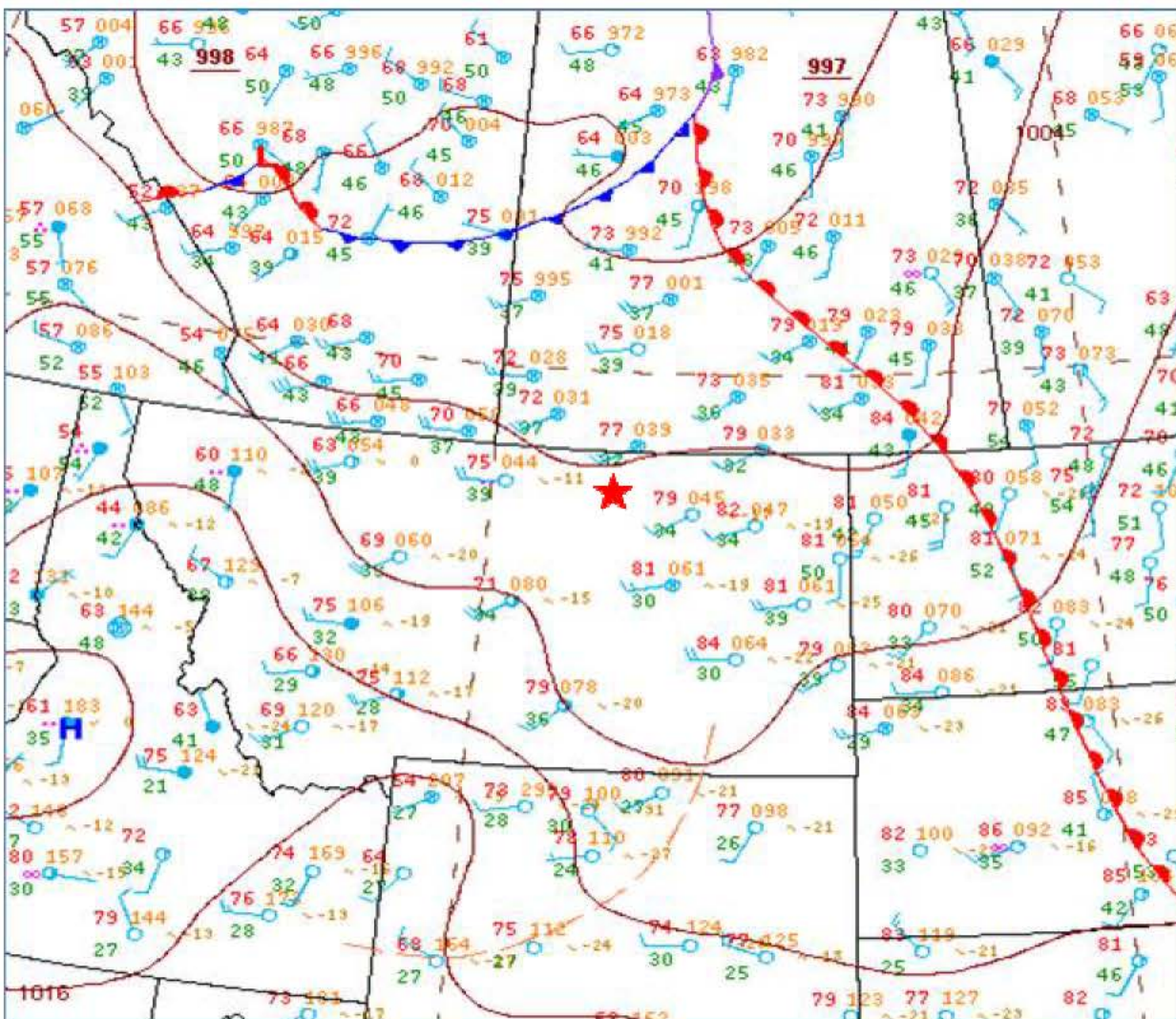


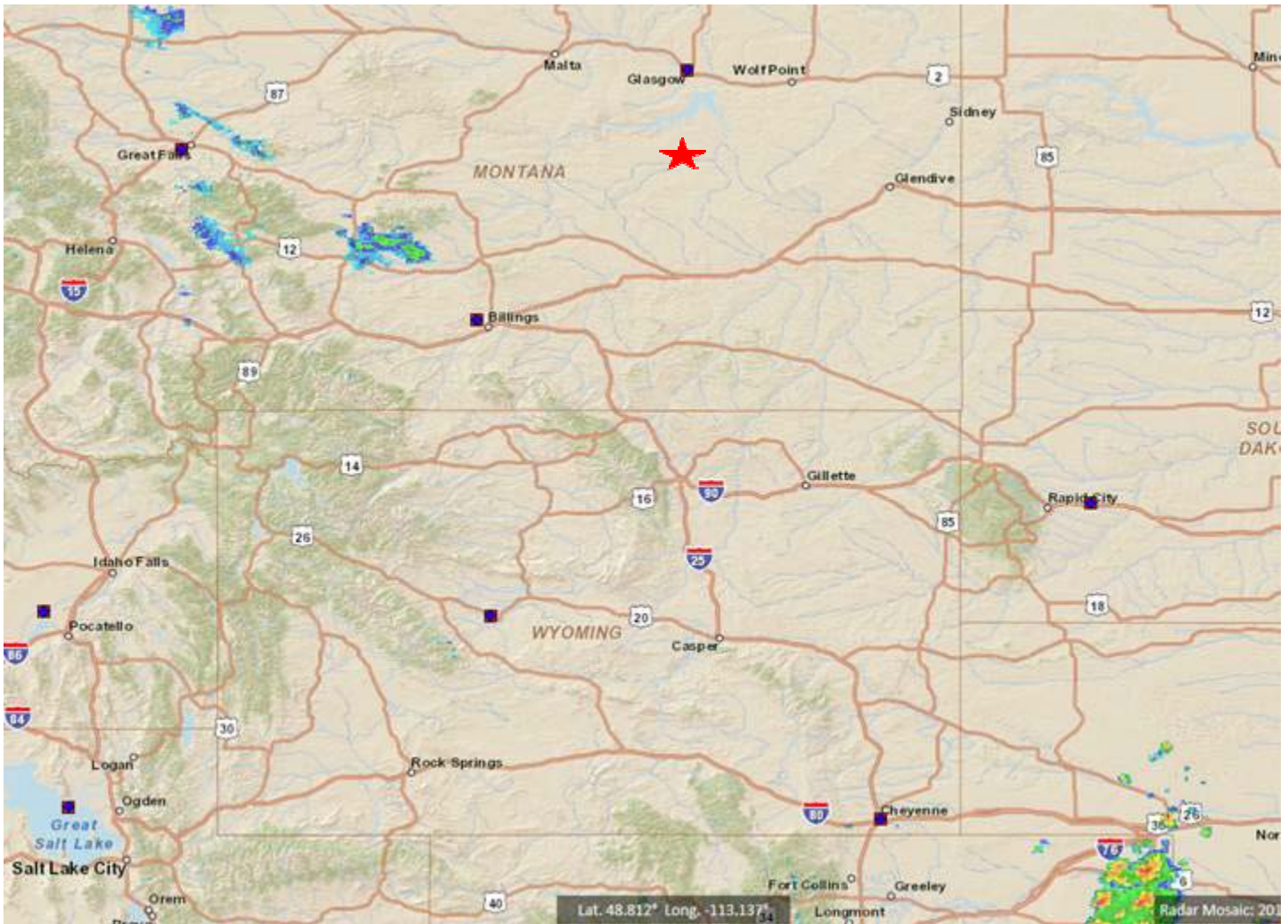
Cornejo Tealeye

From: Eick Donald
Sent: Wednesday, September 21, 2016 8:09 AM
To: Cornejo Tealeye
Cc: Helson David
Subject: WPR16FA182 - Broadus, MT Weather Conditions

Synoptic conditions – The National Weather Service (NWS) Weather Depiction Center (WPC) Surface Analysis Chart for the region at 1500 MDT (2100Z) is included below. The chart depicted a low pressure system at 997-hectopascals (hPa) well to the north over Canada associated with an occluded frontal system. A warm front extended from the triple point southeastward across the North and South Dakota and into Nebraska. The accident site was located in the warm air sector of the front with westerly winds of 15 to 20 knots over the region, with clear skies.



A review of the NWS National weather radar composite for the period depicted no weather echoes over the region at the time of the accident.



Observations – the closest official weather observations were issued for Dawson Community Airport (KGDV), Glendive, Montana located approximately 9 miles east of the accident site at an elevation of 2,458 feet. The airport listed an Automated Weather Observation System (AWOS) and a magnetic variation of 10° east. The following conditions were reported at the approximate time of the accident:

Dawson Community Airport weather at 1356 MDT, automated observation, wind from 220° at 13 knots, visibility 10 statute miles, sky clear below 12,000 feet agl, temperature 26° Celsius (C), dew point temperature 7° C, altimeter 29.77 inches of mercury. Remarks: automated observation system, sea level pressure 1007.0-hPa, temperature 26.1° C, dew point 7.2° C.

The calculated relative humidity was 30%, and provided a density altitude of 4,610 feet. The raw observation surrounding the period indicated no precipitation with the past 24 hours, and reported clear skies and visibility unlimited surrounding the period. The observations were as follows:

METAR KGDV 171656Z AUTO 21012KT 10SM CLR 22/08 A2984 RMK AO2 SLP095 T02170078=
 METAR KGDV 171756Z AUTO 19011KT 10SM CLR 23/09 A2982 RMK AO2 SLP088 T02330089 10233 20089 56014=
 METAR KGDV 171856Z AUTO 21012G18KT 10SM CLR 25/09 A2979 RMK AO2 SLP079 T02500089=
 METAR KGDV 171956Z AUTO 22013KT 10SM CLR 26/07 A2977 RMK AO2 SLP070 T02610072=
 Accident 1957Z
 METAR KGDV 172056Z AUTO 26018G23KT 10SM CLR 27/04 A2974 RMK AO2 SLP061 T02720039 56025=
 METAR KGDV 172156Z AUTO 22015G19KT 10SM CLR 27/04 A2973 RMK AO2 SLP056 T02670044=
 METAR KGDV 172256Z AUTO 25014G21KT 10SM CLR 26/02 A2972 RMK AO2 SLP055 T02560022=

Forecast – the Terminal Aerodrome Forecast for KGDV current at the time of the accident was as follows:

TAF KGDV 171728Z 1718/1818 23011KT P6SM SCT250

FM171900 25015KT P6SM BKN250

FM180200 26010KT P6SM BKN100

FM181500 27025KT P6SM SCT150=

Pilot Reports – the following PIREPs were recorded over the region:

HLN UA /OV KHLN010050 /TM 1410 /FL360 /TP B739 /RM OCNL MOD TURB FL360 WITH 20 KTS WAVE...LGT CHOP FL340 AWC-WEB=

GTF UA /OV GTF073032/TM 1414/FL350/TP E190/TB LGT TURB, MOD CHOP, MTN WAVE 15KTS/RM ZLC=

MSO UUA /OV MSO08030/TM 1632/FL410/TP LJ60/TB SEV/RM 1200 FT LOSS MTN WAVE=

MLS UA /OV MLS/TM 1711/FL350/TP B738/TB LGT-MOD CHOP/RM REPORTED BY NUMEROUS ACFT ZLC=

GDV UA /OV MLS045050 /TM 1800 /FL145 /TP C210 /SK FEW150 /TA M04 /WV 16533KT /TB NEG /RM SMTH=

MLS UA /OV MLS170040/TM 1837/FL340/TP CRJ9/TB LGT TO MOD CHOP/RM ZLC=

GDV UA /OV GDV /TM 1927 /FL115 /TP C340 /TB NEG /RM SMTH DURC SFC-115=

MLS UA /OV MLS075030 /TM 1939 /FL165 /TP C340 /TB NEG BLO 165=

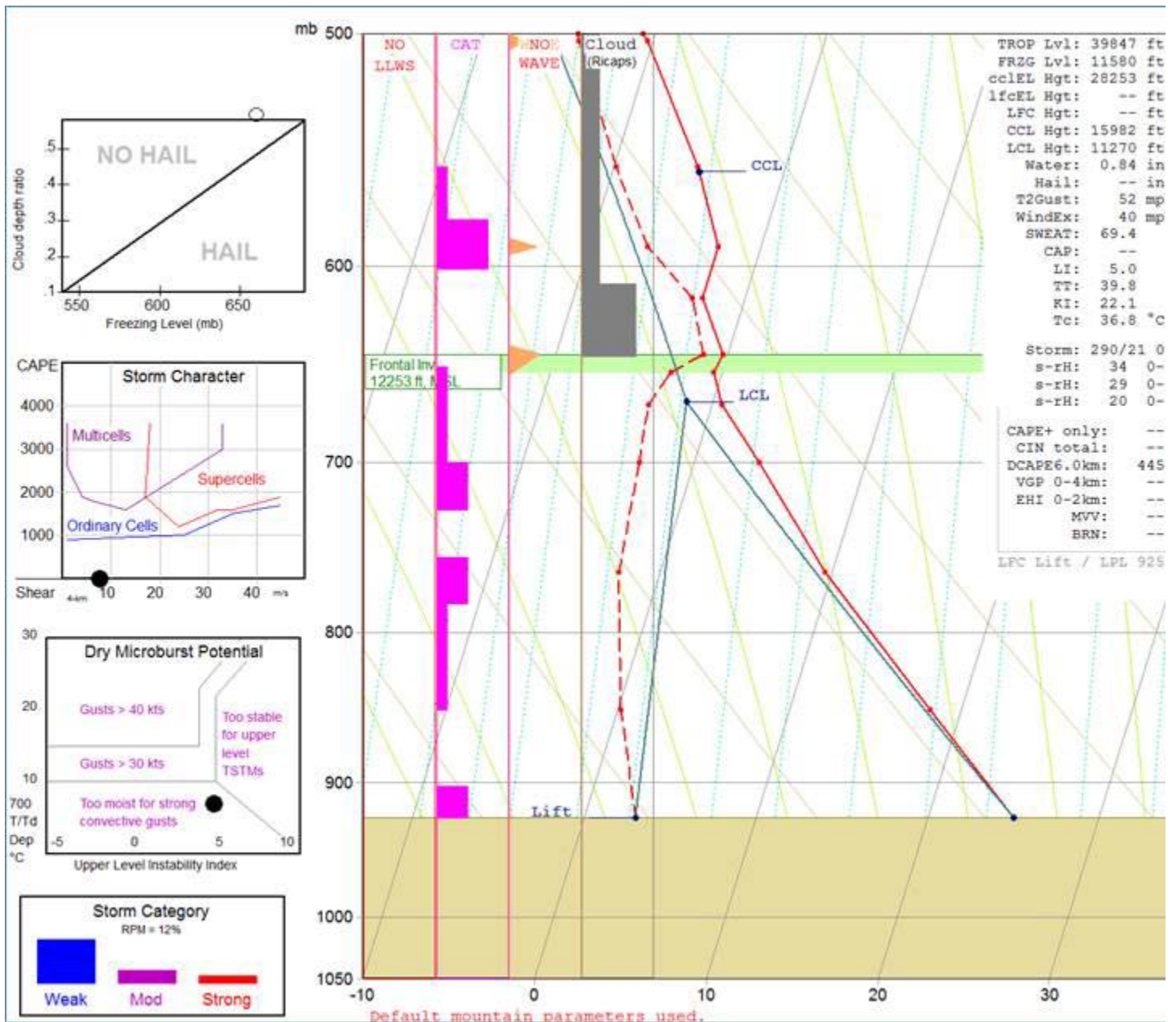
BIL UA /OV BIL250049/TM 2126/FL330/TP B739/TB LGT/RM MTN WAVE /ZLC=

BZN UA /OV EUL-BZN /TM 2115 /FLUNKN /TP PA22 /TA 10 /TB CONS LGT=

Mountain wave conditions reported and conditions observed in sounding and satellite imagery supporting wave formation at high altitudes. No specific turbulence reported in the vicinity of the accident site below 12,000 feet.

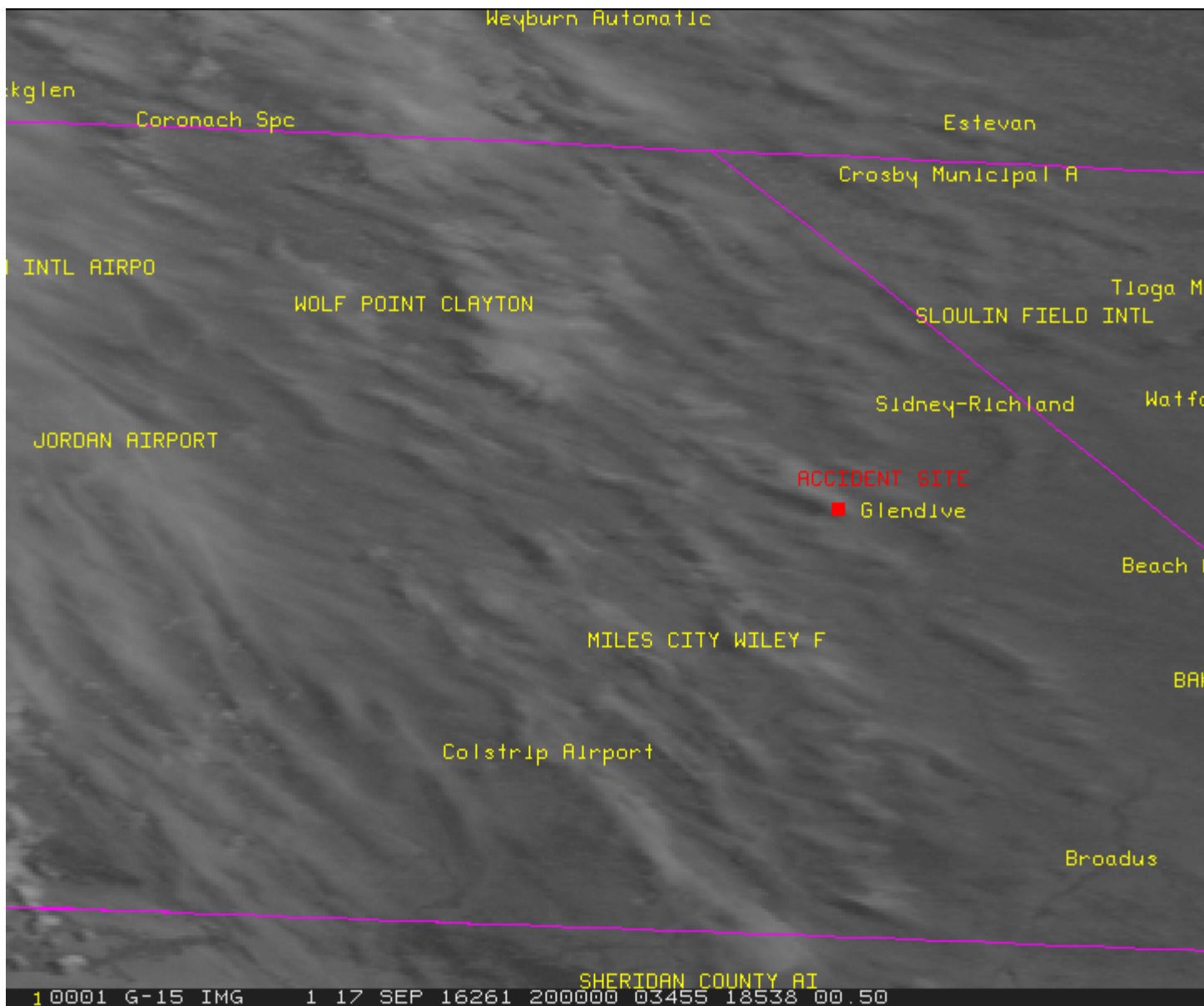
Sounding – the closest NWS upper air observation was from Glasgow, MT (KGGW) located approximately 90 miles northwest at an elevation of 2,297 feet. The 1800 MDT sounding plot is included below. The sounding depicted a dry low-level conditions with the approximate cloud bases or the lifted condensation level at 9,000 feet agl (11,270 feet msl), with the freezing level at 11,580 feet. The wind profile depicted surface wind from 255° at 17 knots with wind speeds increasing with height with little directional variation. The mean 0 to 6 kilometer or 18,000 feet wind was from 260° at 29 knots, with the maximum wind at 41,000 feet from 285° at 53 knots.

The sounding support multiple layers of turbulence and was favorable for mountain wave formation, with the potential for a predominant wave at 12,000 feet near the tops of a frontal inversion, where temperatures increased with height. The sounding indicated a potential for severe turbulence near 14,000 feet due to strong vertical wind shears. Overall the sounding was classified as stable with a lifted index of 5.0 and did not support thunderstorm formation.



Satellite imagery – the GOES-15 infrared and visible imagery depicted high cirriform clouds scattered over the regions with no low or middle layer clouds.

The orientation and formation of the cirriform clouds indicated a wave like appearance consistent with orographic clouds or cirrocumulus standing lenticular clouds (CCSL). A review of the water vapor imagery did not identify any specific moisture channel darkening common with turbulence over the immediate area at the time of the image. Included below are the GOES-15 infrared image with a standard MB temperature enhancement curve applied and visible image at 1400 MDT (2000Z).



Area Forecast – The NWS Salt Lake City covered the Montana area, the forecast current for the period was issued shortly before the accident at 1345 MDT and was as follows:

FAUS45 KKCI 171945

FA5W

-SLCC FA 171945

SYNOPSIS AND VFR CLDS/WX

SYNOPSIS VALID UNTIL 181400

CLDS/WX VALID UNTIL 180800...OTLK VALID 180800-181400

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..TROF FM SERN WY SWWD THRU SRN NV. MOD WLY WND OVR NRN ID/NWRN MT. 08Z TROF FM NERN CO SWWD THRU SWRN NM. MOD WLY WND OVR NRN 2/3 ID/WRN 2/3 MT/NWRN WY. 14Z ZONAL FLOW THRU AREA. MOD WLY WND OVR ID/MT/NRN 1/3 WY. SFC..CDFNT FM N CNTRL MT SWWD

THRU W CNTRL ID AND MOVING EWD. 08Z CDFNT FM E CNTRL MT SWWD THRU
NWRN NV. 14Z CDFNT FM CDFNT FM SERN MT SWWD THRU NWRN MT.

.
ID

NRN...OVC060 TOPS FL320. -RA. BECMG 0003 OVC050 TOPS 160. BECMG 0607 BKN040 TOPS 150. OTLK...IFR CIG.
CNTRL MTNS...BKN120 TOPS FL250. 00Z OVC110 TOPS FL310. 03Z OVC090 TOPS FL250. BECMG 0607 BKN090 TOPS FL210.
OTLK...VFR.

SWRN...BKN150 TOPS FL280. BECMG 0003 OVC110 TOPS FL260. BECMG 0507 BKN140 TOPS FL180. OTLK...VFR.
SERN...BKN CI. BECMG 0003 OVC130 TOPS FL320. 05Z OVC120 TOPS FL290. 07Z BKN110 TOPS FL250. OTLK...VFR.

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MT

CONTDVD WWD...OVC050 TOPS FL340. ISOL -SHRA. BECMG 0003 OVC045 TOPS 170. ISOL -SHRA. BECMG 0607 BKN045 TOPS 150.
OTLK...MVFR CIG.

SWRN MTNS...OVC120 TOPS FL300. BECMG 0003 OVC100 TOPS FL330. BECMG 0607 BKN090 TOPS FL200. OTLK...VFR.
ERN SLOPES OF CONTDVD...BKN110 TOPS FL270. WND SW 25G35KT. BECMG 0003 BKN090 TOPS FL190. WND SW G25KT. BECMG
0607 SCT070
SCT110. WND W 20G30KT. OTLK...VFR WND.
CNTRL...BKN140 TOPS FL280. WND W 25G35KT. 00Z BKN110 TOPS FL310. WND W 25G35KT. BECMG 0607 BKN110 TOPS 140. WND
W 25G35KT. OTLK...VFR WND.

ERN...SCT CI. 00Z BKN150 TOPS FL220. 03Z BKN130 TOPS FL280. WND W G25KT. OTLK...VFR WND.

.
WY

PLAINS...SKC. OCNL SCT CI. 03Z SCT CI. 06Z BKN CI. OTLK...VFR.
MTNS E OF CONTDVD...SKC. OCNL SCT CI. 00Z SCT CI. 03Z BKN CI. OTLK...VFR.
MTNS W OF CONTDVD...SCT CI. OTLK...VFR.

.
NV

NWRN...SCT CI. 00Z BKN CI. BECMG 0306 SKC. OTLK...VFR.
NERN...SKC. 03Z SCT CI. OTLK...VFR.
SRN...SKC. OTLK...VFR.

.
UT

NRN HLF...SKC. 00Z SCT CI. 03Z BKN CI. OTLK...VFR.
SRN HLF...SKC. OTLK...VFR.

.
CO

PLAINS...SCT100. ISOL -TSRA. CB TOPS FL400. BECMG 0003 SCT CI. ISOL -TSRA. CB TOPS FL370. 06Z SCT CI. OTLK...VFR.
MTNS E OF CONTDVD...SCT CI. ISOL -TSRA. CB TOPS FL400. BECMG 0003 SKC. OCNL SCT140. 06Z SKC. OTLK...VFR.
MTNS W OF CONTDVD...SCT130. BECMG 0003 SKC. OCNL SCT CI. 07Z SKC. OTLK...VFR.

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AZ

NRN HLF...SKC. OTLK...VFR.
SWRN...SKC. OTLK...VFR.
SERN...SKC. OTLK...VFR.

.
NM

PLAINS...BKN080 LYRD 140. ISOL -TSRA. CB TOPS FL450. 00Z BKN090 TOPS 150. ISOL -TSRA. CB TOPS FL440. 03Z BKN090 TOPS 130.
OTLK...VFR.
MTNS E OF CONTDVD...SKC. ISOL -TSRA. CB TOPS FL390. 00Z SKC. OTLK...VFR.
MTNS W OF CONTDVD...SKC. OTLK...VFR.

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The forecast for eastern Montana expected some high cirrus clouds during the period.

In-Flight weather Advisories – The most significant advisory current during the period was an AIRMET fore moderate turbulence over the region.

WAUS45 KPCI 171445

WA5T

-SLCT WA 171445

AIRMET TANGO UPDT 2 FOR TURB VALID UNTIL 172100

AIRMET TURB...ID MT WY NV UT WA OR AND CSTL WTRS
FROM YDC TO 50WSW YXC TO 70S YYN TO 30WNW MLS TO SHR TO 60SW BPI
TO 40S REO TO 30NNE LKV TO 140SW ONP TO 110WNW ONP TO 140W TOU TO YDC
MOD TURB BTN FL280 AND FL410. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET TURB...NV UT CO AZ NM CA AND CSTL WTRS
FROM 30ENE JNC TO 40S GLD TO 50W LBL TO 30ESE TBE TO 30SSW TXO TO 60WSW TUS TO BZA TO 20S MZB TO 220SW MZB
TO 140SSW SNS TO 20W BTY TO 40NNW HVE TO 30ENE JNC
MOD TURB BTN FL260 AND FL410. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET TURB...ID MT WY
FROM 50WSW YXC TO 70S YYN TO 40SSW MLS TO 20WNW DDY TO 50SW BPI
TO 40SW PIH TO 60S LKT TO 40SE BKE TO 50WSW YXC
MOD TURB BLW FL180. CONDS CONTG BYD 21Z THRU 03Z.

OTLK VALID 2100-0300Z

AREA 1...TURB ID MT WY NV UT CO WA OR CA AND CSTL WTRS
BOUNDED BY YDC-50WSW YXC-50NNW ISN-70SW DIK-40NE JNC-50NNW HVE- 40ESE FMG-120WNW ONP-130WSW TOU-YDC
MOD TURB BTN FL280 AND FL410. CONDS CONTG THRU 03Z.

AREA 2...TURB ID MT WY UT CO
BOUNDED BY 50WSW YXC-50NNW ISN-70SW RAP-BFF-60S LAR-50SW BPI-30W MLD-40WNW BOI-50WSW YXC
MOD TURB BLW FL180. CONDS CONTG THRU 03Z.



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National Transportation Safety Board

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