



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

August 19, 2019

Weather Study

METEOROLOGY

CEN19FA120

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A. ACCIDENT

Location: Lake, Mississippi
Date: April 13, 2019
Time: 0015 central daylight time
0515 Universal Coordinated Time (UTC)
Airplane: Piper PA28-180; Registration: N4890L

B. METEOROLOGIST

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C. SUMMARY

April 13, 2019, about 0015 central daylight time (CDT), a Piper PA28-180 airplane, N4890L, registered to the pilot, was destroyed when it impacted terrain following an in-flight breakup near Lake, Mississippi. The private pilot sustained fatal injuries. Dark night instrument meteorological conditions prevailed in the area with thunderstorms, lightning, and rain. No flight plan was filed. The personal flight was being conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91. The flight originated at 2306 from the Picayune Municipal Airport (MJD), Picayune, Mississippi, and its intended destination was the Ackerman Choctaw Airport (9M4), Ackerman, Mississippi.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation from the Washington D.C. office, collecting data from official National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). All times are central daylight time (CDT) based upon the 24-hour clock, local time is -5 hours from UTC, and UTC=Z. 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. Directions are referenced to true north and distances in nautical miles. Heights are in feet (ft) above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was based on the coordinates 32.340114° N and 89.364511° W, at an elevation of approximately 450 ft.

E. WEATHER INFORMATION

1.0 Synoptic Conditions

The synoptic or large scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction (NCEP) located in College Park, Maryland. These are the base products used in describing weather features and in the creation of forecasts and warnings. Reference to these charts can be found in the joint NWS and Federal Aviation Administration (FAA) Advisory Circular “Aviation Weather Services”, AC 00-45H change 1.

1.1 Surface Analysis Chart

The southcentral section of the NWS Surface Analysis Chart for 0100 CDT (0600Z) on April 13, 2019 depicted the accident site on the north side of a stationary front that extended from Tennessee southwestward into northwest Georgia, Alabama, southern Mississippi, into Louisiana and then westward into southern Texas. The accident site was located in a region which was favorable for the development of overrunning clouds and precipitation from the frontal zone.

The station models on the chart depicted north-northeast winds of 10 knots, broken to overcast cloud cover, with temperatures in the 60’s degrees Fahrenheit (°F) with dew points in the high 50’s °F.

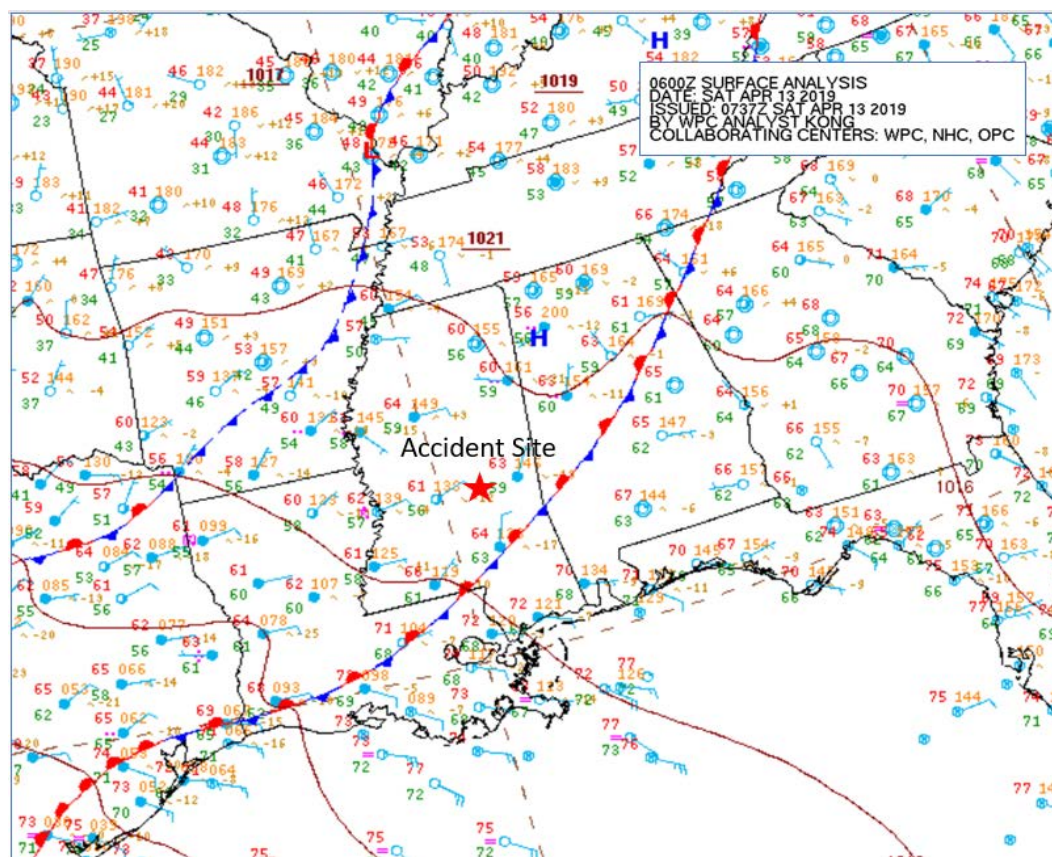


Figure 1 - Southcentral section of the NWS Surface Analysis Chart for 0100 CDT

1.2 National Composite Radar Mosaic

The National Composite Radar Mosaic for 0015 CDT is included as figure 2 with the approximate accident site marked by a red star. The accident site was located on the southern edge of a large area of echoes associated with rain showers and embedded thunderstorms, which were moving northeastward with time. Based on the potential of echoes in the vicinity of the flight track, the closest NWS weather radar will be further documented in section 5.0 of this report.

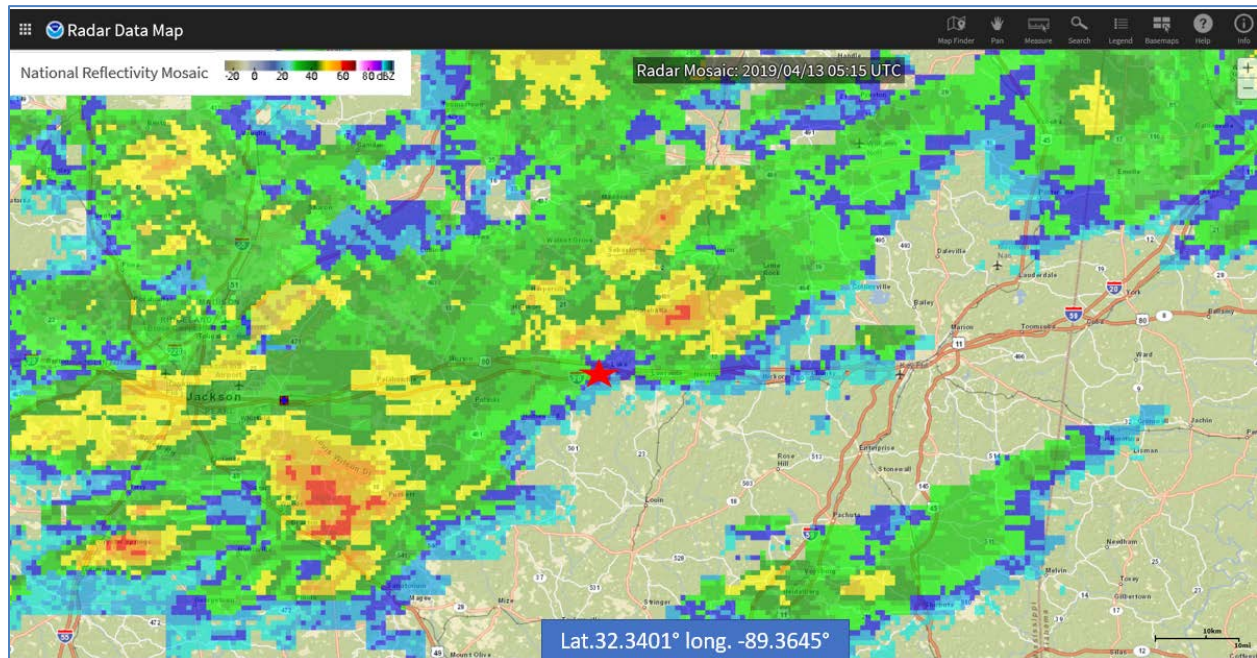


Figure 2 - National Composite Radar Mosaic for 0015 CDT

2.0 Observations

The accident site was located between Jackson and Meridian, Mississippi. The official NWS meteorological aerodrome reports (METAR) and specials reports (SPECI) issued surround the period were documented. The magnetic variation was estimated at 1° W based on the latest sectional map for the area.

2.1 Meridian, MS

The closest official weather reporting location to the accident site was from Key Field Airport (KMEI), Meridian, Mississippi, located 31 miles east of the accident site at an elevation of 298 ft. The airport had a federally installed and maintained Automated Surface Observation System (ASOS) and was augmented during normal tower hours from 0600 through 2200 local. The following conditions were reported at the approximate time of the accident.

KMEI special weather observation at 0042 CDT (0542Z), automated, wind from 360° at 4 knots, visibility 10 miles with thunderstorm in the vicinity¹, ceiling overcast at 2,900 ft agl, temperature 18° Celsius (C), dew point 16° C, altimeter 29.99 inches of mercury (Hg). Remarks: automated observation system, lightning distant southeast, temperature 17.8° C, dew point 15.6° C.

The general flight categories² and raw observations surrounding the period from 2158 CDT through 0158 CDT were as follows:

VFR METAR KMEI 130258Z AUTO 07008KT 10SM -RA FEW060 BKN075 OVC110 17/14 A3001 RMK AO2 PK WND 33031/0209 TSB11E26 SLP159 P0036 60060 T01720144 53020

VFR METAR KMEI 130358Z AUTO 04005KT 10SM -RA FEW042 BKN055 OVC070 17/14 A3000 RMK AO2 RAE03B23 SLP156 P0000 T01720144

MVFR METAR KMEI 130458Z AUTO 05008KT 10SM OVC030 17/16 A2997 RMK AO2 RAE10 SLP145 P0000 T01720156

Accident 0515Z

MVFR SPECI KMEI 130542Z AUTO 36004KT 10SM VCTS OVC029 18/16 A2999 RMK AO2 LTG DSNT SE T01780156

MVFR METAR KMEI 130558Z AUTO 03007KT 10SM VCTS -RA OVC029 17/15 A2997 RMK AO2 LTG DSNT ALQDS RAB50 SLP146 P0000 60060 T01720150 10194 20167 402170150 55013=

MVFR SPECI KMEI 130613Z AUTO 35006KT 10SM OVC028 17/15 A2999 RMK AO2 LTG DSNT ALQDS RAE00 PRESRR P0000 T01720150=

MVFR SPECI KMEI 130620Z AUTO 30009KT 10SM VCTS -RA OVC028 17/15 A3003 RMK AO2 LTG DSNT ALQDS RAE00B18 PRESRR P0000 T01720150=

MVFR SPECI KMEI 130628Z AUTO 36007KT 10SM TS OVC027 17/15 A3001 RMK AO2 LTG DSNT N RAE00B18E27 TSB22 P0000 T01720150=

MVFR SPECI KMEI 130647Z AUTO 02008KT 10SM VCTS BKN029 BKN036 OVC070 17/15 A2997 RMK AO2 LTG DSNT NE RAE00B18E27 TSB22E41 PRESFR P0000 T01720150=

A review of the observations indicated that Marginal Visual Flight Rule (MVFR) conditions prevailed during the period with thunderstorms and rain showers being reported in the vicinity

¹ Vicinity is defined as not at the station but within 5 to 10 miles, based on lightning detection system.

² 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 is a sub-category of VFR.

with lightning being detected in the distant during the period. No strong winds were reported during the period.

2.2 Jackson, MS

The next closest reporting station was from Jackson-Medgar Wiley Evers International Airport (KJAN), Jackson, Mississippi, located 36 miles west of the accident site at an elevation of 346 ft. The airport had an Automated Weather Observation System (AWOS) which was also augmented by tower personnel during normal hours between 0600 and 2100 local. The following conditions were being reported at the approximate time of the accident:

KJAN special weather observation at 0010 CDT (0510Z), automated, wind from 070° at 6 knots, visibility 10 miles with thunderstorm in the vicinity and light rain, ceiling broken at 3,800 ft agl, broken clouds at 4,900 ft, temperature 17° C, dew point 14° C, altimeter 29.98 inches of Hg. Remarks: automated observation system, lightning distant southeast through west, hourly precipitation 0.01 inches, temperature 16.7° C, dew point 13.9° C.

The general flight categories and raw observations surrounding the period from 2254 CDT through 0154 CDT were as follows:

VFR METAR KJAN 130354Z 08005KT 10SM OVC042 17/14 A2998 RMK AO2 RAB02E25 SLP150 P0000
T01670144=
VFR SPECI KJAN 130434Z AUTO 05005KT 10SM VCTS OVC038 17/14 A2996 RMK AO2 LTG DSNT NE-S
T01670139=
VFR SPECI KJAN 130449Z AUTO 06007KT 10SM -RA SCT038 BKN050 BKN120 16/14 A2995 RMK AO2 LTG
DSNT ALQDS RAB39 P0000=
VFR METAR KJAN 130454Z AUTO 06005KT 10SM -RA SCT038 BKN050 BKN120 17/14 A2996 RMK AO2
LTG DSNT ALQDS RAB39 SLP141 P0000 T01670139=
VFR SPECI KJAN 130510Z AUTO 07006KT 10SM VCTS -RA BKN038 BKN049 17/14 A2998 RMK AO2
LTG DSNT SE-W P0001 T01670139=

Accident 0515Z

VFR SPECI KJAN 130523Z AUTO 07006KT 10SM -TSRA SCT038 BKN045 OVC110 17/14 A2997 RMK AO2
LTG DSNT SW AND W TSB17 P0001 T01670139=
VFR SPECI KJAN 130543Z AUTO 07011KT 10SM VCTS -RA SCT050 SCT070 BKN100 16/13 A2993 RMK
AO2 LTG DSNT ALQDS TSB17E37 P0001 T01610133=
VFR METAR KJAN 130554Z AUTO 07010G17KT 10SM VCTS -RA FEW050 BKN120 16/13 A2995 RMK AO2
LTG DSNT ALQDS TSB17E37 SLP138 P0001 60039 T01610133 10200 20161 402280133 56012
VFR SPECI KJAN 130629Z AUTO 06010KT 10SM -RA OVC110 16/13 A2995 RMK AO2 LTG DSNT ALQDS
P0000 T01610128=
VFR SPECI KJAN 130636Z AUTO 05008KT 10SM VCTS -RA OVC110 16/13 A2996 RMK AO2 LTG DSNT
ALQDS P0000 T01610133=

VFR METAR KJAN 130654Z AUTO 02009KT 10SM -RA FEW030 FEW070 OVC110 16/14 A2997 RMK AO2 LTG DSNT N AND NE SLP146 P0000 T01610139=

The observations surrounding the period indicated that VFR conditions prevailed during the period with intermittent thunderstorms and rain showers. Lightning was also confirmed in the area during the period. The highest wind gust reported during the period was 17 knots.

2.3 METAR Display

A display of the observations from the NWS Aviation Weather Centers website for 0020 CDT is included as figure 3 with the approximate accident site noted by a red star. The METAR display depicted general MVFR to VFR conditions prevailing over the area with multiple stations reporting rain and/or thunderstorms and lightning.

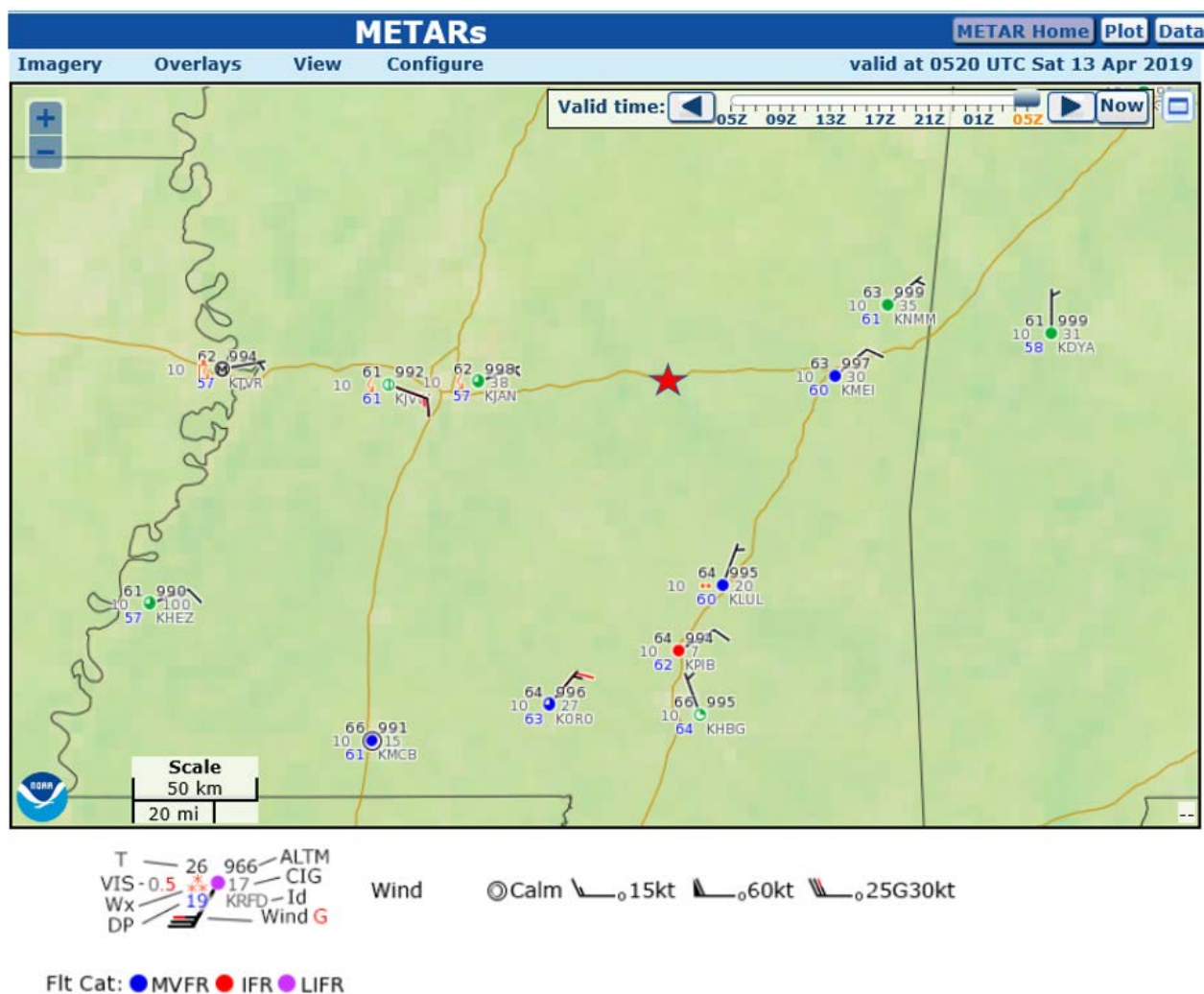


Figure 3 - METAR display from the Aviation Weather Center for 0020 CDT

3.0 Sounding

To determine the vertical structure and state of the atmosphere over the accident site a High-Resolution Rapid Refresh (HRRR)³ numerical model data was retrieved from the NOAA Air Resources Laboratory using the accident sites coordinates based on the initial data at 1900 CDT on April 12, 2019 with model run for 0000 CDT on April 13, 2019. The data was then plotted on a standard Skew T log P diagram⁴ using the complete Rawinsonde Observation RAOB program software⁵ and is presented in figure 4 from the surface to approximately 21,000 ft. Wind data has been rounding to the nearest 10° true north.

The HRRR numerical model sounding for 0000 CDT indicated an elevation of 472 ft, with a temperature of 16.6° C (62° F), dew point temperature of 15.5° C (60° F), with a relative humidity of 93%, with a resultant density altitude of 1,002 ft. A surface based temperature was noted to approximately 1,013 ft. The lifted condensation level (LCL) was identified at 463 ft agl (935 ft msl), and a convective condensation level (CCL) at 3,776 ft agl (4,248 ft msl). The freezing level was 12,495 ft, well above the accident airplanes maximum altitude obtained of 8,600 ft, therefore no structural icing conditions existed. The sounding supported multiple layers of clouds where the relative humidity exceeded 90% were identified from 2,400 ft agl through 6,000 ft, and between 11,500 ft through 21,000 ft. The atmosphere was characterized as stable to conditionally unstable with a Lifted Index of 3, with the RAOB program supporting nimbostratus type clouds with a potential for light rain to embedded cumulonimbus clouds. The precipitable water content of the sounding was 1.43 inches.

The HRRR wind profile indicated a surface wind from the east or 080° at 6 knots gusting to 14 knots with wind veering to the southeast at the accident airplanes cruising level at 8,500 ft, and then to the southwest and west above 10,000 ft with increasing wind speeds. The mean 0 to 6 kilometer or 18,000 ft wind was from 210° at 28 knots, the storm motion estimated at 240° at 21 knots, and the maximum wind at 36,700 ft from 240° at 114 knots.

³ The HRRR is a National Oceanic and Atmospheric Administration (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.

⁴ Skew T log P diagram – is a standard meteorological plot or thermodynamic diagram 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.

⁵ RAOB software – The complete RAwinsonde OBservation program is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania, for plotting and analyzing upper air data.

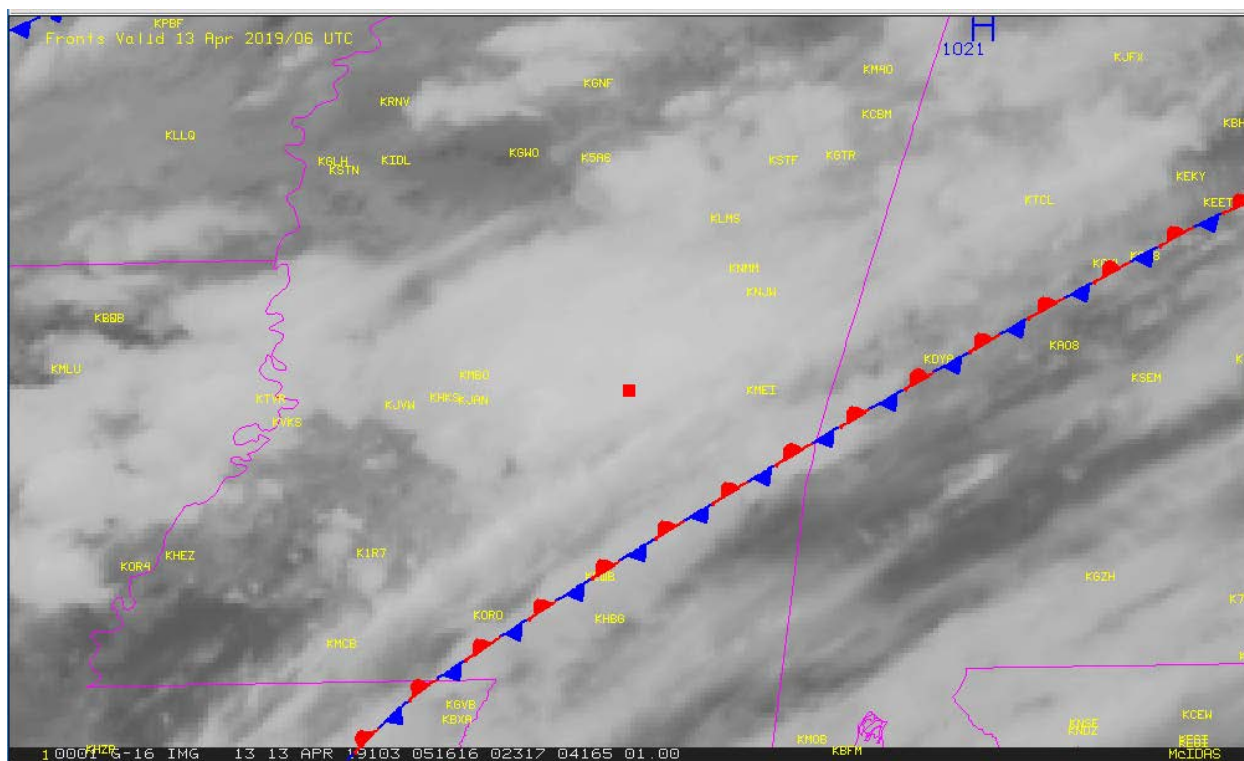
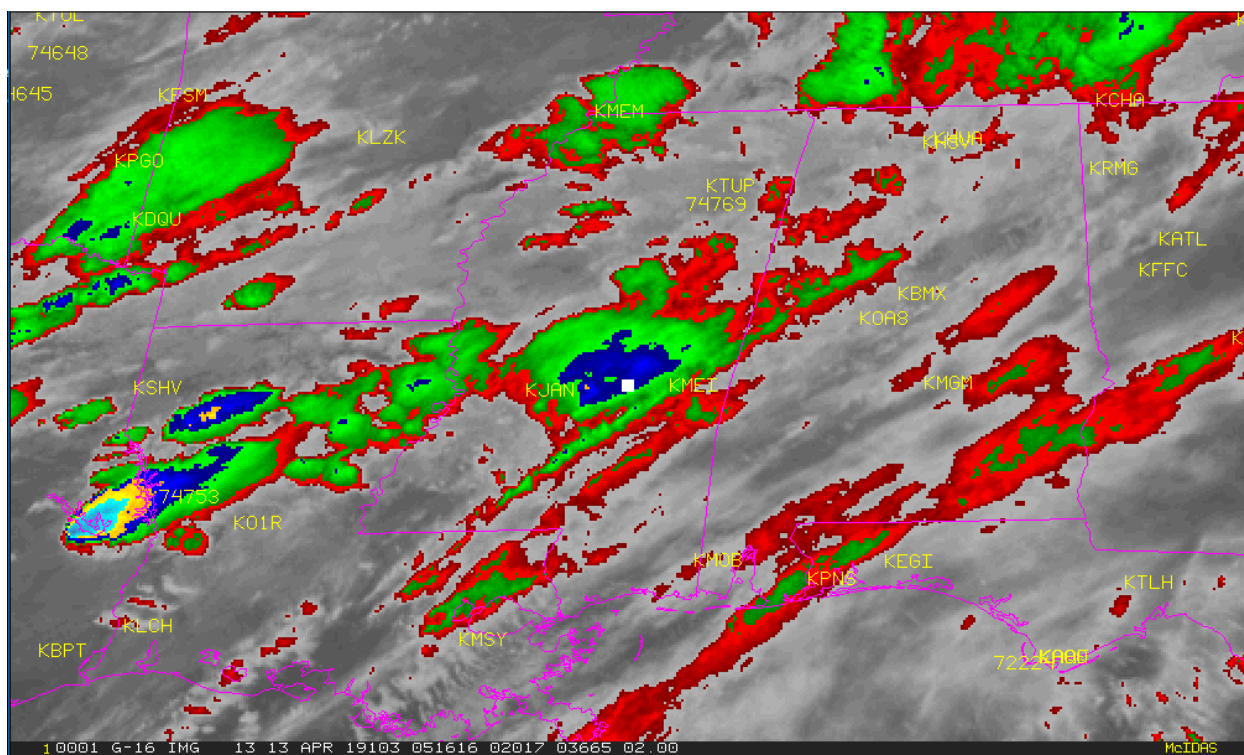
Height (ft-MSL)	Pres (hPa)	T (C)	Td (C)	RH (%)	DD / FF (deg / kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)
472	996	16.6	15.5	93	85 / 6	MDT	MODRT	
557	993	17.0	15.1	89	80 / 14	LGT	LIGHT	
727	987	17.0	14.7	86	79 / 17	LGT	LIGHT	
1013	977	18.6	13.6	73	76 / 20	LGT		
1362	965	18.4	14.3	77	86 / 21	MDT	LIGHT	
1892	947	17.6	14.5	82	98 / 25	MDT	LIGHT	
2522	926	16.5	14.7	89	114 / 23	SVR		
3257	902	15.4	15.0	97	146 / 17			
4008	878	13.8	13.7	99	150 / 15			
4937	849	11.9	11.7	99	144 / 14	LGT		
5958	818	9.8	8.7	93	132 / 17			
7079	785	7.7	3.9	77	134 / 20	MDT		
8346	749	6.0	-5.3	44	152 / 26	MDT		
9817	709	4.6	-8.4	38	171 / 33	SVR		
11441	667	1.4	-1.0	84	200 / 34	SVR		
13324	621	-1.1	-1.9	94	227 / 44	MDT		LGT Rime

Figure 5 - HRRR Model parameters

4.0 Satellite Imagery

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 (McIDAS) software. The infrared long wave imagery was obtained surrounding the time of the accident, with the images closest to the time of the accident documented below. The infrared long wave imagery (band 13) at a wavelength of 10.3 microns (μm) provided radiative cloud top temperatures with a nominal spatial resolution of 2 km.

Figure 6 is the GOES-16 infrared image at 0016 CDT at 2X magnification with a standard MB temperature enhancement curve applied to highlight the higher and often colder cloud tops associated with deep convection and cloud systems. The image depicted the accident site under an enhanced area of clouds with radiative cloud top temperatures of 219° Kelvin or -54° C, which corresponded to cloud tops near 38,000 ft. Figure 7 is the GOES-16 infrared image at 4X magnification for the same period of 0016 CDT with the frontal positions overlaid without the color enhancement. The image depicted a large convective cloud system which supported rain over the accident site.



5.0 Weather Radar Imagery

The closest NWS Weather Surveillance Radar 1988 Doppler (WSR-88D) was located approximately 32 miles west of the accident site at Jackson/Brandon (KDGX), Mississippi. The level II archive data was obtained from the NCEI using the Hierarchical Data Storage System and displayed using the NWS NEXRAD Interactive Viewer and Data Exporter software to take a closer look for any significant precipitation echoes along the flight path.

The WSR-88D is a S-band 10-centimeter wavelength radar with a power output of 750,000 watts, with a 28-foot parabolic antenna concentrating the energy into a 0.95° beam width. The radar produces three basic types of products reflectivity, radial velocity, and spectral width.

During the period the KDGX WSR-88D was operating in the precipitation mode, volume coverage pattern (VCP) 212 where the radar makes 14 different elevation scans in approximately every 4 1/2-minutes. The KDGX WSR-88D with an antenna height of 609 ft. The following table provides the approximate elevation scan and the altitude of the beam over the accident site rounded to the nearest 10 ft.

Elevation	Center of Beam	Base of Beam	Top of Beam	Beam Width
0.48°	2,920 ft	1,310 ft	4,530 ft	3,220 ft
0.87°	4,240 ft	2,630 ft	5,850 ft	3,220 ft
1.32°	5,770 ft	4,160 ft	7,380 ft	3,220 ft
1.80°	7,390 ft	5,780 ft	9,000 ft	3,220 ft

Based on the flight track and distance from the KDGX WSR-88D the 1.80° elevation scan best represented the accident airplane last noted altitude at 8,600 ft, and was scanning the altitudes from 5,780 ft through 9,000 ft.

5.1 Reflectivity

Reflectivity in dBZ provides basic intensity information and is referenced for pilots in Advisory Circular AC 00-24C – “Thunderstorms”. The figure 8 is a table from that advisory circular that provides the basic reflectivity in dBZ and echo intensity values. The FAA have weather radar processors installed to allow air traffic controllers to display moderate, heavy, and extreme precipitation values according to the following reflectivity values.

Reflectivity (dBZ) Ranges	Weather Radar Echo Intensity Terminology
< 30 dBZ	Light
30 – 40 dBZ	Moderate
>40 – 50 dBZ	Heavy
>50 dBZ	Extreme

Figure 8 - Reflectivity Scale

5.2 Base Reflectivity Imagery

Figures 9-11 are the KDGX WSR-88D base reflectivity scans for 0.48°, 0.87°, and 1.80° elevation scans at 0011:49 CDT with the flight track overlaid. The images depict the accident airplane traveling north and overflying echoes of 25 dBZ, and into echoes of 5 dBZ or very light intensity echoes at 8,600 ft. Approximately 5 miles north of the accident airplanes last position is an east to west band of organized heavy to extreme intensity echoes ranging from 45 to 52 dBZ at the lower elevation scans and moderate to heavy or from 35 to 45 dBZ at the accident airplanes altitude. An animation of the echoes showed the activity rapidly moving northeastward and was at its peak intensity at the time of the accident under the aircraft suggesting an updraft at the time of the accident.

A separate review of lightning data Earth Networks indicated from 0000 to 0030 CDT there were a total of 209 in-cloud lightning flashes in an approximately a 30 miles radius of the accident site surrounding the period.

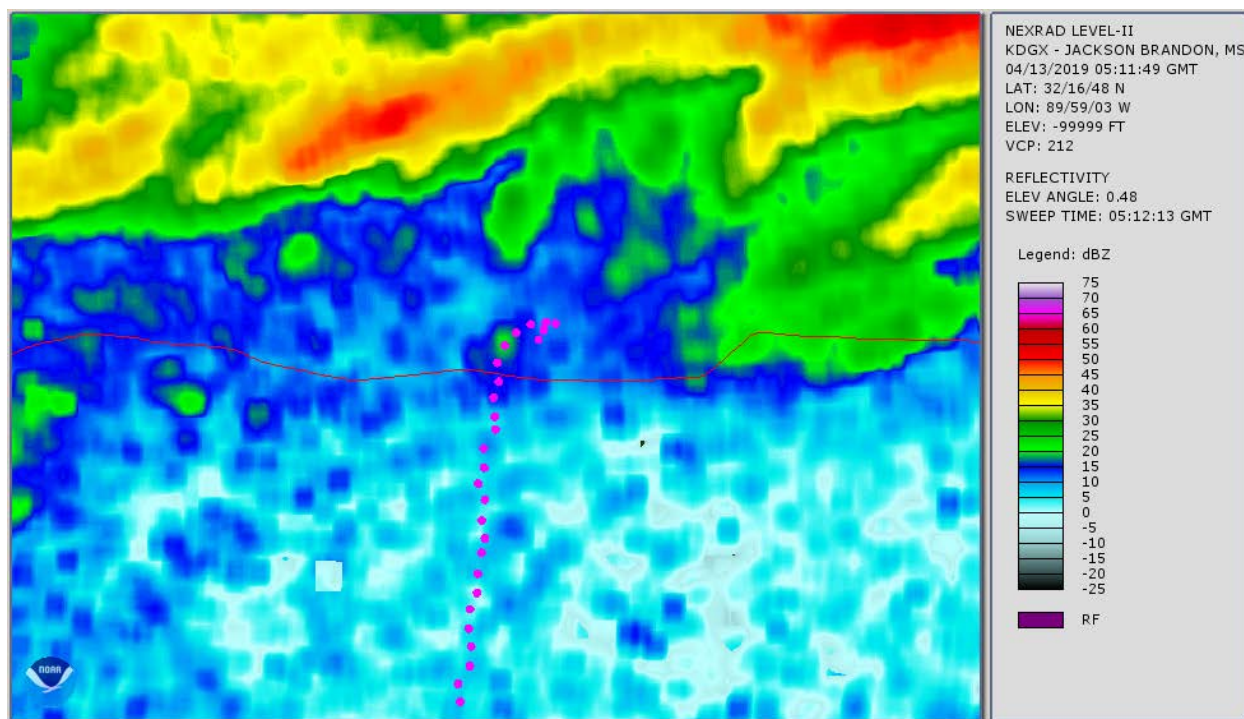


Figure 9 - KDGX WSR-88D 0.48° base reflectivity image at 0011:49 CDT depicting echoes under flight track

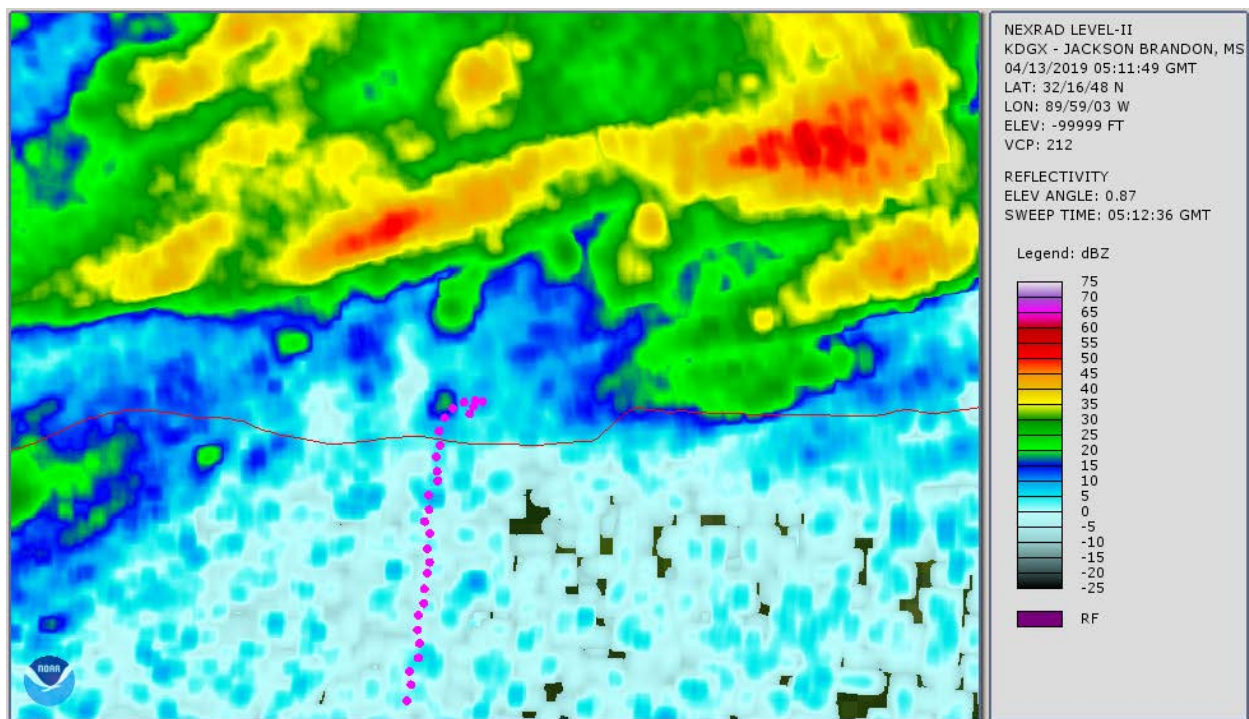


Figure 10 - KDGX WSR-88D 0.87° base reflectivity image at 0011:49 CDT depicting echoes under flight track

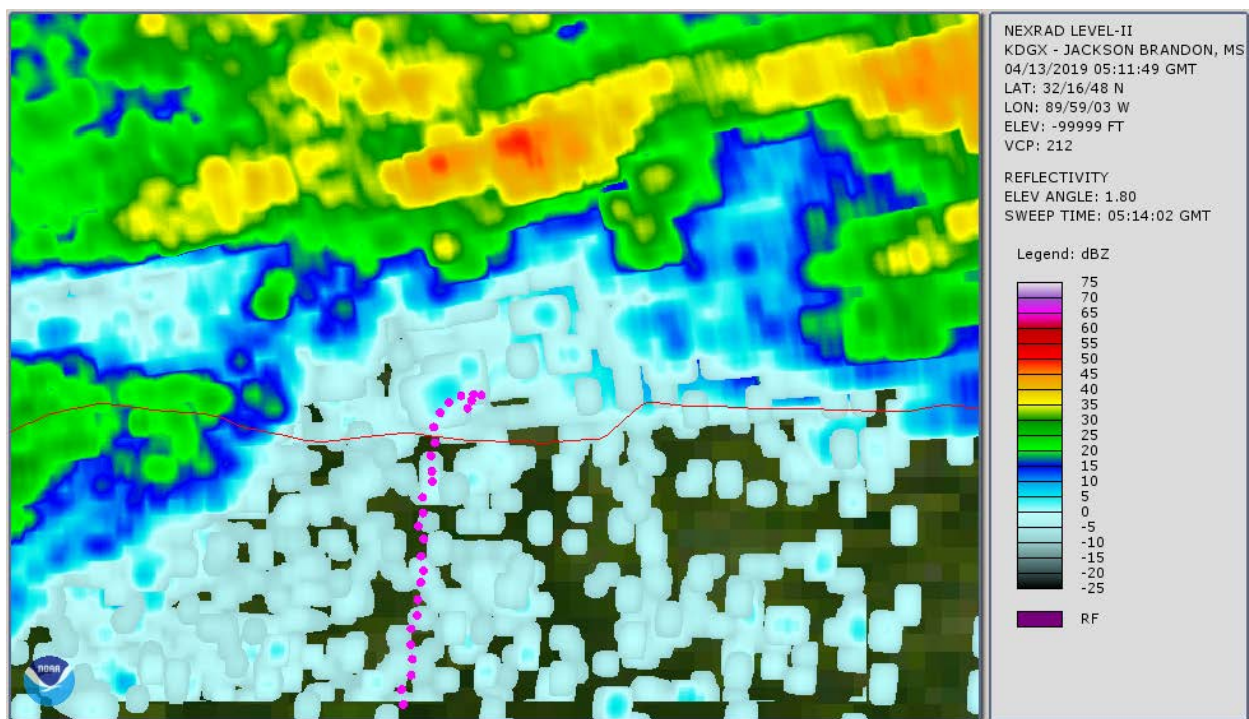


Figure 11 - KDGX WSR-88D 1.80° base reflectivity image at 0011:49 CDT depicting echoes over flight track

5.3 FAA Consolidated Storm Prediction for Aviation Imagery

The archive FAA Consolidated Storm Prediction for Aviation (CoSPA) images surrounding the period were also reviewed. The CoSPA utilizes vertical integrated liquid (VIL)⁶ versus reflectivity in the WSR-88D displays, so some slight differences in echo intensity were being displayed. Figure 12 is the CoSPA image for 0010 CDT which depicted the accident site on the southern edge of an area of echoes of VIL of 30 to 45, which were depicted moving northeast at 50 knots with echo tops near 36,000 ft. Another area was located west of the area with significant lightning activity depicted with the white “+” symbols.

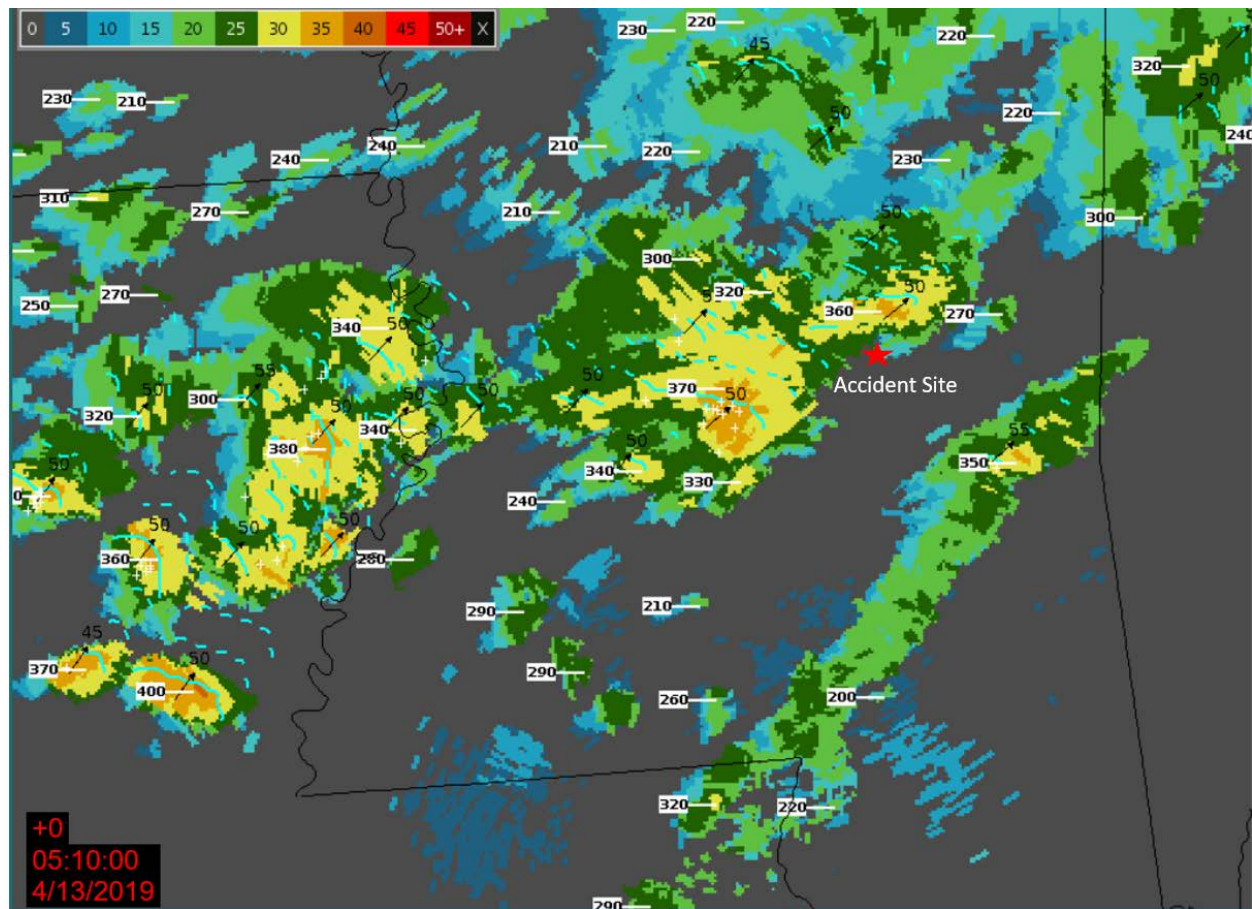


Figure 9 - FAA CoSPA radar image at 0010 CDT

6.0 Pilot Reports

A search for pilot reports or PIREPs over Mississippi surrounding the period of the accident from 2200 through 0300 CDT indicated no reports over the region during the period.

⁶ Vertically integrated liquid (VIL) is an estimate of the total mass of precipitation in the clouds. The measurement is obtained by observing the reflectivity of the air which is obtained with weather radar.

7.0 NWS Forecasts and Advisories

The following NWS advisories and forecasts were issued surrounding the period and relevant to the accident flight.

7.1 Terminal Aerodrome Forecasts

The NWS Jackson, MS, Weather Forecast Office (WFO) was co-located at KJAN was responsible for the region where the accident occurred and the KJAN and KMEI forecast areas. A TAF is only valid for a 5 mile radius around the airport center point, but provides a breakdown in time, of clouds, and the expected conditions over the area, and is often reviewed for preflight and familiarization purposes. The forecasts issued surrounding the period were as follows:

*TAF KJAN 122355Z 1300/1324 05006KT P6SM VCTS BKN120CB
FM130400 08008KT P6SM VCSH BKN035
FM131100 10013G23KT P6SM BKN007 BKN015
FM131700 11013KT P6SM VCSH BKN025 BKN050
FM131900 13016G25KT P6SM BKN015 BKN050=*

*TAF KMEI 130524Z 1306/1406 06006KT P6SM VCSH BKN025
FM131000 09008KT P6SM BKN008
FM131500 10010KT P6SM BKN015
FM131800 13013G23KT P6SM BKN025
FM132000 15013G23KT P6SM BKN035
FM132300 15014G24KT P6SM VCTS SCT035CB BKN250
FM140200 16014KT P6SM VCTS BKN025CB*

The Terminal Aerodrome Forecasts (TAFs) for KJAN and KMEI both expected light northeast winds less than 10 knots, visibility 6 miles or more, with rain showers in the vicinity of the airports or within 10 miles of the stations, with ceiling broken between 2,500 and 3,500 ft agl. IFR ceilings between 700 and 800 ft agl were expected after approximately 0500 CDT and continue into the morning hours.

7.2 Graphic Forecast for Aviation

The Graphic Forecast for Aviation (GFA) replaced the Area Forecast for providing enroute weather conditions and cloud cover with bases and tops. The GFA static forecast for “Aviation Surface Forecast” issued by the AWC during the period for wind, visibility, and weather phenomena, with the Graphic AIRMET⁷ (G-AIRMET) Sierra for IFR conditions and G-Tango for strong gusty surface winds are included as figure 13. The GFA Surface Forecast for 0100 CDT

⁷ Airmen’s Meteorological Information (AIRMET) is a concise description of weather phenomena that are occurring or may occur (forecast) over an area of at least 3,000 square miles that may affect aircraft safety. AIRMETs are issued for moderate turbulence or icing, sustained surface winds of 30 knots or more, Low-Level Wind Shear (LLWS), widespread restricted visibility below 3 statute miles and/or ceilings less than 1,000 ft agl or IFR conditions and mountain obscuration conditions.

depicted light easterly winds of 5 knots, continuous light rain. The G-AIRMET Sierra⁸ for IFR conditions did not extend over the route or the accident site at the time.

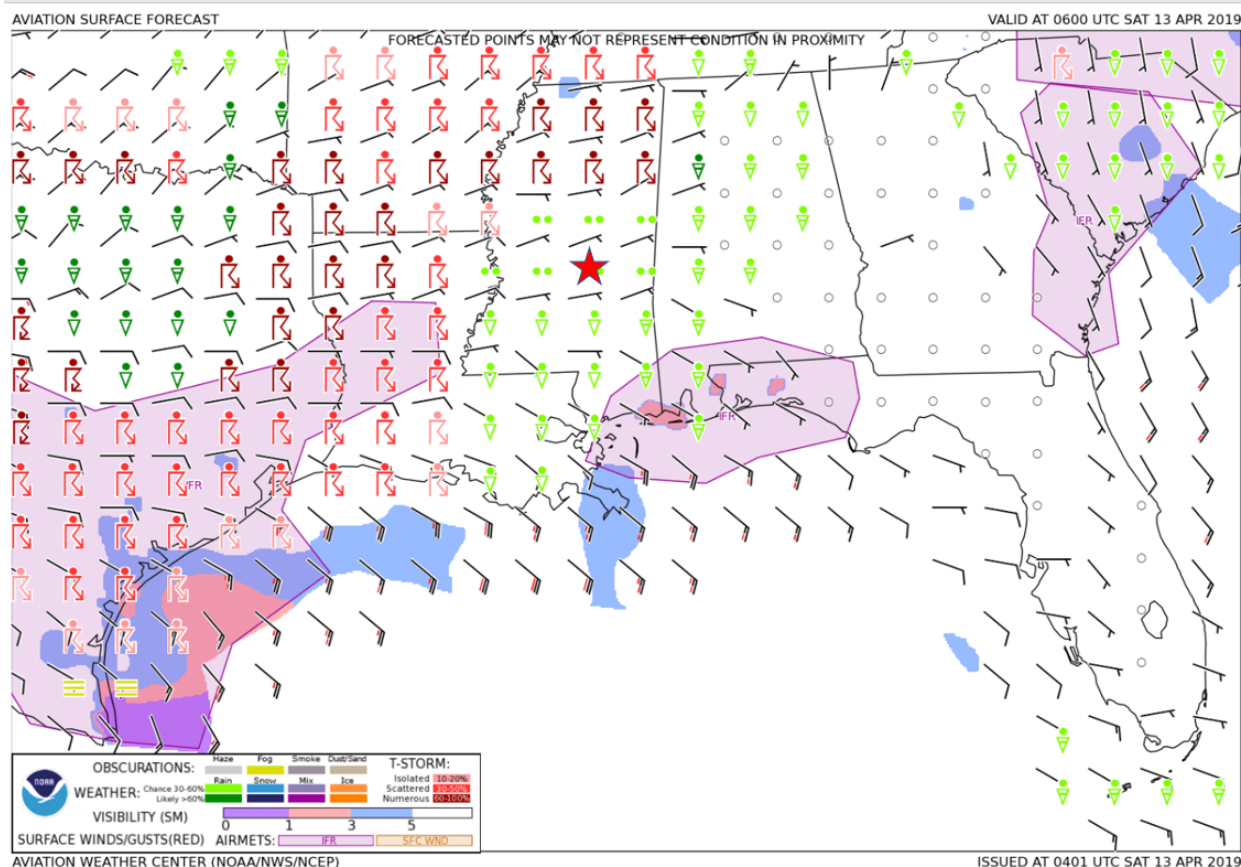


Figure 10 - Graphic Forecast for Aviation Surface Forecast valid for 0100 CDT

The GFA “Aviation Cloud Forecast” provided cloud coverage, bases, layers, and tops with the G-AIRMET Zulu for icing conditions also included on figure 14. The image depicted broken to overcast cloud cover over the route and the accident site with cloud bases near 3,000 ft with tops near 29,000 to 31,000 ft. G-AIRMET Zulu extended over the area with the potential for icing above 12,000 ft over the region, above the accident airplanes altitude of 8,600 ft. See inflight weather advisories in section 7.4 for the text version of the advisory.

⁸ The Graphic-AIRMET Sierra for the period differs slightly from the text version which is the advisory controlling for the period. See section 7.4 below.

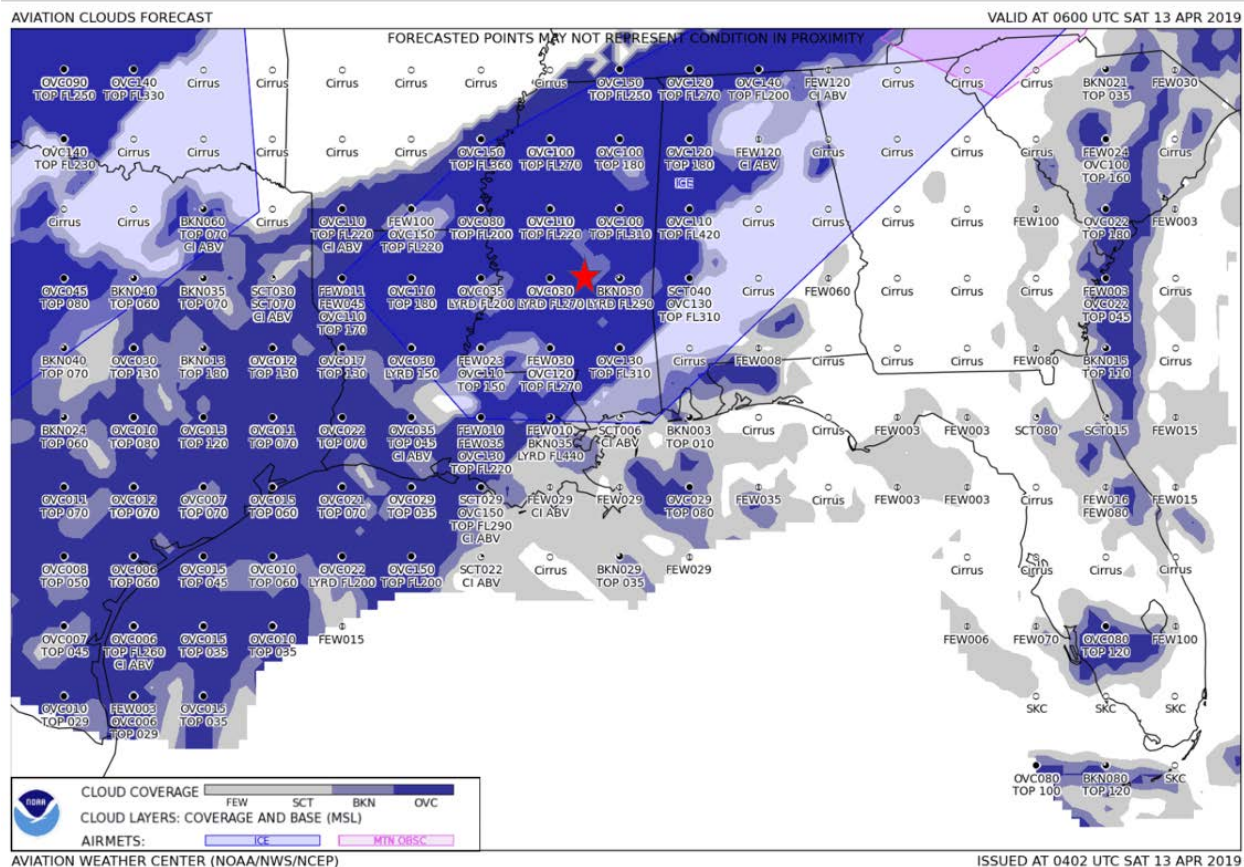


Figure 11 - Graphic Forecast for Aviation Cloud Forecast valid for 0100 CDT

7.3 Winds and Temperature Aloft Forecast

The NWS Winds and Temperature Aloft Forecast for the route of flight is included below and was valid for 0100 CDT, and for use between 2100 through 0400 CDT.

WINDS ALOFT FORECASTS

DATA BASED ON 130000Z

VALID 130600Z FOR USE 0200-0900Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000	45000	53000
MSY	1428	1721+14	2125+08	2230+03	2253-12	2458-23	248638	249547	740558	249464	247167
MOB	1419	1617+13	2020+10	2324+04	2348-11	2458-24	248737	249047	249758	259565	246867
JAN	1420	1624+10	1825+04	2327+00	2465-13	2362-26	236841	239949	742358	249963	247065

The forecast for Jackson, MS (JAN) for 6,000 ft indicated a wind from 160° at 24 knots with a temperature of 10° C. At 9,000 ft the forecast was for a wind from 180° at 25 knots, with a temperature of 4° C.

7.4 Inflight Weather Advisories

Inflight Aviation Weather Advisories are forecasts to advise en route aircraft of development of potentially hazardous weather. Inflight aviation weather advisories in the conterminous U.S. are issued by the NWS AWC, as well as from the Center Weather Service Units (CWSU) associated with FAA ARTCCs. There are four basic types of inflight aviation weather advisories: the Significant Meteorological Information (SIGMET), the Convective SIGMET, the AIRMET, and the Center Weather Advisory (CWA). Inflight advisories serve to notify en route pilots of the possibility of encountering hazardous flying conditions which may not have been forecast at the time of the preflight briefing. Whether or not the condition described is potentially hazardous to a particular flight is for the pilot to evaluate on the basis of experience and the operational limits of the aircraft.

During the period the NWS issued the following Convective SIGMETs 13C and 17C for an area of embedded thunderstorms and the AIRMETs Sierra for IFR conditions (figures 15-17). AIRMET Tango for turbulence and Zulu for icing conditions were issued but did not apply to the accident airplanes altitude.

Convective SIGMETs

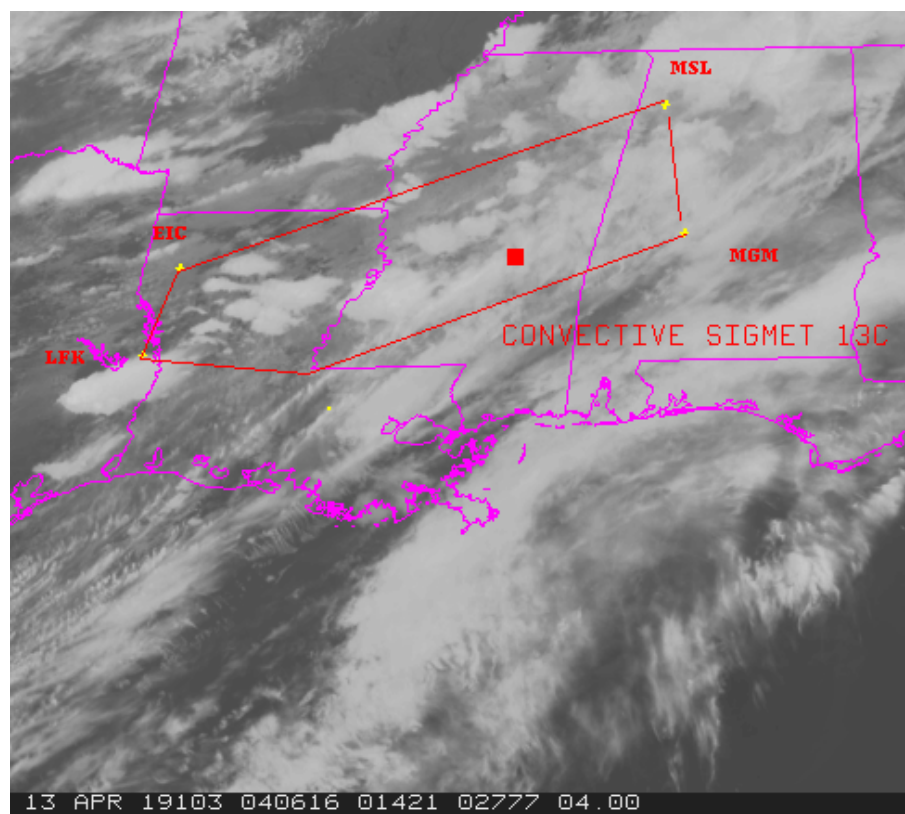


Figure 12 - Convective SIGMET 13C with accident site marked

WSUS32 KKCI 130355
SIGC
MKCC WST 130355
CONVECTIVE SIGMET 13C

VALID UNTIL 0555Z
AL MS LA AR TX
FROM 30SSW MSL-50WNW MGM-30NNW LSU-50E LFK-30SSE EIC-30SSW MSL
AREA EMBD TS MOV FROM 21040KT. TOPS TO FL400.

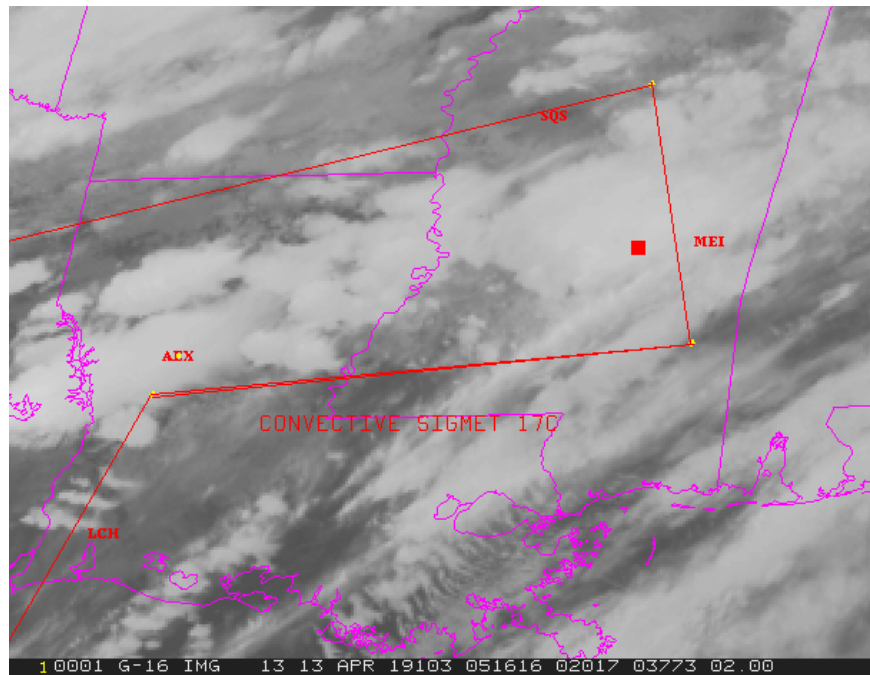


Figure 13 - Convective SIGMET 17C with accident site

WSUS32 KPCI 130455
SIGC
MKCC WST 130455
CONVECTIVE SIGMET 17C
VALID UNTIL 0655Z
MS LA AR TX AND TX CSTL WTRS
FROM 40ENE SQS-50S MEI-20SSW AEX-60SW LCH-40NNW LFK-40ENE SQS
AREA SEV EMBD TS MOV FROM 21040KT. TOPS TO FL450.
HAIL TO 1 IN...WIND GUSTS TO 50KT POSS.

AIRMET Sierra

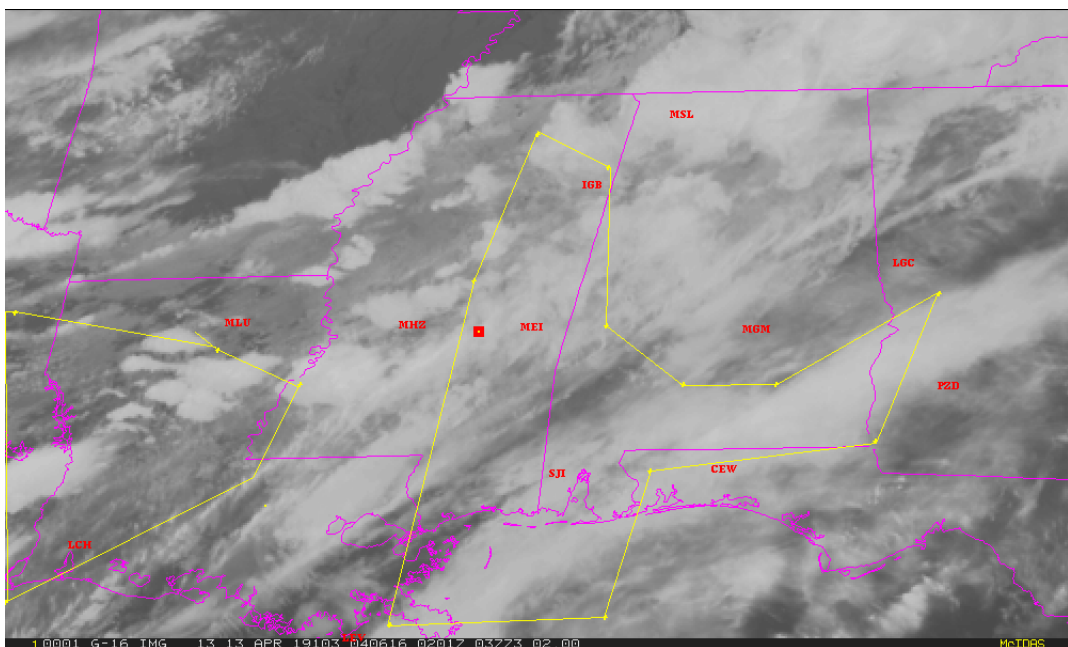


Figure 14 - AIRMET Sierra for IFR conditions

WAUS44 KNCI 130245

WA4S

DFWS WA 130245

AIRMET SIERRA FOR IFR AND MTN OBSCN VALID UNTIL 130900

AIRMET IFR...LA MS AL AND CSTL WTRS

FROM 50SW MSL TO 40E MEI TO 50SW MGM TO 40SSE MGM TO 30SE LGC TO 50SW PZD TO 40W CEW TO 100SSE SJL TO 20ENE LEV TO 40NE MHZ TO 50NW IGB TO 50SW MSL

CIG BLW 010/VIS BLW 3SM BR. CONDS DVLPG 03-06Z. CONDS CONTG BYD 09Z ENDG 12-15Z.

AIRMET IFR...TX LA MS AND CSTL WTRS

FROM 20NNE GGG TO 20SSW MLU TO 60SE MLU TO 20WNW LSU TO 50SW LCH TO 120SSW LCH TO 100SE PSX TO 80E BRO TO 90W BRO TO DLF TO 80SSE FST TO 30SSE SJL TO 70NE JCT TO 20WSW ACT TO 20NNE GGG

CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 09Z THRU 15Z.zlm x

AIRMET Tango

WAUS44 KNCI 130245

WA4T

-DFWT WA 130245

AIRMET TANGO FOR TURB VALID UNTIL 130900

AIRMET TURB...TX AR TN LA MS AL MO MI LH IL IN KY AND CSTL WTRS

FROM 60ESE SSM TO YVV TO 20ESE DXO TO FWA TO CVG TO HNN TO HMV TO GQO TO 30W PZD TO 50SW CEW TO 20SSE LSU TO 30ESE LFK TO 40SW MLU TO 40SW MEM TO 30NE ARG TO 30E GIJ TO 60ESE SSM MOD TURB BTN FL180 AND FL390. CONDS CONTG BYD 09Z THRU 15Z.

AIRMET TURB...OK TX AR LA MS NE KS IA MO IL

FROM 30ENE OBH TO 20SSW IOW TO 50W AXC TO 40SW MEM TO 40SW MLU TO 70WSW GGG TO 60N LRD TO 20SSE DLF TO 90S MRF TO ELP TO INK TO 30ESE TBE TO 50W LBL TO 50S GLD TO 30ENE OBH

MOD TURB BTN FL180 AND FL410. CONDS CONTG BYD 09Z THRU 15Z.

.
AIRMET TURB...AR TN LA MS AL MO KY
FROM 70SSW HNN TO HNV TO GQO TO 30SSE LGC TO 30SW MLU TO 30NW
LIT TO 40W ARG TO 70SSW HNN
MOD TURB BTN 080 AND FL180. CONDS CONTG BYD 09Z ENDG 09-12Z.
.

AIRMET Zulu

WAUS44 KPCI 130245
WA4Z
-DFWZ WA 130245
AIRMET ZULU FOR ICE AND FRZLVL VALID UNTIL 130900
.

AIRMET ICE...OK TX AR LA KS MO
FROM 30SSW MCI TO 20ESE RZC TO 50SSW LIT TO 40SE GGG TO DLF TO
90S MRF TO ELP TO INK TO 30ESE TBE TO 50W LBL TO 40E LBL TO 30SSW MCI
MOD ICE BTN FRZLVL AND FL250. FRZLVL 080-120.
CONDS CONTG BYD 09Z THRU 15Z.
.

AIRMET ICE...TX AR TN LA MS AL KY AND CSTL WTRS
FROM 70SW HNN TO 30SW LOZ TO HNV TO GQO TO 30SSE LGC TO 40W CEW
TO 60SSW SJI TO 30WSW LSU TO 40SE GGG TO 50SSW LIT TO 60SW MEM TO
30NW MEM TO 40SSE IJU TO 70SW HNN
MOD ICE BTN FRZLVL AND FL240. FRZLVL 100-140.
CONDS CONTG BYD 09Z THRU 15Z.
.

OTLK VALID 0900-1500Z...ICE OK TX AR LA MS KS MO
BOUNDED BY 50W COU-40NW ARG-50NW SQS-50NW AEX-60WSW SAT-DLF-90S
MRF-ELP-INK-30ESE TBE-50W LBL-40S GLD-40SSW HLC-30SW SLN-40SSW MCI-50W COU
MOD ICE BTN FRZLVL AND FL230. FRZLVL 080-120. CONDS CONTG THRU 15Z.
.

FRZLVL...RANGING FROM 065-150 ACRS AREA
080 ALG 20NW TXO-20WNW AMA-40SE OSW
120 ALG 30SSE DLF-60E JCT-60SSW VUZ-40WNW ATL
....

8.0 Weather Briefing Information

A search of the FAA Automated Flight Service Station (AFSS) contract provider Leidos indicated no contact from the pilot for a weather briefing, or filing a flight plan, or for flight assistance. A separate check of third party vendor ForeFlight also indicated no known contact with the pilot for any weather briefing data. It is therefore unknown what the pilot used for any preflight planning or familiarization prior to departure.

9.0 Astronomical Conditions

The United States Naval Observatory's website provided the following astronomical conditions for Lake, Scott County, Mississippi, on April 12-13, 2019. The local time of the accident is included in bold italic print for reference.

SUN

Begin of civil twilight	0607 CDT
Sunset	0632 CDT
Sun transition	1258 CDT
Sunset	1925 CDT
End of civil twilight	1950 CDT
<i>Accident</i>	<i>0015 CDT on April 13, 2019</i>
Begin of civil twilight	0606 CDT
Sunrise	0631 CDT

Moon

Moonrise	1210 CDT
Moon transit	1925 CDT
Moonset	0236 CDT on April 13, 2019

The phase of the Moon was a first quarter with the Moon at an altitude of 26.8° above the horizon at an azimuth of 278° and was 55% illuminated above the cloud cover over the area.

Submitted by:

Don Eick
Senior Meteorologist