Constant Pressure Chart for 0800 EDT**

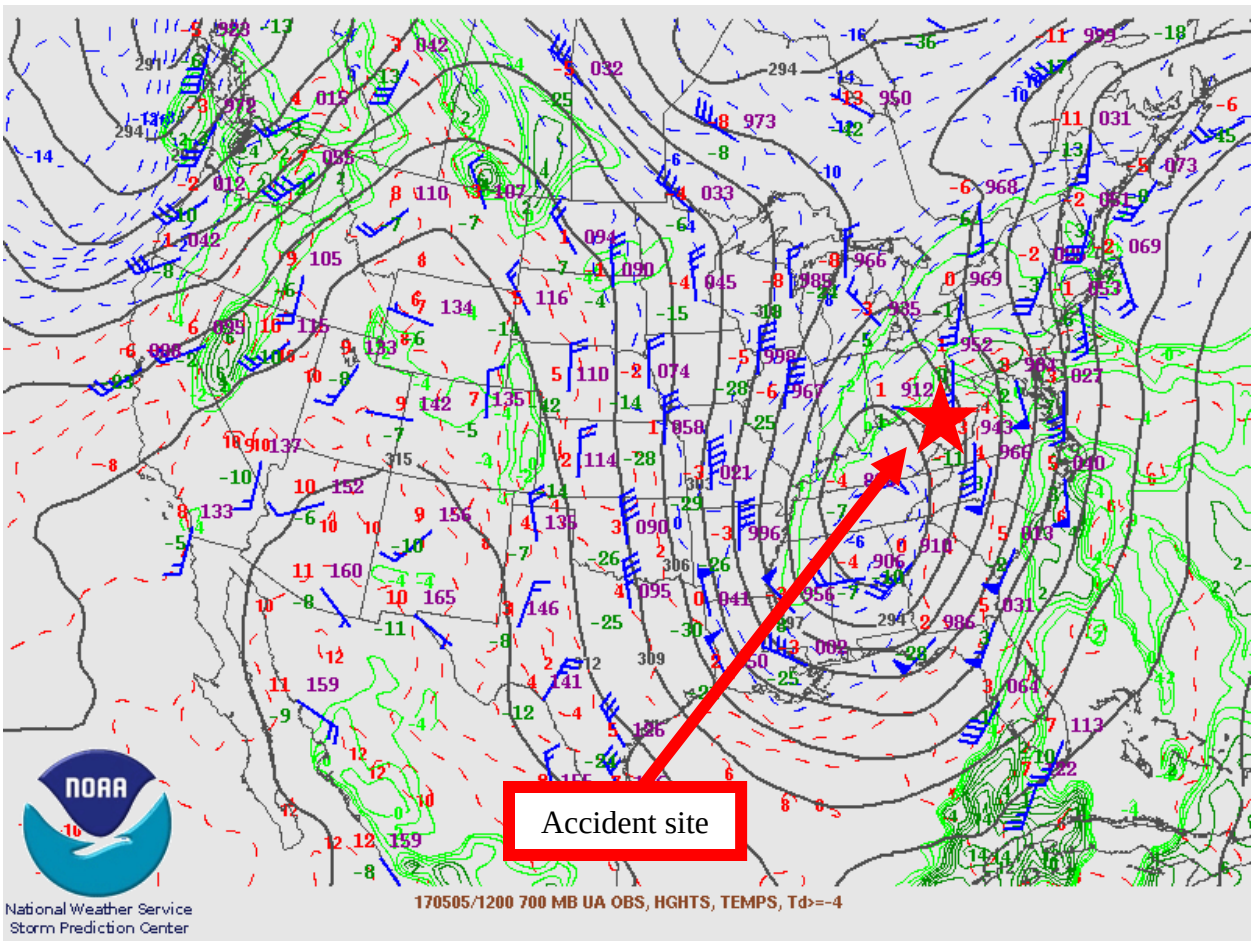



**Figure 4 – 700-hPa Constant Pressure Chart for 0800 EDT**

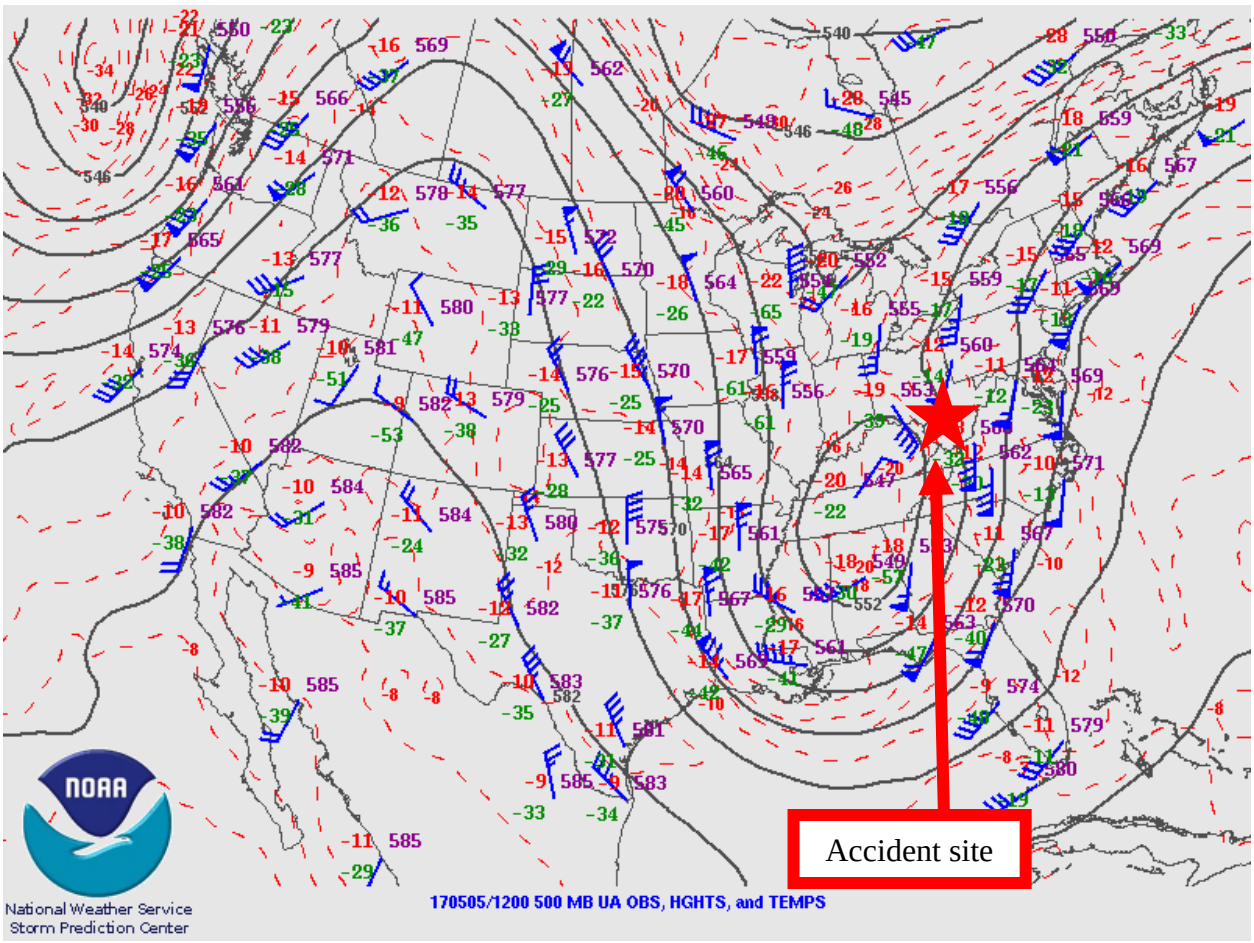



**Figure 5 – 500-hPa Constant Pressure Chart for 0800 EDT**

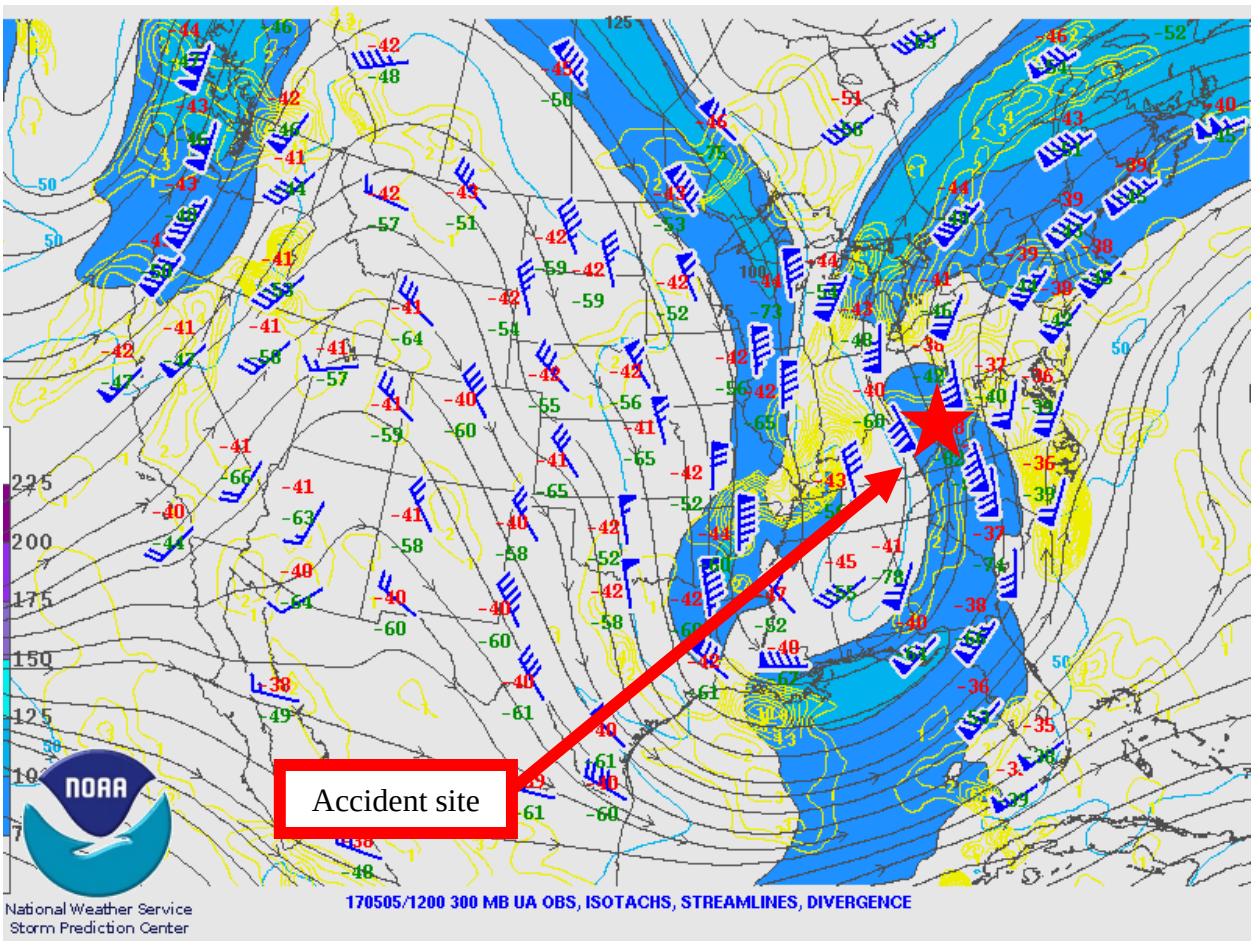



**Figure 6 – 300-hPa Constant Pressure Chart for 0800 EDT**

## 2.0 SPC Products

The SPC issued the following Day 1 Convective Outlook at 2056 EDT on May 4 (figure 7) with areas of general thunderstorms forecast for the accident site between 2100 EDT on May 4 through 0800 EDT on May 5:

SPC AC 050056

Day 1 Convective Outlook
NWS Storm Prediction Center Norman OK
0756 PM CDT Thu May 04 2017

Valid 050100Z - 051200Z

...THERE IS A SLIGHT RISK OF SEVERE THUNDERSTORMS ACROSS INTERIOR PORTIONS OF WESTERN OREGON AND WASHINGTON...

...THERE IS A SLIGHT RISK OF SEVERE THUNDERSTORMS ACROSS PORTIONS OF EASTERN SOUTH CAROLINA AND SOUTHEAST NORTH CAROLINA...

...THERE IS A MARGINAL RISK OF SEVERE THUNDERSTORMS ACROSS PORTIONS

OF THE PACIFIC NORTHWEST...

...THERE IS A MARGINAL RISK OF SEVERE THUNDERSTORMS ACROSS PORTIONS OF THE CAROLINAS INTO SOUTHEAST VIRGINIA...

...SUMMARY...
Isolated severe storms will most likely occur across parts of the Cascades this evening with hail as the primary hazard, though some strong wind gusts also are possible. Localized damaging winds and a tornado or two also will be possible tonight across the South Atlantic Coast States.

...Cascades...

The slight risk area has been expanded northward across portions of south-central WA in accordance with WW 193. A few severe hail and wind gusts have already been reported across the watch area. Additional storms are expected to continue into the evening hours near and west of the Cascades in Oregon. 00z RAOB from SLE indicated steep midlevel lapse rates with MUCAPE near 1000 J/kg, with long, straight hodographs. This will continue to favor hail production, and fast storm motion around 35-40 kt could result in some locally strong wind gusts. This threat should persist for several more hours before diminishing during the nighttime hours.

...Coastal South Carolina/North Carolina and southeast VA...

A shortwave trough is currently ejecting across southern GA with a surface low moving into the central Appalachians. Ahead of the low, backed surface winds will continue to advect mid 60s to near 70 dewpoints along the coastal plain of SC/NC. 00z CHS RAOB shows favorable hodograph for low-level rotation. MLCAPE is somewhat limited, near 500 J/kg but rich boundary layer moisture in conjunction with effective SRH around 200-300 m2/s2 appears to be making up for modest instability. Radar trends have shown a few strong rotation signatures over the past 1-2 hours, and addition of a 5 percent tor/slight risk appears warranted for parts of coastal SC/NC. This threat should spread northward from SC into southeast NC over the next few hours. Further north and west into the NC Piedmont and southeast VA, forecast soundings appear less favorable and a marginal risk will be maintained across this area.

..Leitman.. 05/05/2017

CLICK TO GET WUUS01 PTSDY1 PRODUCT

NOTE: THE NEXT DAY 1 OUTLOOK IS SCHEDULED BY 0600Z

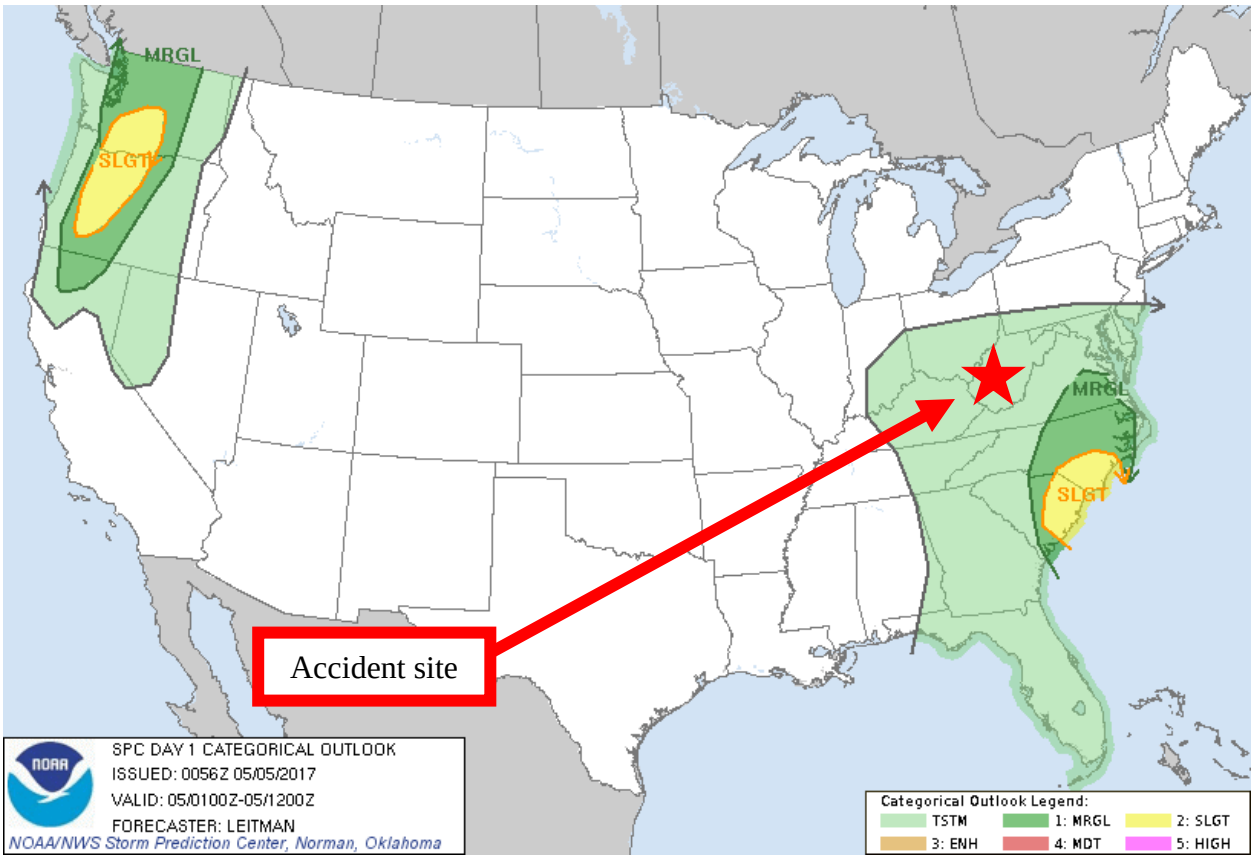



**Figure 7 – SPC day 1 Convective Outlook valid at the time of the accident**

## 3.0 Surface Observations

The area surrounding the accident site was documented using official NWS Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). Figure 8 is a sectional chart with the accident site and the closest weather reporting location to the accident site marked.

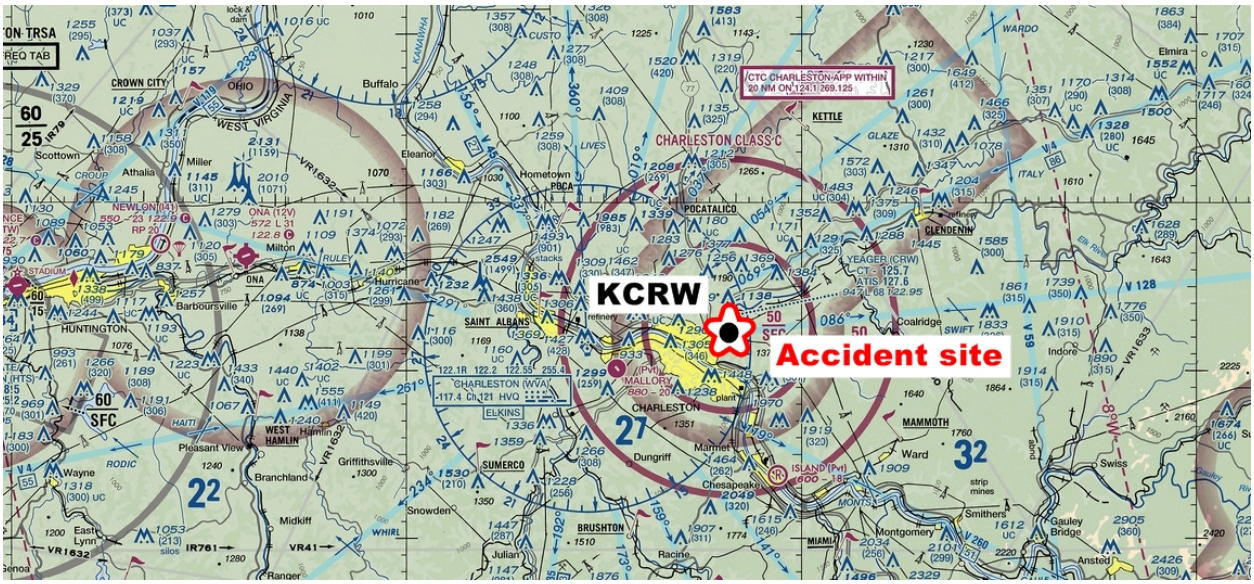



**Figure 8 – Sectional chart of accident area with the location of the accident site and surface observation site**

Yeager Airport (KCRW) was the intended destination airport and was located 3 miles east of Charleston, West Virginia. KCRW had an Automated Surface Observing System (ASOS[2]) and these reports were issued while an observer was logged into the ASOS augmentation. The KCRW ASOS was located within a mile of the accident site, at an elevation of 947 ft, and had a 6° westerly magnetic variation[3] (figure 8). The following observations were taken and disseminated during the times surrounding the accident:[4]

[0303 EDT] SPECI KCRW 050703Z 07007KT 7SM RA FEW001 SCT031 OVC055 14/13 A2950 RMK AO2 VLY FG P0000 T01440133 $=

[0354 EDT] METAR KCRW 050754Z 07006KT 5SM RA BR FEW001 BKN048 OVC070 14/13 A2948 RMK AO2 SLP978 VLY FG P0016 T01440133 $=

[0448 EDT] SPECI KCRW 050848Z 10003KT 6SM -RA BR SCT004 BKN021 OVC048 14/13 A2947 RMK AO2 VLY FG P0004 $=

[0454 EDT] METAR KCRW 050854Z 13003KT 6SM -RA BR SCT004 BKN021 OVC048 14/13 A2947 RMK AO2 SLP974 VLY FG P0004 60023 T01390133 56013 $=

[0546 EDT] SPECI KCRW 050946Z 06010KT 10SM SCT007 BKN013 OVC031 14/13 A2940 RMK AO2 RAE46 PRESFR P0001 T01390133 $=

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

[3] Magnetic variation – The angle (at a particular location) between magnetic north and true north. 1985, latest measurement taken from http://www.airnav.com/airport/KCRW

[4] Bolded sections in this report highlight information that directly reference the weather conditions that affected the accident location around the accident time.

***[0554 EDT] METAR KCRW 050954Z 08011KT 10SM SCT007 BKN013 OVC031 14/13 A2938 RMK AO2 RAE46 PRESFR SLP943 P0001 T01390133 $=***

***[0630 EDT] SPECI KCRW 051030Z 17004KT 10SM FEW001 OVC005 14/13 A2940 RMK AO2 VLY FG T01390133 $=***

**ACCIDENT TIME 0651 EDT**

***[0654 EDT] METAR KCRW 051054Z 23003KT 10SM FEW001 OVC005 14/13 A2941 RMK AO2 SLP952 VLY FG T01440133=***

***[0659 EDT] SPECI KCRW 051059Z 00000KT 10SM FEW001 OVC005 14/13 A2940 RMK AO2 T01440133=***

[0744 EDT] SPECI KCRW 051144Z 20003KT 10SM FEW000 SCT011 BKN060 15/14 A2943 RMK AO2 FG FEW000 T01500139=

[0754 EDT] METAR KCRW 051154Z 00000KT 10SM FEW000 SCT011 BKN060 16/14 A2942 RMK AO2 SLP956 FG FEW000 60024 70046 T01560144 10156 20139 55017=

KCRW weather at 0554 EDT, wind from 080° at 11 knots, 10 miles visibility, scattered clouds at 700 ft above ground level (agl), broken ceiling at 1,300 ft agl, overcast skies at 3,100 ft agl, temperature of 14° Celsius (C), dew point temperature of 13° C, and an altimeter setting of 29.38 inches of mercury. Remarks, station with a precipitation discriminator, rain ended at 0546 EDT, pressure falling rapidly, sea level pressure 994.3 hPa, one-hourly precipitation of 0.01 inches, temperature 13.9° C, dew point temperature 13.3° C, maintenance is needed on the system.

KCRW weather at 0630 EDT, wind from 170° at 4 knots, 10 miles visibility, few clouds at 100 ft agl, overcast ceiling at 500 ft agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 29.40 inches of mercury. Remarks, station with a precipitation discriminator, valley fog, temperature 13.9° C, dew point temperature 13.3° C, maintenance is needed on the system.

KCRW weather at 0654 EDT, wind from 230° at 3 knots, 10 miles visibility, few clouds at 100 ft agl, overcast ceiling at 500 ft agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 29.41 inches of mercury. Remarks, station with a precipitation discriminator, sea level pressure 995.2 hPa, valley fog, temperature 14.4° C, dew point temperature 13.3° C.

KCRW weather at 0659 EDT, wind calm, 10 miles visibility, few clouds at 100 ft agl, overcast ceiling at 500 ft agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 29.40 inches of mercury. Remarks, station with a precipitation discriminator, temperature 14.4° C, dew point temperature 13.3° C.

The 5-minute KCRW ASOS observation data (attachment 1) indicated that the cloud ceilings at KCRW dropped from 1,300 ft agl to 500 ft agl, between 0625 and 0630 EDT. The KCRW ASOS cloud ceilometer observed the cloud ceiling as a broken cloud ceiling at 500 ft agl at 0628:04 EDT (attachment 1), but when the official weather observer viewed the weather conditions, they edited the METAR line and changed the broken cloud ceiling at 500 ft agl to an overcast cloud ceiling at 500 ft agl (attachment 1, editlog). In addition, the official weather observer added a few clouds at 100 ft agl and "valley fog" to the official 0630 EDT transmitted KCRW SPECI (attachment 1). Once the ASOS METAR or SPECI is transmitted from the ASOS, the METAR or SPECI is automatically sent to the air traffic control (ATC) tower's Operator Interface Device (OID).

The observations from KCRW surrounding the accident time indicated a surface wind under 5 knots with IFR[5] ceiling conditions with valley fog.

## 4.0 Upper Air Data

The closest official upper air sounding to the accident site was from Roanoke, Virginia, (KRNK), located 90 miles southeast of the accident site, with a site number 72318, and an elevation of 2,126 ft. The 0800 EDT sounding was plotted on a standard Skew-T log P diagram[6] with the derived stability parameters included in figure 9 (with data from the surface to 500-hPa, or 18,000 ft msl.) This data was analyzed using the RAOB[7] software package. The sounding depicted the lifted condensation level (LCL)[8] at the surface, a convective condensation level (CCL)[9] of 6,706 ft, and a level of free convection (LFC)[10] at the surface. The freezing level was 12,367 ft. The precipitable water value was 0.76 inches.

[5] Instrument Flight Rules – Refers to the general weather conditions pilots can expect at the surface. IFR criteria means a ceiling below 1,000 ft agl and/or less than 3 miles visibility.
[6] Skew T log P diagram – is a standard meteorological plot using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.
[7] RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamopras, Pennsylvania.
[8] LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.
[9] CCL – The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.
[10] 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.

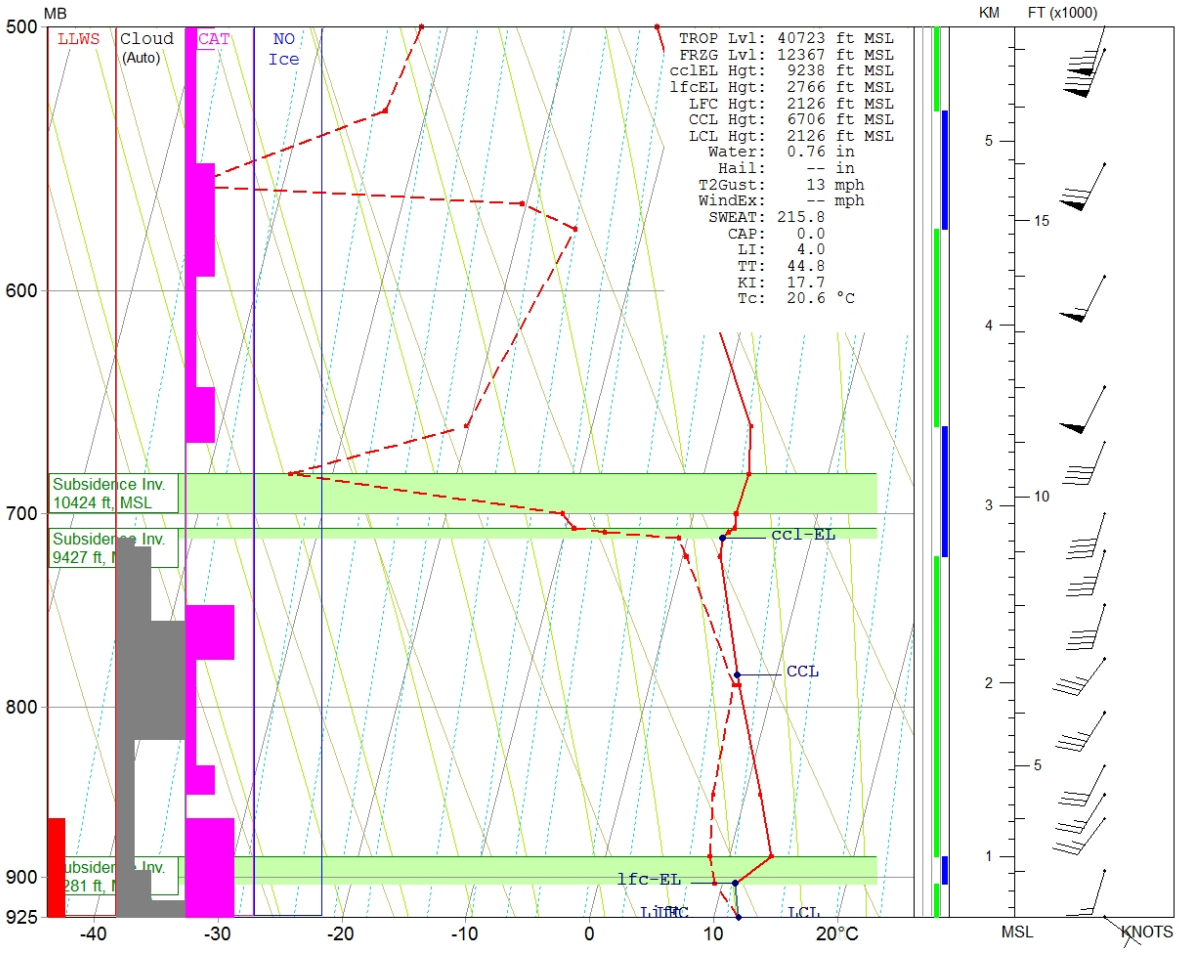



**Figure 9 – 0800 EDT KRNK sounding for the accident site**

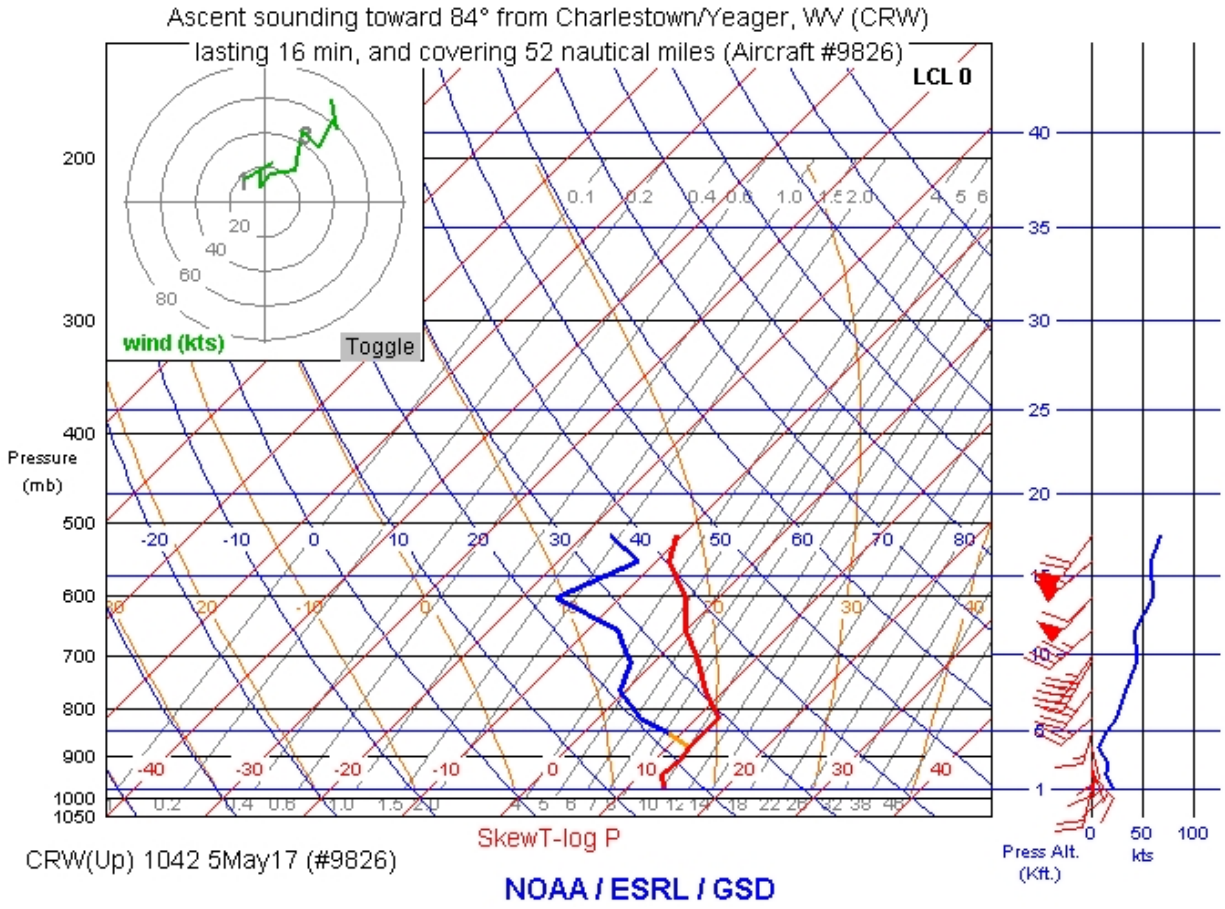
The 0800 EDT KRNK sounding indicated a mostly conditionally unstable environment from the surface through 15,000 ft. There was a stable layer between 2,750 and 3,250 ft and another stable layer between 9,000 and 11,000 ft. An inversion (increase in temperature with height) was located at 3,281 ft (or ~1,100 ft agl) and two more inversions were located at 9,427 and 10,424 ft respectively. RAOB identified that clouds were likely between the surface and 10,000 ft. RAOB did not indicate any icing was likely below 18,000 ft.

The 0800 EDT KRNK sounding wind profile indicated a surface wind from 130° at 4 knots with the wind becoming southwesterly by 3,000 ft and increasing in speed to 15 knots. The wind remained southerly to southwesterly from 3,000 ft through 18,000 ft. The wind speed increased from 15 knots at 3,000 ft to 25 knots by 4,000 ft, with a wind speed above 50 knots by 13,000 ft. RAOB indicated the possibility of low-level wind shear (LLWS) between the surface and 3,500 ft. RAOB indicated the possibility of clear-air turbulence in several layers between the surface and 18,000 ft.

## 5.0 AMDAR Data

An aircraft that provided Aircraft Meteorological Data Reports (AMDAR) identified as aircraft #9826[11] departed KCRW at 0642 EDT (1042Z) approximately 9 minutes prior to the accident time and retrieved meteorological data on its departure (table 1):

[11] Aircraft #9826 – The aircraft number was determined by the AMDAR data display from the Earth System Research Laboratory's Global Systems Division (ESRL/GSD).




| P_alt[12] (ft) | hPa | t/td[13] (°C) | w_dir/w_spd[14] (kts) | Time (UTC) | Bng/Rng[15] (nm) |
|---|---|---|---|---|---|
| **1110** | **973** | **13.7/13.70** | **191°/022** | **1042** | **10°/001** |
| **1960** | **944** | **12.2/12.20** | **138°/016** | **1042** | **32°/002** |
| **2499** | **925** | **12.4/12.40** | **160°/017** | | |
| **2900** | **911** | **12.6/12.60** | **176°/017** | **1043** | **44°/003** |
| **3850** | **880** | **12.3/12.30** | **166°/008** | **1044** | **65°/005** |

**Table 1 – AMDAR meteorological data on a flight departing KCRW 9 minutes prior to the accident time**

At 0642 EDT and with a pressure altitude of 1,110 ft, the pressure was 973 hPa, the air temperature was 13.7° C, the dew point temperature was 13.7° C, and the wind was from 191° at 22 knots.

[12] P_alt – Pressure altitude is the indicated altitude when an altimeter is set to an agreed baseline pressure setting. The baseline pressure setting is 1013.25 hPa or 29.92 inches of mercury

[13] t/td – Air temperature and dew point temperature in degrees Celsius.

[14] w_dir/w_spd – Wind direction (reference to true north) and wind speed in knots.

[15] Bng/Rng – The angle and distance from the start point. In this case the start point was KCRW.

At 0642 EDT and with a pressure altitude of 1,960 ft, the pressure was 944 hPa, the air temperature was 12.2° C, the dew point temperature was 12.2° C, and the wind was from 138° at 16 knots.

At an unknown time and with a pressure altitude of 2,499 ft, the pressure was 925 hPa, the air temperature was 12.4° C, the dew point temperature was 12.4° C, and the wind was from 160° at 17 knots.

At 0643 EDT and with a pressure altitude of 2,900 ft, the pressure was 911 hPa, the air temperature was 12.6° C, the dew point temperature was 12.6° C, and the wind was from 176° at 17 knots.

At 0644 EDT and with a pressure altitude of 3,850 ft, the pressure was 880 hPa, the air temperature was 12.3° C, the dew point temperature was 12.3° C, and the wind was from 166° at 8 knots.

## 6.0 Satellite Data

Visible and infrared data from 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 software. Visible and infrared imagery (GOES-13 bands 1 and 4) at wavelengths of 0.65 microns (μm) and 10.7 μm, respectively, were retrieved for the period. Satellite imagery surrounding the time of the accident, from 0500 EDT through 1000 EDT at approximately 15-minute intervals were reviewed, and the closest images to the time of the accident are documented here.

Figures 10 and 11 present the GOES-13 infrared imagery from 0645 and 0700 EDT at 6X magnification with the accident site highlighted with a red square. Inspection of the infrared imagery indicated cloud cover over the accident site with that cloud cover moving from southwest to northeast. The lower brightness temperatures (yellow, green, and blue colors; higher cloud tops) were located northeast of the accident site at the accident time. Based on the brightness temperatures above the accident site and the vertical temperature profile provided by the 0800 EDT KRNK sounding, the approximate cloud-top heights over the accident site were 5,500 ft at 0700 EDT. It should be noted these figures have not been corrected for any parallax error.

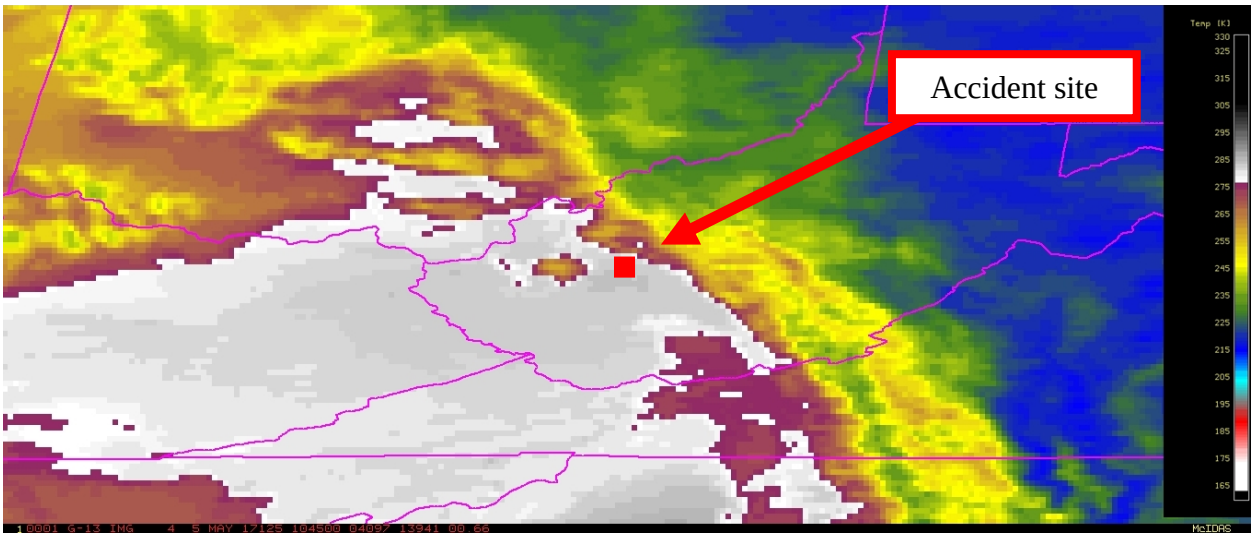



**Figure 10 – GOES-13 infrared image at 0645 EDT**

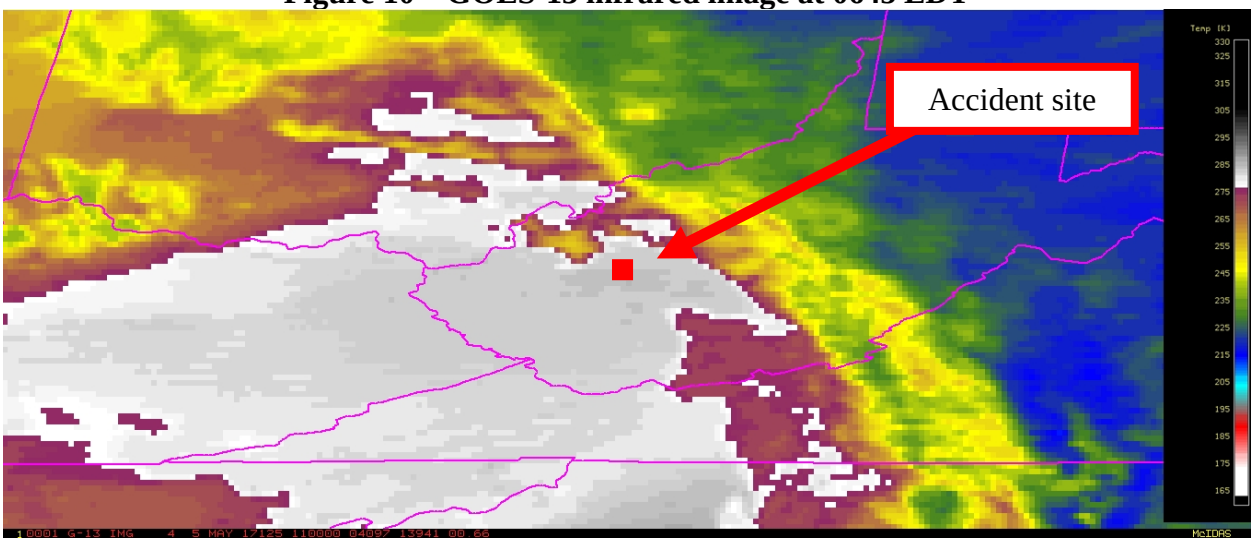



**Figure 11 – GOES-13 infrared image at 0700 EDT**

## 7.0 Radar Imagery Information

The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D)[16] to the accident site was the Charleston, West Virginia, radar (KRLX), which was located 7 miles west-southwest of the accident site at an elevation of 1,080 ft. Level II and III archive radar data were obtained from the NCEI utilizing the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software. The KRLX data showed no precipitation targets above the accident site at the accident time.

[16] The WSR-88D is an S-band 10-centimeter wavelength radar with a power output of 750,000 watts, and with a 28-foot parabolic antenna that concentrates the energy between a 0.87° and 0.96° beam width. The radar produces three basic types of products: base reflectivity, base radial velocity, and base spectral width.

## 8.0 Pilot Reports[17]

All PIREPs close to the accident site from about two hours prior to the accident time to about two hours after the accident time were reviewed. Only PIREPs for below FL180[18] are provided below:

CRW UA /OV HVQ090040/TM 1048/FL080/TP DH8/WX CLEAR/TA 07

CVG UA /OV CVG040050/TM 1106/FL160/TP J328/TA M07/TB LGT CHOP

KLYH UA /OV LYH/TM 1214/FL020/TP C550/RM BASES 005/ TOPS 024

Routine pilot report (UA); 40 miles from Charleston, West Virginia, on the 090° radial; Time – 0648 EDT (1048Z); Altitude – 8,000 ft; Type aircraft – Bombardier Dash 8; Weather – Clear; Temperature – 7° C.

Routine pilot report (UA); 50 miles from Covington, Kentucky, on the 040° radial; Time – 0706 EDT (1106Z); Altitude – 16,000 ft; Type aircraft – Dornier 328; Temperature – -7° C; Turbulence – Light chop.

Routine pilot report (UA); Over Lynchburg, Virginia; Time – 0814 EDT (1214Z); Altitude – 2,000 ft; Type aircraft – Cessna Citation II; Remarks – Bases at 500 ft agl with tops at 2,400 ft agl.

The ATC data revealed that ATC did not solicit nor disseminate any PIREPs to the accident flight or any flights within an hour period surrounding the accident time. This was not in accordance with the FAA JO Order 7110.65, Air Traffic Control.[19]

## 9.0 SIGMET and CWSU Advisories

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

No Center Weather Service Unit (CWSU) Center Weather Advisory was valid for the accident site at the accident time. A CWSU Meteorological Impact Statement (MIS) was valid for the accident site from 2130 EDT on May 4 through 0800 EDT on May 5. The MIS mentioned areas of occasional moderate icing in precipitation between 10,000 ft and FL250 lasting through 0800 EDT, and to see the Airmen's Meteorological Information (AIRMET) advisory for IFR conditions:

[17] Only pilot reports with the WMO header UBWV**, UBOH**, UBVA**, UBKY** identifier were considered.
[18] Flight Level – A Flight Level (FL) is a standard nominal altitude of an aircraft, in hundreds of ft. This altitude is calculated from the International standard pressure datum of 1013.25 hPa (29.92 inHg), the average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above mean sea level or above ground level.
[19] For more information see the ATC data contained in the docket of this accident.

981
FAUS20 KZID 050130
ZID MIS 03 VALID 050130-051200
...FOR ATC PLANNING PURPOSES ONLY...
W OF LN 30NE ROD-30S LOZ FRQ MOD ISOL SEV TURB LYRS 170-FL350
IN AREA OF STG SHEAR DVLPG E THRU PD. **ACRS ZID OCNL MOD ICG IN PCPN 100-FL250 THRU PD. SEE ALSO AIRMET IFR. LAST.**
=

## 10.0 AIRMETs

There were AIRMET advisories Sierra and Tango that were valid for the accident site at the accident time (figures 12 through 15). AIRMET Sierra warned of mountain obscuration conditions in clouds, precipitation, and mist (figures 12 and 13), while AIRMET Tango warned of both moderate turbulence conditions below 15,000 ft and LLWS conditions (figures 14 and 15):

399
WAUS41 KKCI 050845
WA1S
-BOSS WA 050845
AIRMET SIERRA UPDT 1 FOR IFR AND MTN OBSCN VALID UNTIL 051500
.
AIRMET IFR...NH VT MA RI CT NY NJ PA WV MD DC DE VA NC SC AND CSTL WTRS
FROM 50WSW CON TO 40SSE BOS TO 40SSW PVD TO 40S SBY TO 80SSE ECG TO 40SSW ILM TO CAE TO 20NNE SPA TO 30NE HMV TO 50SSW JST TO EWC TO 50WSW CON
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 15Z THRU 21Z.
.
AIRMET IFR...NH VT MA NY LO PA OH LE WV
FROM YOW TO 60SW MSS TO 50NW ALB TO 50WSW CON TO EWC TO HNN TO CVG TO FWA TO 30ESE ECK TO YOW
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 15Z THRU 21Z.
.
**AIRMET MTN OBSCN...NH VT MA NY PA WV MD VA**
**FROM 50WSW YSC TO 20SW MPV TO CON TO HAR TO 20N GSO TO HMV TO HNN TO 20WSW JHW TO SYR TO MSS TO 50WSW YSC**
**MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 15Z THRU 21Z.**
**.**
OTLK VALID 1500-2100Z
AREA 1...IFR ME NH VT MA NY LO PA OH LE WV AND CSTL WTRS
BOUNDED BY YOW-30W MPV-30SSW MLT-70SE MLT-70SE BGR-40NE EWC-40WNW HNN-CVG-FWA-30SE ECK-YOW
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG THRU 21Z.
.
AREA 2...IFR ME NH VT MA RI CT NY NJ PA WV MD DC DE VA NC AND CSTL WTRS
BOUNDED BY 70SE BGR-50ENE ACK-40S SBY-70SSE ECG-40ENE ILM-20E RIC-60SW CSN-30ENE EKN-30S JST-40NE EWC-70SE BGR
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG THRU 21Z.
.
AREA 3...MTN OBSCN ME NH VT MA NY PA WV MD VA
BOUNDED BY 40ESE YQB-60SW BGR-HAR-30NNE GSO-40SSW PSK-EKN-AIR-20WSW JHW-SYR-MSS-YSC-40ESE YQB

MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG THRU 21Z.
.
AREA 4...MTN OBSCN WV VA NC SC GA
BOUNDED BY 40W EKN-40SSW PSK-30NNE GSO-20SSW CLT-20ESE ATL-GQO-HMV-HNN-40W EKN
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG THRU 21Z.

618
WAUS41 KKCI 050845
WA1T
-BOST WA 050845
AIRMET TANGO UPDT 1 FOR TURB AND LLWS VALID UNTIL 051500
.
AIRMET TURB...NY LO PA OH LE WV MD VA
FROM 100WSW YOW TO 50WSW CSN TO 40NNE RDU TO HMV TO HNN TO CVG TO FWA TO 40S ECK TO 100WSW YOW
MOD TURB BTN FL180 AND FL410. CONDS CONTG BYD 15Z THRU 21Z.
.
**AIRMET TURB...ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA NC AND CSTL WTRS**
**FROM 20SSW YSC TO 40NNW ENE TO 40SSW CON TO 60SE HTO TO 30ESE ORF TO 40SSW RDU TO HNN TO CVG TO FWA TO 30SW DXO TO BUF TO 30SW MSS TO 20SSW YSC**
**MOD TURB BLW 150. CONDS CONTG BYD 15Z THRU 21Z.**
.
AIRMET TURB...PA OH WV MD VA NC SC GA FL AND CSTL WTRS
FROM HNN TO 40SSW RDU TO 20ESE OMN TO 20E PIE TO 110SSE SJI TO 40W CEW TO 50SW PZD TO GQO TO HMV TO HNN
MOD TURB BLW 100. CONDS CONTG BYD 15Z THRU 21Z.
.
AIRMET TURB...ME NH VT MA RI CT NY LO NJ PA LE WV MD DC DE VA AND CSTL WTRS
FROM 70NW PQI TO 60NE PQI TO 50WSW YSJ TO 110SE BGR TO 80E ACK TO 30ENE LYH TO 50WSW CSN TO 100WSW YOW TO YOW TO YSC TO 70NW PQI
MOD TURB BTN FL280 AND FL420. CONDS CONTG BYD 15Z THRU 21Z.
.
**LLWS POTENTIAL...VT MA CT NY LO NJ PA OH LE WV MD DC DE VA NC AND CSTL WTRS**
**BOUNDED BY 50SW MSS-20SE MPV-40E ALB-50SSE HTO-90E ORF-40SSE RDU-HMV-HNN-20SSE YYZ-50SW MSS**
**LLWS EXP. CONDS CONTG BYD 15Z ENDG 18-21Z.**
.
OTLK VALID 1500-2100Z
AREA 1...TURB NY LO PA OH LE WV MD VA NC SC GA FL AND CSTL WTRS
BOUNDED BY 100WSW YOW-40ENE ILM-90E TRV-80WSW EYW-90WSW PIE-170SE LEV-130ESE LEV-40W CEW-50SW PZD-GQO-HMV-HNN-CVG-FWA-40S ECK-100WSW YOW
MOD TURB BTN FL180 AND FL410. CONDS CONTG THRU 21Z.
.
AREA 2...TURB PA OH WV MD DC VA NC SC GA FL AND CSTL WTRS
BOUNDED BY 20N JST-HAR-40SSE RIC-20SW ILM-60ENE CRG-30NE TRV-RSW-90SSE SJI-40W CEW-50SW PZD-GQO-HMV-HNN-CVG-40WSW ROD-20ENE AIR-20N JST
MOD TURB BLW 100. CONDS CONTG THRU 21Z.
....

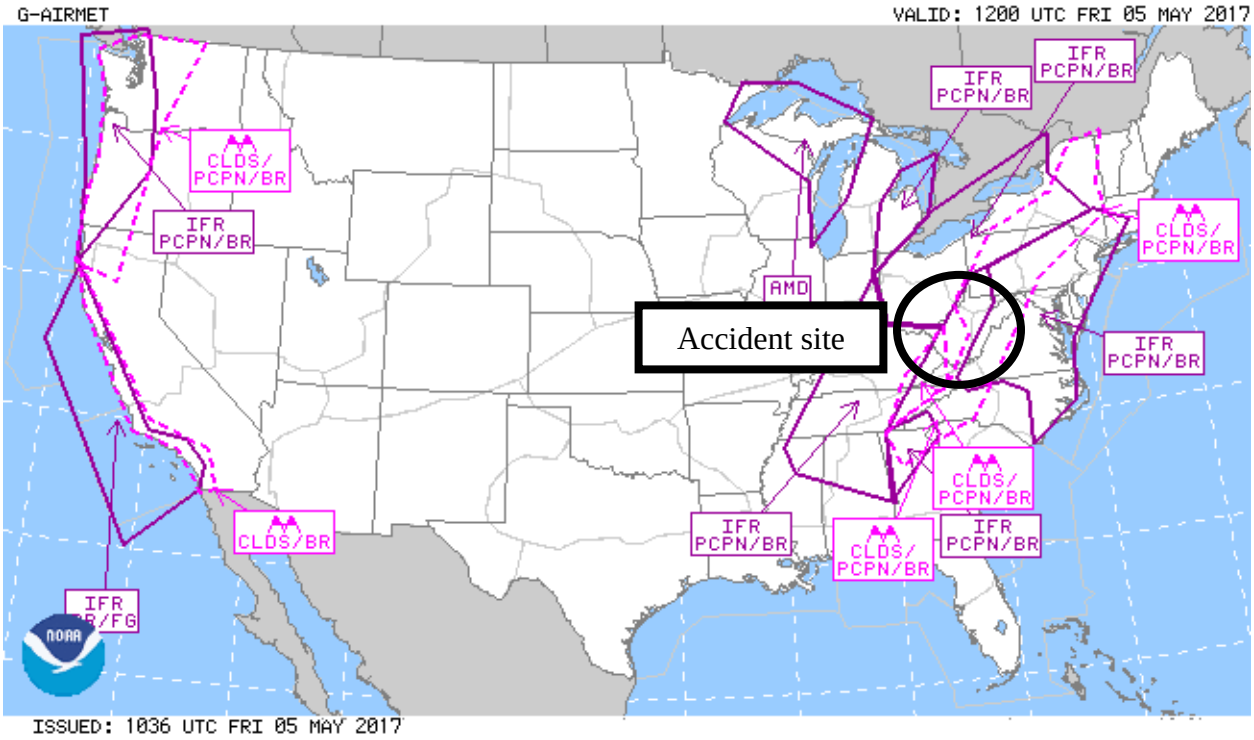



**Figure 12 – G-AIRMETs SIERRA valid at 0800 EDT**

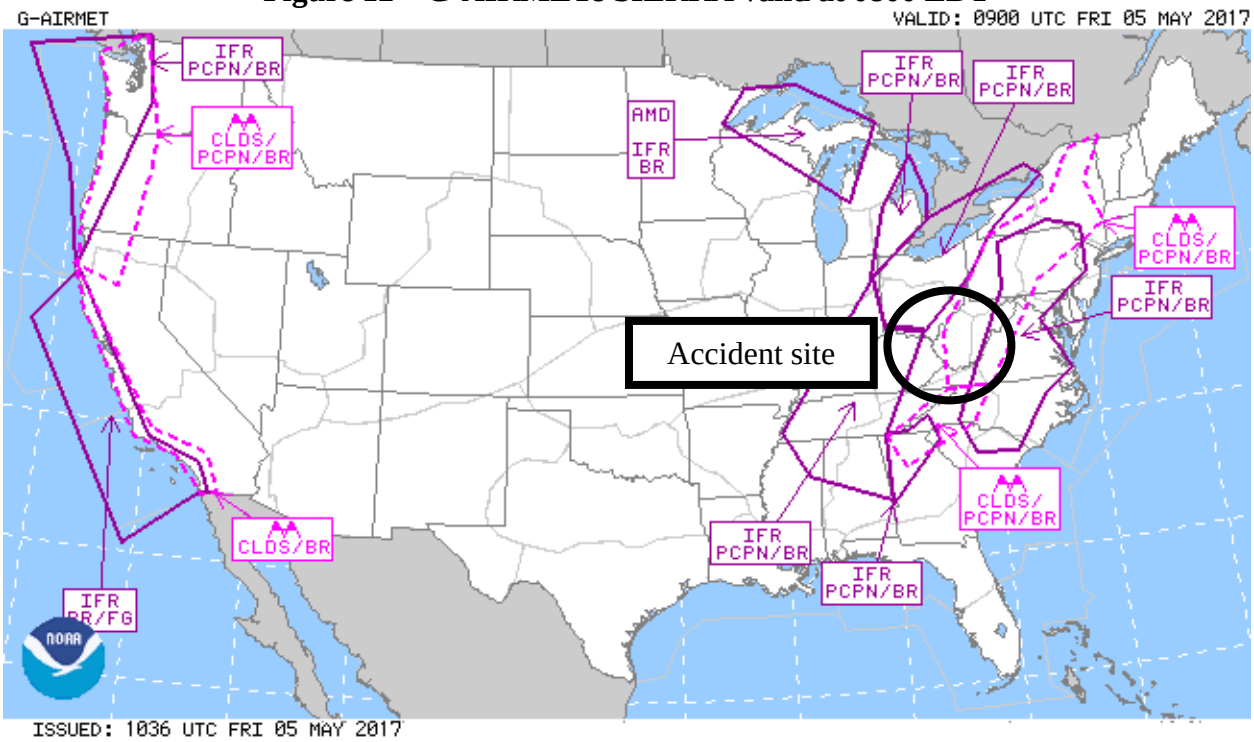



**Figure 13 – G-AIRMETs SIERRA valid at 0500 EDT**

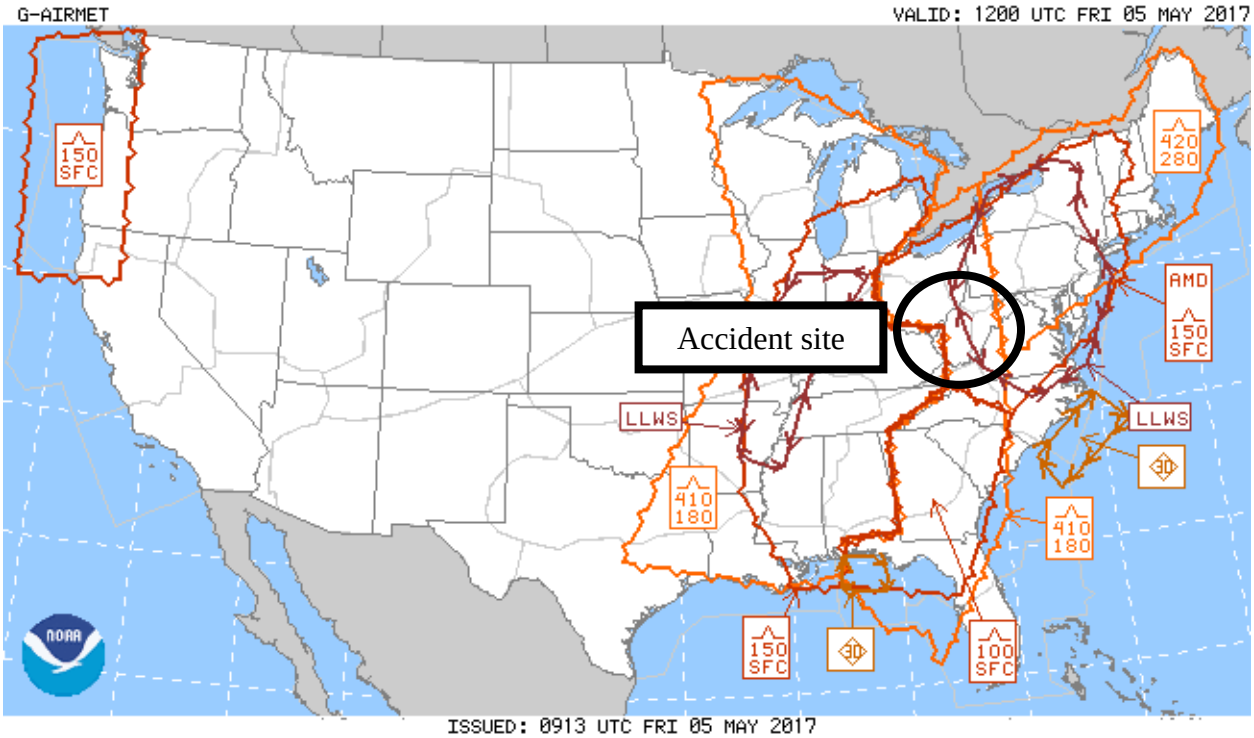



**Figure 14 – G-AIRMETs TANGO valid at 0800 EDT**

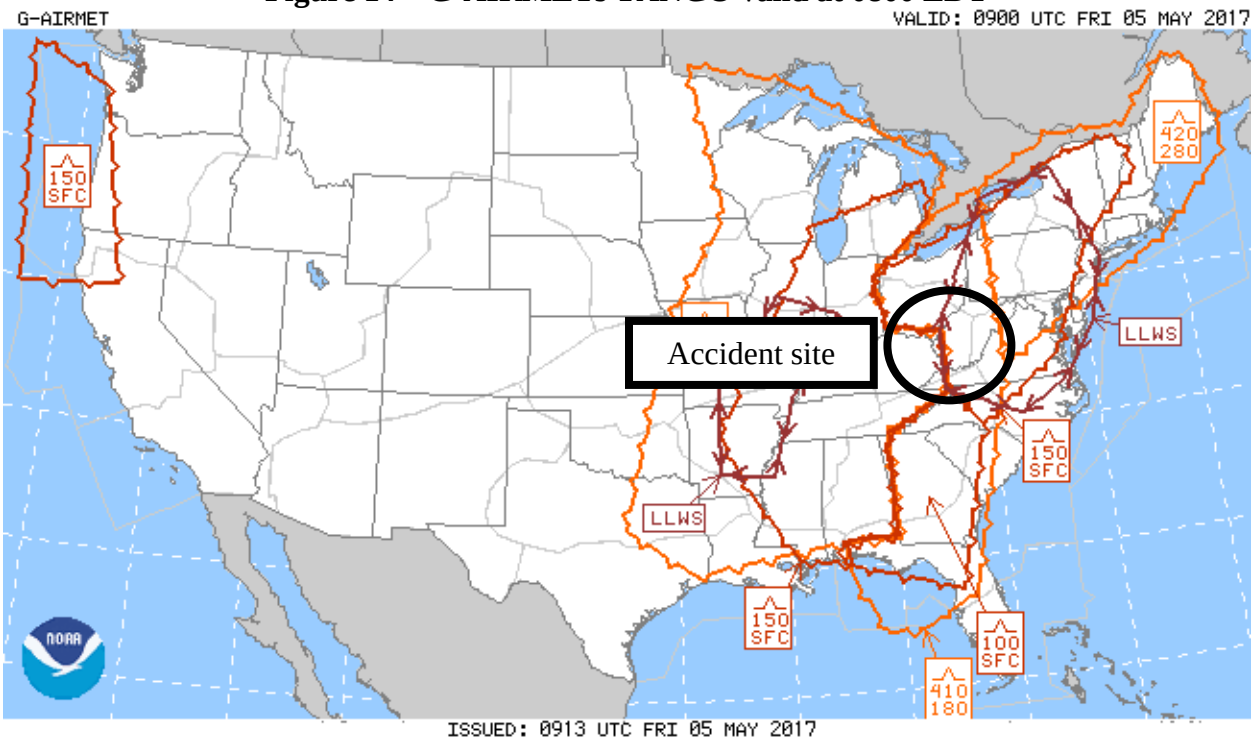



**Figure 15 – G-AIRMETs TANGO valid at 0500 EDT**

## 11.0 Area Forecast

The Area Forecast issued at 0445 EDT, valid at the accident time, forecasted an overcast ceiling at 3,000 ft msl with clouds tops at FL240, visibility between 3 and 5 miles, light rain, and mist:

037
FAUS41 KKCI 050845
FA1W
-BOSC FA 050845
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 060300
CLDS/WX VALID UNTIL 052100...OTLK VALID 052100-060300
ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA AND CSTL WTRS
.
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...SEE MIA FA.
.
ME NH VT
NW ME/E ME...OVC080-100 TOP FL200. ISOL -SHRA. BECMG 1820 OVC030.
-RA. OTLK...MVFR CIG RA...SRN PTNS IFR CIG RA BR.
SW ME/FAR SW NH...OVC080 TOP FL200. BECMG 1618 OVC010. VIS 3-5SM
-RA BR. OTLK...IFR CIG RA BR.
VT/N NH...OVC100 TOP FL200. ISOL -SHRA. BECMG 1518 OVC050. -RA.
WND SE G25KT. OTLK...MVFR CIG RA.
RMNDR S NH...OVC100 TOP FL200. BECMG 1417 OVC030. VIS 3-5SM -RA
BR. OTLK...IFR CIG RA BR.
.
MA RI CT
FAR NW MA...OVC100 TOP FL240. 14Z OVC030. VIS 3-5SM -RA BR.
OTLK...IFR CIG RA BR.
RMNDR W-CNTRL MA/CT/RI...OVC060 TOP FL240. -RA. BECMG 1214
OVC010. VIS 3-5SM -RA BR. OTLK...IFR CIG RA BR.
ELSW...OVC100 TOP FL240. 12Z OVC060 TOP FL240. -RA. 17Z OVC025.
VIS 3-5SM -RA BR. WND SE G25KT.  OTLK...IFR CIG RA BR.
.
NY LO
LONG ISLAND-FAR SE NY...BKN025 OVC040 TOP FL240. -RA. BECMG 1417
OVC010. VIS 3-5SM -RA BR. OTLK...IFR CIG RA BR.
RMNDR ERN NY...OVC100 TOP FL200. ISOL -SHRA. BECMG 1518 OVC050.
-RA. WND SE G25KT. OTLK...MVFR CIG RA.
S CNTRL-SW NY...OVC030-040 TOP FL240. VIS 3-5SM -RA BR. 19Z
OVC030 TOP 090. WDLY SCT -SHRA. OTLK...IFR CIG SHRA.
N CNTRL-NW NY/LO...OVC040 TOP FL240. -RA. BECMG 1215 OVC010-020.
VIS 3-5SM -RA BR. OTLK...IFR CIG RA BR.
.
PA NJ
S NJ-SE PA...BKN010 OVC100 TOP FL240. 12Z OVC010. SCT -SHRA. WDLY
SCT -TSRA. CB TOP FL330. 19Z OVC015 TOP 050. WDLY SCT -SHRA.
OTLK...MVFR CIG SHRA.
N NJ...BKN025 OVC040 TOP FL240. -RA. 14Z OVC010. VIS 3-5SM -RA
BR. ISOL -TSRA. CB TOP FL330. OTLK...IFR CIG SHRA.

NERN PA...BKN045 OVC060 TOP FL240. -RA. 14Z OVC030. VIS 3-5SM -RA
BR. ISOL -TSRA. CB TOP FL330. OTLK...IFR CIG SHRA.
CNTRL PA...OVC040 TOP FL240. VIS 3-5SM -RA BR. 17Z OVC040 TOP
090. OTLK...IFR CIG SHRA.
NW PA...OVC040 TOP FL240. VIS 3-5SM -RA BR. 18Z OVC040 TOP 090.
20Z BKN055. WDLY SCT -TSRA. CB TOP FL400. OTLK...MVFR CIG TSRA.
SW PA...OVC040 TOP FL240. VIS 3-5SM -RA BR. 16Z BKN065 TOP 090.
20Z BKN055. WDLY SCT -TSRA. CB TOP FL400. OTLK...MVFR CIG TSRA.
.
OH LE
NW OH...OVC010 TOP FL200. VIS 3-5SM -RA BR. WND NELY G25KT.
OTLK...IFR CIG SHRA WND.
SW OH...OVC020 TOP 140. -WDLY SCT -SHRA. 18Z OVC020 TOP 080.
OTLK...IFR CIG.
NERN OH/LE...OVC040 TOP FL240. VIS 3-5SM -RA BR. 18Z OVC040 TOP
090. 20Z BKN055. WDLY SCT -SHRA. ISOL -TSRA. CB TOP FL380.
OTLK...MVFR CIG TSRA.
SE OH...OVC050 TOP FL240. VIS 3-5SM -RA BR. 15Z BKN065 TOP 090.
20Z BKN055. WDLY SCT -TSRA. CB TOP FL380. OTLK...MVFR CIG SHRA.
.
**WV**
**NW HLF...OVC030 TOP FL240. VIS 3-5SM -RA BR. 13Z BKN065 TOP 090.**
**20Z BKN055. WDLY SCT -TSRA. CB TOP FL400. OTLK...MVFR CIG TSRA**.
NERN...OVC040 TOP FL240. VIS 3-5SM -RA BR. 13Z BKN065 TOP 090.
ISOL -SHRA. 19Z SCT-BKN065. OTLK...VFR SHRA.
SE...OVC040 TOP 090. VIS 3-5SM BR WDLY SCT -SHRA. 14Z BKN065.
ISOL -SHRA. OTLK...VFR SHRA.
.
MD DC DE VA
N HLF MTNS...OVC040 TOP FL240. VIS 3-5SM -RA BR. 13Z BKN065 TOP
090. ISOL -SHRA. 19Z SCT-BKN065. OTLK...VFR SHRA.
S HLF MTNS...OVC040 TOP 090. VIS 3-5SM BR WDLY SCT -SHRA. 14Z
BKN065. ISOL -SHRA. OTLK...VFR SHRA.
PIEDMONT...OVC010 TOP FL240. SCT -SHRA. WDLY SCT -TSRA. CB TOP
FL350. 14Z BKN025 TOP 090. WDLY SCT -SHRA. 19Z BKN035. ISOL
-SHRA. OTLK...VFR.
CSTL PLAINS...OVC010-020 TOP FL240. SCT -SHRA. 13Z SCT -TSRA. CB
TOP FL400. WND S G25KT. OTLK...MVFR CIG SHRA...22Z VFR SHRA.
.
CSTL WTRS
N HTO...SCT030 BKN100 TOP FL240. 18Z BKN010 OVC050. WDLY SCT
-SHRA. OTLK...MVFR CIG SHRA TSRA.
S HTO...BKN030 OVC100 TOP FL240. WDLY SCT -SHRA. WND E 25KT THRUT
PD. BECMG 1719 OVC010. SCT -TSRA. CB TOP FL420. OTLK...MVFR CIG
TSRA WND.
....

## 12.0 Terminal Aerodrome Forecast

KCRW was the closest site to the accident site with an NWS Terminal Aerodrome Forecast (TAF). The TAF issued before the time of the accident but valid beginning after the accident time was issued at 0636 EDT and was valid for a 19-hour period beginning at 0700 EDT. The 0636 EDT TAF for KCRW was as follows:

KCRW 051036Z 0511/0606 **08005KT 5SM -SHRA SCT005 OVC030**
TEMPO 0511/0512 BKN005 OVC010
FM051200 22007KT P6SM BKN050
FM052000 26005KT P6SM SHRA OVC040
FM060500 26006KT P6SM -SHRA OVC015=

Between 0700 and 0800 EDT, the 0636 EDT TAF expected a wind from 080° at 5 knots, 5 miles visibility, light rain showers, scattered clouds at 500 ft agl, and an overcast ceiling at 3,000 ft agl, with temporary conditions of a broken ceiling at 500 ft agl, and overcast skies at 1,000 ft agl.

The 0556 EDT KCRW TAF was valid at the time of the accident and was valid for a 20-hour period beginning at 0600 EDT. The 0556 EDT TAF for KCRW was as follows:

KCRW 050956Z 0510/0606 **08005KT 5SM -SHRA SCT005 OVC030**
**TEMPO 0510/0512 SCT005 BKN010**
FM051200 22007KT P6SM BKN050
FM052000 26005KT P6SM SHRA OVC040
FM060500 26006KT P6SM -SHRA OVC015=

Between 0600 and 0800 EDT, the 0556 EDT TAF expected a wind from 080° at 5 knots, 5 miles visibility, light rain showers, scattered clouds at 500 ft agl, and an overcast ceiling at 3,000 ft agl. Temporary conditions were forecast between 0600 and 0800 EDT of scattered clouds at 500 ft agl and a broken ceiling at 1,000 ft agl.

The 0440 EDT KCRW TAF was valid at the time of the accident and was valid for a 21-hour period beginning at 0500 EDT. The 0440 EDT TAF for KCRW was as follows:

TAF AMD KCRW 050840Z 0509/0606 **08005KT 4SM -SHRA SCT005 OVC035**
FM051200 22007KT P6SM BKN050
FM052000 26005KT P6SM SHRA OVC040
FM060500 26006KT P6SM -SHRA OVC015=

Between 0500 and 0800 EDT, the 0440 EDT TAF expected a wind from 080° at 5 knots, 4 miles visibility, light rain showers, scattered clouds at 500 ft agl, and an overcast ceiling at 3,500 ft agl.

## 13.0 NWS Area Forecast Discussion

The NWS Office in Charleston, West Virginia, issued the following Area Forecast Discussion (AFD) at 0520 EDT (closest AFD to the accident time with an aviation section). The aviation section of the AFD discussed IFR conditions near sunrise with some wind gusts along the ridgetops:

994
FXUS61 KRLX 050920
AFDRLX

Area Forecast Discussion
National Weather Service Charleston WV
520 AM EDT Fri May 5 2017

.SYNOPSIS...
An upper low brings unsettled and cooler weather through the weekend. Dry weather for early next week with dry northwesterly flow. Another wet system for mid week.

&&

.NEAR TERM /THROUGH TONIGHT/...

As of 520 AM Friday...
Made some minor adjustments to sky cover and PoP grids based on latest sat IR imagery and radar trends.

As of 350 AM Friday...

Mid level dry slot will across the forecast area this morning with some clearing of mid and high level clouds, along with diminished precipitation activity. Strong baroclinic zone in combination with dynamic lift expected to generate a band of moderate to heavy showers across the eastern mountains of West Virginia later today and into the overnight hours. Carried pops about as far west as the Ohio River with higher pops east of that line. Short term, hi-res models in fairly good agreement that categorical pops will carry well past sunset. After a short respite shower activity this morning, have adjusted pops upward for the overnight hours. For max/min temps, used general model blend with inherited forecasts.

&&

.SHORT TERM /SATURDAY THROUGH SUNDAY NIGHT/...
As of 400 AM Friday...

Moist and cool cyclonic circulation around an upper low, centered to our northeast, will continue to affect our weather through at least Saturday night. Look for cloudy and showery weather with below normal temperatures through Saturday night. The best chance for showers will be over northern and eastern WV, especially in the mountains where upslope northwesterly flow will aid the showers. Enough cold air aloft will even bring

some wet snow to the higher elevations of the northern mountains later Saturday night. Models are trending toward faster improvement from the west on Sunday as Canadian high pressure builds in behind the departing upper low, which will be ending showers in the mountains by Sunday afternoon and bring clearing in the west. Temperatures will be below normal this period, especially Sunday night under clear skies and light winds where temperatures will likely drop into the 30s. The potential for frost early Monday morning depends mainly on how light the winds will be, so too early to jump on this.

&&

.LONG TERM /MONDAY THROUGH THURSDAY/...
As of 400 AM Friday...

Models are not in the greatest agreement this period as our weather by the middle of next week will be determined by how the next in a series of upper lows develops over the Ohio Valley. In the meantime, Canadian high pressure will slowly slide east across the area through early next week with dry weather, and only a slow warming trend despite abundant sunshine. Model consensus as such has the next system approaching from the west by Thursday with wet weather returning and temperatures near normal.

&&

.AVIATION /09Z FRIDAY THROUGH TUESDAY/...

**As of 520 AM Friday...**

**Widespread precipitation moving north into the forecast area with generally MVFR conditions, becoming IFR toward sunrise. Along the WV-KY line, noted a clearing line, as surface front transitions to the north. Bringing some improvement to conditions from south to north as mid level dry slot moves across, in association with upper low tracking across the Mid Atlantic region.** May see some convective development after 18Z as daytime heating helps kick off cloud and showers, especially across elevated terrain.

**Southeast winds in tight gradients relax through this morning, with some gusts along the ridgetops. Will see return of wind gusts this afternoon as low continues to weaken, and a secondary surface low approaches, bringing another round of MVFR and IFR conditions.**

FORECAST CONFIDENCE AND ALTERNATE SCENARIOS THROUGH 06Z SATURDAY...

FORECAST CONFIDENCE: **Medium.**

ALTERNATE SCENARIOS: **Timing Cig and Visby values will vary, and IFR may become more widespread.**

EXPERIMENTAL TABLE OF FLIGHT CATEGORY

OBJECTIVELY SHOWS CONSISTENCY OF WFO FORECAST TO AVAILABLE MODEL
INFORMATION:
H = HIGH:  TAF CONSISTENT WITH ALL MODELS OR ALL BUT ONE MODEL.
M = MEDIUM: TAF HAS VARYING LEVEL OF CONSISTENCY WITH MODELS.
L = LOW:  TAF INCONSISTENT WITH ALL MODELS OR ALL BUT ONE MODEL.

DATE FRI 05/05/17
UTC 1HRLY 00 01 02 03 04 05 06 07 08 09 10 11
EDT 1HRLY 20 21 22 23 00 01 02 03 04 05 06 07
CRW CONSISTENCY H H H H H H H H H H L L
HTS CONSISTENCY H H H H H H H H L H H L
BKW CONSISTENCY H M M M M M M H H M M L
EKN CONSISTENCY H H H H H H H H H H H M
PKB CONSISTENCY H H H H H H H H H H H L
CKB CONSISTENCY H H H H H H H H H H M L

EXPERIMENTAL TABLE OF FLIGHT CATEGORY OBJECTIVELY SHOWS CONSISTENCY
OF WFO FORECAST TO AVAILABLE MODEL INFORMATION:
H = HIGH:  TAF CONSISTENT WITH ALL MODELS OR ALL BUT ONE MODEL.
M = MEDIUM: TAF HAS VARYING LEVEL OF CONSISTENCY WITH MODELS.
L = LOW:  TAF INCONSISTENT WITH ALL MODELS OR ALL BUT ONE MODEL.

DATE FRI 05/05/17
UTC 1HRLY 09 10 11 12 13 14 15 16 17 18 19 20
EDT 1HRLY 05 06 07 08 09 10 11 12 13 14 15 16
CRW CONSISTENCY H H H H H H H H H H H M
HTS CONSISTENCY M M L H H M M M H H H L
BKW CONSISTENCY H H M H H H H H H H H L
EKN CONSISTENCY H H H H H H H H H H H M
PKB CONSISTENCY H H L M M L L L L H H L
CKB CONSISTENCY H L M M H H H H H H H M

AFTER 06Z SATURDAY...
No widespread IFR conditions expected.

&&

.RLX WATCHES/WARNINGS/ADVISORIES...
WV...None.
OH...None.
KY...None.
VA...None.

&&

$$

## 14.0 Winds and Temperature Aloft Forecast

The NWS 0401 EDT Winds and Temperature Aloft forecast valid for the closest point to the accident site is included below:

```
671
FBUS31 KWNO 050801
FD1US1
```

```
DATA BASED ON 050600Z
VALID 051200Z   FOR USE 0800-1500Z. TEMPS NEG ABV 24000

FT  3000    6000    9000   12000   18000   24000  30000  34000  39000

CRW 2317 2224+09 2127+03 1933-04 1864-14 1878-25 188739 189347 189257
```

The accident site was closest to the CRW forecast point. The 0401 EDT CRW forecast indicated a wind at 3,000 ft. from 230° at 17 knots, a wind at 6,000 ft from 220° at 24 knots with a temperature of 9° C, and a wind at 9,000 ft from 210° at 27 knots with a temperature of 3° C.

## 15.0 Pilot Weather Briefing

A search of official weather briefing sources such as Leidos weather briefings and Direct User Access Terminal Service (DUATS) was done. The accident pilot did not receive an official DUATS weather briefing, or Leidos weather briefings, but an automated partial flight plan was made through Leidos (attachment 2). A search of archived data from ForeFlight was done and no weather information was received by the accident pilot from ForeFlight (attachment 3). For more information about the accident company's preflight procedures, dispatch information, and flight operations manual please see the Operational Factors/Human Performance Factual Report located in the docket of this accident.

At the accident scene an iPad Mini was located and several weather websites had been visited in the internet browser history.[20] One of the bookmarked internet browser link was, "AWC – ADDS TAFs", at address: http://www.aviationweather.gov/taf. One of the internet tabs open on the iPad Mini was the "AWC – ADDS TAFs" webpage, with the website opened at 2049:38 EDT on May 4.[21] This internet tab link from 2049:38 EDT on May 4 opened a website that provided the most updated TAFs and METARs for KCRW and Louisville International Airport, Kentucky (KSDF).[22] The internet browser history indicated that the last weather selected on the iPad Mini was the "AWC – ADDS TAFs" website that had been selected at 2050:18 and 2050:24 EDT on May 4 for KCRW and KSDF selected; the 2050:18 EDT address selected only TAFs, the 2050:24 EDT address selected TAFs and METARs.[23]

[20] For more information, please see the Personal Electronic Devices Factual Report located docket for this investigation.
[21] For more information, please see Table 2 in the Personal Electronic Devices Factual Report located docket for this investigation.
[22] For more information, please see Table 2 in the Personal Electronic Devices Factual Report located docket for this investigation. The website addresses requested the decoded or plain english version of the TAFs and METARs.
[23] For more information, please see Table 1 in the Personal Electronic Devices Factual Report located docket for this investigation. The website addresses requested the decoded or plain english verion of the TAFs and METARs.

## 16.0 Witness Information

The captain of a flight departing a few minutes before the accident time indicated the cloud bases at 1,000 ft agl with a broken ceiling (attachments 4 and 5). The first officer of the same flight (that departed a few minutes before the accident time) described the cloud deck as being at 700 to 800 ft agl (attachments 4 and 5). A Video Study completed by the NTSB indicated that the estimated cloud ceiling was 683 ft agl.[24]

## 17.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for the accident site on May 5, 2017, indicated the following:

| **SUN** | |
|---|---|
| Begin civil twilight | 0556 EDT |
| Sunrise | 0625 EDT |
| Sun transit | 1323 EDT |
| Sunset | 2022 EDT |
| End civil twilight | 2051 EDT |

## E. LIST OF ATTACHMENTS

Attachment 1 – KCRW ASOS 5- and 1-minute weather observation data

Attachment 2 – Leidos correspondence

Attachment 3 – ForeFlight correspondence

Attachment 4 – Correspondence with the captain of a flight taking off a few minutes before accident time

Attachment 5 – Correspondence with the first officer of a flight taking off a few minutes before accident time

Submitted by:

_____

Paul Suffern
Senior Meteorologist

[24] For more information, including the Video Study, please see the docket for this investigation.

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