



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

May 6, 2019

Weather Study

METEOROLOGY

CEN19FA082

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A. ACCIDENT

Location: Canadian, Texas
Date: February 15, 2019
Time: 0957 central standard time (1557 UTC¹)
Airplane: Cessna 421C; N421NS

B. METEOROLOGIST

Mike Richards
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in central standard time (CST) for February 15, 2019 (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 location: 35.906111° north latitude, 100.573611° west longitude, at an elevation of about 2,560 feet.

D. WEATHER INFORMATION

1.0 Synoptic Conditions

A southcentral section of the National Weather Service (NWS) Surface Analysis Chart for 0900 CST is presented in figure 1. The surface analysis chart showed a low pressure center west of the accident location along the Texas/New Mexico border. Stationary fronts extended north-northwest and southwest from this low pressure center. The accident site was located on the cold air side and north of the front. Station models near the accident location depicted overcast skies and an east-northeast to northeast wind of 10 knots. Temperatures were below freezing and dew point depressions were about 3° Fahrenheit or less. Fog and haze were reported at several stations west of the accident location.

¹ UTC – abbreviation for Coordinated Universal Time

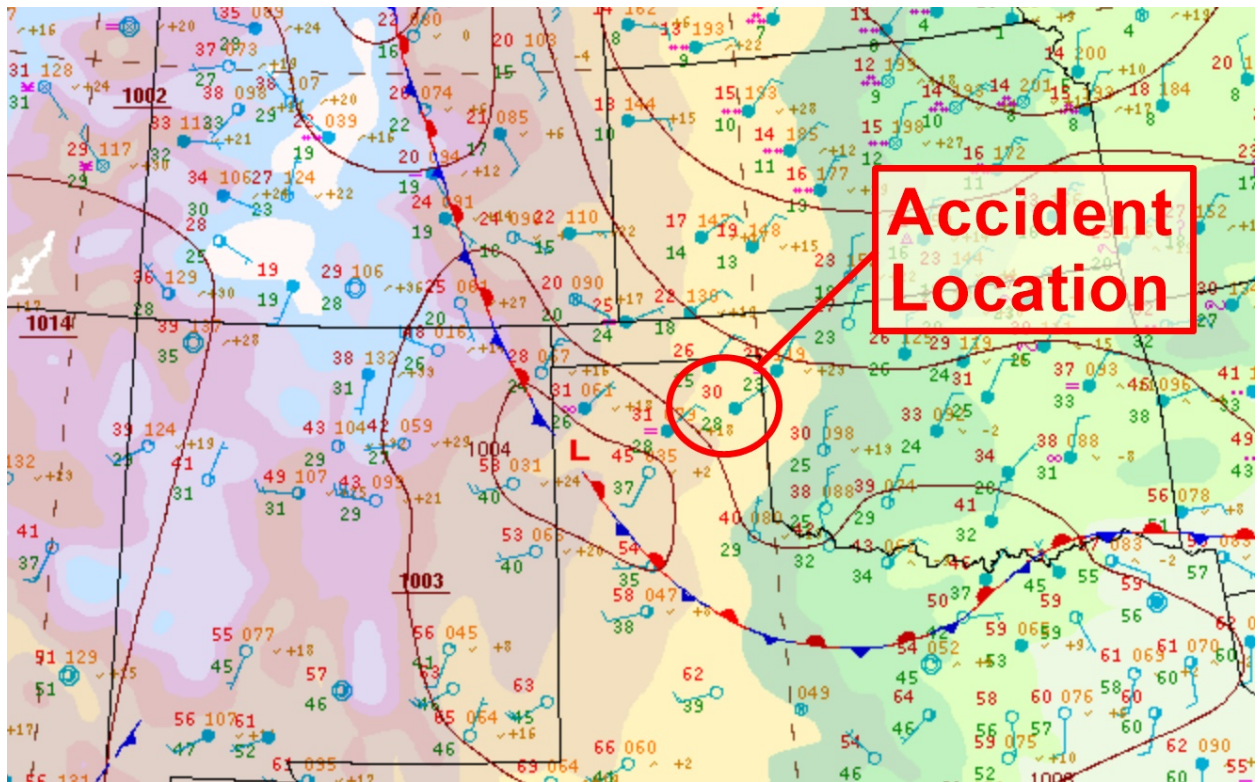


Figure 1 - NWS Surface Analysis Chart for 0900 CST.

2.0 Surface Observations

An Automated Weather Observing System (AWOS) was located at Hemphill County Airport (HHF²) in Canadian, Texas, which was located about 8 miles east of the accident location at an elevation of about 2,400 feet. Automated reports from HHF during the times surrounding the accident time are presented here.

[0855 CST] METAR KHHF 151455Z AUTO 06007KT 10SM OVC010 M01/M02 A2982 RMK AO2 T10101024=

[0915 CST] METAR KHHF 151515Z AUTO 04009KT 7SM OVC008 M01/M02 A2985 RMK AO2 T10111023=

[0935 CST] METAR KHHF 151535Z AUTO 03009KT 10SM OVC008 M01/M02 A2985 RMK AO2 T10111024=

[0955 CST] METAR KHHF 151555Z AUTO 04011KT 7SM OVC008 M01/M02 A2985 RMK AO2 T10111022=

² The National Weather Service uses the 4-digit International Civil Aviation Organization (ICAO) format for station identifiers (as seen in the body of some formatted weather observations). This report uses the 3-digit International Air Transport Association format for station identification, which does not use the geographic designating digit ("K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the ICAO format.

[0915 CST] METAR KHHF 151615Z AUTO 03008KT 7SM OVC008 M01/M02 A2987
RMK AO2 T10141025=

At 0955 CST, HHF reported a wind from 040° at 11 knots, visibility of 7 statute miles, ceiling overcast at 800 feet above ground level (agl), temperature of -1° Celsius (C) and a dew point temperature of -2°C, altimeter setting of 29.85 inches of mercury; remarks: station with a precipitation discriminator, temperature of -1.1°C and dew point temperature of -2.2°C.

An automated weather station of unknown type was located at Mesa Vista Ranch Airport (TX13³) in Pampa, Texas, which was located about 23 miles west of the accident location at an elevation of 2,772 feet. Automated reports from TX13 during the times surrounding the accident time are presented here.

[0855 CST] METAR KBPC 151455Z AUTO 05009KT 10SM OVC007 M01/M02 A2982
RMK AO2=

[0915 CST] METAR KBPC 151515Z AUTO 05013KT 10SM OVC007 M01/M02 A2984
RMK AO2=

[0935 CST] METAR KBPC 151535Z AUTO 07010KT 10SM OVC007 M01/M02 A2983
RMK AO2=

**[0955 CST] METAR KBPC 151555Z AUTO 06009KT 10SM OVC009 M01/M02
A2985 RMK AO2=**

[1015 CST] METAR KBPC 151615Z AUTO 06009KT 10SM OVC009 M01/M02 A2986
RMK AO2=

At 0955 CST, TX13 reported a wind from 060° at 9 knots, visibility of 10 statute miles or greater, ceiling overcast at 900 feet agl, temperature of -1°C and a dew point temperature of -2°C, altimeter setting of 29.85 inches of mercury; remarks: station with a precipitation discriminator.

An AWOS was located at Perry Lefors Field Airport (PPA) in Pampa, Texas, which was located about 27 miles southwest of the accident location at an elevation of 3,245 feet. Automated reports from PPA during the times surrounding the accident time are presented here.

[0855 CST] METAR KPPA 151455Z AUTO 06011KT 5SM BR SCT004 00/M01 A2978
RMK AO2 T10021013=

[0915 CST] METAR KPPA 151515Z AUTO 04012KT 5SM BR SCT004 00/M01 A2980
RMK AO2 T10011013=

[0935 CST] METAR KPPA 151535Z AUTO 05010KT 4SM BR OVC004 00/M01
A2980 RMK AO2 T10041013=

³ Weather Observation from TX13 are disseminated with a “KBPC” identifier.

**[0955 CST] METAR KPPA 151555Z AUTO 04012KT 5SM BR OVC004 00/M01
A2981 RMK AO2 T10051015=**

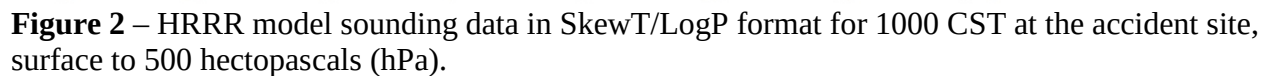
**[1015 CST] METAR KPPA 151615Z AUTO 03012KT 5SM BR OVC004 00/M01
A2983 RMK AO2 T10051015=**

At 0955 CST, TX13 reported a wind from 040° at 12 knots, visibility of 5 statute miles, mist, ceiling overcast at 400 feet agl, temperature of 0°C and a dew point temperature of -1°C, altimeter setting of 29.81 inches of mercury; remarks: station with a precipitation discriminator, temperature of -0.5°C and dew point temperature of -1.5°C.

3.0 Upper Air Data

A High-Resolution Rapid Refresh (HRRR) model⁴ sounding for the accident site at 1000 CST (figure 2) was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory. The wind between the surface and about 3,800 feet was from the northeast at 6 to 8 knots. However, at about 4,300 feet, the wind was from west-southwest at 8 knots, and increased in magnitude above this level to a west of about 40 knots at 5,700 feet. Calculations made by the Rawinsonde OBservation Program (RAOB) indicated the potential for severe or greater turbulence between about 3,700 feet and about 5,700 feet. RAOB also indicated the potential for light icing below 4,300 feet. RAOB identified cloudy conditions between about 3,100 and about 4,500 feet. The atmosphere was below freezing below about 4,350 feet and a steep temperature inversion was noted between about 3,750 feet and about 5,700 feet.

⁴ The HRRR is a NOAA real-time three-kilometer resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by three-kilometer grids with three-kilometer radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a one-hour period.



Advanced Very-High-Resolution Radiometer (AVHRR) visible (0.63μm) and infrared (10.8μm) data from the METOP-A platform were obtained from the NOAA. Imagery from near the time of the accident are presented in figures 3 and 4. The visible AVHRR imagery depicted cloudy skies over the accident region. The infrared data retrieved brightness temperatures over the accident location of about -15°C, which, considering the HRRR sounding, corresponded to cloud top heights of about 18,500 feet. However, the HRRR sounding retrieved a very dry atmosphere at this level, which would not support clouds. Further, minimum temperatures below the temperature inversion do not go below about -4°C. It is possible the model did not resolve upper level moisture or the tropospheric temperature profile very well. Additional information for this atmosphere from models, balloons and aircraft did not add any value. Therefore, confident determination of cloud top heights from the satellite data are not possible.

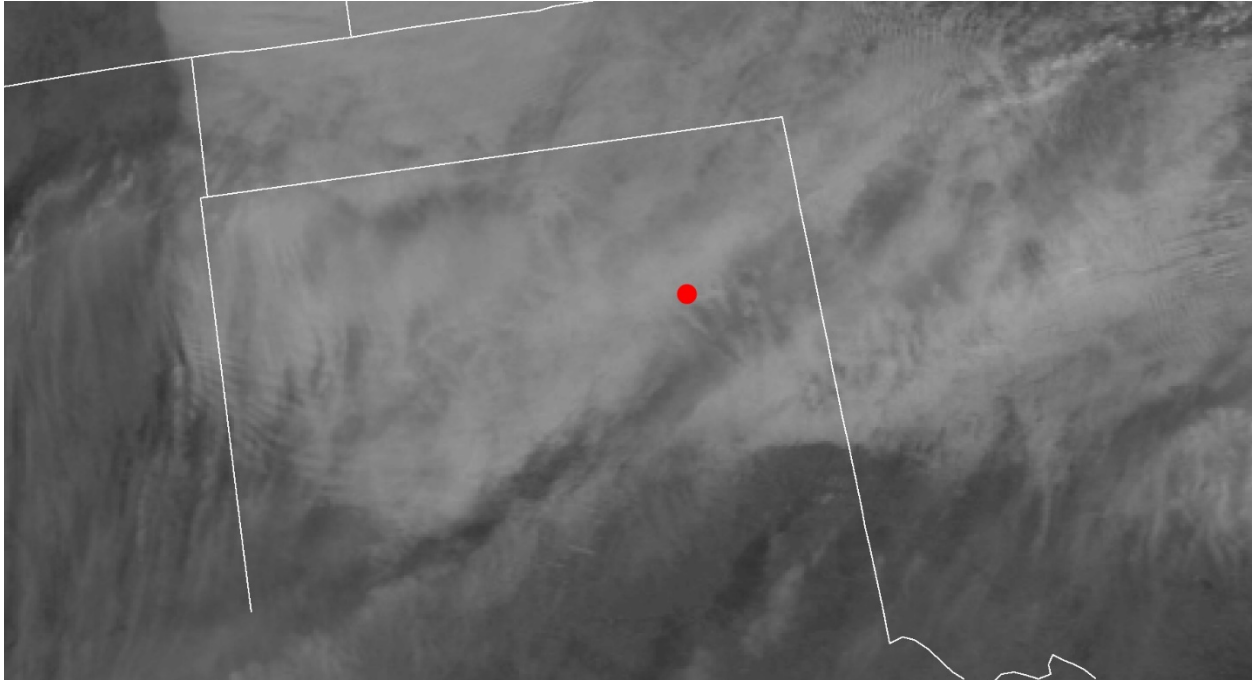


Figure 3 – METOP-A visible imagery from about 0956 CST. Accident location denoted by red dot.

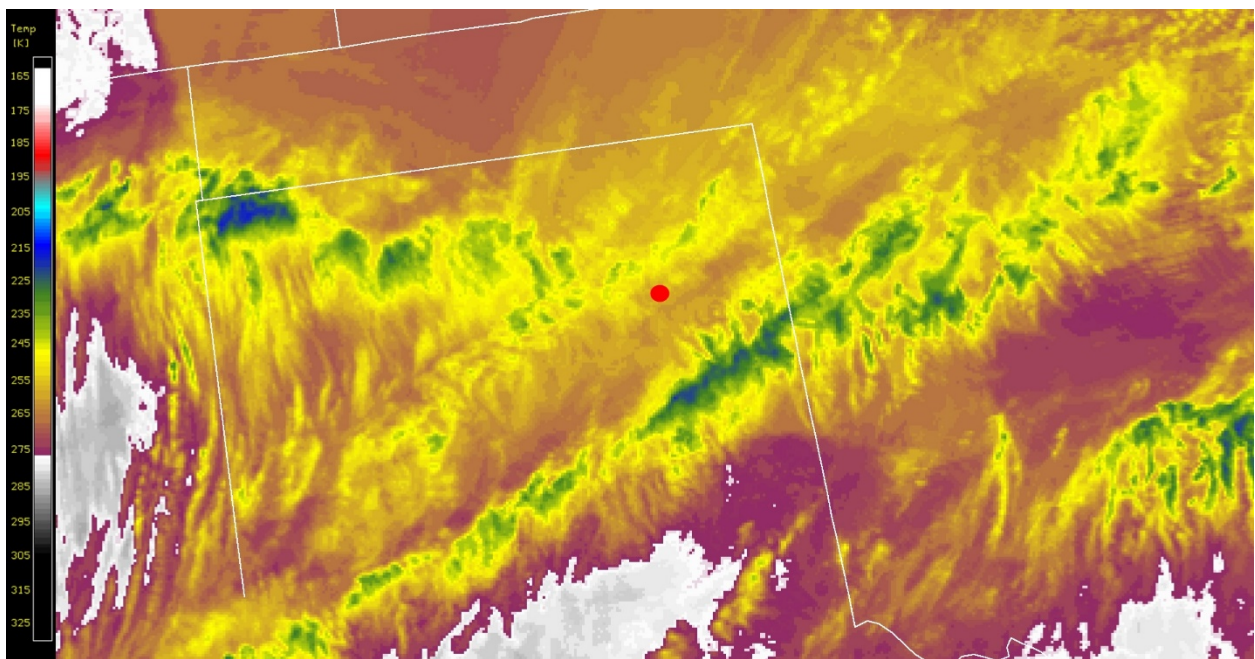


Figure 4 – METOP-A infrared imagery (brightness temperature in degrees Kelvin) from about 0956 CST. Accident location denoted by red dot.

5.0 Weather Radar

Weather radar imagery from the region did not depict any pertinent meteorological returns for the accident region.

6.0 Pilot Reports

There were no publicly disseminated pilot reports⁵ in the accident region made below FL300⁶.

7.0 Area Forecast Discussion

Area Forecast Discussions (AFD) were issued by the National Weather Service Weather Forecast Office in Amarillo, Texas at 0557 and 1130 CDT. Presented here are the “Aviation” sections of those AFDs.

*FXUS64 KAMA 151157
AFDAMA
Area Forecast Discussion
National Weather Service Amarillo TX
557 AM CST Fri Feb 15 2019*

*.AVIATION...
12z TAF Cycle:*

MVFR cigs at KGUY expected to improve to VFR in the next few hours. The exact timing may need to be amended, but confidence is fairly high cigs will increase through the morning. VFR will prevail at KDHT and KAMA through the period. Southwest to westerly winds will be strongest at KAMA, but are expected to decrease through the afternoon as front approaches, becoming northeasterly during the afternoon. Some marginal wind shear is expected through 15z this morning at KAMA and KDHT.

*FXUS64 KAMA 151750
AFDAMA
Area Forecast Discussion
National Weather Service Amarillo TX
1150 AM CST Fri Feb 15 2019*

.AVIATION...

⁵ Only pilot reports with the WMO headers UBTX** and UBOK** were considered. Pilot reports publicly-disseminated only over radio were not captured.

⁶ Flight Level (FL) - 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 inches of mercury), the average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above msl or agl.

Significant changes made to the 18Z TAF period. MVFR to at times IFR conditions are expected at all 3 TAF sites to start the 18Z TAF period. Clouds behind the cold front have made all the way to KAMA with bkn to ovc sigs below 1 kft to start the TAF period. KGUY should continue to be in clouds into the overnight. Clouds look to straddle KAMA and KDHT making this area tricky with the clouds forecast. Ranges for cloud cover as a result will be between VFR and MVFR at times. Winds out of the east and northeast will veer to more southwesterly towards the end of the TAF period. As a result, clouds should begin to dissipate toward the end of the TAF period as well.

8.0 AIRMETs

Airmen's Meteorological Information (AIRMET) advisories for instrument flight rule (IFR)⁷ conditions, moderate turbulence below FL180 and moderate icing between the freezing level and FL230 were active for the accident site at the accident time.

At 0935 PST, the NWS Aviation Weather Center (AWC) issued the following amended AIRMET for IFR conditions that was active for the accident site at the accident time. The previous AIRMET for IFR conditions for this area, which was issued at 0845 CST, was close to but did not include the accident location.

*WAUS44 KKCI 151535 AAA
WA4S
-DFWS WA 151535 AMD
AIRMET SIERRA UPDT 4 FOR IFR AND MTN OBSCN VALID UNTIL 152100
.
AIRMET IFR...OK TX...UPDT
FROM 30SSE LAA TO 40NW END TO 60SE MMB TO 30E AMA TO 40NE TCC TO
30SSE LAA
CIG BLW 010/VIS BLW 3SM BR. CONDS ENDG 18-21Z.*

At 0845 CST, the AWC issued the following AIRMET for moderate turbulence below FL180 that was active for the accident site at the accident time. At 0845 CST, an AIRMET for low level wind shear potential was issued for an area very close to, but not including, the accident location.

*WAUS44 KKCI 151445
WA4T
DFWT WA 151445
AIRMET TANGO UPDT 2 FOR TURB AND LLWS VALID UNTIL 152100
.
AIRMET TURB...OK TX
FROM 40ESE LAA TO 30SE LBL TO 50SE MMB TO 50NW ACT TO 20NNW DLF TO
90S MRF TO ELP TO INK TO 30ESE TBE TO 50W LBL TO 40ESE LAA
MOD TURB BLW FL180. CONDS CONTG BYD 21Z THRU 03Z.*

⁷ IFR conditions - Ceilings less than 1,000 feet agl and/or visibility less than three statute miles.

At 0845 CST, the AWC issued the following AIRMET for moderate icing between the freezing level and FL230 that was active for the accident site at the accident time.

WAUS44 KKCI 151445

WA4Z

DFWZ WA 151445

AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 152100

*.
AIRMET ICE...OK TX AR TN ND SD NE KS MN IA MO WI IL IN KY*

*FROM 20WNW ISN TO 20SSW FSD TO 30NW BDF TO 30W ROD TO CVG TO HNN
TO HNV TO 40SW LOZ TO 50SSW ARG TO 50ESE OKC TO 50NE CDS TO 50SW LBL
TO 50W LBL TO GLD TO BFF TO 70SW RAP TO 20WNW ISN*

***MOD ICE BTN FRZLVL AND FL230. FRZLVL SFC-080. CONDS CONTG BYD 21Z
THRU 03Z.***

9.0 SIGMETs

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

10.0 CWSU Products

There was no Center Weather Advisory or Meteorological Impact Statement issued by the Center Weather Service Unit at the Albuquerque Air Route Traffic Control Center (ZAB) that were active for the accident location at the accident time.

Submitted by:

Mike Richards
Senior Meteorologist

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