

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN23FA084

METEOROLOGY

Specialist's Factual Report

March 16, 2023

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A. ACCIDENT

Location: Yoakum, Texas
Date: January 17, 2023
Time: 1039 central standard time
1639 coordinated universal time (UTC)
Airplane: Piper PA46-350P; Registration: N963MA

B. METEOROLOGY SPECIALIST

Paul Suffern
National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's Senior Meteorologist did not travel for this investigation but gathered all data remotely. Data for this investigation were collected from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). This Specialist's Factual Report contains the meteorological factors pertinent to the weather surrounding the accident time. All times are central standard time (CST) and are based upon the 24-hour clock, where local time is -6 hours from UTC. Directions are referenced to true north and distances are in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles. NWS station identifiers use the standard International Civil Aviation Organization 4-letter station identifiers versus the International Air Transport Association 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports.

The accident site was located at approximate latitude 29.3064° N, longitude 97.1111° W, and elevation of 290 feet (ft).

D. 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 and the 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 Federal Aviation Administration (FAA) "Aviation Weather Handbook", FAA-H-8083-28.¹

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart centered over the southcentral United States for 1200 CST is provided as figure 1 with the location of the accident site within the black circle. The chart depicted a series of low-pressure systems and frontal boundaries from Colorado eastward through Arkansas. Closer to the accident site a surface trough² was located west of the accident site across central Texas oriented from south to north. Troughs and fronts can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present.

The station model closest to the accident site depicted an air temperature of 63 degrees Fahrenheit (°F), dew point temperature of 63°F, mist, overcast skies, and a southeast wind at 5 knots.

¹ [FAA-H-8083-28](#)

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

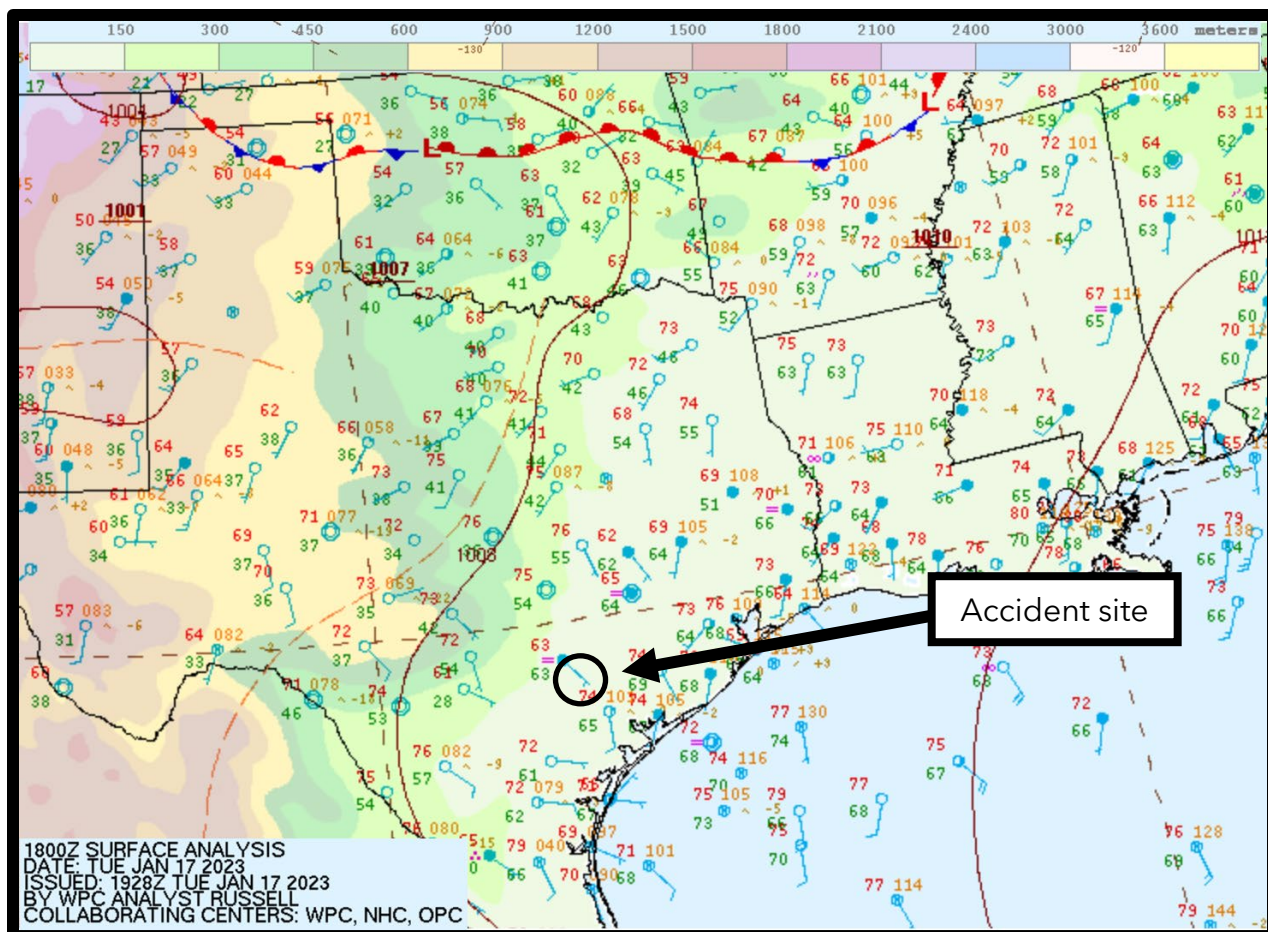


Figure 1. NWS Surface Analysis Chart for 1200 CST.

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 0600 CST at 925-, 850-, 700-, and 500- hectopascal (hPa) are presented in figures 2 through 5. The charts indicated a vertically stacked low-pressure center in the Great Lakes region of the United States with no mid-level troughs near the accident site. The 925- and 850-hPa constant pressure chart depicted variable winds above the accident site under 10 knots (figures 2 and 3) with the winds becoming westerly by 700-hPa (figure 4). The wind speed increased to 40 knots from the west by 500-hPa (figure 5).

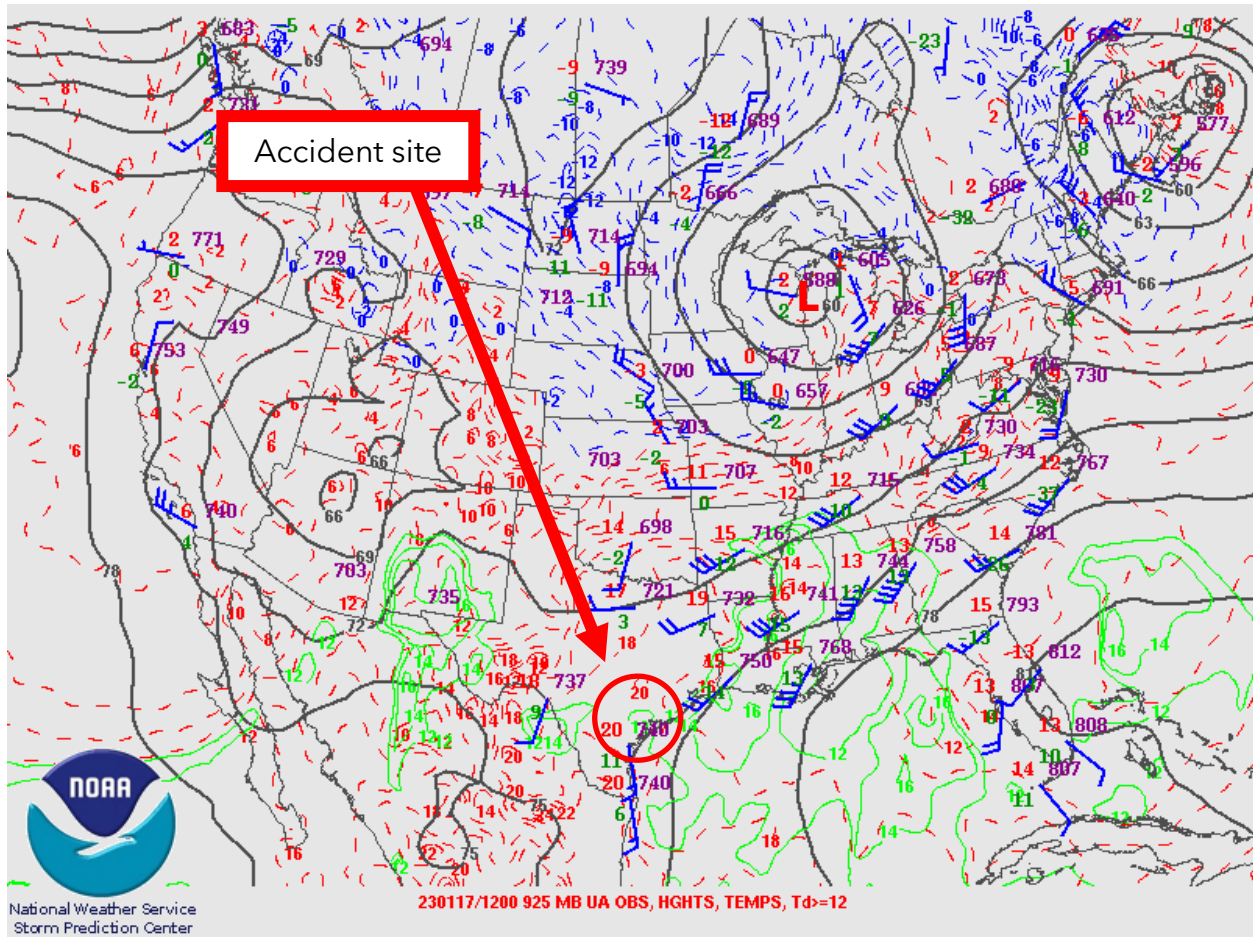


Figure 2. 925-hPa Constant Pressure Chart for 0600 CST.

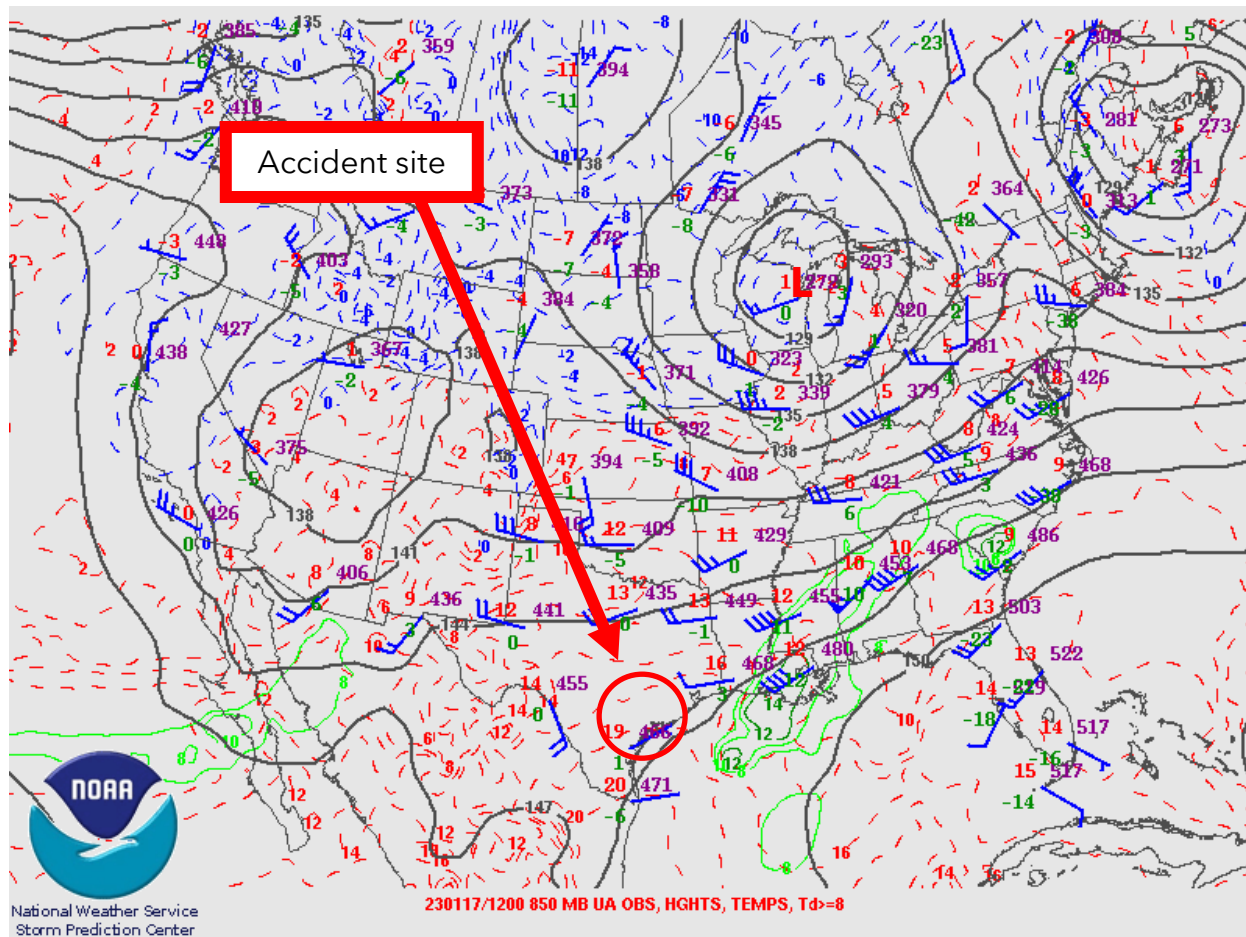


Figure 3. 850-hPa Constant Pressure Chart for 0600 CST.

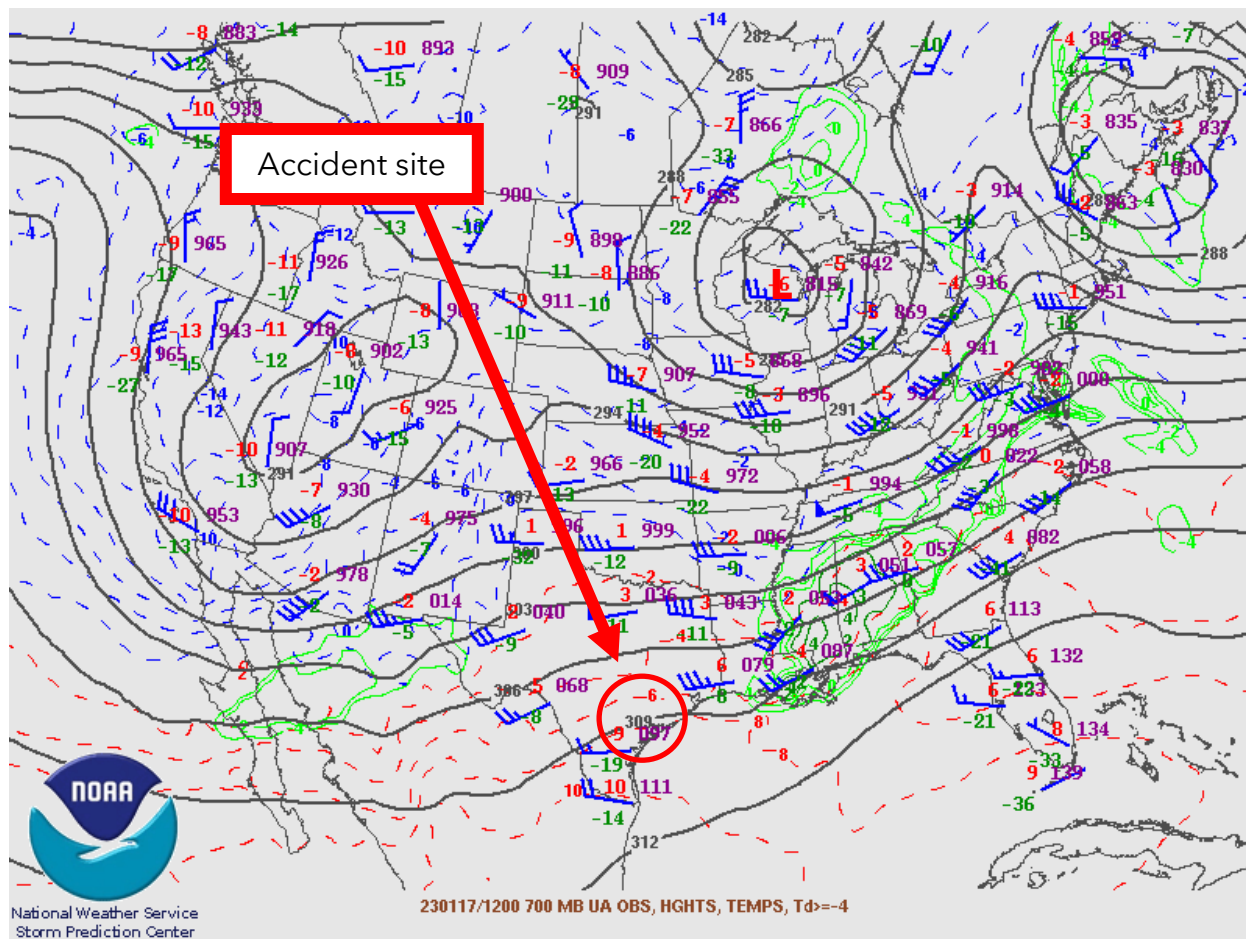


Figure 4. 700-hPa Constant Pressure Chart for 0600 CST.

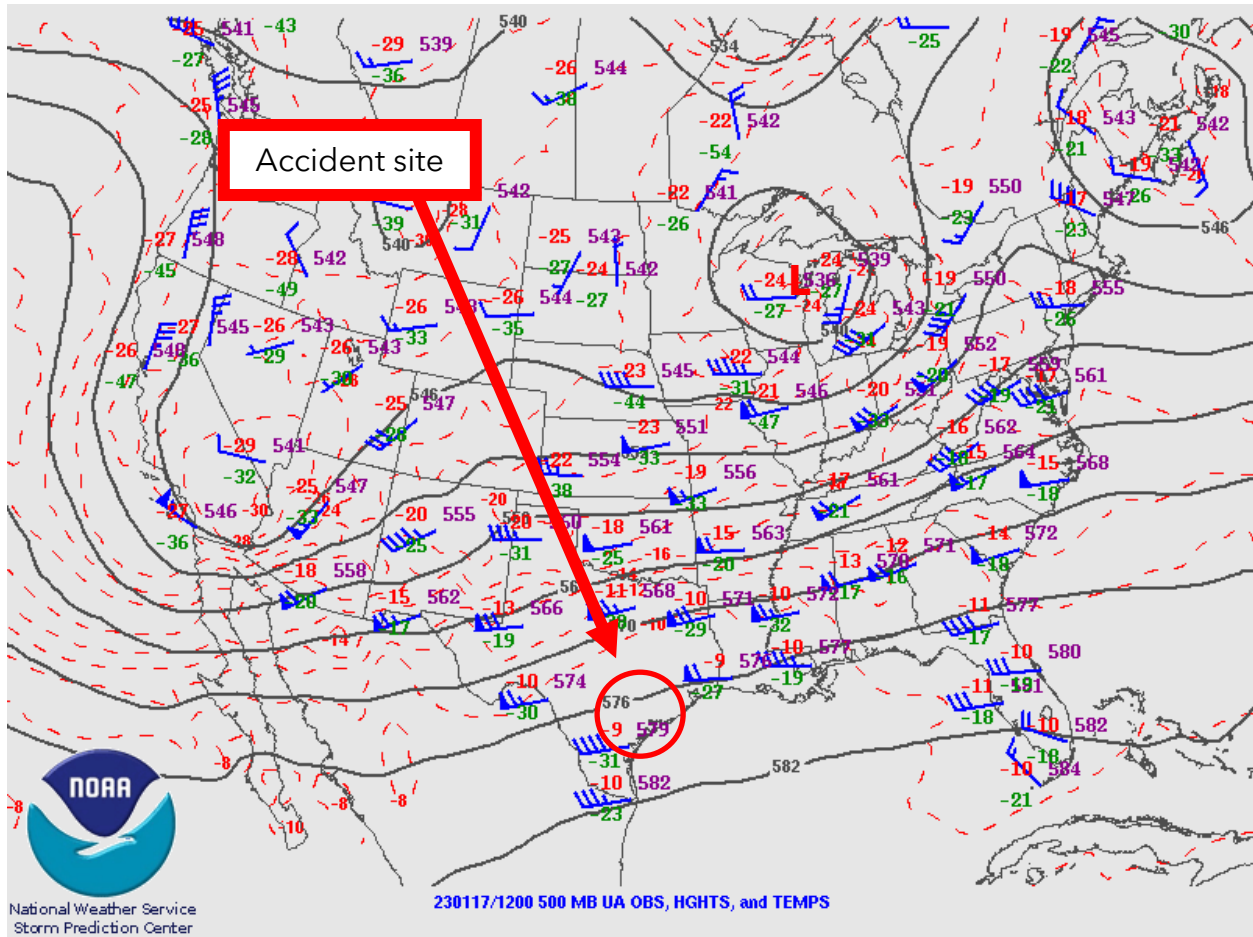


Figure 5. 500-hPa Constant Pressure Chart for 0600 CST.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METARs) and Special Reports (SPECIs). The following observations were taken from standard code and are provided in plain language. Figure 6 is a local sectional chart with the accident site and the closest weather reporting locations marked. A magnetic variation³ of 3° east was indicated over the area.

³ Magnetic variation - The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>

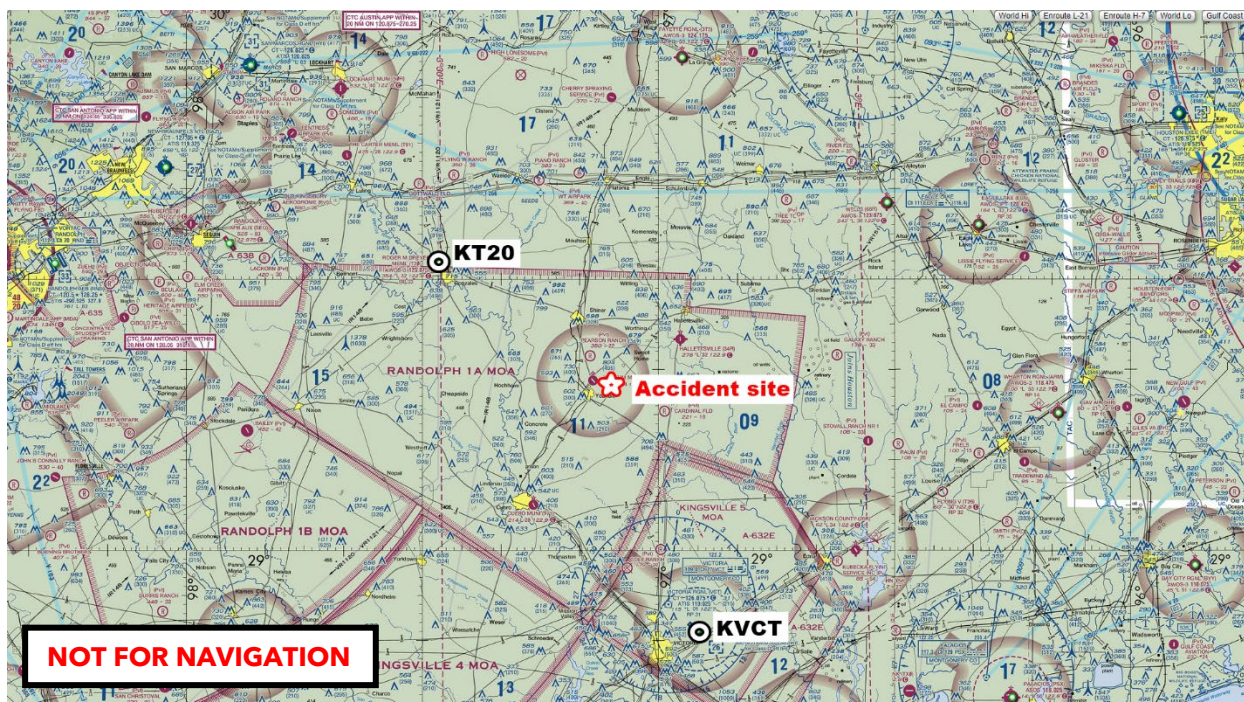


Figure 6. FAA sectional aeronautical chart of the accident area with the location of the accident site and surface observation sites.

Roger M Dreyer Memorial Airport (KT20) had the closest official weather station to the accident site. KT20 had an Automated Weather Observing System (AWOS⁴) and its longline⁵ reports were not augmented. The KT20 AWOS was located 23 miles northwest of the accident site (figure 6), at an elevation of 354 ft, and issued the following observations surrounding the period of the accident:⁶

[0915 CST] METAR KT20 171515Z AUTO 05003KT 2 1/2SM BR BKN001
BKN006 14/14 A2985 RMK AO2 T01360136

[0935 CST] METAR KT20 171535Z AUTO 11004KT 5SM BR SCT001
15/15 A2986 RMK AO2 T01460146

⁴ AWOS - Automated Weather Observing System is equipped with meteorological instruments to typically observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to 12,000 feet, and altimeter setting. AWOS are maintained by the FAA. Certain AWOS may have different reporting or observational equipment.

⁵ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline dissemination of weather observations is the primary vehicle through which the weather observations are distributed.

⁶ The bold sections of products in this report are intended to highlight the text that directly reference the weather conditions that affected the accident region around the accident time. The local times in this section next to the METARs are provided for quick reference between UTC and local times.

[0955 CST] METAR KT20 171555Z AUTO 12004KT 7SM CLR 15/15
A2987 RMK AO2 T01540154

[1015 CST] METAR KT20 171615Z AUTO 14005KT 10SM CLR 16/16
A2987 RMK AO2 T01550155

**[1035 CST] METAR KT20 171635Z AUTO 14006KT 10SM CLR 16/16
A2987 RMK AO2 T01610161**

ACCIDENT TIME 1039 CST

**[1055 CST] METAR KT20 171655Z AUTO 14006KT 10SM CLR 17/17
A2986 RMK AO2 T01680166**

[1115 CST] METAR KT20 171715Z AUTO 15006KT 7SM BKN004 17/17
A2986 RMK AO2 T01700168

The bold type observations decoded in plain language were as follows:

KT20 weather at 1035 CST, automated, wind from 140° at 6 knots, visibility 10 miles or greater, clear skies below 12,000 ft above ground level (agl), temperature of 16° Celsius (C), dew point temperature 16°C, and an altimeter setting of 29.87 inches of mercury (inHg). Remarks, automated station with a precipitation discriminator, temperature 16.1°C, dew point temperature 16.1°C.

KT20 weather at 1055 CST, automated, wind from 140° at 6 knots, visibility 10 miles or greater, clear skies below 12,000 ft agl, temperature of 17°C, dew point temperature 17°C, and an altimeter setting of 29.86 inHg. Remarks, automated station with a precipitation discriminator, temperature 16.8°C, dew point temperature 16.6°C.

Victoria Regional Airport (KVCT) had the next closest official weather station to the accident site. KVCT had an Automated Surface Observing System (ASOS⁷) and its longline reports were augmented by air traffic control (ATC) when the tower was in operation⁸. The KVCT ASOS was located 29 miles south-southeast of the accident site (figure 6), at an elevation of 115 ft, and issued the following observations surrounding the period of the accident:

⁷ ASOS - Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, weather phenomena, ceiling, temperature, dewpoint, altimeter, and barometric pressure. ASOS are maintained by the NWS.

⁸ ATC hours of operation 0700 to 2200 local.

[0758 CST] SPECI KVCT 171358Z 00000KT 1 1/2SM BR OVC006 18/18
A2983 RMK AO2 T01830183 \$

[0851 CST] METAR KVCT 171451Z 00000KT 1 1/2SM BR OVC010 19/19
A2986 RMK AO2 SLP110 T01890189 53022 \$

[0951 CST] METAR KVCT 171551Z 13006KT 1 1/2SM BR OVC010 20/19
A2987 RMK AO2 SLP112 T02000189 \$

[0953 CST] SPECI KVCT 171553Z 13006KT 3SM BR BKN007 OVC013
20/19 A2987 RMK AO2 T02000189 \$

**[1030 CST] SPECI KVCT 171630Z 18003KT 7SM SCT013 21/19
A2988 RMK AO2 T02060189 \$**

ACCIDENT TIME 1039 CST

**[1051 CST] METAR KVCT 171651Z VRB06KT 7SM SCT013 22/19
A2987 RMK AO2 SLP113 T02220189 \$**

[1151 CST] METAR KVCT 171751Z 18010KT 8SM SCT013 23/18 A2983
RMK AO2 SLP101 T02330183 10239 20178 58009 \$

The bold type observations decoded in plain language were as follows:

KVCT weather at 1030 CST, wind from 180° at 3 knots, visibility 7 miles, scattered clouds at 1,300 ft agl, temperature of 21°C, dew point temperature 19°C, and an altimeter setting of 29.88 inHg. Remarks, automated station with a precipitation discriminator, temperature 20.6°C, dew point temperature 18.9°C, maintenance indicator on.

KVCT weather at 1051 CST, variable wind at 6 knots, visibility 7 miles, scattered clouds at 1,300 ft agl, temperature of 22°C, dew point temperature 19°C, and an altimeter setting of 29.87 inHg. Remarks, automated station with a precipitation discriminator, sea level pressure 1011.3 hPa, temperature 22.2°C, dew point temperature 18.9°C, maintenance indicator on.

The observations from the KT20 AWOS and KVCT ASOS immediately prior to and following the accident time identified VFR⁹ conditions. However, IFR and LIFR conditions were observed with the cloud cover (section 4.0) within 30 to 60 minutes of the accident time.

3.0 Upper Air Sounding

A High-Resolution Rapid Refresh (HRRR)¹⁰ model sounding was created¹¹ for the approximate accident site coordinates for 1000 CST. The HRRR sounding was plotted on a standard Skew-T Log P diagram¹² from the surface to 600-hPa (or approximately 14,000 ft) using the RAOB¹³ software package and is included as figure 7. The sounding depicted an elevation of 305 ft over the grid point with a near surface temperature of 18.1°C, a dew point temperature of 17.0°C and a relative humidity of 93%. The sounding depicted the lifted condensation level (LCL)¹⁴ at 465 ft agl (770 ft msl) and the convective condensation level (CCL)¹⁵ at 6,983 ft. The freezing level was located at 13,884 ft. The precipitable water value at 0.78 inches.

⁹ The NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories:

- Low Instrument Flight Rules (LIFR*) – ceiling below 500 ft above ground level (agl) and/or visibility less than 1 statute mile.
- Instrument Flight Rules (IFR) – ceiling between 500 to below 1,000 feet agl and/or visibility 1 to less than 3 miles.
- Marginal Visual Flight Rules (MVFR**) – ceiling from 1,000 to 3,000 ft agl and/or visibility 3 to 5 miles.
- Visual Flight Rules (VFR) – ceiling greater 3,000 ft agl and visibility greater than 5 miles.

* By definition, IFR is a ceiling less than 1,000 ft agl and/or visibility less than 3 miles while LIFR is a sub-category of IFR.

**By definition, VFR is a ceiling greater than or equal to 3,000 ft agl and visibility greater than 5 miles while MVFR is a sub-category of VFR.

¹⁰ 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.

¹¹ HRRR sounding was created using NOAA Air Resource Laboratory: [READY Archived Meteorology \(noaa.gov\)](https://ready.noaa.gov/).

¹² 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.

¹³ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Esonde Research Services, The Villages, Florida.

¹⁴ LCL – The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹⁵ 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.

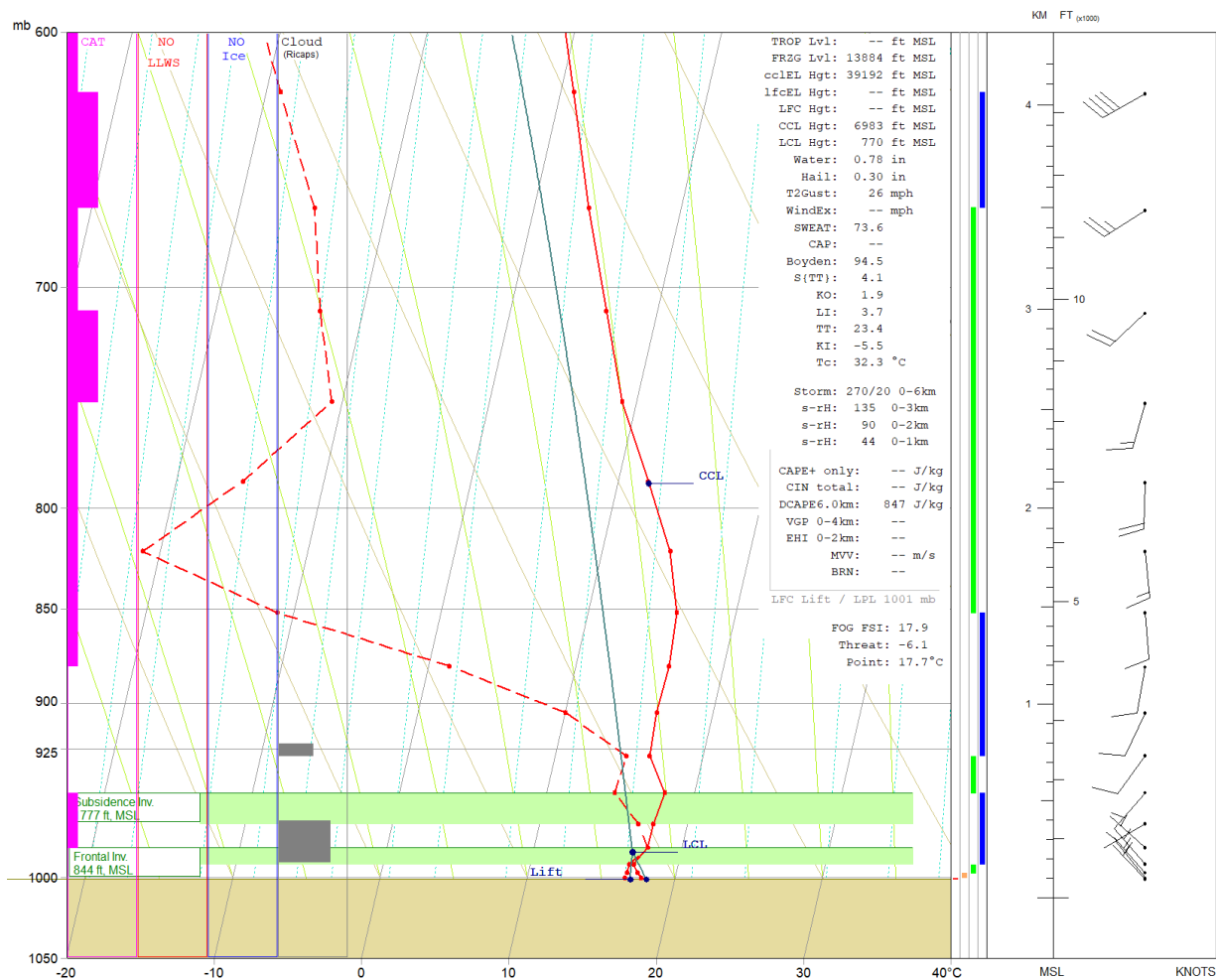


Figure 7. 1000 CST HRRR sounding.

The 1000 CST HRRR sounding indicated alternating layers of conditionally unstable and stable environments from the surface through 5,000 ft. RAOB indicated cloud cover from 300 ft agl through 1,000 ft agl (~1,300 ft msl) with another cloud layer around 500 ft thick with the cloud base around 2,500 ft msl. The top of a frontal inversion¹⁶ was noted at 844 ft and the top of a subsidence inversion was noted at 1,777 ft.

The 1000 CST HRRR sounding wind profile indicated a near surface wind from 318° at 3 knots with the wind remaining northwest to westerly through 1,500 ft under 10 knots. The wind became southerly by 3,000 ft and increased in speed to 20 knots by 7,000 ft. RAOB did not indicate the possibility of low-level wind shear (LLWS), but did indicated light clear air turbulence (CAT) in several layers below 14,000 ft.

¹⁶ Inversion - A departure from the usual decrease of the value of an atmospheric property with increasing altitude; also, the layer through which this departure occurs (the "inversion layer"), or the lowest altitude at which the departure is found (the "base of the inversion").

4.0 Satellite Data

Geostationary Operational Environmental Satellite number 16 (GOES-16) visible and infrared data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. Visible and infrared imagery (GOES-16 bands 2 and 13) at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period from 0700 CST through 1400 CST and reviewed, and the closest images to the time of the accident were documented.

Figure 8 presents the GOES-16 visible image at 1040 CST at 3X magnification with the accident site highlighted with a red square. The image depicted cloud cover over the accident site with the lower cloud cover moving from southeast to northwest (attachment 1). Figure 9 presents the GOES-16 infrared image at 1040 CST at 7X magnification with the accident site highlighted with a red square. The lower brightness temperatures (red colors; higher cloud tops) were located north and to the west of the accident site at the accident time. The brightness temperature of 282 Kelvin above the accident site would have been near 8,000 ft based on the vertical temperature profile provided by the 1000 CST HRRR sounding. It should be noted these figures have not been corrected for any parallax error.

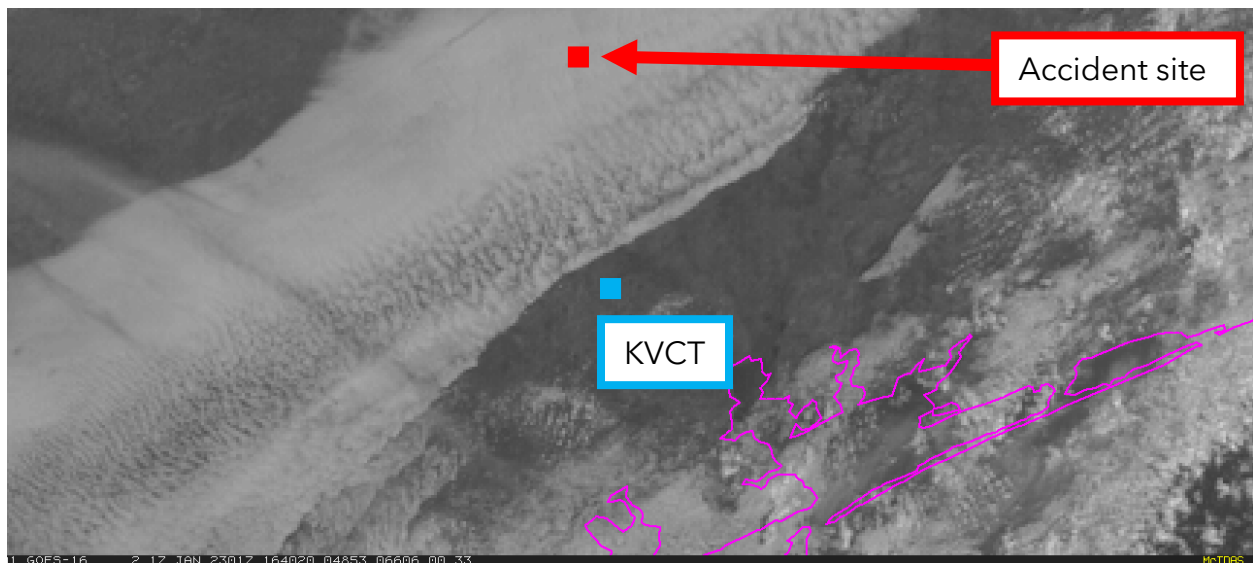


Figure 8. GOES-16 visible image at 1040 CST.

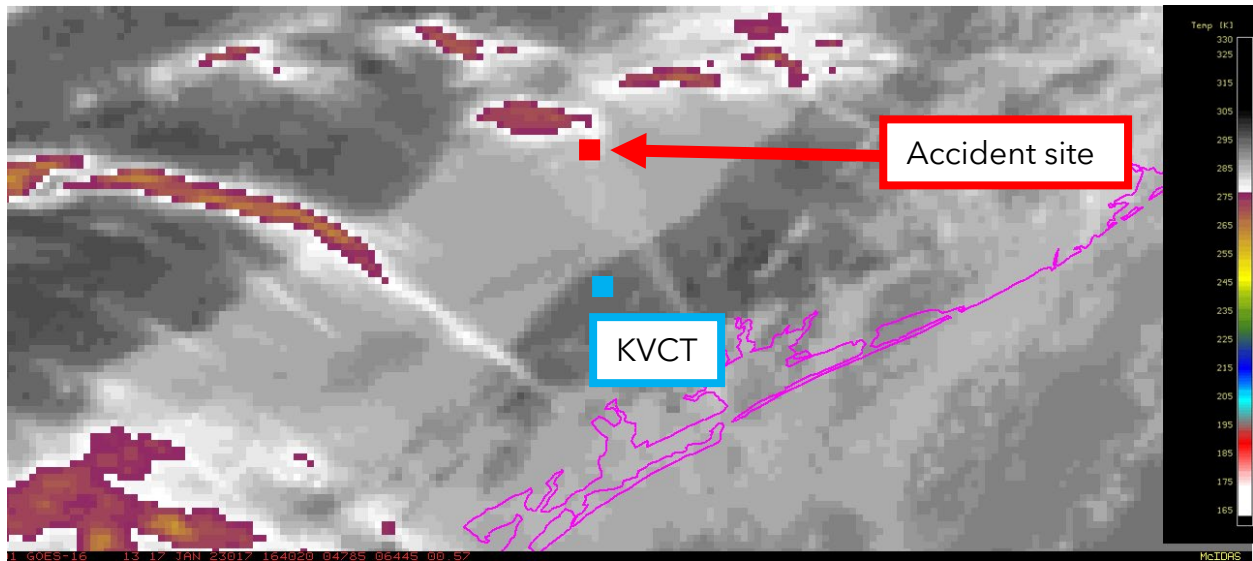


Figure 9. GOES-16 infrared image at 1040 CST.

5.0 National Radar Imagery

A regional view of the NWS National Reflectivity Mosaic is included as figure 10 for 1040 CST with the approximate location of the accident site marked by a red circle. The image depicted no echoes above the accident site.

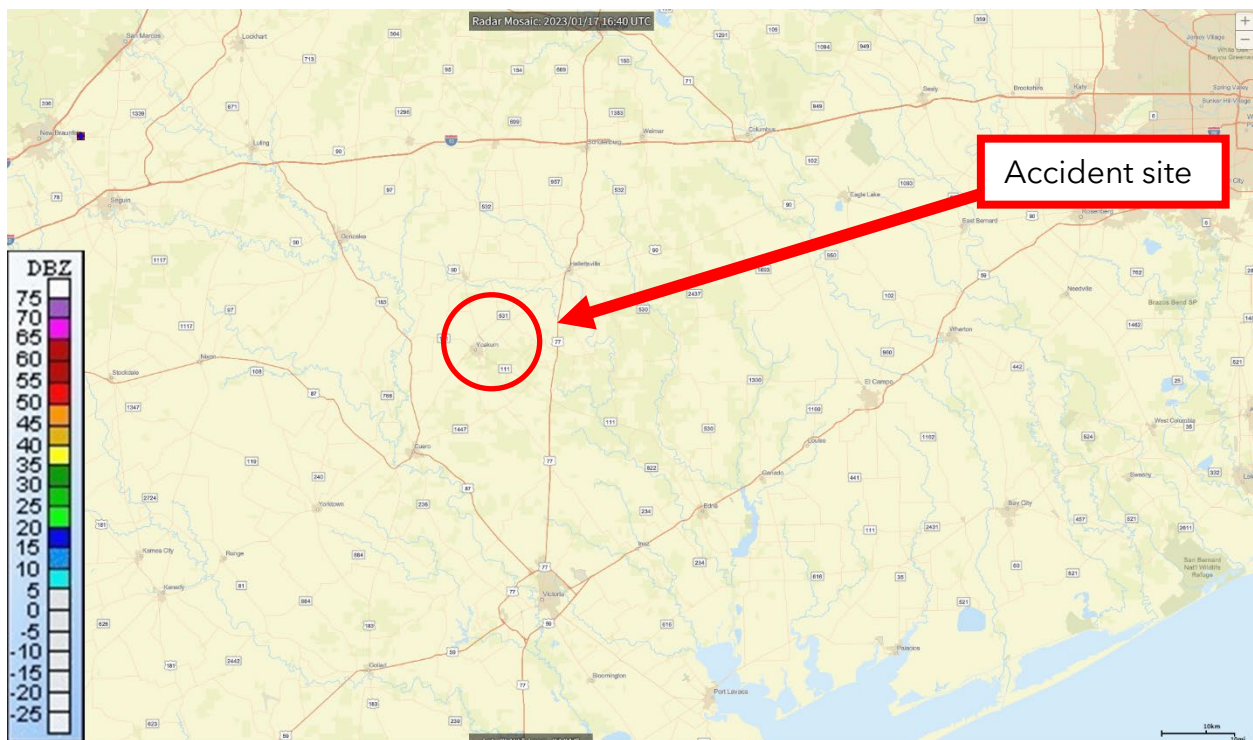


Figure 10. National Reflectivity Mosaic for 1040 CST.

6.0 Pilot Reports

The longline-disseminated pilot reports¹⁷ (PIREPs) distributed into the national airspace system (NAS) within two hours before and after the accident time and within 150 miles of the accident site at altitudes below 18,000 ft are shown here:

DWH UA /OV DURD/TM 1439/FL006/TP H25B/RM B006 1 NM N
NGP UA /OV 4NM SE NGP/TM 1440/FLDURC/TP BE9L/SK OVC T023
CRP UA /OV 6NM NW CRP/TM 1530/FLDURD/TP E170/SK OVC B011 T020
IAH UA /OV 2 EAST/TM 1558/FL010/TP A319/SK BASES 010
IAH UA /OV IAH/TM 1603/FL035/TP B737/SK BASES 008 TOPS 025
HOU UA /OV HOU/TM 1604/FL030/TP C750/SK BASES 009 TOPS 130
IAH UA /OV 4MF/TM 1622/FLDURD/TP B737/SK BASES013
IAH UA /OV IAH270004/TM 1700/FL021/TP B737/SK BKN021
HBV UA /OV KHBV/TM 1740/FLUNKN/TP UNKN/RM BASES RPTD FL011 ZHU
CXO UA /OV CXO360005/TM 1750/FLDURGC/TP PA44/SK BASES 024 TOPS 033
HBV UA /OV HBV/TM 1757/FL020/TP PC12/SK TOP020/RM AT KHBV TOPS FL020 AT
1757Z BY PC12 KZHU

7.0 Significant Meteorological Information

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

8.0 Center Weather Service Advisories

The Houston (ZHU) Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU) was responsible for the accident region. Center Weather Advisory (CWA) 103 was valid for the accident site at the accident time. CWA 103 (figure 11) was issued at 0859 CST and valid through 1100 CST and forecast an area of LIFR conditions across southeastern Texas that included the accident site. CWA 102 issued at 0658 CST and valid through 0900 CST also forecast LIFR conditions for the accident site:

FAUS21 KZHU 171459
ZHU1 CWA 171500
ZHU CWA 103 VALID UNTIL 171700
FROM 35WNW LFK-40SW BTR-60SSW LSU-55SE IAH-25S CRP-5E BRO-65SSE

¹⁷ Only PIREPs with the World Meteorological Organization headers UBTX** were considered. These do not include pilot reports only broadcast via radio.

LRD-10S LRD-50NE CWK-35WNW LFK
 AREA LIFR CONDS WITH CIGS MNLY AOB 005/VIS OCNLLY AOB 1/2SM FG.
 CONDS CONT TO IMPR THRU 17Z. TX LA
 =

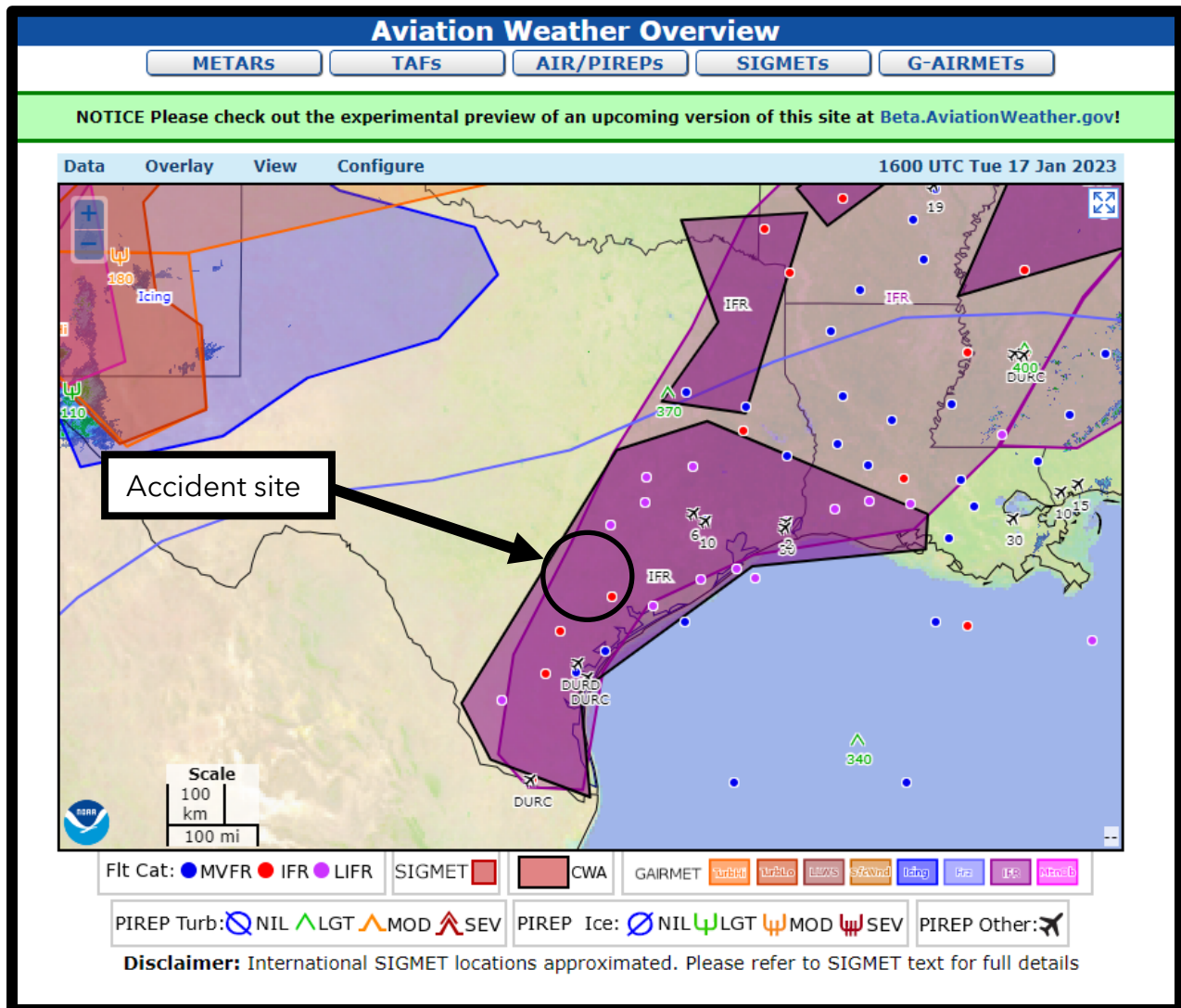


Figure 11. CWAs, Graphical-AIRMETs, and PIREPs valid at 1000 CST.

9.0 Airmen's Meteorological Information

The NWS Aviation Weather Center had text Airmen's Meteorological Information (AIRMET) advisory Sierra valid for the accident site at the accident time. The text AIRMET Sierra was issued at 0845 CST and forecast IFR conditions due to mist and fog:

WAUS44 KPCI 171445

WA4S

-DFWS WA 171445

AIRMET SIERRA UPDT 5 FOR IFR AND MTN OBSCN VALID UNTIL 172100

.
**AIRMET IFR...OK TX AR TN LA MS AL MO IL IN KY AND CSTL WTRS
FROM 40SE TTH TO BWG TO 20ESE BNA TO 30S MSL TO 40SW IGB TO
20SSW MCB TO 50SSW LSU TO 120SSW LCH TO BRO TO 90W BRO TO 60NE
LRD TO 40SSW CWK TO 60SE MLC TO 50NW ARG TO 50NW PXV TO 40SE TTH
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 21Z ENDG 21-00Z.**

.
AIRMET IFR...TN LA MS AL IN KY
FROM 50SW ROD TO CVG TO HNN TO HMV TO GQO TO 40SE LGC TO 20E MGM
TO 40WSW MGM TO 40WNW SJI TO 30SSW MCB TO 40SW IGB TO 30S MSL TO
40SE IIU TO 50SW ROD
CIG BLW 010/VIS BLW 3SM PCPN/BR/FG.

.
AIRMET MTN OBSCN...TN KY
FROM HNN TO HMV TO GQO TO 60ESE BWG TO HNN
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z ENDG BY 00Z.

.
OTLK VALID 2100-0300Z...IFR AL
BOUNDED BY 20SSW GQO-20WNW PZD-30SE MGM-30NW MGM-20SSW GQO
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS DVLPG 21-00Z. CONDS ENDG
BY 03Z.

....

10.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products issued before the accident flight and valid from 0900 until 1500 CST are shown in attachment 2. The GFA surface forecasts applicable to the accident site that were valid before the accident flight's departure from 0900 until 1500 CST indicated LIFR conditions until 1200 CST with VFR conditions by 1200 through 1500 CST, and a southeast wind of 5 knots. The GFA cloud forecast applicable to the accident site that was valid from 0900 until 1500 CST indicated broken clouds at 300 ft with cloud tops at 2,400 ft then cirrus clouds above from 0900 through 1200 CST and after 1200 CST only scattered clouds at 1,700 ft were expected with cirrus clouds above. The Graphical AIRMET¹⁸ (G-AIRMET) Sierra valid for the accident site from 0900 CST until 1200 CST is located on the GFA surface forecast graphics. The only human-generated information reflected in the two GFA products were the G-AIRMETs.

¹⁸ Graphical AIRMETs (G-AIRMETs), found on the Aviation Weather Center webpage at <http://aviationweather.gov>, are graphical forecasts of en-route weather hazards valid at discrete times no more than 3 hours apart for a period of up to 12 hours into the future (for example, 00, 03, 06, 09, and 12 hours). G-AIRMETs are snap shots at discrete time intervals as defined above. The text AIRMET is the result of the production of the G-AIRMET but provided in a time smear for a 6hr valid period.

11.0 Terminal Aerodrome Forecast

KVCT was the closest site with an NWS Terminal Aerodrome Forecast¹⁹ (TAF) current at the time of the accident. The KVCT TAF valid at the accident time was an amended TAF issued at 1015 CST and was valid for a 20-hour period beginning at 1000 CST. The 1015 CST TAF for KVCT was as follows:

FTUS44 KCRP 171615 AAC
TAFVCT
TAF AMD
KVCT 171615Z 1716/1812 17008KT P6SM SCT010 BKN030
TEMPO 1716/1718 3SM BR BKN010
FM172200 15012KT P6SM FEW025 SCT040
FM180200 17008KT P6SM BKN025
TEMPO 1808/1812 4SM BR OVC009=

Between 1000 and 1600 CST the KVCT forecast expected a wind from 170° at 8 knots, 6 miles visibility or greater, scattered clouds at 1,000 ft agl, and a broken ceiling at 3,000 ft agl. Temporary conditions²⁰ were forecast between 1000 and 1200 CST with 3 miles visibility, mist, and a broken ceiling at 1,000 ft agl expected. Additional amended KVCT TAFs issued at 0917, 0821, and 0520 CST, including the one valid before departure, are below:

FTUS44 KCRP 171517 AAB
TAFVCT
TAF AMD
KVCT 171517Z 1715/1812 VRB04KT 2SM BR BKN010
FM171600 17008KT P6SM SCT010 BKN030
FM172200 15012KT P6SM FEW025 SCT040
FM180200 17008KT P6SM BKN025
TEMPO 1808/1812 4SM BR OVC009=

¹⁹ According to NWS Instruction 10-813: "An NWS TAF consists of the expected meteorological conditions significant to aviation at an airport for a specified time period. For the U.S., this is the area within five (5) statute miles (SM) of the center of an airport's runway complex."

www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

²⁰ The TEMPO group is used for any conditions in wind, visibility, weather, or sky condition which are expected to last for generally less than an hour at a time (occasional), and are expected to occur during less than half the time period.

FTUS44 KCRP 171421 AAA
TAFVCT
TAF AMD
KVCT 171421Z 1714/1812 VRB04KT 2SM BR BKN004
TEMPO 1714/1715 1/4SM FG VV002
FM171600 17008KT P6SM SCT010 BKN030
FM172200 15012KT P6SM FEW025 SCT040
FM180200 17008KT P6SM BKN025
TEMPO 1808/1812 4SM BR OVC009=

FTUS44 KCRP 171120
TAFVCT
TAF
KVCT 171120Z 1712/1812 VRB04KT 1/2SM FG BKN004
TEMPO 1712/1715 1/4SM FG VV002
FM171600 17008KT P6SM SCT010 BKN030
FM172200 15012KT P6SM FEW025 SCT040
FM180200 17008KT P6SM BKN025
TEMPO 1808/1812 4SM BR OVC009=

12.0 National Weather Service Area Forecast Discussion

The NWS weather forecast office in Corpus Christi, Texas, (WFO CRP) was responsible for the public forecast in the region of the accident site. WFO CRP issued the following Area Forecast Discussion (AFD) at 0542 CST, the closest AFD to the accident time with an aviation section:

FXUS64 KCRP 171142
AFDCRP

Area Forecast Discussion
National Weather Service Corpus Christi TX
542 AM CST Tue Jan 17 2023

...New AVIATION...

.SHORT TERM...
(Today through Wednesday)
Issued at 314 AM CST Tue Jan 17 2023

Key Messages:

- Areas of Dense fog continue this morning
- High Risk of rip currents today, Moderate tonight
- Cold front arriving Wednesday with showers and a few thunderstorms possible

Patchy to areas of fog and dense fog have developed across portions

of the Coastal Plains early this morning. A Dense Fog Advisory is in effect through 9 AM for areas mainly east of Highway 281 with visibilities down to 1/8-1/4 of a mile at times. Conditions are expected to begin improving after daybreak, except for right along the immediate coast where foggy conditions may persist through noon. Patchy fog may redevelop tonight, but not anticipating it to be as widespread as this morning.

Today it will be very warm across South Texas with well above normal temperatures expected under generally mostly to partly cloudy skies. Highs will range from the mid 70s along the coast to the mid to upper 80s out west. Light and variable winds early in the morning will become south to southeasterly and increase to around 10-15 mph during the day.

A strengthening onshore flow tonight ahead of an advancing upper level low crossing into the Southern Plains will allow for rain chances to gradually increase across the eastern half of the CWA overnight as moisture rises. Precipitable water values are expected to be around 1.2-1.5 inches by Wednesday morning in advance of an associated cold front moving through. Isolated to scattered showers and a few thunderstorms will be possible ahead of the boundary mainly over portions of the Victoria Crossroads and northern Coastal Bend Wednesday morning, with chances diminishing through the afternoon in its wake. The front should near the Brush Country and Rio Grande Plains around 12Z Wednesday, reaching the coast closer to around 18Z. Due to the fast moving nature of this front, anticipating rainfall amounts to remain below a quarter of an inch for most locations. Much drier conditions will develop from west to east behind the boundary with winds shifting to the northwest and briefly increasing to around 15-20 mph.

A High Risk of rip currents is in effect again today for the Gulf-facing beaches of the Middle Texas Coast due to the combination of high swells and moderate onshore winds. Swells should be subsiding overnight, but will remain high enough to prompt a Moderate Risk for the tonight period. Regarding coastal flooding potential, although tides have been running around 1.0-1.2 ft above predicted, the astronomical tides are very low. Therefore, not anticipating tides to exceed 2 ft MSL during the period.

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.LONG TERM...

(Wednesday night through next Monday)

Issued at 314 AM CST Tue Jan 17 2023

Key Messages:

- Minor Coastal Flooding expected Friday afternoon/evening
- Rain chances return Friday night

- Scattered showers Saturday with isolated thunderstorms east

Cool and dry conditions are expected behind the front for Wednesday night into Thursday as high pressure settles into the area. Low RH values will occur Thursday afternoon but north winds will be light to preclude reaching elevated fire danger criteria.

An upper low over the Desert Southwest Thursday night will move east across the southern Rockies Friday and into the southern high plains Saturday evening. A coastal trough will develop along the lower Texas coast Friday. With moderate to strong easterly flow, this will lead to minor coastal flooding near time of high tide Friday afternoon and evening. P-ETSS shows tide levels could reach up to 2.5 feet MSL during this period.

Moisture will steadily increase with the easterly flow Friday into Friday night. Isentropic lift will increase Friday night leading to scattered showers. As the coastal trough lifts north Saturday, some instability will move inland to provide a threat for isolated storms for the coastal region.

The short wave trough is expected to move across the southern plains Sunday morning with a cold front ushering in drier air that will diminish rain chances. It will be cool and dry Sunday night but the ridge axis will move east by Monday with an onshore flow returning.

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.AVIATION...

(12Z TAFS)

Issued at 530 AM CST Tue Jan 17 2023

Poor aviation conditions across ALI/VCT terminals this morning owing to dense fog development. LIFR conditions are expected to persist across these aforementioned sites through 15-16Z today. At CRP, IFR conditions are ongoing. However, still expecting LIFR to redevelop over the next few hours if the winds are able to weaken and the fog returns. Across the west, conditions remain at VFR levels. A return to VFR is expected at the eastern terminals by this afternoon, remaining at these levels through tonight. MVFR/IFR conditions return at all terminals late tonight into early Wednesday morning ahead of an advancing cold front. Winds will generally be light and variable this morning, becoming gusty at around 15-20 kts out of the south to southeast this afternoon at ALI/CRP. Winds will be light and variable again overnight ahead of the boundary.

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.MARINE...

Issued at 314 AM CST Tue Jan 17 2023

A Marine Dense Fog Advisory remains in effect for the bays and

nearshore waters of the Middle Texas Coast through noon. A generally weak to moderate south to southeasterly flow is expected today, before strengthening to moderate to strong levels tonight. Advisory conditions will be possible late tonight offshore ahead of an approaching cold front. The front is expected to move offshore around mid day Wednesday with a moderate west to northwesterly wind developing in its wake. Showers and a few thunderstorms will be possible along and ahead of the front Wednesday.

A weak to moderate offshore flow Wednesday night will become moderate Thursday as high pressure builds into the region. The flow will become moderate northeasterly/SCEC Thursday night and increase to moderate to strong easterly/SCA Friday and Friday night as a coastal trough forms near the lower Texas coast. Scattered showers are expected Friday through Saturday night with isolated thunderstorms Saturday. The flow will turn northeasterly on Saturday with a moderate to strong northerly flow Saturday night behind a cold front with SCA conditions persisting into Sunday.

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.PRELIMINARY POINT TEMPS/POPS...

Corpus Christi	81	66	82	47	/	0	10	10	0
Victoria	80	65	79	44	/	0	30	50	0
Laredo	86	63	81	47	/	0	0	0	0
Alice	84	65	84	47	/	0	10	10	0
Rockport	74	63	79	49	/	0	30	40	0
Cotulla	87	62	81	43	/	0	0	0	0
Kingsville	83	65	84	47	/	0	10	10	0
Navy Corpus	78	66	78	53	/	0	20	30	0

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.CRP WATCHES/WARNINGS/ADVISORIES...

TX...Dense Fog Advisory until 9 AM CST this morning for TXZ231>234-241>247-342>347-442-443-447.

High Rip Current Risk through this afternoon for TXZ345-442-443-447.

GM...Dense Fog Advisory until noon CST today for GMZ231-232-236-237-250-255.

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13.0 Winds and Temperature Aloft Forecast

The NWS 0757 CST Winds and Temperature Aloft forecast valid for the closest points to the accident site are included below:

FBUS31 KWNO 171357

FD1US1

DATA BASED ON 171200Z

VALID 171800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
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PSX 1915 1717+15 2219+09	2428+04	2545-09	2546-22	244939	256349	267757			
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SAT 1810 1819+15 2125+10	2332+04	2446-10	2550-22	245439	257349	258158			
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The closest forecast points to the accident site were the Palacios, Texas (PSX) and San Antonio, Texas (SAT) locations. The 0757 CST forecast was for use between 0800 CST and 1500 CST.

14.0 Pilot Weather Information

Title 14 CFR 91.103 states that “Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight.” FAA AC 91-92 “Pilot’s Guide to a Preflight Planning” (dated March 15, 2021) provided pilot guidance on preflight self-briefings, including planning, weather interpretation, and risk identification/mitigation skills. The AC further stated in part:

Pilots adopting these guidelines will be better prepared to interpret and utilize real-time weather information before departure and en route, in the cockpit, via technology like Automatic Dependent Surveillance-Broadcast (ADS-B) and via third-party providers.²¹

A search of archived information indicated that the accident pilot did not request weather information from Leidos Flight Service. The accident pilot did request and receive a weather briefing package from ForeFlight at 0705 CST, and the weather briefing package at 0705 CST contained all the standard weather forecast information valid at that time including CWA 102. For more information please see attachments 3 and 4. Prior to the flight the accident pilot had not viewed any weather imagery information on the ForeFlight App. It is unknown what additional weather information, if any, the accident pilot checked or received during the accident flight.

²¹ https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-92.pdf. The AC also listed multiple online FAA resources for aviation flight planning services for adverse weather.

15.0 Witness Information

The landowner where the accident plane came to rest stated that shortly after the accident occurred he noticed a lot of fog at the accident site with a calm wind. In addition, an air medical helicopter dispatched from Bastrop, Texas, to fly to the accident site cancelled its flight due to the heavy fog in the area around 1130 CST. For more information please see the docket for this investigation.

16.0 Astronomical Data

The astronomical data obtained for the accident site on January 17, 2023, indicated the following:

SUN

Begin civil twilight 0658 CST

Sunrise 0723 CST

Accident time 1039 CST²²

Sun transit 1239 CST

Sunset 1754 CST

End civil twilight 1819 CST

At the time of the accident the Sun was located at an altitude of 32.32° and azimuth of 146.55°.

E. LIST OF ATTACHMENTS

Attachment 1 - GOES-16 Visible imagery animation from 0921 to 1121 CST

Attachment 2 - GFA information valid at the accident time

Attachment 3 - ForeFlight information

Attachment 4 - ForeFlight weather information

Submitted by:

Paul Suffern
Senior Meteorologist

²² Inserted accident time for reference and context.