



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

April 21, 2015

Group Chairman's Weather Study Report

METEOROLOGY

CEN15FA174

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A. ACCIDENT

Location: 33 miles east-northeast of El Paso, Texas
Date: March 17, 2015
Time: approximately 1240 mountain daylight time (1840 UTC¹)
Aircraft: Cessna 182Q, registration: N735KF

B. METEOROLOGY GROUP

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C. SUMMARY

For a summary of the accident, refer to the *Accident Summary* report, which is available in the docket for this investigation.

D. 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 Climatic Data Center (NCDC). All times are mountain daylight time (MDT) on March 17, 2015, and are based upon the 24-hour clock, where local time is -6 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 accident location was located at latitude 31.95° N, longitude 105.97° W, elevation 6,004 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) and the Weather Prediction Center (WPC), 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-0045G CHG 1.

1.1 Surface Analysis Chart

The NWS Surface Analysis Charts for 1200 and 1500 MDT are provided as figures 1 and 2, with the approximate location of the accident site marked. The chart depicted a cold front stretched from northwestern New Mexico southeastward towards the accident site then eastward into north central Texas. This cold front moved southward toward the accident site between 1200 and 1500 MDT being just north of the accident site by 1500 MDT. A surface low pressure center with a pressure of 1014-hectopascals (hPa) was located in south central New Mexico just north of the accident site at 1500 MDT (figure 2). The station models around the accident site depicted temperatures in the mid 40’s to mid 60’s Fahrenheit (F), with temperature-dew point spreads of 4° F or more (the closest temperature-dew point spreads were right near the accident site), a southeast to northeast wind between 5 and 20 knots, cloudy skies, and reports of light to moderate rain. Areas near and ahead of fronts and surface low pressure centers are typically areas where enhanced lift, clouds, and precipitation can occur. The cloudy skies and rainy conditions would have been expected to move from northeast to southwest across the accident site around the accident time given the southward movement of the cold front (figures 1 and 2).

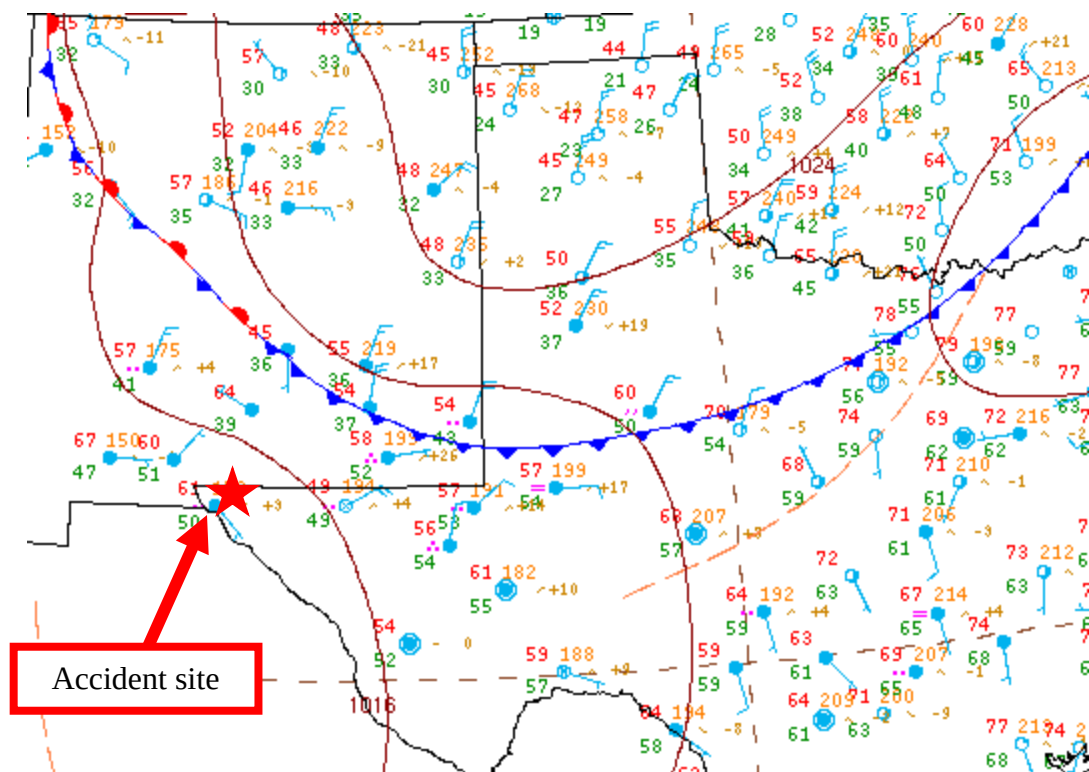


Figure 1 – NWS Surface Analysis Chart for 1200 MDT

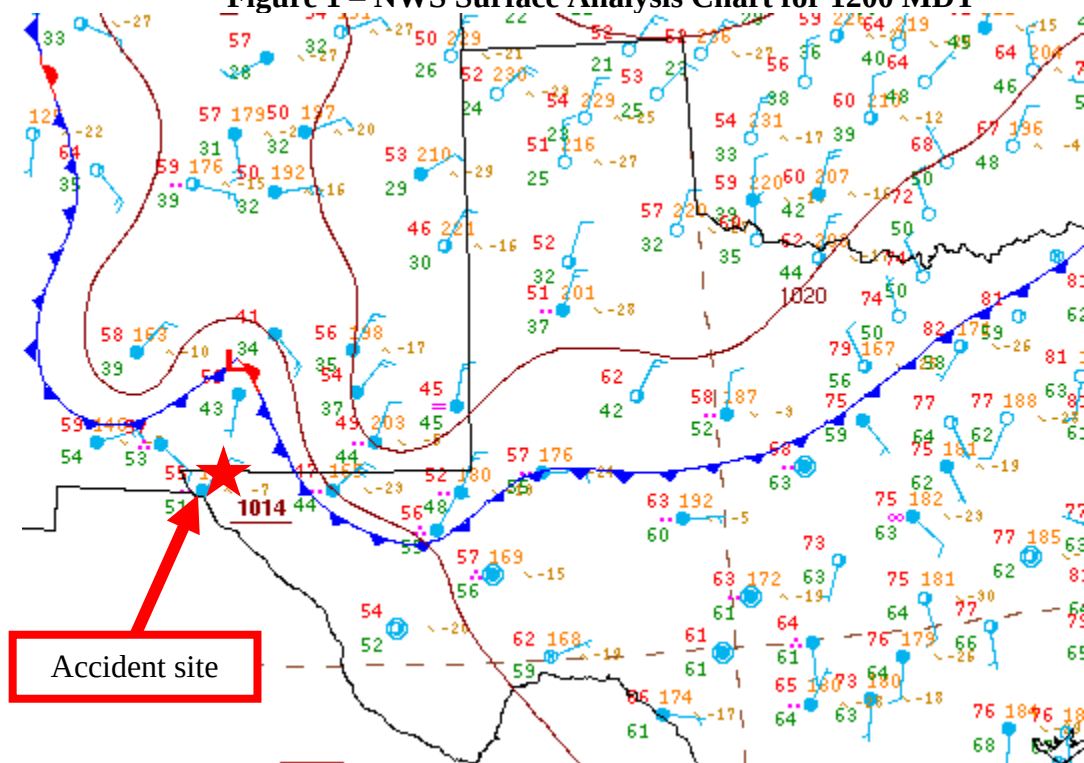


Figure 2 – NWS Surface Analysis Chart for 1500 MDT

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 1800 MDT at 850-, 700-, 500-, and 300-hPa are presented in figures 3 through 6. The 850- and 700-hPa charts depicted a 5 to 10 knot east wind with an east wind leading to upslope winds across the mountainous terrain surround El Paso. The 500-hPa chart depicted a mid-level trough² and associated mid-level low pressure area just to the east of the accident site at 1800 MDT with an easterly wind between 10 and 30 knots. An upper-level low pressure center was located just south of the accident site at 300-hPa (figure 6). Areas near and ahead of troughs and mid- and upper-level low pressure centers are typically areas where enhanced lift, clouds, and precipitation can occur. In addition, there was an easterly wind component from 850-hPa upwards and this would have led to upslope winds in the mountainous terrain surrounding El Paso leading to additional areas of clouds, precipitation, and mountain obscuration.

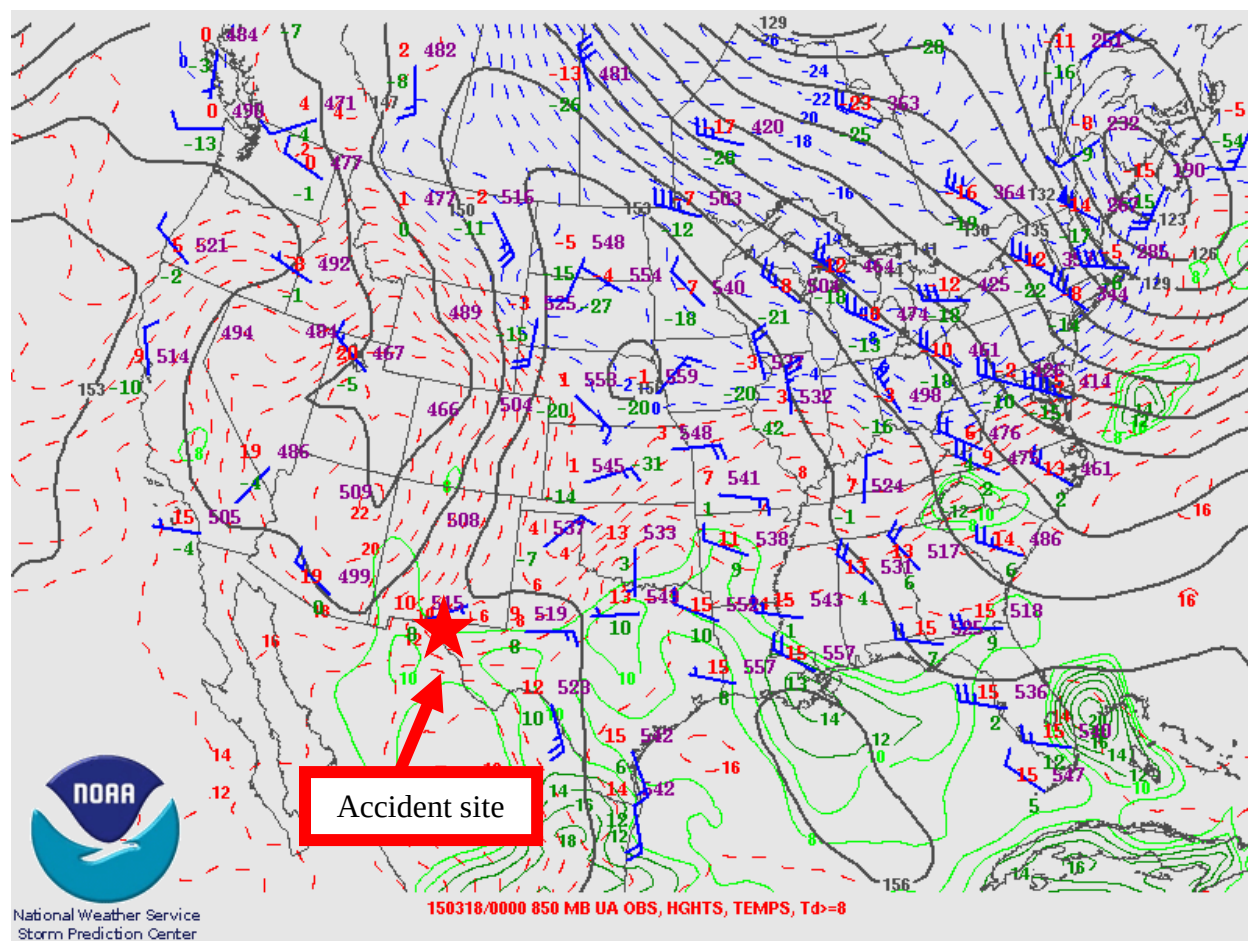


Figure 3 – 850-hPa Constant Pressure Chart for 1800 MDT

² Trough – An elongated area of relatively low atmospheric pressure or heights.

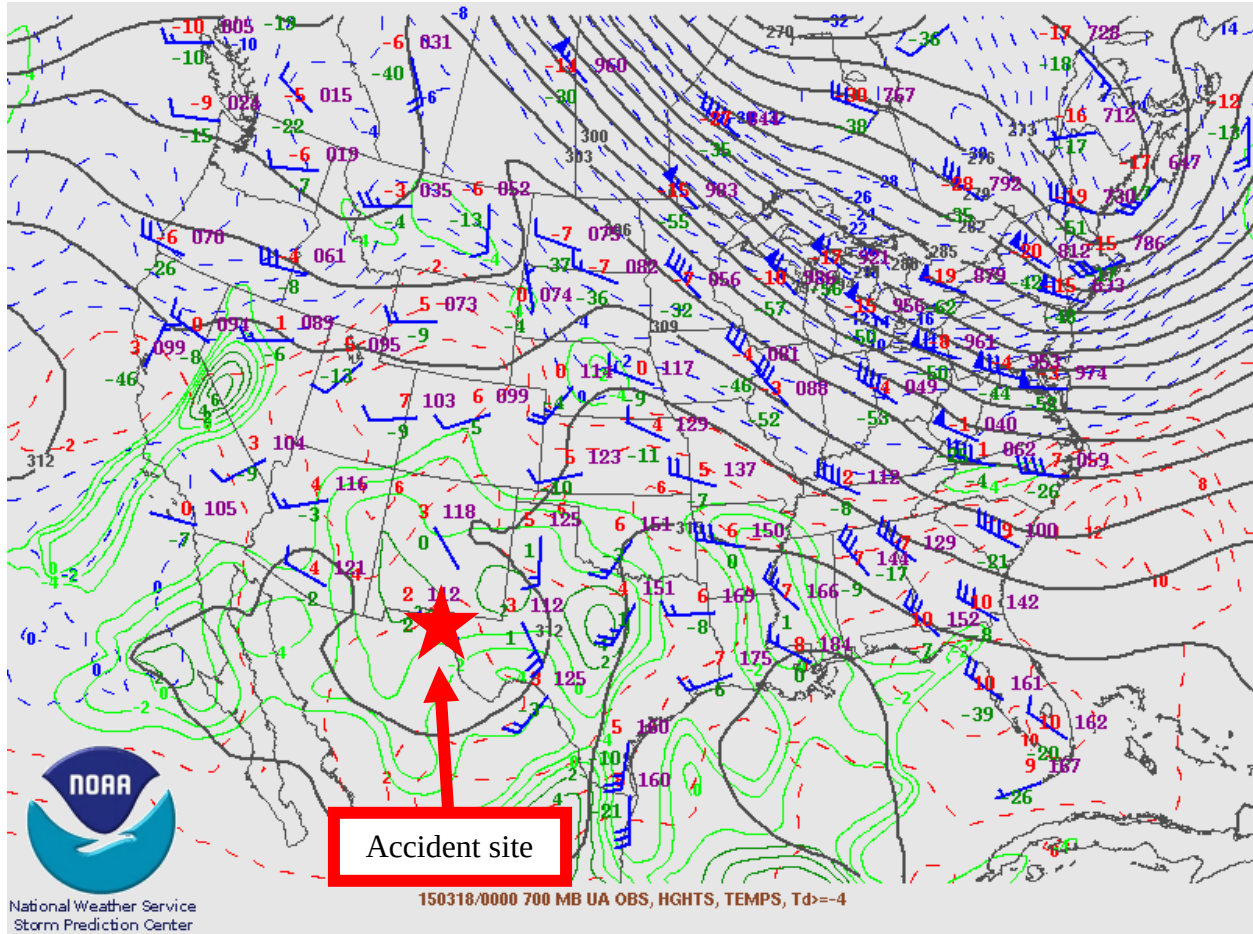


Figure 4 – 700-hPa Constant Pressure Chart for 1800 MDT

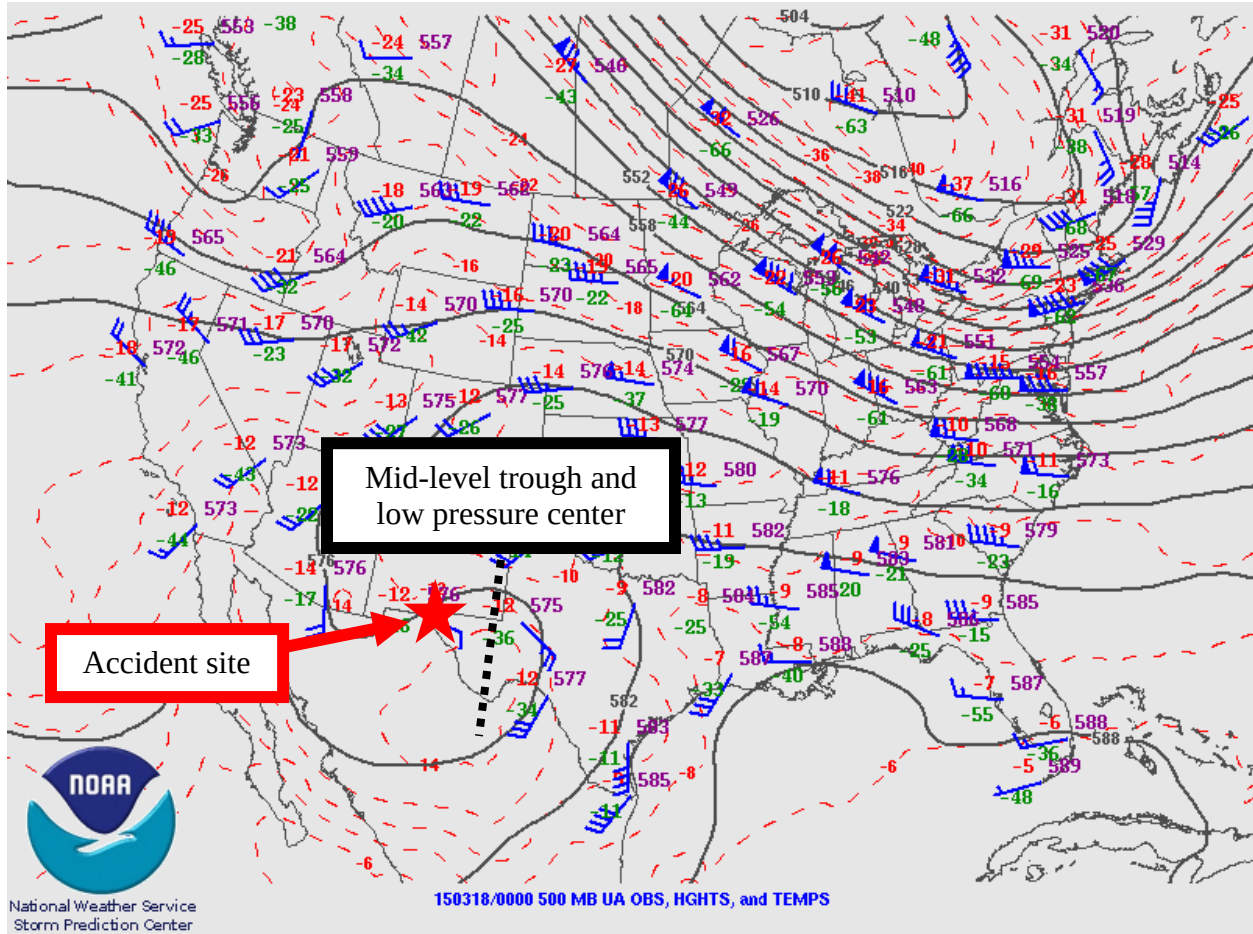


Figure 5 – 500-hPa Constant Pressure Chart for 1800 MDT

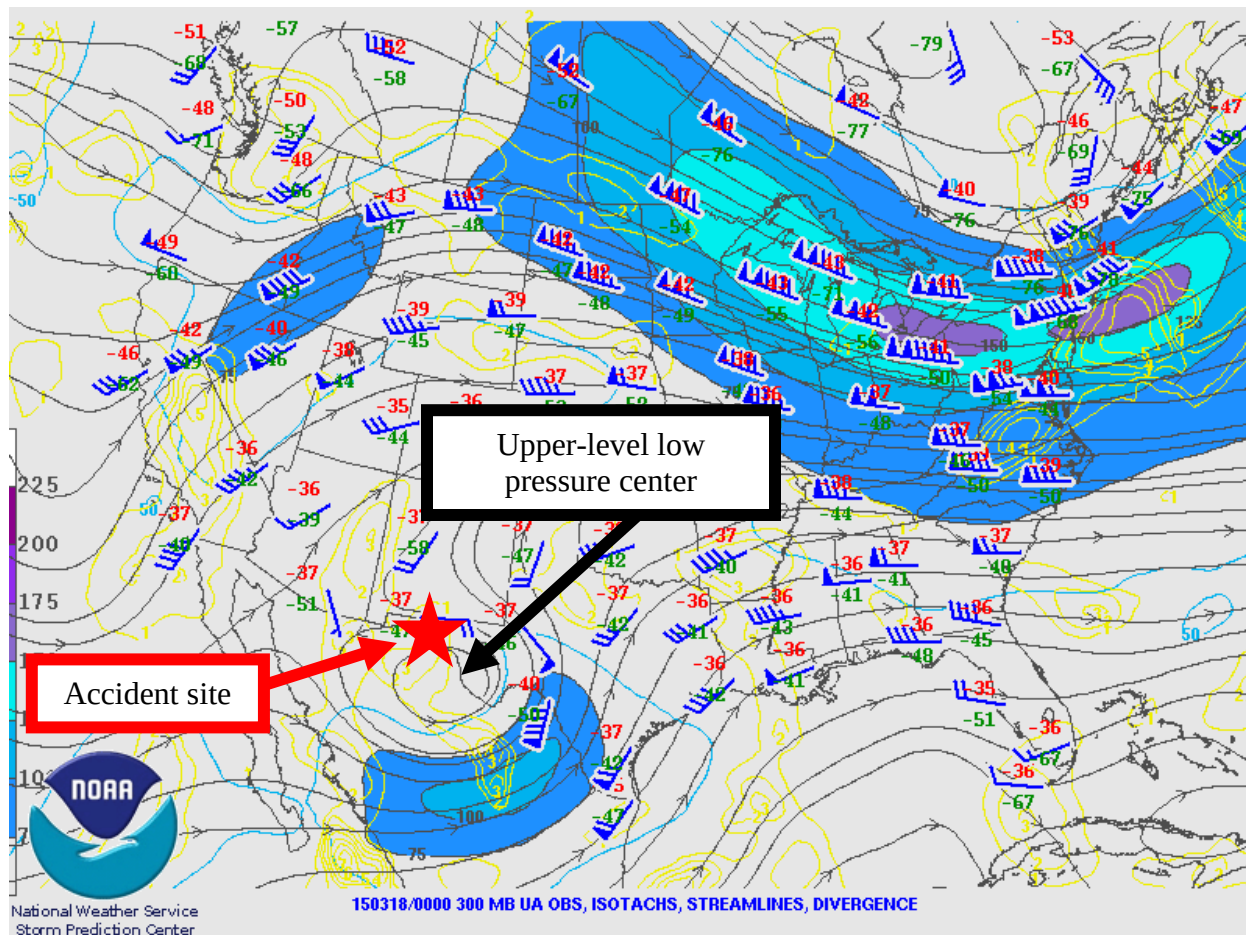


Figure 6 – 300-hPa Constant Pressure Chart for 1800 MDT

2.0 Storm Prediction Center Products

SPC issued the following Day 1 Convective Outlook at 1025 MDT (figure 7) with areas of thunderstorms forecasted for the accident site:

SPC AC 171625

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
1125 AM CDT TUE MAR 17 2015

VALID 171630Z - 181200Z

...NO SVR TSTM AREAS FORECAST...

...SUMMARY...

ISOLATED TO WIDELY SCATTERED THUNDERSTORMS SHOULD BE EMBEDDED WITHIN A LARGER PRECIPITATION SHIELD THAT WILL SPREAD ACROSS TEXAS INTO THE LOWER MISSISSIPPI VALLEY. ISOLATED THUNDERSTORMS MAY ALSO DEVELOP ACROSS THE NORTHERN INTER-MOUNTAIN REGION.

...SYNOPSIS...

MULTIPLE FLOW STREAMS ARE PRESENT THIS MORNING OVER THE CONUS...WITH A DEEP NRN STREAM TROUGH APPROACHING NEW ENGLAND...AN INTERMEDIATE STREAM FROM ORE EWD TO THE NRN ROCKIES...AND A SRN STREAM AS FAR S AS 20-25 N LATITUDE IN MEXICO. IN THE WAKE OF THE NRN STREAM WAVE...A SURFACE COLD FRONT IS MOVING SWD INTO THE TN VALLEY AND THE SRN PLAINS. WITHIN THE SRN STREAM...A WEAK CLOSED LOW OVER NW MEXICO WILL TRANSLATE NNEWD TO THE TX BIG BEND THIS AFTERNOON...AND CONTINUE NEWD OVER TX TONIGHT. BOUNDARY LAYER DEWPOINTS IN THE LOW-MID 60S HAVE RETURNED TO S AND E TX...BUT WIDESPREAD CLOUDS AND INCREASING RAINFALL/ELEVATED CONVECTION FROM THE RIO GRANDE NEWD INTO CENTRAL TX WILL INHIBIT SURFACE HEATING...AS POOR LAPSE RATES ALOFT LIMIT BUOYANCY. THOUGH SOMEWHAT STRONGER SURFACE HEATING WILL BE POSSIBLE ALONG THE SLOWING FRONT ACROSS NE TX THIS AFTERNOON...THIS AREA WILL BE INFLUENCED BY SHORTWAVE RIDGING ALOFT.

A NARROW ZONE OF SURFACE HEATING WILL BE POSSIBLE THIS AFTERNOON ACROSS NE MEXICO AND ADJACENT AREAS OF THE TX BIG BEND...WITHIN THE MIDDLE LEVEL DRY SLOT. HOWEVER... BUOYANCY IS EXPECTED TO REMAIN RATHER MODEST /MUCAPE AOB 1000 J PER KG/...AND VERTICAL SHEAR WILL WEAKEN WITH TIME AS THE MIDDLE LEVEL LOW APPROACHES FROM MEXICO. SOME SMALL HAIL COULD OCCUR GIVEN THE RELATIVELY COOL MIDDLE LEVEL TEMPERATURES /NEAR -15 C AT 500 MB/...BUT THE LARGE HAIL RISK APPEARS TOO MARGINAL TO WARRANT MAINTAINING AN OUTLOOK AREA.

..THOMPSON/PICCA.. 03/17/2015

CLICK TO GET WUUS01 PTSDY1 PRODUCT

NOTE: THE NEXT DAY 1 OUTLOOK IS SCHEDULED BY 2000Z

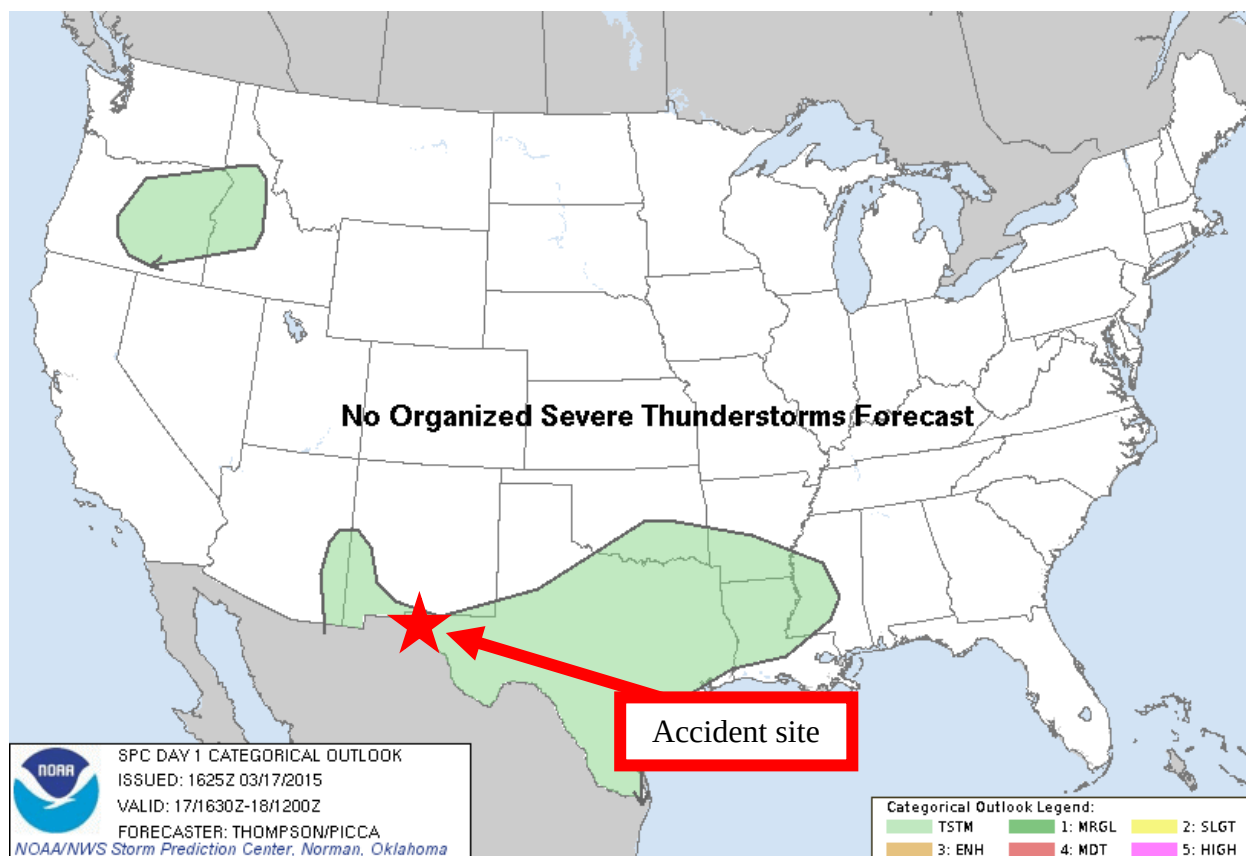


Figure 7 – Storm Prediction Center day 1 Convective Outlook valid at the time of the accident

3.0 Surface Observations

The area surrounding the accident site was documented utilizing official NWS Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). The following observations were taken from standard code and are provided in plain language.

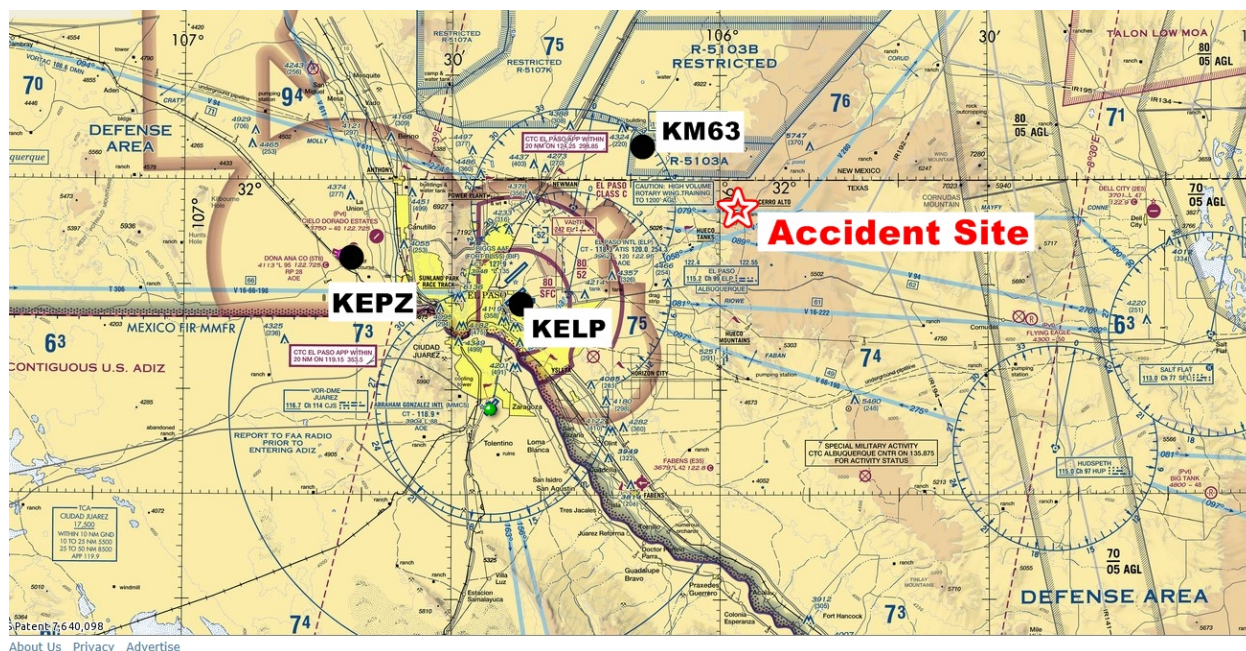


Figure 8 – Map of Texas and New Mexico with the location of the accident site, surface observation sites, and weather radar location

McGregor Range Base Camp (KM63) was the closest official weather station to the accident site and had an Automated Weather Observing System (AWOS³) whose reports were not supplemented. KM63 was located 11 miles west-northwest of the accident site at an elevation of 4,209 feet (figure 8). The following observations were taken and disseminated during the times surrounding the accident:⁴

[0956 MDT] KM63 171556Z AUTO 11009KT 10SM SCT075 BKN090 17/08
A3012 RMK AO2 SLP149 T01650083=

[1056 MDT] KM63 171656Z AUTO 11010KT 10SM SCT050 BKN085 16/08
A3014 RMK AO2 SLP159 T01630083=

[1105 MDT] KM63 171705Z AUTO 13009KT 10SM -RA SCT042 BKN055 BKN090
16/08 A3014 RMK AO2 RAB05=

**[1156 MDT] KM63 171756Z AUTO 08003KT 6SM -RA FEW025 BKN042 14/11
A3015 RMK AO2 RAB05 SLP162 P0005 60004 T01400112 10168
20136 53007=**

³ AWOS – Automated Weather Observing System is equipped with meteorological instruments to observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to twelve thousand feet, and altimeter setting.

⁴ The bold sections in this NWS product and the rest of products in the weather factual report are to highlight the individual sections that directly reference the weather conditions that are or will affect the accident location around the accident time.

***[1230 MDT] KM63 171830Z AUTO 01015G20KT 6SM -RA FEW013 SCT020
BKN029 BKN037 13/11 A3014 RMK AO2 CIG 029V037 BKN V SCT=***

ACCIDENT TIME 1240 MDT

***[1256 MDT] KM63 171856Z AUTO 01010KT 10SM -RA FEW014 BKN024 BKN029
13/10 A3014 RMK AO2 CIG 021V026 SLP162 P0006 T01250096=***

***[1301 MDT] KM63 171901Z AUTO 01015G20KT 10SM -RA FEW019 SCT027
BKN031 13/09 A3014 RMK AO2=***

***[1356 MDT] KM63 171956Z AUTO 01019G28KT 8SM -RA OVC036 13/07 A3011
RMK AO2 PK WND 01026/38 LTG DSNT SW SLP151 P0001
T01290067=***

***[1456 MDT] KM63 172056Z AUTO 35017G24KT 10SM -DZ BKN038 OVC043
13/07 A3010 RMK AO2 LTG DSNT S RAE39DZB39 SLP151
60007 T01330068 57015=***

KM63 weather at 1156 MDT was reported as wind from 080° at 3 knots, 6 miles visibility, light rain, few clouds at 2,500 feet above ground level (agl), a broken ceiling at 4,200 feet agl, temperature of 14° Celsius (C), dew point temperature of 11° C, and an altimeter setting of 30.15 inches of mercury. Remarks: automated station with a precipitation discriminator, rain began at 1105 MDT, sea level pressure 1016.2 ha, one-hourly precipitation of 0.05 inches, 6-hourly precipitation of 0.04 inches, temperature 14.0° C, dew point temperature 11.2° C, 6-hourly maximum temperature of 16.8° C, 6-hourly minimum temperature of 13.6° C, 3-hourly pressure increase of 0.7 hPa.

KM63 weather at 1230 MDT was reported as wind from 010° at 15 knots with gusts to 20 knots, 6 miles visibility, light rain, few clouds at 1,300 feet agl, scattered clouds at 2,000 feet agl, a broken ceiling at 2,900 feet agl, broken skies at 3,700 feet agl, temperature of 13° C, dew point temperature of 11° C, and an altimeter setting of 30.14 inches of mercury. Remarks: automated station with a precipitation discriminator, ceiling variable between 2,900 and 3,700 feet agl, clouds varying between broken and scattered.

KM63 weather at 1256 MDT was reported as wind from 010° at 10 knots, 10 miles visibility, light rain, few clouds at 1,400 feet agl, a broken ceiling at 2,400 feet agl, broken skies at 2,900 feet agl, temperature of 13° C, dew point temperature of 10° C, and an altimeter setting of 30.14 inches of mercury. Remarks: automated station with a precipitation discriminator, ceiling varying between 2,100 feet and 2,600 feet agl, sea level pressure 1016.2 hPa, one-hourly precipitation of 0.06 inches, temperature 12.5° C, dew point temperature 9.6° C.

KM63 weather at 1301 MDT was reported as wind from 010° at 15 knots with gusts to 20 knots, 10 miles visibility, light rain, few clouds at 1,900 feet agl, scattered clouds at 2,700 feet agl, a broken ceiling at 3,100 feet agl, temperature of 13° C, dew point temperature of 9° C, and an altimeter setting of 30.14 inches of mercury. Remarks: automated station with a precipitation discriminator.

El Paso International Airport (KELP) was located 4 miles northeast of El Paso, Texas, and had an Automated Surface Observing System (ASOS⁵) whose reports were supplemented by a human observer. KELP was located 22 miles west-southwest of the accident site, at an elevation of 3,962 feet, and had an 8° easterly magnetic variation⁶ (figure 8). The following observations were taken and disseminated during the times surrounding the accident:

[0651 MDT] KELP 171251Z 04003KT 10SM BKN050 BKN090 BKN200 16/09
A3009 RMK AO2 RAE1157 SLP136 P0000 T01610094=

[0751 MDT] KELP 171351Z 00000KT 10SM SCT050 BKN090 OVC200 16/09
A3011 RMK AO2 SLP143 T01610089=

[0851 MDT] KELP 171451Z 14005KT 10SM -RA FEW060 BKN090 OVC200
16/09 A3013 RMK AO2 RAB50 SLP154 P0000 60000 T01610089 53013=

[0951 MDT] KELP 171551Z 15010KT 10SM -RA FEW060 BKN090 OVC200
17/09 A3014 RMK AO2 RAE18B47 SLP157 P0000 T01670094=

**[1051 MDT] KELP 171651Z 14008KT 10SM -RA FEW028 SCT065 OVC090
16/11 A3013 RMK AO2 SLP157 OCNL CLDS TPG MTNS SW-NW
P0001 T01560111=**

**[1151 MDT] KELP 171751Z 14006KT 10SM -RA FEW027 BKN040 OVC055
16/10 A3014 RMK AO2 RAE14B47 SLP158 OCNL CLDS
TPG MTNS W-NW P0000 60001 T01610100 10167 20156 51003=**

ACCIDENT TIME 1240 MDT

**[1251 MDT] KELP 171851Z 09012KT 7SM -RA FEW027 BKN030 OVC038 16/12
A3013 RMK AO2 SLP158 CLDS TPG MTNS SW-NW P0000 T01560117=**

**[1306 MDT] KELP 171906Z 09008G17KT 3SM -RA BR FEW022 BKN029 OVC039
14/13 A3013 RMK AO2 MTNS OBSCD SW-NW P0004 T01440128=**

[1331 MDT] KELP 171931Z 06014G20KT 2 1/2SM -RA BR FEW006 BKN029
OVC038 14/13 A3013 RMK AO2 MTNS OBSCD SW-NW P0008
T01390128=

⁵ ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, ceiling, temperature, dewpoint, altimeter, and barometric pressure.

⁶ Magnetic variation – The angle (at a particular location) between magnetic north and true north.

[1351 MDT] KELP 171951Z 07012KT 3SM RA BR FEW007 BKN015 OVC025
13/11 A3013 RMK AO2 SLP162 BKN V SCT MTNS OBSCD SW-NW
P0012 T01280111=

KELP weather at 1051 MDT was reported as wind from 140° at 8 knots, 10 miles visibility, light rain, few clouds at 2,800 feet agl, scattered clouds at 6,500 feet agl, overcast ceiling at 9,000 feet agl, temperature of 16° C, dew point temperature of 11° C, and an altimeter setting of 30.13 inches of mercury. Remarks: automated station with a precipitation discriminator, sea level pressure 1015.7 hPa, occasional clouds topping mountains southwest through northwest, one-hourly precipitation of 0.01 inches, temperature 15.6° C, dew point temperature 11.1° C.

KELP weather at 1151 MDT was reported as wind from 140° at 6 knots, 10 miles visibility, light rain, few clouds at 2,700 feet agl, broken ceiling at 4,000 feet agl, overcast skies at 5,500 feet agl, temperature of 16° C, dew point temperature of 10° C, and an altimeter setting of 30.14 inches of mercury. Remarks: automated station with a precipitation discriminator, rain ended at 1114 MDT, rain began at 1147 MDT, sea level pressure 1015.8 hPa, occasional clouds topping mountains west through northwest, one-hourly precipitation of a trace, 6 hourly precipitation of 0.01 inches, temperature 16.1° C, dew point temperature 10.0° C, 6-hourly maximum temperature of 16.7° C, 6-hourly minimum temperature of 15.6° C, 3-hourly pressure increase of 0.3 hPa.

KELP weather at 1251 MDT was reported as wind from 090° at 12 knots, 7 miles visibility, light rain, few clouds at 2,700 feet agl, broken ceiling at 3,000 feet agl, overcast skies at 3,800 feet agl, temperature of 16° C, dew point temperature of 12° C, and an altimeter setting of 30.13 inches of mercury. Remarks: automated station with a precipitation discriminator, sea level pressure 1015.8 hPa, clouds topping mountains southwest through northwest, one-hourly precipitation of a trace, temperature 15.6° C, dew point temperature 11.7° C.

KELP weather at 1306 MDT was reported as wind from 090° at 8 knots with gusts to 17 knots, 3 miles visibility, light rain and mist, few clouds at 2,200 feet agl, broken ceiling at 2,900 feet agl, overcast skies at 3,900 feet agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 30.13 inches of mercury. Remarks: automated station with a precipitation discriminator, mountains obscured southwest through northwest, one-hourly precipitation of a 0.04 inches, temperature 14.4° C, dew point temperature 12.8° C.

The observations from KM63 and KERP indicated ceilings were likely between 6,000 and 8,000 feet msl around the time of the accident with light rain moving across the area and a gusty north to east surface wind. This was consistent with the cold front (section 1.1) moving southward across the area at the accident time. In addition, the KERP observations indicated clouds topping and obscuring the mountainous terrain to the southwest through northwest of KERP. The mountains to the east of KERP were too far away to be included in the KERP observations, however, with clouds obscuring mountains and topping mountains to the west of KERP it was likely that the mountains and terrain near the accident site were also obscured due to clouds and precipitation at the accident time. Section 6.4 will further describe the movement of the precipitation over the accident site at the accident time and likely instrument meteorological conditions.

4.0 Upper Air Data

The closest official upper air sounding site was in Santa Teresa, New Mexico, (KEPZ) with a site number of 72364, located 37 miles west-southwest of the accident site, and a site elevation of 4,518 feet. The 1800 MDT KEPZ sounding was plotted on a standard Skew-T log P diagram⁷ with the derived stability parameters included in figure 9 (with data from the surface to 500-hPa, or 18,000 feet msl.) This data was analyzed utilizing the RAOB⁸ software package. The sounding depicted the Lifted Condensation Level (LCL)⁹ at 5,919 feet msl and a Convective Condensation Level (CCL)¹⁰ of 8,196 feet. The freezing level was located at 11,960 feet. The precipitable water value was 0.96 inches.

⁷ 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.

⁸ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania.

⁹ Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹⁰ Convective Condensation Level (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.

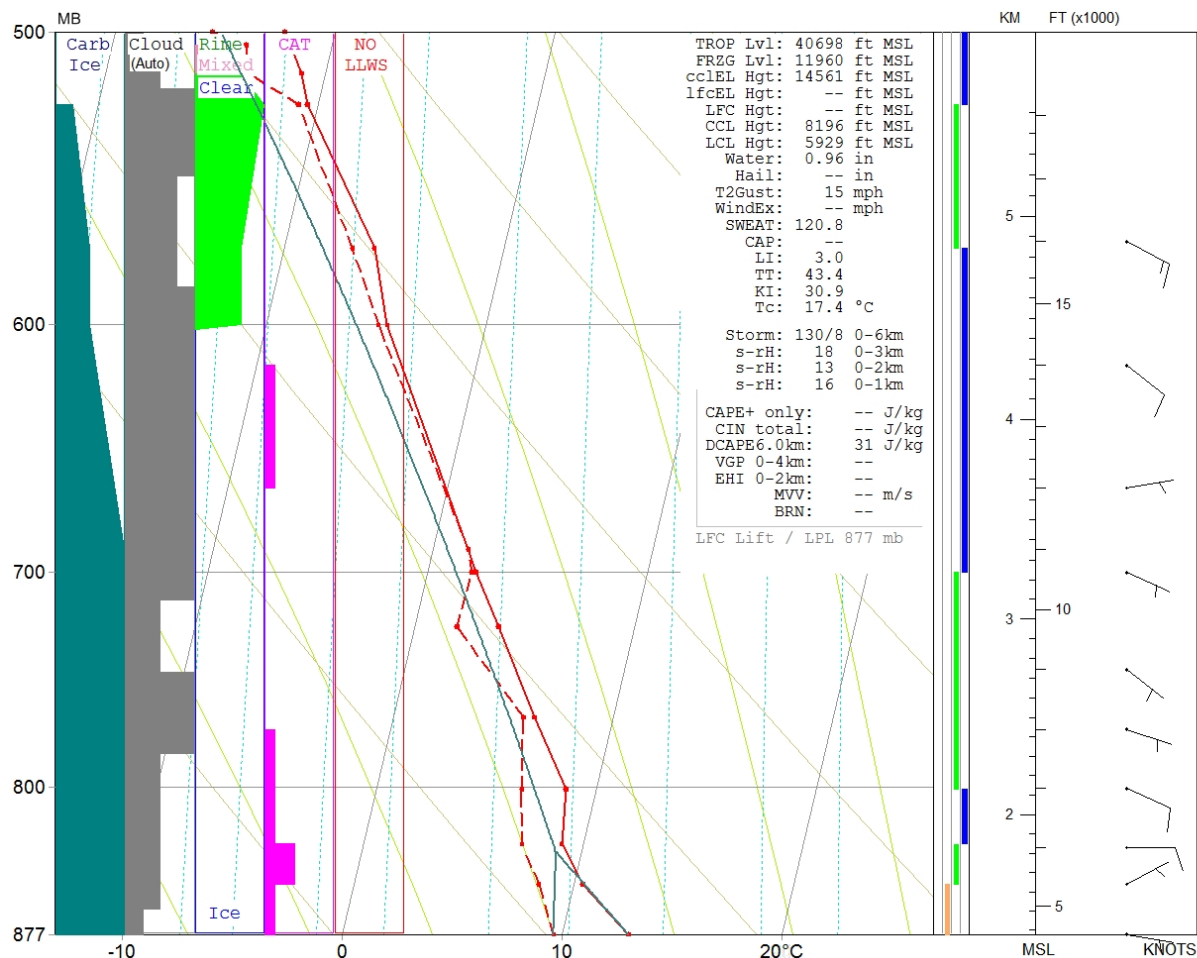


Figure 9 – 1800 MDT KEPZ sounding

The 1800 MDT KEPZ sounding indicated a relatively moist vertical environment from the surface through 18,000 feet msl and that vertical environment was mainly conditionally unstable. This conditionally unstable vertical environment would produce clouds and precipitation if a lifting mechanism was in the area to help lift the air. This environment would have been conducive of cloud formation as indicated by RAOB from the surface to 18,000 feet, especially with the mid-level trough and frontal boundaries in the area of the accident site (sections 1.1. and 1.2). Rime icing was indicated by RAOB above 15,000 feet.

The sounding wind profile indicated there was a surface wind from 100° at 4 knots and the wind remained out of the east through 18,000 feet with the wind speed remained at or below 15 knots. No low-level wind shear (LLWS) was indicated by RAOB and RAOB only indicated the possibility of light clear-air turbulence from the surface through 14,000 feet.

5.0 Satellite Data

Visible and infrared data from the Geostationary Operational Environmental Satellite number 15 (GOES-15) was obtained from the NCDC and processed with the NTSB's Man-computer Interactive Data Access System (McIDAS) workstation. Visible and infrared imagery (GOES-15 bands 1 and 4) at a wavelength of 0.65 microns (μm) and 10.7 μm retrieved brightness temperatures for the scene. Satellite imagery surrounding the time of the accident, from 1100 MDT through 1600 MDT 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-15 visible imagery from 1230 and 1245 MDT at 2X magnification with the accident site highlighted with a red square. Inspection of the visible imagery indicated a general west to east movement of the clouds over the accident site at the accident time. There were no breaks or holes in the clouds anywhere in southern New Mexico and western Texas. Figure 12 presents the GOES-15 infrared imagery from 1245 MDT at 6X magnification with the accident site highlighted with a red square. Inspection of the infrared imagery indicated more enhanced and higher clouds (greens, higher cloud tops) were south and east of the accident site at the accident time. The infrared data indicated that the cloud tops in the area of the accident site were all of equal or similar cloud top height. Based on the brightness temperatures above the accident site and the vertical temperature profile provided by the 1800 MDT KEPZ sounding, the approximate cloud-top heights over the accident site were 20,000 feet at 1245 MDT.

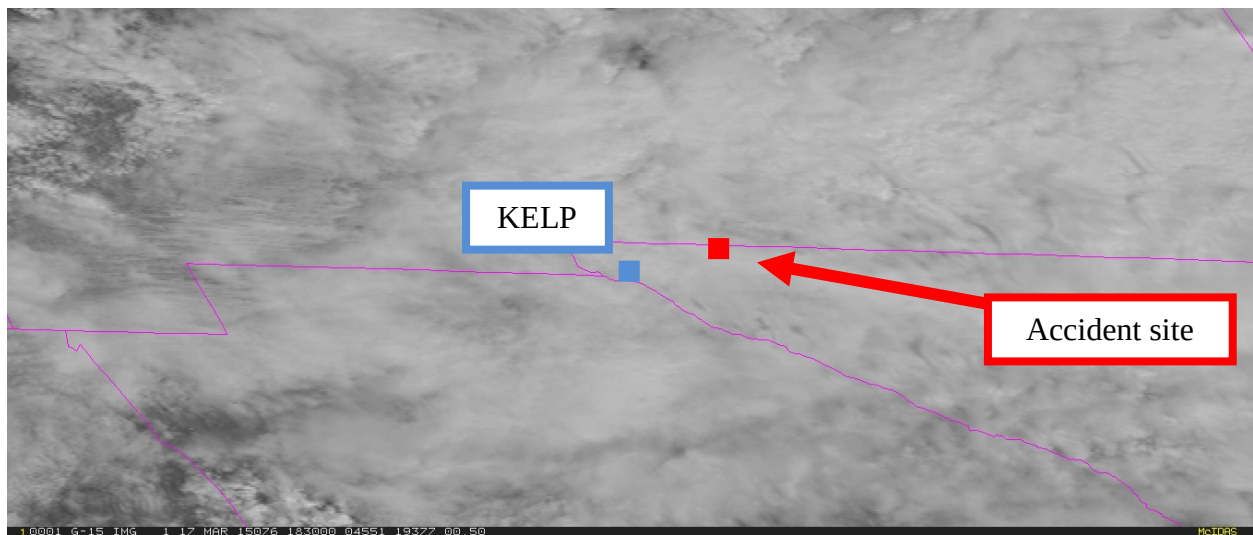


Figure 10 – GOES-15 visible image at 1230 MDT

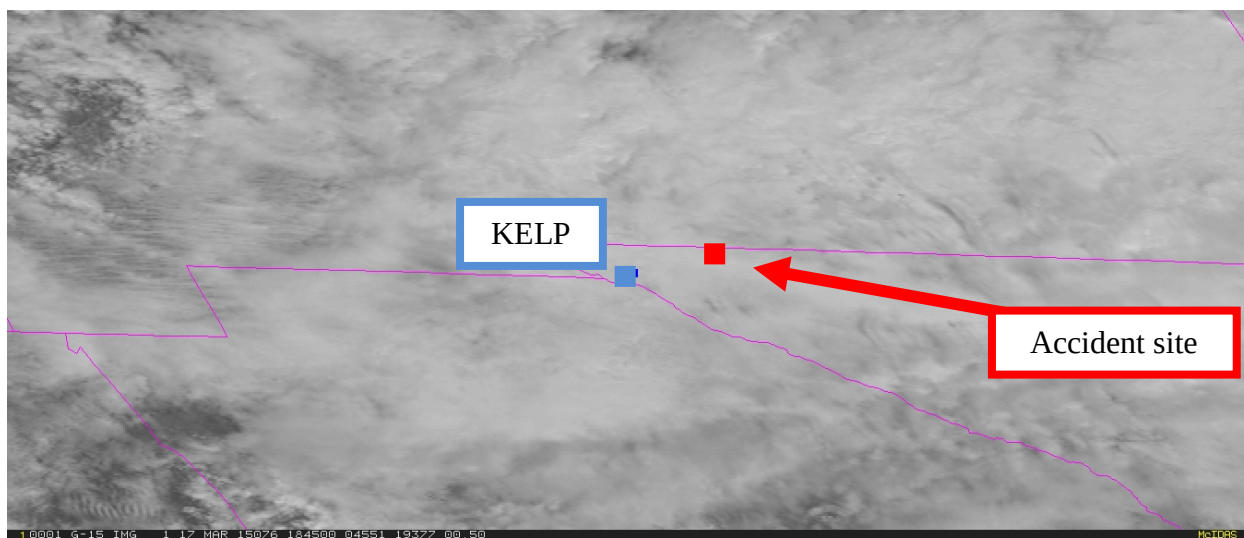


Figure 11 – GOES-15 visible image at 1245 MDT

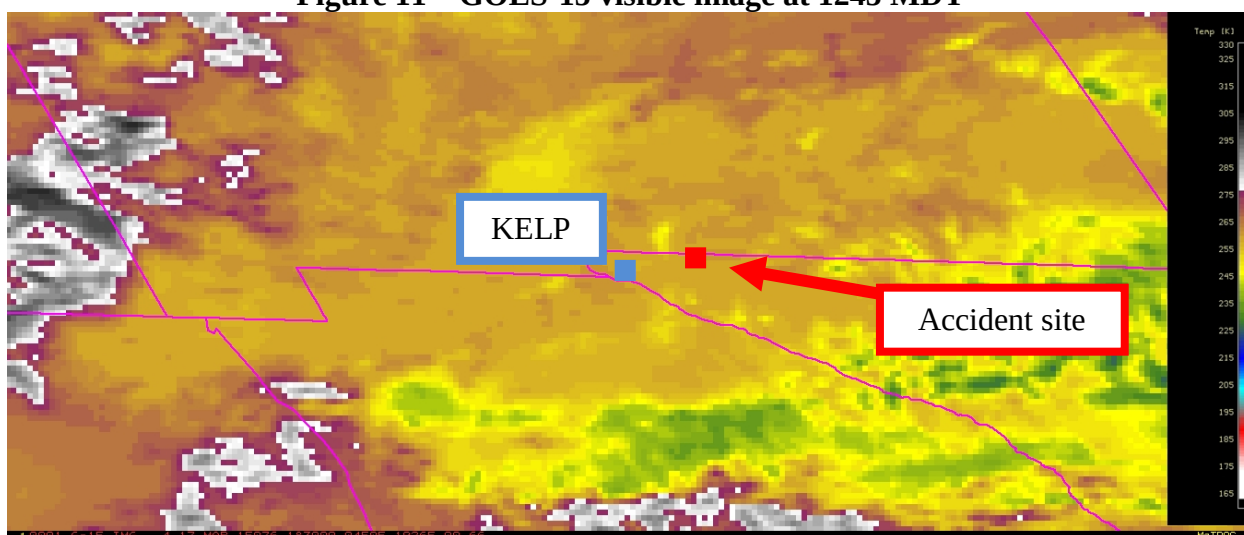


Figure 12 – GOES-15 infrared image at 1245 MDT

6.0 Radar Imagery Information

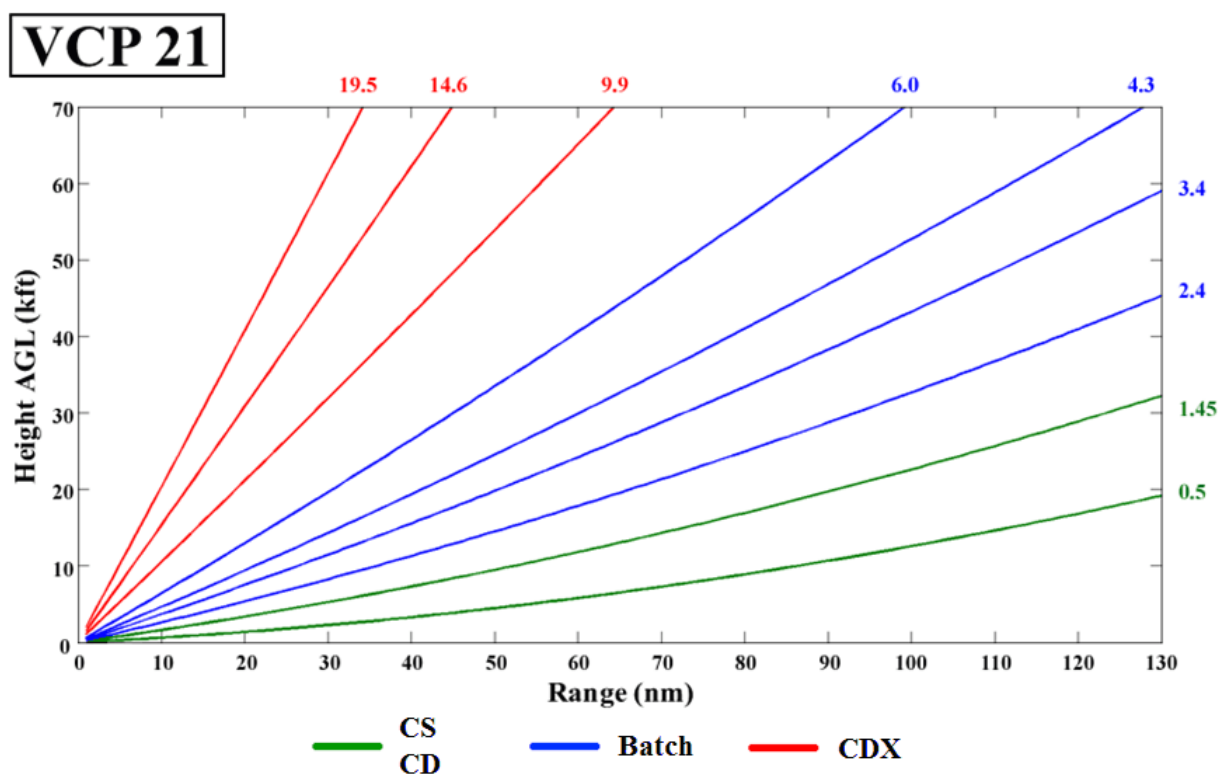
The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D)¹¹ was from KEPZ with a site elevation of 4,104 feet. Level II and III archive radar data was obtained from the NCDC utilizing the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software.

¹¹ 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.

6.1 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 five to ten 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 where the radar makes 9 elevation scans from 0.5° 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 KEPZ WSR-88D radar was operating in the precipitation mode (Mode A) VCP-21. 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.



VCP-21 Precipitation Mode Scan Strategy

6.2 Beam Height Calculation

Assuming standard refraction¹² of the WSR-88D 0.95° wide radar beam, the following table shows the approximate beam height and width¹³ information¹⁴ 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
0.5°	7,050 feet	5,230 feet	8,880 feet	3,650 feet
2.4°	14,480 feet	12,650 feet	16,300 feet	3,650 feet

Based on the radar height calculations, the 0.5° elevation scan depicted the conditions between 5,230 feet and 8,880 feet msl over the accident site and these are the closest altitudes to the accident flight level before the accident occurred.¹⁵ However, the 0.5° elevation scan was blocked by terrain east of KEPZ (figure 14) and therefore the closest data to the accident flight altitude (that was not blocked by terrain) before the accident was from the 2.4° elevation scan which depicted the conditions between 12,650 and 16,300 feet msl.

6.3 Reflectivity

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors¹⁶ it is a function of the drop size distribution, number of particles per unit volume, physical state (ice or water), shape, and aspect. Reflectivity is normally displayed in decibels (dBZ¹⁷), 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 1	< 5 5 to 9	

¹² Standard Refraction in the atmosphere is when the temperature and humidity distributions are approximately average, and values set at the standard atmosphere.

¹³ Beam width – A measure of the angular width of a radar beam.

¹⁴ Beamwidth values are shown for legacy resolution products. Super resolution products would an effective beamwidth that would be approximately half these values.

¹⁵ For more information please see the Air Traffic Control (ATC) data.

¹⁶ 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: drifting snow, blowing snow, blowing spray. (g) Liquid or solid deposits on exposed objects: dew, frost, rime, and glazed ice.

¹⁷ dBZ – A non-dimensional “unit” of radar reflectivity which represents a logarithmic power ratio (in decibels , or dB) with respect to radar reflectivity factor, Z.

	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	

Federal Aviation Administration (FAA) Advisory Circular AC 00-24B, “Thunderstorms,” dated January 2, 1983, also defines the echo intensity levels and potential weather phenomena associated with those levels. If the maximum VIP Level is 1 “weak” and 2 “moderate”, then light to moderate turbulence is possible with lightning. VIP Level 3 is “strong” and severe turbulence is possible with lightning. VIP Level 4 is “very heavy” and severe turbulence is likely with lightning. VIP Level 5 is “intense” with severe turbulence, lightning, hail likely, and organized surface wind gusts. VIP Level 6 is “extreme” with severe turbulence, lightning, large hail, extensive surface wind gusts and turbulence.

6.4 Radar Summary

Figure 13 provides a radar summary image from 1245 MDT with reflectivity values over the southwestern United States, with the accident site located in an area of 20 to 30 dBZ values. These reflectivity values indicated very light to moderate echoes near the accident site around the accident time and with a VIP level of 1 and 2.

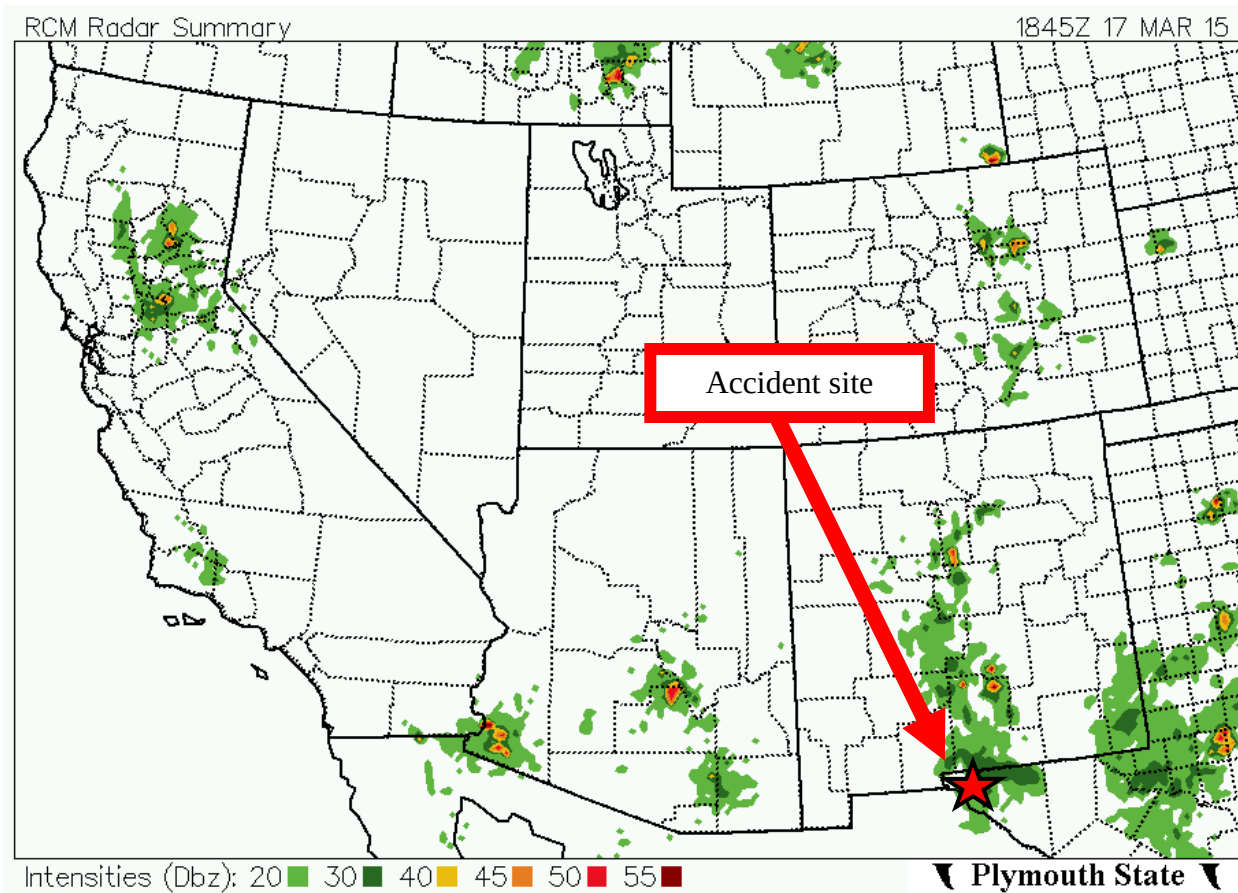


Figure 13 – Radar summary image for 1245 MDT with the accident site

6.5 Base Reflectivity and Lightning Data

Figure 14 presents the KEPZ WSR-88D base reflectivity images for the 0.5° elevation scan initiated at 1237 MDT with a resolution of 0.5° X 250 m. There were no precipitation targets over the accident site at the accident time on the 0.5° elevation scan and this was due to the weather radar beam from KEPZ being blocked by the terrain east of KEPZ and east of Santa Teresa (area blocked by terrain marked in figure 14). Figures 15, 16, and 17 present the KEPZ WSR-88D base reflectivity images for the 2.4° elevation scans initiated at 1231, 1237, and 1242 MDT with a resolution of 0.5° X 250 m. The base reflectivity indicated 10 to 25 dBZ values moving from east to west across the accident site between 12,650 and 16,300 feet msl. This likely resulted in rain across the mountainous terrain near the accident site at the accident time given the reports of light rain at KM63 and KELP (section 3.0). There were no lightning strikes near the accident site at the accident time.

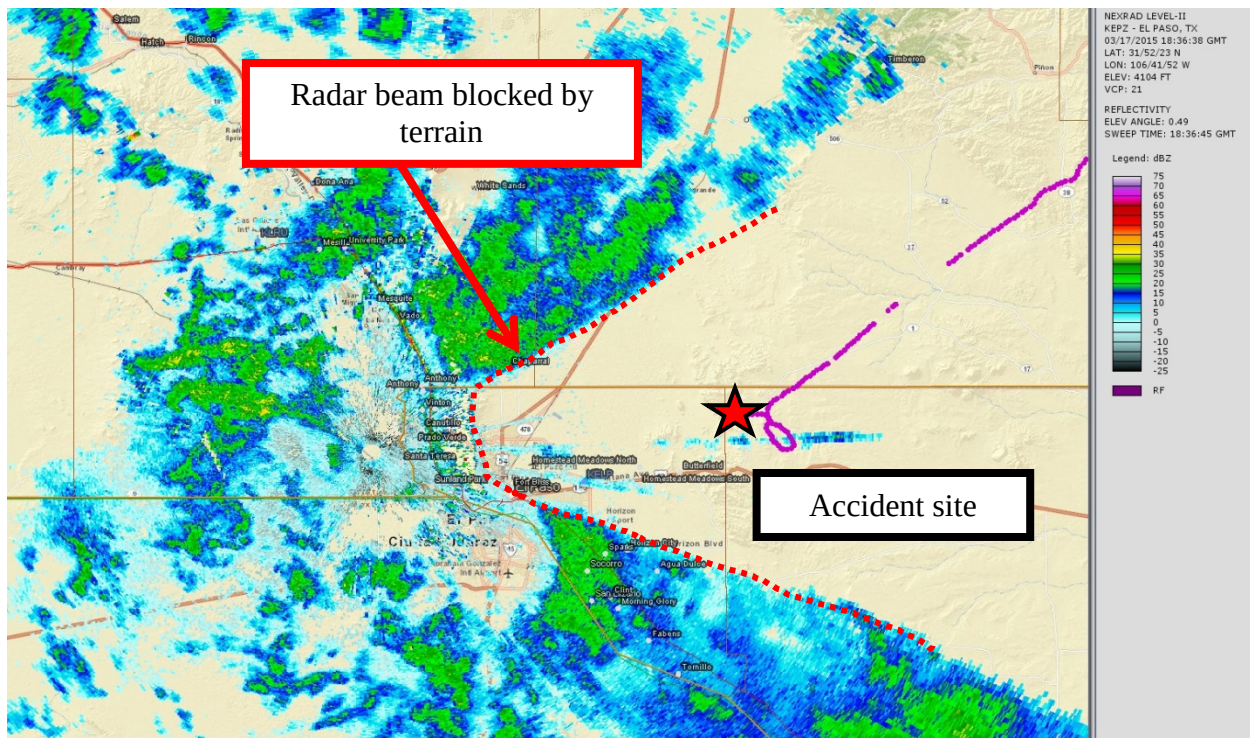


Figure 14 – KEPZ WSR-88D reflectivity for the 0.5° elevation scan initiated at 1237 MDT with ATC flight track

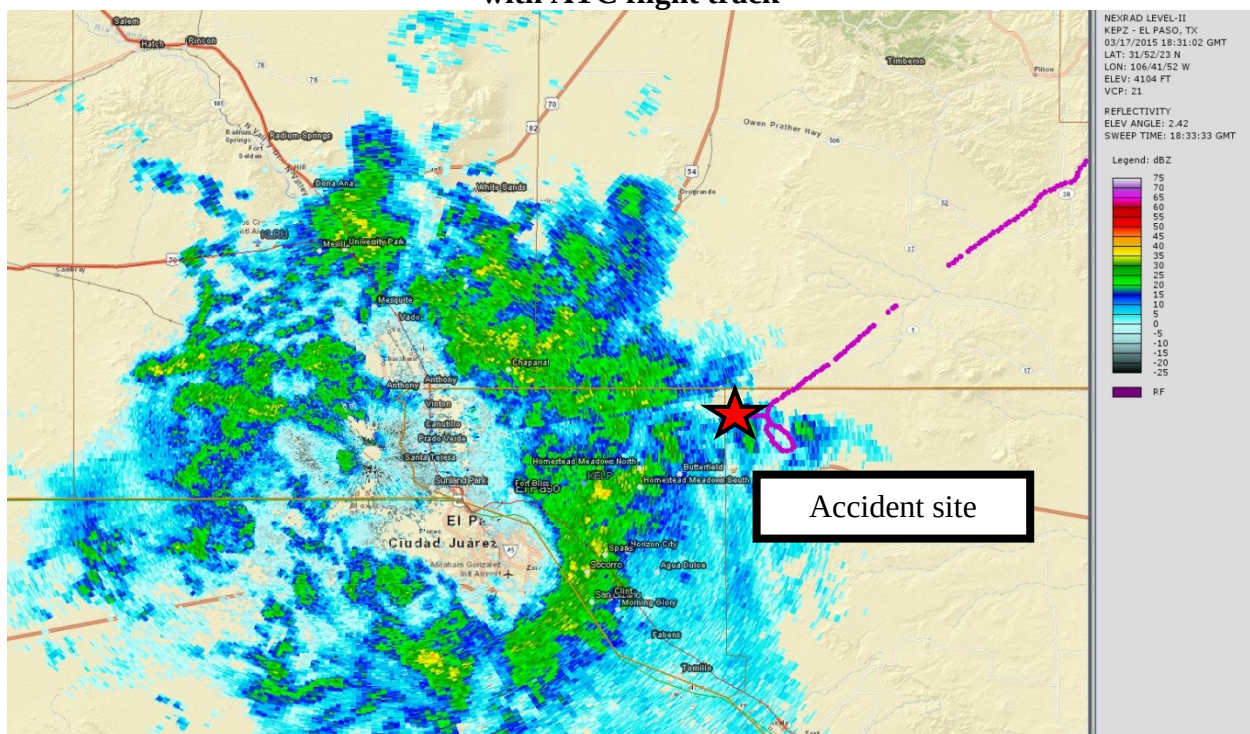


Figure 15 – KEPZ WSR-88D reflectivity for the 2.4° elevation scan initiated at 1231 MDT with ATC flight track

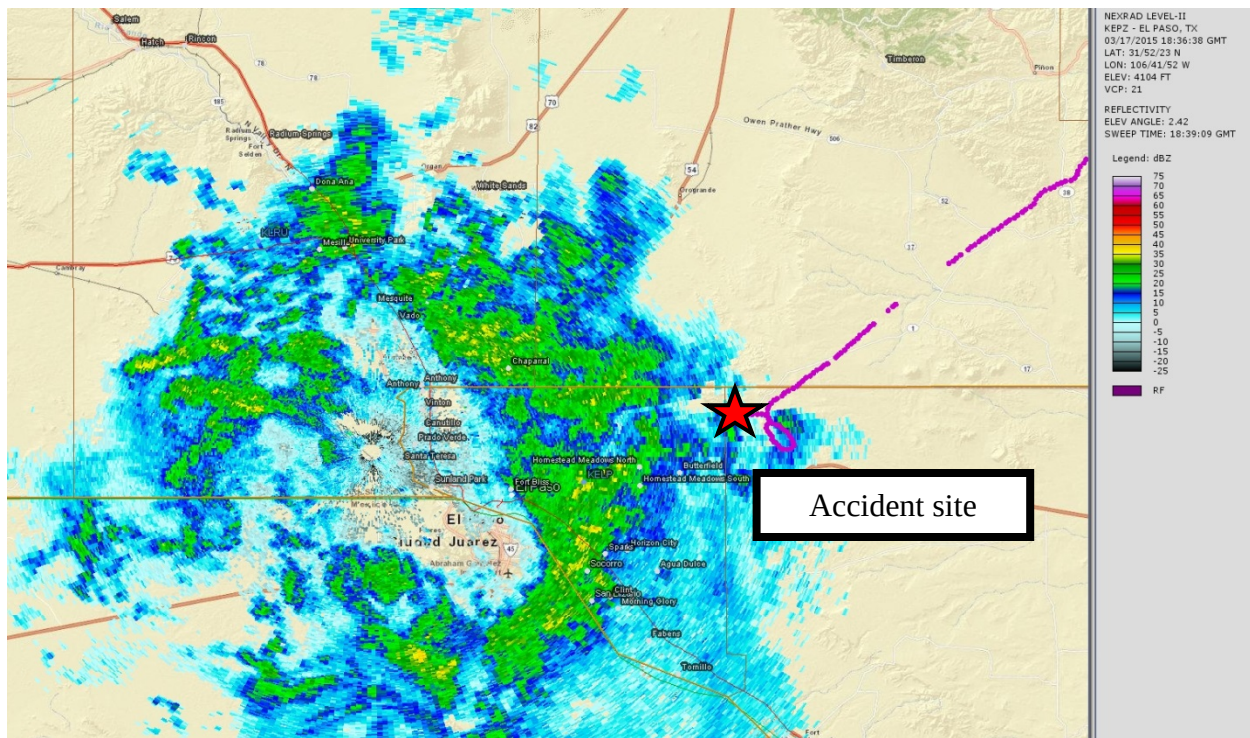


Figure 16 – KEPZ WSR-88D reflectivity for the 2.4° elevation scan initiated at 1237 MDT with ATC flight track

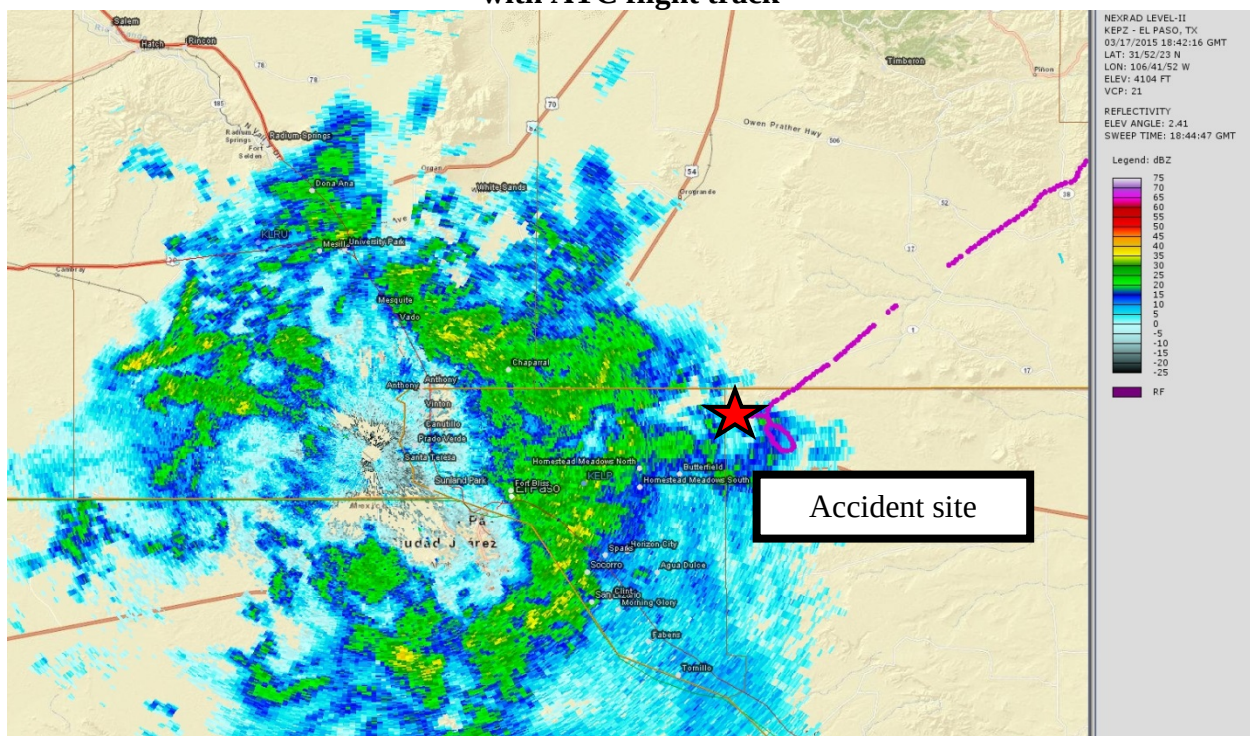


Figure 17 – KEPZ WSR-88D reflectivity for the 2.4° elevation scan initiated at 1242 MDT with ATC flight track

7.0 Pilot Reports

All pilot reports (PIREPs) were reviewed close to the accident site from around three hours prior to the accident time to around three hours after the accident time, and the PIREPs displayed below are the only PIREPs for below 15,000 feet msl:

ELP UA /OV 30E ELP 1735/TM 1735/FL140/TP BE36/TA 0/IC LT RIME ICE/RM ZAB TMU=

TCS UA /OV TCS/TM 1741/FL130/TP BE35/TA 0/IC LT RIME/RM ZAB TMU =

Routine pilot report (UA); 30 miles east of El Paso, Texas; Time – 1135 MDT (1735Z); Altitude – 14,000 feet; Type aircraft – Beechcraft Bonanza 36; Temperature – 0° C; Icing – Light rime.

Routine pilot report (UA); Over Truth or Consequences, New Mexico; Time – 1141 MDT (1741Z); Altitude – 13,000 feet; Type aircraft – Beechcraft Bonanza 35; Temperature – 0° C; Icing – Light rime.

8.0 SIGMET and CWSU Advisories

No SIGMET was valid for the accident site at the accident time for the accident flight.

No Center Weather Service Unit (CWSU) Advisory (CWA) was valid for the accident site at the accident time.

No Meteorological Impact Statements (MIS) were valid for the accident site at the accident time.

9.0 AIRMETs

AIRMETs Sierra and Zulu were issued at 0845 MDT, with an update to AIRMET Sierra at 1215 MDT, and valid at the accident time for the accident site for below 15,000 feet msl. They forecasted mountains obscured by clouds and precipitation, ceiling below 1,000 feet agl with visibilities below 3 miles in precipitation and mist, moderate icing between 12,000 feet and FL260¹⁸, and moderate icing between 10,000 feet and FL210:

WAUS44 KKCI 171815 AAA

WA4S

_DFWS WA 171815 AMD

AIRMET SIERRA UPDT 4 FOR IFR AND MTN OBSCN VALID UNTIL 172100

.

AIRMET IFR...TX AND CSTL WTRS...UPDT

FROM 60SW LBB TO 70ESE ABI TO CWK TO 30SE CRP TO 60E BRO TO 90W

BRO TO DLF TO 70SSE FST TO 30ENE ELP TO INK TO 60SW LBB

CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

¹⁸ Flight Level – A Flight Level (FL) is a standard nominal altitude of an aircraft, in hundreds of feet. 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.

.
AIRMET MTN OBSCN...TX
FROM 60W INK TO 70WNW DLF TO 50SSW MRF TO ELP TO 60W INK
MTNS OBSC BY CLDS/PCPN. CONDS DVLPG 18-21Z. CONDS CONTG BYD 21Z
THRU 03Z.

....
WAUS44 KPCI 171445
WA4S
_DFWS WA 171445
AIRMET SIERRA UPDT 3 FOR IFR AND MTN OBSCN VALID UNTIL 172100

.
AIRMET IFR...TX LA AND CSTL WTRS
FROM 50WSW TXK TO 20N LFK TO 40SE AEX TO 30S LCH TO 110S LCH TO
120SSW LCH TO 80E BRO TO 90W BRO TO 20WSW LRD TO DLF TO 50WSW
DLF TO 80SSE FST TO 20ENE MAF TO 70ESE ABI TO 50ENE TTT TO 50WSW
TXK
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

.
AIRMET MTN OBSCN...TX
FROM 60W INK TO 70WNW DLF TO 50SSW MRF TO ELP TO 60W INK
MTNS OBSC BY CLDS/PCPN. CONDS DVLPG 18-21Z. CONDS CONTG BYD 21Z
THRU 03Z.

....
WAUS44 KPCI 171445
WA4Z
_DFWZ WA 171445
AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 172100

.
AIRMET ICE...TX
FROM 40NE LBB TO 40W SPS TO 20NW CWK TO 30SSW CRP TO BRO TO 90W
BRO TO DLF TO 90SE MRF TO 60SW MRF TO ELP TO INK TO 60SSW TXO TO
40NE LBB
MOD ICE BTN 120 AND FL260. CONDS CONTG BYD 21Z THRU 03Z.

.
OTLK VALID 2100-0300Z...ICE OK TX AND CSTL WTRS
BOUNDED BY 30SSE END-60S MLC-60E CWK-20E BRO-90W BRO-DLF-60SW
MRF-ELP-INK-30SW TXO-40SSE MMB-30SSE END
MOD ICE BTN 120 AND FL260. CONDS CONTG THRU 03Z.

.
FRZLVL...RANGING FROM 020-160 ACRS AREA
MULT FRZLVL 020-100 BOUNDED BY 50W LBL-40S ICT-30WSW END-30E
AMA-30ESE TCC-30ESE TBE-50W LBL
080 ALG 50NNE TCC-40NNW AMA-40S ICT
120 ALG 60W DLF-40ESE FST-40SSW INK-20S ELP-ELP
120 ALG 50SSW TXO-20SE OSW

....
WAUS45 KPCI 171445
WA5Z
_SLCZ WA 171445
AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 172100

.
AIRMET ICE...AZ NM
FROM 40WSW ALS TO 30ESE TBE TO INK TO 20ESE ELP TO 50S TUS TO
40SW INW TO 50W RSK TO 40WSW ALS
MOD ICE BTN 100 AND FL210. CONDS CONTG BYD 21Z THRU 03Z.

.

AIRMET ICE...CA AND CSTL WTRS
FROM 40W BTY TO 120SW MZB TO 220SW MZB TO 180SSW RZS TO 20E EHF
TO 40W BTY
MOD ICE BTN 140 AND FL240. CONDS DVLPG 15-18Z. CONDS CONTG BYD
21Z THRU 03Z.

.
AIRMET ICE...ID MT NV UT WA OR CA AND CSTL WTRS
FROM 40S YXC TO 20ENE DBS TO 30SSW DBS TO 30WNW ELY TO 200SSW RZS
TO 150SW SNS TO 80NNW FMG TO 70NE LKV TO 60SW PDT TO 50NNW EPH TO
40S YXC
MOD ICE BTN FRZLVL AND FL240. FRZLVL 060-110. CONDS CONTG BYD 21Z
ENDG 21-00Z.

.
AIRMET ICE...ID MT WY
FROM 30SW YQL TO 20WNW HVR TO 20S GGW TO 60WSW DIK TO 70SW RAP TO
40NE BOY TO 30ESE DBS TO 30WSW FCA TO 30S YXC TO 30SW YQL
MOD ICE BTN FRZLVL AND FL240. FRZLVL SFC-090. CONDS CONTG BYD 21Z
THRU 03Z.

.
OTLK VALID 2100-0300Z...ICE ID MT WY WA OR
BOUNDED BY 20SSW YXC-50N GGW-60SW DIK-40WSW RAP-30SE
SHR-DBS-50SSE BOI-50S BKE-70NNW DNJ-80SW YXC-20SSW YXC
MOD ICE BTN FRZLVL AND FL240. FRZLVL 010-090. CONDS CONTG THRU
03Z.

.
FRZLVL...RANGING FROM SFC-130 ACRS AREA
MULT FRZLVL BLW 070 BOUNDED BY 20SSE YXC-40SSE HLN-30WSW DLN-
70WSW YXC-20SSE YXC
MULT FRZLVL 050-130 BOUNDED BY 60WSW MLS-40SSE MLS-60NW RAP-
70SW RAP-BFF-30ENE CHE-40WSW BOY-70SSW BIL-60WSW MLS
MULT FRZLVL 050-130 BOUNDED BY BFF-GLD-50W LBL-30ESE TBE-40NE
TCC-20ESE FTI-20SSW HBU-30ENE CHE-BFF
SFC ALG 70SW YXC-50W BIL-50ENE BIL-60SSE MLS-70W RAP-50W RAP
040 ALG GTF-40NNE BIL-70E SHR-50WSW RAP
080 ALG 30WNW DNJ-50N DNJ-70NNE JAC-50SSW CYS-30NE CIM-50N
TCC-50NNE TCC
120 ALG ELP-40N ELP-40WSW CME-50SSW TXO
120 BOUNDED BY 40E MTU-40NNE JNC-30ENE JNC-40ESE JNC-50SE RSK-
30NW ABQ-30WSW ABQ-70SW ABQ-20E SJN-20NW SJN-20E INW-20N
INW-20S TBC-20NW TBC-30NW TBC-30SE BCE-20NE BCE-40SE DTA-
40E DTA-50WSW MTU-40E MTU

....

10.0 Area Forecast

The Area Forecast issued at 0345 MDT valid at the accident time forecasted a broken ceiling at 10,000 feet msl with tops to 16,000 feet. At 0800 MDT and beyond the ceiling was forecast to be at 7,000 feet msl with overcast skies at 10,000 feet and tops to FL180. The tops were forecast to be as high as FL250 by 1200 MDT. Occasional visibilities between 3 and 5 miles were forecast along with light rain throughout the area:

FAUS44 KPCI 170945
FA4W
_DFWC FA 170945

SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 180400
CLDS/WX VALID UNTIL 172200...OTLK VALID 172200-180400
OK TX AR TN LA MS AL

.
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...10Z CDFNT SRN VT-SE MO-NERN OK-LOW PRES OKC THEN SWWD
TO CDS-TXO-WRN CO. HI PRES LA CSTL WTRS. HI PRES RDG NCNTRL SD-OK
PNHDL. 04Z CDFNT GA CSTL WTRS-SW AL-LOW PRES 40N TTT. STNR FNT
40N TTT-40NW FST. CDFNT 40NW FST-30NE ELP-SCNTRL CO.

.
OK
PNHDL...BKN050 TOP 070. THRU 22Z WND NLY 25G35KT. 12Z BKN060 TOP
080. 18Z SCT CI. OTLK...VFR TIL 00Z WND.
NW...SCT CI. 12Z BKN060 TOP 080. WND N 20G30KT. 20Z SCT060. WND N
G25-30KT. OTLK...VFR TIL 00Z WND.
SW...SKC. 14Z SCT060. WND N 20G30KT. OTLK...VFR WND 01Z MVFR RA
TSRA BR.
CNTRL...SKC. 15Z SCT035 BKN CI. WND N 20G30KT. OTLK...VFR WND 02Z
MVFR CIG RA BR WND.
NERN...SCT CI. 16Z SCT120. 18Z WND N G25KT. 21Z SCT-BKN CI. WND N
G25-30KT. OTLK...VFR TIL 00Z WND.
SE...SKC. TIL 13Z VIS 3-5SM BR. 15Z SCT120. OTLK...VFR 03Z MVFR
CIG RA.

.
NWRN TX
PNHDL...SKC. 11Z SCT060. WND N 20G35KT. 15Z OVC060 TOP 080. WND N
20G35KT. 21Z SCT-BKN CI. WND NELY G25KT. OTLK...VFR TIL 00Z WND.
RMNDR...SKC. 18Z BKN070 TOP FL250. 20Z OVC050. OTLK...MVFR CIG
02Z IFR CIG RA BR.

.
SWRN TX
MTNS WWD...BKN100 TOP 160. 14Z BKN070 OVC100 TOP FL180. BECMG
1820 TOP FL250. OCNL VIS 3-5SM -RA. OTLK...MVFR CIG RA.
RMNDR W OF PECOS RVR...BKN120 TOP 150. 16Z OVC100. 21Z BKN060 TOP
FL250. WDLY SCT -SHRA. OTLK...MVFR CIG SHRA.
E OF PECOS RVR...BKN030-035 OVC070 TOP 160. 18Z OCNL -RA.
OTLK...IFR CIG RA BR.

.
N CNTRL TX
NW...SKC. 15Z BKN070 TOP 090. 18Z BKN040 TOP 060. WND N G25-30KT.
OTLK...VFR 00Z MVFR RA TSRA BR.
SW...SCT100. 18Z OVC035 TOP 060. OTLK...MVFR CIG 00Z IFR CIG RA
BR.
NERN...SCT025. 17Z SCT030. 21Z BKN040 BKN080 TOP 100. OTLK...MVFR
CIG 00Z SHRA.
SE...OVC010-015 TOP 025. 19Z BKN030 TOP 100. 21Z TOP LYRD FL220.
WDLY SCT -SHRA. OTLK...MVFR CIG SHRA.

.
NERN TX
OVC025 TOP 040. 11Z OVC010-020. VIS 3-5SM BR. 14Z BKN020. 18Z
SCT050. OTLK...VFR.

SERN TX
OVC010-020 TOP 040. VIS 3-5SM BR. 16Z SCT030. OTLK...VFR 01Z MVFR CIG.

.

S CNTRL TX
HILL COUNTRY...OVC030-035 TOP 150. 19Z OCNL -RA. OTLK...IFR CIG RA BR.
MIDDLE CSTL PLAIN...OVC010 TOP 025. VIS 3SM BR. 18Z BKN015 LYRD 160. WDLY SCT -SHRA. OTLK...MVFR CIG SHRA 01Z IFR CIG SHRA BR.
LWR CSTL PLAIN...OVC010 TOP 035. VIS 3SM BR. OCNL -DZ. 15Z VIS 3-5SM BR. 19Z TOP LYRD FL300. VIS 3-5SM BR. SCT -SHRA. OTLK...IFR CIG SHRA BR.
LWR RIO GRANDE VLY...OVC010 TOP 110. VIS 3SM BR. 15Z TOP FL300. 18Z SCT -SHRA/-TSRA. CB TOP FL360. OTLK...IFR CIG SHRA TSRA BR.
RMNDR...OVC015 TOP 060. VIS 3SM BR. OCNL -DZ. 14Z TOP LYRD FL300. 19Z VIS 5SM -RA BR. OTLK...IFR CIG RA BR.

.

AR LA
NW AR...SCT-BKN CI. 18Z BKN035 TOP 070. OTLK...MVFR CIG.
SW AR/NW LA...SCT015. VIS 3SM BR. 14Z SCT CI. 21Z SCT040 SCT120. OTLK...VFR 02Z MVFR CIG.
NERN AR...SKC. TIL 13Z OCNL VIS 5SM BR. 18Z OVC030 TOP 060. OTLK...VFR.
SE AR/NERN-CNTRL LA...SKC. TIL 14Z OCNL VIS 3-5SM BR. OTLK...VFR.
SW LA...SKC. 11Z OVC010-020 TOP 040. VIS 3-5SM BR. 15Z SCT030. 18Z SCT050 SCT100. OTLK...VFR.
SE LA...SKC. TIL 14Z OCNL VIS 3-5SM BR. OTLK...VFR.

.

TN
WRN...SKC. TIL 13Z OCNL VIS 5SM BR. 18Z OVC030 TOP 060. OTLK...VFR.
MIDDLE...SKC. 14Z SCT060. 19Z OVC025 TOP 050. OTLK...MVFR CIG 02Z VFR.
ERN...SKC. 11Z OVC045 TOP 060. 14Z OVC025-030. OTLK...MVFR CIG 03Z VFR.

.

MS AL
NRN MS...SCT035. TIL 14Z OCNL VIS 3-5SM BR. 20Z SCT040. OTLK...VFR 00Z MVFR CIG.
CNTRL-SE MS/SW AL...SKC. VIS 3-5SM BR. 14Z SCT025. 19Z SCT050. OTLK...VFR.
SW MS...SKC. TIL 14Z OCNL VIS 3-5SM BR. 18Z SCT035 SCT130. OTLK...VFR.
NRN AL...SCT035. 12Z BKN025 TOP 050. 16Z BKN035. 21Z OVC025. OTLK...MVFR CIG.
CNTRL AL...SKC. 13Z BKN035 TOP 050. 16Z SCT050. OTLK...VFR.
SE AL...SKC. 18Z SCT040. OTLK...VFR.

....

11.0 Terminal Aerodrome Forecast

KELP was the closest official NWS site with a Terminal Aerodrome Forecast (TAF). The TAF valid at the time of the accident was issued at 1135 MDT and was valid for a 24-hour period beginning at 1200 MDT. The TAF forecasted:

TAF KELP 171735Z 1718/1818 **14010KT P6SM VCSH FEW030 SCT070 OVC090**
FM172000 07015KT P6SM -SHRA BKN050
TEMPO 1722/1802 2SM TSRA OVC040CB
FM180200 11007KT P6SM VCSH BKN050
FM180900 16005KT P6SM BKN050=

The KELP forecast expected wind from 140° at 10 knots, greater than 6 miles visibility, vicinity¹⁹ showers, few clouds at 3,000 feet agl, scattered clouds at 7,000 feet agl, an overcast ceiling at 9,000 feet agl at the accident time.

The KELP TAF issued at 0520 MDT was the valid TAF before the 1135 MDT updated TAF, and the 0520 MDT TAF was valid for a 24-hour period beginning at 0600 MDT:

TAF KELP 171120Z 1712/1812 **03006KT P6SM VCSH BKN060**
FM172000 07012KT P6SM -SHRA BKN050
TEMPO 1722/1802 2SM TSRA OVC040CB
FM180800 10007KT P6SM BKN040=

The 0520 MDT TAF expected wind from 030° at 6 knots, greater than 6 miles visibility, vicinity showers, a broken ceiling at 6,000 feet agl at the accident time.

12.0 National Weather Service Area Forecast Discussion

The National Weather Service Office in El Paso, Texas/Santa Teresa, New Mexico, issued an Area Forecast Discussion (AFD) at 0347 MDT. The aviation section of the AFD mentioned scattered areas of MVFR²⁰ ceilings and isolated areas of IFR²¹ conditions due to shower and thunderstorm activity. Some of the thunderstorms could produce wind gusts to 40 mph and small hail as well:

FXUS64 KEPZ 170947
AFDEPZ
AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE EL PASO TX/SANTA TERESA NM
347 AM MDT TUE MAR 17 2015
.SYNOPSIS...
MOIST UNSTABLE AIR WILL FLOW INTO NEW MEXICO AND WEST TEXAS WHILE
UPPER DISTURBANCES AND WEAK COLD FRONTS PUSH INTO THE REGION. THIS

¹⁹ In the vicinity of the airport is defined as a weather phenomenon within 5-10 miles of the airfield, but not over the airfield.

²⁰ Marginal Visual Flight Rules – Refers to the general weather conditions pilots can expect at the surface. MVFR criteria means a ceiling between 1,000 and 3,000 feet agl and/or 3 to 5 miles visibility.

²¹ Instrument Flight Rules – Refers to the general weather conditions pilots can expect at the surface. IFR criteria means a ceiling below 1,000 feet agl and/or less than 3 miles visibility.

WEATHER PATTERN WILL GENERATE SHOWERS AND THUNDERSTORMS ACROSS MUCH OF THE BORDERLAND TODAY THROUGH SATURDAY. WESTERLY WINDS WILL BRING WARMER DRY WEATHER EARLY NEXT WEEK.

&&

.DISCUSSION...

ACTIVE...COMPLEX AND SOMEWHAT UNUSUAL WEATHER PATTERN WILL AFFECT THE SOUTHWESTERN UNITED STATES THROUGH THE NEXT 5 DAYS. EARLY THIS MORNING AN UPPER LEVEL LOW PRESSURE SYSTEM WAS LOCATED OVER NORTHWESTERN MEXICO WITH DEEP CYCLONIC CIRCULATION AROUND IT TRANSPORTING VERY ABUNDANT MOISTURE INTO SOUTHERN NEW MEXICO/WEST TEXAS. SYSTEM WILL MOVE SLOWLY TO THE NORTHEAST TODAY WITH FURTHER MOISTURE TRANSPORT PUSHING PRECIPITABLE WATER TO WELL ABOVE NORMAL AND NEAR RECORD LEVELS OF AROUND .8 TO 1 INCH. IN ADDITION A WEAK COLD FRONT WILL MOVE INTO THE CWA FROM THE NORTHEAST. THUS A SITUATION WILL DEVELOP WHERE INCREASING DIFFERENTIAL PVA AND DYNAMIC FORCING ALOFT WILL SPREAD OVER LOW LEVEL FRONTOGENETIC FORCING AND UPLIFT ASSOCIATED WITH SURFACE BOUNDARY. THIS SCENARIO SHOULD GENERATE WIDESPREAD RAINFALL THIS AFTERNOON AND THIS EVENING. LIMITING FACTOR WILL BE VERY MARGINAL INSTABILITY BUT GIVEN THE HIGH AMOUNTS OF MOISTURE ISOLATED AREAS OF THUNDERSTORMS AND HEAVY RAINFALL LOOK POSSIBLE.

UPPER LOW WILL BE EAST OF THE ROCKIES BY EARLY WEDNESDAY MORNING WITH SHORT WAVE RIDGE ALOFT AND LEE CYCLONE FORMATION ALONG THE FRONT RANGE. THIS SHOULD GREATLY DIMINISH PRECIP THREAT MOST AREAS THROUGH EARLY AFTERNOON. HOWEVER ANOTHER UPPER LOW WILL BE MOVING SLOWLY EASTWARD INTO SOUTHERN CALIFORNIA/NORTHERN BAJA BY LATE TOMORROW AFTERNOON WITH BACKING MORE SOUTHERLY FLOW AHEAD OF IT TRANSPORTING MOISTURE BACK TOWARD NEW MEXICO/WEST TEXAS. THIS WILL SUSTAIN SOME THREAT OF RAIN WEDNESDAY AFTERNOON/WEDNESDAY NIGHT...ESPECIALLY OVER WESTERN ZONES WHICH WILL BE CLOSER TO THE UPPER LOW CENTER.

THURSDAY THROUGH SATURDAY THE UPPER LOW WILL CONTINUE TO DRIFT SLOWLY EAST WITH SYSTEM NOT MOVING ACROSS THE CWA UNTIL SATURDAY. APPROACH OF SYSTEM WILL BRING INCREASING DYNAMIC FORCING WHILE SOUTHERLY FLOW AHEAD OF IT WILL SUSTAIN MOISTURE INFLOW WITH PRECIPITABLE REMAINING AROUND .7 INCH. IN ADDITION ANOTHER WEAK COLD FRONT WILL PUSH SOUTHWARD THROUGH THE CWA ON FRIDAY. THESE FACTORS WILL MAINTAIN CONVECTIVE THREAT INTO SATURDAY. INSTABILITY WILL REMAIN MARGINAL BUT 400 MB WIND SPEEDS OF AROUND 40 TO 50 KT MUCH OF THE PERIOD SUGGESTS THREAT OF SEVERE WEATHER SHOULD BE MONITORED...ESPECIALLY IF AIR MASS BECOMES MORE UNSTABLE THEN WHAT IS NOW EXPECTED.

SUNDAY THROUGH TUESDAY WEST TO NORTHWEST FLOW ALOFT WILL SUSTAIN INFLOW OF DRIER AIR WITH NO PRECIP EXPECTED. RATHER STRONG LEE CYCLONE TO THE NORTHEAST MAY ALSO SUPPORT BREEZY CONDITIONS ON SUNDAY.

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.AVIATION...VALID 17/12Z-18/12Z.

SCATTERED AREAS MVFR CEILINGS AND VISIBILITY AND ISOLATED IFR CONDITIONS WILL OCCUR IN SHOWERS AND THUNDERSTORMS...ESPECIALLY BETWEEN 20Z AND 06Z. ISOLATED STORMS MAY PRODUCER WIND GUSTS TO 40 MPH AND SMALL HAIL.

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.FIRE WEATHER...

MOIST UNSTABLE AIR WILL FLOW INTO NEW MEXICO AND WEST TEXAS WHILE UPPER DISTURBANCES AND WEAK COLD FRONTS PUSH INTO THE REGION. THIS

WEATHER PATTERN WILL GENERATE SHOWERS AND THUNDERSTORMS ACROSS MUCH OF THE BORDERLAND TODAY THROUGH SATURDAY. THIS SITUATION SHOULD GREATLY REDUCE THE FIRE DANGER AS TOTAL RAINFALL AMOUNTS WILL BE AROUND A HALF INCH ACROSS MOST AREAS BUT WITH RAINFALL AMOUNTS EXCEEDING AN INCH OVER SOME LOCATIONS. TEMPERATURES WILL REMAIN NEAR OR A LITTLE BELOW NORMAL THROUGH FRIDAY WITH WIND SPEEDS AROUND 10 TO 20 MPH. WESTERLY WINDS WILL BRING WARMER DRY WEATHER BACK TO THE REGION EARLY NEXT WEEK.

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.PRELIMINARY POINT TEMPS/POPS...

EL PASO	66 53 70 55 71 / 60 50 20 20 10
SIERRA BLANCA	60 48 67 50 68 / 60 50 20 20 10
LAS CRUCES	65 49 69 49 69 / 50 40 20 20 20
ALAMOGORDO	65 48 69 48 71 / 30 30 20 20 20
CLOUDCROFT	46 39 50 37 49 / 60 40 30 30 30
TRUTH OR CONSEQUENCES	67 49 64 48 67 / 20 30 30 20 30
SILVER CITY	62 46 60 44 60 / 40 50 50 30 30
DEMING	66 50 70 48 69 / 50 40 30 20 20
LORDSBURG	69 49 68 46 66 / 30 40 40 30 30
WEST EL PASO METRO	65 53 70 56 70 / 60 50 20 20 10
DELL CITY	63 47 70 48 72 / 50 60 20 20 10
FORT HANCOCK	65 52 71 53 72 / 50 50 20 20 10
LOMA LINDA	61 49 64 50 65 / 60 50 20 20 10
FABENS	64 51 70 53 71 / 60 50 20 20 10
SANTA TERESA	63 50 70 52 70 / 60 50 20 20 10
WHITE SANDS HQ	64 51 69 52 68 / 50 40 20 20 20
JORNADA RANGE	65 46 70 46 70 / 40 40 20 20 20
HATCH	64 49 70 48 69 / 30 40 20 20 20
COLUMBUS	66 52 69 51 68 / 50 40 30 20 20
OROGRANDE	64 51 68 52 69 / 40 40 20 20 10
MAYHILL	51 41 57 41 58 / 60 50 30 30 30
MESCALERO	53 42 58 39 58 / 60 40 30 30 30
TIMBERON	52 41 57 41 57 / 60 50 30 30 20
WINSTON	61 45 61 44 59 / 40 50 40 30 30
HILLSBORO	60 48 66 46 64 / 30 40 30 30 30
SPACEPORT	65 48 68 44 69 / 20 30 20 20 20
LAKE ROBERTS	60 44 59 41 59 / 40 50 40 30 40
HURLEY	64 48 62 44 62 / 30 40 40 30 20
CLIFF	68 45 67 44 66 / 30 50 40 30 30
MULE CREEK	70 44 64 37 63 / 30 50 40 40 30
FAYWOOD	64 47 65 46 63 / 40 40 40 30 30
ANIMAS	67 50 69 48 67 / 50 40 40 30 30
HACHITA	66 49 70 47 68 / 50 40 40 30 20
ANTELOPE WELLS	67 49 69 46 67 / 50 30 40 30 30
CLOVERDALE	64 48 65 46 64 / 50 30 50 40 30

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.EPZ WATCHES/WARNINGS/ADVISORIES...

NM...NONE.

TX...NONE.

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13.0 National Weather Service Hazardous Weather Outlook

The National Weather Service Office in El Paso, Texas/Santa Teresa, New Mexico, issued a Hazardous Weather Outlook (HWO) at 0533 MDT. The HWO mentioned scattered to numerous rain showers with isolated thunderstorms occurring mainly during the afternoon and evening hours with heavy rains, minor flooding, and strong winds all possible with the thunderstorms and stronger showers:

FLUS44 KEPZ 171130

HWOEPZ

HAZARDOUS WEATHER OUTLOOK

NATIONAL WEATHER SERVICE EL PASO TX/SANTA TERESA NM

533 AM MDT TUE MAR 17 2015

NMZ401>417-TXZ418>424-181100-

UPPER GILA RIVER VALLEY-SOUTHERN GILA HIGHLANDS/BLACK RANGE-

SOUTHERN GILA FOOTHILLS/MIMBRES VALLEY-

SOUTHWEST DESERT/LOWER GILA RIVER VALLEY-LOWLANDS OF THE BOOTHEEL-

UPLANDS OF THE BOOTHEEL-SOUTHWEST DESERT/MIMBRES BASIN-

EASTERN BLACK RANGE FOOTHILLS-SIERRA COUNTY LAKES-

NORTHERN DONA ANA COUNTY-SOUTHERN DONA ANA COUNTY/MESILLA VALLEY-

CENTRAL TULAROSA BASIN-SOUTHERN TULAROSA BASIN-

WEST SLOPES SACRAMENTO MOUNTAINS BELOW 7500 FEET-

SACRAMENTO MOUNTAINS ABOVE 7500 FEET-

EAST SLOPES SACRAMENTO MOUNTAINS BELOW 7500 FEET-OTERO MESA-

WESTERN EL PASO COUNTY-EASTERN/CENTRAL EL PASO COUNTY-

NORTHERN HUDSPETH HIGHLANDS/HUECO MOUNTAINS-SALT BASIN-

SOUTHERN HUDSPETH HIGHLANDS-

RIO GRANDE VALLEY OF EASTERN EL PASO/WESTERN HUDSPETH COUNTIES-

RIO GRANDE VALLEY OF EASTERN HUDSPETH COUNTY-

533 AM MDT TUE MAR 17 2015

THIS HAZARDOUS WEATHER OUTLOOK IS FOR PORTIONS OF NM AND TX.

.DAY ONE...TODAY AND TONIGHT.

SCATTERED TO NUMEROUS RAIN SHOWERS WITH ISOLATED THUNDERSTORMS WILL OCCUR WITH MOST ACTIVITY DURING THE AFTERNOON AND EVENING. ISOLATED LOCATIONS MAY EXPERIENCE HEAVY RAINFALLS WHICH MAY CAUSE MINOR FLOODING OR THE PONDING OF WATER...MAINLY ACROSS LOW LYING AREAS AND AROUND LOW WATER CROSSINGS. WINDS MAY ALSO GUST TO 40 MPH WITH A FEW STORMS. TOTAL RAINFALL AMOUNTS WILL BE AROUND .25 INCH BUT VERY ISOLATED LOCATIONS MAY RECEIVE UP TO AN INCH.

.DAYS TWO THROUGH SEVEN...WEDNESDAY THROUGH MONDAY.

ISOLATED TO SCATTERED SHOWERS AND THUNDERSTORMS WEDNESDAY THROUGH SATURDAY AFTERNOON. ISOLATED LOCATIONS MAY EXPERIENCE HEAVY RAINFALLS WITH MINOR FLOODING OR THE PONDING OF WATER. WIND GUSTS TO 40 MPH MAY ALSO OCCUR WITH A FEW STORMS. LITTLE OR NO SNOW EXPECTED ACROSS AREA MOUNTAINS.

.SPOTTER INFORMATION STATEMENT...

SPOTTERS SHOULD REPORT ANY SIGNIFICANT WEATHER SUCH AS HEAVY RAINS TO THE NATIONAL WEATHER SERVICE.

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14.0 Pilot Weather Briefing

The accident pilot did not receive an official weather briefing from Lockheed Martin Flight Service (LMFS) or any other official source. There is no knowledge of any additional weather briefing information the accident pilot received.

15.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for the accident site on March 17, 2015, indicated the following:

SUN

Begin civil twilight	0647 MDT
Sunrise	0712 MDT
Sun transit	1312 MDT
Sunset	1913 MDT
End civil twilight	1938 MDT

F. LIST OF ATTACHMENTS

None.

Paul Suffern
NTSB, AS-30