



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

December 2, 2019

Weather Study

METEOROLOGY

CEN20FA019

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A. ACCIDENT

Location: San Marcos, Texas
Date: November 20, 2019
Time: 0555 central standard time
1155 Coordinated Universal Time (UTC)
Aircraft: Raytheon A36; Registration: N88855

B. METEOROLOGIST

Paul Suffern
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. 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 official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Centers for Environmental Information (NCEI). All times are central standard time (CST) 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 miles. NWS airport and 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 location used was at latitude 29.9000° N, longitude 97.8520° W at an approximate elevation of 590 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 Weather Prediction Center, 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 00-45H change 2¹.

¹

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1030

1.1 Surface Analysis Chart

The southcentral section of the NWS Surface Analysis Chart for 0600 CST is provided as figure 1 with the location of the accident site marked within the red circle. The chart depicted a high pressure system at 1021-hectopascals (hPa) to the east-southeast in the Gulf of Mexico. No defined frontal boundaries were identified over the region.

The station models around the accident site depicted air temperatures in the mid 60 degrees Fahrenheit (°F), dew point temperatures in the mid 60's °F with a temperature-dew point spread of 1° or less, a south to east wind at 5 to 10 knots, overcast cloud cover, and fog.

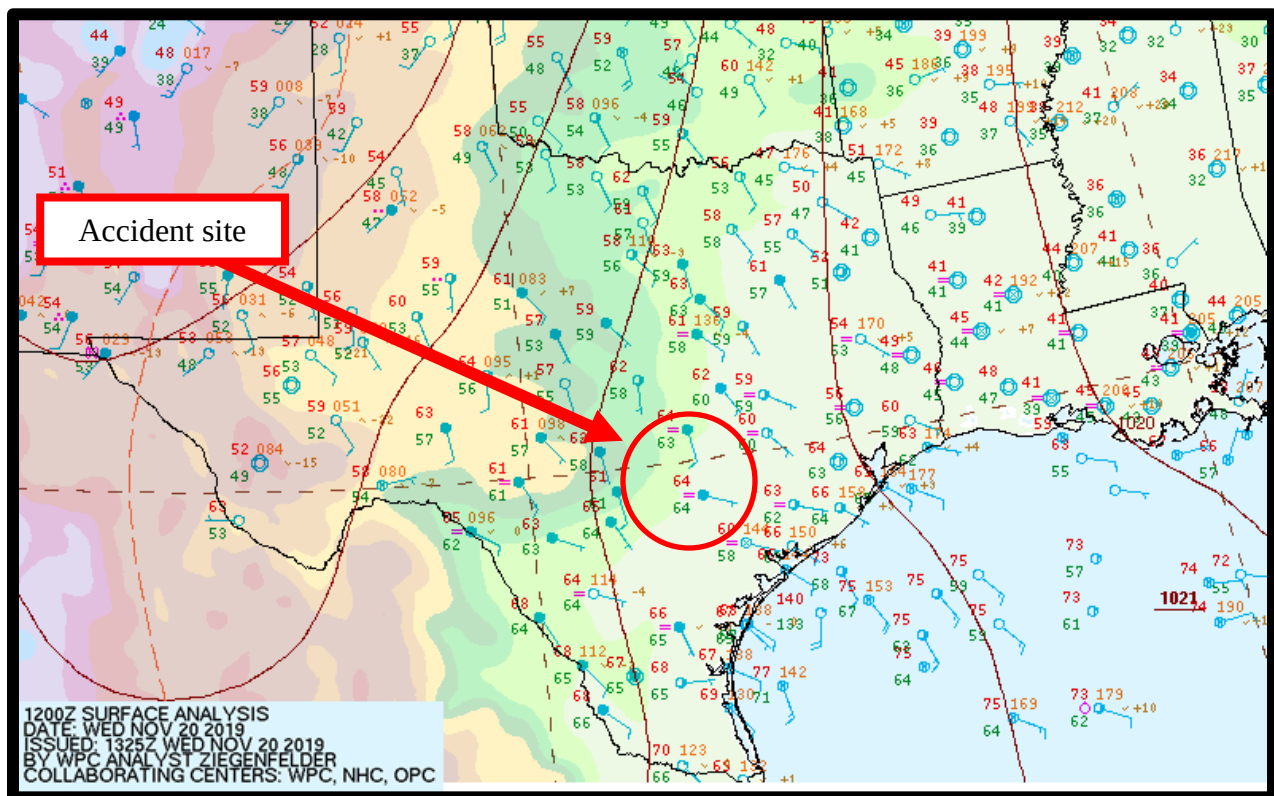


Figure 1 – NWS Surface Analysis Chart for 0600 CST

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 0600 CST at 925-, 850-, 700-, 500-, and 300-hPa are presented in figures 2 through 6. There was a low-level ridge² located near and above the accident site at 925- and 850-hPa (figures 2 and 3). The wind was from the south at 30 knots at 925-hPa (figure 2) with the wind becoming southwesterly at 20 knots by 700-hPa (figure 4). At 300-hPa, the wind was from the west-southwest at about 60 knots (figure 6).

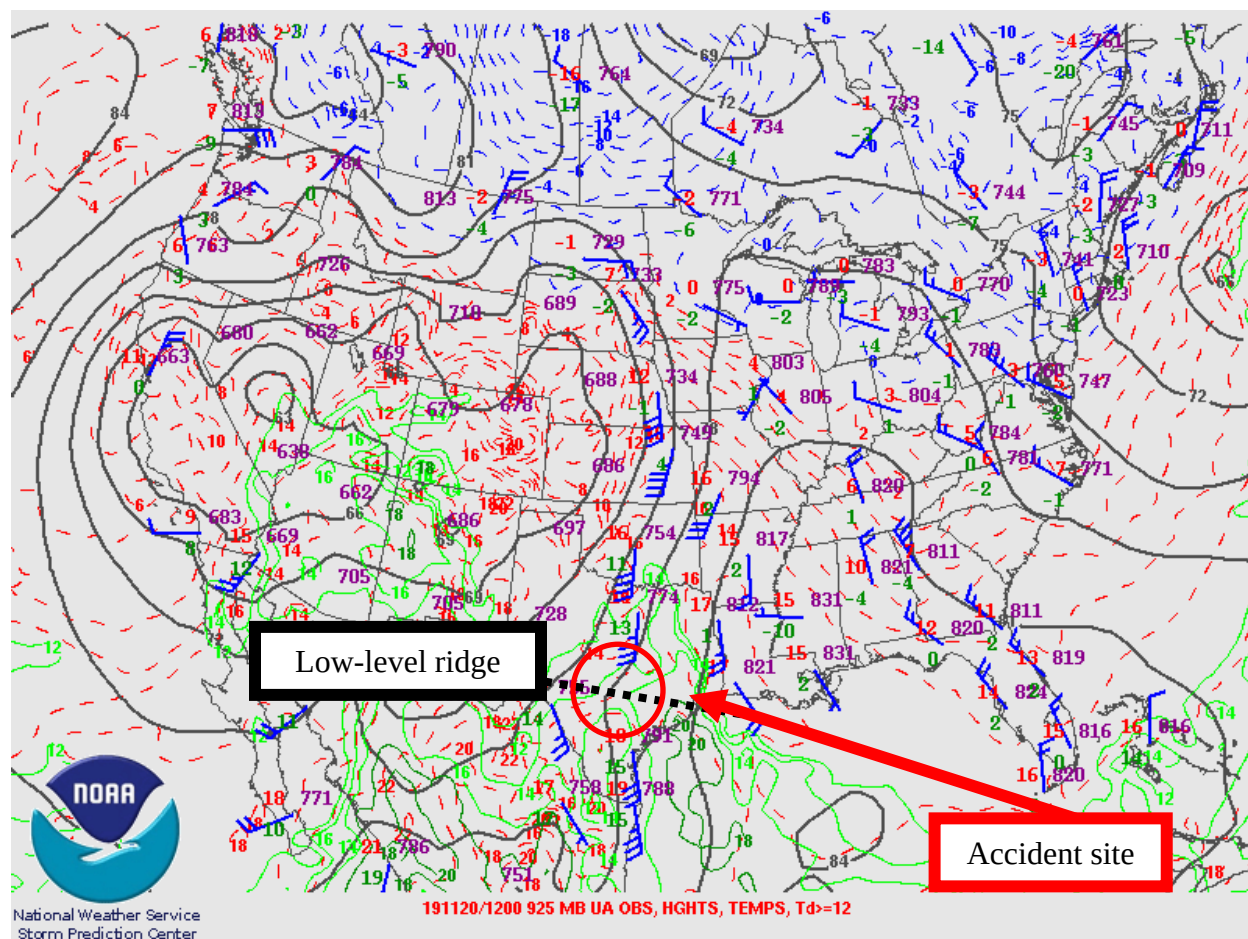


Figure 2 – 925-hPa Constant Pressure Chart for 0600 CST

² Ridge – An elongated area of relatively high atmospheric pressure or heights.

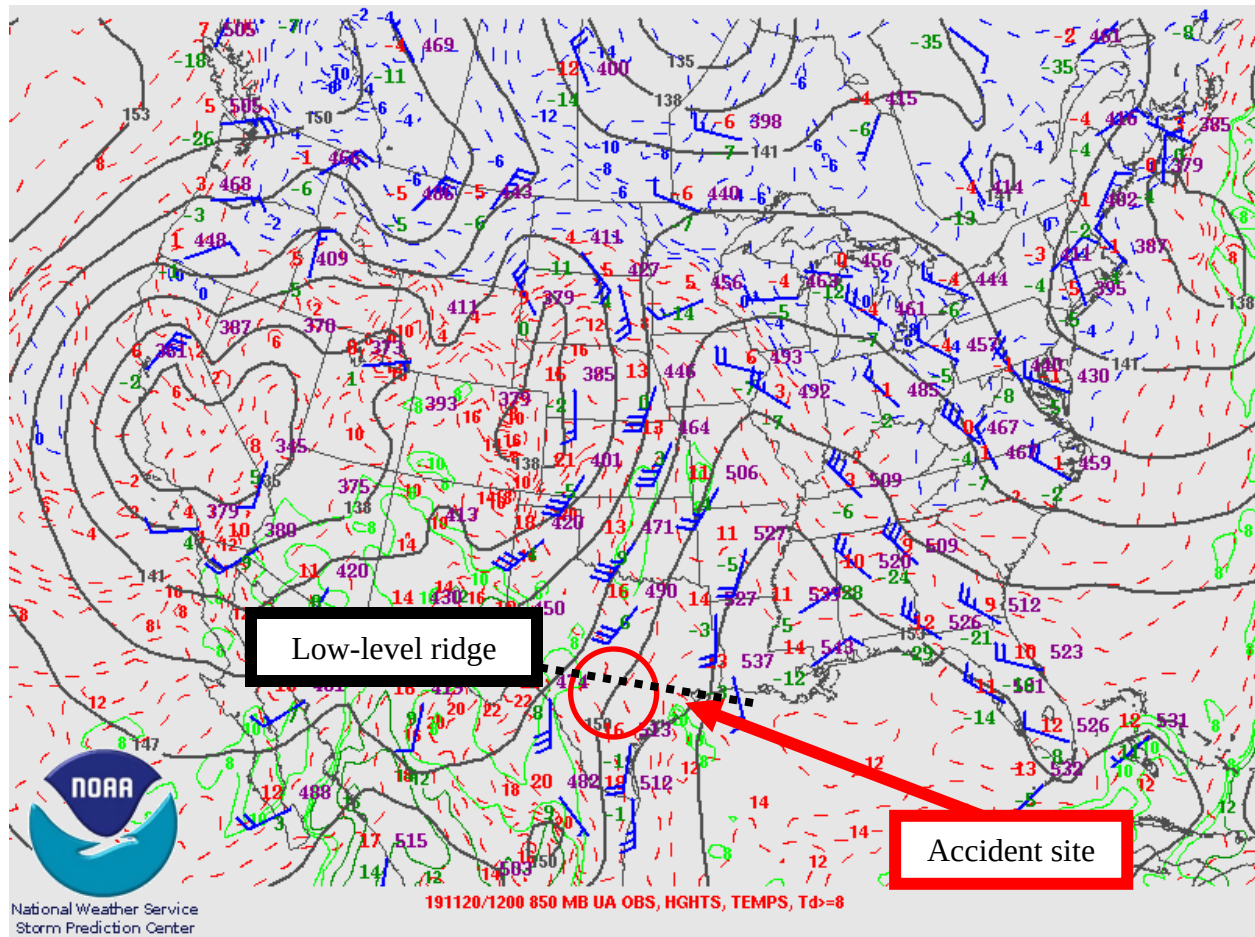


Figure 3 – 850-hPa Constant Pressure Chart for 0600 CST

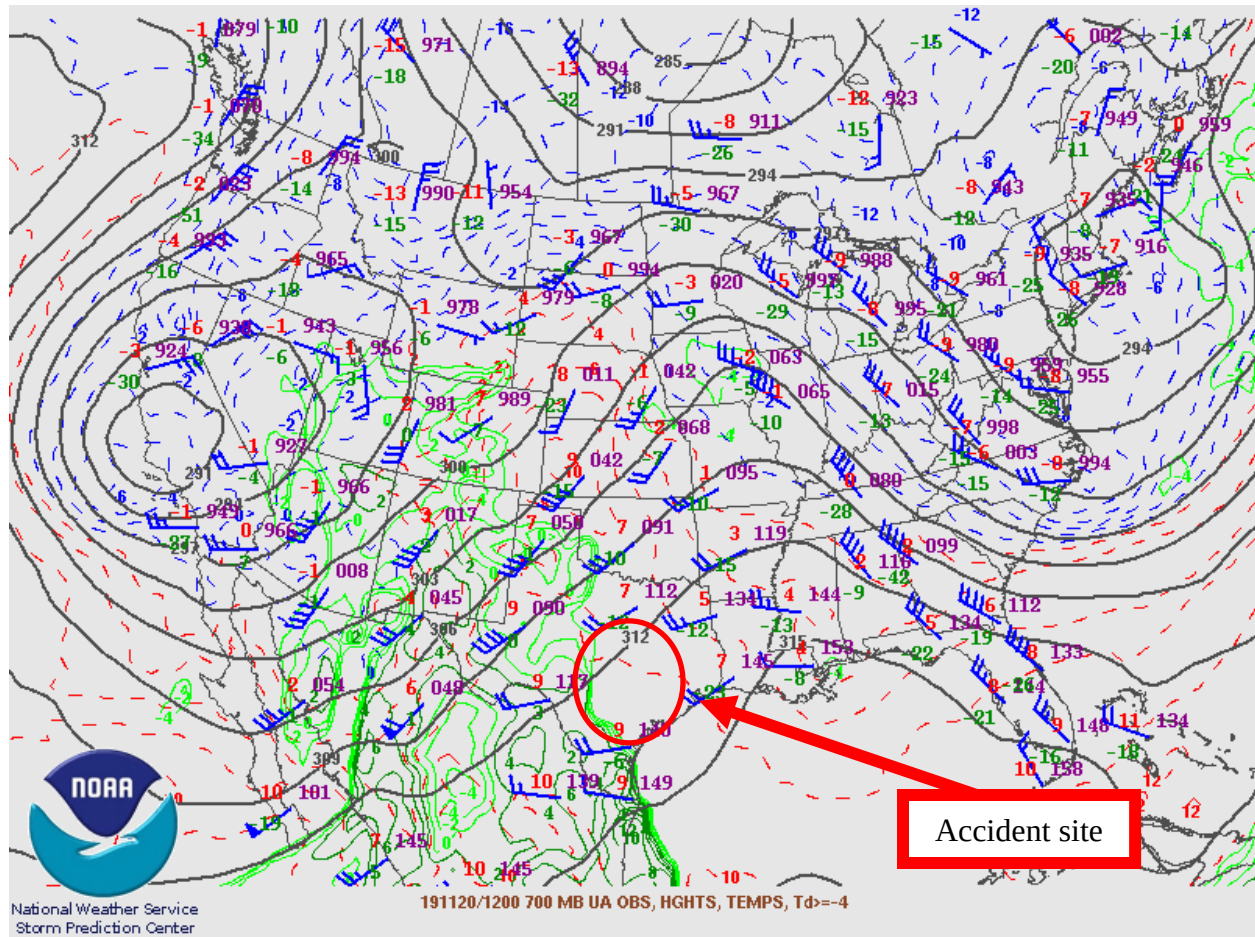


Figure 4 – 700-hPa Constant Pressure Chart for 0600 CST

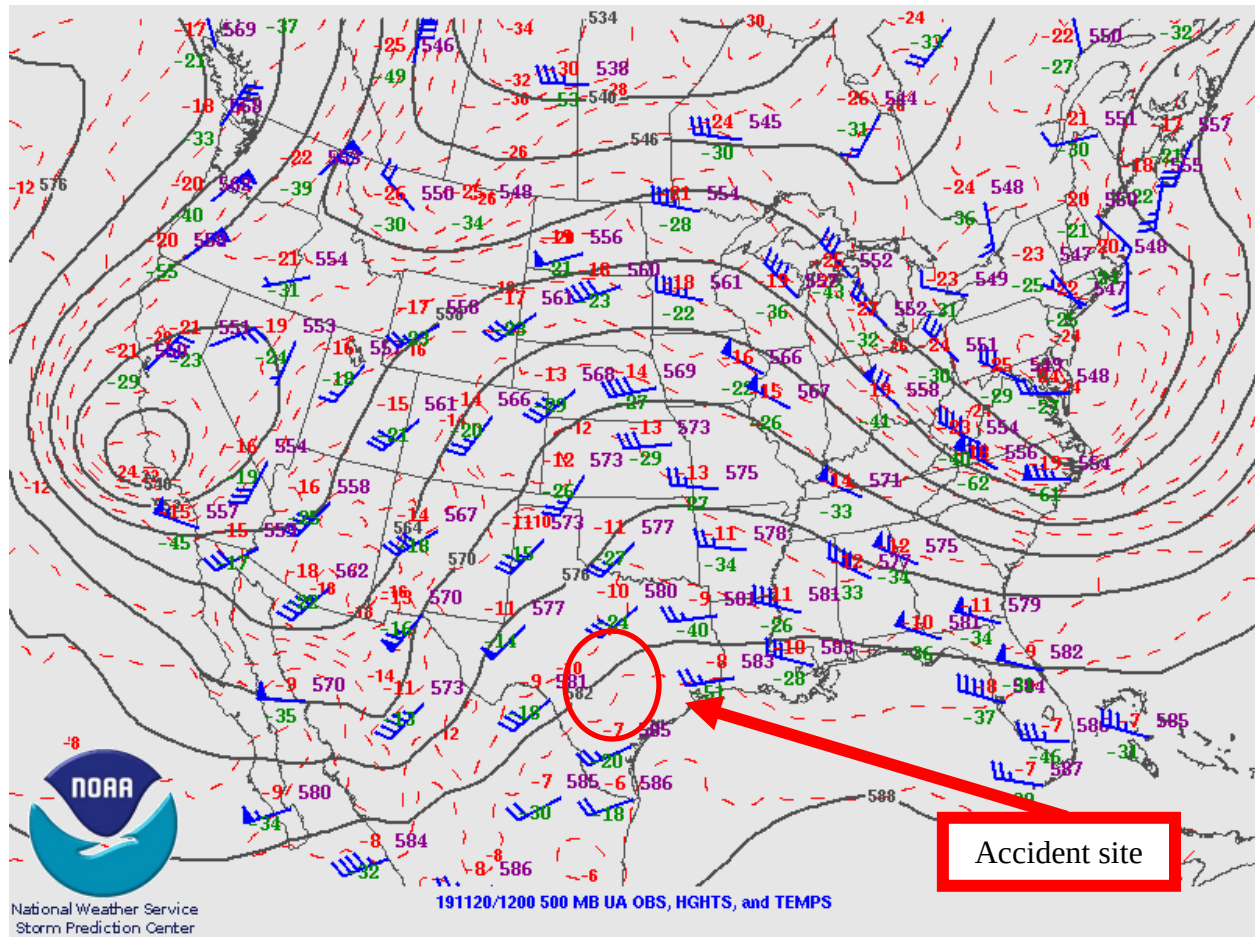


Figure 5 – 500-hPa Constant Pressure Chart for 0600 CST

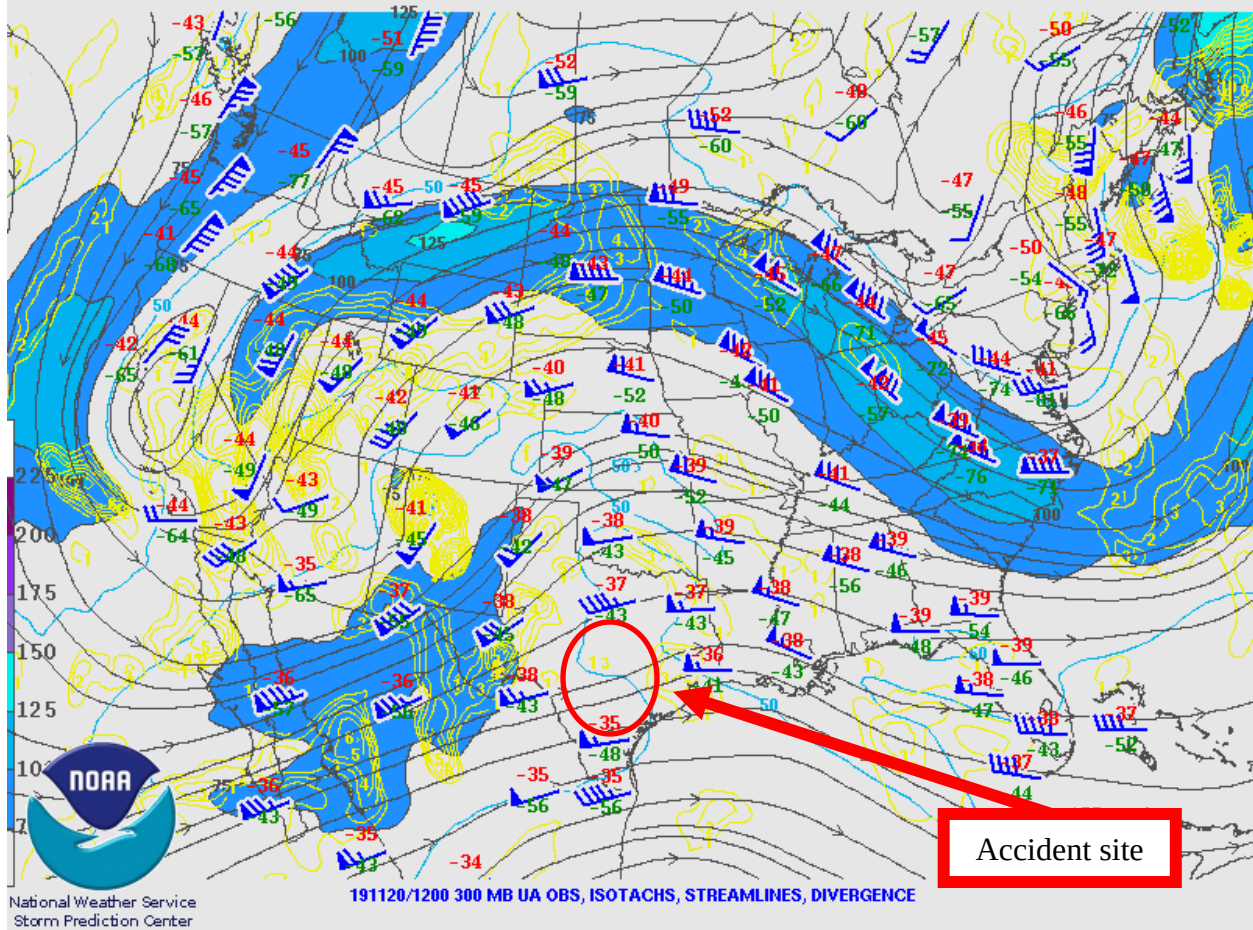


Figure 6 – 300-hPa Constant Pressure Chart for 0600 CST

2.0 SPC Convective Outlook

No thunderstorms were forecast for the accident site at the accident time.

3.0 Surface Observations

The area surrounding the accident site was documented using official Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). Figure 7 is a sectional chart with the accident site and the closest weather reporting location to the accident site marked.

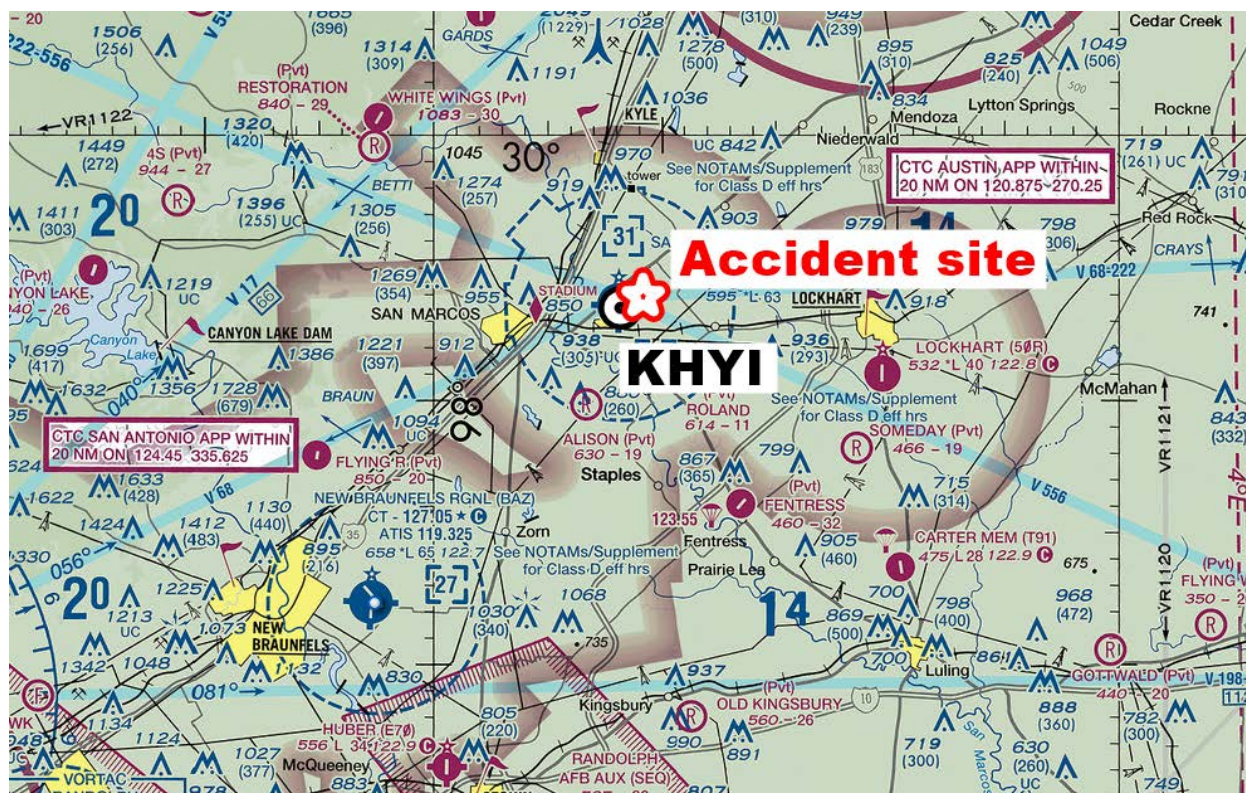


Figure 7 – Sectional chart of accident area with the location of the accident site and the closest surface observation site

The closest official weather reporting facility to the accident site and the departure airport was from San Marcos Regional Airport (KHYI), Austin, Texas, at an elevation of 595 ft, located within a mile of the accident site (figure 7). KHYI had an Automated Weather Observing System (AWOS³) whose reports were supplemented by air traffic control (ATC) when the ATC tower was in operation⁴. KHYI had a 4° easterly magnetic variation⁵. The following observations were taken and disseminated during the times surrounding the accident:⁶

[0444 CST] SPECI KHYI 201044Z AUTO 16004KT 3SM BR OVC003 17/17 A2997
RMK AO2=

[0451 CST] SPECI KHYI 201051Z AUTO 17005KT 2 1/2SM BR OVC003 17/17 A2997
RMK AO2=

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 ATC tower hours of operation were from 0700 to 1900 local.

⁵ Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>

⁶ Bolded sections in this report highlight information that directly reference the weather conditions that affected the accident location around the accident time.

[0456 CST] METAR KHYI 201056Z AUTO 16004KT 2SM BR OVC003 17/17 A2997
RMK AO2 SLP140 T01720167=

[0505 CST] SPECI KHYI 201105Z AUTO 15004KT 1 1/4SM BR OVC003 17/17 A2996
RMK AO2=

[0509 CST] SPECI KHYI 201109Z AUTO 14004KT 3/4SM BR OVC003 17/17 A2996
RMK AO2=

**[0521 CST] SPECI KHYI 201121Z AUTO 14004KT 1/2SM FG OVC003 17/17 A2996
RMK AO2=**

ACCIDENT TIME 0555 CST

**[0556 CST] METAR KHYI 201156Z AUTO 17004KT 1/2SM FG OVC003 17/17 A2997
RMK AO2 SLP142 T01720167 10172 20150 55000=**

[0607 CST] SPECI KHYI 201207Z AUTO 14004KT 1/4SM FG OVC003 17/17 A2996
RMK AO2=

[0634 CST] SPECI KHYI 201234Z AUTO 13004KT 1/2SM FG OVC003 17/17 A2997
RMK AO2=

KHYI weather at 0521 CST, automated, wind from 140° at 4 knots, 1/2 mile visibility, fog, an overcast ceiling at 300 ft above ground level (agl), temperature of 17°Celsius (C), dew point temperature of 17°C, and an altimeter setting of 29.96 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator.

KHYI weather at 0556 CST, automated, wind from 170° at 4 knots, 1/2 mile visibility, mist, an overcast ceiling at 300 ft agl, temperature of 17°C, dew point temperature of 17°C, and an altimeter setting of 29.97 inHg. Remarks: automated station with a precipitation discriminator, sea level pressure 1014.2 hPa, temperature 17.2°C, dew point temperature 16.7°C, 6-hour maximum temperature of 17.2°C, 6-hourly minimum temperature of 15.0°C, 3-hourly pressure tendency change of 0.0 hPa.

The observations for KHYI surrounding the period indicated LIFR⁷ conditions in fog and low ceilings with southerly surface winds under 5 knots.

⁷ As defined by 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

4.0 Upper Air Data

A High-Resolution Rapid Refresh (HRRR)⁸ model sounding was created for the accident site for 0600 CST with station elevation of 597 ft⁹. The 0600 CST HRRR sounding was plotted on a standard Skew-T Log P diagram¹⁰ with the derived stability parameters from the surface to 700-hPa (or approximately 10,000 ft msl) and is included as figure 8. This data was analyzed using the RAOB¹¹ software package. The sounding depicted the lifted condensation level (LCL)¹² at 420 ft agl and the convective condensation level (CCL)¹³ at 1,967 ft agl. The sounding had a greater than 95% relative humidity from the surface through 3,000 ft msl. The freezing level was located at 14,721 ft msl. The precipitable water value was 1.10 inches.

is a sub-category of VFR.

⁸ 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.

⁹ HRRR sounding was created using NOAA Air Resource Laboratory: <https://ready.arl.noaa.gov/READYamet.php>

¹⁰ 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.

¹¹ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania.

¹² LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹³ 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.

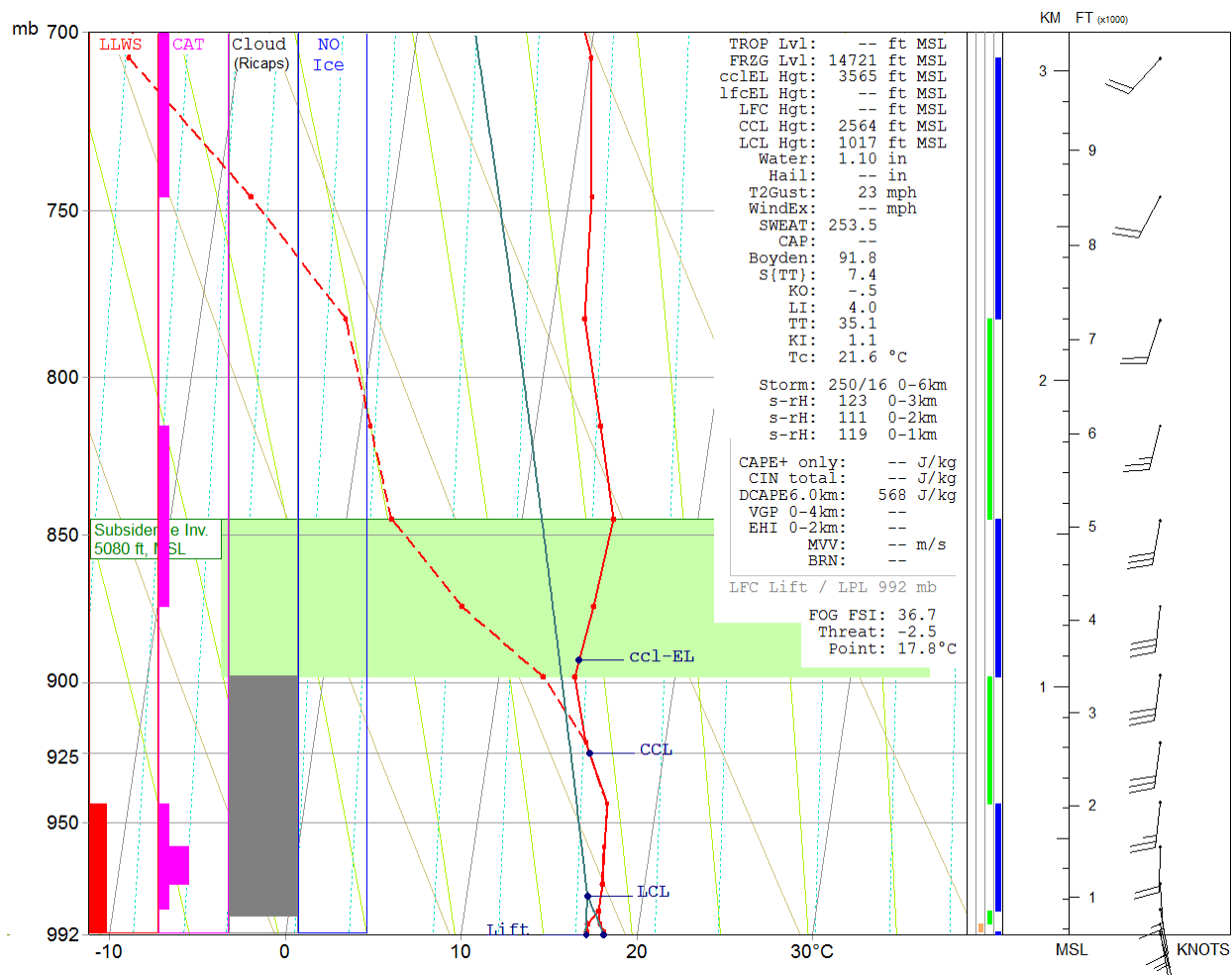


Figure 8 – 0600 CST HRRR sounding

The 0600 CST HRRR sounding indicated alternating layers of conditional instability and stability from the surface through 10,000 ft msl. RAOB identified the possibility of clouds from ~200 ft agl through ~3,500 ft msl. RAOB did not indicate the possibility of icing conditions below 10,000 ft msl. RAOB indicated an inversion¹⁴ due to subsidence from 3,500 ft to 5,080 ft msl.

The 0600 CST HRRR sounding wind profile indicated a surface wind from 166° at 5 knots with the wind veering¹⁵ to the southwest by 10,000 ft msl. The wind speed increased to 30 knots by 2,500 ft msl. RAOB indicated the possibility of light low-level wind shear (LLWS) between the surface and ~2,000 ft agl. RAOB indicated the possibility of light clear-air turbulence (CAT) existed in several layers between the surface and 10,000 ft msl.

¹⁴ 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").

¹⁵ A clockwise turning of the wind with height in the northern hemisphere.

5.0 Satellite Data

Data from the Geostationary Operational Environmental Satellite number 16 (GOES-16) data was 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 (band 2) and infrared (bands 13) imagery at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period. Satellite imagery surrounding the time of the accident, from 0300 CST through 1000 CST at approximately 5-minute intervals were reviewed, and the closest images to the time of the accident are documented here. Given the sun angle and time of day the visible imagery did not provide useful information.

Figure 9 is the GOES-16 infrared imagery from 0600 CST at 6X magnification and with a temperature enhancement curve applied with the accident site highlighted with a red square. Inspection of the infrared imagery indicated multiple cloud layers over the area at the accident time ranging from low stratiform clouds and high cirrus clouds. The lower brightness temperatures (green colors; higher cloud tops) were located above and to the southwest through southeast of the accident site. Based on the brightness temperatures above the accident site (253 Kelvin) and the vertical temperature profile provided by the 0600 CST HRRR sounding, the approximate cloud-top heights over the accident site were 25,000 ft at 0600 CST. It should be noted these figures have not been corrected for any parallax error.

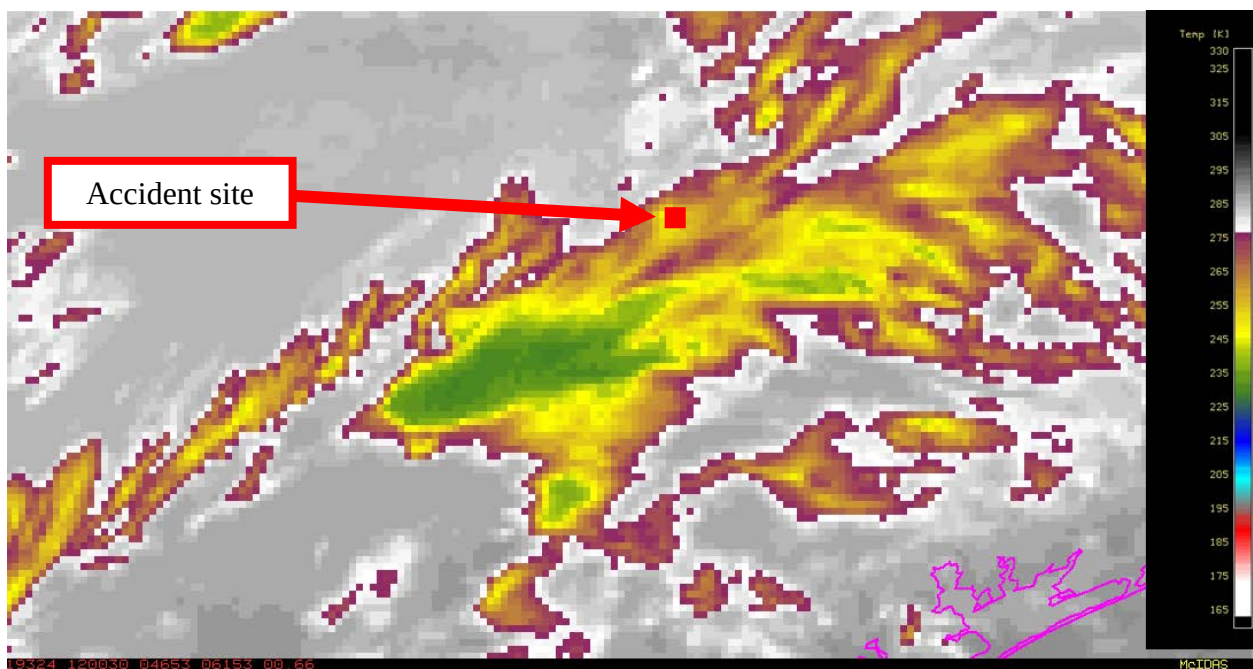


Figure 9 – GOES-16 infrared image at 0600 CST

Attachment 1 presents the GOES-16 Nighttime Microphysics RGB (red green blue) imagery from 0501 to 0706 CST. Inspection of the Nighttime Microphysics RGB imagery indicated 2 levels of cloud cover above the accident site at the accident time. The lower-level cloud cover was moving from south to north and was indicated by the aqua and green colors. The higher-level cloud cover was moving from southwest to northeast and was indicated by the dark red colors. The aqua and green colors on the Nighttime Microphysics RGB imagery indicated fog and very low warm water clouds¹⁶. The dark red colors on the Nighttime Microphysics RGB imagery indicate high thick ice clouds.

6.0 Regional Radar Imagery Information

A regional view of the NWS national composite radar mosaic is included as figure 10 for 0555 CST with the approximate location of the accident site marked within a red circle. The image depicted no precipitation echoes over the accident site at the accident time.

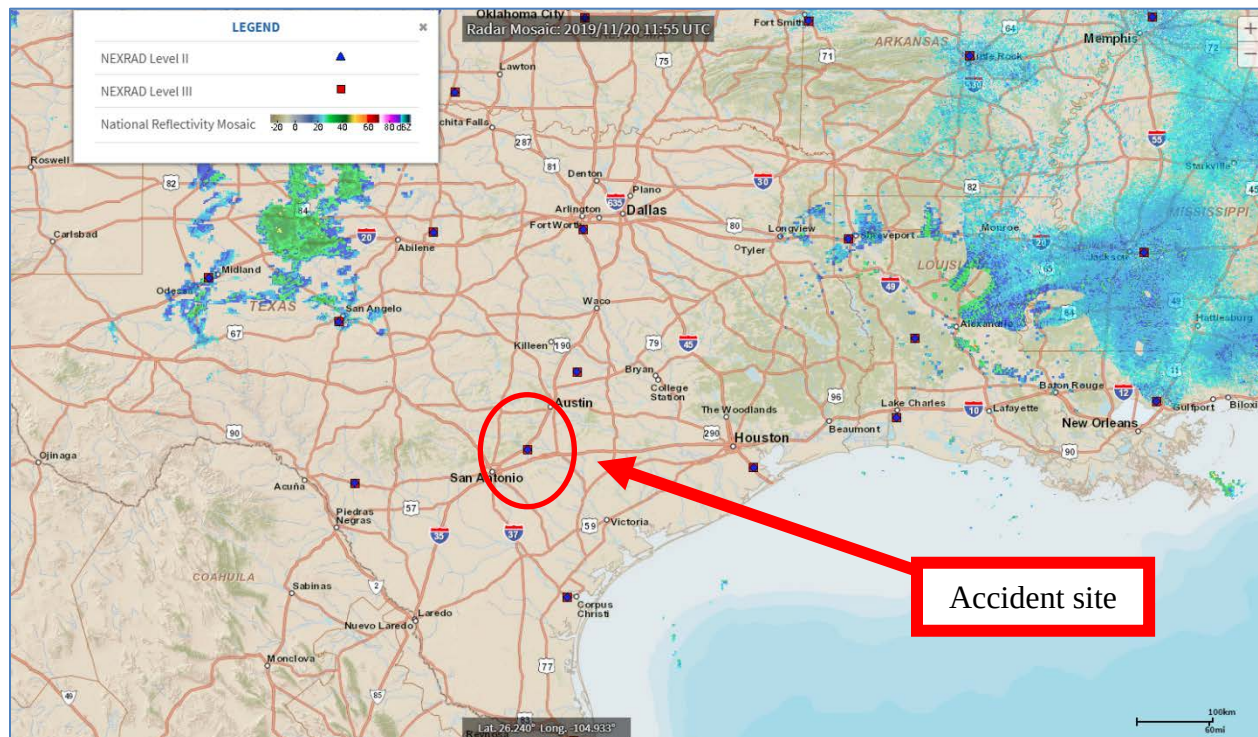


Figure 10 – Regional Composite Reflectivity image for 0555 CST

7.0 Pilot Reports

All pilot reports¹⁷ (PIREPs) within 100 miles of the accident site from about two hours prior to the accident time to about two hours after the accident time for below 18,000 ft are provided below:

ACT UA /OV ACT/TM 1145/FL027/TP C550/SK TOP027/RM ZFW AWC-WEB/

¹⁶ Also see: <https://nasasporttraining.wordpress.com/2017/02/23/nighttime-microphysics-rgb-application-aviation-module-2/>

¹⁷ Only pilot reports with the World Meteorological Organization (WMO) header UBTX** identifier were considered.

SAT UA /OV SAT135002/TM 1240/FL005/TP B737/SK OVC/RM TOPS 035 CLR ABV

SAT UA /OV SAT045002/TM 1313/FL015/TP SR22/RM BASES OVC015

GTU UA /OV 180006/TM 1326/FL030/TP B350/SK OVC013-TOP025/SKC

HYI UA /OV HYI030003/TM 1405/FL008/TP E120/SK OVC003-TOP030/SKC/RM DURC

The PIREPs indicated overcast clouds at 300 to 500 ft agl between KHYI and San Antonio International Airport (KSAT), San Antonio, Texas with cloud tops between 2,500 and 3,500 ft.

8.0 SIGMET

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

9.0 CWSU Advisories

There were no Center Weather Service Unit (CWSU) Meteorological Impact Statements (MIS) valid for the accident site at the accident time. The Houston CWSU issued a Center Weather Advisory (CWA) for the accident site area at 0515 CST (CWA 101) which warned of LIFR conditions with widespread ceilings at or below 500 ft agl, and visibility at or below 1 mile in mist and fog. The conditions were expected to continue beyond 0700 CST (figures 11 and 12):

FAUS21 KZHU 201115

ZHU1 CWA 201114 COR

ZHU CWA 101 VALID UNTIL 201300

FROM ACT-35W IAH-75SSW CRP-SAT-ACT

**AREA OF LIFR CONDS. SCT/WDSPRD CIGS AOB 005/VIS AOB 1SM BR/FG. CONDS
TO CONT BYD 13Z.**

=

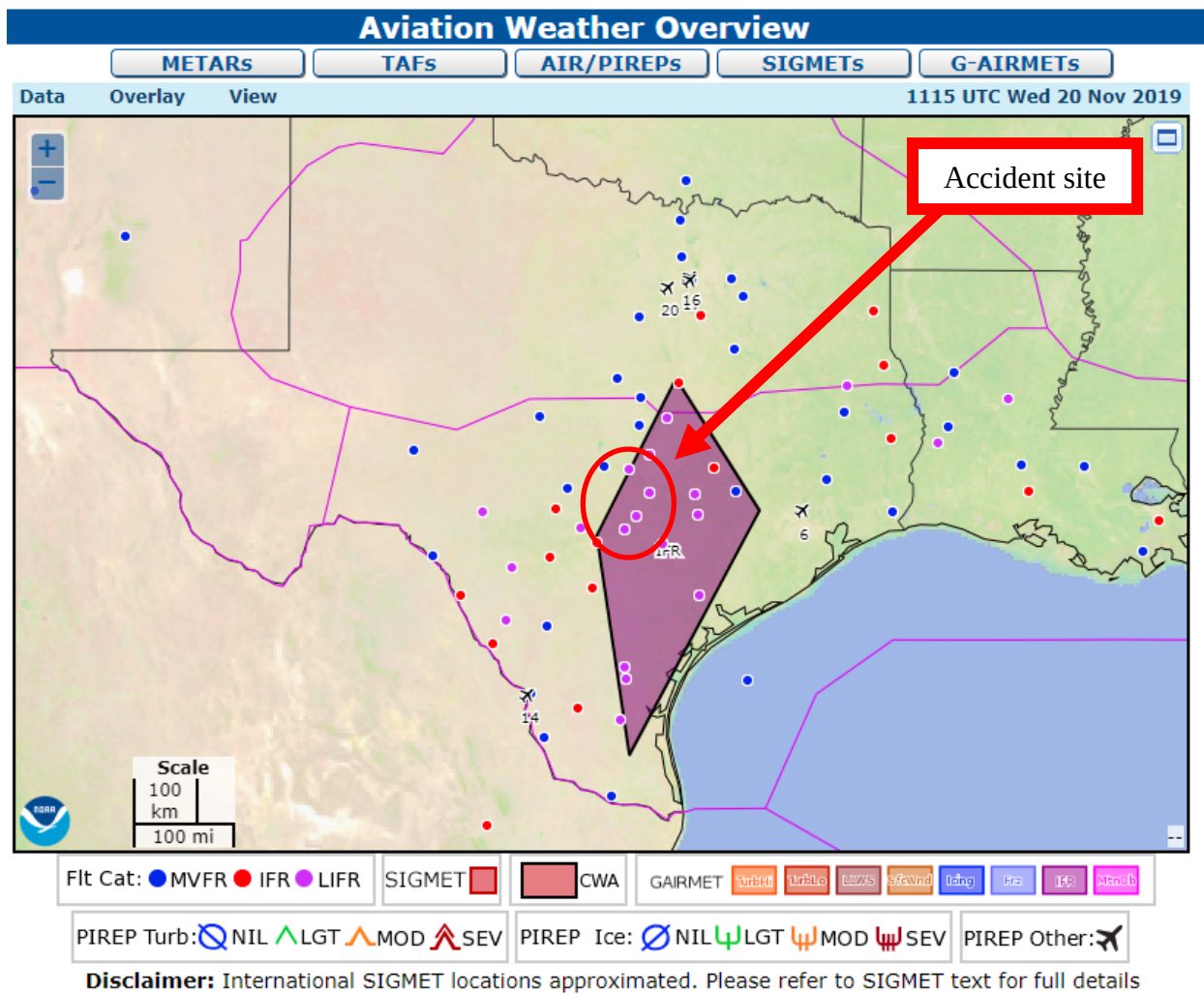


Figure 11 – CWAs and SIGMETs map valid at 0515 CST

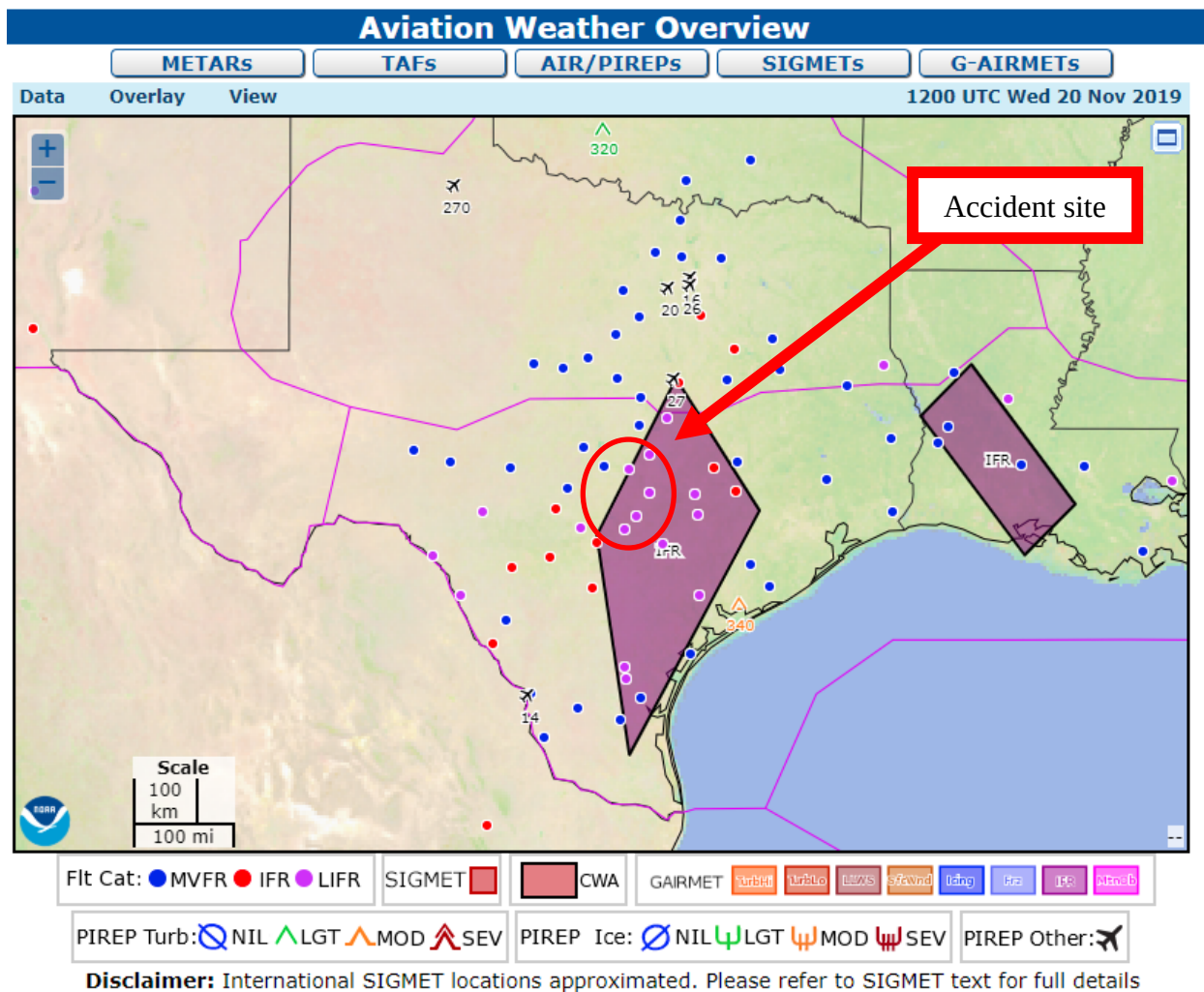


Figure 12 – CWAs and SIGMETs map valid at 0600 CST

10.0 AIRMETs

Airmen's Meteorological Information (AIRMET) advisory Sierra was issued at 0528 CST and valid through 0900 CST and was the only AIRMET valid for the accident site at the accident time for below 10,000 ft msl. AIRMET Sierra warned of IFR conditions due to mist:

WAUS44 KKCI 201128 AAA

WA4S

-DFWS WA 201128 AMD

AIRMET SIERRA UPDT 4 FOR IFR AND MTN OBSCN VALID UNTIL 201500

AIRMET IFR...TN MN IA MO WI LM LS MI IL IN KY

FROM YQT TO 60NNE SAW TO 40NNE GRB TO FWA TO CVG TO

HNN TO HMY TO 20ENE GQO TO 30E FAM TO 50SSE DSM TO 30S FOD TO

BRD TO 40ESE INL TO YQT

CIG BLW 010/VIS BLW 3SM BR. CONDS CONTG BYD 15Z ENDG 18-21Z.

**AIRMET IFR...TX LA MS AL AND CSTL WTRS...UPDT
FROM 50WSW TXK TO 40SSW ELD TO 40N LSU TO 50WSW SJI TO 20E LEV
TO 40SSW LCH TO 20SSE PSX TO 30W BRO TO 90W BRO TO DLF TO 70WSW
DLF TO 60WSW SJT TO 40NNE JCT TO 20WNW TTT TO 50WSW TXK
CIG BLW 010/VIS BLW 3SM BR. CONDS CONTG BYD 15Z ENDG 15-18Z.**

.
AIRMET MTN OBSCN...TX
FROM 60W INK TO 20W FST TO 70WNW DLF TO 100SSE MRF TO ELP TO 60W
INK
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 15Z ENDG BY 18Z.

.
AIRMET MTN OBSCN...TN KY
FROM HNN TO HNV TO GQO TO 50WSW LOZ TO HNN
MTNS OBSC BY CLDS/BR. CONDS CONTG BYD 15Z ENDG 18-21Z.

.
OTLK VALID 1500-2100Z...IFR OK KS
BOUNDED BY 20SE SLN-70ENE ICT-70SE ICT-40WNW MLC-40SW OKC-30W
END-30W ICT-20SE SLN
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS DVLPG 18-21Z. CONDS CONTG
THRU 21Z.

....

11.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products made available before the accident flight are shown in attachment 2. The GFA surface forecast products indicated IFR to LIFR surface visibilities conditions would be likely for 0600 CST with a chance of rain showers and fog (between 30 to 60 percent chance) with a surface wind from the southeast at 5 knots. The GFA cloud forecast products indicated an overcast cloud ceiling at 1,400 ft msl with cloud tops to 3,500 ft msl. For more information please see attachment 2.

The reason for the differences between the GFA surface forecast and the GFA cloud forecast is the two are computed automatically by two different weather models. The Rapid Refresh (RAP) weather model is used for the cloud forecast and the Localized Aviation MOS¹⁸ Program (LAMP) weather model is used for the surface forecast charts, and both forecasts are issued with no human intervention. The only human-generated information reflected in the two GFA products are the G-AIRMETs (graphical AIRMETs) and the GFA is “human-over-the-loop.”

12.0 Terminal Aerodrome Forecast

Austin-Bergstrom International Airport (KAUS) was the closest site with a NWS Terminal Aerodrome Forecast (TAF) and KAUS was located 20 miles northeast of the accident site. The KAUS TAF valid at the accident time was issued at 0317 CST and was valid for a 27-hour period beginning at 0300 CST. The 0317 CST TAF for KAUS was as follows:

¹⁸ Model Output Statistics: https://www.weather.gov/mdl/mos_home

TAF AMD KAUS 201017Z 2010/2112 **17007KT 4SM BR OVC004**
FM201500 17011KT P6SM OVC008
FM201600 16014KT P6SM BKN015
FM201800 17019KT P6SM BKN040
FM210600 17010KT P6SM BKN020=

The TAF expected a wind from 170° at 7 knots, 4 miles visibility, mist, and an overcast ceiling at 400 ft agl. The KAUS TAF was updated at 0539 CST, but that TAF was not valid until 0600 CST. That forecast continued to expect LIFR to IFR conditions through 1000 CST.

TAF KAUS 201139Z 2012/2118 17007KT 4SM BR OVC004
FM201500 17011KT P6SM OVC008
FM201600 16014KT P6SM BKN015
FM201800 17019KT P6SM BKN040
FM210300 17010KT P6SM OVC015=

13.0 NWS Area Forecast Discussion

The NWS Office in Austin/San Antonio, Texas, issued the following Area Forecast Discussion (AFD) at 0553 CST (closest AFD to the accident time with an aviation section). The aviation section of the AFD discussed continued IFR to LIFR conditions during the morning hours with mist and patchy drizzle:

FXUS64 KEWX 201153
AFDEWX
Area Forecast Discussion
National Weather Service Austin/San Antonio TX
553 AM CST Wed Nov 20 2019

.UPDATE...
12Z Aviation forecast below.

.AVIATION...

Widespread stratus will produce a mix of IFR and LIFR ceilings through the morning hours. In addition LIFR to MVFR visibility in BR and patchy -DZ will occur through the morning. Ceilings and visibility will gradually improve 16Z-18Z to MVFR and eventually VFR after 18Z, with the exception of some places closer to the Rio Grande which could take longer into the afternoon to become VFR. Widespread stratus is again expected to develop tonight between 03Z-06Z producing MVFR ceilings, with pockets of IFR conditions possible. S to SE winds gradually strengthening to around 12-18KT late morning into the afternoon, with some gusts near 25KT.

.PREV DISCUSSION... /ISSUED 251 AM CST Wed Nov 20 2019/

SHORT TERM (Today through Thursday)...

Patchy fog this morning along the Coastal Plains and up to the I-35 corridor will mix out by late morning. By the afternoon, strong southerly flow at the surface, in response to an approaching shortwave, may generate some showers in the Hill Country and Edwards Plateau. Temperatures today stay warm with highs in the upper 70s to

low 80s. Meanwhile, an upper level low dips down into the western U.S. on Thursday, and with increasing moisture from the south, there is a chance for more showers, with better chances in our northeastern counties. Increased cloudiness on Thursday will shave off a degree or two from our highs.

LONG TERM (Thursday Night through Tuesday)...

Thursday night the upper low lifts into the Central Plains and forces a cold front across the area on Friday morning through early afternoon. Showers and thunderstorms along the front are expected, with better chances in the Hill Country and Edwards Plateau in the morning, and shifting to eastern counties by Friday afternoon. Drier cooler air will filter in and clouds will decrease from west to east. We see cooler temperatures Friday night and Saturday morning with drier air in place. The weekend looks clear and dry with high pressure ridging settling in. As the ridge shifts east, southerly winds return out of the southeast Sunday afternoon. Another system approaches Tuesday, though there is still disagreement on the progression of this system. Will keep rain chance modest while the models work out the progression.

.PRELIMINARY POINT TEMPS/POPS...

Austin Camp Mabry	79 63 77 60 69 / 20 20 40 30 50
Austin Bergstrom Intl Airport	79 63 78 59 71 / 10 20 40 20 50
New Braunfels Muni Airport	81 63 78 60 71 / 10 20 20 20 40
Burnet Muni Airport	75 63 74 55 64 / 20 20 40 40 50
Del Rio Intl Airport	76 63 79 59 75 / 20 10 - 30 -
Georgetown Muni Airport	77 63 76 57 67 / 20 20 40 40 60
Hondo Muni Airport	78 64 79 60 76 / 20 10 10 20 30
San Marcos Muni Airport	78 63 78 59 71 / 10 20 30 20 40
La Grange - Fayette Regional	79 64 78 62 74 / 10 20 30 30 50
San Antonio Intl Airport	80 63 77 61 72 / 20 10 20 20 40
Stinson Muni Airport	81 64 79 61 74 / 10 10 10 20 30

.EWX WATCHES/WARNINGS/ADVISORIES...

None.

14.0 Winds and Temperature Aloft Forecast

The NWS 0153 CST Winds and Temperature Aloft forecast valid for 0600 CST for the closest point to the accident site is included below:

FBUS31 KWN0 200753

FD1US1

DATA BASED ON 200600Z

VALID 201200Z FOR USE 0800-1500Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
SAT	1835	1918+16	2216+10	2517+05	2422-08	2640-19	255036	256646	268756

The accident site was closest to the San Antonio, Texas (SAT) forecast point. The SAT forecast for use between 0200 and 0900 CST indicated a wind at 3,000 ft from 180° at 35 knots and at 6,000 ft a wind from 190° at 18 knots with a temperature of 16°C.

15.0 Pilot Weather Briefing

The accident pilot did not request or receive a weather briefing through the FAA contract Automated Flight Service Station provider Leidos. Leidos did have a record of the ForeFlight information provided (attachment 5).

A search of archived ForeFlight information indicated that the accident pilot did request weather information via ForeFlight Mobile (attachment 3) at 2146 CST on November 19 with a planned departure of 0500 CST on November 20. The 2146 CST on November 19 weather briefing information contained all the standard weather information valid at that time. Additionally, the pilot appeared to “refresh” the weather briefing at 0451 CST on November 20 and that weather briefing contained all the valid weather forecast at that time including the forecast for continued LIFR conditions (attachment 4). There is no record of the accident pilot receiving or retrieving any other weather information before or during the accident flight.

16.0 Astronomical Data

The astronomical data obtained for the accident site on November 20, 2019, indicated the following conditions:

SUN

<i>Accident</i>	<i>0555 CST¹⁹</i>
Begin civil twilight	0635 CST
Sunrise	0700 CST
Sun transit	1217 CST
Sunset	1734 CST
End civil twilight	1759 CST

MOON

Moonrise	0027 CST
<i>Accident</i>	<i>0555 CST²⁰</i>
Moon transit	0715 CST
Moonset	1356 CST

The Moon had 43.2% illumination as a Third Quarter Moon; however, was obscured by the cloud cover.

¹⁹ Inserted accident time for reference and context.

²⁰ Inserted accident time for reference and context.

E. LIST OF ATTACHMENTS

Attachment 1 – GOES-16 Nighttime Microphysics RGB animation from 0501 to 0706 CST

Attachment 2 – GFA products available before the accident flight for around the accident time

Attachment 3 – ForeFlight Weather briefing information

Attachment 4 – ForeFlight Weather briefing information part 2

Attachment 5 – Leidos copy of the ForeFlight weather information provided

Submitted by:

Paul Suffern
Senior Meteorologist

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