NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

November 4, 2019

Weather Study

METEOROLOGY

CEN19FA185

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A. ACCIDENT

Location: Brainerd, Minnesota
Date: June 28, 2019
Time: 0040 central daylight time (0540 UTC[1])
Airplane: Type: Agusta A-109S; Registration: N11NM

B. METEOROLOGIST

Mike Richards
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's meteorological specialist travelled in support of this accident investigation and also gathered weather data remotely. Unless otherwise noted, all times are in central daylight time (CDT) for June 28, 2019 (based upon the 24-hour clock), directions are referenced to true north, distances are in nautical miles and heights are above mean sea level (msl).

Coordinates used for the accident location: 46.403333° north latitude, 94.128333° west longitude, at an elevation of about 1,220 feet.

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Surface Observing System (ASOS) was located at Brainerd Lakes Regional Airport (BRD[2]) in Brainerd, Minnesota, which was the site of the accident. Publicly-disseminated automated reports from BRD during the times surrounding the accident time are presented here. The ASOS reports haze (HZ) if the visibility is less than seven statute miles, no precipitation is reported and the dew point depression is greater than 4° Fahrenheit.

[1] UTC – abbreviation for Coordinated Universal Time
[2] The National Weather Service uses the 4-digit International Civil Aviation Organization (ICAO) format for station identifiers (as seen in the body of some formatted weather observations). This report uses the 3-digit International Air Transport Association format for station identification, which does not use the geographic designating digit ("K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the ICAO format.

[2330 CDT] SPECI KBRD 280430Z AUTO 05004KT 1SM HZ CLR 19/16 A3008 RMK AO2 T01940161=

[2353 CDT] METAR KBRD 280453Z AUTO 03003KT 1 1/2SM HZ CLR 19/17 A3008 RMK AO2 SLP183 T01940167=

[2358 CDT] SPECI KBRD 280458Z AUTO 03003KT 1 3/4SM HZ FEW002 19/17 A3008 RMK AO2 T01940167=

[0000 CDT] SPECI KBRD 280500Z AUTO 03003KT 1SM HZ VV002 19/17 A3008 RMK AO2 T01940167=

[0010 CDT] SPECI KBRD 280510Z AUTO 03003KT 2SM HZ BKN002 19/16 A3008 RMK AO2 VIS 1V5 T01890161=

[0013 CDT] SPECI KBRD 280513Z AUTO 04003KT 1SM HZ BKN002 19/16 A3008 RMK AO2 VIS 1/4V5 T01890161=

[0018 CDT] SPECI KBRD 280518Z AUTO 05004KT 1/4SM HZ BKN002 19/16 A3008 RMK AO2 T01890161=

[0053 CDT] METAR KBRD 280553Z AUTO 04003KT 1/4SM HZ VV002 19/17 A3007 RMK AO2 SLP181 60000 T01940167 10233 20178 402440178 50000=

[0142 CDT] SPECI KBRD 280642Z AUTO 05005KT 1/2SM HZ VV002 20/17 A3008 RMK AO2 T02000172=

At 0018 CDT, BRD reported a wind from 050° at 4 knots, visibility of 1/4 statute mile, haze, ceiling broken at 200 feet above ground level (agl), temperature of 19° Celsius (C) and a dew point temperature of 16°C, altimeter setting of 30.08 inches of mercury; remarks: station with a precipitation discriminator, temperature of 18.9°C and dew point temperature of 16.1°C.

At 0053 CDT, BRD reported a wind from 040° at 3 knots, visibility of 1/4 statute mile, haze, vertical visibility of 200 feet agl, temperature of 19°C and a dew point temperature of 17°C, altimeter setting of 30.07 inches of mercury; remarks included: station with a precipitation discriminator, hectopascals, temperature of 19.4°C and dew point temperature of 16.7°C.

Five-minute observations from the BRD ASOS for times surrounding the accident time are presented here:

[0030 CDT] 5-MIN KBRD 280530Z AUTO 04005KT 1/2SM HZ OVC002 19/16 A3008 1090 81 1900 040/05 RMK AO2 T01940161

[0035 CDT] 5-MIN KBRD 280535Z AUTO 04004KT 1/4SM HZ VV002 19/17 A3008 1090 84 1900 040/04 RMK AO2 T01940167

[0040 CDT] 5-MIN KBRD 280540Z AUTO 04005KT 1/4SM HZ VV002 19/17 A3007 1090 84 1900 040/05 RMK AO2 T01940167

[0045 CDT] 5-MIN KBRD 280545Z AUTO 04004KT 1/4SM HZ VV002 19/17 A3007 1090 84 1900 040/04 RMK AO2 T01940167

At 0040 CDT, KBRD calculated[3] a wind from 040° at 5 knots, visibility of 1/4 statute mile, haze, vertical visibility of 200 feet agl, temperature of 19°C and a dew point temperature of 17°C, altimeter setting of 30.07 inches of mercury pressure altitude of 1,090 feet, relative humidity of 84 percent, density altitude of 1,900 feet, magnetic wind direction of 040° with wind magnitude of 5 knots; remarks: station with a precipitation discriminator, temperature of 19.4°C and dew point temperature of 16.7°C.

2.0 Satellite Imagery

Figure 1 presents a "RGB nighttime microphysics" GOES-16 band combination product for 0041 CDT obtained from the College of DuPage. This product assists in identifying cloud level and type at night. Figure 2 presents a guide on interpretating these types of images. Figure 1 reveals fog and/or very low warm cloud in the accident region.

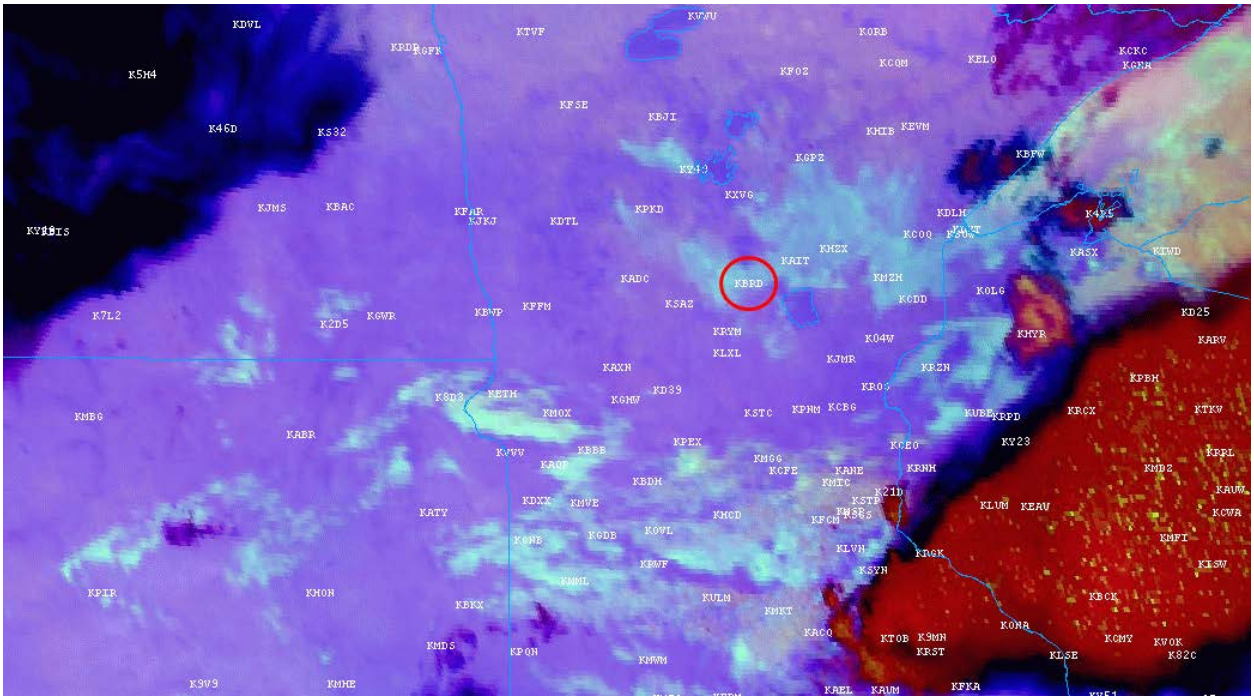

Figure 1 – GOES-16 RGB nighttime microphysics image from 0041 CDT. Accident location denoted by red circle. This image has not been corrected for any parallax error.

[3] Five-minute observations are not "reported" publicly in real-time.

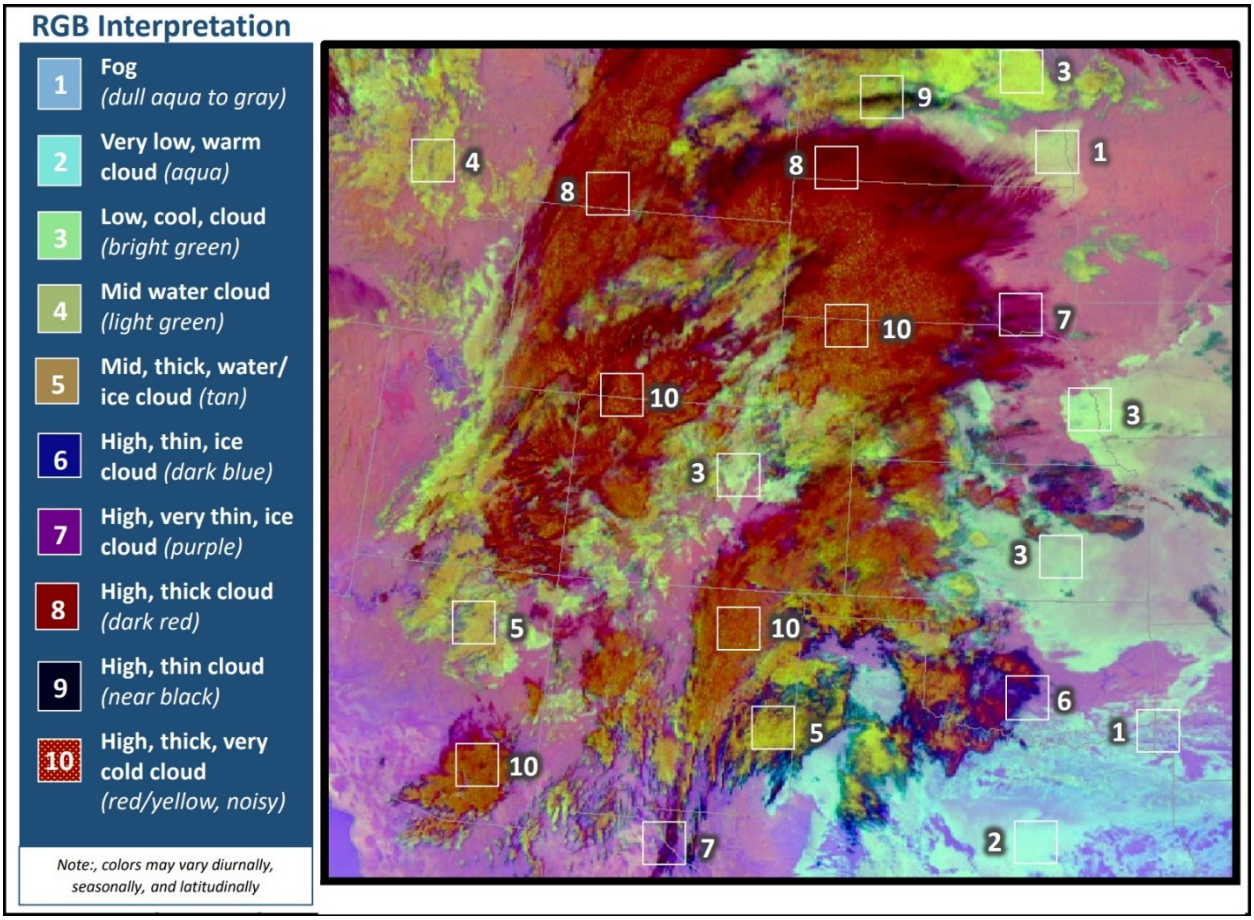

Figure 2 – Interpretation aid for the GOES-16 RGB nighttime microphysics image found in Figure 1. Taken from *http://rammb.cira.colostate.edu/training/visit/quick_guides/QuickGuide_GOESR_NtMicroRGB_final.pdf.*

3.0 Weather Radar

Review of WSR-88D[4] Level-II weather radar imagery from the times surrounding the accident time did not reveal any pertinent areas of reflectivity.

4.0 Pilot Reports

There were no publicly-disseminated pilot reports[5] made within 100 miles of the accident location within two hours of the accident time below 10,000 feet.

[4] Weather Surveillance Radar 88 Doppler (WSR-88D)
[5] Pilot reports publicly-disseminated only over radio were not captured.

5.0 Terminal Aerodrome Forecasts

Terminal Aerodrome Forecasts (TAF) were issued for BRD by the National Weather Service (NWS) Weather Forecast Office (WFO) in Duluth, Minnesota. Presented here is the most recent BRD TAF issued prior to the accident time with a valid forecast period that included the accident time.

At 2304 CDT on June 27, 2019, a TAF was issued for BRD that forecasted for the accident time: wind from 020° at 4 knots, visibility of one and one-half statute miles, haze and sky clear.

TAF KBRD 280405Z 2804/2824 **02004KT 1 1/2SM HZ SKC**
FM280900 00000KT P6SM SCT027 BKN045
FM281400 VRB04KT P6SM SCT060=

6.0 Area Forecast Discussion

Area Forecast Discussions (AFD) were issued by the NWS WFO in Duluth, Minnesota. Presented here are the "Aviation" sections of the AFDs issued at 2329 CDT on June 27, 2019, and 0028 CDT on the day of the accident.

FXUS63 KDLH 280429
AFDDLH
Area Forecast Discussion
National Weather Service Duluth MN
1129 PM CDT Thu Jun 27 2019

.AVIATION...(For the 00Z TAFS through 00Z Friday evening)
Issued at 647 PM CDT Thu Jun 27 2019

An easterly flow off of Lake Superior has led to some IFR cigs to move into the DLH area, along with some showers still in the vicinity. The cigs are expected to improve back to VFR by 02Z. Elsewhere, VFR cigs were found, even as an MCV continues to move through the area. The MCV was responsible for the showers nearby. Later this evening, expect BR to develop, with some FG at HIB as cigs/vsbys drop into the VLIFR/IFR range. The BR/FG should quickly erode after sunrise, at all locations, then back to VFR.

FXUS63 KDLH 280528
AFDDLH
Area Forecast Discussion
National Weather Service Duluth MN
1228 AM CDT Fri Jun 28 2019

.AVIATION...(For the 06Z TAFS through 06Z Friday night)
Issued at 1228 AM CDT Fri Jun 28 2019

A shortwave was moving through northwest Wisconsin late this evening and may still cause some showers or a thunderstorm there for a couple more hours. Most other areas will see clear to partly cloudy skies with areas of fog. The fog will be dense in spots with the visibility of a quarter to half mile at times. We expect the fog to lift around or shortly after 13Z for most areas. VFR conditions are then expected.

7.0 AIRMETs

An Airmen's Meteorological Information (AIRMET) advisory for instrument flight rule (IFR)[6] conditions was active for the accident site at the accident time.

WAUS43 KKCI 280245
WA3S
-CHIS WA 280245
AIRMET SIERRA FOR IFR VALID UNTIL 280900
.
AIRMET IFR...ND SD MN WI LS
FROM 40NNW DLH TO 60W RHI TO 30SW EAU TO 40SE RWF TO 80S ABR TO 40NW ABR TO 50SSW BJI TO 40NNW DLH
CIG BLW 010/VIS BLW 3SM BR. CONDS DVLPG 06-09Z. CONDS CONTG BYD 09Z ENDG 12-15Z.

8.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) are intended to provide the necessary aviation weather information to give users a complete picture of the weather that might impact flight in the continental United States. Hourly model data and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS are available, however only certain imagery are archived by the NWS.

The following images (figures 3 and 4) depict GFA forecast information on sky condition, icing, mountain obscuration, IFR conditions and surface wind AIRMET advisories, surface visibility, surface wind, precipitation, and other obscurations and hazards, valid for the times surrounding the accident.

[6] IFR conditions - Ceilings less than 1,000 feet agl and/or visibility less than three statute miles.

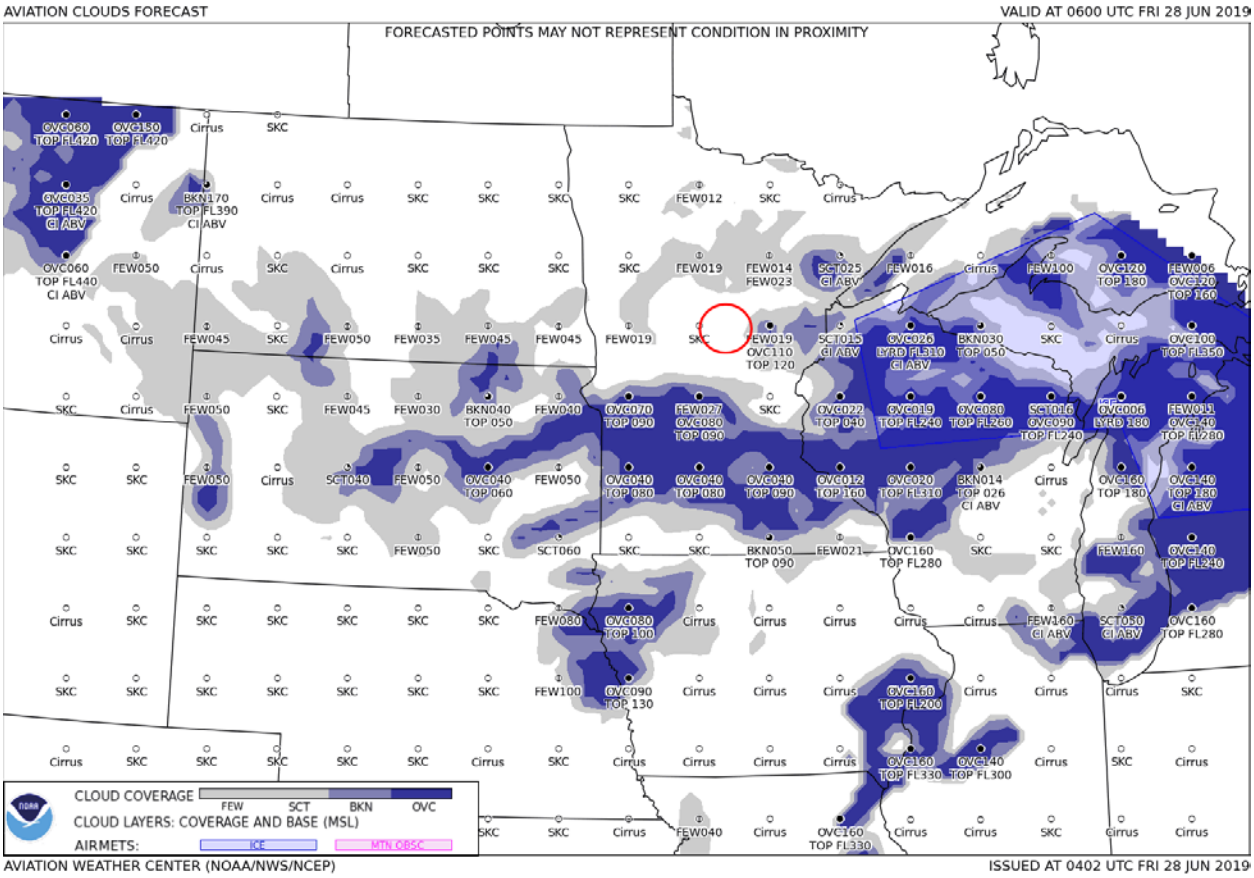

Figure 3 – GFA forecast imagery depicting sky condition and icing and mountain obscuration AIRMETs. Issued about 2300 CDT on June 27, 2019, and valid for 0100 CDT on the accident day. This GFA forecast imagery depicted clear sky conditions over the accident area. The accident location is located within the red circle.

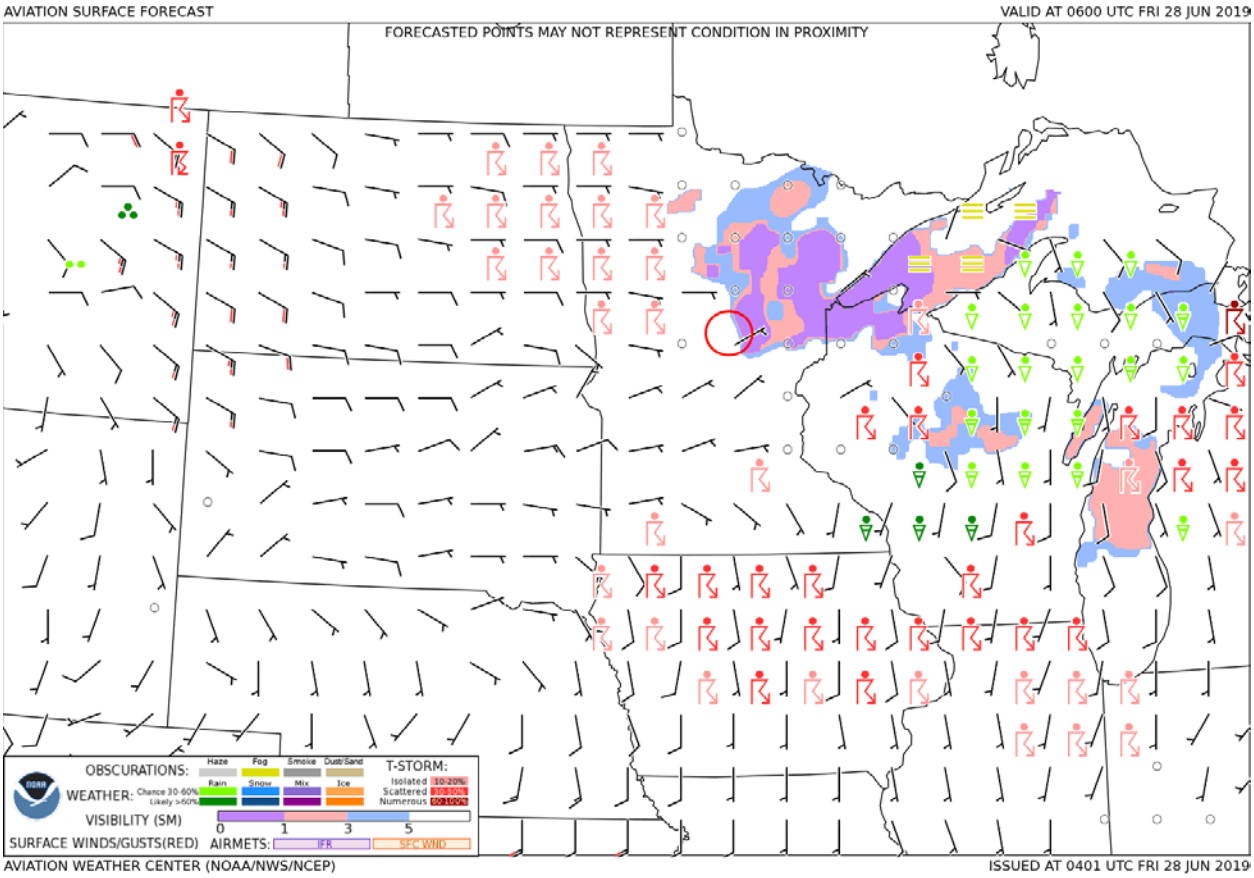

Figure 4 – GFA forecast imagery depicting IFR conditions and surface wind AIRMETs, surface visibility, surface wind, precipitation, and other obscurations and hazards. Issued about 2300 CDT on June 27, 2019, and valid for 0100 CDT on the accident day. This GFA forecast imagery depicted surface visibilities from between zero and one statute miles to greater than five statute miles in the area of the accident with a nearby east-northeast wind of 5 knots. The accident location is located within the red circle.

9.0 SIGMETs

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

10.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statement issued by the Center Weather Service Unit (CWSU) at the Minneapolis Air Route Traffic Control Center that were active for the accident location at the accident time.

Submitted by:

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Mike Richards
Senior Meteorologist

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