



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

June 12, 2025

Weather Study

METEOROLOGY

CEN25LA188

A. ACCIDENT

Location: Vega, Texas
Date: 1540 central daylight time (CDT)
Time: 2040 coordinated universal time (UTC)
Airplane: Piper PA-18; Registration: N7175D

B. METEOROLOGIST

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National Transportation Safety Board
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C. WEATHER INFORMATION

1.0 Synoptic Conditions

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 WPC located in College Park, Maryland. These are the base products used in describing weather features and in the creation of forecasts and warnings. Reference to these charts and other products can be found in the Federal Aviation Administration (FAA) “Aviation Weather Handbook”, FAA-H-8083-28¹.

1.1 Surface Analysis Chart

The National Weather Service (NWS) Surface Analysis Chart for 1500 CDT (2100Z) centered over the Texas panhandle is included as figure 1 with the approximate accident site marked by the red star. The chart depicted a developing stationary front extending from the Texas Panhandle into southern Oklahoma, with broken to overcast cloud cover along and north of the front. A trough² was depicted extending to the east-northeast of the accident site across extreme northern Texas into Oklahoma, and Kansas, with another trough to the west-southwest over New Mexico which extended south-southeast. A general deformation zone extended over the accident site, or a neutral point in pressure. The station models of the Texas Panhandle indicated variable winds in the area of 10 knots or less, clear skies, temperatures in the mid 70’s Fahrenheit (°F), with dew point temperatures in the mid 50’s °F.

¹ <https://www.faa.gov/regulationspolicies/handbooksmanuals/aviation/faa-h-8083-28-aviation-weather-handbook>

² A trough (abbreviated “TROF”) is an elongated area of low pressure and supports convergence and general lifting of the general airmass, and if sufficient moisture is present clouds and precipitation.

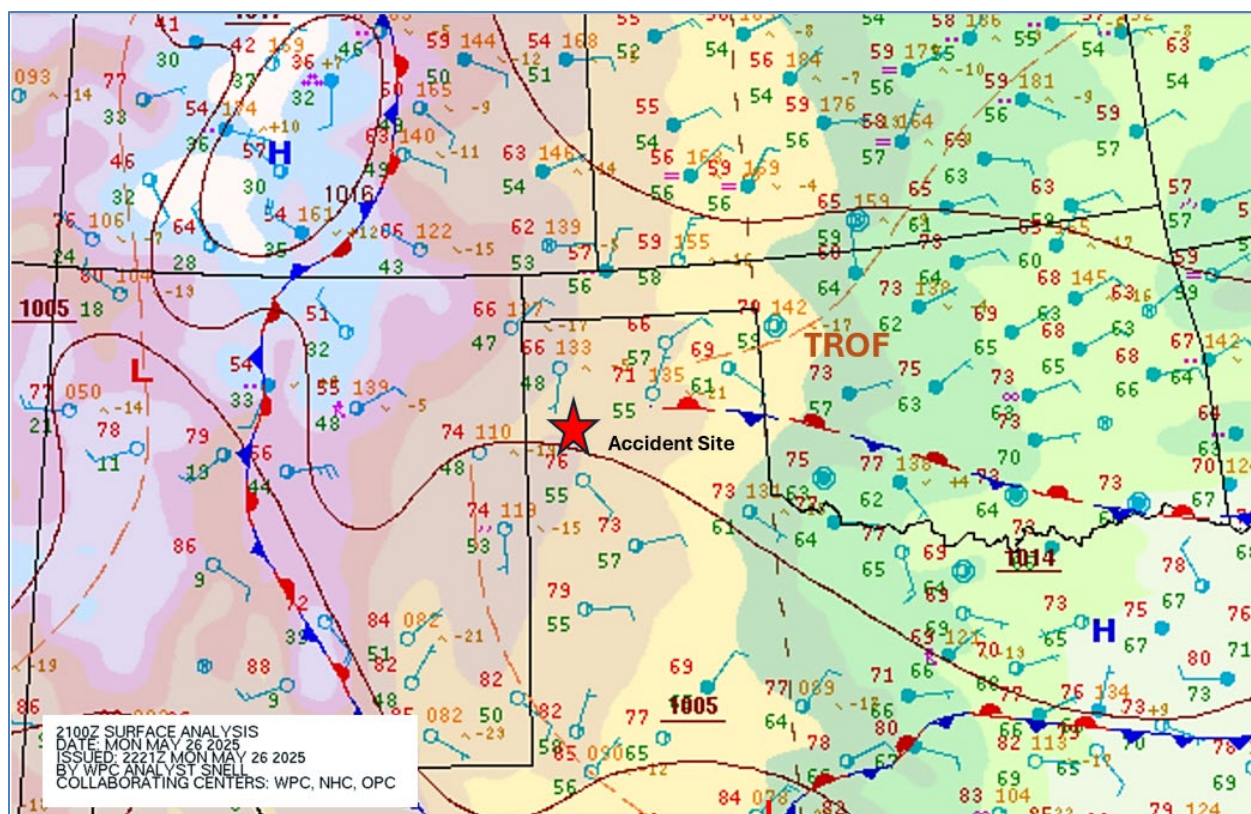


Figure 1 - NWS Surface Analysis Chart for 1500 CDT with the approximate accident site marked by the red star.

1.2 Streamline Analysis

A streamline analysis³ for 1500 CDT is included as figure 2 with the approximate accident site marked by the red star. The chart is based on the instantaneous wind flow from the plotted METAR observations over the area. The image depicted a general band of convergence over the Texas Panhandle with a vortex (annotated by the dashed brown line) which extended southwestward over the general vicinity of the accident site. The convergent band in the immediate vicinity of the accident site implied the potential for variable winds and support for localized lifting and potential shear in the wind field.

³ Streamlines – represent the instantaneous direction of the wind.

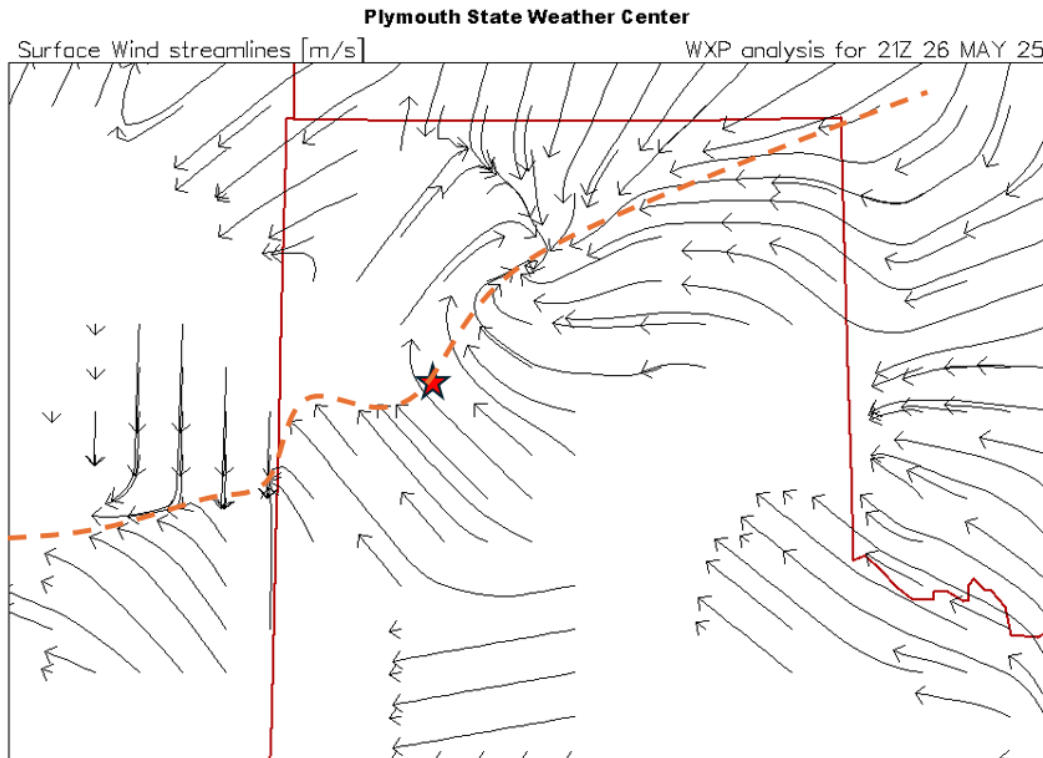


Figure 2 - Streamlines analysis for 1500 CDT with approximate accident site indicated.

1.3 Regional Composite Radar Mosaic

The NWS regional view of the National Composite Radar Mosaic for 1540 CDT is included as figure 3 with the approximate accident site marked by the red star. The image depicted an intense area of echoes east of Amarillo, with no significant meteorological echoes within 50 miles of the accident site. The absence of any convective echoes over the area implies no convective microbursts associated with descending precipitation cores, or organized outflow boundaries were likely occurring during the period of the accident.

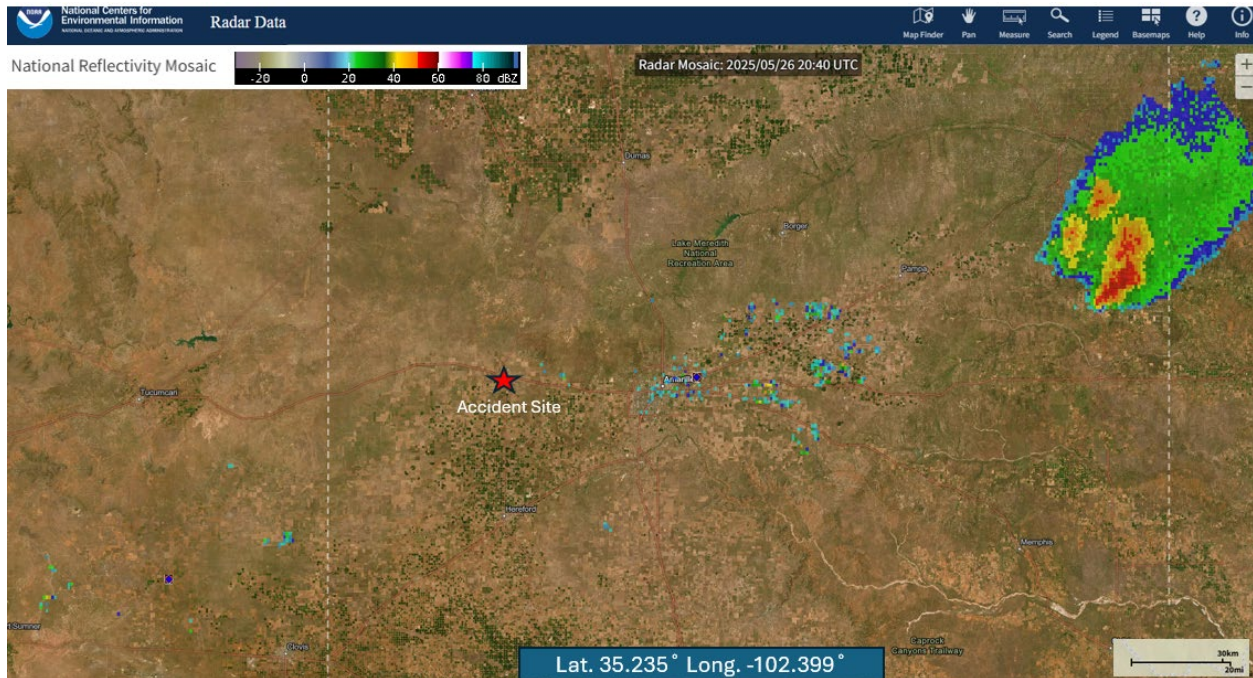


Figure 3 – NWS Regional Composite radar Mosaic for 1540 CDT with the accident site marked by red star.

2.0 Surface observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METAR) and Aviation Selected Special Weather Reports (SPECI). Cloud heights are reported above ground level (agl) in the following section. The magnetic variation over the area was estimated at 6.5° East based on the latest sectional chart for the area.

2.1 Vega, Texas

The accident occurred while landing at Oldham County Airport (E52), Vega, Texas, which reported an elevation of 3,995 ft. The airport has no official weather reporting capability and only lists a lighted wind indicator for weather.

2.2 Hereford, Texas

The closest official weather reporting facility to the accident site was from Hereford Memorial Airport (KHRX), Hereford, Texas, located 25 miles south at an elevation of 3,788 ft. The airport had an Automated Weather Observation System (AWOS) which broadcasted line-of-sight on 118.5 VHF or dial in and disseminated observations longline every 20 minutes on FAA weather circuits through the National Airspace System (NAS). The following conditions were reported surrounding the time of the accident.

Weather observation for KHRX at 1535 CDT, automated, wind from 140° at 11 knots gusting to 15 knots, visibility 10 miles or more, sky clear below 12,000 ft agl, temperature 25°Celsius (C), dew point temperature 13°C, and altimeter setting 30.03 inches of mercury

(inHg). Remarks: automated station with a precipitation discriminator, temperature 24.6°C, dew point 13.3°C, thunderstorm sensor inoperative.

Weather observation for KHRX at 1555 CDT, automated, wind from 140° at 9 knots, wind 090° variable 150°, visibility 10 miles or more, sky clear below 12,000 ft agl, temperature 25°C, dew point temperature 13°C, and altimeter setting 30.023 inHg. Remarks: automated station with a precipitation discriminator, temperature 24.5°C, dew point 12.8°C, thunderstorm sensor inoperative.

The raw observation reported surrounding the period were as follows in their original format. The observations in bold blue type are decoded above.

METAR KHRX 261815Z AUTO 02010G14KT 10SM CLR 21/14 A3007 RMK AO2 T02080136 TSNO=

METAR KHRX 261835Z AUTO 06009G14KT 10SM CLR 22/14 A3006 RMK AO2 T02180139 TSNO=

METAR KHRX 261855Z AUTO 08008KT 10SM CLR 22/14 A3005 RMK AO2 T02240138 TSNO=

METAR KHRX 261915Z AUTO 07008KT 10SM CLR 23/14 A3005 RMK AO2 T02330137 TSNO=

METAR KHRX 261935Z AUTO 08008KT 10SM BKN050 23/13 A3005 RMK AO2 T02340127 TSNO=

METAR KHRX 261955Z AUTO 10011G15KT 10SM BKN050 BKN060 25/14 A3003 RMK AO2 T02450135 TSNO=

METAR KHRX 262015Z AUTO 12013G16KT 10SM SCT070 25/13 A3003 RMK AO2 T02470131 TSNO=

METAR KHRX 262035Z AUTO 14011G15KT 10SM CLR 25/13 A3003 RMK AO2 T02460133 TSNO=

Accident 2040Z

METAR KHRX 262055Z AUTO 14009KT 090V150 10SM CLR 25/13 A3002 RMK AO2 T02450128 TSNO=

METAR KHRX 262115Z AUTO 13008G14KT 090V160 10SM CLR 25/13 A3002 RMK AO2 T02470133 TSNO=

METAR KHRX 262135Z AUTO 00000KT 10SM SCT046 BKN049 24/13 A3002 RMK AO2 T02350127 TSNO=

METAR KHRX 262155Z AUTO 11005KT 10SM SCT044 BKN049 24/13 A3001 RMK AO2 T02410129 TSNO=

METAR KHRX 262215Z AUTO 13005KT 10SM SCT045 24/12 A3002 RMK AO2 T02440124 TSNO=

METAR KHRX 262235Z AUTO 00000KT 10SM SCT050 BKN065 BKN070 24/12 A3002 RMK AO2 T02360117 TSNO=

A review of the observations for KHRX indicated VFR conditions prevailing during the period with winds from the north backing to the east, and then southeast surrounding the period of the accident. The wind speeds were generally at 10 knots and gusting to 16 knots at KHRX near the time of the accident and then decreasing with the evening. A scattered to broken and overcast layer of clouds near 5,000 ft agl were reported prior to and after the accident.

2.3 Amarillo, Texas

The next closest weather reporting station to the accident site was from Rick Husband Amarillo International Airport (KAMA), Amarillo, Texas, located 34 miles east at an elevation of 3,607 ft. The airport had an Automated Surface Observation System (ASOS) which broadcasted on 118.85 VHF and disseminated observations longline hourly with specials as required and was augmented by tower personnel through a Limited Aviation Weather Reporting System (LAWRS) during normal operating hours. Surrounding the time of the accident the following conditions were reported.

Weather observation for KAMA at 1453 CDT, wind from 100° at 8 knots gusting to 16 knots, visibility 10 miles or more, scattered clouds at 7,000 ft agl, temperature 22°C, dew point temperature 13°C, and altimeter setting 30.03 inHg. Remarks: automated station with a precipitation discriminator, sea-level pressure 1013.3-hectopascals (hPa), temperature 21.7°C, dew point 13.3°C.

Weather observation for KAMA at 1553 CDT, wind from 130° at 6 knots, visibility 10 miles or more, a few clouds at 8,500 ft agl, temperature 24°C, dew point temperature 12°C, and altimeter setting 30.01 inHg. Remarks: automated station with a precipitation discriminator, sea-level pressure 1012.2-hPa, temperature 23.9°C, dew point 12.2°C, 3-hour pressure tendency fallen 2.1-hPa.

The raw observations reported surrounding the time of the accident were as follows.

SPECI KAMA 261720Z 32017G27KT 10SM BKN016 18/14 A3010 RMK AO2 PK WND 31027/1720 T01780139=

SPECI KAMA 261749Z 36014G20KT 10SM SCT018 SCT035 19/13 A3008 RMK AO2 PK WND 31027/1720=

METAR KAMA 261753Z 36013G20KT 10SM FEW018 19/13 A3008 RMK AO2 PK WND 31027/1720 SLP153 60004 T01890128 10189 20139 58001=

METAR KAMA 261853Z 07012KT 10SM FEW085 21/12 A3005 RMK AO2 SLP140 T02060122=

METAR KAMA 261953Z 10008G16KT 10SM SCT070 22/13 A3003 RMK AO2 SLP133 T02170133=

Accident 2040Z

METAR KAMA 262053Z 13006KT 10SM FEW085 24/12 A3001 RMK AO2 SLP122 T02390122 56021=

Wind shift

METAR KAMA 262153Z 02005KT 10SM OVC055 22/12 A3001 RMK AO2 SLP123 T02220122=

METAR KAMA 262253Z 04008KT 10SM FEW070 BKN090 22/13 A3001 RMK AO2 SLP124 T02220128=

A review of the KAMA observations also indicated VFR conditions prevailing with winds from the north, veering to the east and then back to the north-northeast after the accident. Wind speeds ranged from 8 to 17 knots with gusts to 27 knots prior to the accident, and less than 8 knots after the accident. A distinct wind shift was noted between 1553 and 1653 CDT with winds shifting from the southeast to the north-northeast.

2.4 Dumas, Texas

The next closest station to the accident site was from Moore County Airport (KDUX), Dumas, Texas, located about 42 miles northeast of the accident site at an elevation of 3,706 ft. The airport had an AWOS which broadcasted on 118.075 VFH and disseminated observations every 20 minutes. At the time of the accident the following conditions were reported.

Weather observation for KDUX at 1535 CDT, automated, wind from 230° at 6 knots, visibility 10 miles or more, sky clear below 12,000 ft agl, temperature 20°C, dew point temperature 10°C, altimeter setting 30.03 inHg. Remarks: automated station with a precipitation discriminator, temperature 19.5°C, dew point 10.0°C.

The raw observations in standard code surrounding the period were as follows:

METAR KDUX 261935Z AUTO 04003KT 10SM CLR 18/12 A3003 RMK AO2 T01810117=

METAR KDUX 261955Z AUTO 00000KT 10SM CLR 19/11 A3004 RMK AO2 T01890109=

METAR KDUX 262015Z AUTO 15003KT 10SM CLR 19/11 A3004 RMK AO2 T01880110=

METAR KDUX 262035Z AUTO 23006KT 10SM CLR 20/10 A3003 RMK AO2 T01950100=

Accident 2040Z

METAR KDUX 262055Z AUTO 24006KT 10SM CLR 20/10 A3003 RMK AO2 T02010101=

Wind shift

METAR KDUX 262115Z AUTO 30007KT 10SM CLR 21/11 A3003 RMK AO2 T02070108=

METAR KDUX 262135Z AUTO 30005KT 10SM CLR 20/11 A3002 RMK AO2 T02030107=

METAR KDUX 262155Z AUTO 34005KT 10SM CLR 21/10 A3002 RMK AO2 T02060100=

METAR KDUX 262215Z AUTO 33004KT 10SM CLR 22/10 A3002 RMK AO2 T02150097=

A review of the observations noted a wind shift after 1555 CDT with winds shifting from the southeast to the northwest.

3.0 Sounding

Meteorological data was retrieved from the NOAA Air Resource Laboratory (ARL) Real-time Environmental Application and Display Systems (READY) archive of High-Resolution Rapid Refresh (HRRR)⁴⁴ numerical model data for the closest grid point to the accident site. The HRRR data were then plotted on a standard Skew T log P diagram⁵ for 1600 CDT using the RAOB

⁴⁴ The HRRR is a NOAA real-time 3-kilometer (km) resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by 3 km grids with 3 km radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a 1-hour period.

⁵ Skew T log P diagram – is a standard meteorological plot or thermodynamic diagram using temperature and the

Analysis software⁶ from the surface to 500-hPa or approximately 18,000 ft and is included as figure 4.

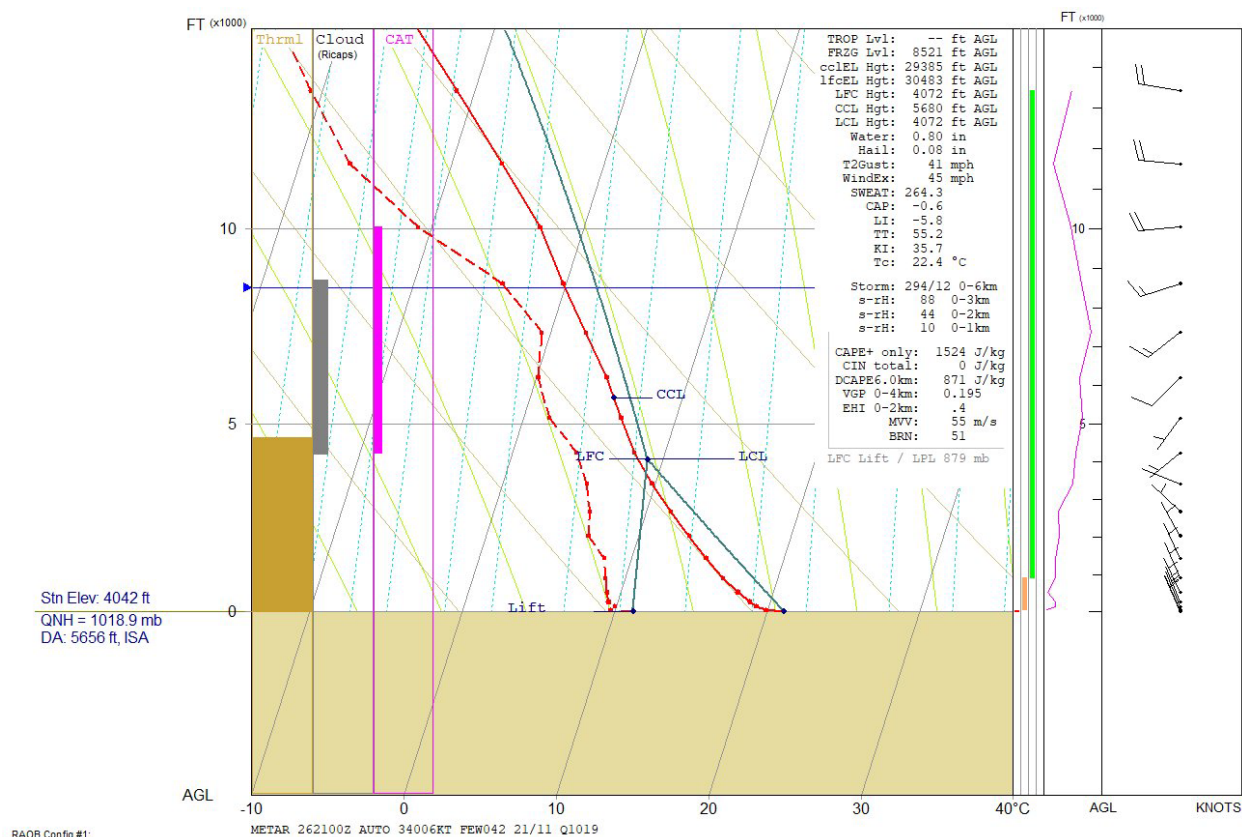


Figure 4 - High-Resolution Rapid Refresh (HRRR) numerical model sounding over the approximate accident site for 1600 CDT from the surface to about 18,000 ft.

The 1600 CDT HRRR sounding depicted an elevation of 4,042 ft over the grid point with a near surface temperature of 21.1°C (70°F), a dew point temperature of 11.2°C (52.2°F), a relative humidity of 53%, a sea-level pressure of 879-hPa. The resultant density altitude was calculated at 5,656 ft. The lifted condensation level (LCL) and level of free convection (LFC) were determined to be at 4,072 ft agl, and the convective condensation level (CCL) at 5,680 ft agl. The precipitable water content was 0.80 inches. The RAOB Analysis program supported a few cumulus clouds at 4,200 ft agl with tops near 8,700 ft. The sounding was characterized as conditionally unstable with a Lifted Index (LI) of -5.8 and a Convective Available Potential Energy (CAPE) of 1,524 Joules/kilogram, and the maximum vertical velocity of any potential updrafts of 55 meters/second or 110 knots. The Downdraft CAPE (DCAPE) was 871 J/kg and the T2Gust and WindEx estimate were about 40 knots. The RAOB Analysis program also indicated strong support for thermals to about 5,000 ft agl.

logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

⁶ RAOB –The Complete RAwinsonde OBservation program is an interactive sounding analysis program developed by Eosonde Research Services (ERS) previously known as Environmental Research Services, The Villages, Florida.

The sounding wind profile indicated a surface wind from about 340° at 6 knots, with winds backing to the west above 5,000 ft agl with gradually increasing wind speeds. The mean 0 to 6 kilometer (or 18,000 ft) wind was from 165° at 16 knots. The RAOB Analysis program did not highlight any strong vertical or horizontal shears in the wind field below 7,700 ft. The effects of the thermal or convective turbulence is not considered or the effect of any low-level convergence bands.

A table of the sounding parameters of height, pressure (Pres), temperature (T), dewpoint temperature (Td), relative humidity (RH), wind, and derived Clear Air Turbulence (CAT), Low-Level Wind Shear (LLWS), and Icing potential from the surface through 10,000 ft.

Height (ft-msl)	Pres (hPa)	T (°C)	Td (°C)	RH (%)	Wind (dir/kts)	CAT (FAA)	LLWS (FAA)	Icing (USAF)
4042	879	21.1	11.2	53	338/ 6			
4074	878	19.9	9.7	52	338/ 6			
4171	875	19.2	9.9	55	339/ 6			
4300	871	18.7	9.4	55	339/ 7			
4560	863	17.7	9.1	57	336/ 6			
4952	851	16.4	8.7	60	338/ 6			
5481	835	14.9	8.2	64	336/ 5			
6085	817	13.3	6.7	64	333/ 4			
6734	798	11.6	6.3	70	316/ 3			
7465	777	9.8	5.5	75	294/ 2			
8283	754	8.0	4.2	77	228/ 3	LGT		
9195	729	6.4	1.7	72	214/ 6	LGT		
10247	701	4.6	0.1	73	223/ 10	LGT		

A review of the HRRR data from 1400 through 1600 CDT indicated a wind shift from the east to the north-northwest during the period.

4.0 Satellite Imagery

The NOAA Geostationary Operational Environmental Satellite number 19 (GOES-19) infrared and visible imagery were obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System (McIDAS) software. The infrared band 13 imagery at a wavelength of 10.3 microns (µM) provided a resolution of 2 kilometers (1 NM), while the visible band 2 imagery at 0.64 µm provided a resolution of 0.5 km (0.25 nm). The images were reviewed surrounding the time of the accident.

Figure 5 is the GOES-19 visible band image for 1541 CDT at 2X magnification with the accident site marked by the red square. The image depicted a line of low cumulus clouds extending northeast to southwest across the area and was located immediately south of the accident site. This line was associated with the convergence line indicated by the streamlines moving southeastward through the area. The infrared image indicated the radiative cloud top temperatures near 282 Kelvin associated with the cumulus clouds south of the accident site, which corresponded to 8.8°C and tops near 7,500 ft based on the HRRR sounding. A defined cumulonimbus cloud with an overshooting cloud top and extensive anvil outflow was observed in the vicinity of Hemphill County Airport (KHHF), Canadian, Texas in the northeast panhandle and approximately over 100

miles from the accident site. No other organized convective clouds were identified in the vicinity of the accident site.

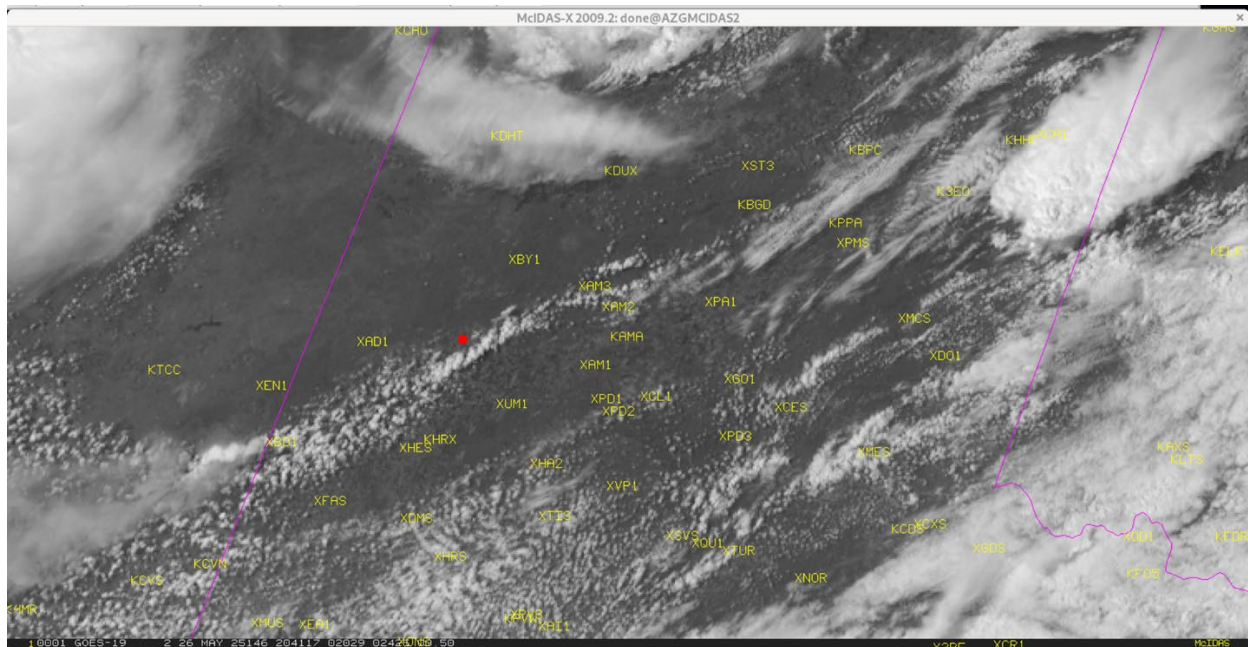


Figure 5 - GOES-19 visible image for 1541 CDT at 2X magnification with the accident site noted in red.

5.0 Pilot Reports

The following pilot weather reports (PIREPs) were reported within 100 miles of the accident site between 1300 and 1700 CDT. The following reports are in raw code with time referenced to UTC.

LBB UA /OV LBB210015/TM 1903/FL064/TP PC12/SK BASES 064 DURD

LBB UA /OV LBB130020/TM 2022/FL055/TP C182

LBB UA /OV LBB130010/TM 2024/FL062/TP B350/RM BASES 062

LBB UA /OV LBB230010/TM 2026/FL067/TP B737/RM BASES 067

Accident 2040Z

DHT UA /OV DHT356039/TM 2055/FL190/TP BE60/SK TOP280-300/WX TS/RM ZAB/FDCS

LBB UA /OV LBB080008/TM 2115/FL060/TP P46T/SK BKN059-TOPUNKN

LBB UA /OV LBB290006/TM 2131/FL060/TP CRJ7/SK OVC064-TOPUNKN

AMA UA /OV PNH050041/TM 2222/FL430/TP CL35/SK TOP410/RM ZAB/FDCS

CAO UA /OV TBE169049 /TM 2224 /FL380 /TP B738 /WX TS /RM PRODUCED BY SKYPATH

AMA UA /OV PNH035060/TM 2249/FL450/TP CL35/SK TOP450/RM ZAB/FDCS

A review of the reports noted no reports of any low-level turbulence or wind shear, several of the reports noted the thunderstorm northeast of Amarillo with tops near Flight level 410 and over New Mexico over 80 miles from the accident site.

6.0 NWS Forecasts

6.1 Terminal Aerodrome Forecast

The NWS does not issue a Terminal Aerodrome Forecast (TAF) for E52. The closest TAF was issued for KAMA located 34 miles east of the accident site. While a TAF is only current for a 5 statute mile radius of the specific airport, pilots and flight planning systems will often provide the closest TAF for reference of the expected conditions in the general area. The NWS Amarillo Weather Forecast Office (WFO) issued an amended TAF for KAMA at 1308 CDT and was as follows:

*AMD TAF KAMA 261808Z 2618/2718 03012G22KT P6SM SCT025 BKN050
FM262300 03008KT P6SM BKN045
FM270500 02008KT 6SM -SHRA BR BKN020
PROB30 2705/2708 2SM TSRA BKN015CB
FM270900 01008KT 4SM BR OVC006=*

The forecast expected from 1300 through 1800 CDT expected VFR conditions to prevail with a wind from 030° at 12 knots with gusts to 22 knots, visibility better than 6 miles, scattered clouds at 2,500 ft agl, ceiling broken at 5,000 ft. No low-level wind shear below 2,000 ft was forecast. The forecast expected a chance of rain showers and possible thunderstorms after midnight through 0300 CDT.

6.2 Area Forecast Discussion

The NWS Amarillo WFO issued the Area Forecast Discussion at 1307 CDT describing the weather conditions impacting the area and the details behind the TAF forecast. The discussion was as follows:

*FXUS64 KAMA 261807
AFDAMA*

*Area Forecast Discussion
National Weather Service Amarillo TX
107 PM CDT Mon May 26 2025*

...New KEY MESSAGES, SHORT TERM, LONG TERM...

*.KEY MESSAGES...
Issued at 104 PM CDT Mon May 26 2025*

-Showers and storms in this afternoon and then again in the evening. Low chance for storms to be severe with 1" hail and 60 mph winds.

-Wednesday through the end of the week will bring daily chances of thunderstorms, some that could reach severe criteria. Currently best chances remain on Wednesday but overall confidence in any severe storms is low at this time.

*.SHORT TERM...
(This evening through Tuesday night)
Issued at 104 PM CDT Mon May 26 2025*

*A weather system continues to impact the panhandles with rounds of rain showers and thunderstorms. Currently there is a small disturbance from this weather system is moving across the panhandles causing the ongoing line of rain showers and thunderstorms. The rain showers and thunderstorms along this line are more potent in the northern panhandles which were not worked over by the early morning convection. In addition **there is a small MCV that has formed on the northern portions of the line which will further aid thunderstorm development**. Overall dynamics as such that most of the thunderstorms along this line will remain weak with a low chance for strong to severe storms. This line of storms is moving at a fairly fast clip to the east such that it should eject out of the panhandles by the mid afternoon hours. Behind this line conditions may clear out allowing for some daytime heating to rebuild instability. This instability will come into play late this afternoon through this evening when the main portions of this weather system passes through the panhandles. This will have a high chance of flaring up another line of rain showers and thunderstorms. Since the southern panhandles is being worked over less by the current wave it stand to reason that high instability will be located there. This means the main portion of the weather system may be more active in the southern panhandles than the northern. There is a low chance that the storms with the main wave may become strong to severe with winds and hail remaining the main threats. This activity has a high chance of continuing into the overnight hours before finally moving out of the panhandles along with the main portions of the weather system. While all the rain and thunderstorms are occurring there is a low chance for flooding through multiple rounds of rain hitting the same spot. There is then a moderate chance for misty to foggy conditions to develop during the early morning hours of Tuesday following the departure of the rain/thunder. Then for Tuesday a brief ridge have a high chance of passing across the panhandles bringing more stable conditions. However this ridge will not be sufficient to stop all convection with there being a low chance for isolated thunderstorms during Tuesday afternoon. As there is little in the way of upper level support it is very unlikely that any storms on Tuesday will become strong much less severe.*

SH

.AVIATION...

(18Z TAFS)

Issued at 1152 AM CDT Mon May 26 2025

*A weather system continues to impact the panhandles and all terminals with rain showers, thunderstorms, low clouds, and mist/fog. **Currently a band of rain showers and thunderstorms is passing across the panhandle impacting all terminals through the early afternoon with MVFR or worse conditions. This band then will move to the east allowing a brief window of improved conditions at all terminals for the mid afternoon up to VFR.** Then for the late afternoon and evening another round of rain showers and thunderstorms passed through degrading conditions again to MVFR to IFR. Once this band departs in the late evening a deck of low clouds will have a high chance of staying across all terminals with IFR conditions. Then during the overnight hours fog may develop under this low cloud deck leading to further reduced conditions LIFR or below.*

6.3 Inflight Weather Advisories

The only inflight weather advisory current in the area was a Convective SIGMET which extended east of the accident site associated with the thunderstorms in the northeast portion of the Texas panhandle.

WSUS32 KKKCI 261955

SIGC

-MKCC WST 261955

CONVECTIVE SIGMET 20C

VALID UNTIL 2155Z

*TX OK KS
FROM 30ENE GCK-40WSW ICT-60NE CDS-40NW CDS-40WNW LBL-30ENE GCK
AREA SEV TS MOV FROM 24015KT. TOPS TO FL450.
HIAL TO 1.25 IN...WIND GUSTS TO 50KT POSS.*

Submitted by:

Don Eick
Senior Meteorologist

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