National Transportation Safety Board
Office of Aviation Safety
Washington, DC 20594

CEN23FA142

METEOROLOGY

Specialist's Factual Report

August 16, 2023

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A. ACCIDENT

Location: Port Allen, Louisiana
Date: March 26, 2023
Time: 0238 central daylight time
0738 coordinated universal time (UTC)
Helicopter: Robinson R44 II; Registration: N441PD

B. METEOROLOGY SPECIALIST

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Senior Meteorologist
National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

The NTSB'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 daylight time (CDT) and are based upon the 24-hour clock, where local time is -5 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 30.511753° N, longitude 91.324385° W, and elevation of 15 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 0400 CDT is provided as figure 1 with the location of the accident site within the black circle. The chart depicted a low-pressure system at 1010-hectopascals (hPa) located in western Mississippi. A stationary front stretched from southwest to northeast from Texas into the southeastern United States with the stationary front located within 50 miles of the accident site. 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 69 degrees Fahrenheit (°F), dew point temperature of 68°F, cloudy skies, mist, and a calm wind.

[1] FAA-H-8083-28

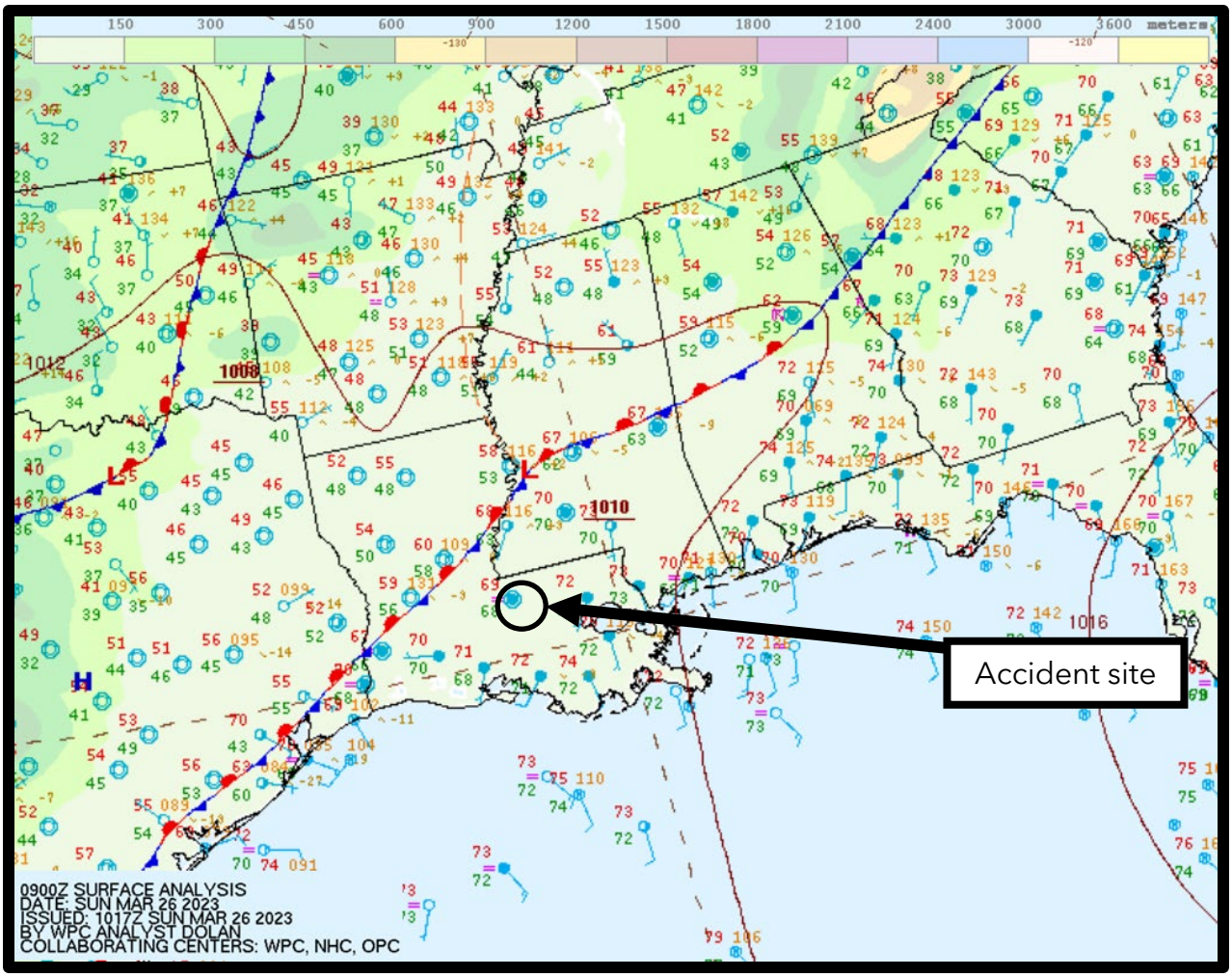

Figure 1. NWS Surface Analysis Chart for 0400 CDT.

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 0700 CDT at 925-, 850-, and 700-hPa are presented in figures 2 through 4. The charts depicted a trough[2] above the accident site and to the northwest at 850-hPa (figure 3). The 925-hPa constant pressure chart depicted a southwest wind around 25 knots (figure 2) increasing to 40 knots by 700-hPa (figure 4).

[2] Trough – An elongated area of relatively low atmospheric pressure or heights.

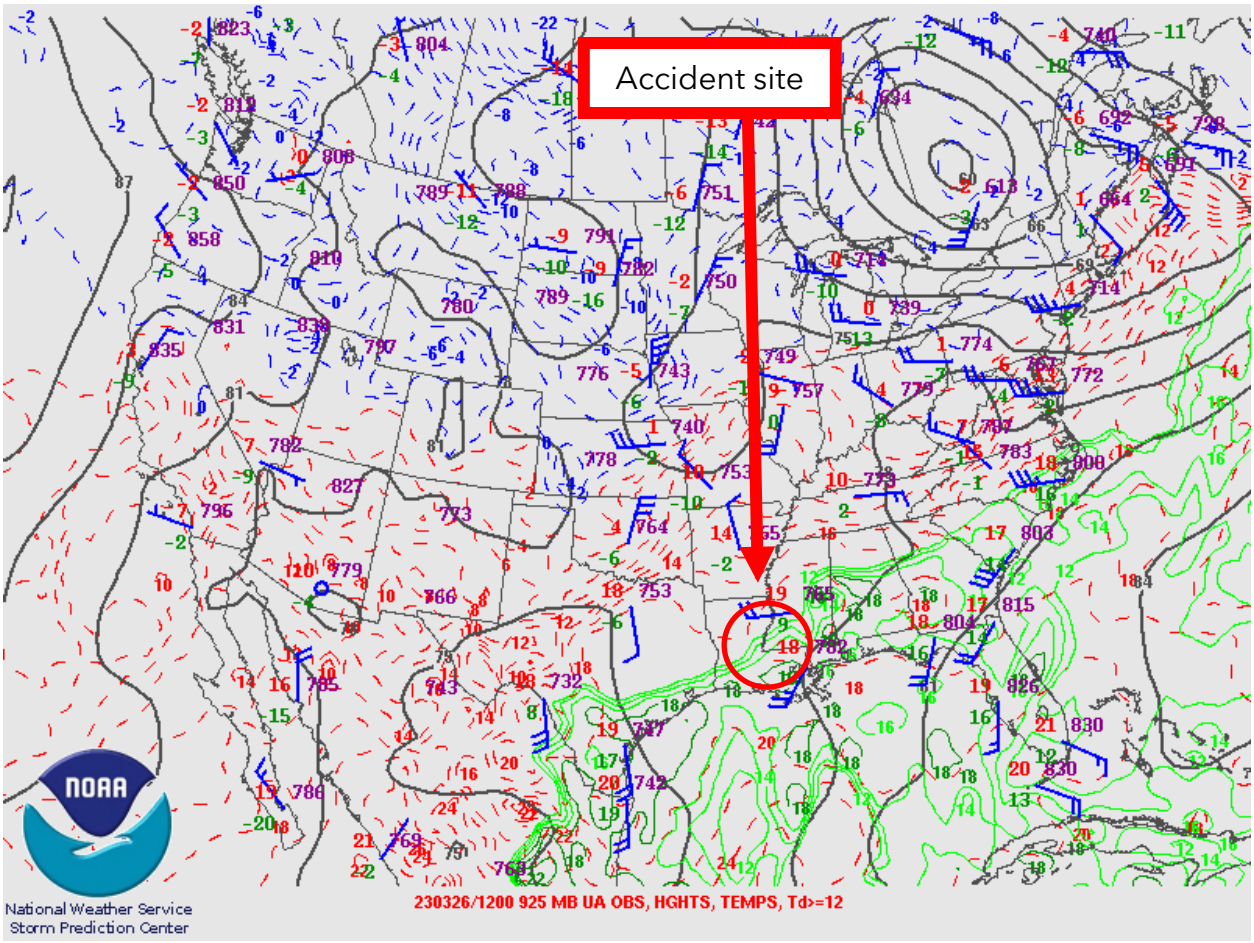

Figure 2. 925-hPa Constant Pressure Chart for 0700 CDT.

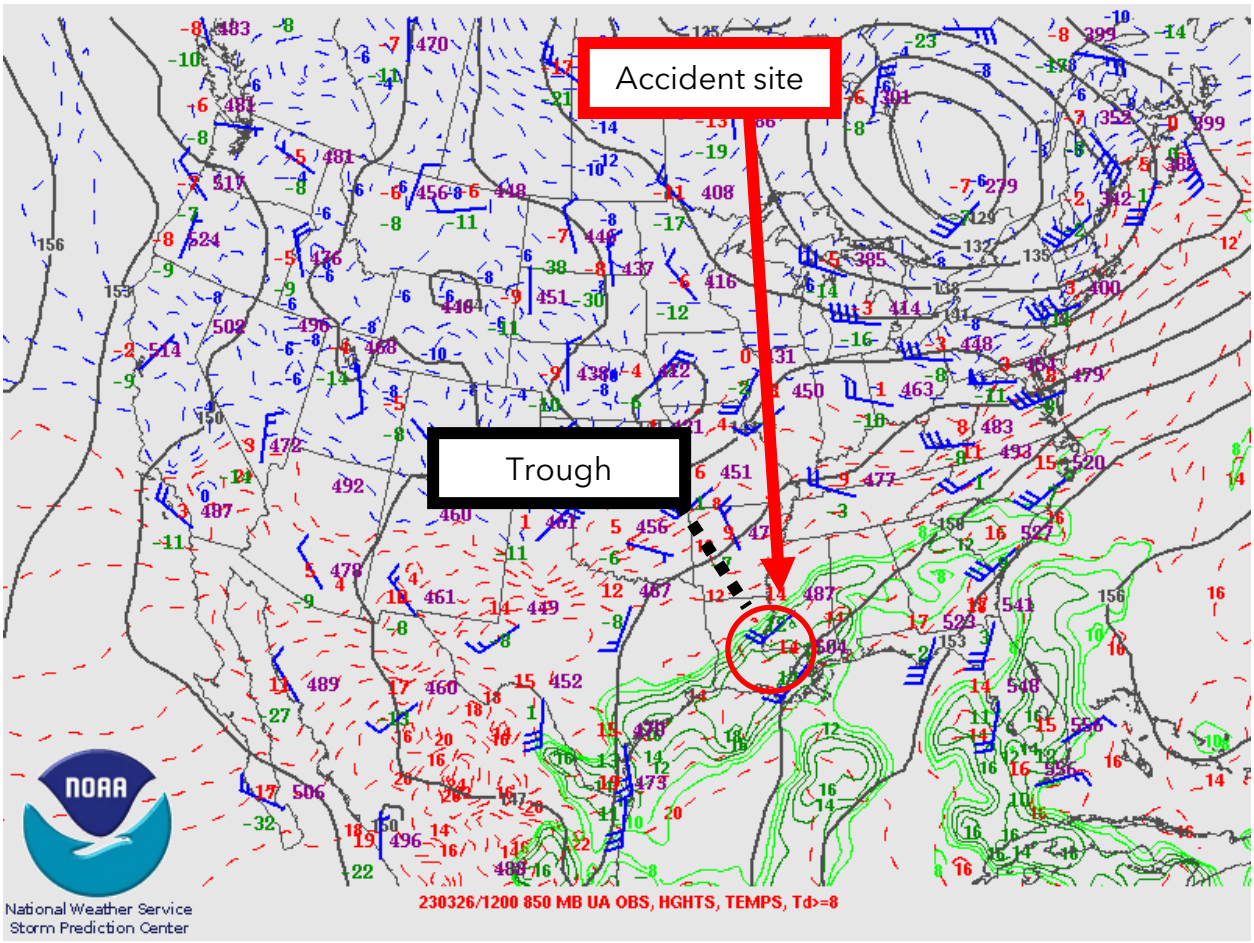

Figure 3. 850-hPa Constant Pressure Chart for 0700 CDT.

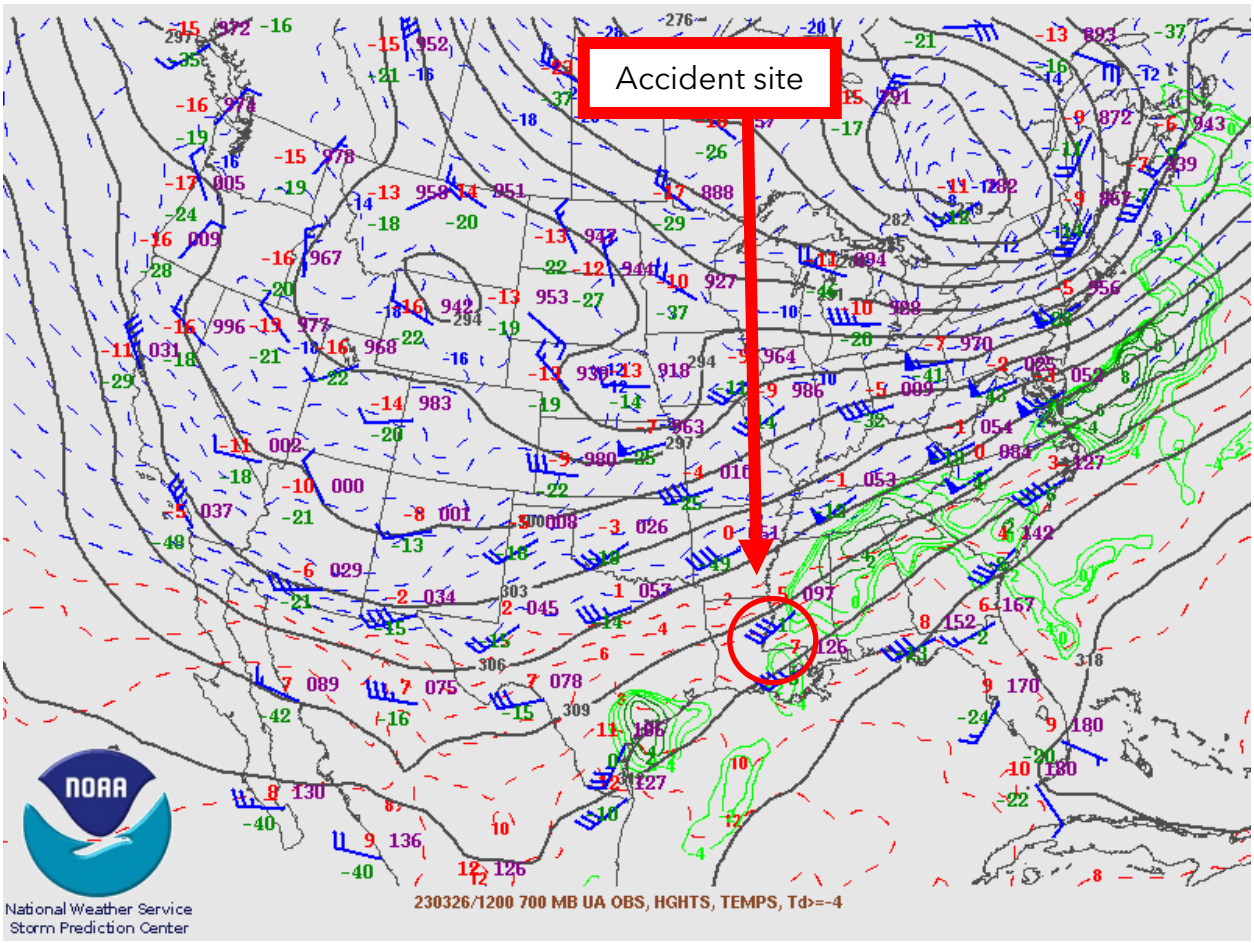

Figure 4. 700-hPa Constant Pressure Chart for 0700 CDT.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METARs) and Special Reports (SPECIs)[3]. The following observations were taken from standard code and are provided in plain language. Figure 5 is a local sectional chart with the accident site and the closest weather reporting location marked. A magnetic variation[4] of 0° was indicated over the area.

[3] Latest criteria for SPECIs can be found in the Federal Meteorological Handbook: Federal Meteorological Handbook Number 1, Surface Weather Observations and Reports (icams-portal.gov)
[4] Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from https://skyvector.com/

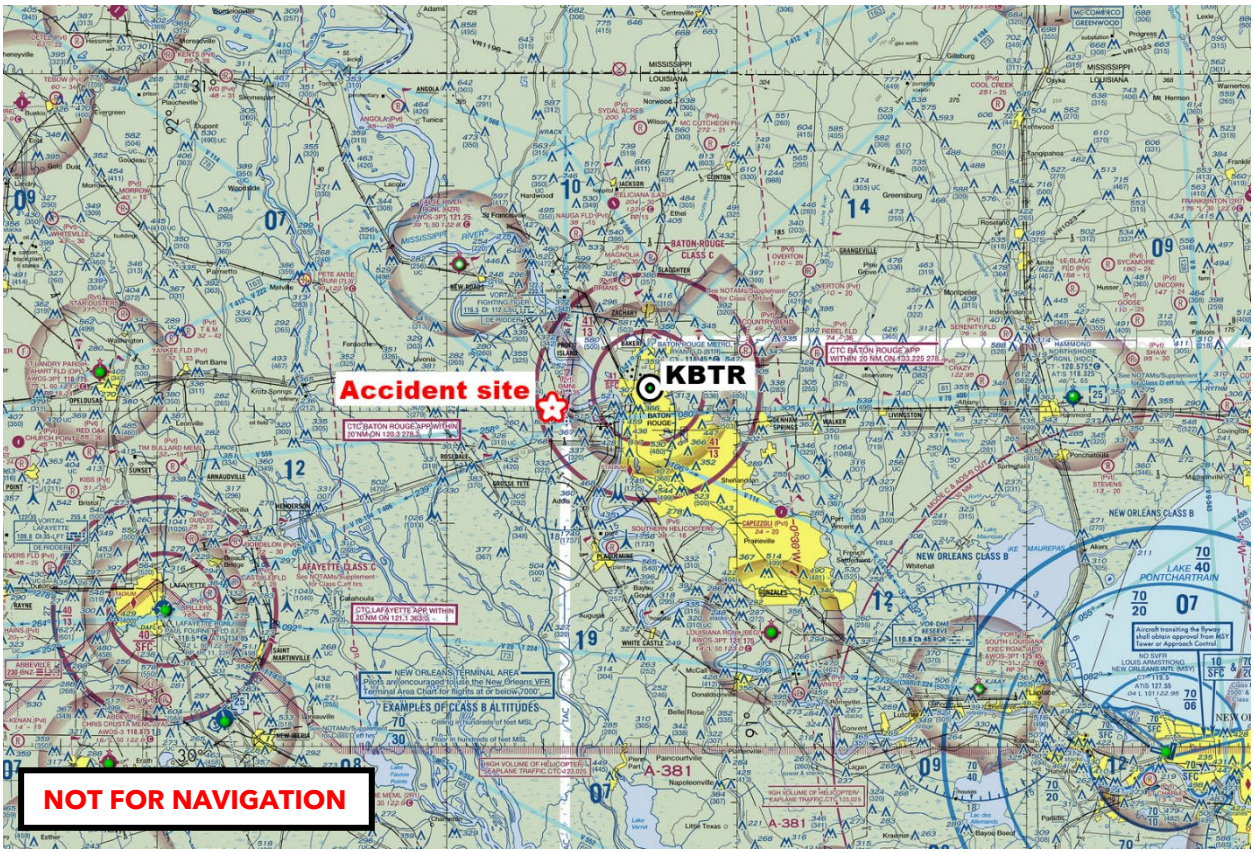

Figure 5. FAA sectional aeronautical chart of the accident area with the location of the accident site and surface observation site noted.

Baton Rouge Metropolitan Airport (KBTR) had the closest official weather station to the accident site. KBTR had an Automated Surface Observing System (ASOS[5]) and its longline[6] reports were augmented by air traffic control (ATC) when the tower was in operation[7]. The KBTR ASOS was located 9 miles east-northeast of the accident site (figure 5), at an elevation of 70 ft, and issued the following observations surrounding the accident time:[8]

[5] 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.

[6] "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.

[7] ATC hours of operation 0500 to midnight local.

[8] 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.

[2353 CDT on March 25] METAR KBTR 260453Z 18005KT 10SM CLR 23/19 A2987 RMK AO2 SLP113 T02280194

[0049 CDT] SPECI KBTR 260549Z AUTO 18004KT 10SM BKN012 23/21 A2987 RMK AO2

[0053 CDT] METAR KBTR 260553Z AUTO 18004KT 10SM BKN012 23/21 A2987 RMK AO2 SLP115 T02330206 10278 20228 403110211 51004

[0153 CDT] METAR KBTR 260653Z AUTO 19006KT 10SM OVC010 23/21 A2986 RMK AO2 SLP111 T02330211

[0237 CDT] SPECI KBTR 260737Z AUTO 18008KT 10SM OVC009 24/22 A2986 RMK AO2 CIG 009V013 T02390217

ACCIDENT TIME 0238 CDT

[0244 CDT] SPECI KBTR 260744Z AUTO 18006KT 10SM OVC011 24/22 A2986 RMK AO2 T02390217

[0253 CDT] METAR KBTR 260753Z AUTO 20008KT 10SM OVC012 24/22 A2987 RMK AO2 SLP113 T02390217

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

KBTR weather at 0237 CDT, automated, wind from 180° at 8 knots, visibility 10 miles or greater, overcast ceiling at 900 ft above ground level (agl), temperature of 24° Celsius (C), dew point temperature of 22°C, and an altimeter setting of 29.86 inches of mercury (inHg). Remarks, automated station with a precipitation discriminator, ceiling varying between 900 and 1,300 ft agl, temperature 23.9°C, dew point temperature 21.7°C.

KBTR weather at 0244 CDT, automated, wind from 180° at 6 knots, visibility 10 miles or greater, overcast ceiling at 1,100 ft agl, temperature of 24°C, dew point temperature of 22°C, and an altimeter setting of 29.86 inHg. Remarks, automated station with a precipitation discriminator, temperature 23.9°C, dew point temperature 21.7°C.

The observations from the KBTR ASOS around the accident time identified IFR to MVFR[9] conditions.

[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

3.0 Upper Air Sounding

A High-Resolution Rapid Refresh (HRRR)[10] model sounding was created[11] for the approximate accident site coordinates for 0300 CDT. The HRRR sounding was plotted on a standard Skew-T Log P diagram[12] from the surface to 700-hPa (or approximately 10,000 ft) using the RAOB[13] software package and is included as figure 6. The sounding depicted an elevation of 49 ft over the grid point with a near surface temperature of 22.1°C, a dew point temperature of 19.3°C, and a relative humidity of 84%. The sounding depicted the lifted condensation level (LCL)[14] at 1,186 ft agl, the convective condensation level (CCL)[15] at 2,828 ft agl, and the level of free convection (LFC)[16] at 10,748 ft. The freezing level was located at 12,960 ft. The precipitable water value at 1.50 inches.

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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).

[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 Eosonde 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.

[16] LFC – The level at which a parcel of saturated air becomes warmer than the surrounding air and begins to rise freely. This occurs most readily in a conditionally unstable atmosphere.

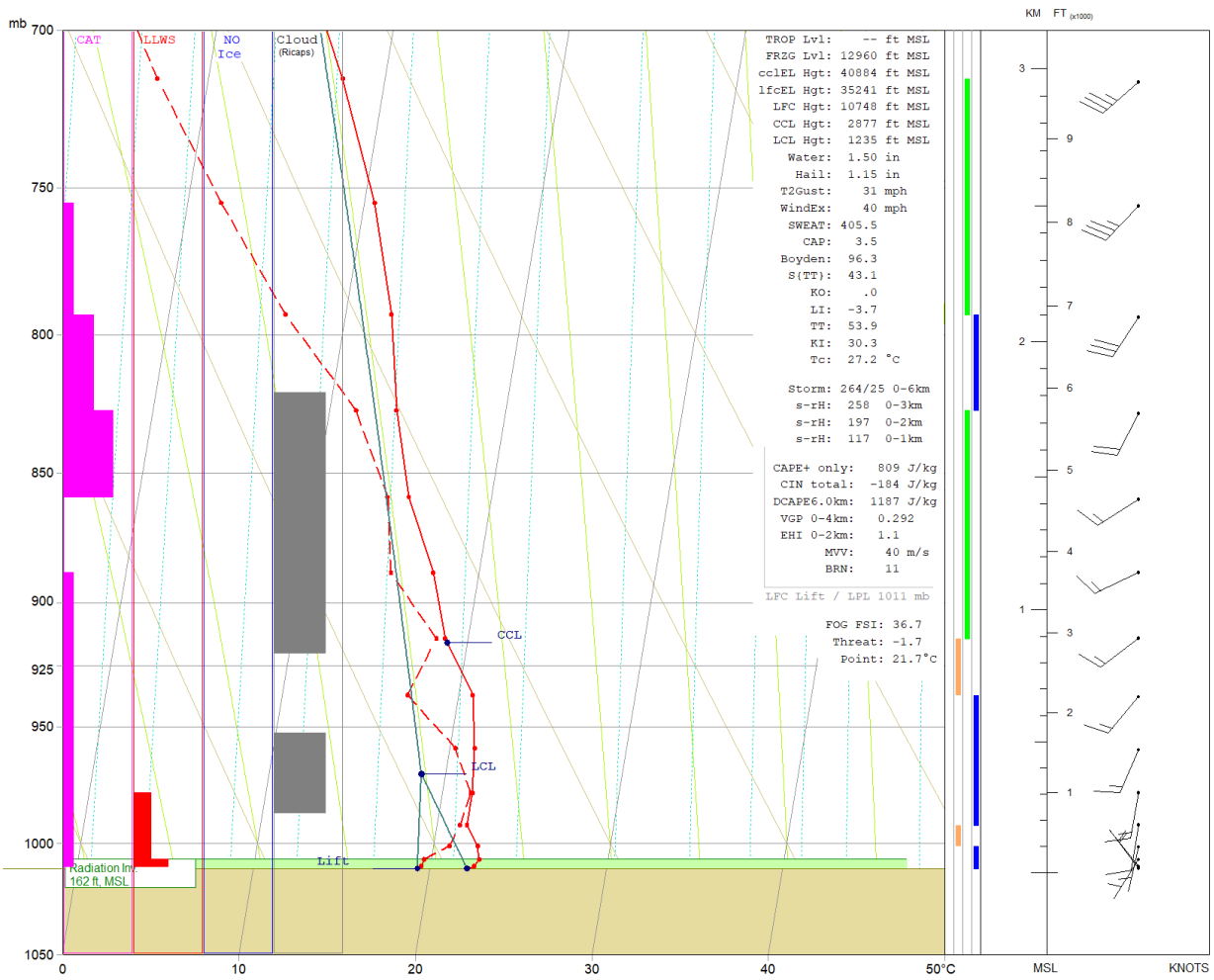

Figure 6. 0300 CDT HRRR sounding.

The 0300 CDT HRRR sounding indicated a stable environment from the surface through 2,000 ft. RAOB indicated a cloud layer between 700 and 1,750 ft agl with another cloud layer between 3,000 and 6,000 ft agl. No icing was indicated below 10,000 ft. The top of a radiation inversion[17] was noted at 162 ft.

The 0300 CDT HRRR sounding wind profile indicated a near-surface wind from 325° at 3 knots with the wind becoming southwesterly through 10,000 ft. The wind speed increased to 15 knots by 1,000 ft agl and to 35 knots by 10,000 ft. RAOB indicated the possibility of light low-level wind shear (LLWS) and light clear air turbulence (CAT) between the surface and 1,000 ft agl, then another layer of light CAT between 1,000 and 8,000 ft.

[17] 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 0000 CDT through 0700 CDT and reviewed, and the closest images to the time of the accident were documented. Given the sun angle, the visible imagery (band 2) did not provide useful information at the accident time.

Figure 7 presents the GOES-16 infrared image at 0236 CDT at 8X magnification with the accident site highlighted with a red square. The lower brightness temperatures (red colors; higher cloud tops) were located northwest of the accident site at the accident time. The brightness temperature of 290 Kelvin above the accident site would have been near 4,000 ft based on the vertical temperature profile provided by the 0300 CDT HRRR sounding. It should be noted these figures have not been corrected for any parallax error. The Nighttime Microphysics Red, Green, Blue (RGB) imagery[18] indicated the cloud cover above the accident site was a combination of low- and very low-level water clouds with the cloud cover moving northward and expanding in areal coverage with time (attachment 1).

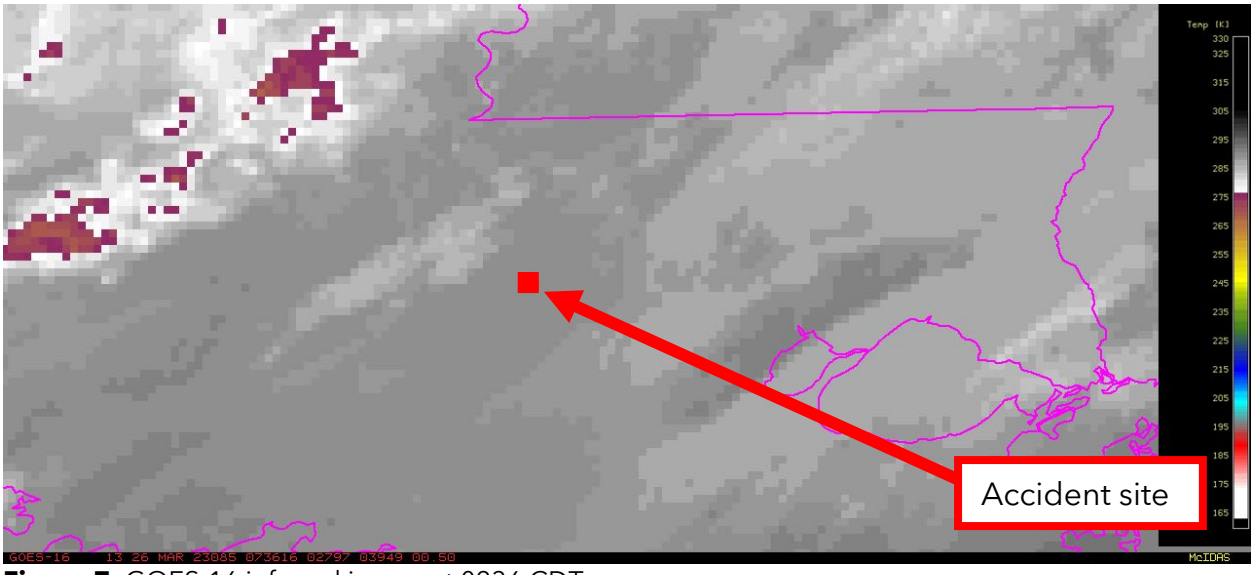

Figure 7. GOES-16 infrared image at 0236 CDT.

18 https://weather.msfc.nasa.gov/sport/training/quickGuides/rgb/QuickGuide_NtMicro_GOESR_NASA_SPoRT_20191206.pdf

5.0 National Radar Imagery

A regional view of the NWS National Reflectivity Mosaic is included as figure 8 for 0235 CDT with the approximate location of the accident site marked by a red circle. The image depicted no echoes above the accident site.

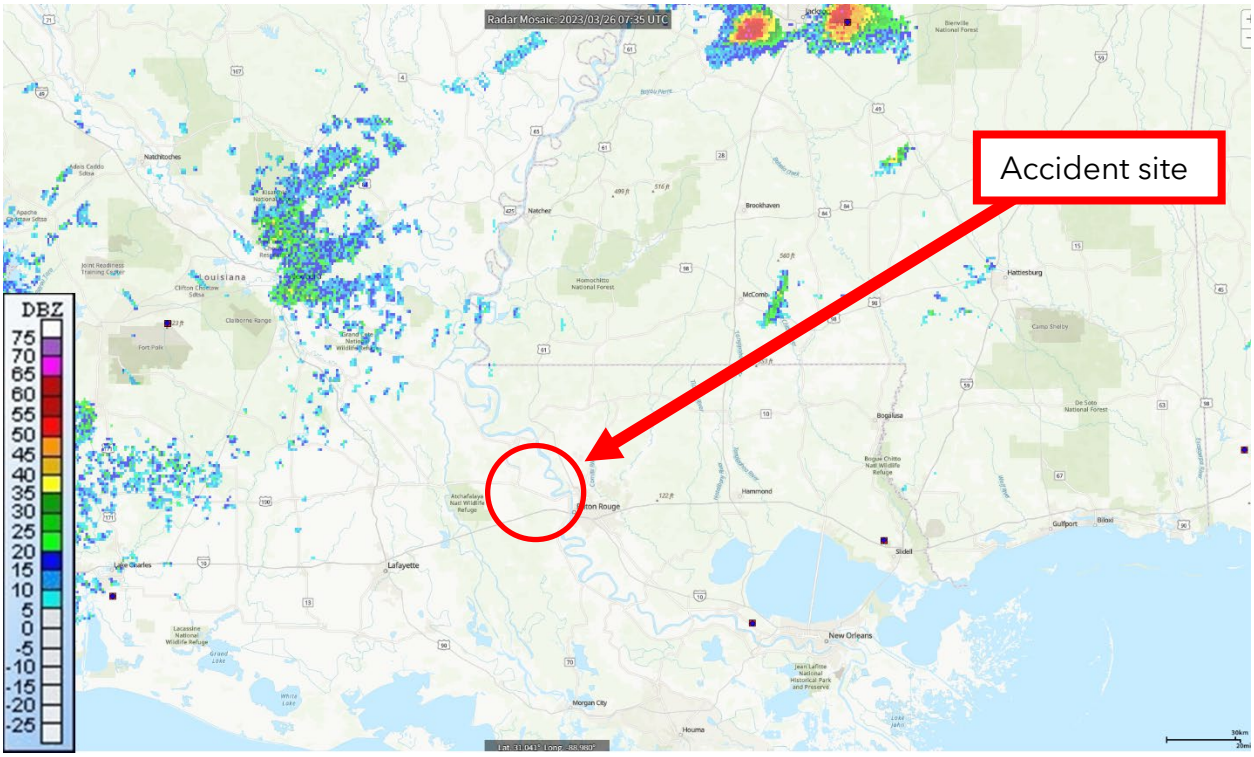

Figure 8. National Reflectivity Mosaic for 0235 CDT.

6.0 Pilot Reports

There were no longline-disseminated pilot reports[19] (PIREPs) distributed into the national airspace system (NAS) within two hours before and after the accident time and within 100 miles of the accident site at altitudes below 18,000 ft.

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.

[19] Only PIREPs with the World Meteorological Organization headers UBMS**, UBLA**, and UBTX** were considered. These do not include pilot reports only broadcast via radio.

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. There was no Center Weather Advisory (CWA) valid for the accident site at the accident time.

9.0 Airmen's Meteorological Information

The NWS Aviation Weather Center (AWC) 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 2145 CDT (March 25) and forecast IFR conditions due to mist and fog:

WAUS44 KKCI 260245
WA4S
-DFWS WA 260245
AIRMET SIERRA FOR IFR VALID UNTIL 260900
.
AIRMET IFR...TX LA MS AL AND CSTL WTRS
FROM 40NW ATL TO 50SW PZD TO 40W CEW TO 120SSE SJI TO 50ESE LEV
TO 50S LEV TO 120SSW LCH TO 80E BRO TO 50W BRO TO 30W CRP TO 30S
LFK TO 20NNW MCB TO 20NE MEI TO 40NW ATL
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 09Z THRU 15Z.
•
OTLK VALID 0900-1500Z...IFR TX LA MS AL AND CSTL WTRS
BOUNDED BY 30S GQO-50SW PZD-40W CEW-130ESE LEV-120SSW LCH-80E
BRO-90W BRO-30WNW LRD-20ESE SAT-50NNW IAH-30S GQO
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG THRU 15Z.
....

10.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products issued by the AWC before the accident flight and valid from 0100 until 0700 CDT are shown in attachment 2. The GFA surface forecasts applicable to the accident site that were valid before the accident flight's departure from 0100 until 0700 CDT indicated VFR conditions with a southwest wind of 5 knots. In addition, Graphical AIRMET[20] (G-AIRMET) Sierra was valid for the accident site at 0400 CDT with isolated (between 10 and 20 percent chance) thunderstorms forecast to be over the accident site between 0100 and 0700

[20] 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.

CDT. The GFA cloud forecast applicable to the accident site that was valid from 0100 until 0700 CDT indicated broken to overcast clouds at the accident site with bases between 300 and 600 ft and tops between 3,500 ft and 6,000 ft. The only human-generated information reflected in the two GFA products were the G-AIRMETs.

11.0 Terminal Aerodrome Forecast

KBTR was the closest site with an NWS Terminal Aerodrome Forecast[21] (TAF) current at the time of the accident. The KBTR TAF valid at the accident time was issued at 0020 CDT and was valid for a 24-hour period beginning at 0100 CDT. The 0020 CDT TAF for KBTR was as follows:

FTUS44 KLIX 260520
TAFBTR
TAF
KBTR 260520Z 2606/2706 17007KT P6SM FEW020 FEW050
FM261100 17005KT P6SM VCSH BKN003 BKN010
FM261400 15005KT 5SM -SHRA VCTS BKN008 BKN015CB
FM261700 18008KT P6SM VCTS BKN008 BKN020CB
FM262300 21010KT P6SM VCTS SCT020CB BKN040=

Between 0100 and 0600 CDT the KBTR forecast expected a wind from 170° at 7 knots, 6 miles visibility or greater, few clouds at 2,000 ft agl, and few clouds at 5,000 ft agl.

12.0 National Weather Service Area Forecast Discussion

The NWS weather forecast office in New Orleans, Louisiana, (WFO LIX) was responsible for the public forecast in the region of the accident site. WFO LIX issued the following Area Forecast Discussion (AFD) at 0016 CDT, the AFD issued closest to the accident time with an aviation section:

FXUS64 KLIX 260516
AFDLIX

Area Forecast Discussion
National Weather Service New Orleans LA
1216 AM CDT Sun Mar 26 2023

...New AVIATION...

[21] 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

.UPDATE...
Issued at 942 PM CDT Sat Mar 25 2023

Overall no major changes made to the forecast outside of updating some hourly PoPs and weather. Main concern is the subtle disturbance coming across the TX Big Bend region. The first subtle piece of this is already running over Austin, TX and could begin to approach western portions of the CWA before 7z while the bulk of the energy may be closer to 8z. This may be what the HRRR is picking up on as it tries to fire off convection overnight and this could develop just west of the area and move into locations near and northwest of BTR. This may be a little bullish but given the rather amped up airmass in place this could be more than sufficient to get storm to break through that warm nose around h78-h8 and then just rapidly develop. These would likely not be sfc based so not as concerned with damaging winds or tornadoes, but large hail could be an absolute concern. There will be a lot of CAPE in the hail growth region to work with and maybe a little upper lvl diffluence in place as well. Mid lvl lapse rates are just as impressive around 7-7.5 c/km while 0-6km bulk shear of around 55-60kt will be quite capable of leading to organized convection. So the big take is if we can actually get convection to develop and break through h8 there is a good chance we could be dealing with a few severe storms during the early through late morning hours along the LA/MS border. /CAB/

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.SHORT TERM...
(This evening through Monday)
Issued at 232 PM CDT Sat Mar 25 2023

A somewhat diffuse cold frontal boundary resides across the northern half of the forecast area. Much of the thermal/moist gradient resides to our north, however, eyes will focus on one particular detail, which could have some implications on the forecast this evening and overnight. This would be backing and increasing surface flow leading to the cold front sharpening. This is important as the environment is conducive for convection. MLCAPE of 1500-2000 j/kg with H5 temps around -14C...steep lapse rates, especially in the hail growth region is enough to catch some attention. The EML is still present, which will limit coverage. The thought it with the sharpening frontal boundary the low level ascent may be just enough to overcome the inhibition allowing for convective initiation to take place later this evening. Low level hodographs signal the potential for splitting supercells with large hail and wind being possible. That said, a right mover especially in closer proximity to the surface boundary may have a tornadic potential. Again, coverage this evening will be limited mainly to SW MS.

Starting early Sunday both CAMs and Globals show clusters of storms developing along the front, which by that time should still reside

along our northern forecast zones. As the front lifts northward as a warm front, isentropic upglide will take place, with much of the elevated convection/shower activity on the opposite side of the front further north into MS. However, there will be a severe weather potential right along the front. Severe hail and damaging winds are the primary concerns, however, any storms that root into the boundary layer and interact with the front or perhaps developing LLJ later in the day may contain a tornadic potential as well.

Going into Sunday night and into Monday a weak upper level impulse may drive the front southward again meandering over the area. If multiple rounds of convection develop we may start to see a localized hydro risk, especially where the heaviest rainfall is anticipated over the Florida Parishes and SW MS. With instability still lingering along and head of the front, we'll also need to watch for an isolated strong to perhaps severe storm through the end of the period. Although with the shelf waters a bit on the cooler side, instability may be more limited closer to the tidal lakes and coast.

Finally, fog potential will be there overnight tonight and into Sunday. Both stat and ensemble guidance are signaling this potential. Moisture pooling ahead of the front along with southerly return flow over the aforementioned cooler SSTs will help with advecting marine fog inland especially over the MS Gulf Coast. (Frye)

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.LONG TERM...
(Monday Night through Saturday)
Issued at 232 PM CDT Sat Mar 25 2023

Going into the early portions of the next workweek, the surface front will remain rather close. Subtle/weak vorts within the active WSW flow aloft will keep rounds/clusters of convection developing over the area. Not expecting continuous rainfall, but periods of showers and thunderstorms will remain possible from Monday and into Tuesday. Will need to monitor for convective clusters and locations that may receive multiple rounds of heavy rainfall for a localized flooding threat.

By midweek an amplifying mid and upper level trough will finally help push the front through the region and should allow us to finally dry out. Temperatures will remain on the milder/warm side as a progressive upper flow begins to transition to an upper level ridge by late week. This ridge should persist through the end of the forecast period as the H5 high centers over the southern Gulf of Mexico. This will place our region in southwesterly flow. GLobals have a frontal boundary and parent trough moving toward our region on Saturday...with strong southerly return flow well in advance of this feature, continued "middle of the road" POPs late in the period, especially across the northern tier. (Frye)

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.AVIATION...
(06Z TAFS)
Issued at 1201 AM CDT Sun Mar 26 2023

Low cigs are already beginning to spread across the region with most terminals in MVFR status but a few are in IFR status and the other have been bouncing back and forth with it. Vsbys may be a small issue especially along coastal MS but this appears to be not as big a concern as earlier thought. The one issue that could be a bigger problem but confidence is low is convection between 10-14z. Energy coming in from northern Mexico could be just enough to try and get a few storms to pop and these could impact BTR and MCB through the early to mid morning hours. /CAB/

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.MARINE...
Issued at 232 PM CDT Sat Mar 25 2023

A frontal boundary will remain just north of the Gulf waters, which will keep light to moderate southerly winds ongoing. The front will continue to lift northward late tonight, which may allow winds to increase a bit. With the cooler SSTs over the nearshore waters, some marine fog will be possible as a rich low level air mass continues to move over the cooler shelf waters. A marine dense fog advisory will be issued overnight. Otherwise, winds will increase again by midweek as a cold front moves through the region once again. (Frye)

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.PRELIMINARY POINT TEMPS/POPS...
MCB 64 79 61 73 / 60 40 60 40
BTR 70 84 67 76 / 40 40 60 40
ASD 67 81 66 77 / 40 50 50 60
MSY 69 79 67 76 / 30 50 40 60
GPT 67 76 65 74 / 40 50 50 70
PQL 67 80 65 77 / 40 40 40 60

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.LIX WATCHES/WARNINGS/ADVISORIES...
LA...None.
GM...Dense Fog Advisory until 9 AM CDT this morning for GMZ530-532-534-536-538-550-552-555-557.

MS...None.
GM...Dense Fog Advisory until 9 AM CDT this morning for GMZ532-534-536-538-550-552-555-557.

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13.0 Winds and Temperature Aloft Forecast

The NWS 2059 CDT March 25, Winds and Temperature Aloft forecast valid for the closest points to the accident site are included below:

FBUS31 KWNO 260159
FD1US1
DATA BASED ON 260000Z
VALID 260600Z FOR USE 0200-0900Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
LCH	**1811**	**2115+13**	2424+09	2337+03	2450-13	2665-24	267840	269149	772658
MSY	**1918**	**2228+15**	2334+10	2434+04	2447-12	2656-23	267139	278349	772057

The closest forecast points to the accident site were the Lake Charles and New Orleans, Louisiana (LCH and MSY, respectively). The 2059 CDT March 25 forecast was for use between 2100 CDT on March 25 and 0400 CDT on March 26.

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. [22]

A search of archived information indicated that the accident pilot did not request weather information from Leidos Flight Service or ForeFlight. It is unknown what weather information, if any, the accident pilot checked or received before or during the accident flight.

[22] 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 Astronomical Data

The astronomical data obtained for the accident site on March 26, 2023, indicated the following:

SUN	
Accident time	**0238 CDT**[23]
Begin civil twilight	0638 CDT
Sunrise	0702 CDT
Sun transit	1311 CDT
Sunset	1921 CDT
End civil twilight	1945 CDT

MOON	
Accident time	**0238 CDT**
Moonrise	1010 CDT
Moon transit	1757 CDT
Moonset	2359 CDT

At the time of the accident the Sun and the Moon were below the horizon.

E. LIST OF ATTACHMENTS

Attachment 1 – GOES-16 Nighttime Microphysics RGB imagery animation from 0101 to 0301 CDT

Attachment 2 – GFA information valid at the accident time

Submitted by:

Paul Suffern
Senior Meteorologist

[23] Inserted accident time for reference and context.