



National Transportation Safety Board

Office of Aviation Safety
Washington, D.C. 20594-2000

September 2, 2015

WEATHER STUDY
WPR15FA247

A. Accident

Location: Helena, Montana

Date: August 19, 2015

Time: estimated 2230 mountain daylight time (0430 UTC¹ on August 20, 2015)

Aircraft: Cessna 172; N62731

B. Meteorological Specialist

Mike Richards

Senior Meteorologist

National Transportation Safety Board

Operational Factors Division, AS-30

Washington, DC 20594-2000

C. Details of the Investigation

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in mountain daylight time (MDT) for August 19, 2015 (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 locations: 46.655278° North latitude, 111.558611° West longitude, elevation of approximately 4,800 feet.

¹ UTC – abbreviation for Coordinated Universal Time

Synoptic Conditions

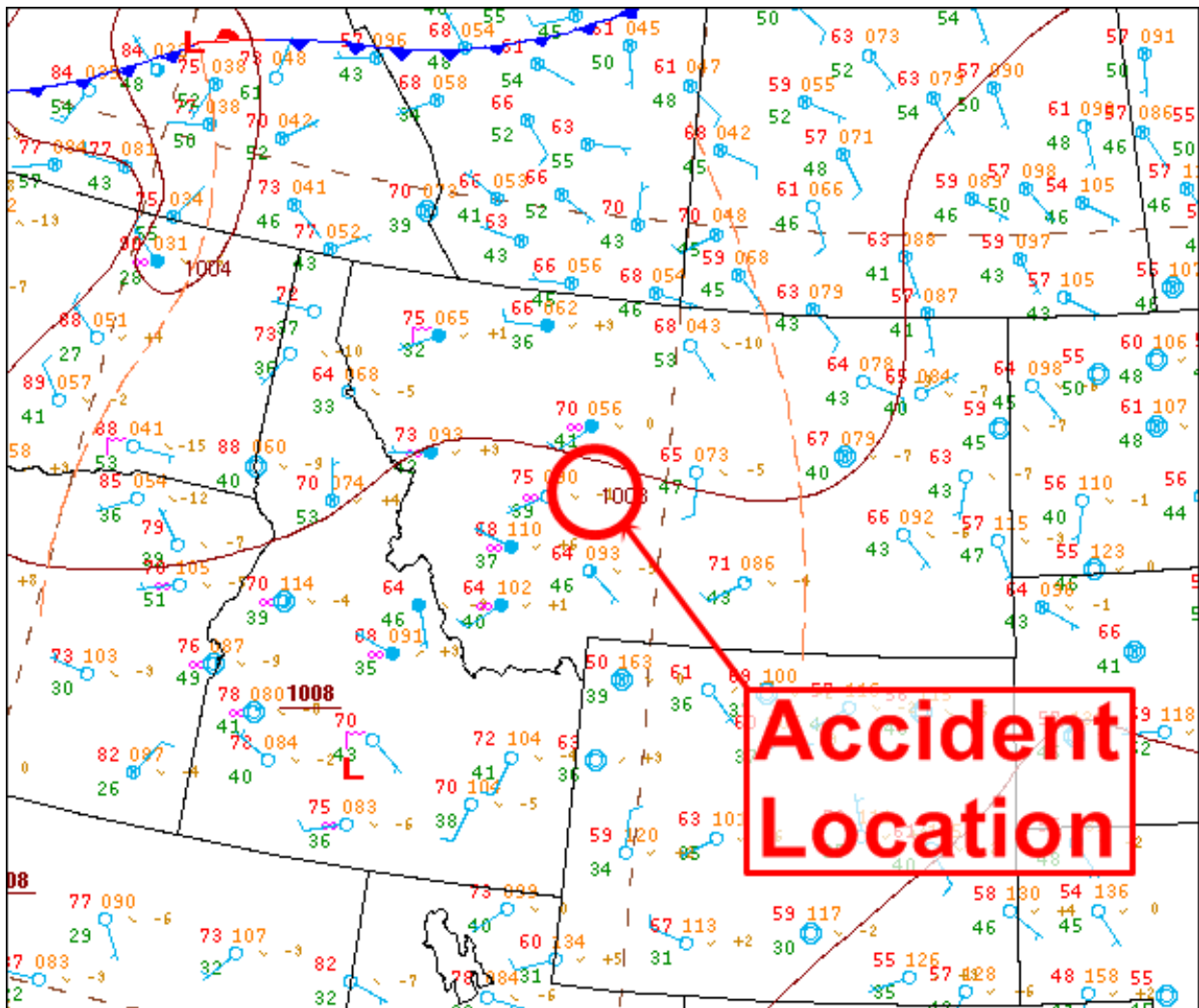


Figure 1 – NWS Surface Analysis Chart for 2100 MDT.

Surface Observations

An Automated Surface Observing Station (ASOS) was located at Helena Regional Airport (HLN) in Helena, Montana, which was located about 18 miles west-southwest of the accident location at an elevation of 3,877 feet. Weather observer-augmented reports from HLN during the times surrounding the accident time are presented here:

[1953 MDT] METAR KHLN 200153Z 27006KT 4SM HZ FEW043 26/04 A2982 RMK AO2 SLP086 T02560044=

[2053 MDT] METAR KHLN 200253Z 24004KT 5SM HZ FEW055 24/04 A2983 RMK AO2 SLP090 T02390039 55001=

[2153 MDT] METAR KHLN 200353Z 25005KT 5SM HZ OVC048 22/04 A2986 RMK AO2 SLP099 T02220044=

[2253 MDT] METAR KHLN 200453Z 25007KT 4SM HZ OVC041 22/05 A2986
RMK AO2 SLP098 T02220050=

[2353 MDT] METAR KHLN 200553Z 28006KT 4SM HZ OVC041 21/05 A2987 RMK
AO2 SLP097 T02060050 10278 20200 51012=

At 2253 MDT, HLN reported a wind from 250° at 7 knots, visibility of 4 statute miles, haze, ceiling overcast at 4,100 feet above ground level (agl), temperature of 22° Celsius (C) and a dew point temperature of 5°C, altimeter setting of 29.86 inches of mercury; remarks included: station with a precipitation discriminator.

Weather Radar

WSR-88D Level-II weather radar imagery from Great Falls, Montana (KTFX), is presented in figure 2. KTFX was located approximately 49 miles north of the accident site at an elevation of about 3,715 feet. Assuming standard refraction and considering the 0.95° beam width for the WSR-88D radar beam, the KTFX 0.867° tilt would have “seen” altitudes between about 7,300 and 12,300 feet above msl at the accident location.

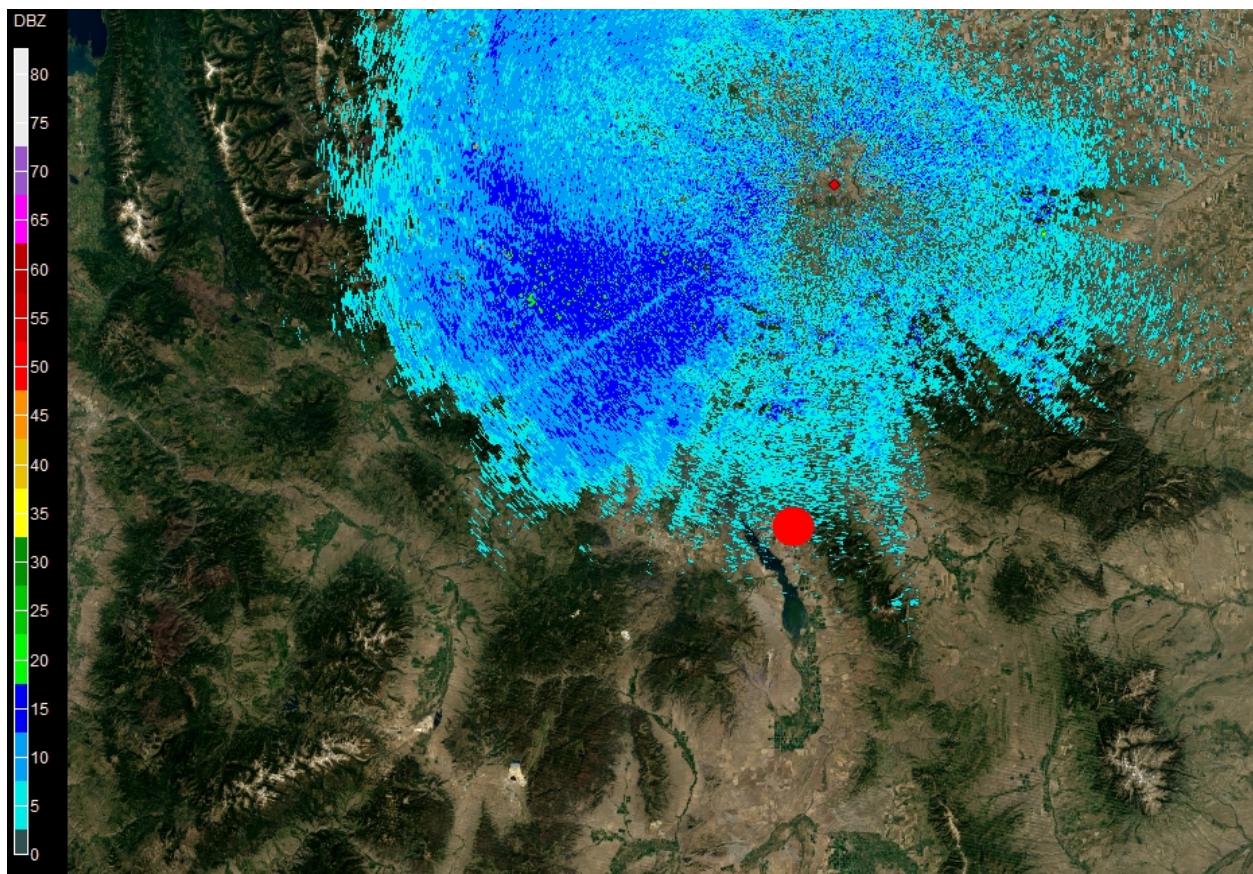


Figure 2 – KTFX 0.867° Level-II reflectivity product from 2229 MDT. Accident location denoted by red dot.

Upper Air Sounding

A North American Mesoscale (NAM) model sounding (figure 3) for the accident location at 2100 MDT was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory. Near-surface wind was from the west at about 5 knots. Above this level the wind increased in magnitude to about 20 knots at 7,500 feet, but remained generally westerly through about 11,000 feet. Calculations made by the Rawinsonde Observation Program (RAOB) did not identify significant turbulence in this atmosphere.

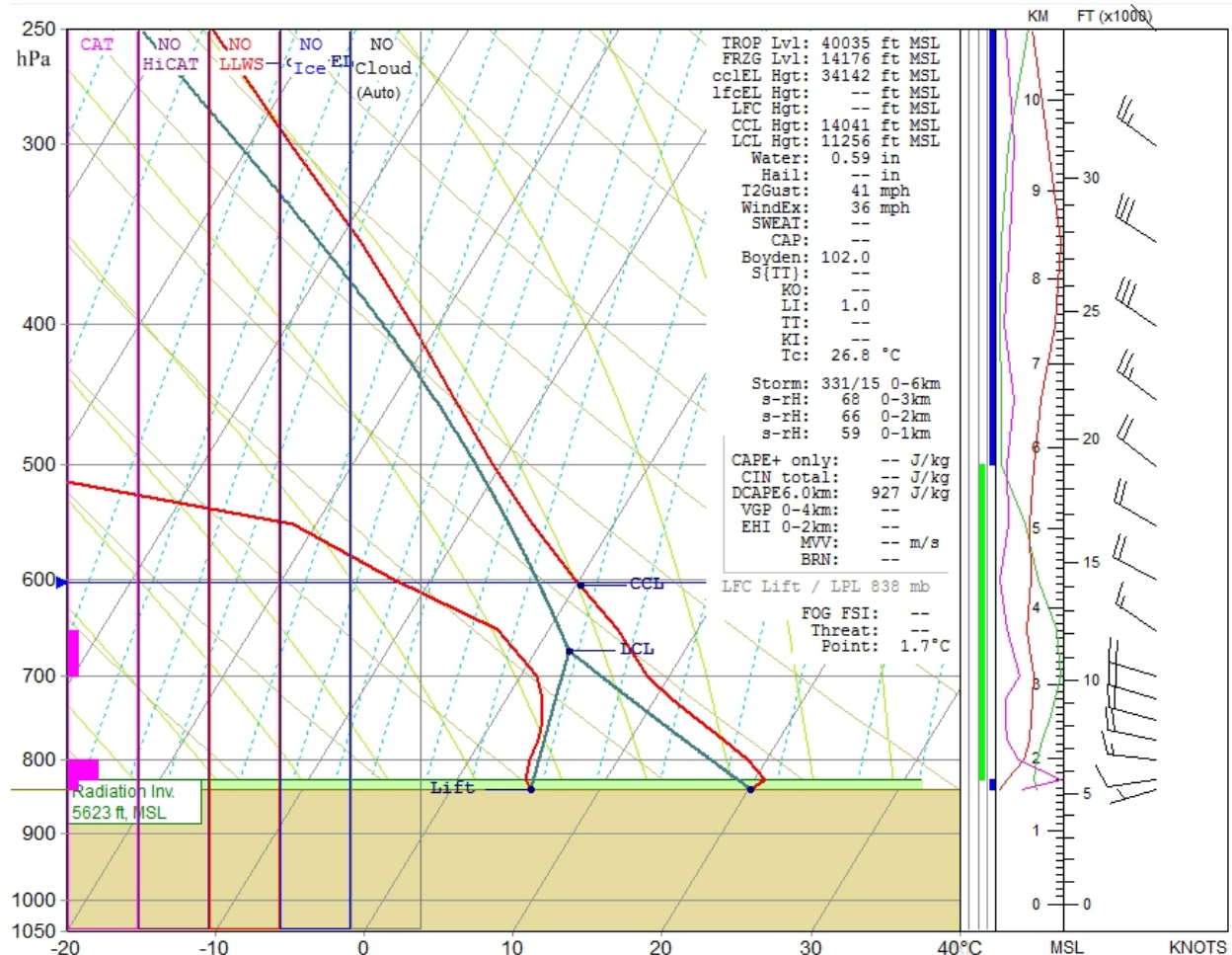


Figure 3 – NAM model sounding data in SkewT/LogP format for 2100 MDT, surface to 250 hPa.

Pilot Reports

There were no publicly disseminated pilot reports² made within two hours of the accident time over the state of Montana.

² Only pilot reports with the WMO header UBMT** were considered.

Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-15 infrared (10.7 μm) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from 2230 MDT is presented in figure 4. The GOES-15 infrared brightness temperatures varied between approximately 15°C and 11°C in the vicinity of the accident site. 10.8 μm infrared imagery from the Advanced Very High Resolution Radiometer (AVHRR) instrument onboard the MetOP-B satellite at 2230 MDT is presented in figure 5. The AVHRR brightness temperatures varied between approximately 16°C and 11°C in the vicinity of the accident site.

“True color” imagery from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument onboard the TERRA satellite for 1215 MDT on the day of the accident, as well as for 1300 MDT on August 20, 2015, are presented in figures 6 and 7, respectively. These MODIS images show smoke cloud from burning biomass over the accident region during these times.

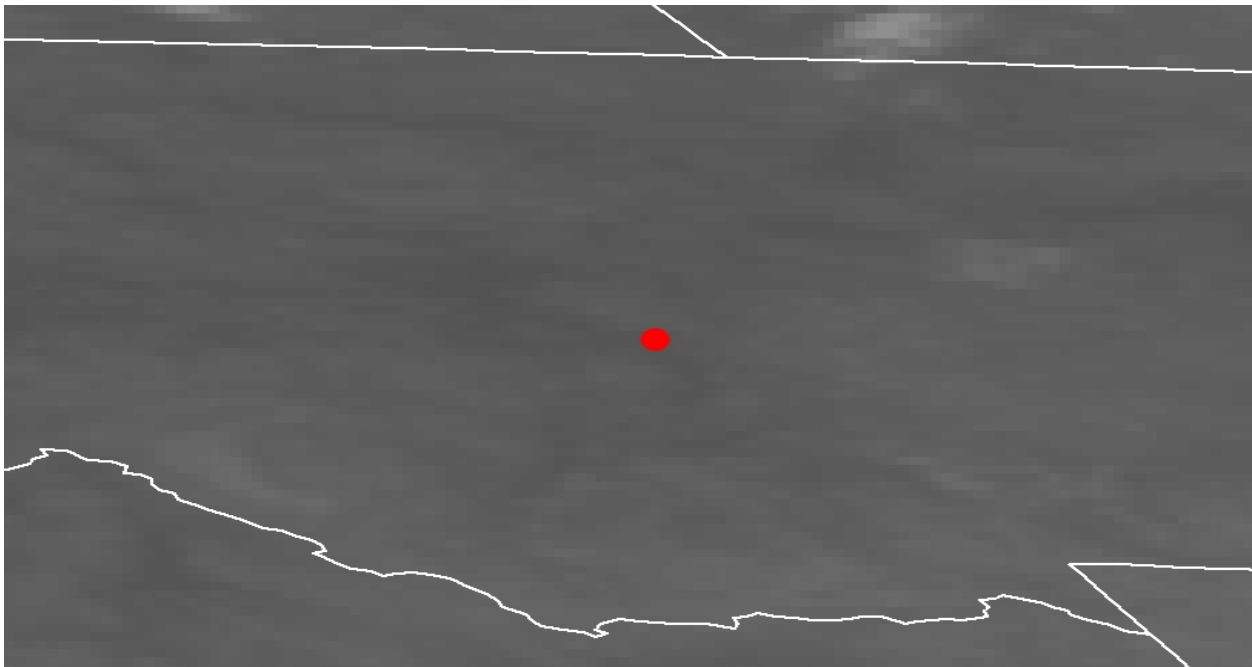


Figure 4 – GOES-15 10.7 μm (infrared) imagery from 2230 MDT.

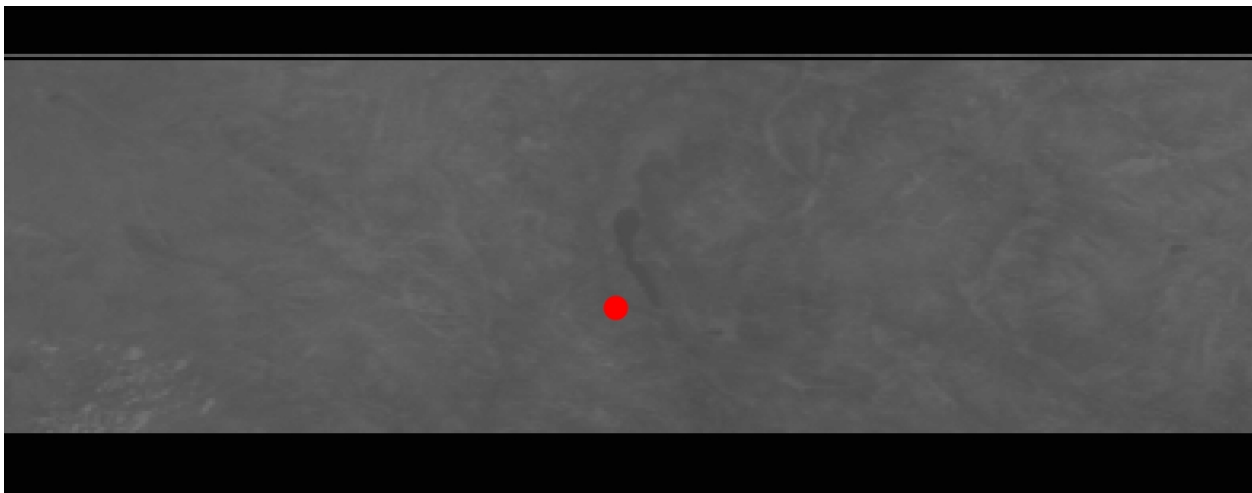


Figure 5 – AVHRR 10.8 μm imagery from 2230 MDT. Red dot denotes accident location.

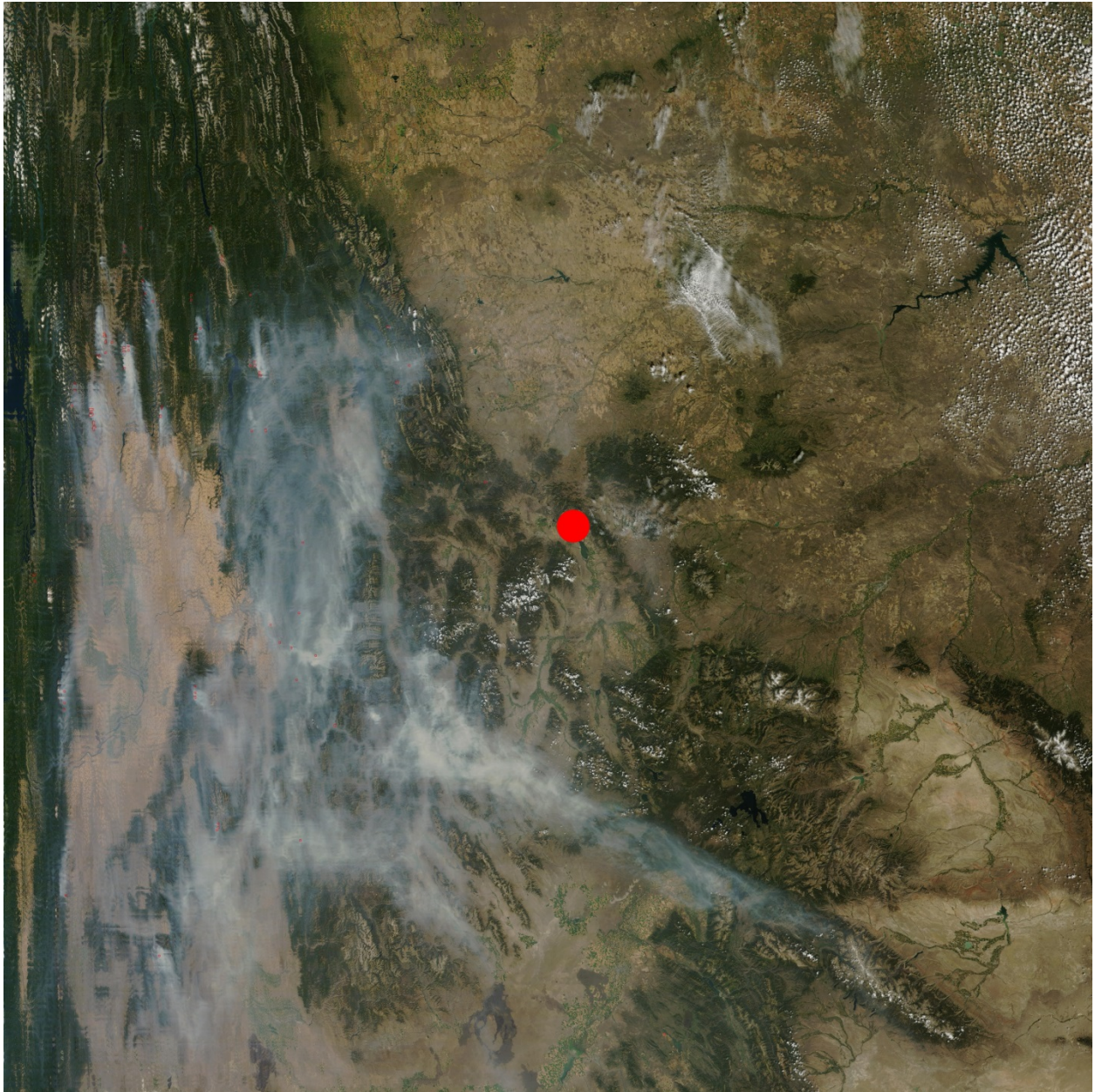


Figure 6 – MODIS “true color” imagery from 1215 MDT. Red dot denotes accident location.

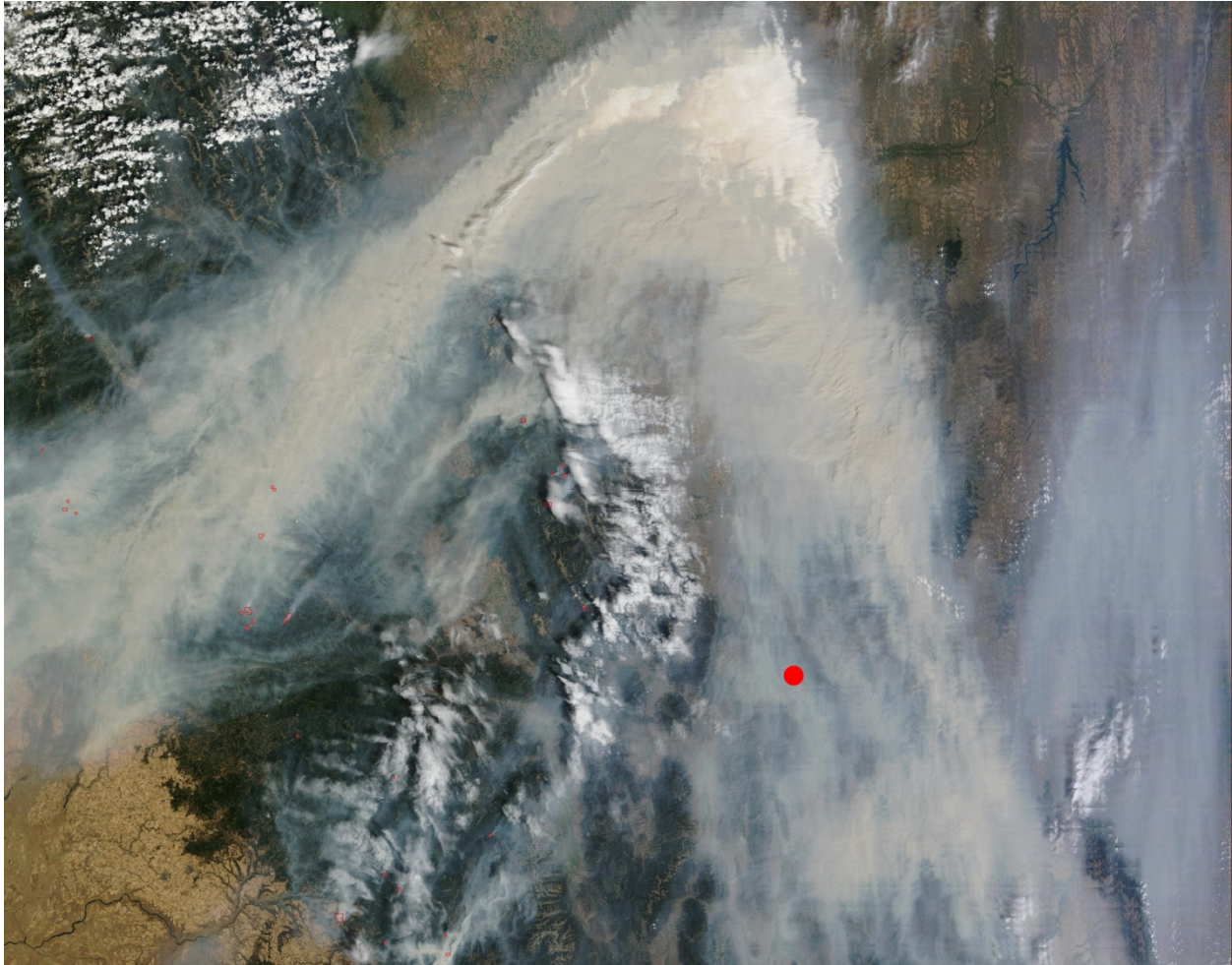


Figure 7 – MODIS “true color” imagery from 1300 MDT on August 20, 2015. Red dot denotes accident location.

Smoke Text Product

A Smoke Text Product was issued by the NOAA on August 19, 2015. Only the portion of the product directed toward smoke in the western US/southwest Canada is included here. The product was distributed with the following disclaimers: 1) *This text product is primarily intended to describe significant areas of smoke associated with active fires and smoke which has become detached from the fires and drifted some distance away from the source fire...typically over the course of one or more days*, and 2) *Unless otherwise indicated: Areas of smoke are analyzed using GOES-EAST and GOES-WEST Visible satellite imagery. Only a general description of areas of smoke or significant smoke plumes will be analyzed. A quantitative assessment of the density/amount of particulate or the vertical distribution is not included. Widespread cloudiness may prevent the detection of smoke even from significant fires.*

Smoke Text Product - Satellite Services Division Wednesday, August 19, 2015
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN
SATELLITE IMAGERY THROUGH 0200Z August 20, 2015
SMOKE:
Western US/SW Canada:

Large areas of smoke ranging from light to heavy density are visible over a majority of the western US as well as southwest Canada. The heaviest smoke is visible over parts of Oregon, Washington, Idaho, and Montana this evening. Moderate density smoke is observed farther east into central Montana and central Wyoming, Light density smoke extends to the Dakotas and across most of Colorado. Additionally, a ribbon of smoke is seen dipping down from Saskatchewan/Manitoba covering all of North Dakota and South Dakota, as well as Nebraska. This smoke is residual from Canadian wildfires.

Terminal Aerodrome Forecasts

A Terminal Aerodrome Forecasts (TAF) was issued for HLN at 1908 MDT. The TAF forecasted for the accident time: a wind from 270° at 6 knots, visibility of 4 statute miles, haze, scattered clouds at 4,000 feet agl.

TAF AMD KHLN 200108Z **2001/2024 27006KT 4SM HZ SCT040**
TEMPO 2001/2003 2SM HZ SCT020 BKN035
FM201900 29011G21KT 6SM HZ SKC=

Area Forecast

An Area Forecast that included the southwestern mountains of Montana was issued at 2045 MDT by the Aviation Weather Center in Kansas City, Missouri. Cloud heights are above msl. The Area Forecast forecasted for the southwestern mountains of Montana for the accident time: smoke layer broken at 8,000 feet and layered up to 13,000 feet, occasional visibility of 3 to 5 statute miles in smoke and haze.

FAUS45 KPCI 200245
FA5W
SLCC FA 200245
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 202100
CLDS/WX VALID UNTIL 201500...OTLK VALID 201500-202100
ID MT WY NV UT CO AZ NM

.
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...ALF..03Z UPR RDG DMNT RGN WITH FLOW NWLY AND FAIRLY ZONAL AS TROF OVR BC-ALTA DROPS SEWD TOWARD MT-CAN BORDER BY 12Z. THRU 21Z NWLY FLOW CONTS AS SHRTWV TROF/RDG DAMPENED AND FLOW REMAINS FAIRLY ZONAL ACRS RGN...SFC..03Z DSIPT STNRY FNT SWRN NM. SFC TROF CNTRL MT THRU PLAINS WY. THERMAL LOW PRES SWRN AZ. HI PRES RMNDR. 21Z CDFNT ALG MT-CAN BORDER. THERMAL LOW PRES SWRN AZ. HI PRES RMNDR.

MT

CONTDVD WWD...SKC. FU ALF. FU TOP 130. OTLK...VFR.

SWRN MTNS...FU Lyr BKN080 LYRD 130. OCNL VIS 3-5SM FU HZ.

OTLK...MVFR CIG FU HZ.

ERN SLOPES OF CONTDVD...SKC. OCNL FU ALF. FU TOP 140. OTLK...VFR.

CNTRL-ERN...SKC. OCNL FU ALF. 12Z SCT100 SCT CI. OTLK...VFR.

Aviation Section of the Area Forecast Discussion

An Area Forecast Discussion (AFD) was issued at 2114 MDT by the NWS Weather Forecast Office (WFO) in Great Falls, Montana. The aviation portion of the AFD is presented here:

FXUS65 KTFX 200314

AFDTFX

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE GREAT FALLS MT

914 PM MDT WED AUG 19 2015

.AVIATION...

UPDATED 2320Z.

VFR CONDITIONS WILL CONTINUE AT LEAST THROUGH THE DAY ON THURSDAY, AS HIGH PRESSURE IS EXPECTED TO KEEP THE AREA MOSTLY CLEAR. HOWEVER, SMOKE FROM WILD FIRES ACROSS THE PACIFIC NORTHWEST AND INTO WESTERN MONTANA WILL KEEP SKIES HAZY ACROSS MUCH OF THE AREA WITH MINOR REDUCTIONS IN VISIBILITY. MORE SIGNIFICANT VISIBILITY RESTRICTIONS ARE POSSIBLE IN THE VALLEYS OF SOUTHWEST MONTANA. WINDS WILL DECREASE OVERNIGHT, BUT BREEZY WESTERLY WINDS WILL RETURN TO THE EAST SLOPES OF THE ROCKIES AND INTO THE HELENA VALLEY ON THURSDAY.

An AFD was issued at 0004 MDT on August 20, 2015, by the NWS WFO in Great Falls, Montana. The aviation portion of the AFD, which was created at 2320 MDT, is presented here:

FXUS65 KTFX 200604

AFDTFX

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE GREAT FALLS MT

914 PM MDT WED AUG 19 2015

AVIATION SECTION UPDATED

.AVIATION...

UPDATED 2320Z. OVERALL MOSTLY CLEAR SKIES WILL PREVAIL...BUT SIGNIFICANT AMOUNTS OF SMOKE MOVING EAST WILL LIMIT VISIBILITIES. EXPECT MOUNTAINS/PASSES TO BE OBSCURED...AND SURFACE VISIBILITIES TO BE AS LOW AS 2 MILES AT TIMES THROUGH THURSDAY AFTERNOON.

AIRMETs

An Airmen's Meteorological Information (AIRMET) advisory for mountain obscuration due to smoke/haze was issued at 2045 MDT and was active for the accident region (figure 8).

WAUS45 KPCI 200245

WA5S

SLCS WA 200245

AIRMET SIERRA FOR IFR AND MTN OBSCN VALID UNTIL 200900

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NO SGFNT IFR EXP OUTSIDE OF CNVTV ACT.

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AIRMET MTN OBSCN...ID MT

FROM 20SSW GTF TO 40ENE DBS TO 60N TWF TO 30E BOI TO 20WNW DNJ
TO 70N DNJ TO 70SE MLP TO 20SSW GTF

MTNS OBSC BY FU/HZ. CONDS CONTG BYD 09Z THRU 15Z.

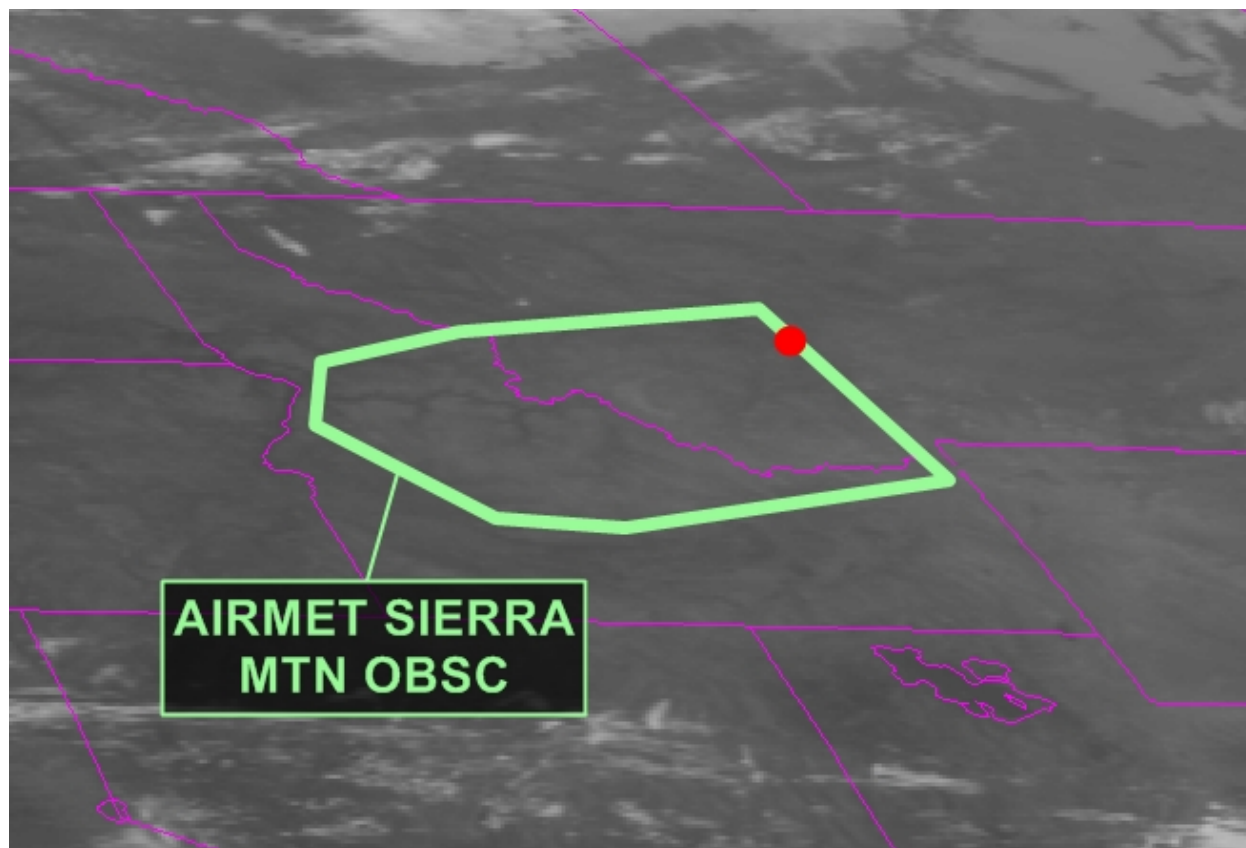


Figure 8 – AIRMET Sierra for mountain obscuration. Accident location denoted by the red dot.

SIGMETs

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

CWSU Products

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

Astronomical Data

The astronomical data obtained from the United States Naval Observatory for 46° 39' north latitude and 111° 34' west longitude, indicated the following:

SUN

Sunset	2030 MDT
End Civil Twilight	2102 MDT

MOON

Moonrise	1130 MDT
Moonset	2243 MDT

*Submitted by: Mike Richards
NTSB, AS-30*