NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

October 18, 2016

Group Chairman's Factual Report

METEOROLOGY

ERA16FA140

Table Of Contents

A. ACCIDENT

Location: Near Enterprise, Alabama
Date: March 26, 2016
Time: 0018 central daylight time (0518 UTC[1])
Aircraft: Eurocopter AS 350 B2; registration N911GF

B. METEOROLOGY GROUP

Paul Suffern
Senior Meteorologist
National Transportation Safety Board
Operational Factors Division, AS-30
Washington, D.C. 20594-2000

C. SUMMARY

On March 26, 2016 about 0018 central daylight time, a Eurocopter AS 350 B2, N911GF, impacted trees and terrain near Enterprise, Alabama. The airline transport pilot, flight nurse, flight paramedic, and patient being transported, were fatally injured. The helicopter, registered to Haynes Life Flight LLC. and operated by Metro Aviation Inc. was substantially damaged. The flight was operated under the provisions of Title 14 *Code of Federal Regulations* Part 135, as a helicopter emergency medical services flight. Night instrument meteorological conditions (IMC) prevailed for the flight, which operated on a company visual flight rules (VFR) flight plan. The flight departed from a farm field near Goodman, Alabama about 0017, destined for Baptist Medical Center Heliport (AL11), Montgomery, Alabama.

[1] UTC – is an abbreviation for Coordinated Universal Time.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) meteorologist did not travel to the accident site for this investigation, but did travel to Metro Aviation Inc. to gather more information for this accident. The NTSB meteorologist also gathered weather data for this investigation from the NTSB's Washington D.C. office and from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Centers for Environmental Information (NCEI). All times in this report are central daylight time (CDT) on March 26, 2016, based upon the 24 hour clock, local time is -5 hours to UTC, and UTC=Z. 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 statute miles.

The approximate accident site was identified as latitude 31.29° N and longitude 85.97° W at 275 feet.

E. 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 (NCEP) and the Weather Prediction Center (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 joint NWS and Federal Aviation Administration (FAA) Advisory Circular "Aviation Weather Services", AC-0045G CHG 2.

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart for 0100 CDT is provided as figure 1, with the approximate location of the accident site marked. The chart depicted a stationary front stretched from northeastern Gulf of Mexico north-northeastward into southeastern Alabama and northeastward into western South Carolina. A low pressure center with a pressure of 1014-hectopascals (hPa) was located in eastern Alabama. The station models around the accident site depicted air temperatures in the low to mid 60's degrees Fahrenheit (°F), with temperature-dew point spreads of 1° F or less, a southeast to east wind below 10 knots, cloudy skies, and fog. Areas near frontal boundaries and low temperature-dewpoint spreads at the surface are typically locations conducive for low clouds and fog, and if enough moisture is available in the vertical, then precipitation can also be present.

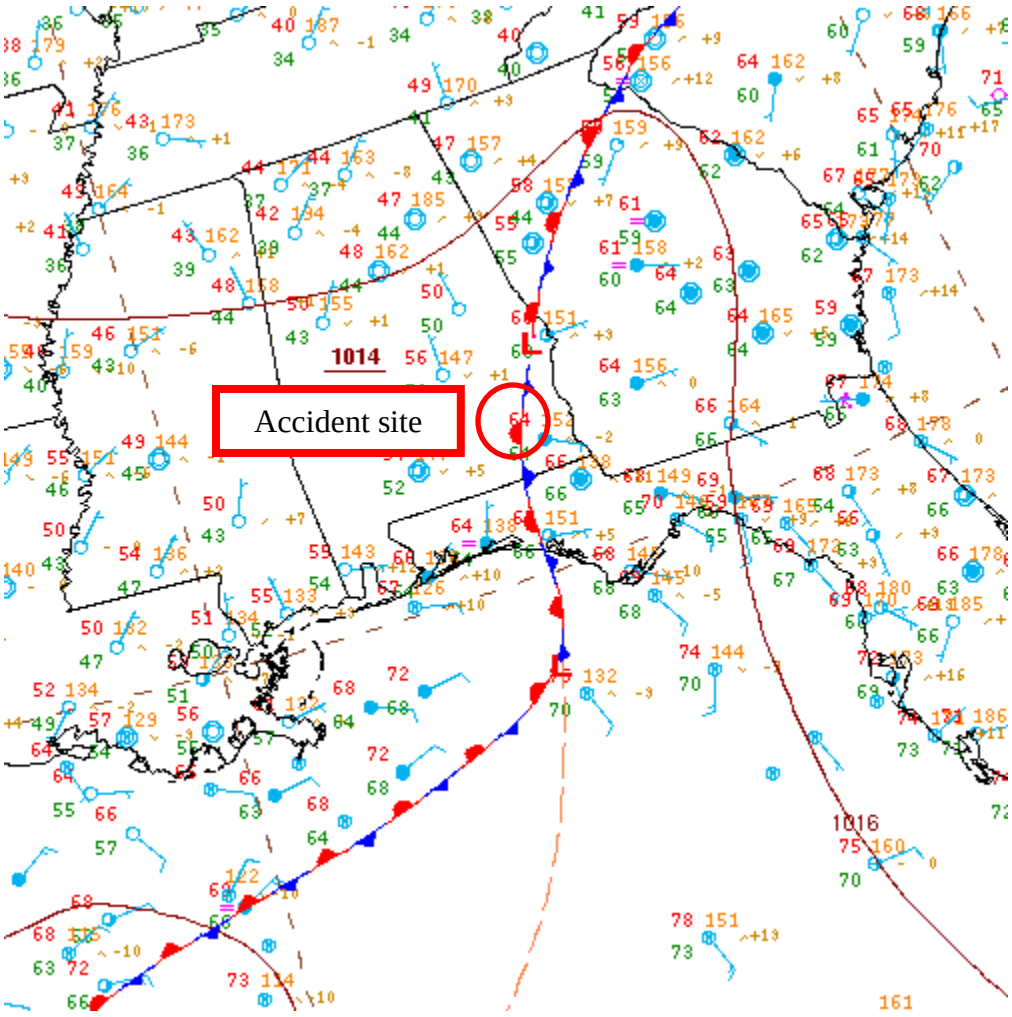


Figure 1 – NWS Surface Analysis Chart for 0100 CDT

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 1900 CDT on March 25 at 925-, 850-, 700-, 500-, and 300-hPa are presented in figures 2 through 6. The 925- and 850-hPa charts depicted a low-level trough[2] just southwest of the accident site. Areas near and ahead of troughs are typically areas where enhanced lift, clouds, and precipitation can occur. There was a south wind under 10 knots at 925-hPa with the wind becoming west to southwesterly by 850-hPa through 300-hPa. The wind increased to 30 knots at 700-hPa with the highest wind speed of 60 knots at 300-hPa.

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

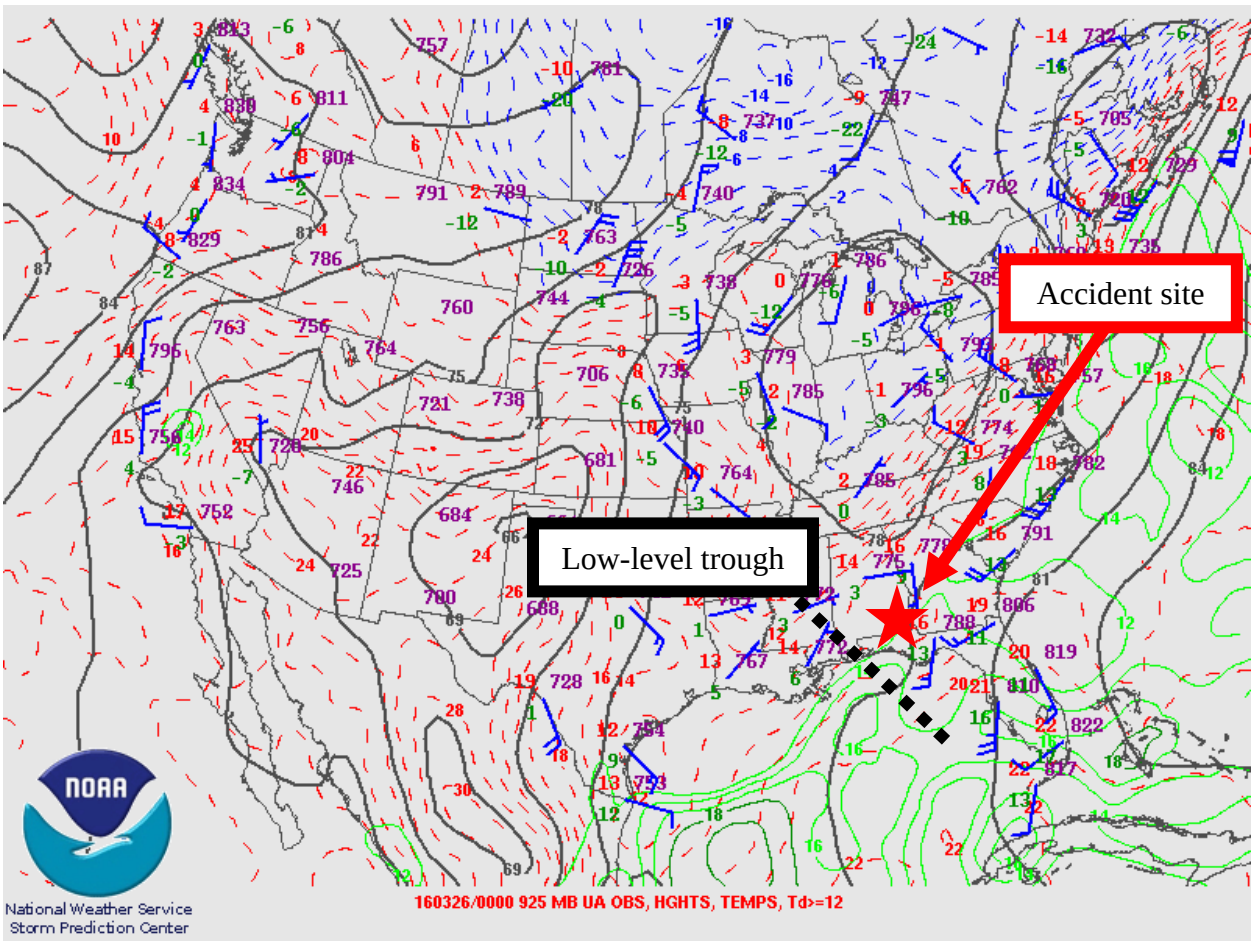


Figure 2 – 925-hPa Constant Pressure Chart for 1900 CDT on March 25

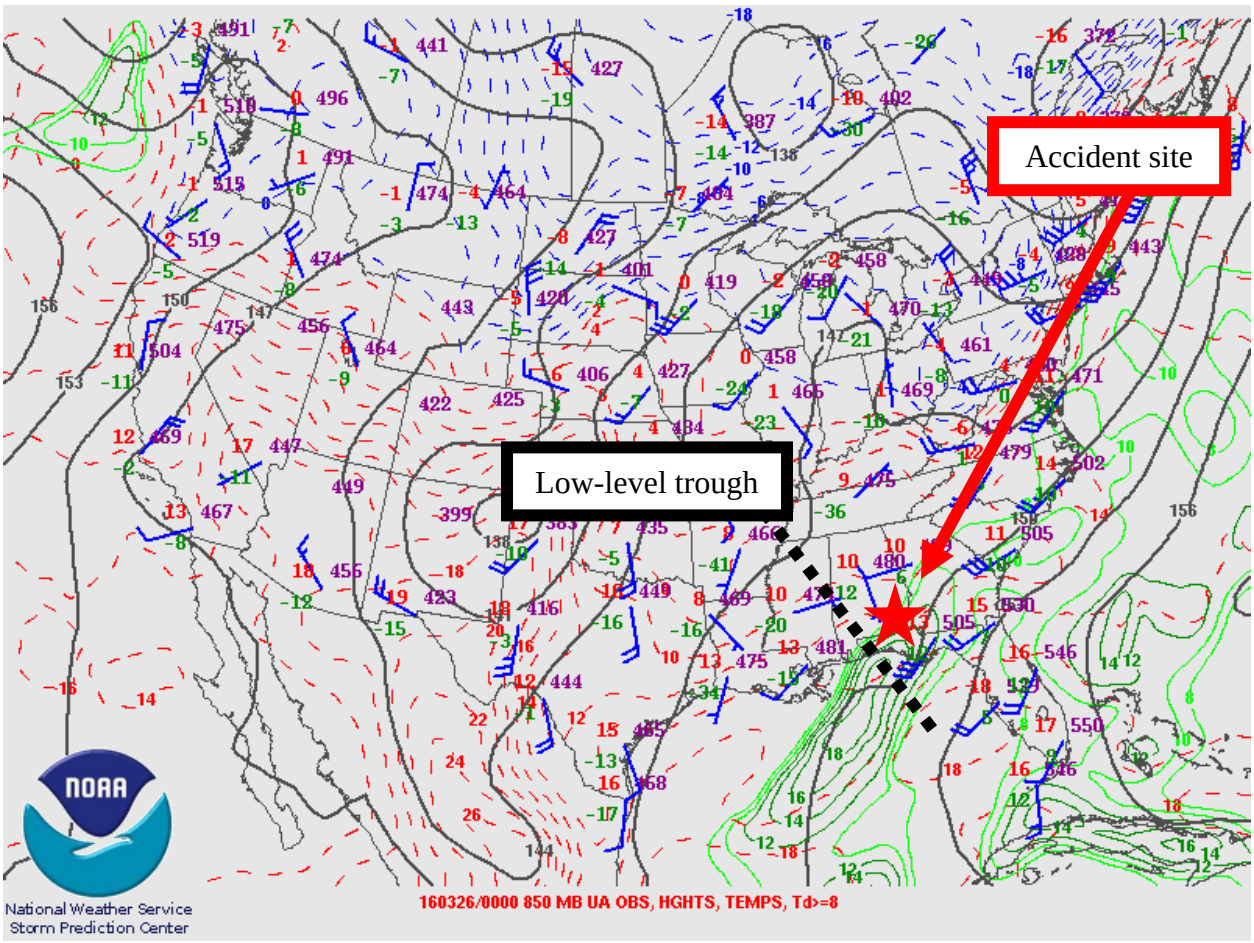


Figure 3 – 850-hPa Constant Pressure Chart for 1900 CDT on March 25

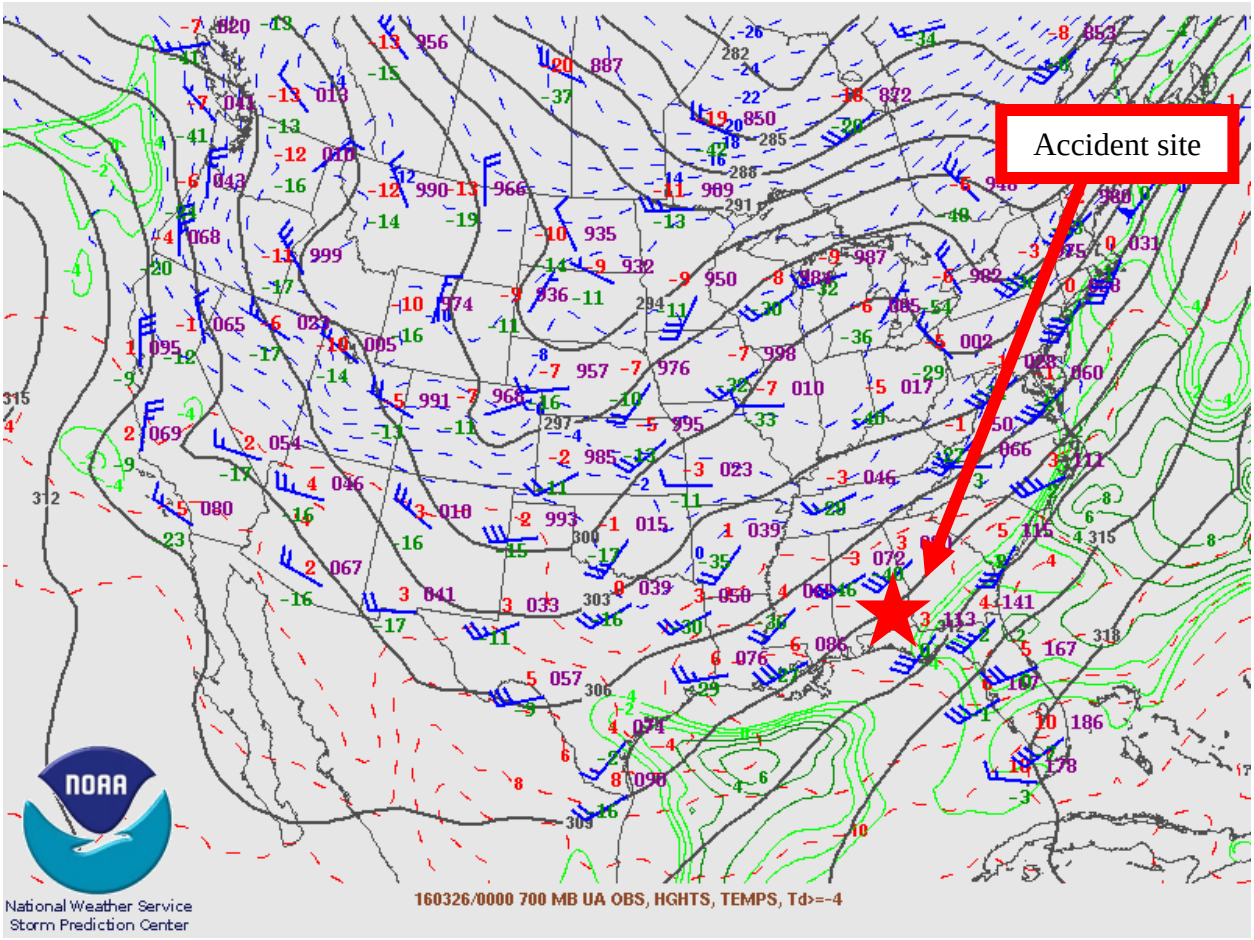


Figure 4 – 700-hPa Constant Pressure Chart for 1900 CDT on March 25

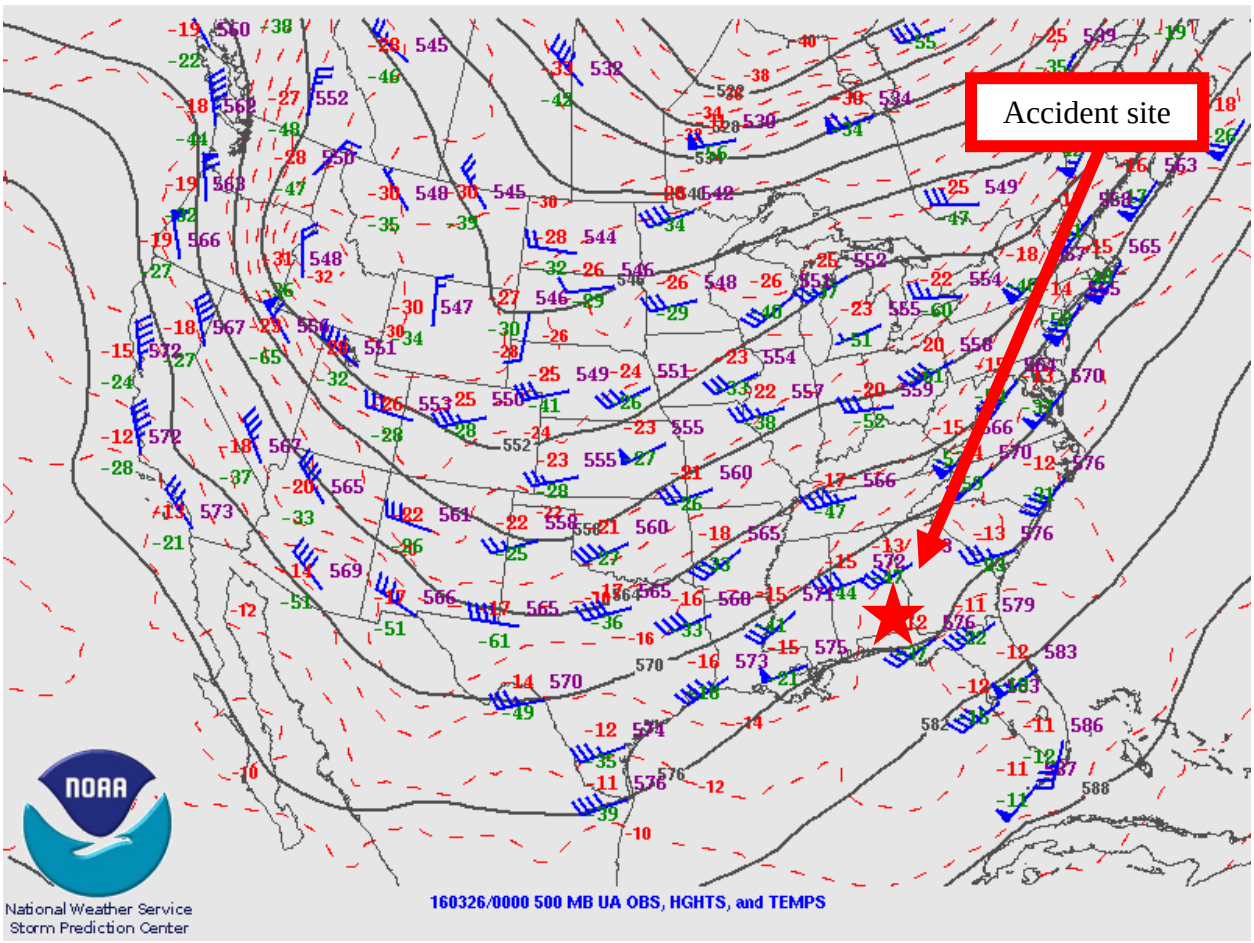


Figure 5 – 500-hPa Constant Pressure Chart for 1900 CDT on March 25

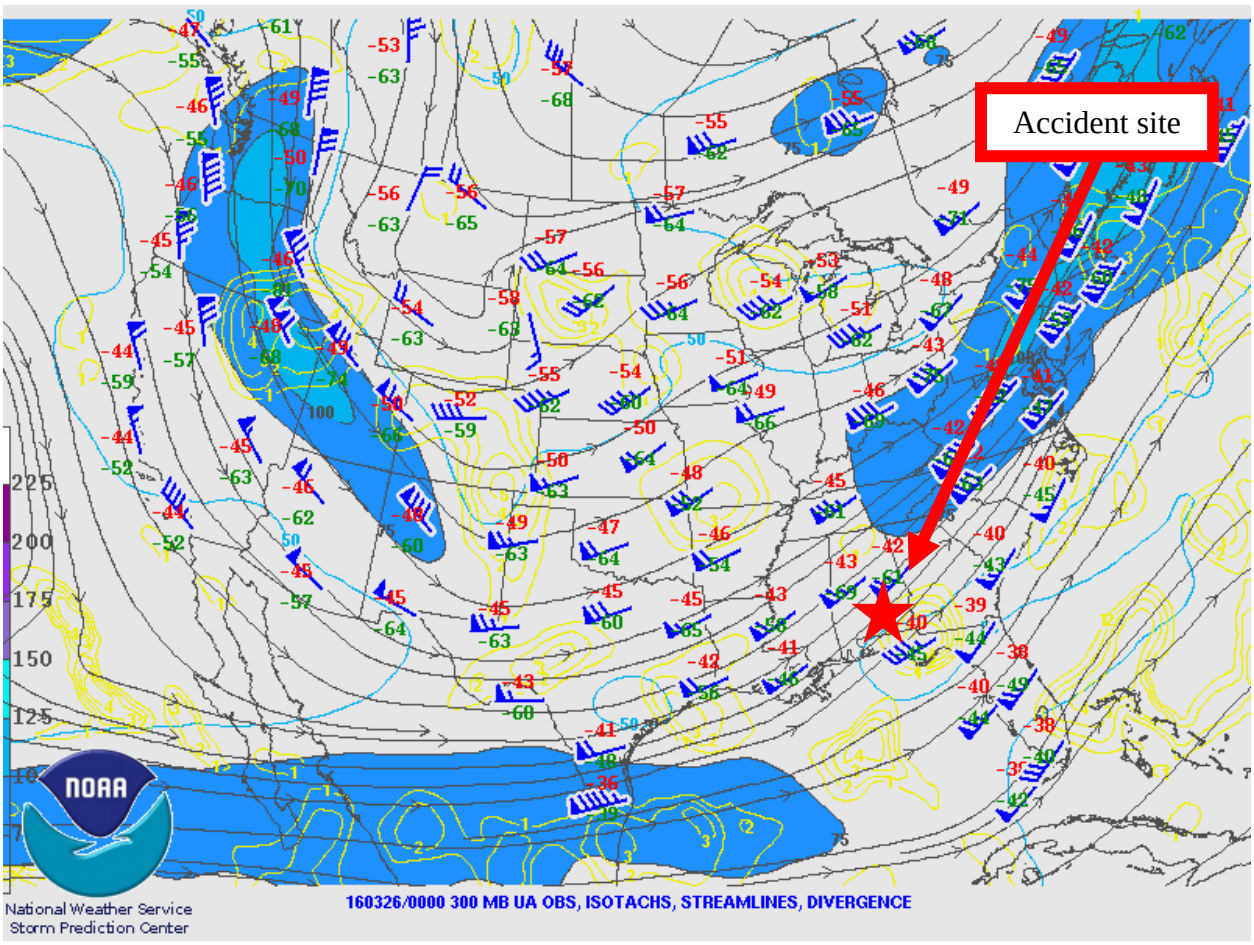


Figure 6 – 300-hPa Constant Pressure Chart for 1900 CDT on March 25

2.0 Storm Prediction Center Products

SPC issued the following Day 1 Convective Outlook at 1956 CDT on March 25 (figure 7) with areas of general (non-severe) thunderstorms forecast for the accident site around the accident time:

SPC AC 260056

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0756 PM CDT FRI MAR 25 2016

VALID 260100Z - 261200Z

...NO SVR TSTM AREAS FORECAST...

...SUMMARY...
SCATTERED THUNDERSTORM ACTIVITY REMAINS POSSIBLE TONIGHT ACROSS
PORTIONS OF EASTERN GULF COASTAL AND SOUTH ATLANTIC COASTAL AREAS.

...SOUTHEAST...

THE REMNANTS OF CONVECTIVE OUTFLOW...FROM THE LARGE MESOSCALE CONVECTIVE SYSTEM THAT IMPACTED PORTIONS OF THE EASTERN GULF COAST YESTERDAY...REMAIN PROMINENT. A STILL WELL-DEFINED BOUNDARY ASSOCIATED WITH THIS FEATURE...AND REINFORCED BY CONVECTION OVER THE CENTRAL FLORIDA PENINSULA TODAY...HAS BECOME QUASI-STATIONARY IN ROUGH WEST-EAST FASHION SOUTH OF THE EASTERN GULF COAST INTO THE CENTRAL INTERIOR FLORIDA PENINSULA...SOUTHEASTWARD INTO THE PALM BEACH AREA.

VIGOROUS THUNDERSTORM ACTIVITY IS STILL ONGOING ALONG THIS BOUNDARY NORTH THROUGH EAST OF LAKE OKEECHOBEE...BUT AS THE BOUNDARY LAYER TO THE WEST OF THIS CONVECTION CONTINUES TO COOL...AND APPARENT UPPER SUPPORT SHIFTS OFF THE COAST...THIS CONVECTION IS EXPECTED TO DIMINISH BY 02-04Z. SOME GUIDANCE... INCLUDING THE NCEP HIGH RESOLUTION RAPID REFRESH...SUGGESTS THAT ANOTHER IMPULSE WITHIN THE SUBTROPICAL STREAM COULD SUPPORT NEW STORM DEVELOPMENT WITHIN MOIST UNSTABLE AIR NEAR SOUTHWESTERN FLORIDA GULF COASTAL AREAS OVERNIGHT. ON THE NORTHERN EDGE OF WARMER AND MORE STRONGLY CAPPING MID-LEVEL AIR /AS REFLECTED BY THE THERMAL GRADIENT AROUND 700 MB/...THIS APPEARS AT LEAST POSSIBLE...BUT IS NOT CERTAIN.

MORE CERTAINTY EXISTS CONCERNING POTENTIAL FOR NEW THUNDERSTORM DEVELOPMENT TONIGHT ALONG/NORTH OF THE AFOREMENTIONED OUTFLOW BOUNDARY OVER PORTIONS OF THE NORTHEASTERN GULF OF MEXICO...GENERALLY EAST OF PLAQUEMINES PARISH LOUISIANA...PERHAPS INTO FLORIDA COASTAL AREAS AROUND APALACHICOLA TOWARD 12Z SATURDAY. AS LARGER-SCALE UPPER TROUGHING GRADUALLY DIGS UPSTREAM...MODELS SUGGEST MODEST STRENGTHENING OF SOUTHERLY 850 MB FLOW /30+ KT/ ACROSS THIS REGION...WHICH COULD ENHANCE ASCENT ASSOCIATED WITH LOW-LEVEL WARM ADVECTION. CAPE AND DEEP LAYER SHEAR MAY STILL BE SUFFICIENT TO SUPPORT A VIGOROUS ORGANIZED CLUSTER OF STORMS. HOWEVER...WITH ACTIVITY LIKELY ROOTED ABOVE RESIDUAL STABLE SURFACE BASED LAYER...POTENTIAL FOR SEVERE WIND GUSTS REACHING THE SURFACE APPEARS NEGLIGIBLE AT THE PRESENT TIME.

LOW-LEVEL WARM ADVECTION...ASSOCIATED WITH A BELT OF ENHANCED SOUTHERLY 850 MB FLOW NOW IMPINGING ON COASTAL AREAS EAST OF THE FLORIDA BIG BEND...ALREADY APPEARS TO BE SUPPORTING ONGOING WEAK THUNDERSTORM ACTIVITY ACROSS PARTS OF SOUTHERN GEORGIA. THIS ACTIVITY MAY PERSIST THIS EVENING AND DEVELOP NORTHEASTWARD TOWARD SOUTH CAROLINA COASTAL AREAS...BEFORE DIMINISHING AS THE INITIAL 850 MB SPEED MAXIMUM WEAKENS LATER TONIGHT.

..KERR.. 03/26/2016

CLICK TO GET WUUS01 PTSDY1 PRODUCT

NOTE: THE NEXT DAY 1 OUTLOOK IS SCHEDULED BY 0600Z

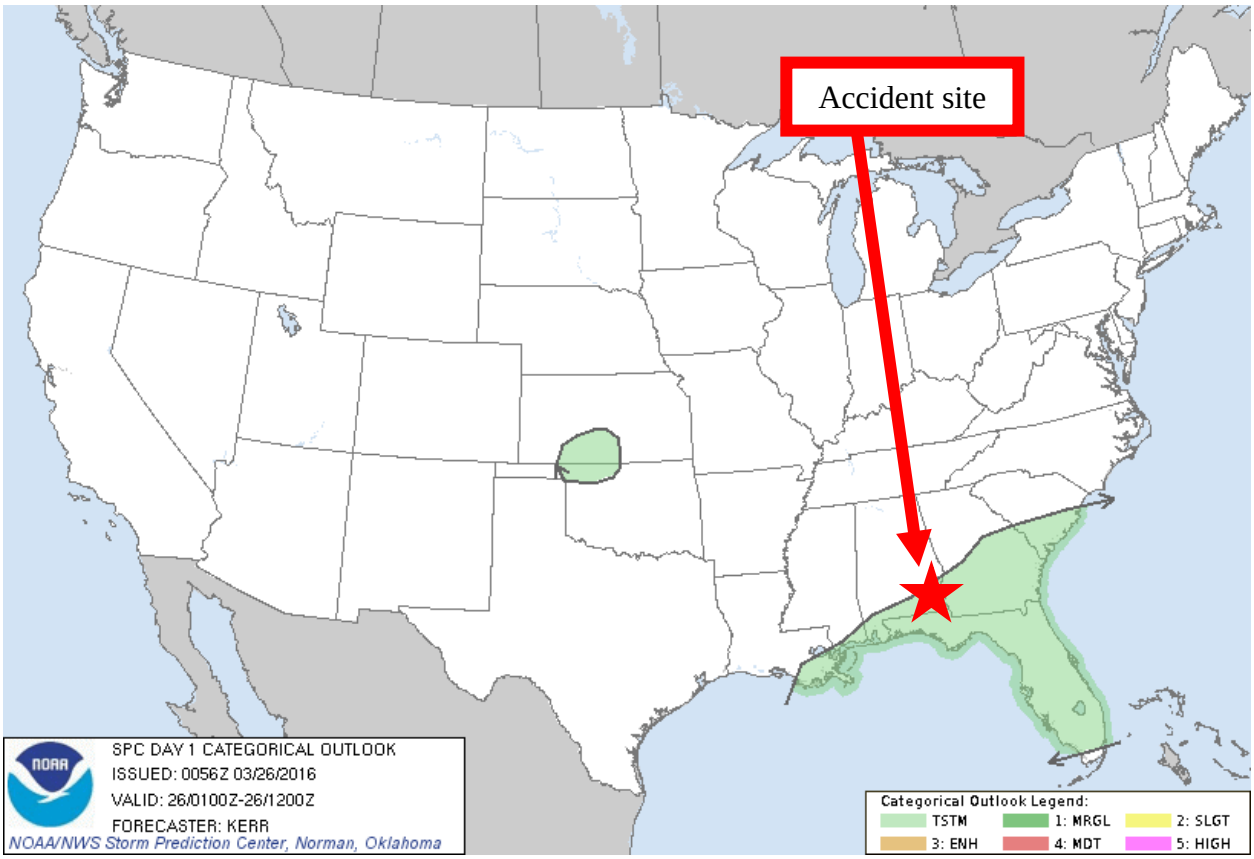


Figure 7 – Storm Prediction Center day 1 Convective Outlook valid at the time of the accident

3.0 Surface Observations

The area surrounding the accident site was documented utilizing official NWS Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). The following observations were taken from standard code and are provided in plain language.

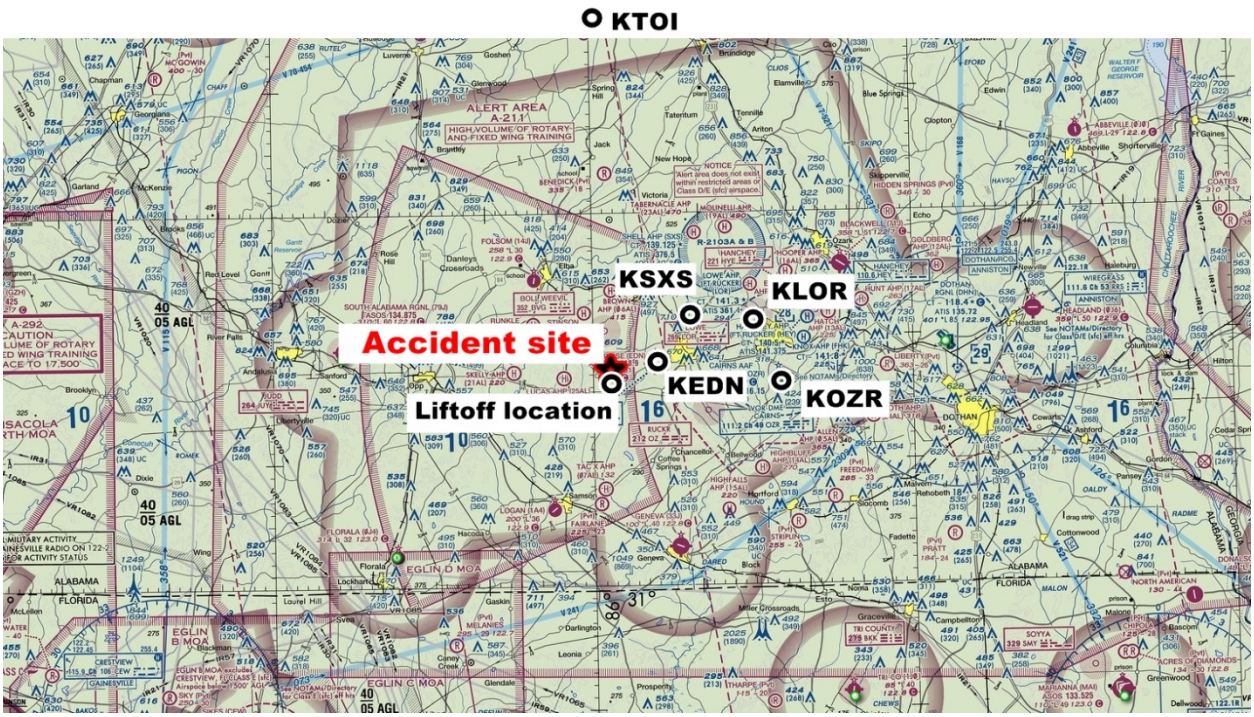


Figure 8 – Sectional chart of Alabama and Florida with the location of the accident site and surface observation sites

Enterprise Municipal Airport (KEDN) was the closest official weather station to the accident site located 3 miles west of Enterprise, Alabama, and had an Automated Weather Observing System (AWOS[3]) whose reports were not supplemented. KEDN was located 4 miles east-northeast of the accident site, at an elevation of 361 feet, and had a 3° westerly magnetic variation[4] (figure 8). The following observations were taken and disseminated during the times surrounding the accident:[5]

[2235 CDT] KEDN 260335Z AUTO 00000KT 10SM OVC020 17/17 A2996 RMK AO2=

[2255 CDT] KEDN 260355Z AUTO 00000KT 10SM SCT003 OVC020 17/17 A2995 RMK AO2=

[2315 CDT] KEDN 260415Z AUTO 13003KT 7SM SCT003 OVC018 17/17 A2997 RMK AO2 LTG DSNT N=

[2335 CDT] KEDN 260435Z AUTO 11006KT 7SM SCT003 SCT007 OVC016 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] Magnetic variation – The angle (at a particular location) between magnetic north and true north.

[5] The bold sections in this NWS product and the rest of products in the weather factual report are to highlight the individual sections that directly reference the weather conditions that affected the accident location around the accident time. The local times in section 3.0 next to the METARs are provided for quick reference between UTC and local times around the accident time.

[2355 CDT] KEDN 260455Z AUTO 13004KT 5SM BR BKN003 BKN007 OVC014 17/17 A2997 RMK AO2=

[0015 CDT] KEDN 260515Z AUTO 12004KT 3SM DZ OVC003 17/17 A2997 RMK AO2=

ACCIDENT TIME 0018 CDT

[0035 CDT] KEDN 260535Z AUTO 12004KT 3SM DZ OVC003 17/17 A2997 RMK AO2 P0001=

[0055 CDT] KEDN 260555Z AUTO 00000KT 4SM -DZ OVC003 17/17 A2996 RMK AO2 P0001=

[0115 CDT] KEDN 260615Z AUTO 00000KT 5SM BR OVC003 17/17 A2996 RMK AO2=

[0135 CDT] KEDN 260635Z AUTO 12004KT 2 1/2SM BR OVC003 17/17 A2996 RMK AO2=

[0155 CDT] KEDN 260655Z AUTO 12004KT 1SM BR OVC003 17/17 A2996 RMK AO2=

KEDN weather at 2355 CDT on March 25 was reported as wind from 130° at 4 knots, 5 miles visibility, mist, a broken ceiling at 300 feet above ground level (agl), broken skies at 700 feet agl, and overcast skies at 1,400 feet agl, temperature of 17° Celsius (C), dew point temperature of 17° C, and an altimeter setting of 29.97 inches of mercury. Remarks, automated station with precipitation discriminator.

KEDN weather at 0015 CDT was reported as wind from 120° at 4 knots, 3 miles visibility, drizzle, an overcast ceiling at 300 feet agl, temperature of 17° C, dew point temperature of 17° C, and an altimeter setting of 29.97 inches of mercury. Remarks, automated station with precipitation discriminator.

KEDN weather at 0035 CDT was reported as wind from 120° at 4 knots, 3 miles visibility, drizzle, an overcast ceiling at 300 feet agl, temperature of 17° C, dew point temperature of 17° C, and an altimeter setting of 29.97 inches of mercury. Remarks, automated station with precipitation discriminator, one-hourly precipitation of 0.01 inches.

KEDN weather at 0055 CDT was reported as wind calm, 4 miles visibility, light drizzle, an overcast ceiling at 300 feet agl, temperature of 17° C, dew point temperature of 17° C, and an altimeter setting of 29.96 inches of mercury. Remarks, automated station with precipitation discriminator, one hourly precipitation of 0.01 inches.

Shell Army Heliport (KSXS) was the next closest official weather station to the accident site located near Fort Rucker, Alabama. KSXS was 8 miles northeast of the accident site (figure 8). KSXS had automated surface observing equipment whose reports were not supplemented. KSXS was located at an elevation of 400 feet and had a 1° westerly magnetic variation. The following observations were taken and disseminated during the times surrounding the accident:

[2256 CDT] KSXS 260356Z AUTO 12002KT 8SM FEW002 BKN022 BKN032 17/17 A2997 RMK AO2 SLP149 T01740170=

[2331 CDT] KSXS 260431Z AUTO 11005KT 3SM BR SCT001 BKN005 OVC017 17/17 A2998 RMK AO2 CIG 005V017=

[2336 CDT] KSXS 260436Z AUTO 11006KT 3SM BR BKN001 OVC015 17/17 A2998 RMK AO2 CIG 001V015 BKN V FEW=

[2346 CDT] KSXS 260446Z AUTO 12005KT 2 3/4SM BR BKN001 BKN005 OVC011 18/17 A2999 RMK AO2 VIS 2 3/4V4=

[2356 CDT] KSXS 260456Z AUTO 12006KT 3SM BR BKN001 OVC010 18/17 A2998 RMK AO2 SLP153 T01750173=

[0006 CDT] KSXS 260506Z AUTO 14005KT 2 1/2SM BR BKN001 BKN003OVC006 18/17 A2998 RMK AO2 VIS 2 1/2V3=

ACCIDENT TIME 0018 CDT

[0021 CDT] KSXS 260521Z AUTO 13004KT 3SM BR BKN001 OVC003 18/17 A2998 RMK AO2=

[0036 CDT] KSXS 260536Z AUTO 13005KT 2 3/4SM BR BKN001 OVC008 18/17 A2998 RMK AO2=

[0041 CDT] KSXS 260541Z AUTO 13004KT 3SM BR BKN001 OVC007 18/17 A2998 RMK AO2=

[0051 CDT] KSXS 260551Z AUTO 12002KT 2 1/2SM BR SCT001 BKN004 OVC007 18/17 A2998 RMK AO2 VIS 2 1/2V3 CIG 001V004=

[0056 CDT] KSXS 260556Z AUTO 13002KT 2 1/2SM BR SCT001 BKN004 OVC007 18/17 A2997 RMK AO2 VIS 2 1/2V3 CIG 001V004 SLP149 P0002 T01750174 10182 20174 402280151 53001=

KSXS weather at 2356 CDT on March 25 was reported as wind from 120° at 6 knots, 3 miles visibility, mist, a broken ceiling at 100 agl, overcast skies at 1,000 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.98 inches of mercury. Remarks, automated station with precipitation discriminator, sea level pressure 1015.3 hPa, temperature 17.5° C, dew point temperature 17.3° C.

KSXS weather at 0006 CDT was reported as wind from 140° at 5 knots, 2 and a half miles visibility, mist, a broken ceiling at 100 feet agl, broken skies at 300 feet agl, overcast skies at 600 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.98 inches of mercury. Remarks, automated station with precipitation discriminator, visibility varying between 2 and a half miles and 3 miles visibility.

KSXS weather at 0021 CDT was reported as wind from 130° at 4 knots, 3 miles visibility, mist, a broken ceiling at 100 feet agl, overcast skies at 300 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.98 inches of mercury. Remarks, automated station with precipitation discriminator.

KSXS weather at 0036 CDT was reported as wind from 130° at 5 knots, 2 and three quarters miles visibility, mist, a broken ceiling at 100 feet agl, overcast skies at 800 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.98 inches of mercury. Remarks, automated station with precipitation discriminator.

Lowe Army Heliport (KLOR) was located 3 miles west of Fort Rucker Ozark, Alabama, and had automated surface observing equipment whose reports were not supplemented. KLOR was located 12 miles east-northeast of the accident site, at an elevation of 294 feet, and had a 3° westerly magnetic variation (figure 8). The following observations were taken and disseminated during the times surrounding the accident:

[2225 CDT] KLOR 260325Z AUTO 00000KT 10SM BKN004 OVC025 18/17 A2995 RMK AO2 T01830167 $=

[2235 CDT] KLOR 260335Z AUTO 02003KT 10SM OVC005 18/17 A2995 RMK AO2 T01830167 $=

[2253 CDT] KLOR 260353Z AUTO 00000KT 8SM OVC005 18/17 A2995 RMK AO2 SLP141 T01830172 $=

[2312 CDT] KLOR 260412Z AUTO 00000KT 5SM BR OVC004 18/17 A2997 RMK AO2 T01830172 $=

[2353 CDT] KLOR 260453Z AUTO 00000KT 3SM -RA BR OVC004 18/17 A2997 RMK AO2 RAB13 SLP145 P0002 T01830172 402220156 $=

[0011 CDT] KLOR 260511Z AUTO 00000KT 2 1/2SM -RA BR OVC004 18/17 A2996 RMK AO2 P0000 T01830172 $=

ACCIDENT TIME 0018 CDT

[0027 CDT] KLOR 260527Z AUTO 00000KT 4SM BR OVC004 18/17 A2996
RMK AO2 RAE27 P0001 T01830172 $=

[0053 CDT] KLOR 260553Z AUTO 00000KT 6SM BR OVC004 18/17 A2995
RMK AO2 RAE27 SLP141 P0001 60003 T01830172 10189 20178 50001 $=

[0153 CDT] KLOR 260653Z AUTO 00000KT 2SM BR OVC004 18/17 A2995
RMK AO2 SLP140 T01830172 $=

[0200 CDT] KLOR 260700Z AUTO 00000KT 1 1/2SM BR OVC003 18/18 A2994
RMK AO2 T01830178 $=

[0233 CDT] KLOR 260733Z AUTO 00000KT 3/4SM BR VV003 18/18 A2994
RMK AO2 T01780178 $=

KLOR weather at 2353 CDT on March 25 was reported as wind calm, 3 miles visibility, light rain, mist, an overcast ceiling at 400 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.97 inches of mercury. Remarks, automated station with precipitation discriminator, rain began at 2313 CDT on March 25, sea level pressure 1014.5 hPa, one-hourly precipitation of 0.02 inches, temperature 18.3° C, dew point temperature 17.2° C, 24-hour maximum temperature of 22.2° C, 24-hour minimum temperature of 15.6° C, maintenance is needed on the system.

KLOR weather at 0011 CDT was reported as wind calm, 2 and a half miles visibility, light rain, mist, an overcast ceiling at 400 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.96 inches of mercury. Remarks, automated station with precipitation discriminator, one-hourly precipitation of a trace, temperature 18.3° C, dew point temperature 17.2° C, maintenance is needed on the system.

KLOR weather at 0027 CDT was reported as wind calm, 4 miles visibility, mist, an overcast ceiling at 400 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.96 inches of mercury. Remarks, automated station with precipitation discriminator, rain ended at 0027 CDT, one-hourly precipitation of 0.01 inches, temperature 18.3° C, dew point temperature 17.2° C, maintenance is needed on the system.

KLOR weather at 0053 CDT was reported as wind calm, 6 miles visibility, mist, an overcast ceiling at 400 feet agl, temperature of 18° C, dew point temperature of 17° C, and an altimeter setting of 29.95 inches of mercury. Remarks, automated station with precipitation discriminator, rain ended at 0027 CDT, sea level pressure 1014.1 hPa, one-hourly precipitation of 0.01 inches, 6-hourly precipitation of 0.03 inches, temperature 18.3° C, dew point temperature 17.2° C, 6-hourly maximum temperature of 18.9° C, 6-hourly minimum temperature of 17.8° C, 3-hourly pressure increase of 0.1 hPa, maintenance is needed on the system.

Cairns Army Airfield (KOZR) was located 6 miles south of Fort Rucker/Ozark, Alabama, and had automated surface observing equipment whose reports were supplemented by official weather observers. KOZR was located 13 miles east of the accident site, at an elevation of 301 feet, and had a 3° westerly magnetic variation (figure 8). The following observations were taken and disseminated during the times surrounding the accident:

[2318 CDT] KOZR 260418Z AUTO 12003KT 5SM BR OVC002 18/18 A2998 RMK AO2 DZE06DZB08E18=

[2327 CDT] KOZR 260427Z AUTO 11002KT 4SM -DZ BR OVC002 18/18 A2997 RMK AO2 DZE06DZB08E18DZB27=

[2346 CDT] KOZR 260446Z AUTO 12003KT 5SM BR OVC002 18/18 A2997 RMK AO2 DZE06DZB08E18DZB27E46=

[2358 CDT] KOZR 260458Z AUTO 12004KT 4SM BR OVC002 18/18 A2998 RMK AO2 DZE06DZB08E18DZB27E46 SLP153 P0000 T01780178=

[0003 CDT] KOZR 260503Z AUTO 11002KT 5SM DZ BR OVC002 18/18 A2998 RMK AO2 DZB03=

[0013 CDT] KOZR 260513Z AUTO 09004KT 5SM -DZ BR OVC003 18/18 A2997 RMK AO2 DZB03=

ACCIDENT TIME 0018 CDT

[0022 CDT] KOZR 260522Z AUTO 10004KT 5SM BR OVC003 18/18 A2996 RMK AO2 DZB03E22=

[0042 CDT] KOZR 260542Z AUTO 10004KT 8SM OVC002 18/18 A2996 RMK AO2 DZB03E22=

[0058 CDT] KOZR 260558Z AUTO 11002KT 9SM OVC002 18/18 A2996 RMK AO2 DZB03E22 SLP146 P0000 60001 T01800180 10180 20173 401950151 50001=

[0138 CDT] KOZR 260638Z AUTO 11003KT 2 1/2SM BR OVC002 18/18 A2996 RMK AO2 VIS 2 1/2V5=

[0143 CDT] KOZR 260643Z AUTO 12004KT 1 3/4SM BR OVC002 18/18 A2996 RMK AO2 VIS 1 3/4V4=

KOZR weather at 0003 CDT was reported as wind from 110° at 2 knots, 5 miles visibility, drizzle, mist, an overcast ceiling at 200 feet agl, temperature of 18° C, dew point temperature of 18° C, and an altimeter setting of 29.98 inches of mercury. Remarks, automated station with precipitation discriminator, drizzle began at 0003 CDT.

KOZR weather at 0013 CDT was reported as wind from 090° at 4 knots, 5 miles visibility, light drizzle, mist, an overcast ceiling at 300 feet agl, temperature of 18° C, dew point temperature of 18° C, and an altimeter setting of 29.97 inches of mercury. Remarks, automated station with precipitation discriminator, drizzle began at 0003 CDT.

KOZR weather at 0022 CDT was reported as wind from 100° at 4 knots, 5 miles visibility, mist, an overcast ceiling at 300 feet agl, temperature of 18° C, dew point temperature of 18° C, and an altimeter setting of 29.96 inches of mercury. Remarks, automated station with precipitation discriminator, drizzle began at 0003 CDT and ended at 0022 CDT.

KOZR weather at 0042 CDT was reported as wind from 100° at 4 knots, 8 miles visibility, an overcast ceiling at 200 feet agl, temperature of 18° C, dew point temperature of 18° C, and an altimeter setting of 29.96 inches of mercury. Remarks, automated station with precipitation discriminator, drizzle began at 0003 CDT and ended at 0022 CDT.

Troy Municipal Airport at North Kenneth Campbell Field (KTOI) was located 4 miles northwest of Troy, Alabama, and had an Automated Surface Observing System (ASOS[6]) whose reports were not supplemented. KTOI was the closest official observation site to the takeoff location (Troy Regional Medical Center in Troy) before the accident flight headed down to the car accident scene. KTOI was located 6 miles northwest of Troy Regional Medical Center in Troy. KTOI was located 34 miles north of the accident flight accident site, at an elevation of 397 feet, and had a 4° westerly magnetic variation (figure 8). The following observations were taken and disseminated during the times surrounding the accident:

[1853 CDT] KTOI 252353Z AUTO 14004KT 10SM CLR 19/14 A2993 RMK
AO2 SLP133 T01890139 10244 20189 53008 TSNO=

[1953 CDT] KTOI 260053Z AUTO 00000KT 10SM CLR 18/14 A2994 RMK
AO2 SLP134 T01780139 TSNO=

[2053 CDT] KTOI 260153Z AUTO 00000KT 10SM CLR 17/14 A2996 RMK
AO2 SLP142 T01670139 TSNO=

[2153 CDT] KTOI 260253Z AUTO 00000KT 10SM FEW070 16/14 A2996 RMK
AO2 SLP143 T01610139 53010 TSNO=

[2253 CDT] KTOI 260353Z AUTO 00000KT 10SM BKN065 16/14 A2997 RMK AO2 SLP145 T01610144 TSNO=

[2353 CDT] KTOI 260453Z AUTO 00000KT 9SM SCT060 16/14 A2998 RMK AO2 SLP149 T01560139 TSNO=

ACCIDENT TIME 0018 CDT

[6] ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, ceiling, temperature, dewpoint, altimeter, and barometric pressure.

[0018 CDT] KTOI 260518Z AUTO 03003KT 9SM SCT006 SCT060 16/14 A2997 RMK AO2 T01560139 TSNO=

[0028 CDT] KTOI 260528Z AUTO 00000KT 9SM BKN005 16/14 A2998 RMK AO2 T01560139 TSNO=

[0050 CDT] KTOI 260550Z AUTO 03003KT 9SM OVC004 17/15 A2997 RMK AO2 TSNO=

[0053 CDT] KTOI 260553Z AUTO 04003KT 9SM OVC004 17/15 A2997 RMK AO2 SLP144 T01670150 10194 20150 402440150 58001 TSNO=

[0148 CDT] KTOI 260648Z AUTO 00000KT 9SM SCT005 OVC015 17/16 A2997 RMK AO2 TSNO=

KTOI weather at 2253 CDT on March 25 was reported as wind calm, 10 miles visibility, a broken ceiling at 6,500 feet agl, temperature of 16° C, dew point temperature of 14° C, and an altimeter setting of 29.97 inches of mercury. Remarks, automated station with precipitation discriminator, sea level pressure 1014.5 hPa, temperature 16.1° C, dew point temperature 14.4° C, lightning detection system is not operating.

KTOI weather at 2353 CDT on March 25 was reported as wind calm, 10 miles visibility, scattered clouds at 6,000 feet agl, temperature of 16° C, dew point temperature of 14° C, and an altimeter setting of 29.98 inches of mercury. Remarks, automated station with precipitation discriminator, sea level pressure 1014.9 hPa, temperature 15.6° C, dew point temperature 13.9° C, lightning detection system is not operating.

KTOI weather at 0018 CDT was reported as wind from 030° at 3 knots, 10 miles visibility, scattered clouds at 900 feet agl, scattered clouds at 6,000 feet agl temperature of 16° C, dew point temperature of 14° C, and an altimeter setting of 29.97 inches of mercury. Remarks, automated station with precipitation discriminator, temperature 15.6° C, dew point temperature 13.9° C, lightning detection system is not operating.

KTOI weather at 0028 CDT was reported as wind calm, 9 miles visibility, a broken ceiling at 500 feet agl, temperature of 16° C, dew point temperature of 14° C, and an altimeter setting of 29.98 inches of mercury. Remarks, automated station with precipitation discriminator, temperature 15.6° C, dew point temperature 13.9° C, lightning detection system is not operating.

Based on data gathered by the investigation[7], the initial call notification for the accident flight went to the accident pilot at 2321 CDT on March 25. The accident flight departed Troy, Alabama, for the car accident scene at 2325 CDT on March 25 and landed at the car accident location at 2354 CDT on March 25. The accident flight took off from the car accident at 0017 CDT and the accident occurred at 0018 CDT. Here is a summary of the weather conditions at the closest weather observation points at each of the times above and if those weather observation points were IFR[8], LIFR[9], MVFR[10], or VFR[11] at the surface:

Weather at 2321 CDT on March 25:

KTOI was VFR
KEDN was MVFR
KSXS was MVFR
KLOR was LIFR
KOZR was LIFR

Weather at 2325 CDT on March 25:

KTOI was VFR
KEDN was MVFR
KSXS was MVFR
KLOR was LIFR
KOZR was LIFR

Weather at 2331 CDT on March 25: KSXS became IFR

KTOI was VFR
KEDN was MVFR
KSXS was IFR
KLOR was LIFR
KOZR was LIFR

[7] For more information see the factual data contained in the docket for this accident.
[8] Instrument Flight Rules – Refers to the general weather conditions pilots can expect at the surface. IFR criteria means a ceiling below 1,000 feet agl and/or less than 3 miles visibility.
[9] Low Instrument Flight Rules – Refers to the general weather conditions pilots can expect at the surface. LIFR criteria means a ceiling below 500 feet agl and/or less than 1 miles visibility.
[10] Marginal Visual Flight Rules – Refers to the general weather conditions pilots can expect at the surface. MVFR criteria means a ceiling between 1,000 and 3,000 feet agl and/or 3 to 5 miles visibility.
[11] Visual Flight Rules – Refers to the general weather conditions pilots can expect at the surface. VFR criteria means a ceiling greater than 3,000 feet agl and greater than 6 miles visibility.

Weather at 2355 and 2356 on March 25: KEDN became IFR

KTOI was VFR
KEDN was LIFR
KSXS was LIFR
KLOR was LIFR
KOZR was LIFR

Weather at 0017 and 0018 CDT:

KTOI was VFR
KEDN was LIFR
KSXS was LIFR
KLOR was LIFR
KOZR was LIFR

4.0 Upper Air Data

A North American Mesoscale (NAM) model sounding was created for the accident site for 0100 CDT. The 0100 CDT NAM sounding was plotted on a standard Skew-T log P diagram[12] with the derived stability parameters included in figure 9 (with data from the surface to 600-hPa, or 14,000 feet msl.) This data was analyzed utilizing the RAOB[13] software package. The sounding depicted the Lifted Condensation Level (LCL)[14] at 579 feet msl, a Convective Condensation Level (CCL)[15] of 3,722 feet, and a Level of Free Convection (LFC)[16] at 16,807 feet. The freezing level was located at 13,319 feet. The precipitable water value was 1.17 inches.

[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 Environmental Research Services, Matamopras, Pennsylvania.
[14] Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.
[15] Convective Condensation Level (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] Level of Free Convection (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.

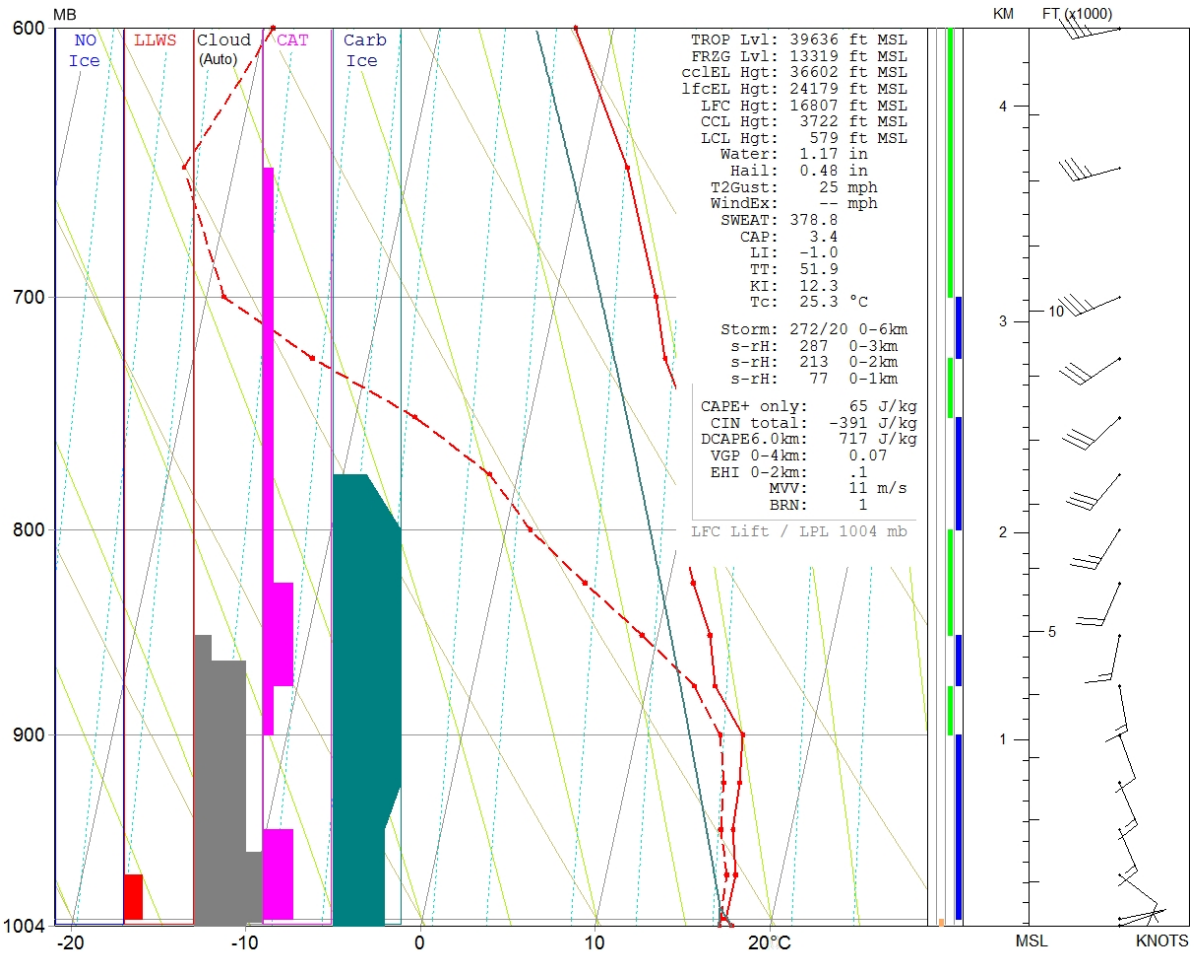


Figure 9 – 0100 CDT NAM sounding at the accident site

The 0100 CDT NAM sounding indicated a moist vertical environment from the surface through 5,000 feet, with a relatively dry layer from 5,000 feet to 14,000 feet. RAOB indicated this environment would have been conducive of cloud formation from the surface to 5,000 feet, especially in areas with frontal boundaries or troughs (sections 1.1 and 1.2). No icing was indicated by RAOB below 14,000 feet.

The sounding wind profile indicated there was a surface wind from 070° at 2 knots and the wind remained out of the east to southeast under 15 knots below 4,000 feet msl. Above 4,000 feet the wind turned from southeast to the south by 5,000 feet and to the west by 12,000 feet. The wind increased in magnitude from 15 knots near 5,000 feet to 35 knots at 12,000 feet. Low-level wind shear (LLWS) was indicated by RAOB at light to moderate strength in the lowest 500 feet agl due to the change wind direction. Several layers of possible clear-air turbulence were identified by RAOB from the surface through 14,000 feet.

5.0 Satellite Data

Visible and infrared data from the Geostationary Operational Environmental Satellite number 13 (GOES-13) was obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Safety Board's Man-computer Interactive Data Access System software. Visible and infrared imagery (GOES-13 bands 1 and 4) at a wavelength of 0.65 microns (μm) and 10.7 μm retrieved brightness temperatures for the scene. Satellite imagery surrounding the time of the accident, from 1900 CDT on March 25 through 0300 CDT on March 26 at approximately 15-minute intervals, were reviewed and the images most applicable to the time of the accident are documented here.

Figures 10, 11, and 12 present the GOES-13 infrared imagery from 0100, 0115, 0130 CDT at 4X magnification with the accident site highlighted with a red square. Inspection of the infrared imagery indicated abundant cloud cover over the accident site at the accident time. The cloud tops near the accident site were moving from southwest to northeast in the direction of the 700- to 300-hPa wind (section 1.2). The more enhanced bands (blues and greens, cooler cloud tops) were southeast of the accident site over the northeastern Gulf of Mexico and northern Florida. Based on the brightness temperatures above the accident site and the vertical temperature profile provided by the 0100 CDT NAM sounding, the approximate cloud-top heights over the accident site were 16,000 feet at 0115 CDT. It should be noted these figures have not been corrected for any parallax error.

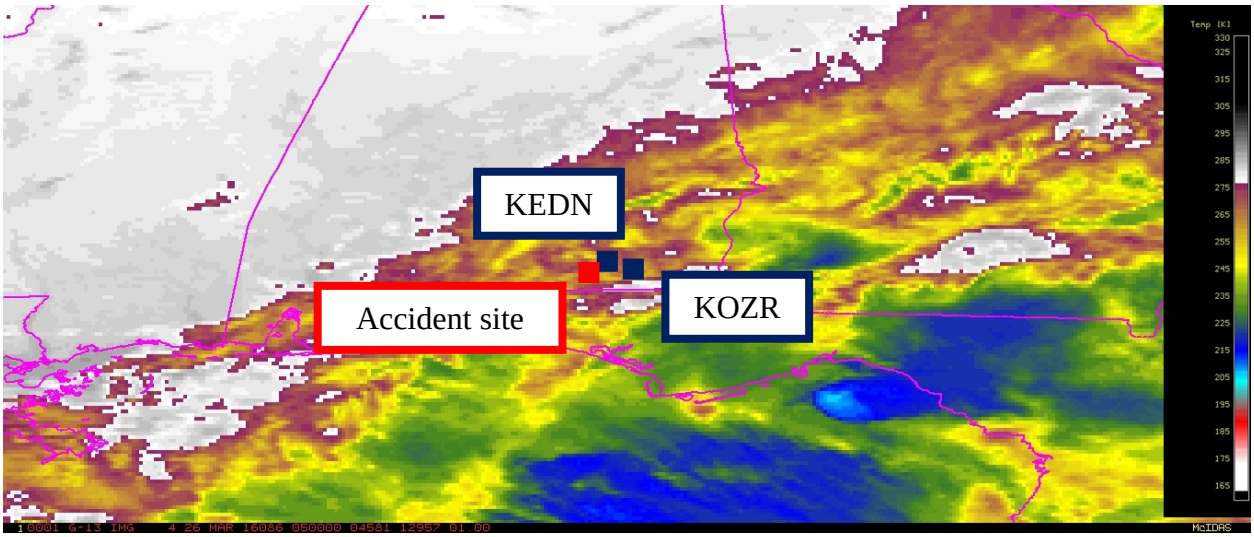


Figure 10 – GOES-13 infrared image at 0100 CDT

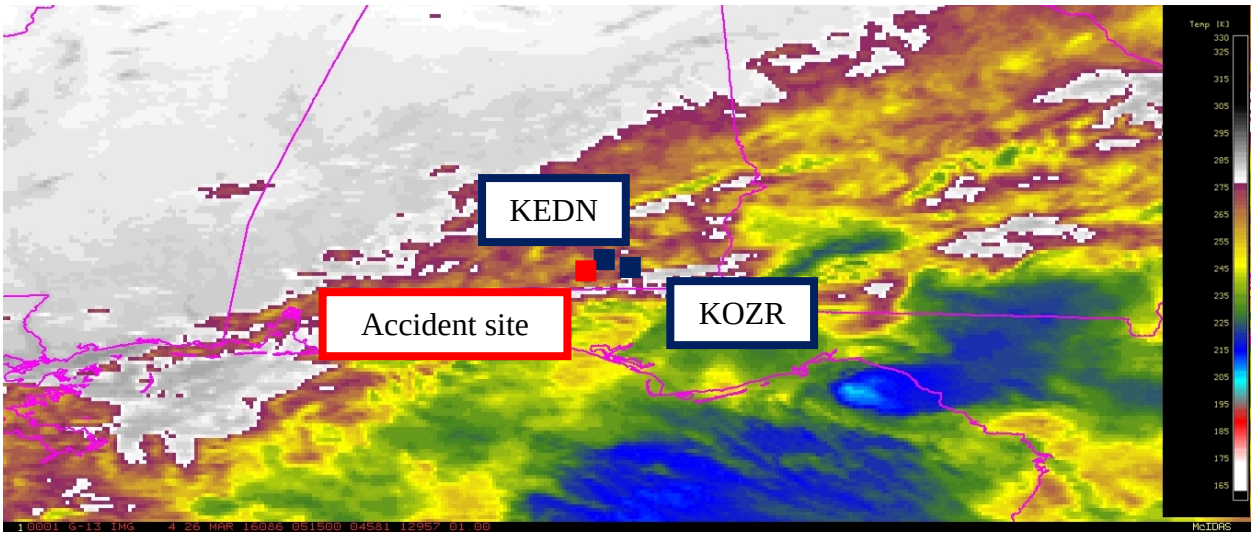


Figure 11 – GOES-13 infrared image at 0115 CDT

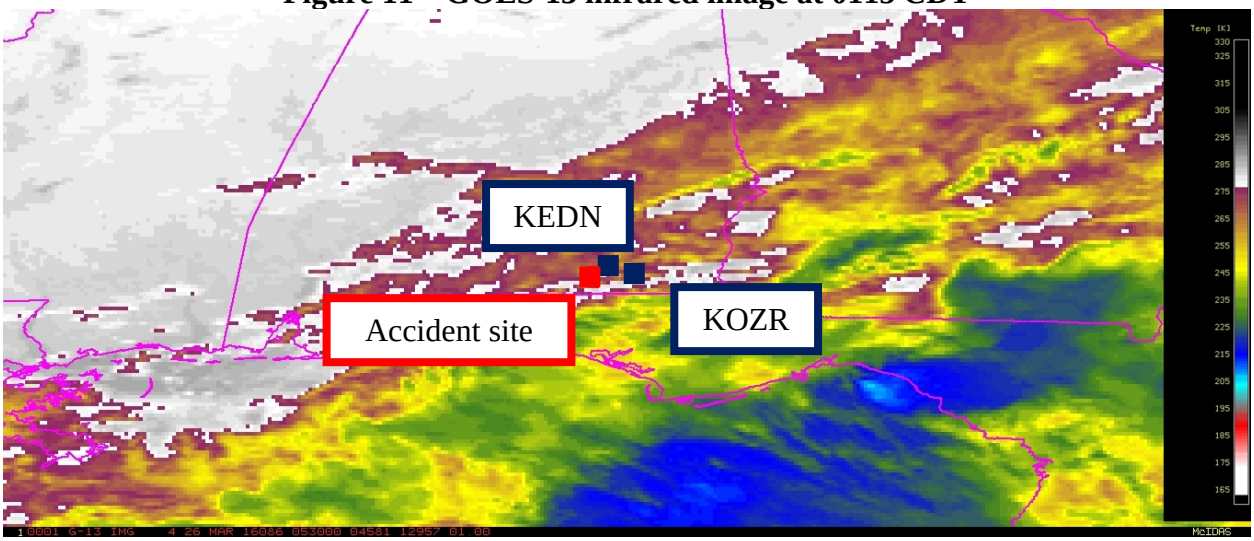


Figure 12 – GOES-13 infrared image at 0130 CDT

6.0 Radar Imagery Information

The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D)[17] was Fort Rucker, Alabama, (KEOX), located 28 east-northeast of the accident site at an elevation of 434 feet. Level II and III archive radar data was obtained from the NCDC utilizing the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software.

[17] The WSR-88D is an S-band 10-centimeter wavelength radar with a power output of 750,000 watts, and with a 28-foot parabolic antenna that concentrates the energy between a 0.87° and 0.96° beam width. The radar produces three basic types of products: base reflectivity, base radial velocity, and base spectral width.

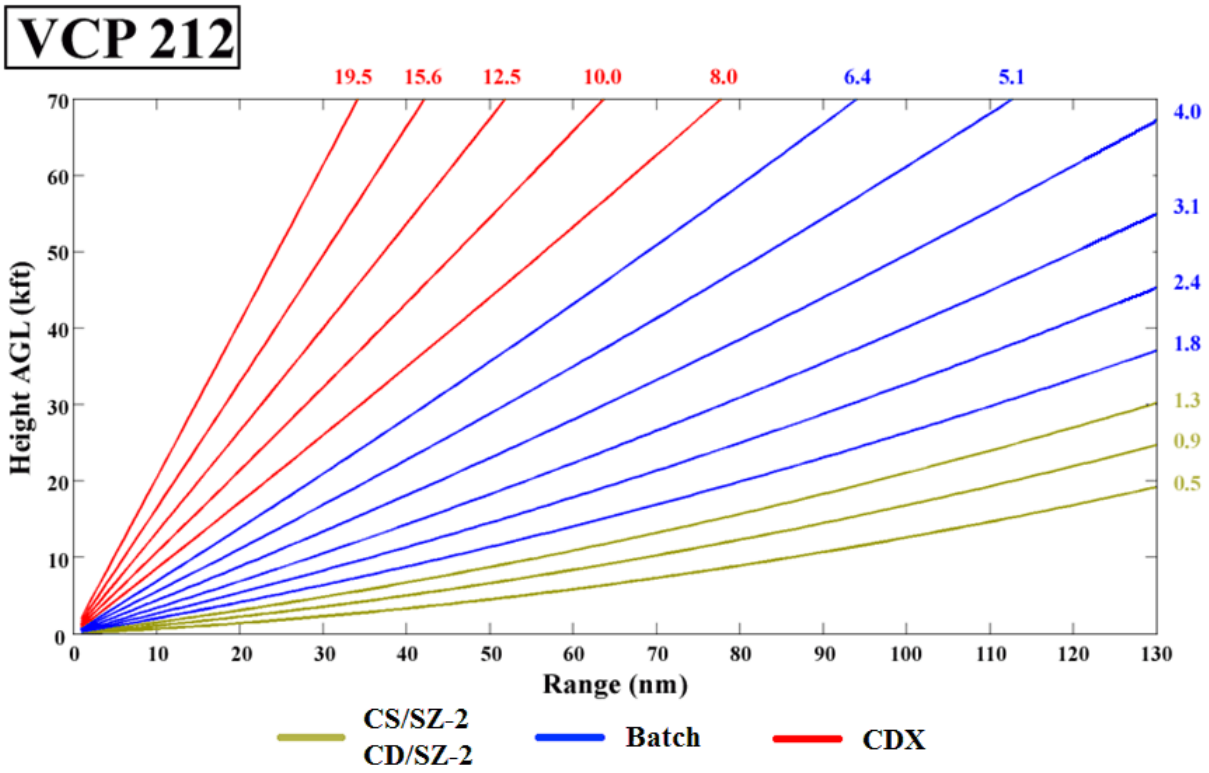
6.1 Volume Scan Strategy[18]

The WSR-88D is a computer-controlled radar system, which automatically creates a complete series of specific scans in a specific sequence known as a volume scan. Individual elevation scans are immediately available on the WSR-88D's Principle Users Processor (PUP). Products that require data from multiple elevation scans are not available until the end of the five to ten minute volume scan.

The WSR-88D operates in several different scanning modes, identified as Mode A and Mode B. Mode A is the precipitation scan and has three common scanning strategies. The most common is where the radar makes 14 elevation scans from 0.5° to 19.5° every four and a half minutes. This particular scanning strategy is documented as volume coverage pattern 212 (VCP-212). Mode B is the clear-air mode, where the radar makes 5 elevation scans during a ten minute period. During the period surrounding the accident, the KEOX WSR-88D radar was operating in the precipitation mode (Mode A, VCP-212). The following chart provides an indication of the different elevation angles in this VCP, and the approximate height and width of the radar beam with distance from the radar site. In addition, KEOX was operating with Supplemental Adaptive Intra-Volume Low-Level Scan (SAILS) turned on. SAILS[19] provided an additional 0.5° degree scan within the four and a half minute normal scan time.

[18] Contiguous Surveillance (CS)--The low PRF scan of the split cut. Gives a high R_{max} value to determine proper target location and intensity, but a low V_{max} value limits the velocities that can be measured.
Contiguous Doppler (CD)--The high PRF scan of the split cut. Gives a low R_{max} value causing more range folded (multiple trip) echoes, but a high V_{max} value to get higher, more accurate velocity values.
Batch Mode – Uses alternating low and high PRFs on each radial for one full rotation at each elevation angle. The two resulting data sets (low PRF and high PRF) are combined to resolve range ambiguity. Used in the middle elevation angles.
W – With range unfolding (W)
WO – Without range unfolding (WO)

[19] For information on SAILS please see:
http://www.roc.noaa.gov/WSR88D/NewRadarTechnology/NewTechDefault.aspx



VCP-212 Precipitation Mode Scan Strategy

6.2 Beam Height Calculation

Assuming standard refraction[20] of the WSR-88D 0.95° wide radar beam, the following table shows the approximate beam height and width[21] information[22] of the radar display over the site of the accident. The heights have been rounded to the nearest 10 feet.

ANTENNA ELEVATION	BEAM CENTER	BEAM BASE	BEAM TOP	BEAM WIDTH
0.5°	2,480 feet	1,100 feet	3,860 feet	2,760 feet

Based on the radar height calculations, the 0.5° elevation scan depicted the conditions between 1,100 feet and 3,860 feet msl over the accident site at the accident time and these are the closest altitudes to the accident flight near the accident site. [23]

[20] Standard Refraction in the atmosphere is when the temperature and humidity distributions are approximately average, and values set at the standard atmosphere.
[21] Beam width – A measure of the angular width of a radar beam.
[22] Beamwidth values are shown for legacy resolution products. Super resolution products would an effective beamwidth that would be approximately half these values.
[23] For more information see the ATC data contained in the docket for this accident.

6.3 Reflectivity

Reflectivity is the measure of the efficiency of a target in intercepting and returning radio energy. With hydrometeors[24] it is a function of the drop size distribution, number of particles per unit volume, physical state (ice or water), shape, and aspect. Reflectivity is normally displayed in decibels (dBZ[25]), and is a general measure of echo intensity. FAA Advisory Circular AC 00-24C, "Thunderstorms," dated February 19, 2013, also defines the echo intensity levels and weather radar echo intensity terminology associated with those levels. For dBZ values less than 30 the weather radar echo intensity terminology should be "light." For dBZ values between 30 and 40, the terminology should be "moderate." "Heavy" terminology is used for dBZ values greater than 40 dBZ but less than 50 dBZ, inclusive. Finally, any dBZ values above 50 dBZ shall be described as "extreme." From the NWS, precipitation conditions at the surface can be inferred from VIP Levels described in the chart below:

- VIP 1 (Level 1, 18-30 dBZ) - Light precipitation
- VIP 2 (Level 2, 30-38 dBZ) - Light to moderate rain.
- VIP 3 (Level 3, 38-44 dBZ) - Moderate to heavy rain.
- VIP 4 (Level 4, 44-50 dBZ) - Heavy rain
- VIP 5 (Level 5, 50-57 dBZ) - Very heavy rain; hail possible.
- VIP 6 (Level 6, >57 dBZ) - Very heavy rain and hail; large hail possible.

6.4 Base Reflectivity and Lightning Data[26]

Figures 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, and 23 present the KEOX WSR-88D base reflectivity images for the 0.5° elevation scan with a resolution of 0.5° X 250 m at 2320, 2322, 2324, 2333, 2345, 2353, 2356 CDT all on March 25, and 0014, 0016, 0019, and 0021 CDT on March 26, respectively. At the time of the initial call to the accident pilot and before the 2325 CDT on March 25 departure of the flight to the car accident scene, there were 5 to 15 dBZ reflectivity values between the departure point and car accident scene. Between 2324 and 2356 CDT on March 26, 10 to 25 dBZ reflectivity values move from south to north across the southern third of the flight track to the car accident scene and the flight likely encountered some very light to light precipitation on the way car accident scene. Between 0014 and 0021 CDT (figures 20 to 23) the accident flight took off into 15 to 25 dBZ reflectivity values and likely encountered light precipitation. There were no lightning strikes near the accident site at the accident time.

[24] Hydrometeors are any product of condensation or sublimation of atmospheric water vapor, whether formed in the free atmosphere or at the earth's surface; also, any water particles blown by the wind from the earth's surface. Hydrometeors are classified as; (a) Liquid or solid water particles suspended in the air: cloud, water droplets, mist or fog. (b) Liquid precipitation: drizzle and rain. (c) Freezing precipitation: freezing drizzle and freezing rain. (d) Solid (frozen) precipitation: ice pellets, hail, snow, snow pellets, and ice crystals. (e) Falling particles that evaporate before reaching the ground: virga. (f) Liquid or solid water particles lifted by the wind from the earth's surface: drifting snow, blowing snow, blowing spray. (g) Liquid or solid deposits on exposed objects: dew, frost, rime, and glazed ice.

[25] dBZ – A non-dimensional "unit" of radar reflectivity which represents a logarithmic power ratio (in decibels , or dB) with respect to radar reflectivity factor, Z.

[26] For more information see the ATC data contained in the docket for this accident.

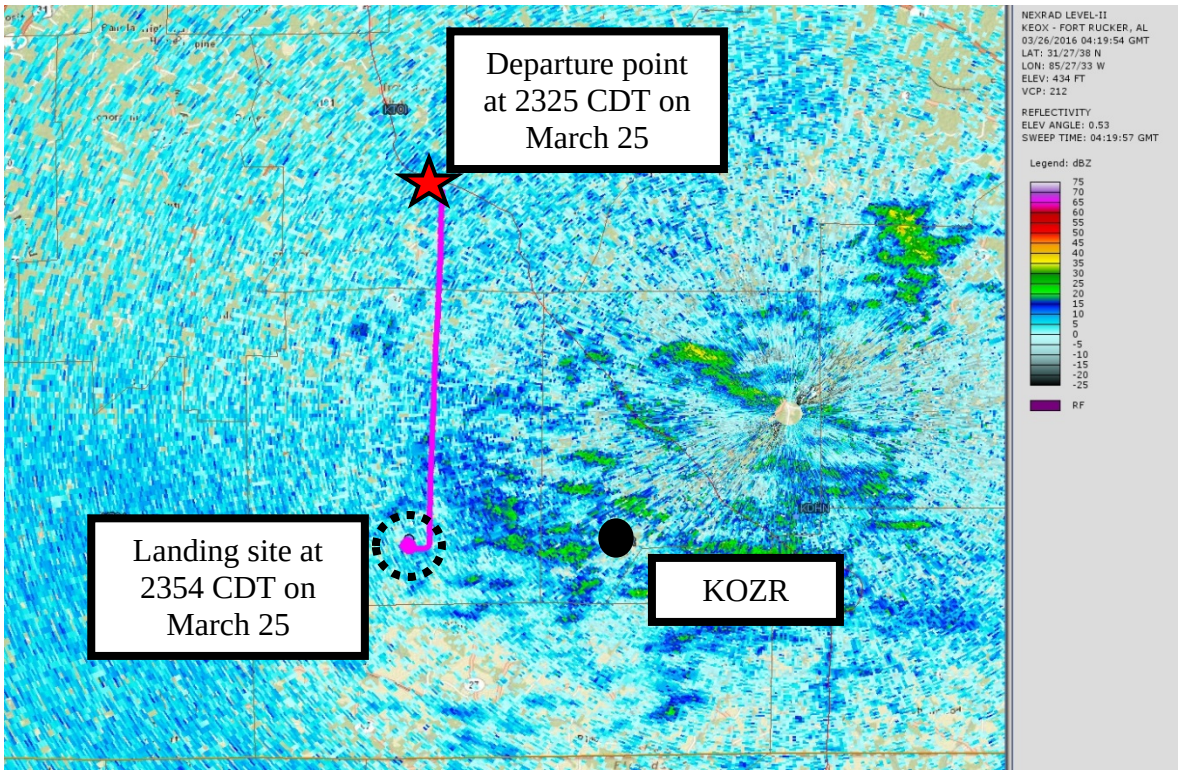


Figure 13 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 2320 CDT on March 25 with accident flight track to the car accident scene

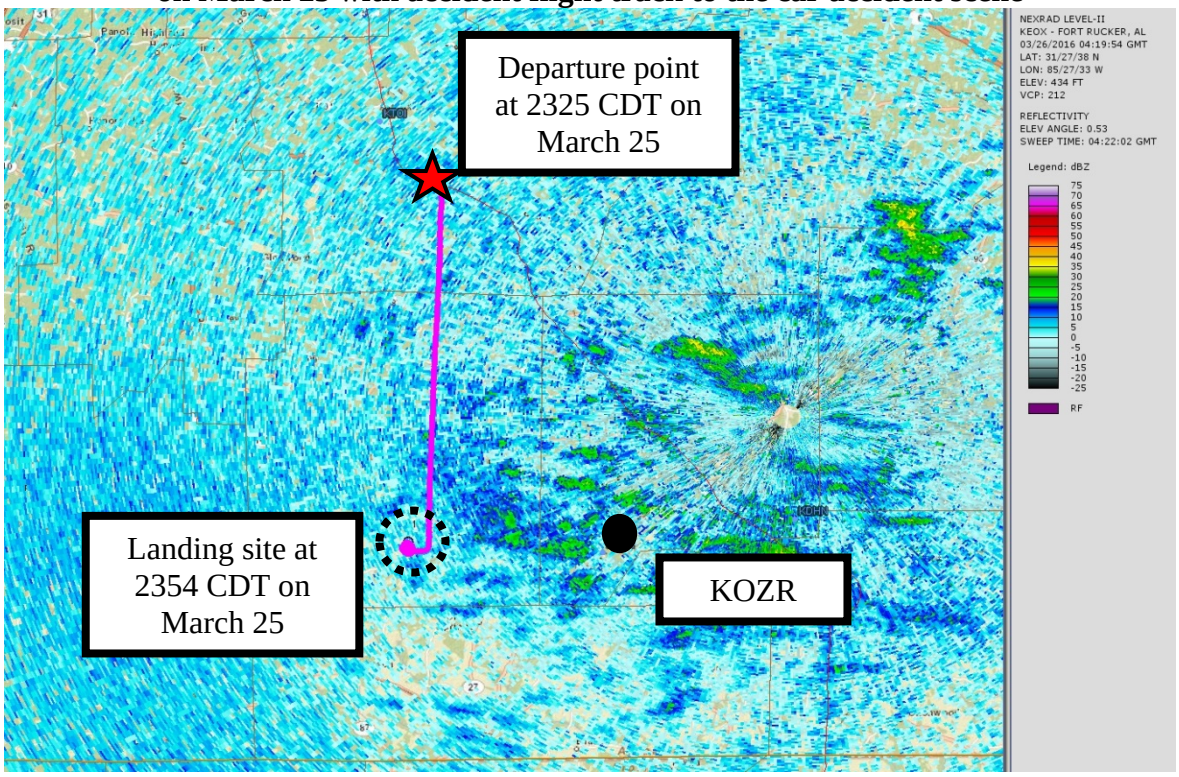


Figure 14 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 2322 CDT on March 25 with accident flight track to the car accident scene

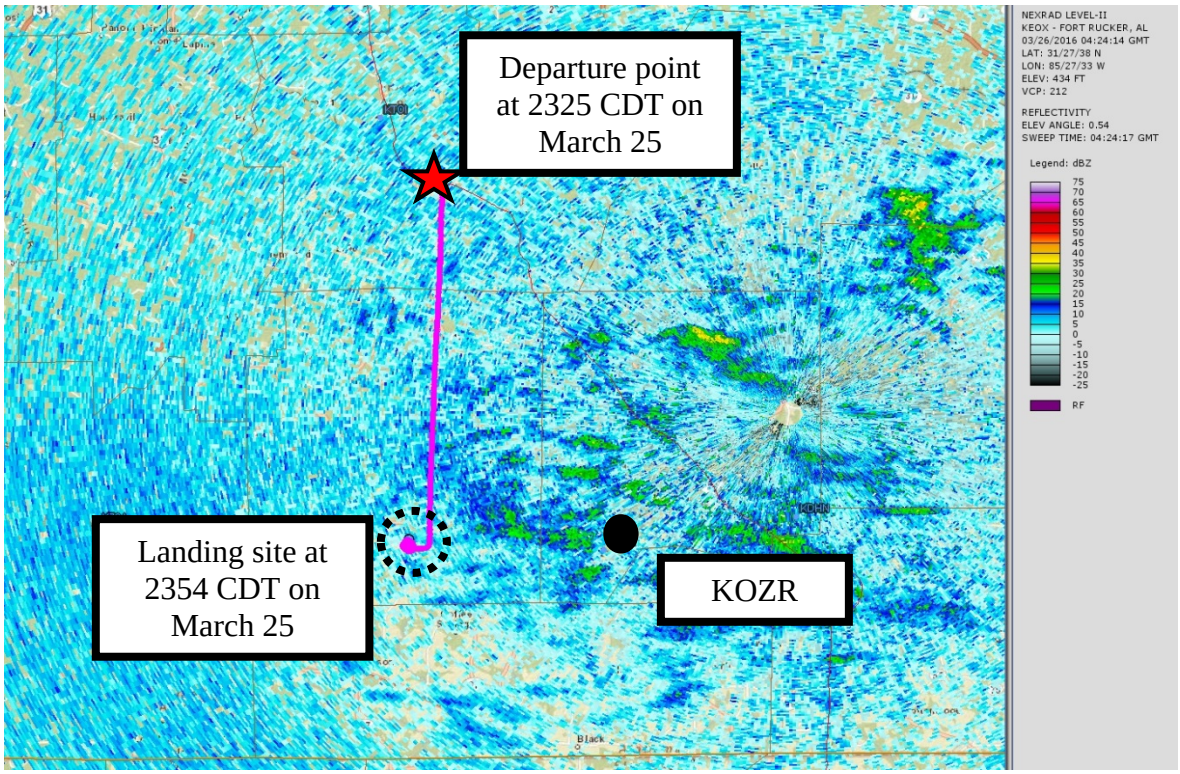


Figure 15 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 2324 CDT on March 25 with accident flight track to the car accident scene

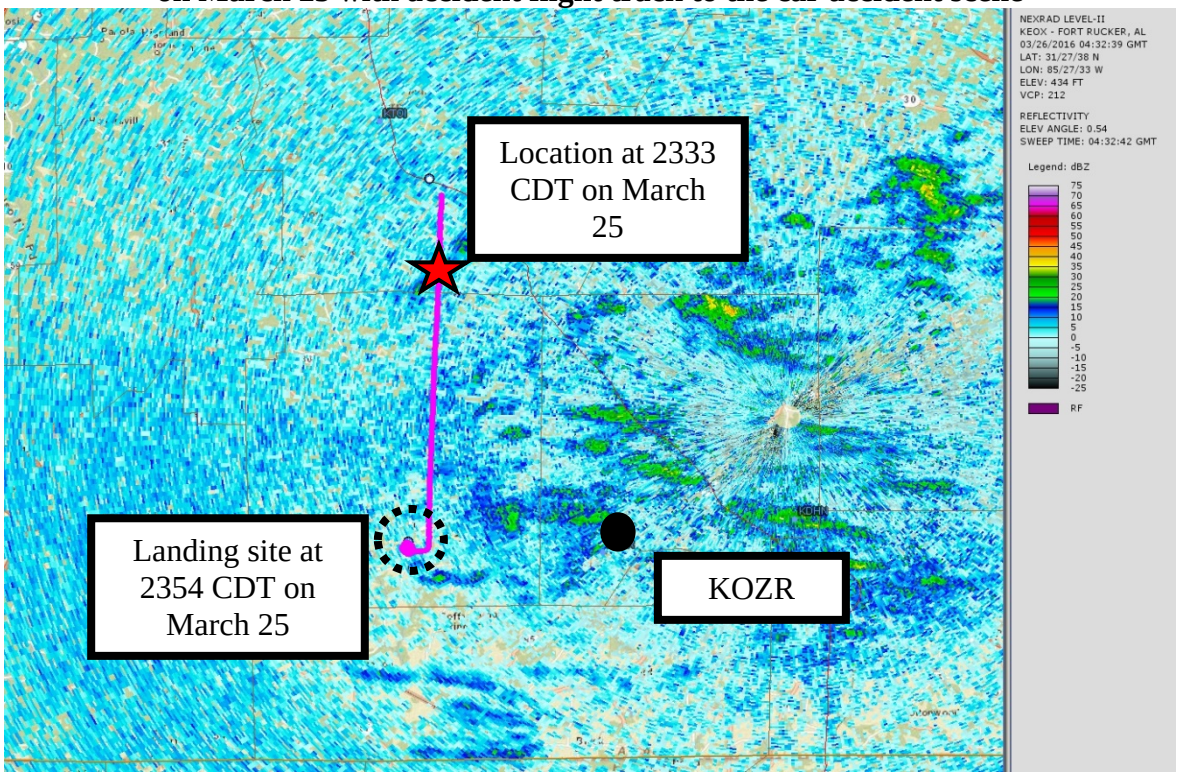


Figure 16 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 2333 CDT on March 25 with accident flight track to the car accident scene

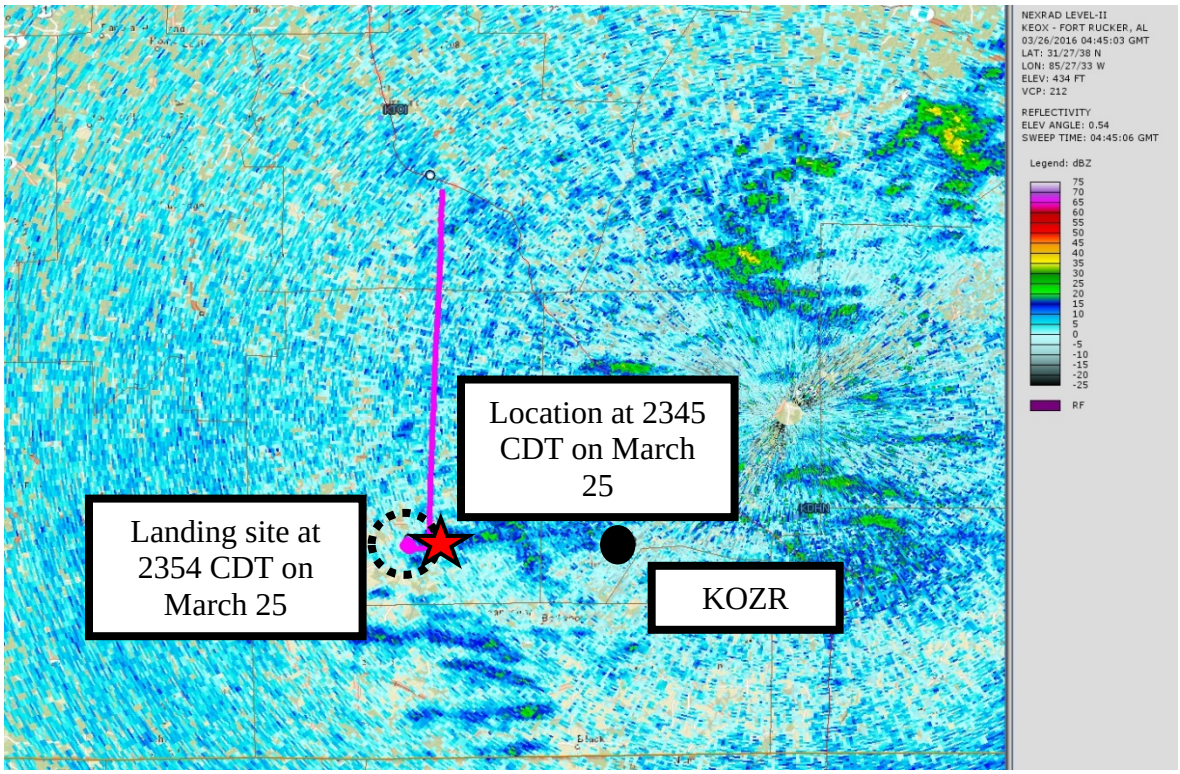


Figure 17 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 2345 CDT on March 25 with accident flight track to the car accident scene

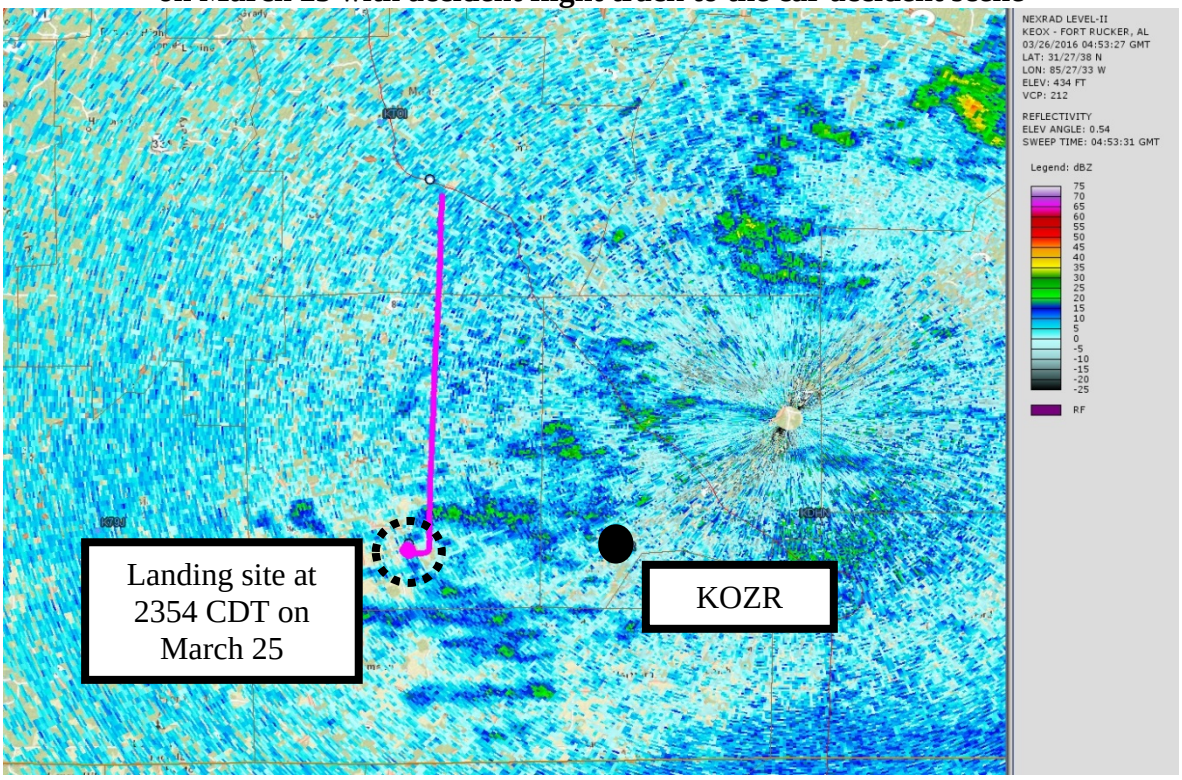


Figure 18 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 2353 CDT on March 25 with accident flight track to the car accident scene

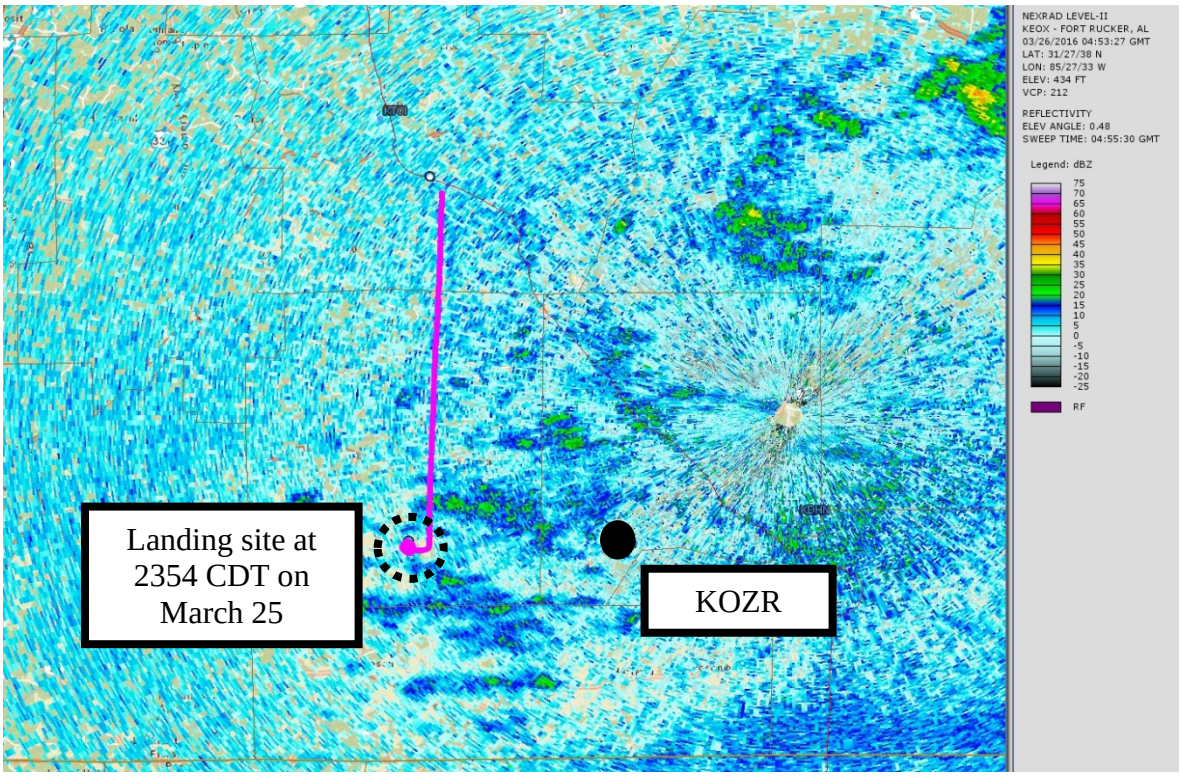


Figure 19 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 2356 CDT on March 25 with accident flight track to the car accident scene

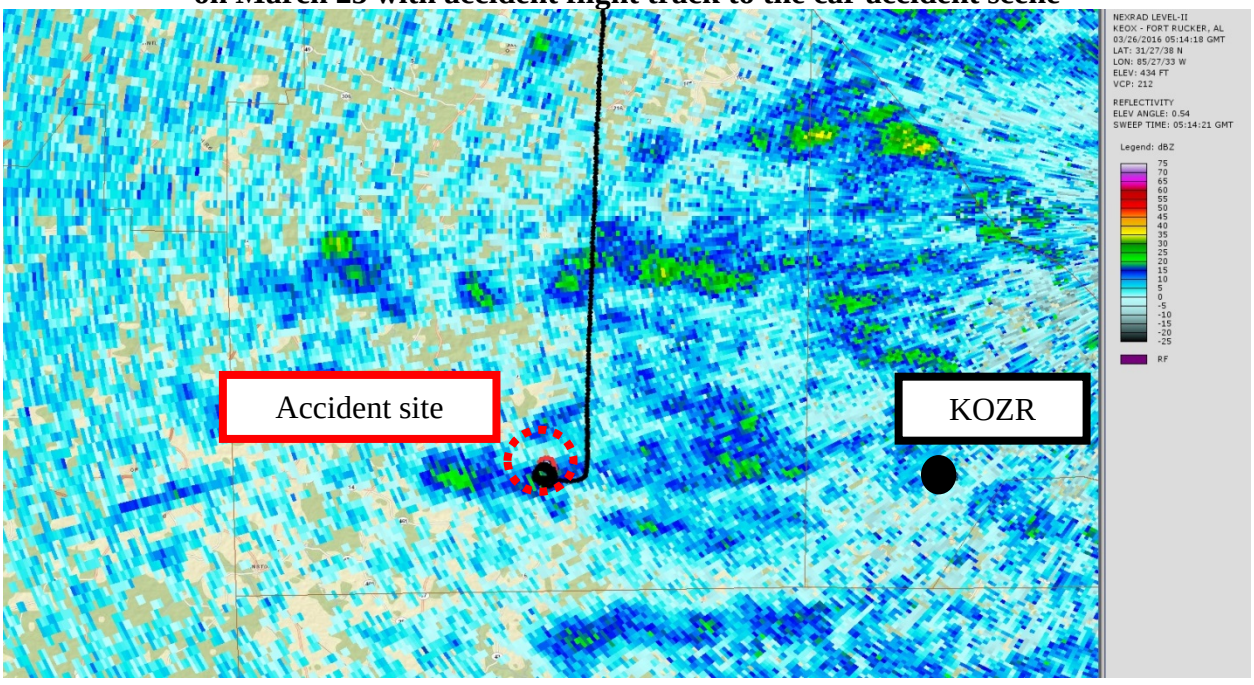


Figure 20 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 0014 CDT with accident flight track to the car accident scene (black line) and final accident flight track (red line)

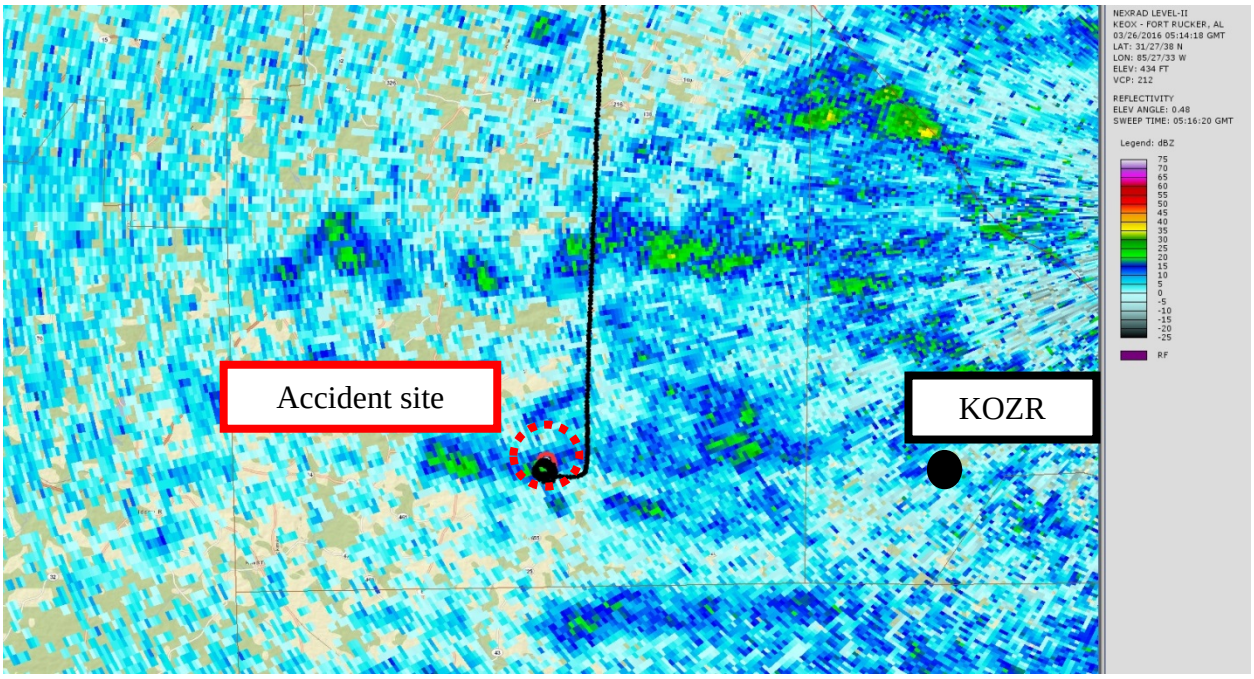


Figure 21 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 0016 CDT with accident flight track to the car accident scene (black line) and final accident flight track (red line)

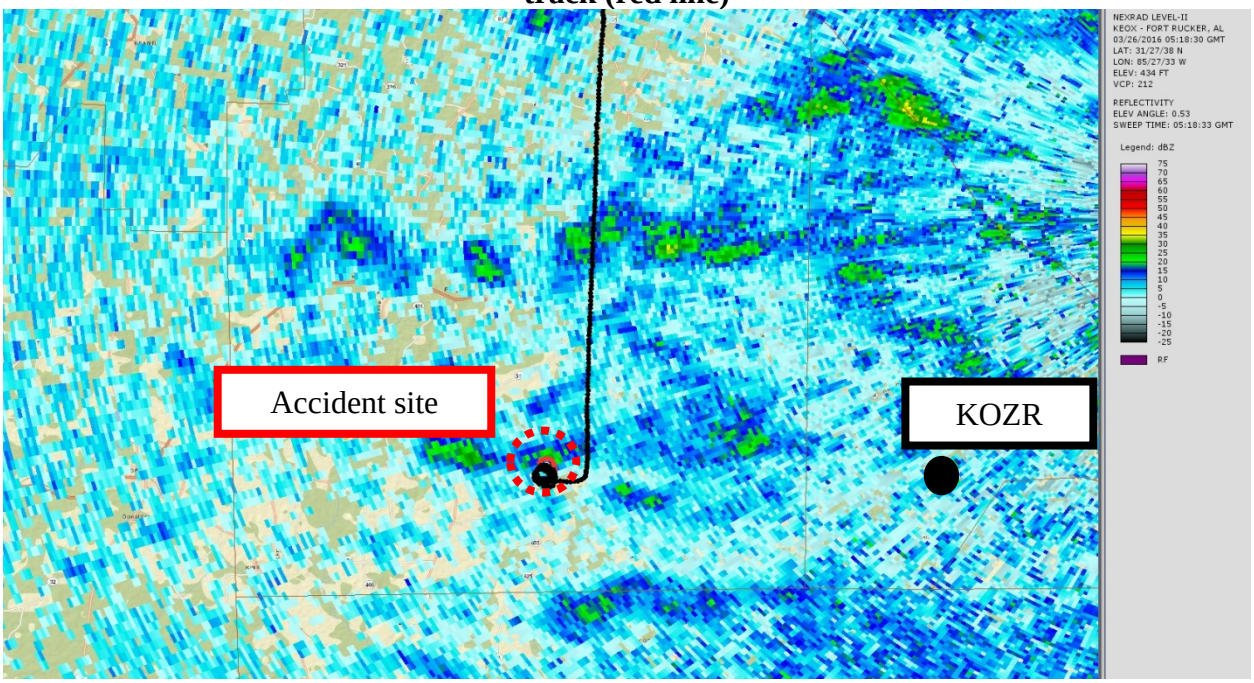


Figure 22 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 0019 CDT with accident flight track to the car accident scene (black line) and final accident flight track (red line)

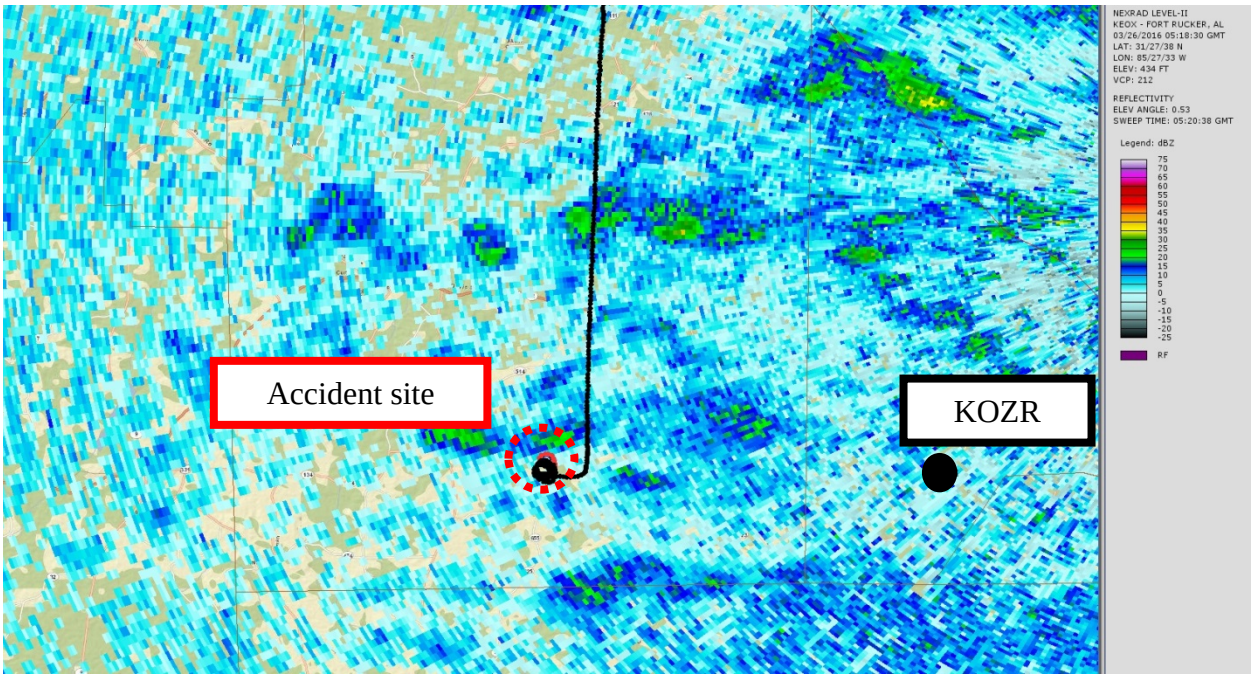


Figure 23 – KEOX WSR-88D reflectivity for the 0.5° elevation scan initiated at 0021 CDT with accident flight track to the car accident scene (black line) and final accident flight track (red line)

6.5 3-Dimensional Radar Reflectivity Data

Figures 24 and 26 present a 3-dimensional view of the KEOX WSR-88D base reflectivity for the elevation scans initiated at 0014 CDT, while figures 25 and 27 present the same views as figure 24 and 26. Figures 25 and 27 are from the elevations scans initiated at 0019 CDT. The accident aircraft's flight track obtained from ATC[27] was also plotted on the Google Earth image for a time comparison with the base reflectivity images. The images indicated that the accident flight took off in an area of greater than 10 dBZ reflectivity values and these reflectivity values moved north with the accident flight and were present at the accident site at the accident time. The reflectivity values stretched to 14,000 feet msl in the vertical which was a similar altitude to the cloud top heights described in section 5.0.

[27] For more information see the ATC data contained in the docket for this accident.

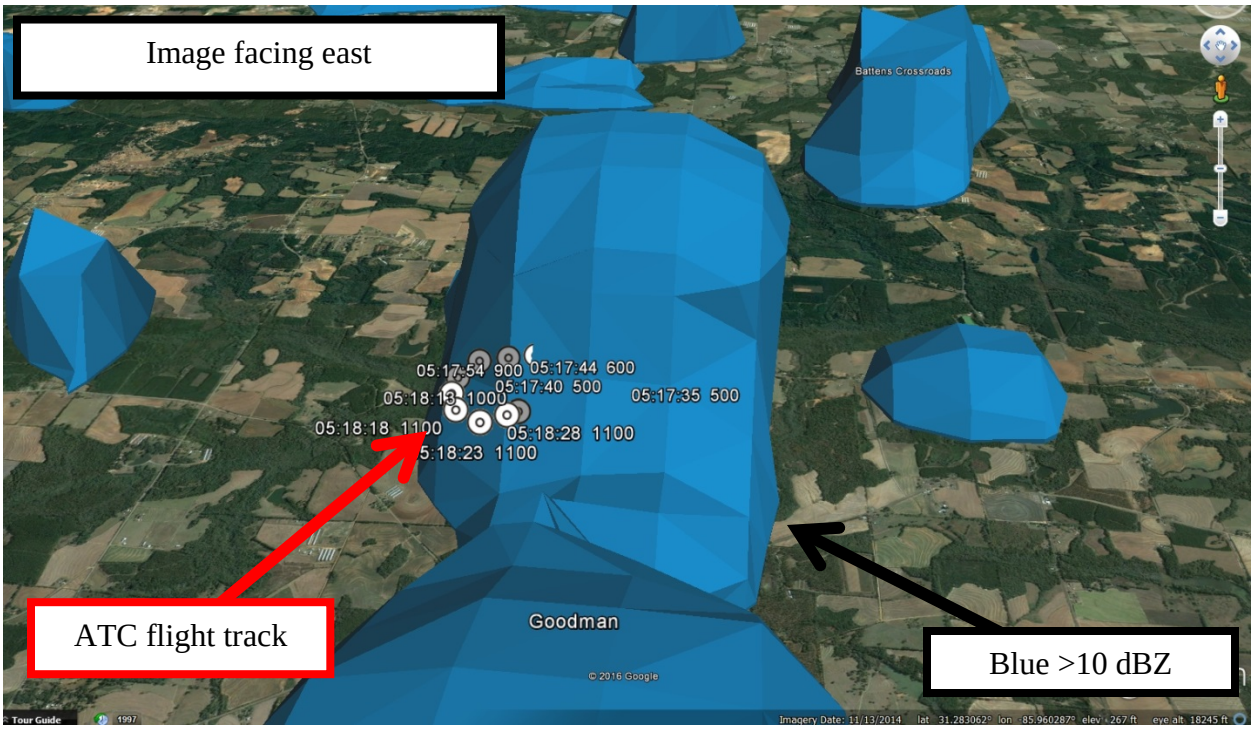


Figure 24 – 3-dimensional KEOX WSR-88D base reflectivity from the scan initiated at 0014 CDT and the ATC Flight Track with the image facing east

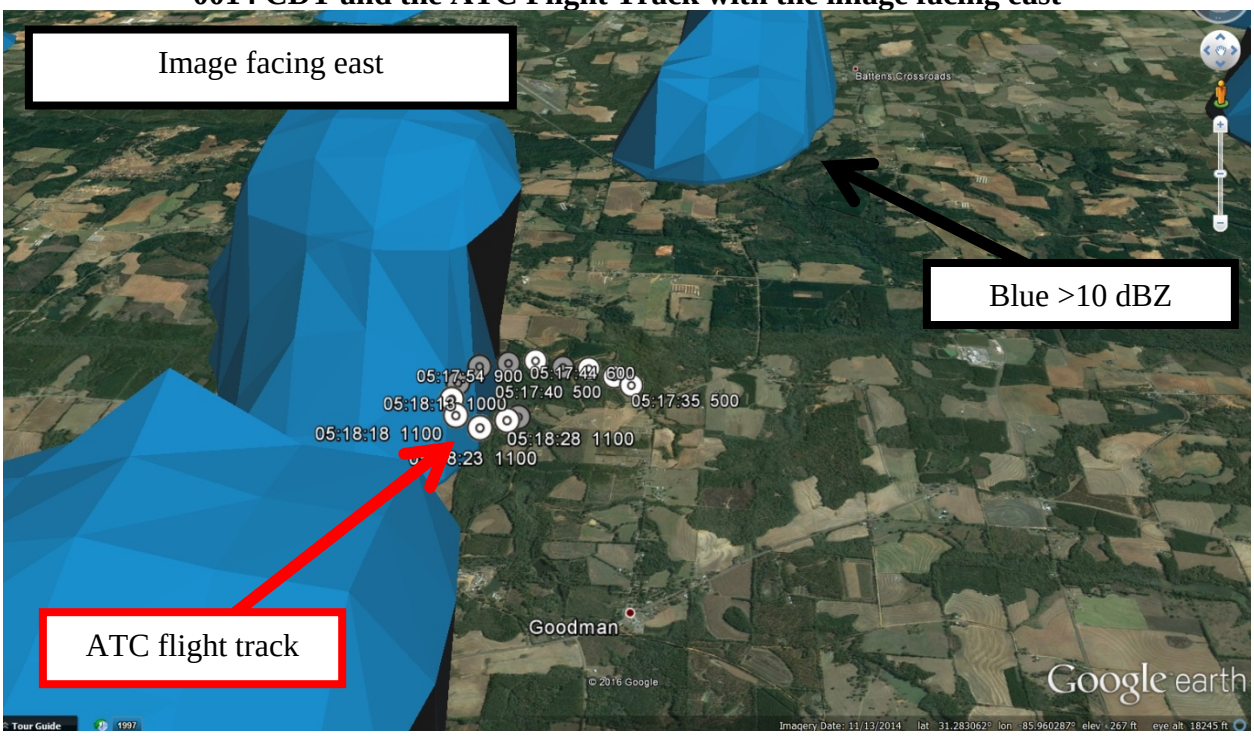


Figure 25 – 3-dimensional KEOX WSR-88D base reflectivity from the scan initiated at 0019 CDT and the ATC Flight Track with the image facing east

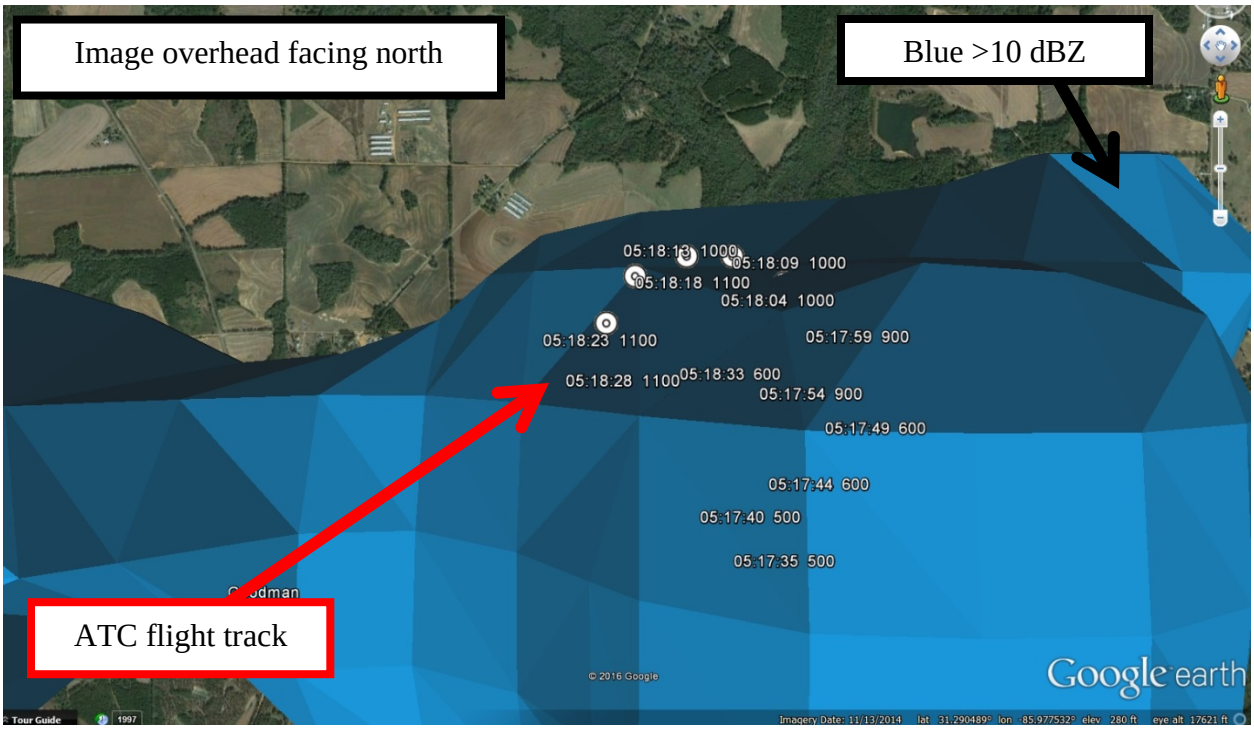


Figure 26 – 3-dimensional overhead view of KEOX WSR-88D base reflectivity from the scan initiated at 0014 CDT and the ATC Flight Track with the image facing north

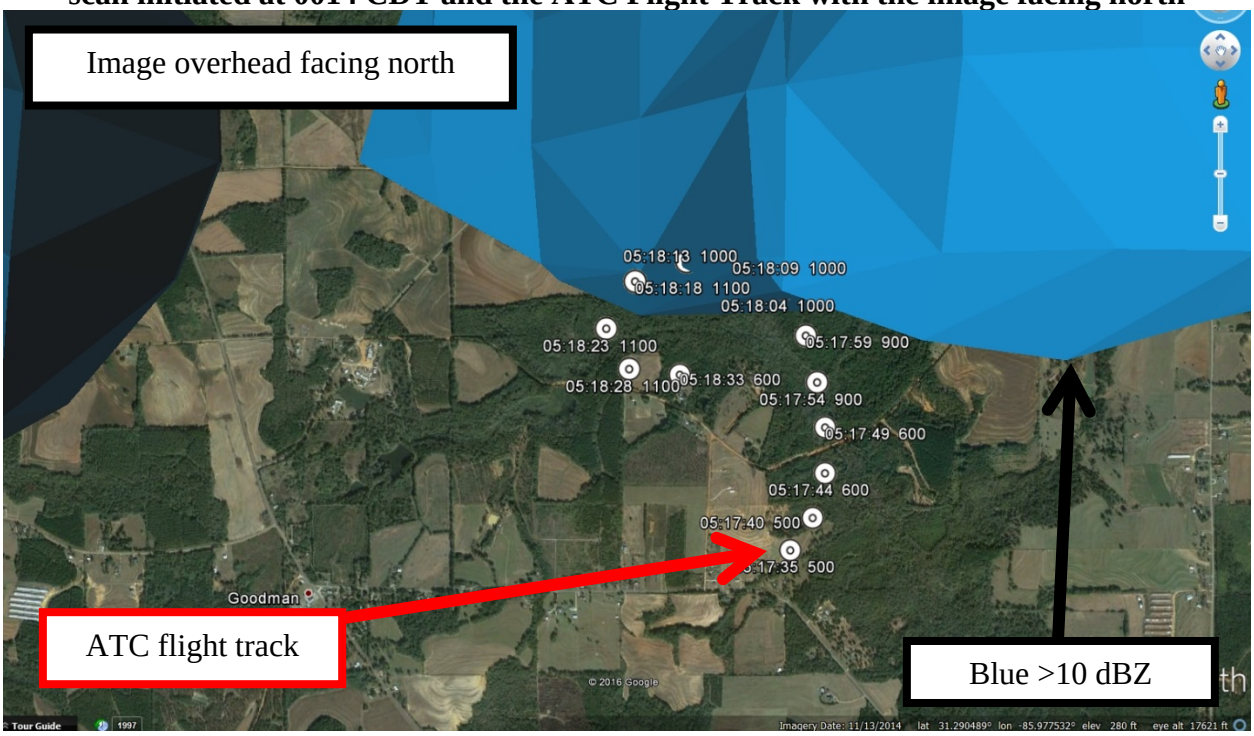


Figure 27 – 3-dimensional overhead view of KEOX WSR-88D base reflectivity from the scan initiated at 0019 CDT and the ATC Flight Track with the image facing north

7.0 Pilot Reports

All pilot reports (PIREPs) were reviewed close to the accident site from around three hours prior to the accident time to around three hours after the accident time and no PIREPs were publically disseminated in the National Airspace System for over all of Alabama, Georgia, and Florida, around the accident time.

8.0 SIGMET and CWSU Advisories

No SIGMET was valid for the accident site at the accident time.

No Center Weather Service Unit (CWSU) Advisory (CWA) was valid for the accident site at the accident time.

No Meteorological Impact Statement (MIS) was valid for the accident site at the accident time.

9.0 AIRMETs

AIRMET Sierra for IFR conditions due to mist was issued at 2145 CDT on March 25 and valid at the accident time. There was another AIRMET Sierra for IFR conditions due to mist and precipitation valid just east of the accident site for portions of Georgia and northwestern Florida (figures 28, 29, 30, and 31):

WAUS44 KKCI 260245
WA4S
DFWS WA 260245
AIRMET SIERRA FOR IFR VALID UNTIL 260900
.
AIRMET IFR...TX
FROM 30E JCT TO 20ESE SAT TO 40WNW CRP TO 70SE DLF TO 50WSW JCT
TO 30E JCT
CIG BLW 010/VIS BLW 3SM BR. CONDS DVLPG 06-09Z. CONDS CONTG BYD
09Z THRU 15Z.
.
AIRMET IFR...AL
FROM LGC TO 50SW PZD TO 20WNW CEW TO 20W MGM TO LGC
CIG BLW 010/VIS BLW 3SM BR. CONDS CONTG BYD 09Z THRU 15Z.
....

WAUS42 KKCI 260245
WA2S
MIAS WA 260245
AIRMET SIERRA FOR IFR VALID UNTIL 260900
.
AIRMET IFR...SC GA FL AND CSTL WTRS
FROM 30WNW CAE TO 20WSW CHS TO 30NNW CRG TO 30W CTY TO 60SE SJI
TO 40W CEW TO 50SW PZD TO 20SSE LGC TO 30WNW CAE
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 09Z THRU 15Z.
....

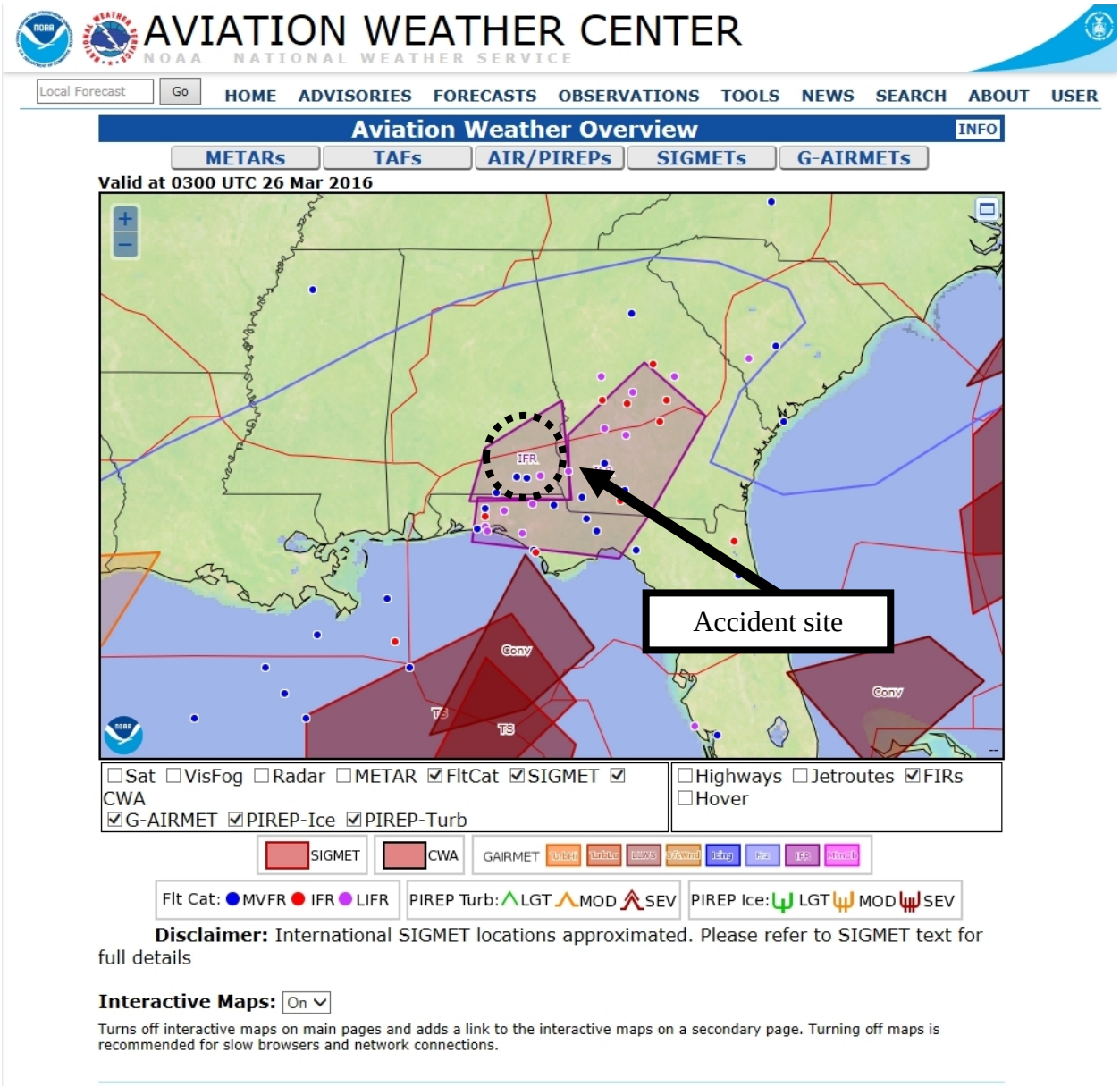


Figure 28 – AIRMETs, SIGMETs, and CWAs valid for the Southeastern United States at 2200 CDT on March 25

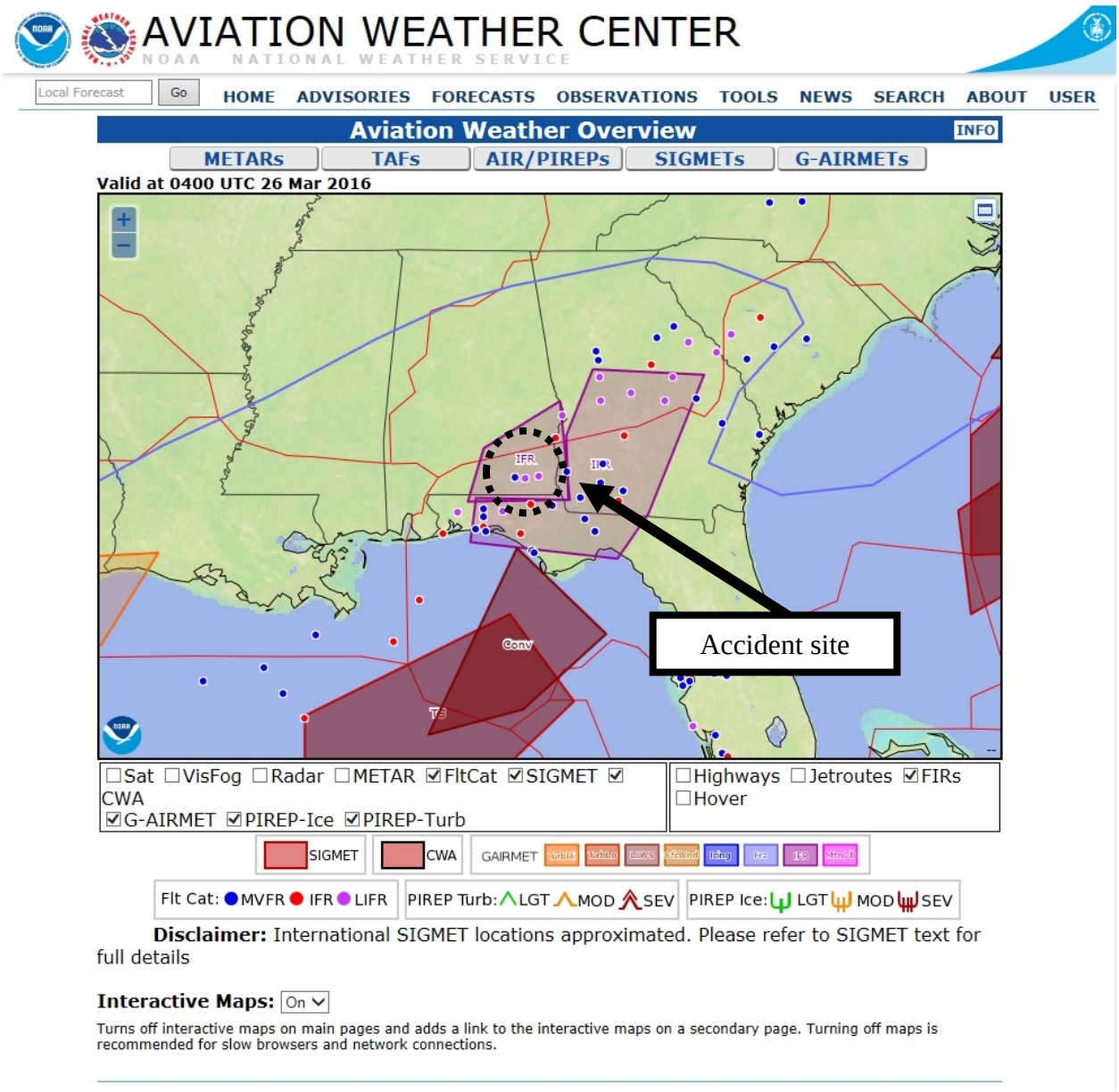


Figure 29 – AIRMETs, SIGMETs, and CWAs valid for the Southeastern United States at 2300 CDT on March 25

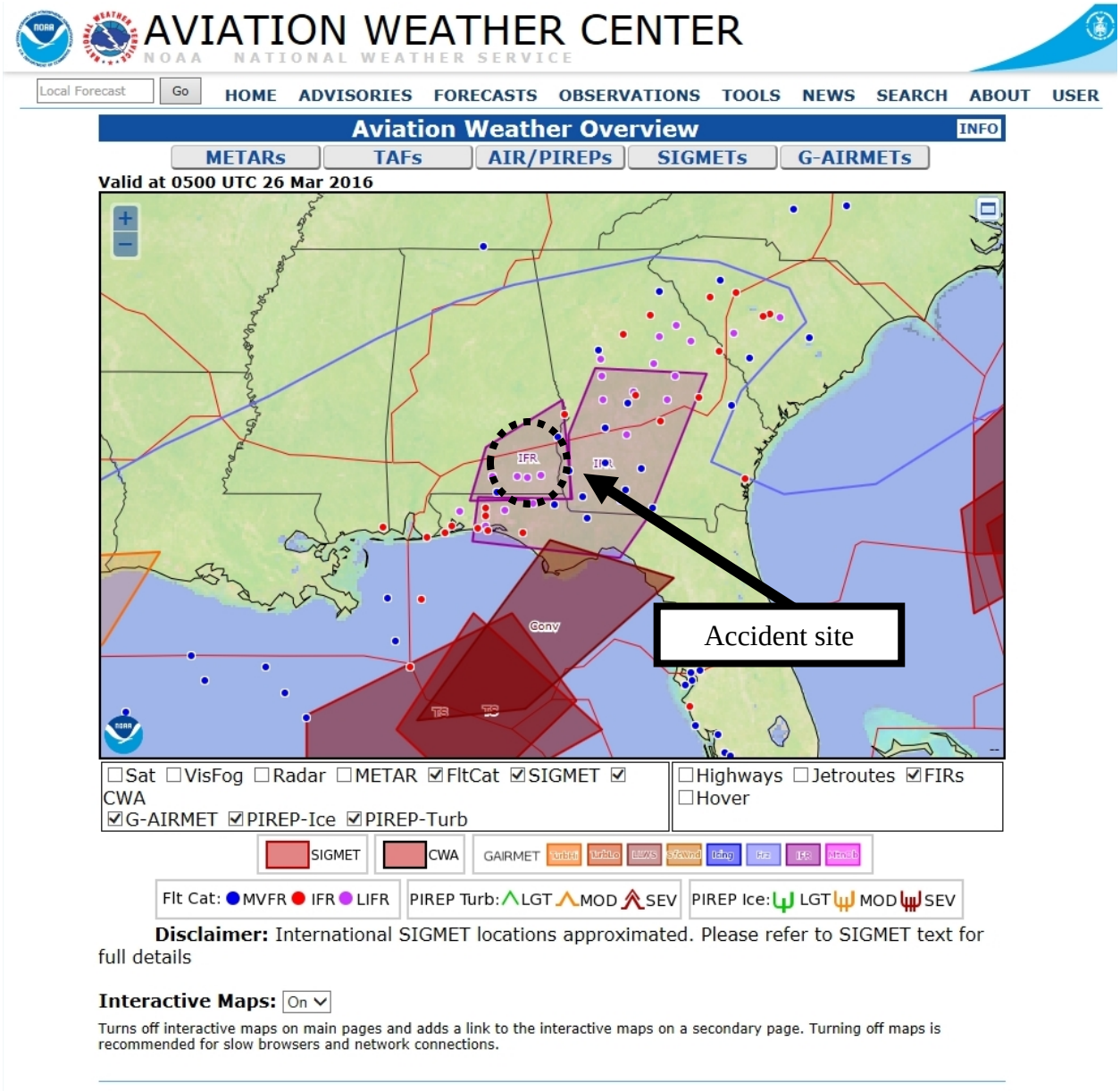


Figure 30 – AIRMETs, SIGMETs, and CWAs valid for the Southeastern United States at 0000 CDT

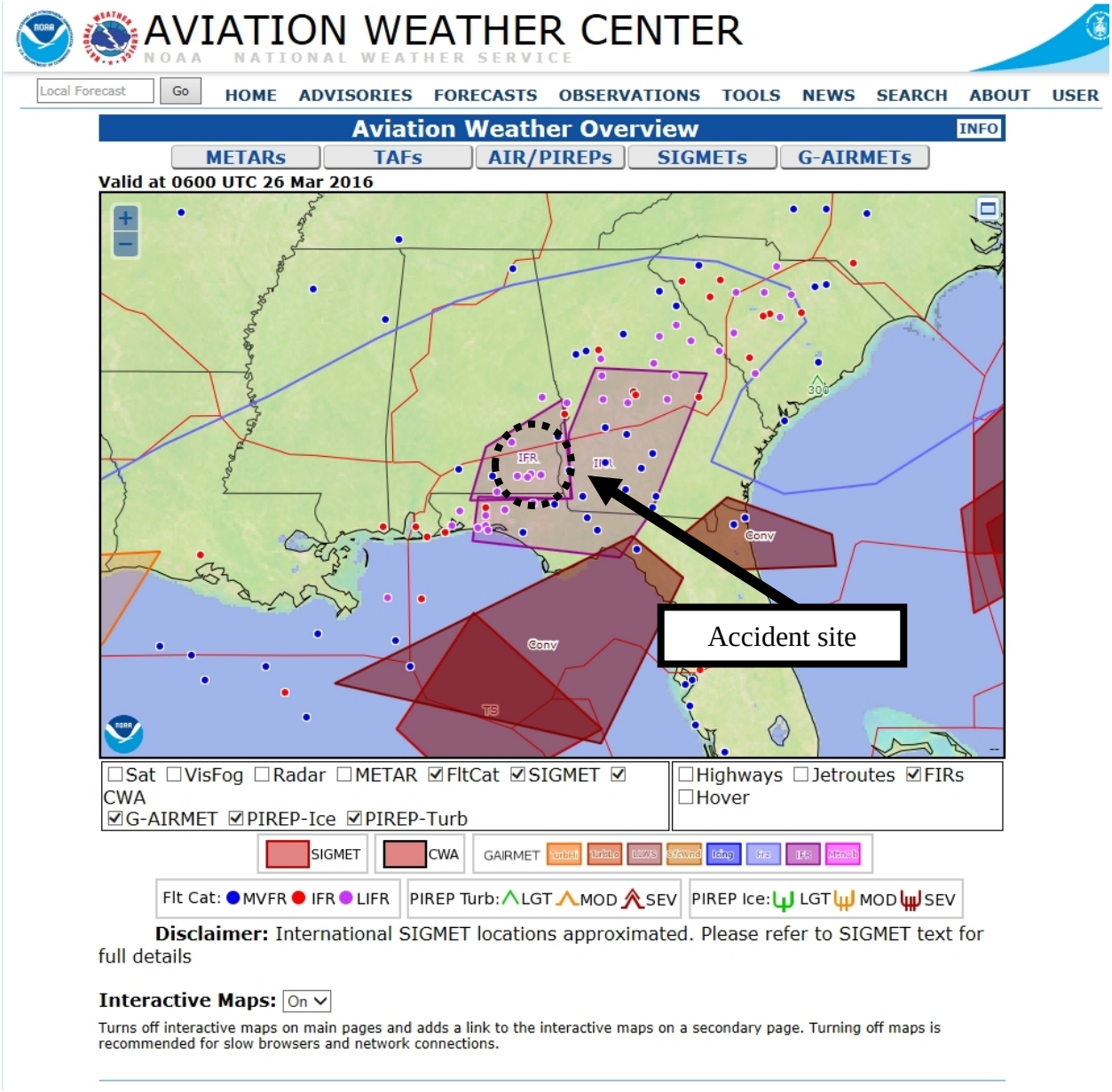


Figure 31 – AIRMETs, SIGMETs, and CWAs valid for the Southeastern United States at 0100 CDT

10.0 Area Forecast

The Area Forecast issued at 1345 CDT on March 25 was valid at the accident time and forecasted a broken ceiling at 3,000 feet msl becoming an overcast ceiling at 1,500 feet msl between 2200 CDT on March 25 and 0100 CDT with a visibility of 3 miles and mist:

FAUS44 KKCI 251845
FA4W
_DFWC FA 251845
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 261300

CLDS/WX VALID UNTIL 260700...OTLK VALID 260700-261300
OK TX AR TN LA MS AL
.
SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.
TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HGTS DENOTED BY AGL OR CIG.
.
SYNOPSIS...CDFNT FM LO PRES CNTRL SD-NW KS-NERN NM. SFC TROF FM W
CNTRL KS-NERN TX PNHDL-TX BIG BEND AREA. HI PRES E 2/3 FCST AREA.
13Z CDFNT FM LO PRES NW IA-NERN KS-W CNTRL OK-E CNTRL NM. HI
PRES NERN PTN FCST AREA.
.
OK
PNHDL-NW...SCT-BKN CI. WND S 20G30KT. BECMG 2100 BKN100 TOP
FL200. ISOL -SHRA/-TSRA. CB TOP FL300. OTLK...VFR TIL 09Z
SHRA/TSRA E HLF.
SW...SKC TO SCT CI. WND S 20G30KT. OTLK...VFR.
RMNDR...SKC TO SCT CI. OTLK...VFR AFT 09Z SHRA N 1/3.
.
NWRN TX
N HLF PNHDL...SCT-BKN CI. WND S 20G30KT. BECMG 2100 BKN100 TOP
FL200. ISOL -SHRA/-TSRA. CB TOP FL300. OTLK...VFR.
RMNDR...SCT CI. TIL 02Z WND S G25KT. OTLK...VFR.
.
SWRN TX
SKC. TIL 01Z WND S G25KT NERN TRANSPECOS. OTLK...VFR BECMG 0912
MVFR CIG ERN TRANSPECOS.
.
N CNTRL TX
SKC. TIL 01Z WND S G25KT. OTLK...VFR.
.
NERN TX
SKC. OTLK...VFR.
.
SERN TX
SKC. OTLK...VFR.
.
S CNTRL TX
HILL COUNTRY...SCT CI. OTLK...VFR BECMG BY 09Z MVFR CIG BR.
NERN SXNS...SCT CI. OTLK...VFR.
RMNDR...SCT CI. OTLK...VFR BECMG 0912 MVFR CIG.
.
AR
NERN...BKN030 TOP 040. BECMG BY 21Z SCT030. OTLK...VFR.
RMNDR...SKC. OTLK...VFR.
.
LA
SKC. OTLK...VFR BECMG 0912 MVFR CIG FAR SE.
.
TN
W...BKN030 TOP 040. BECMG BY 21Z SCT030. OTLK...VFR.
MID...BKN030 TOP 040-050. BECMG 2100 SKC. OTLK...VFR.
E...BKN030 TOP 040. BECMG BY 21Z SCT030. OTLK...VFR.
.
MS
EXTRM N...BKN030 TOP 040. BECMG BY 20Z SKC. OTLK...VFR.

RMNDR...SKC. OTLK...VFR BECMG 0912 MVFR CIG FAR SE.
.
AL
EXTRM N...BKN030 TOP 040. BECMG BY 20Z SKC. OTLK...VFR.
SE...BKN030 TOP 120. 21Z TOP 060-080. BECMG 0306 OVC015 VIS 3SM BR FAR SE. AFT 06Z OVC015 VIS 3SM BR THRUT. OTLK...IFR CIG BR.
RMNDR...SKC. OTLK...VFR BECMG 0912 MVFR CIG MOBILE AREA.
....

11.0 Terminal Aerodrome Forecast

KOZR was the closest site with a TAF. The TAF valid at the time of the accident was issued at 2305 CDT on March 25 and was valid for a 26-hour period beginning at 2300 CDT on March 25. The TAF for KOZR was as follows:

TAF AMD KOZR 260405Z 2604/2706 18006KT 9999 BKN005 OVC030 QNH2987INS
BECMG 2605/2606 29006KT 6000 BR OVC006 QNH2991INS
BECMG 2615/2616 18006KT 9999 NSW BKN012 QNH2997INS
BECMG 2617/2618 20006KT 8000 -SHRA BKN010 QNH2998INS
TEMPO 2618/2622 22010G15KT 4800 -TSRA BKN006CB
BECMG 2700/2701 17006KT 9999 NSW BKN007 QNH3002INS
TX23/2621Z TN15/2612Z AMD 260400=

The forecast valid at the accident time expected a wind from 290° at 6 knots, 4 miles visibility, mist, an overcast ceiling at 600 feet agl, and a minimum altimeter setting of 29.91 inches of mercury.

Dothan Regional Airport (KDHN) was the closest site with a NWS TAF located 27 miles east-northeast of the accident site. The TAF valid at the time of the accident was issued at 1823 CDT on March 25 and was valid for a 24-hour period beginning at 1900 CDT on March 25. The TAF for KDHN was as follows:

TAF KDHN 252323Z 2600/2624 **12004KT 3SM -RA BR BKN004 OVC030**
FM260600 VRB03KT 1SM BR SCT003 OVC005
FM261300 18006KT 4SM TSRA BR SCT008 OVC010CB
FM262100 23006KT P6SM BKN050=

The forecast valid at the accident time expected a wind from 120° at 4 knots, 3 miles visibility, light rain and mist, a broken ceiling at 400 feet agl, and overcast skies at 3,000 feet agl.

12.0 National Weather Service Area Forecast Discussion

The National Weather Service Office in Tallahassee, Florida, issued an Area Forecast Discussion (AFD) at 1929 CDT on March 25. The aviation section of the AFD mentioned that IFR would be present at all airports overnight with improving conditions by the daytime on March 26. The chance for rain was expected overnight, but rain coverage was expected to be more after 0700 CDT:

FXUS62 KTAE 252329
AFDTAE

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE TALLAHASSEE FL
729 PM EDT FRI MAR 25 2016

.Aviation...

[Through 00Z Saturday]... Showers have decreased in coverage with only ABY and DHN reporting rain at 00Z. Expect all sites to reach IFR overnight and only improve to MVFR on Saturday. Rain chances will increase after 12Z with widespread coverage through the day.

&&

.Prev Discussion [402 PM EDT]...

.Near Term [Through Tonight]...

Areas of rain and embedded thunderstorms that were far more widespread this morning have consolidated into a narrower band stretching from DeFuniak Springs to Marianna to Tifton as of 19Z. As the low-level jet further weakens and pivots to the east later this afternoon and evening, the areal coverage and intensity of rain should continue to gradually diminish. We maintained relatively high PoPs this afternoon where rain is currently occurring, but overnight limited PoPs to 40% or lower. The next round of rain should begin in earnest tomorrow - outlined below in the short term section. With the expectation that cloud cover will persist overnight and the front should stall, we are not expecting a lot of cooling, and lows in most areas should be in the 60s (as were temps for much of the day today over most of the area).

.Short Term [Saturday Through Sunday Night]...

A broad full CONUS northern stream trough will be in place through the short term forecast period. A shortwave currently over the Pacific Northwest will move through the Four Corners region on Saturday, the Central Plains on Sunday, and into the Midwest on Sunday night. At the same time, the southern stream will nose into the Southeast beginning on Saturday, and provide a deep tropical southwesterly fetch through the period. At the surface, a frontal boundary currently draped across the region will gradually lift northwest on Saturday, before moving back into the Tri-State region on Sunday as it weakens.

The tropical connection will advect anomalously high PWAT values into the Tri-State region Saturday and especially on Sunday. Values will increase from 1.5"-1.75" Saturday, to as high as 2" on Sunday. This will yield the potential for some very heavy rainfall at times. More specifics on this threat can be found in the hydrology discussion below.

As far as the convective evolution is concerned, it will likely be driven by a couple convective clusters. The first should develop in the northeast Gulf along the aforementioned front late tonight and move through the Tri-State region all day Saturday. The next round will likely form in the north-central Gulf along the retreating front early Sunday morning, moving into the Tri-State region some time on Sunday. In between the main rounds of convection, ragged stratiform rain should be expected.

Regarding severe weather, widespread severe thunderstorms are not expected. There will be plenty of instability for thunderstorms through the period, though deep layer shear is expected to be marginal. Steep lapse rates are expected to advect inland both Saturday and Sunday, and will likely have the greatest affect on thunderstorms at the onset of convection, before transitioning to moist adiabatic as convection expands throughout the region. With

meager low-layer shear each day, expect the primary threats in
isolated strong to severe storms to be hail or damaging winds.
.Long Term [Monday Through Friday]...
Drier air will arrive on Monday after the cold front finally sweeps
all of the deep layer moisture out to the east. After the passage of
this front, minimum temperatures could drop into the lower 50s on
Monday night and Tuesday morning. After a couple of dry and
seasonable days, another frontal system will approach the area.
Advection of warm and moist air from the Gulf of Mexico ahead of the
front will promote an increase in the humidity in the later parts of
the week. This warm and humid southerly flow will also promote
isentropic lift over the region. PoPs will return to the forecast
Wednesday and through the rest of the period.
.Marine...
A relatively weak pressure pattern will keep winds and seas below
headline levels (outside of convection) through early next week.
Heavy rain and thunderstorms are expected through the weekend,
with some storms possibly becoming severe.
.Fire Weather...
A stalled frontal boundary will result in widespread showers and
thunderstorms through the weekend. Most of the area will receive a
wetting rain at some point. Drier air will move in Monday but RH
values will stay above critical thresholds.
.Hydrology...
Widespread 3 to 5 inches of rain are expected through Sunday night
on top of what has already fallen through today. Around 1 to 2
inches of it will come Saturday, with the remainder expected on
Sunday. Each day isolated higher amounts doubling the widespread
averages are possible (especially on Sunday). The rain today and
tomorrow will likely be more antecedent, resulting in little to
no flooding concerns. However, by Sunday isolated flash flooding
will be possible as the bulk of the rain falls on saturated soils.
A flash flood watch may be issued tonight or tomorrow for expected
impacts on Sunday.
Regarding river flooding, the highest impacts will likely be felt
across the Florida Panhandle and into extreme southern Georgia.
Ensemble guidance is most likely underestimating rainfall amounts
and still forces many rivers in these areas into action stage. The
Choctawhatchee, Shoal, and Apalachicola are already in action
stage and should be expected to at least reach minor flood stage.
Levels could creep even higher in these basins should they be
impacted by the isolated higher amounts. Depending on the exact
locations of heaviest rain, the Ochlockonee may also reach flood
stage when all is said and done.
&&
.Preliminary Point Temps/PoPs...
Tallahassee 65 73 66 74 65 / 40 90 70 100 80
Panama City 63 73 67 70 65 / 40 90 80 100 70
Dothan   58 75 65 71 60 / 20 70 70 90 50
Albany   60 73 65 74 62 / 30 70 60 90 70
Valdosta   64 74 66 73 65 / 30 90 30 100 90
Cross City   67 77 67 76 68 / 30 60 10 90 80
Apalachicola 65 71 66 70 66 / 40 90 70 100 80
&&
.TAE WATCHES/WARNINGS/ADVISORIES...
FL...High Rip Current Risk until 4 AM EDT /3 AM CDT/ Saturday FOR

Coastal Bay-Coastal Gulf-South Walton.
GA...NONE.
AL...NONE.
GM...NONE.
&&
$$

13.0 Winds and Temperature Aloft Forecast

The NWS winds and temperatures aloft forecast valid for the flight is included below:

FBUS31 KWNO 251959
FD1US1
_DATA BASED ON 251800Z
VALID 260000Z FOR USE 2000-0300Z. TEMPS NEG ABV 24000
FT 3000 6000 9000 12000 18000 24000 30000 34000 39000

PFN 1818 2418+12 2524+08 2531+03 2537-13 2444-25 224540 225051 225561

Panama City (PFN) was the closest site to the accident site with a NWS winds and temperatures forecast with PFN located 59 south-southeast of the accident site. The PFN forecast indicated a wind at 3,000 feet from 180° at 18 knots.

14.0 Pilot Weather Briefing[28]

The accident pilot did not receive an official weather briefing from Lockheed Martin Flight Service (LMFS) or from Direct User Access Terminal Service (DUATS) and was not required to do so. The accident pilot did check the weather before the flight down to the automobile accident scene[29], but it is unknown what weather information the accident pilot reviewed. It is unknown if the accident pilot checked any weather information after landing at the automobile accident scene before the accident flight. Metro Aviation Inc. provides internet based, NWS approved, weather information to each of its bases of operation. This information was confirmed to have been readily available to the accident pilot at the time of the flight request to respond to the car accident. The accident pilot completed an Operational Control Form-1 (OCF-1) at the start of the pilot's shift around 1928 CDT on March 25. On the OCF-1, the accident pilot reported the weather as "yellow" (attachment 2). If the accident pilot had reviewed weather conditions after the 2321 CDT March 25 notification time, the surface observations, TAFs, and AIRMET Sierra would have all indicated LIFR to IFR conditions near the car accident site. There is no record of the accident pilot receiving or retrieving any additional weather information before the accident flight, or before and during the flight to the car accident scene. No additional weather information was provided to the accident pilot by Metro Operational Control Center (Metro OCC) after the current flight tracking record change was done by Haynes Ambulance Communication Center (HCC) at 2359 CDT on March 25 (discussed in section 15.0).

[28] For more information see the factual data contained in the docket for this accident.
[29] For more information see Witness Statements and Interview Summaries contained in the docket for this accident.

15.0 Metro Aviation Inc. Operational Control Center

There were two Metro OCC personnel on duty before and during the time of the accident at Metro OCC. The trainee Operational Control Coordinator stated that the accident flight request to the car accident scene came into the Metro OCC after 2300 CDT on March 25 with the flight being acknowledged. The weather was reviewed using information from approved FAA resources and through their Schneider Electric weather source (attachment 1). To the best of the knowledge of the trainee Operational Control Coordinator there was no reason to potentially turn down a flight based on the weather conditions reviewed (attachment 1). A review of the Metro Aviation Inc. post accident review document noted that latitude and longitude provided by HCC for the car accident scene was incorrectly formatted and this incorrectly formatted latitude and longitude was not corrected until after the accident flight had departed for the car accident scene (attachment 2). However, HCC noted that the format for the latitude and longitude provided to Metro OCC for the accident flight, was in the same latitude and longitude format that HCC had been providing to Metro OCC for the past 2 years. The HCC latitude and longitude format provided to Metro OCC was part of the standard procedure and formatting.[30] Based on the information provided by Metro Aviation in attachment 3, the exemplar provided was noted to contain the same latitude and longitude format that was used on the accident flight, and mentioned by HCC. Page 5 of attachment 3 under requested route also had the latitude and longitude formatted without "N" or "W" in the flight release.

For the accident flight, Metro OCC mentioned their software only recognized the car accident scene as being near the Troy Regional Medical Center and therefore only queried NWS information for weather reporting points close to KTOI (attachment 2). In addition, the trainee Operational Control Coordinator reviewed the Release Summary for the accident flight with the senior Operational Control Coordinator providing no oversight of the review (attachment 2). The trainee Operational Control Coordinator was contacted and added that on the night of the accident he and the senior Operational Control Coordinator were using the "old system" or "OCC Helper" which the trainee Operational Control Coordinator was not that familiar with. The trainee Operational Control Coordinator mentioned "OCC Helper" could crash while one was looking at it and flights could be airborne 15 minutes before a person was aware of it. In addition, the trainee Operational Control Coordinator mentioned that the coordinates for the location of the automobile accident were correct, but that the format was not correct in the OCC Helper. The trainee Operational Controller Coordinator stated that the latitude and longitude format was a common problem on the OCC Helper and that Metro OCC personnel had to reformat the latitude and longitude coordinates at times to get the coordinates to work on the OCC Helper. The trainee Operational Control Coordinator mentioned that HCC would not have known of any formatting issues with Metro's OCC Helper software. The trainee Operational Control Coordinator stated that the OCC Helper software did not show them the weather the night of the accident. He and the senior Operational Control Coordinator reviewed the weather the night of the accident, but nothing drew their attention to the weather that night as they could only see the weather for the Troy Base and Baptist Medical Center in Montgomery.[31] With the internal coordinate formatting issues with OCC Helper the night of the accident, the trainee Operational Control Coordinator mentioned they could not see the weather for Enterprise and

[30] For more information see Witness Statements and Interview Summaries contained in the docket for this accident.
[31] For more information see Witness Statements and Interview Summaries contained in the docket for this accident.

Dothan. The senior Metro OCC person on duty was contacted regarding the statement he provided and he did not choose to provide any additional information.[32]

Before the accident, it was common practice for communication centers, such as HCC, to fill out only the first segment, or first few segments of the total flight route on the OCF-2 forms when sending that information into Metro OCC for review (attachment 2). Then when all the segments of flight were known, it was common practice to go back and complete or adjust the OCF-2 form in the official Metro OCC Release Summary (attachment 2). This adjustment of the flight route occurred for the accident flight with the initial flight notification on the OCF-2 form from HCC being at 2321 CDT on March 25 and a current flight tracking record change done by HCC at 2359 CDT on March 25 (attachment 2). For more information regarding the practices and procedures, including technology and resources, for Metro Aviation prior to April 13, 2016, please see attachment 3.[33]

After the accident, Metro Aviation Inc. issued a company memo and customer memorandum (attachments 4 and 5), which directed all flight requests to have the complete route entered in a flight request, rather than post takeoff adjustments being made to the flight requests. In addition, weather was directed to be assessed at the flight origin, along each route leg, and at each destination point (attachment 4). If a customer communication center does not know a destination to enter, they are directed to enter the farthest reasonable possible destination point. For more information regarding these changes please see attachments 4 and 5 and the Operations data located in the docket of this accident.

16.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for the accident site on March 26, 2016, indicated the following:

SUN	
Begin civil twilight	0615 CDT
Sunrise	0639 CDT
Sun transit	1249 CDT
Sunset	1900 CDT
End civil twilight	1924 CDT

MOON	
Moonrise	2103 CDT on March 25
Moon transit	0250 CDT
Moonset	0832 CDT
Moonrise	2155 CDT

The phase of the Moon was Waning Gibbous with 91% of the Moon's visible disk illuminated. The Moon would have been visible above the solid layer of cloud cover at 16,000 feet (section 5.0).

[32] For more information see Witness Statements and Interview Summaries contained in the docket for this accident.
[33] For more information see the factual data contained in the docket for this accident.

17.0 Video and Witness Information[34]

A video of the accident flight takeoff was taken and provided for the investigation. During the takeoff sequence very light to light precipitation can be seen falling in the field surrounding the accident aircraft. The precipitation was also visible in the accident aircraft's light beams directed forward from the accident aircraft.

One of the witnesses at the car accident scene mentioned that there was fog down to eye level or visibility level and slight drizzle around the time of the accident flight takeoff. Another witness stated that there was a heavy mist and the ceiling was "very low, maybe 100 foot." This witness also stated that a person could see the tops of the trees, but with a flashlight a person could easily tell where the fog started. Another witness stated that at the time of the accident aircraft's departure that the fog was mixed with rain and the fog was "kind of pretty thick." This 3rd witness mentioned that the accident aircraft flew over the road, which wasn't very far from the accident aircraft previous landing zone and the witness lost all visual on the accident aircraft due to the fog. For more information regarding the witness information, please see the witness statements located in the docket for this accident.

F. LIST OF ATTACHMENTS

Attachment 1 – Accident Statement from the trainee Operational Control Coordinator at Metro OCC

Attachment 2 – Post-Accident Review of Metro Aviation Inc. Operational Control Center

Attachment 3 – Metro OCC Operations prior to April 13, 2016

Attachment 4 – Metro Aviation Inc. company memo from March 28, 2016

Attachment 5 – Metro Aviation Inc. customer memorandum from April 6, 2016

Paul Suffern
NTSB, AS-30

[34] For more information see the factual data contained in the docket for this accident.