



National Transportation Safety Board

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

March 18, 2015

**WEATHER STUDY
CEN15FA171**

A. Accident

Location: Eufaula, Oklahoma

Date: March 12, 2015

Time: about 2315 Central daylight time (0415 UTC¹ on March 13, 2015)

Aircraft: Airbus AS350, registration: N929EM

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 for March 12, 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: 35.355171° North latitude, 95.800277° West longitude.

¹ UTC – abbreviation for Coordinated Universal Time

Synoptic Conditions

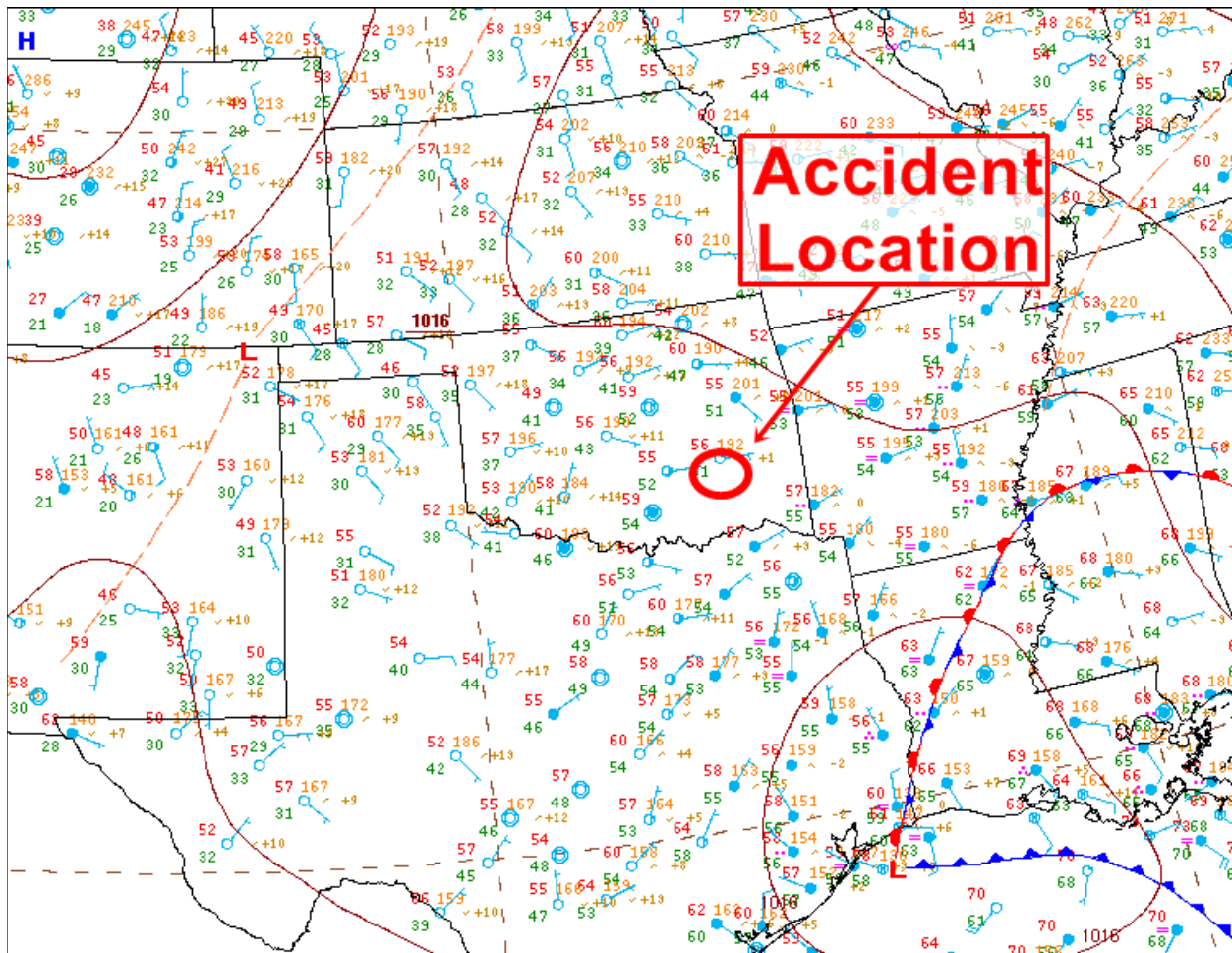


Figure 1 – NWS Surface Analysis Chart for 2200 CDT.

Figure 1 presents the NWS Surface Analysis Chart for 2200 central daylight time (CDT). See the Area Forecast located in the “Area Forecast” section for a synopsis of synoptic conditions.

Surface Observations

A meteorological reporting station was located at Okmulgee Regional Airport (OKM) in Okmulgee, Oklahoma, which was located about 20 miles north-northwest of the accident location at an elevation of approximately 720 feet.

An automated weather report from OKM at 2315 CDT indicated a wind from 020° at 3 knots, visibility of 10 statute miles or greater, ceiling broken at 2,400 feet above ground level (agl), broken cloud layer base at 3,000 feet agl, temperature of 12° Celsius (C) and a dew point temperature of 11°C, altimeter setting of 30.13 inches of mercury; remarks: station with a precipitation discriminator, hourly temperature of 11.6°C and hourly dew point temperature of 10.5°C.

Prior to this report, the lowest cloud layer had been reported as being at or above 5,000 feet agl since 2015 CDT, except for 2255 CDT, when the lowest cloud layer was reported as being scattered at 1,100 feet agl.

[2015 CDT] METAR KOKM 130115Z AUTO 15003KT 10SM SCT050 15/10 A3011
RMK AO2 T01480095=
[2035 CDT] METAR KOKM 130135Z AUTO 12003KT 10SM BKN050 15/10 A3010
RMK AO2 T01500096=
[2055 CDT] METAR KOKM 130155Z AUTO 09010KT 10SM SCT050 13/09 A3011
RMK AO2 T01290093=
[2115 CDT] METAR KOKM 130215Z AUTO 09009KT 10SM SCT085 13/10 A3010
RMK AO2 T01260101=
[2135 CDT] METAR KOKM 130235Z AUTO 10009KT 10SM SCT085 13/10 A3011
RMK AO2 T01250102=
[2155 CDT] METAR KOKM 130255Z AUTO 10011KT 10SM CLR 12/10 A3012 RMK
O2 T01180101=
[2215 CDT] METAR KOKM 130315Z AUTO 09007KT 10SM CLR 12/10 A3012 RMK
AO2 T01160102=
[2235 CDT] METAR KOKM 130335Z AUTO 09010KT 10SM SCT090 12/10 A3013
RMK AO2 T01200104=
[2255 CDT] METAR KOKM 130355Z AUTO 02003KT 10SM SCT011 SCT024
SCT030 11/10 A3013 RMK AO2 T01140101=
**[2315 CDT] METAR KOKM 130415Z AUTO 02003KT 10SM BKN024 BKN030
12/11 A3013 RMK AO2 T01160105=**
[2335 CDT] METAR KOKM 130435Z AUTO 00000KT 10SM OVC022 12/11 A3013
RMK AO2 T01170106=
[2355 CDT] METAR KOKM 130455Z AUTO 00000KT 10SM OVC020 12/11 A3012
RMK AO2 T01210108=

A meteorological reporting station was located at McAlester Regional Airport (MLC) in McAlester, Oklahoma, which was located about 28 miles south of the accident location at an elevation of approximately 770 feet. Beginning at 2153 CDT and continuing through the accident time, MLC automated reporting indicated the lowest cloud bases were between 900 and 2,100 feet agl. It should be noted that some of the low cloud layers were characterized as “few.”²

[2053 CDT] METAR KMLC 130153Z AUTO 09005KT 10SM OVC085 14/11 A3009
RMK AO2 SLP187 T01390106=
[2153 CDT] METAR KMLC 130253Z AUTO 09007KT 050V120 10SM FEW010
FEW090 13/11 A3011 RMK AO2 SLP192 T01330106 53001=

² “Few” clouds is defined as covering 1 to 2 oktas of the sky, as viewed from the reporting site. With automated (non-augmented) reporting, only the sky immediately above the ceilometer is viewable.

[2253 CDT] METAR KMLC 130353Z AUTO 07006KT 10SM FEW095 FEW120 13/11 A3011 RMK AO2 SLP192 T01280106=
 [2327 CDT] SPECI KMLC 130427Z AUTO 07004KT 10SM FEW009 SCT021 BKN080 13/11 A3010 RMK AO2 T01280106=
 [2338 CDT] SPECI KMLC 130438Z AUTO VRB03KT 10SM BKN021 OVC080 13/11 A3010 RMK AO2 T01280106=
 [2353 CDT] METAR KMLC 130453Z AUTO VRB03KT 10SM OVC020 13/11 A3010 RMK AO2 SLP189 T01280106=

A meteorological reporting station was located at Davis Field Airport (MKO) in Muskogee, Oklahoma, which was located about 28 miles northeast of the accident location at an elevation of approximately 611 feet.

[2053 CDT] METAR KMKO 130153Z AUTO 12005KT 10SM FEW050 BKN070 OVC120 13/11 A3012 RMK AO2 SLP199 T01280106 \$=
 [2153 CDT] METAR KMKO 130253Z AUTO 14004KT 10SM OVC040 13/11 A3013 RMK AO2 SLP201 T01280106 51008 \$=
 [2253 CDT] METAR KMKO 130353Z AUTO 13003KT 9SM FEW020 OVC030 12/11 A3013 RMK AO2 SLP201 T01220106 \$=
 [2312 CDT] SPECI KMKO 130412Z AUTO 00000KT 9SM OVC028 12/11 A3013 RMK AO2 T01220106 \$=
 [2353 CDT] METAR KMKO 130453Z AUTO 00000KT 8SM OVC016 12/11 A3013 RMK AO2 SLP198 T01220106 \$=

A meteorological reporting station was located at Stigler Regional Airport (GZL) in Stigler, Oklahoma, which was located about 35 miles east of the accident location at an elevation of approximately 600 feet. Beginning at 2135 CDT and continuing through the accident time, GZL automated reporting indicated ceilings below 1,000 feet agl.

[2015 CDT] METAR KGZL 130115Z AUTO 11008KT 10SM OVC037 13/11 A3013 RMK AO2=
 [2035 CDT] METAR KGZL 130135Z AUTO 09007KT 10SM BKN039 OVC070 13/11 A3012 RMK AO2=
 [2055 CDT] METAR KGZL 130155Z AUTO 10010KT 10SM BKN031 BKN070 OVC120 13/12 A3011 RMK AO2=
 [2115 CDT] METAR KGZL 130215Z AUTO 10007KT 10SM SCT007 BKN016 OVC031 13/12 A3012 RMK AO2=
 [2135 CDT] METAR KGZL 130235Z AUTO 12005KT 10SM BKN006 OVC031 13/12 A3013 RMK AO2=
 [2155 CDT] METAR KGZL 130255Z AUTO 11006KT 8SM -RA OVC006 13/12 A3013 RMK AO2=
 [2215 CDT] METAR KGZL 130315Z AUTO 11008KT 8SM OVC005 13/12 A3013 RMK AO2=

[2235 CDT] METAR KGZL 130335Z AUTO 09009KT 10SM OVC006 13/12 A3012
RMK AO2=
[2255 CDT] METAR KGZL 130355Z AUTO 09009KT 10SM BKN006 OVC014 13/12
A3012 RMK AO2=
[2315 CDT] METAR KGZL 130415Z AUTO 08007KT 10SM OVC008 13/12 A3012
RMK AO2=
[2335 CDT] METAR KGZL 130435Z AUTO 08008KT 10SM OVC006 13/12 A3012
RMK AO2=
[2355 CDT] METAR KGZL 130455Z AUTO 08007KT 10SM OVC006 13/12 A3011
RMK AO2=



Figure 2 – Depiction of station locations presented in this section.

Weather Radar

WSR-88D Level-II weather radar imagery from Tulsa, Oklahoma (KINX), is presented in figure 3. KINX was located approximately 50 miles north-northeast of the accident site at an elevation of 668 feet. Assuming standard refraction and considering the 0.95° beam width for the WSR-

88D radar beam, the KINX 0.493° tilt would have “seen” altitudes between about 2,350 and 7,400 feet above msl at the accident location.

The KINX imagery from 2315 CDT depicted reflectivity patterns consistent with isolated light rain to the east and south-southeast of the accident site at the accident time. No reflectivity values were noted as being coincident with the accident location. A loop of the KINX weather radar imagery indicated these reflectivity values were moving in a northerly direction.

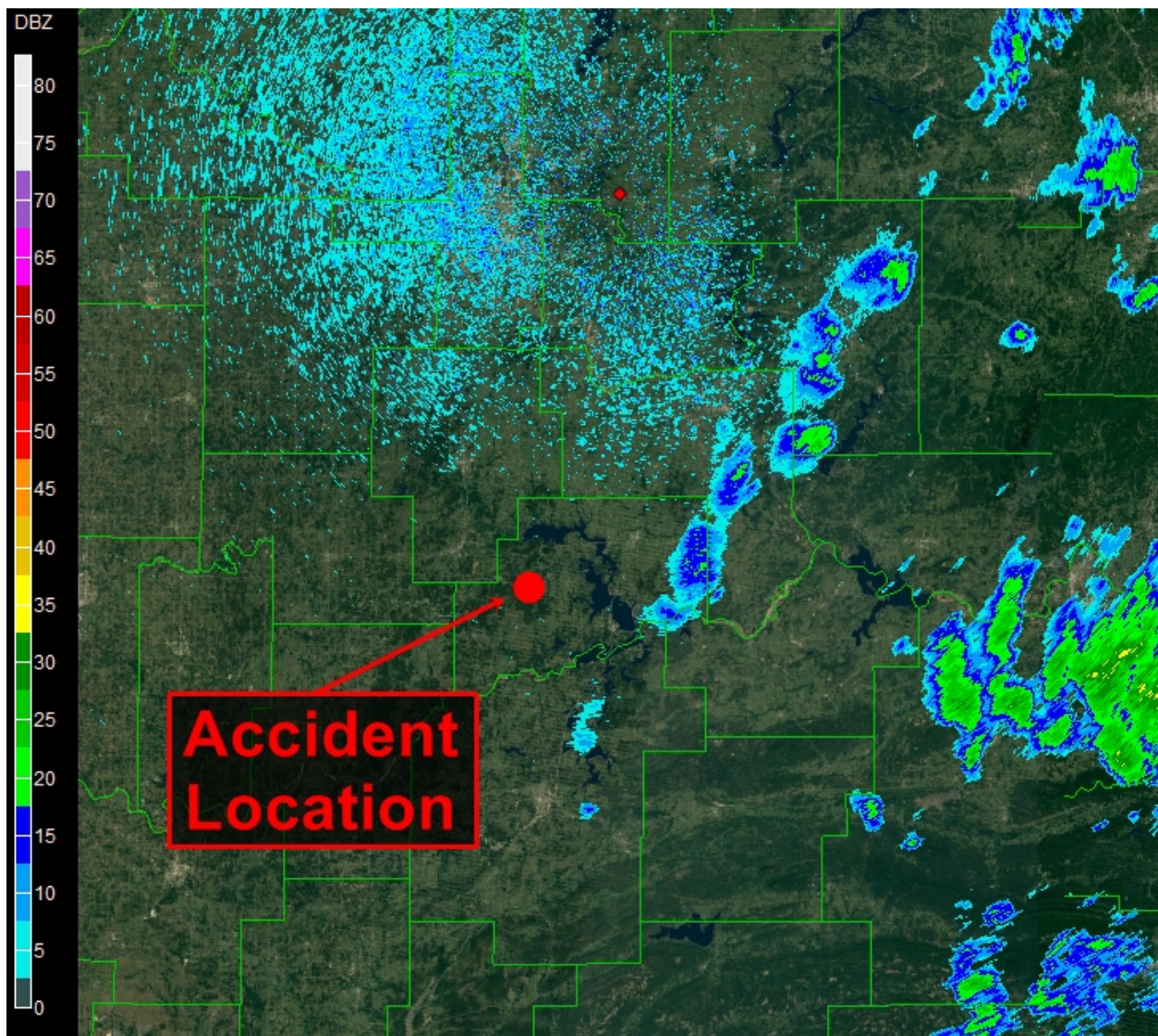


Figure 3 – KHGX 0.493° Level-II reflectivity product from 2315 CDT.

Model Sounding

A North American Mesoscale (NAM) model sounding (figure 4) for the accident location at 2200 CDT was retrieved from the National Oceanic and Atmospheric Administration’s (NOAA) Air Resources Laboratory. The NAM model sounding indicated that relative humidity was greater than 90 percent between about 2,500 and 11,000 feet. Near surface wind was from the east at about 6 knots. Above this level the wind *veered* with height to a near-southerly wind at

10,000 feet. Between about 1,000 and 3,000 feet, the wind was from the east at about 23 knots. The freezing level was at 10,700 feet.

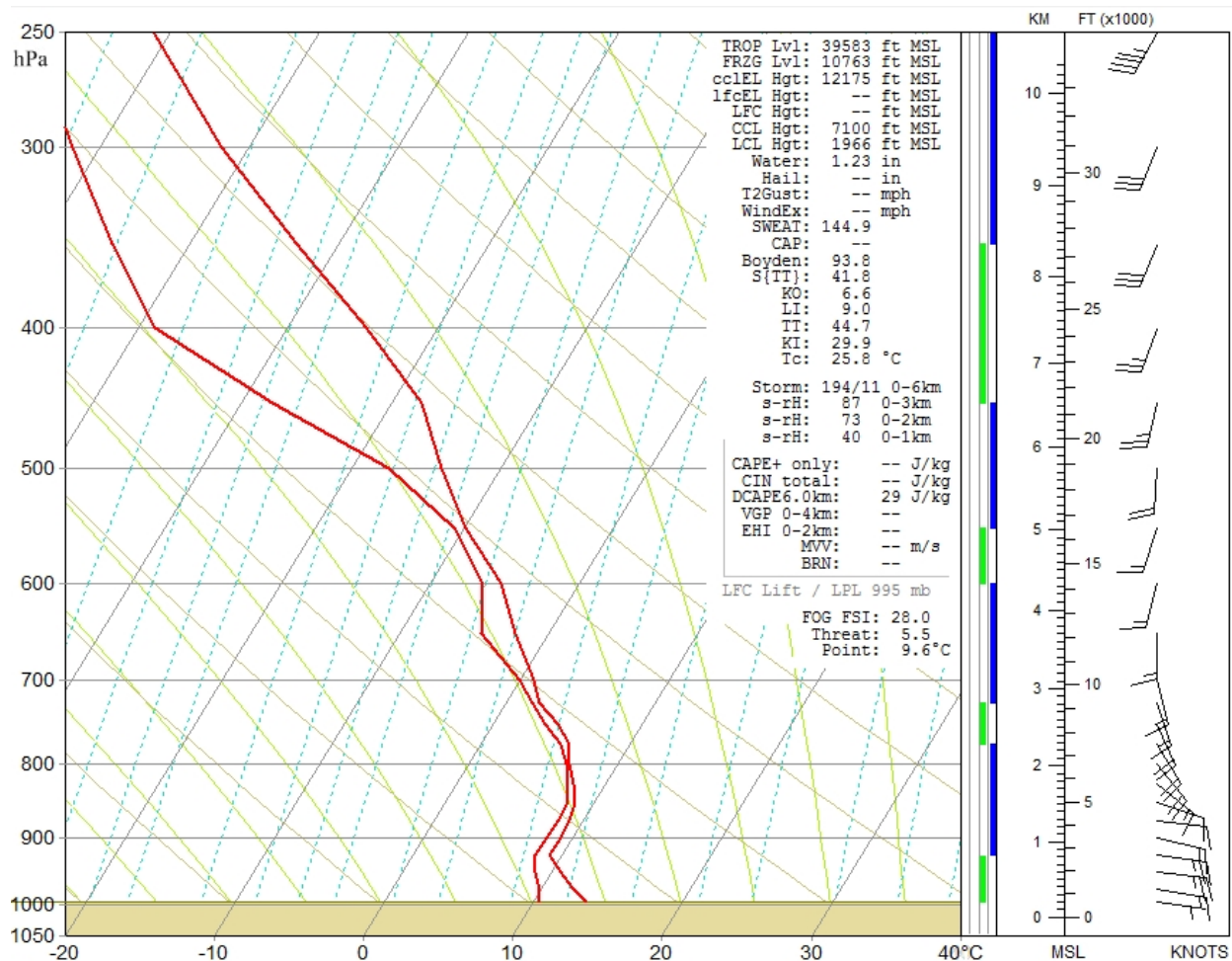


Figure 4 – NAM model sounding for the accident site in SkewT/LogP format for 2200 CDT, surface to 250 hPa.

Pilot Reports

The only publicly disseminated pilot report³ made within about two hours of the accident time and 100 statute miles of the accident site is presented here. This report: *At 0028 CDT on March 13, 2015, a Boeing 737 aircraft at 4,300 feet 8 miles away on the 225° radial from Tulsa International Airport reported broken cloud bases at 3,000 feet above msl with cloud tops at 4,300 feet msl.*

TUL UA /OV TUL225008/TM 0528/FL043/TP B737/SK BKN030-TOP043

³ Obtained from the Aviation Weather Center.

Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-13 infrared ($10.7\mu\text{m}$) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from 2330 CDT is presented in figure 5. The GOES-13 infrared imagery identified cloudy conditions at the accident location, with cloud-top temperatures varying between approximately 1°C and -13°C in the immediate accident region. When considering the NAM model sounding, 1°C and -13°C corresponded to heights of approximately 10,200 and 18,300 feet, respectively. It should be noted that figure 5 has not been corrected for any parallax error.

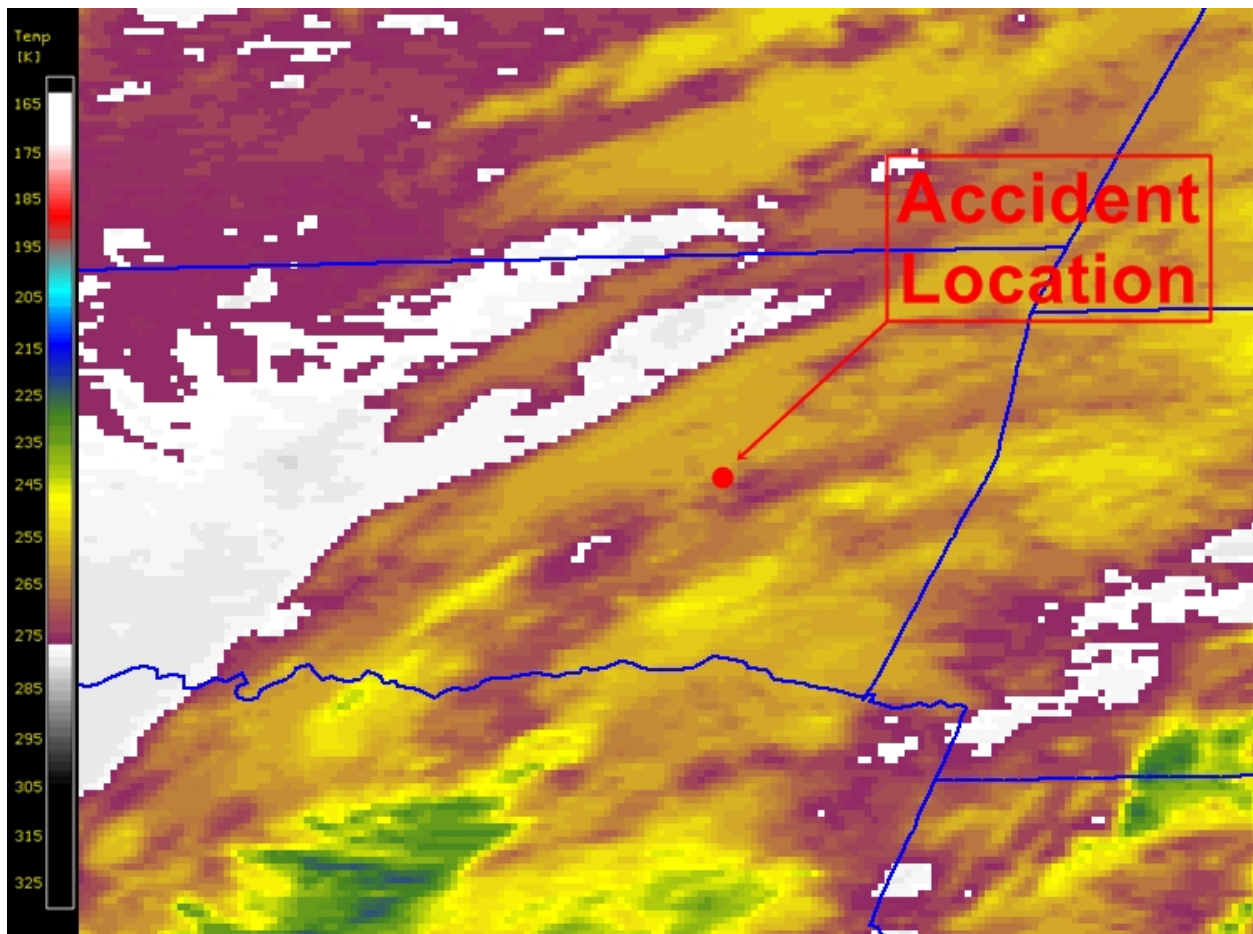


Figure 5 – GOES-13 $10.7\mu\text{m}$ (infrared) color-enhanced imagery from 2330 CDT.

Area Forecast

An amended Area Forecast that included Oklahoma was issued at 2218 CDT by the Aviation Weather Center in Kansas City, Missouri. Cloud heights are above msl. The portion of the Area Forecast directed toward northeastern Oklahoma forecasted for the accident time: broken clouds at 5,000 feet with layered clouds to FL280⁴ and isolated light rain showers. The portion of the

⁴ A flight level (FL) is specific barometric pressure, expressed as a nominal altitude in hundreds of feet. The pressure is computed assuming an International standard sea-level pressure datum of 1013.25 hPa (29.92 inHg).

Area Forecast directed toward southeastern Oklahoma forecasted for the accident time: broken clouds at 2,000 feet, visibility 3 to 5 statute miles, light rain and mist.

FAUS44 KPCI 130318 AAA

FA4W

-DFWC FA 130318 AMD

SYNOPSIS AND VFR CLDS/WX

SYNOPSIS VALID UNTIL 132000

CLDS/WX VALID UNTIL 131400...OTLK VALID 131400-132000

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...02Z WRMFNT FL PNHDL-SE MS-CNTRL LA-SE TX. TROF SE AR-ERN TN. 20Z WRMFNT E CNTRL OK-CNTRL AR-NRN MS-SE AL. CDFNT SE AR-SE MS.

.

OK

W HLF

PNHDL...SCT-BKN CL. OTLK...VFR WND.

RMNDR...SKC. 08Z SCT CL. OTLK...VFR.

NERN...BKN050 LYRD FL280. ISOL -SHRA. BECMG 0609 BKN030. OCNL VIS 3-5SM SCT -SHRA BR. OTLK...IFR CIG SHRA BR.

SE...BKN030 LYRD FL280. ISOL -SHRA. **BECMG 0407 BKN020. VIS 3-5SM -RA BR.** OTLK...IFR CIG RA BR.

Aviation Section of the Area Forecast Discussion

An Area Forecast Discussion (AFD) was issued at 2109 CDT by the NWS Weather Forecast Office in Tulsa, Oklahoma. The aviation portion of the AFD, which was originally issued at 1830 CDT in a previous AFD, is presented here:

FXUS64 KTSA 130209

AFDTSA

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE TULSA OK

909 PM CDT THU MAR 12 2015

.PREV DISCUSSION... /ISSUED 630 PM CDT THU MAR 12 2015/

AVIATION...

CONCERNING TAF SITES KTUL/ KRVS /KBVO /KMLC /KXNA /KFYV /KFSM /KROG. CIGS/VSBS WILL DROP TO MVFR/IFR (AND OCCASIONAL LIFR) FOR THE WESTERN ARKANSAS TAFS OVERNIGHT IN PERIODS OF RAIN. THESE CONDITIONS WILL EVENTUALLY TRANSLATE INTO EASTERN OKLAHOMA TOWARD 12Z.

AIRMETs

An Airmen's Meteorological Information (AIRMET) Zulu for instrument flight rules (IFR) conditions was active for the accident site at the accident time. No other AIRMETs were active for altitudes below 10,000 feet above msl for the accident location at the accident time

WAUS44 KPCI 130245

WA4S

-DFWS WA 130245

AIRMET SIERRA FOR IFR AND MTN OBSCN VALID UNTIL 130900

.

AIRMET IFR...OK TX AR TN LA MS AL KS MO IL KY AND CSTL WTRS
FROM 40ENE IRK TO 20S PXV TO 50SSW BNA TO 20NNW LGC TO 50SW
PZD TO 40W CEW TO 90SSE SJI TO 70SE LEV TO 120SSW LCH TO 100SE
PSX TO 20S PSX TO 60SSE SAT TO 50SW OKC TO 30NW OSW TO 40ENE IRK
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 09Z THRU 15Z.

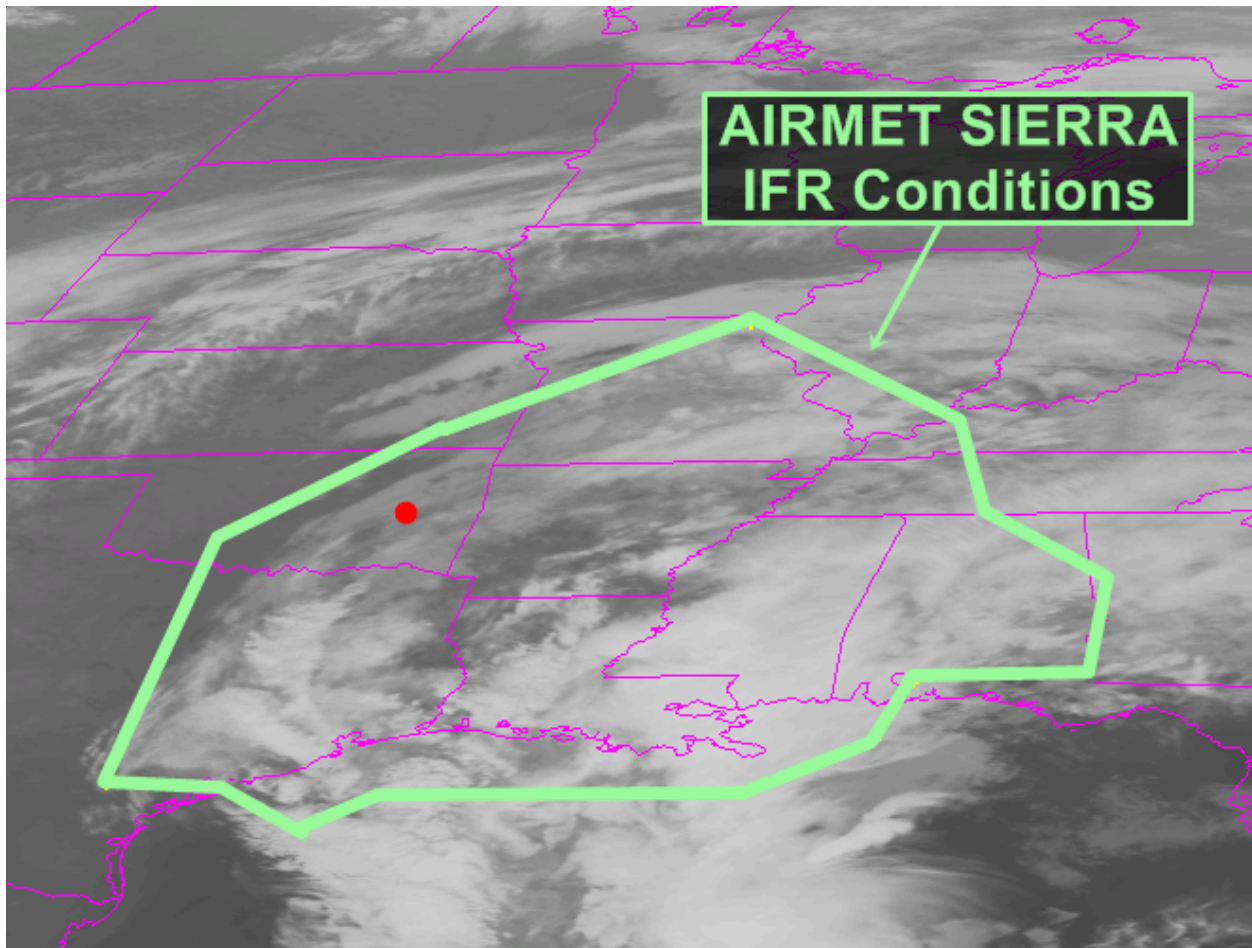


Figure 6 – AIRMET active below 10,000 feet above msl for the accident location at the accident time.

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 at the Fort Worth Air Route Traffic Control Center that were active for the accident location at the accident time.

Lightning

Total lightning data from the Earth Networks Total Lightning Network did not identify the presence of any lightning in the accident area at the accident time.

Formal Weather Briefing

Lockheed Martin Flight Services, DUAT and DUATs had no contact with the accident aircraft on the day of the accident.

Astronomical Data

The astronomical data obtained from the United States Naval Observatory for 95° 48' west longitude and 35° 21' north latitude, indicated the following:

SUN	
Sunset	1928 CDT
End Civil Twilight	1953 CDT
MOON	
Moonset	1144 CDT

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