NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

April 14, 2017

Group Chairman's Factual Report

METEOROLOGY

ERA17FA074

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A. ACCIDENT

Location: Near Port Orange, Florida
Date: December 27, 2016
Time: 1757 eastern standard time
2257 Coordinated Universal Time (UTC)
Airplane: Epic LT, N669WR

B. METEOROLOGIST

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National Transportation Safety Board

C. SUMMARY

On December 27, 2016, about 1757 eastern standard time, N669WR, an experimental amateur-built Epic LT, sustained substantial damage when it impacted terrain while executing an instrument approach to Spruce Creek Airport (7FL6), Port Orange, Florida. The private pilot and his passenger were fatally injured. Instrument meteorological conditions prevailed for the flight that originated at the Millington Regional Jetport (NQA), Millington, Tennessee about 1558 and was destined for 7FL6. An instrument flight rules flight plan was filed for the personal flight conducted under 14 *Code of Federal Regulations* Part 91.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Meteorologist did not travel for this investigation and gathered the weather data for this investigation from 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 are eastern standard time (EST) on December 27, 2016, and are based upon the 24-hour clock, where local time is -5 hours from UTC, and UTC=Z (unless otherwise noted). Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 29.0803° N, longitude 81.0467° W, at an approximate elevation of 23 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 and the Weather Prediction Center, located in College Park, Maryland. These are the base products used in describing synoptic weather features and in the creation of forecasts and warnings for the NWS. Reference to these charts can be found in the joint NWS and Federal Aviation Administration Advisory Circular "Aviation Weather Services", AC 00-45H.

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart for 1600 and 1900 EST are provided as figures 1 and 2 with the approximate location of the accident site marked within the red circle. The charts depicted a low-level trough[1] moving westward across the accident site from 1600 to 1900 EST. Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present. At 1900 EST the low-level trough was located in central Florida oriented north to south. There was a surface high pressure center located in the northeastern Gulf of Mexico with a pressure of 1022-hectopascals (hPa) (figure 1). A cold front oriented southwest to northeast moved slowly eastward between 1600 and 1900 EST and was located in central Georgia and Alabama by 1900 EST. The station models around the accident site at both 1600 and 1900 EST depicted air temperatures in the low 60's to low 70's degrees Fahrenheit (°F), dew point temperatures in the mid 60's °F with temperature-dew point spreads of 6° F or less, a northeast to southeast wind at 10 knots around 1600 EST with a calm wind at 1900 EST, mist, mostly clear skies at 1600 EST, and cloudy skies by 1900 EST.

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

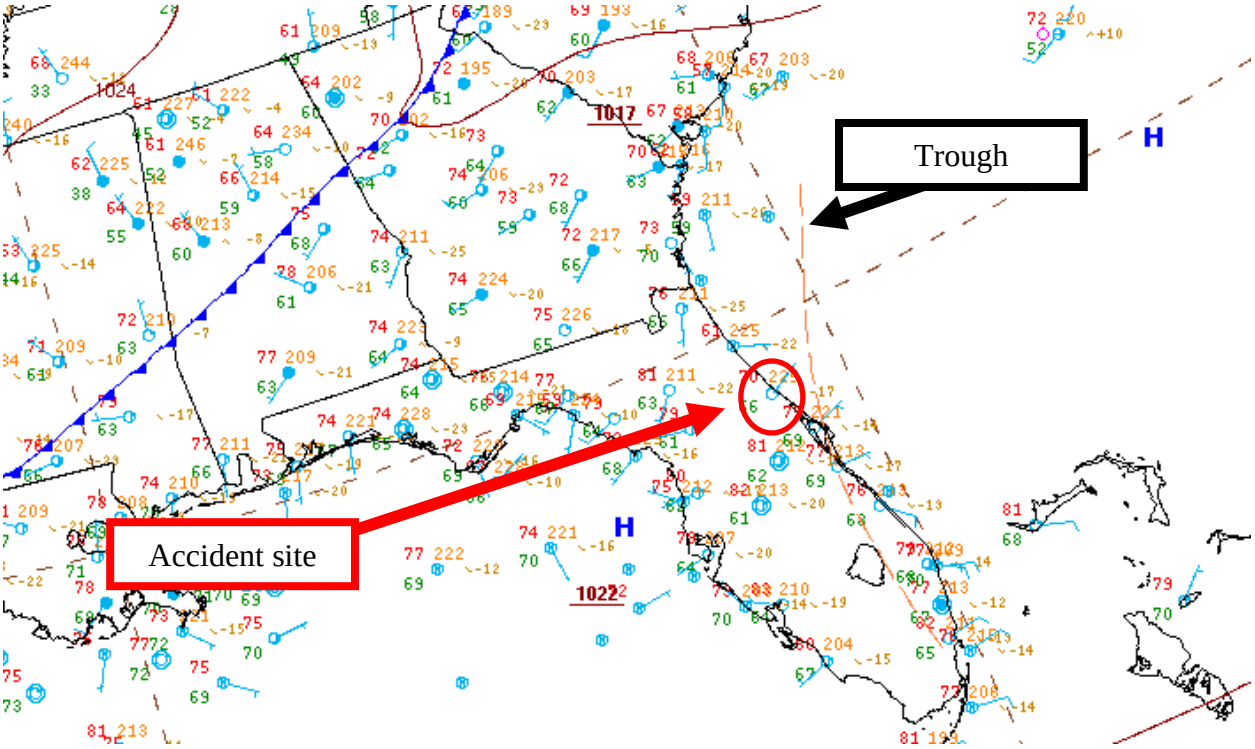

Figure 1 – NWS Surface Analysis Chart for 1600 EST

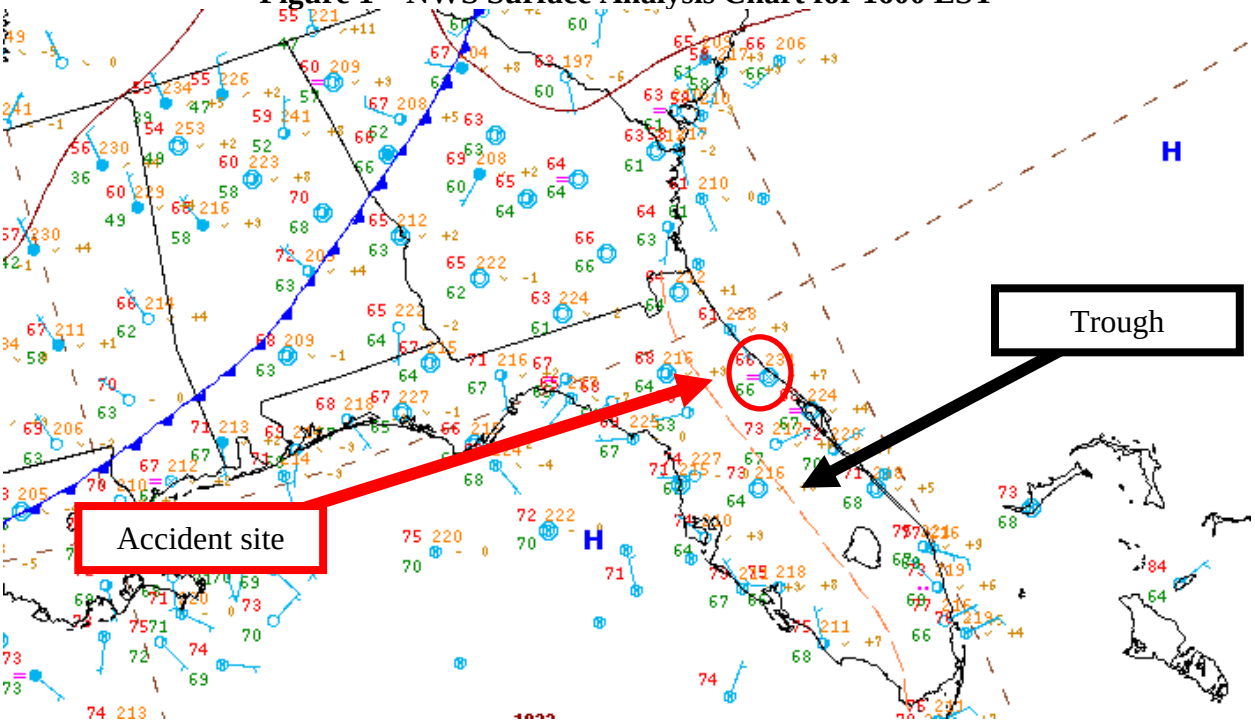

Figure 2 – NWS Surface Analysis Chart for 1900 EST

1.2 Upper Air Charts

The NWS Storm Prediction Center Constant Pressure Charts for 1900 EST at 925-, 850-, 700-, 500-, and 300-hPa are presented in figures 3 through 7. There was a low-level trough located along the eastern US coast at 925- and 850-hPa, but the low-level trough did not reach all the way down to Florida. This low-level trough was associated with the cold front located in the southeastern United States (figures 1 and 2). There was an east wind of 5 to 10 knots at 925- and 850-hPa (figures 3 and 4) above the accident site at 1900 EST. The wind became southwesterly by 700-hPa with a wind speed of 15 knots. The 15-knot southwesterly wind at 700-hPa became a 50-knot west-northwesterly wind by 300-hPa (figure 7).

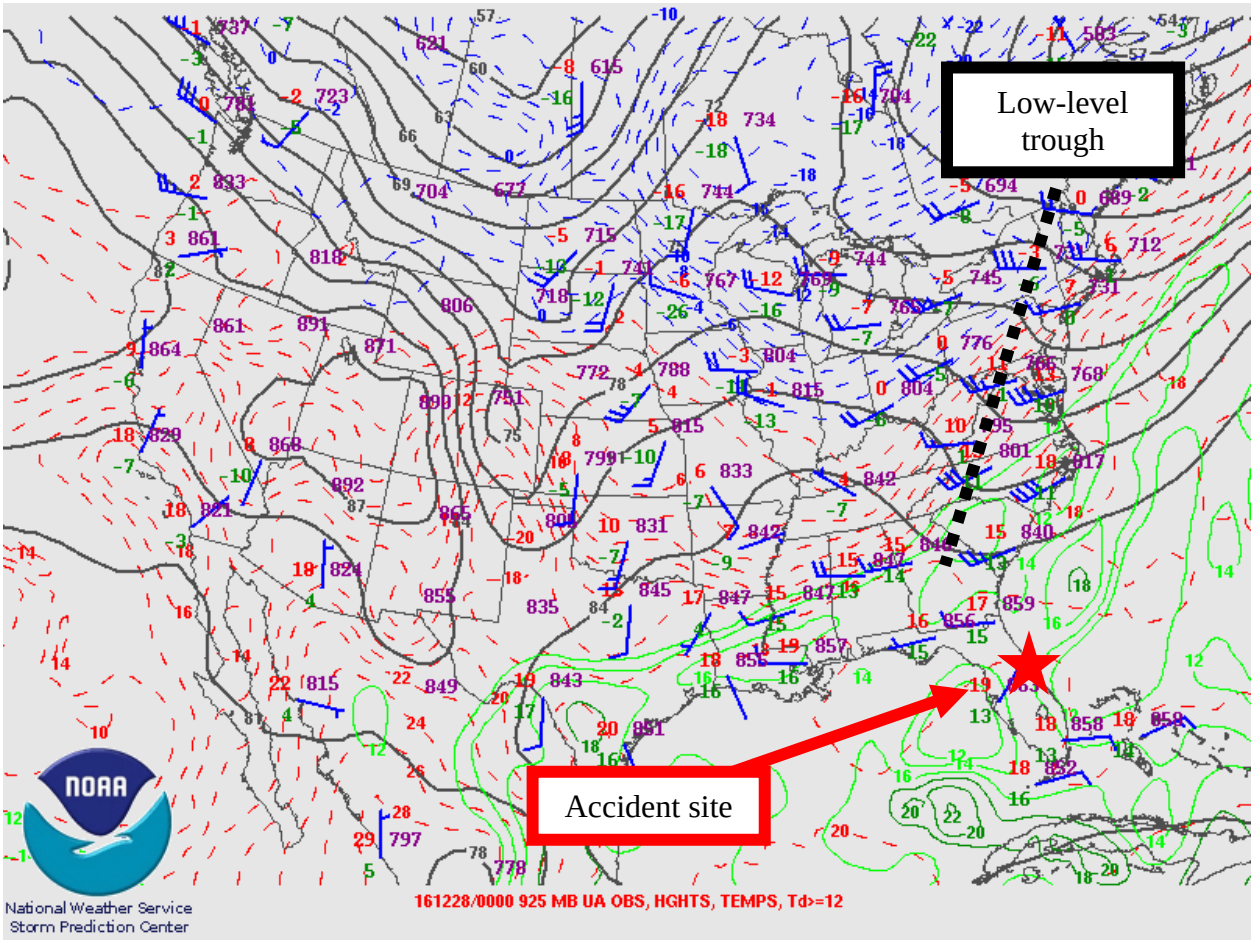

Figure 3 – 925-hPa Constant Pressure Chart for 1900 EST

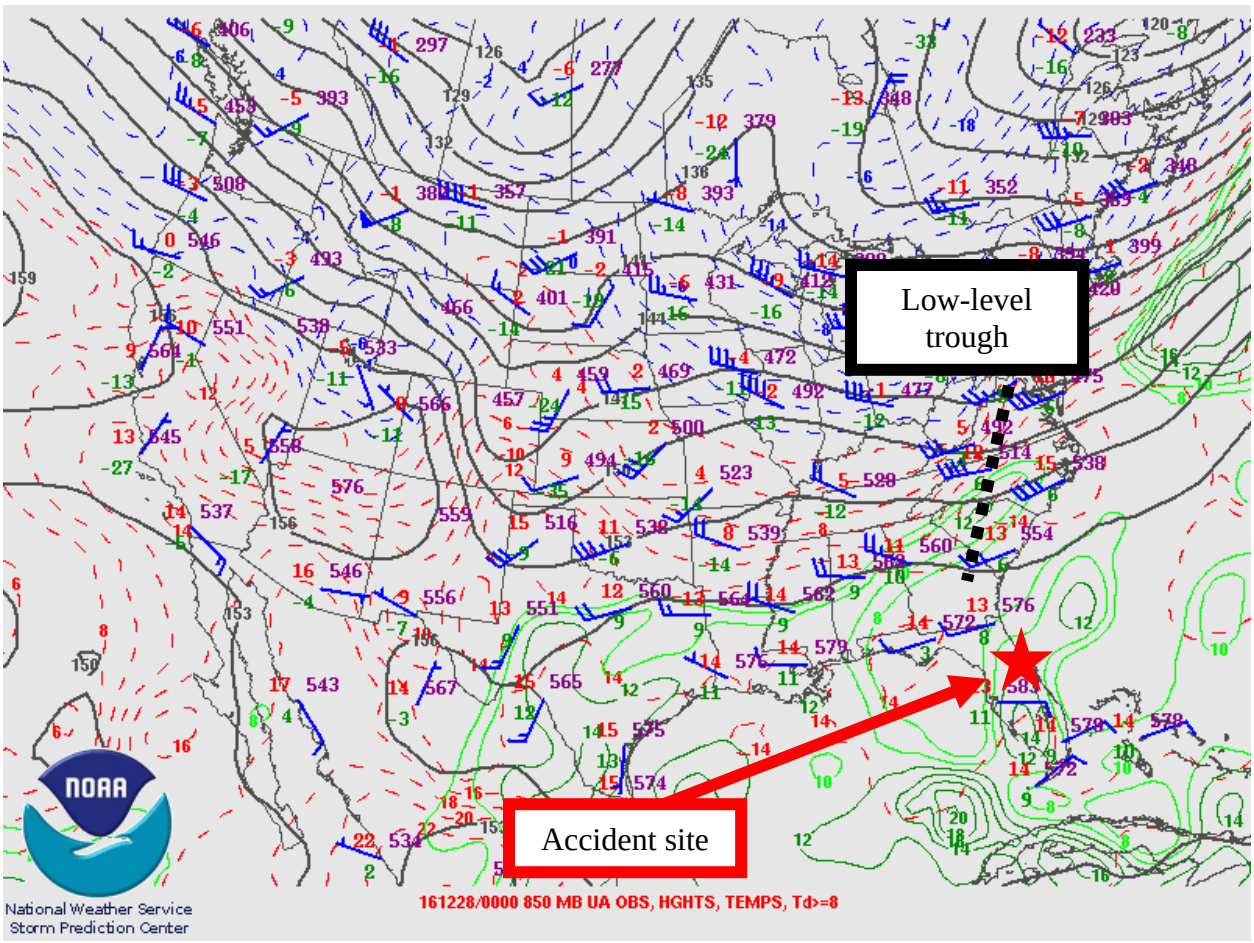

Figure 4 – 850-hPa Constant Pressure Chart for 1900 EST

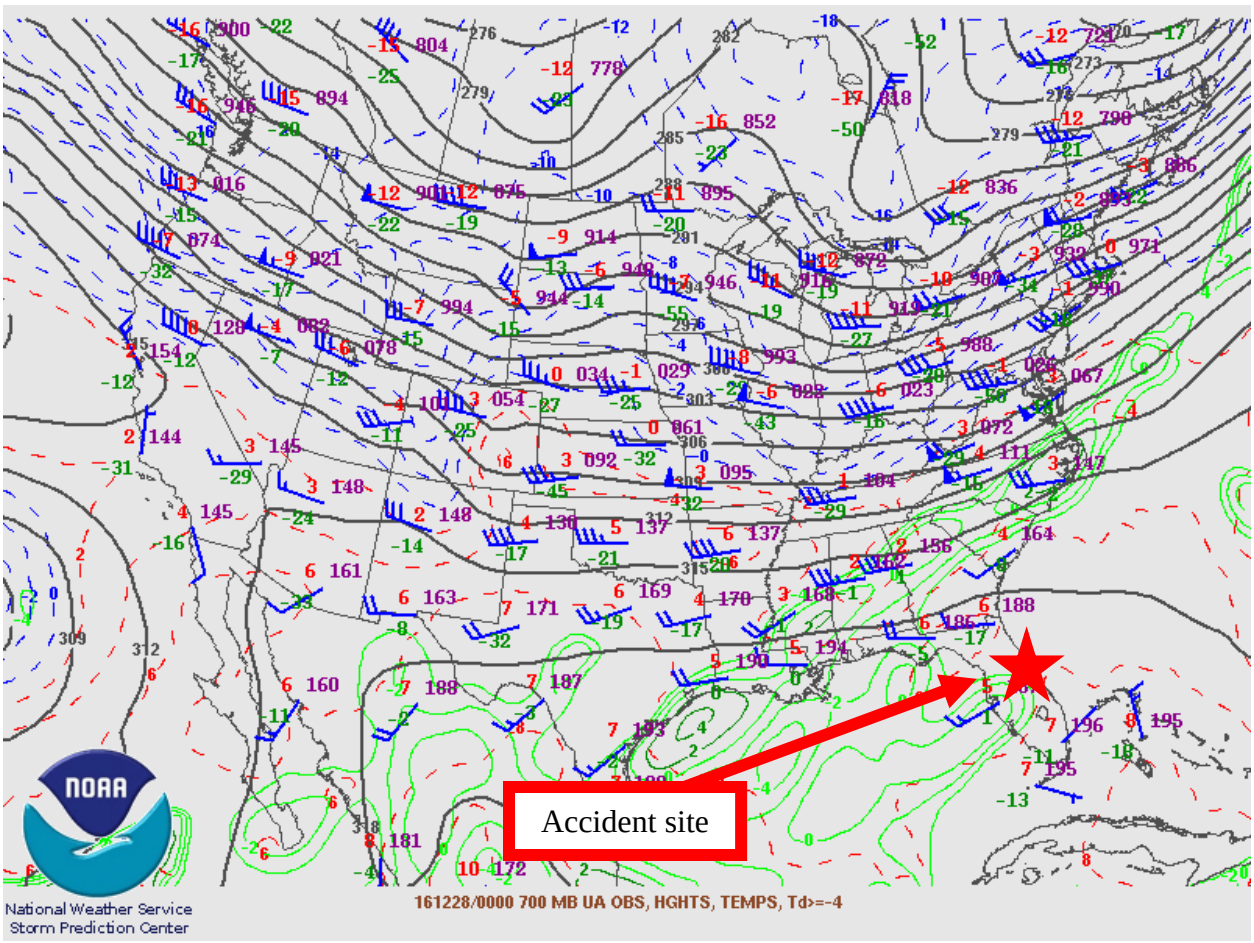

Figure 5 – 700-hPa Constant Pressure Chart for 1900 EST

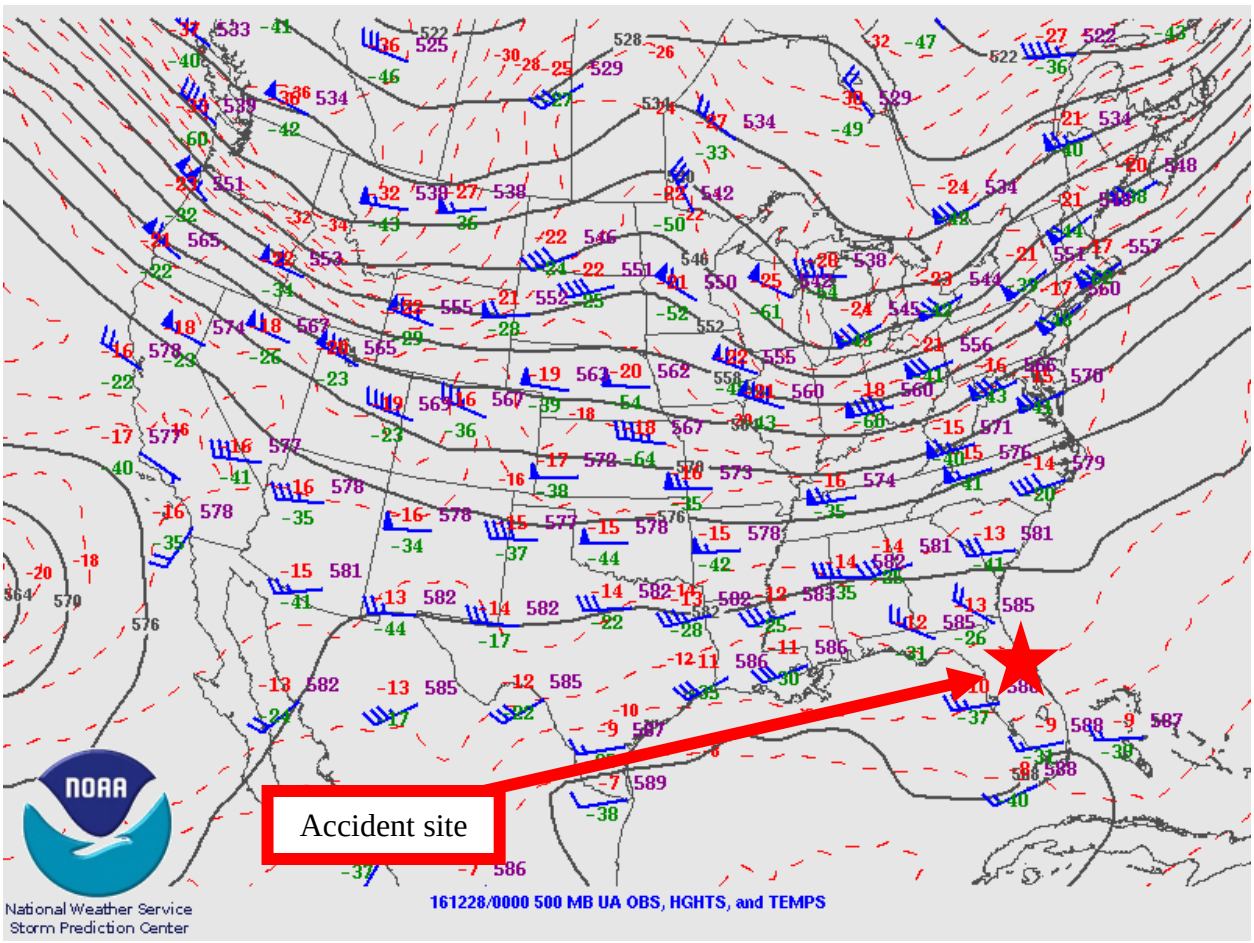

Figure 6 – 500-hPa Constant Pressure Chart for 1900 EST

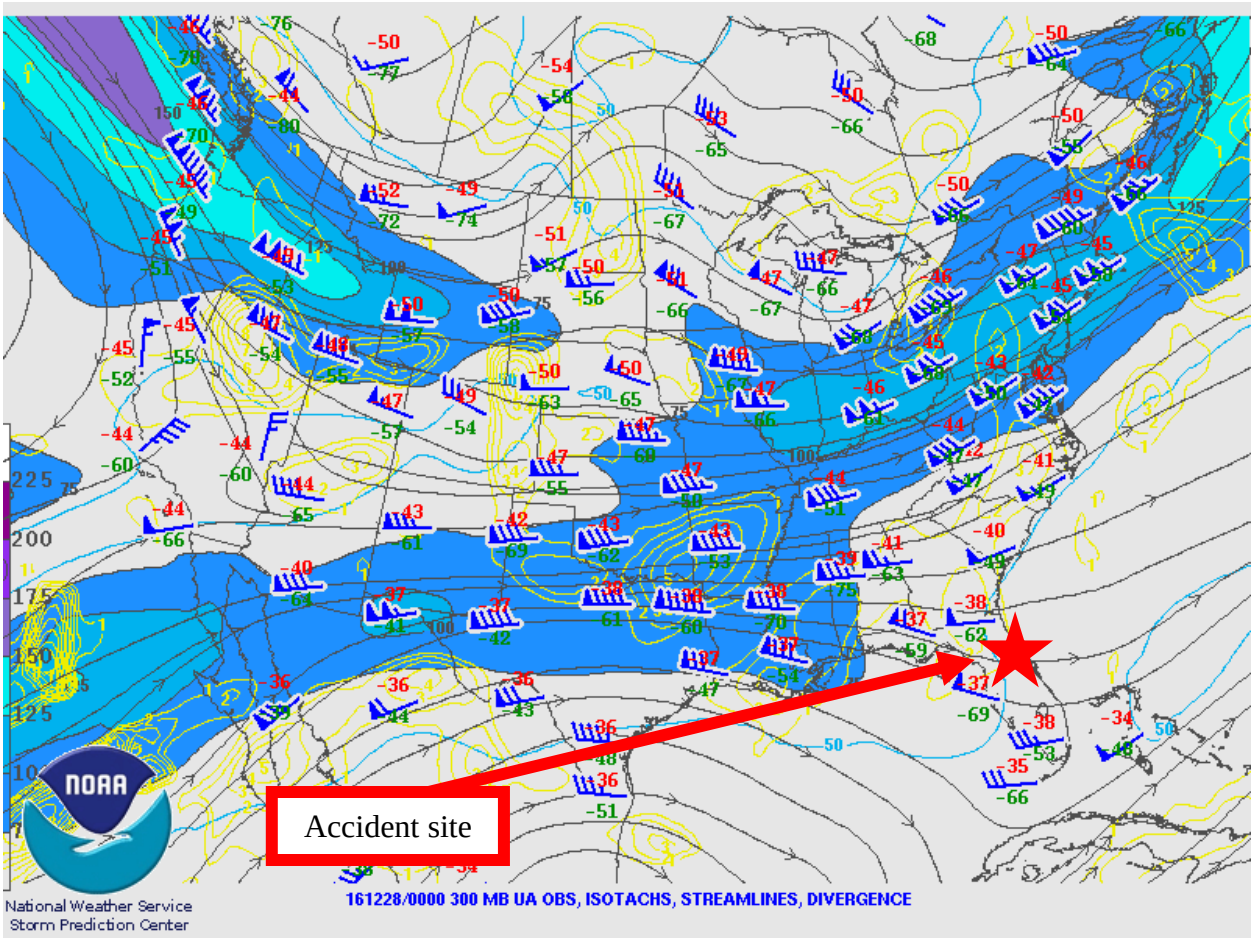

Figure 7 – 300-hPa Constant Pressure Chart for 1900 EST

2.0 Storm Prediction Center (SPC) Products

There were no thunderstorms forecast for the accident site at the accident time.

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 with visibility in statute miles for this section. Figure 8 is a sectional chart with the accident site and the closest weather reporting locations to the accident site marked.

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

7FL6 was the closest airport to the accident site and was the destination airport. 7FL6 was located 7 miles south of Daytona Beach, Florida, and had an official weather station which was an Automated Weather Observing System (AWOS[2]) whose reports were not supplemented. 7FL6 was an AWOS that did not have a ceilometer or way to measure cloud bases or ceiling conditions. 7FL6 was located within a mile of the accident site, at an elevation of 24 feet, and had a 5° westerly magnetic variation[3] (figure 8). The following observations were taken and disseminated during the times surrounding the accident (figure 9):

2 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.

3 Magnetic variation – The angle (at a particular location) between magnetic north and true north. 2000, latest measurement taken from http://www.airnav.com/airport/7FL6

Data for 7FL6											
Date(Z)	Time(Z)	Time(L)	Temperature(F)	Dewpoint(F)	True Direction(degrees)	Magnetic Direction(degrees)	Speed(knots)	Gust(knots)	Visibility(SM)	Altimeter(inHG)	Density Altitude(feet)
12/28/2016	1455	0955	69	69	230	230	0	0	25	30190	400
12/28/2016	1355	0855	64	64	300	300	0	0	1.5	30190	100
12/28/2016	1255	0755	62	62	220	220	0	0	0.25	30170	0
12/28/2016	1155	0655	62	62	220	220	0	0	0.25	30160	0
12/28/2016	1055	0555	62	62	220	220	0	0	0.25	30160	0
12/28/2016	0955	0455	62	61	190	190	0	0	0.5	30150	0
12/28/2016	0855	0355	63	62	190	190	0	0	0.75	30150	100
12/28/2016	0755	0255	64	64	190	190	0	0	0.5	30160	100
12/28/2016	0655	0155	64	64	190	190	0	0	2.5	30170	100
12/28/2016	0555	0055	64	64	190	190	0	0	0.25	30170	100
12/28/2016	0455	2355	64	64	190	190	0	0	2	30180	100
12/28/2016	0355	2255	64	64	80	70	0	0	1.25	30190	100
12/28/2016	0255	2155	65	64	80	70	0	0	0.75	30200	100
12/28/2016	0155	2055	66	65	80	70	0	0	0.25	30190	200
12/28/2016	0055	1955	67	66	80	70	0	0	0.25	30200	300
12/28/2016	0004	1904	67	66	80	70	0	0	0.5	30190	300
12/27/2016	2255	1755	67	66	110	110	3	0	2.5	30180	300
12/27/2016	2155	1655	68	65	70	60	4	0	25	30180	300
12/27/2016	2055	1555	70	65	80	70	5	0	40	30180	500
12/27/2016	1955	1455	73	66	50	40	8	0	40	30190	600
12/27/2016	1855	1355	72	66	80	70	5	0	40	30210	600
12/27/2016	1755	1255	79	66	330	330	2	0	40	30220	1000
12/27/2016	1655	1155	77	68	220	210	2	0	40	30240	800
12/27/2016	1555	1055	71	67	30	20	1	0	25	30290	400
12/27/2016	1455	0955	66	66	60	60	2	0	1.75	30300	100
12/27/2016	1355	0855	63	62	340	330	0	0	1.5	30280	-100
12/27/2016	1255	0755	61	60	80	70	0	0	0.25	30280	-200
12/27/2016	1155	0655	62	61	80	70	0	0	0.75	30270	-100

Figure 9 – 7FL6 METAR data from around the accident time

7FL6 weather at 1655 EST, wind from 070° at 4 knots, 25 miles visibility, temperature 68° F, dew point temperature 65° F, and altimeter setting 30.18 inches of mercury. Remarks, density altitude 300 feet.

7FL6 weather at 1755 EST, wind from 110° at 3 knots, 2.5 miles visibility, temperature 67° F, dew point temperature 66° F, and altimeter setting 30.18 inches of mercury. Remarks, density altitude 300 feet.

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7FL6 weather at 1904 EST, wind calm, 0.5 miles visibility, temperature 67° F, dew point temperature 66° F, and altimeter setting 30.19 inches of mercury. Remarks, density altitude 300 feet.

New Smyrna Beach Municipal Airport (KEVB) was the next closest official weather station to the accident site, and was located 3 miles northwest of New Smyrna Beach, Florida. KEVB had an AWOS whose reports were supplemented by air traffic control. KEVB was located 5 miles east-southeast of the accident site, at an elevation of 10 feet, and had a 4° westerly magnetic variation[5] (figure 8). The following observations were taken and disseminated during the times surrounding the accident:

[4] The bold sections in this NWS product and the rest of products in this report are intended to highlight the 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.

[5] Magnetic variation – The angle (at a particular location) between magnetic north and true north. 1990, latest measurement taken from http://www.airnav.com/airport/KEVB

[1147 EST] METAR KEVB 271647Z 00000KT 10SM SCT006 23/19 A3026=

[1247 EST] METAR KEVB 271747Z 06007KT 10SM SCT016 20/17 A3023=

[1347 EST] METAR KEVB 271847Z 04010KT 2SM BR SCT020 18/17 A3021=

[1450 EST] METAR KEVB 271950Z 04010KT 2SM BR OVC006 19/18 A3020=

[1550 EST] METAR KEVB 272050Z 04010KT 1/2SM FG OVC002 18/18 A3018=

[1650 EST] METAR KEVB 272150Z 09004KT 1/2SM FG OVC002 19/19 A3017=

[1750 EST] METAR KEVB 272250Z 09004KT 1/4SM FG OVC001 19/19 A3018=

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[1850 EST] METAR KEVB 272350Z 12004KT 1/4SM FG OVC001 19/19 A3018=

[1950 EST] METAR KEVB 280050Z 00000KT 1/4SM FG OVC001 19/19 A3019=

[2050 EST] METAR KEVB 280150Z 00000KT 1/4SM FG OVC001 18/18 A3019=

[2150 EST] METAR KEVB 280250Z 00000KT 1/4SM FG OVC001 18/18 A3019 RMK LAST=

KEVB weather at 1650 EST, wind from 090° at 4 knots, a half mile visibility, fog, overcast ceiling at 200 feet above ground level (agl), temperature of 19° Celsius (C), dew point temperature of 19° C, and an altimeter setting of 30.17 inches of mercury.

KEVB weather at 1750 EST, wind from 090° at 4 knots, a quarter mile visibility, fog, overcast ceiling at 100 feet agl, temperature of 19° C, dew point temperature of 19° C, and an altimeter setting of 30.18 inches of mercury.

KEVB weather at 1850 EST, wind from 120° at 4 knots, a quarter mile visibility, fog, overcast ceiling at 100 feet agl, temperature of 19° C, dew point temperature of 19° C, and an altimeter setting of 30.18 inches of mercury.

KEVB weather at 1950 EST, wind calm, a quarter mile visibility, fog, overcast ceiling at 100 feet agl, temperature of 19° C, dew point temperature of 19° C, and an altimeter setting of 30.19 inches of mercury.

Daytona Beach International Airport (KDAB) was the next closest official weather station to the accident site, and was located 3 miles southwest of Daytona Beach, Florida. KDAB had Automated Surface Observing System (ASOS[6]) whose reports were supplemented by an official human observer. KDAB was located 6 miles north of the accident site, at an elevation of 34 feet, and had a 5° westerly magnetic variation[7] (figure 8). The following observations were taken and disseminated during the times surrounding the accident:

[1553 EST] METAR KDAB 272053Z 06005KT 10SM FEW006 FEW025 FEW100 21/19 A3019 RMK AO2 SLP225 T02110189 57017 $=

[1641 EST] SPECI KDAB 272141Z 08005KT 9SM BKN005 BKN025 BKN100 20/19 A3019 RMK AO2 T02000189 $=

[1653 EST] METAR KDAB 272153Z 07006KT 3SM BR OVC005 19/19 A3019 RMK AO2 SLP225 T01940189 $=

[1657 EST] SPECI KDAB 272157Z 07005KT 1SM BR OVC005 19/19 A3019 RMK AO2 TWR VIS 2 T01940189 RVRNO $=

[1711 EST] SPECI KDAB 272211Z 08005KT 3/4SM BR OVC003 19/19 A3019 RMK AO2 T01940189 RVRNO $=

[1726 EST] SPECI KDAB 272226Z 09004KT 1/4SM FG OVC003 19/19 A3019 RMK AO2 TWR VIS 1/2 T01890189 RVRNO $=

[1753 EST] METAR KDAB 272253Z 11005KT 1/4SM FG VV003 19/19 A3019 RMK AO2 TWR VIS 1/2 SLP225 T01890189 RVRNO $=

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[1853 EST] METAR KDAB 272353Z 00000KT 1/4SM FG VV002 19/19 A3021 RMK AO2 TWR VIS 1/2 SLP231 T01890189 10233 20189 53007 RVRNO $=

[1953 EST] METAR KDAB 280053Z 16003KT 1/4SM FG VV002 19/19 A3021 RMK AO2 SLP231 T01890189 RVRNO $=

[2053 EST] METAR KDAB 280153Z 00000KT 1/8SM FG VV002 18/18 A3021 RMK AO2 SLP231 T01830183 RVRNO $=

[2153 EST] METAR KDAB 280253Z 00000KT 1/8SM FG VV002 18/18 A3021 RMK AO2 SLP231 T01780178 54000 RVRNO $=

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

7 Magnetic variation – The angle (at a particular location) between magnetic north and true north. 2000, latest measurement taken from http://www.airnav.com/airport/KDAB

KDAB weather at 1726 EST, wind from 090° at 4 knots, a quarter mile visibility, fog, overcast ceiling at 300 feet agl, temperature of 19° C, dew point temperature of 19° C, and an altimeter setting of 30.19 inches of mercury. Remarks, station with a precipitation discriminator, tower visibility a half mile, temperature 18.9° C, dew point temperature 18.9° C, runway visual range is missing, maintenance is needed on the system.

KDAB weather at 1753 EST, wind from 110° at 5 knots, a quarter mile visibility, fog, vertical visibility at 300 feet agl, temperature of 19° C, dew point temperature of 19° C, and an altimeter setting of 30.19 inches of mercury. Remarks, station with a precipitation discriminator, tower visibility a half mile, sea level pressure 1022.5 hPa, temperature 18.9° C, dew point temperature 18.9° C, runway visual range is missing, maintenance is needed on the system.

KDAB weather at 1853 EST, wind calm, a quarter mile visibility, fog, vertical visibility at 200 feet agl, temperature of 19° C, dew point temperature of 19° C, and an altimeter setting of 30.21 inches of mercury. Remarks, station with a precipitation discriminator, tower visibility a half mile, sea level pressure 1023.1 hPa, temperature 18.9° C, dew point temperature 18.9° C, 6-hourly maximum temperature of 23.3° C, 6-hourly minimum temperature of 18.9° C, 3-hourly pressure increase of 0.7 hPa, runway visual range is missing, maintenance is needed on the system.

KDAB weather at 1953 EST, wind from 160° at 3 knots, a quarter mile visibility, fog, vertical visibility at 200 feet agl, temperature of 19° C, dew point temperature of 19° C, and an altimeter setting of 30.21 inches of mercury. Remarks, station with a precipitation discriminator, sea level pressure 1023.1 hPa, temperature 18.9° C, dew point temperature 18.9° C, runway visual range is missing, maintenance is needed on the system.

DeLand Municipal Airport (KDED) was the closest official weather station located west of the accident site, and was located 3 miles northeast of DeLand, Florida. KDED had AWOS whose reports were not supplemented. KDED was located 12 miles west of the accident site, at an elevation of 79 feet, and had a 5° westerly magnetic variation[8] (figure 8). The following observations were taken and disseminated during the times surrounding the accident:

[1555 EST] METAR KDED 272055Z AUTO 31004KT 10SM SCT046 27/17 A3016 RMK AO2=

[1615 EST] METAR KDED 272115Z AUTO 09010KT 10SM BKN044 25/19 A3016 RMK AO2=

[1635 EST] METAR KDED 272135Z AUTO 08007KT 10SM SCT044 25/19 A3016 RMK AO2=

[1655 EST] METAR KDED 272155Z AUTO 06004KT 10SM CLR 23/19 A3016 RMK AO2=

[8] Magnetic variation – The angle (at a particular location) between magnetic north and true north. 2000, latest measurement taken from http://www.airnav.com/airport/KDED

[1715 EST] METAR KDED 272215Z AUTO 10007KT 10SM CLR 23/19 A3016 RMK AO2=

[1735 EST] METAR KDED 272235Z AUTO 11006KT 10SM CLR 22/19 A3017 RMK AO2=

[1755 EST] METAR KDED 272255Z AUTO 10005KT 10SM CLR 21/19 A3017 RMK AO2=

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[1815 EST] METAR KDED 272315Z AUTO 09003KT 10SM CLR 21/19 A3018 RMK AO2=

[1835 EST] METAR KDED 272335Z AUTO 11005KT 10SM CLR 20/18 A3018 RMK AO2=

[1855 EST] METAR KDED 272355Z AUTO 10005KT 10SM CLR 20/18 A3018 RMK AO2=

[1915 EST] METAR KDED 280015Z AUTO 08005KT 10SM CLR 19/18 A3019 RMK AO2=

[1935 EST] METAR KDED 280035Z AUTO 11004KT 3SM BR BKN003 BKN050 19/19 A3019 RMK AO2 VIS 1 1/2V5=

[1955 EST] METAR KDED 280055Z AUTO 10003KT 1 1/2SM BR OVC003 19/19 A3019 RMK AO2=

KDED weather at 1735 EST, wind from 110° at 6 knots, 10 miles visibility, clear skies below 12,000 feet agl, temperature of 22° C, dew point temperature of 19° C, and an altimeter setting of 30.17 inches of mercury. Remarks, station with a precipitation discriminator.

KDED weather at 1755 EST, wind from 100° at 5 knots, 10 miles visibility, clear skies below 12,000 feet agl, temperature of 21° C, dew point temperature of 19° C, and an altimeter setting of 30.17 inches of mercury. Remarks, station with a precipitation discriminator.

KDED weather at 1815 EST, wind from 090° at 3 knots, 10 miles visibility, clear skies below 12,000 feet agl, temperature of 21° C, dew point temperature of 19° C, and an altimeter setting of 30.18 inches of mercury. Remarks, station with a precipitation discriminator.

KDED weather at 1835 EST, wind from 110° at 5 knots, 10 miles visibility, clear skies below 12,000 feet agl, temperature of 20° C, dew point temperature of 18° C, and an altimeter setting of 30.18 inches of mercury. Remarks, station with a precipitation discriminator.

The observations from 7FL6, KEVB, and KDAB surrounding the accident time indicated an east surface wind around 5 knots with LIFR[9] to IFR[10] conditions around the accident site at the accident time. The visibility dropped to 2.5 miles 2 minutes before the accident time at 7FL6. KDED remained VFR[11] with a surface east wind until 1935 EST when KDED also began observing IFR ceiling and visibility conditions.

4.0 Upper Air Data

A High-Resolution Rapid Refresh (HRRR)[12] model sounding was created for the accident site for 1800 EST. The 1800 EST sounding was plotted on a standard Skew-T log P diagram[13] with the derived stability parameters included in figure 10 (with data from the surface to 700-hPa, or 10,000 feet msl.) This data was analyzed using the RAOB[14] software package. The sounding depicted the lifted condensation level (LCL)[15] at 42 feet msl, a convective condensation level (CCL)[16] of 4,380 feet, and a level of free convection (LFC)[17] at 5,081 feet. The freezing level was 13,536 feet. The precipitable water value was 1.34 inches.

[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] 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.
[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 5 miles visibility.
[12] The HRRR is a NOAA real-time three-kilometer resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by three kilometer grids with three kilometer radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a one hour period.
[13] 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.
[14] RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamopras, Pennsylvania.
[15] Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.
[16] 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.
[17] 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.

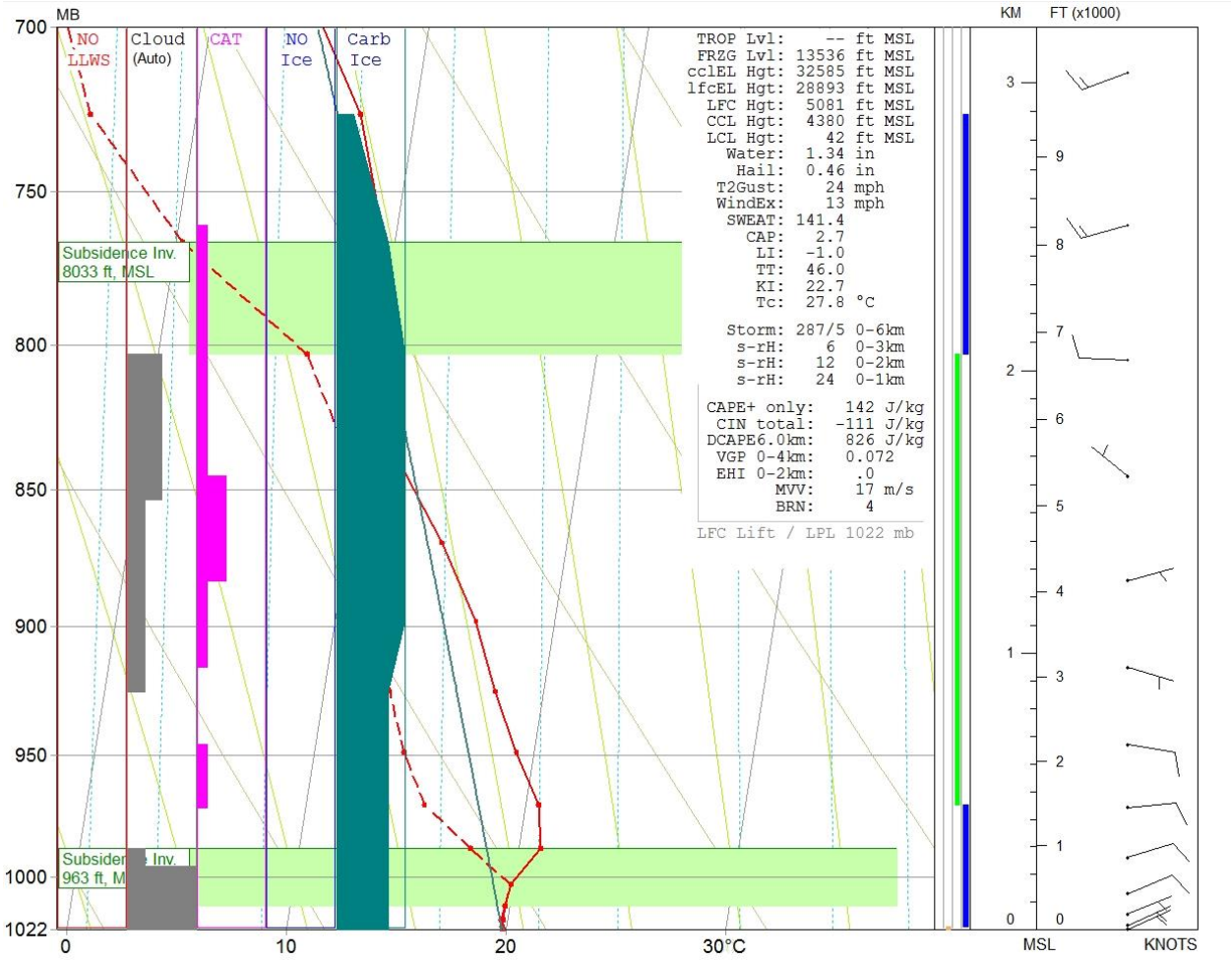

Figure 10 – 1800 EST HRRR sounding for the accident site

The 1800 EST HRRR sounding indicated a stable layer between the surface and 1,500 feet with a conditionally unstable layer between 1,500 feet and 7,000 feet. An inversion (increase in temperature with height) was in place between the surface and 1,000 feet. With the relatively moist atmosphere between the surface and 1,000 feet. RAOB indicated that clouds were likely. RAOB also indicated that clouds were likely from 3,000 feet through 7,000 feet. No icing was indicated by RAOB below 10,000 feet with the freezing level located above 13,000 feet.

The 1800 EST HRRR sounding wind profile indicated a surface wind from 065° at 5 knots with the wind remaining variable and under 10 knots through 6,000 feet. Above 6,000 feet the wind was westerly with the wind speed between 10 and 15 knots. RAOB did not indicate the possibility of low-level wind shear between the surface and 2,000 feet. RAOB did indicate the possibility of light clear-air turbulence in two layers between 1,500 feet and 8,000 feet.

5.0 Satellite Data

Visible and infrared data from the Geostationary Operational Environmental Satellite number 13 (GOES-13) data was obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. Visible and infrared imagery (GOES-13 bands 1 and 4) at wavelengths of 0.65 microns (μm) and 10.7 μm, respectively, were retrieved for the period. Satellite imagery surrounding the time of the accident, from 1500 EST through 2100 EST at approximately 15-minute intervals were reviewed, and the closest images to the time of the accident are documented here.

Figures 11 and 12 present the GOES-13 visible imagery from 1630 and 1700 EST, the closest two visible images before the sunset, at 4X magnification with the accident site marked with a red star (cloud cover was not visible after sunset on the visible imagery channel). The visible imagery indicated cloud cover above KDAB and KEVB at 1630 and 1700 EST with the cloud cover moving westward between 1630 and 1700 EST. Figures 13 and 14 present the GOES-13 infrared imagery from 1700 and 1800 EST at 8X magnification with the accident site highlighted with a red square. Inspection of the infrared imagery indicated cloud cover east of the Florida Peninsula with scattered cloud cover west of KDED. Above the accident site cloud cover was present, but because the infrared data has a 4 km x 4 km nominal resolution, it is difficult to determine where the edges of the cloud tops were near the accident site around the accident time. The lower brightness temperatures (yellows and greens, higher cloud tops) were located east of the Florida Peninsula. Based on the brightness temperatures above the accident site and the vertical temperature profile provided by the 1800 EST HRRR sounding, the approximate cloud-top heights over the accident site were 5,000 feet at 1800 EST. It should be noted these figures have not been corrected for any parallax error.

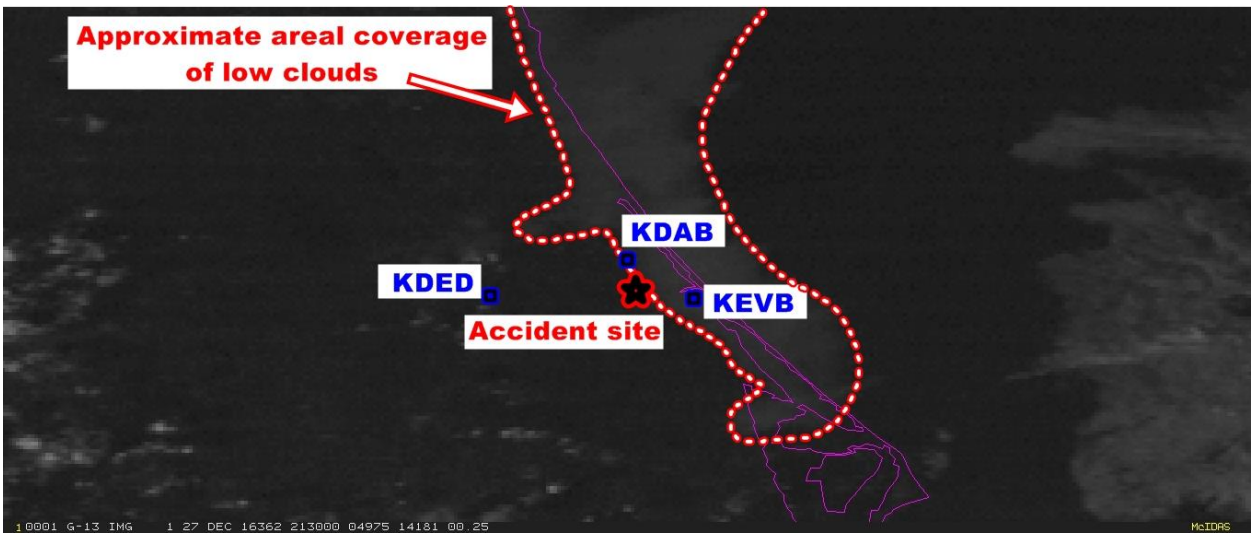

Figure 11 – GOES-13 visible image at 1630 EST

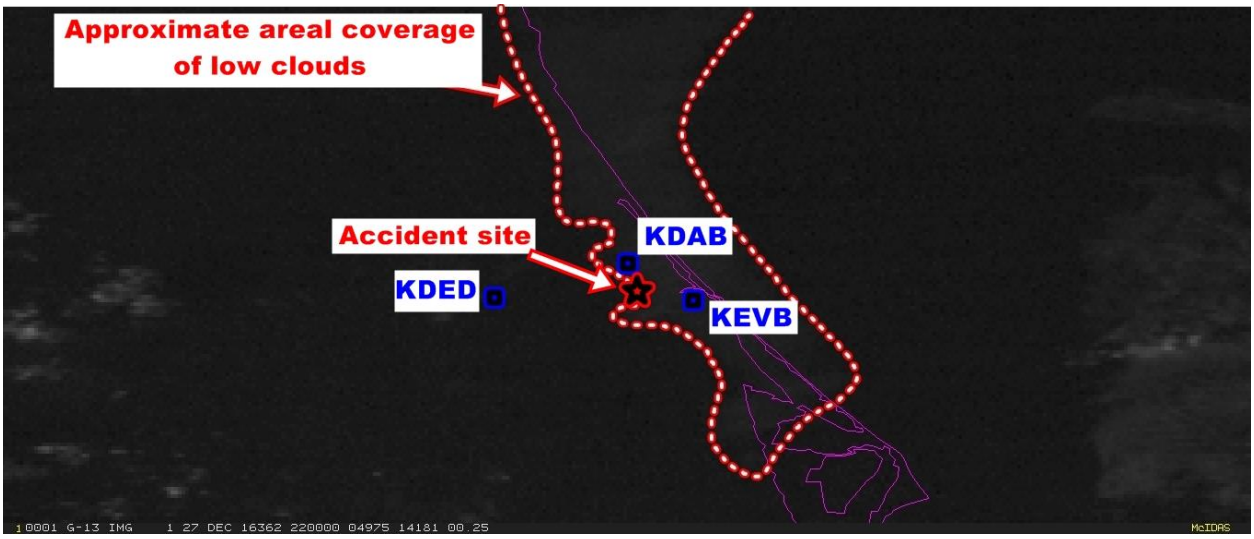

Figure 12 – GOES-13 visible image at 1700 EST

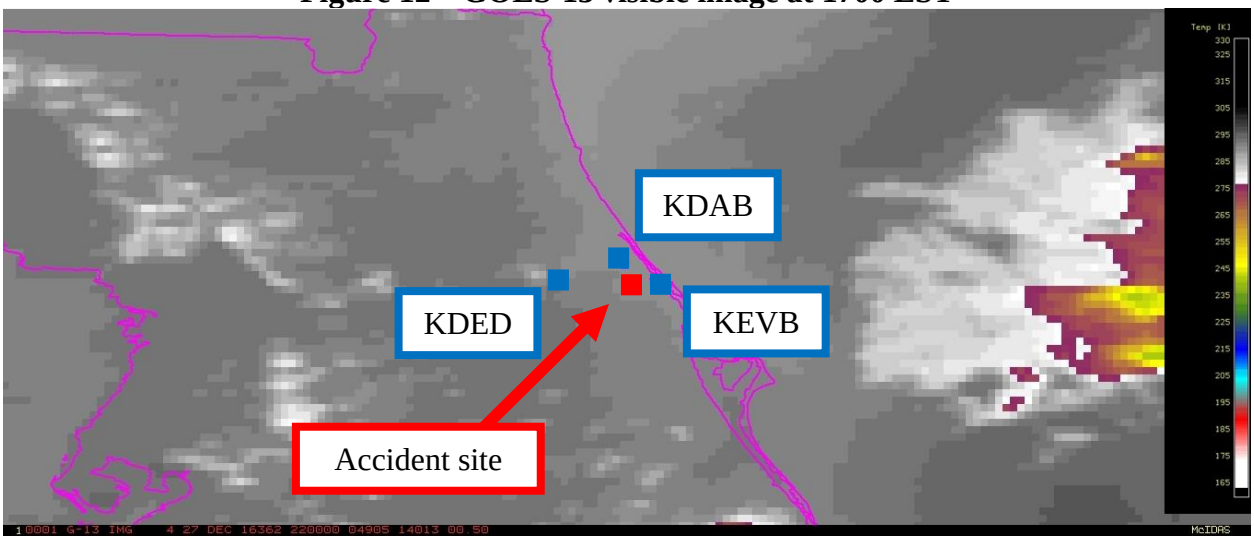

Figure 13 – GOES-13 infrared image at 1700 EST

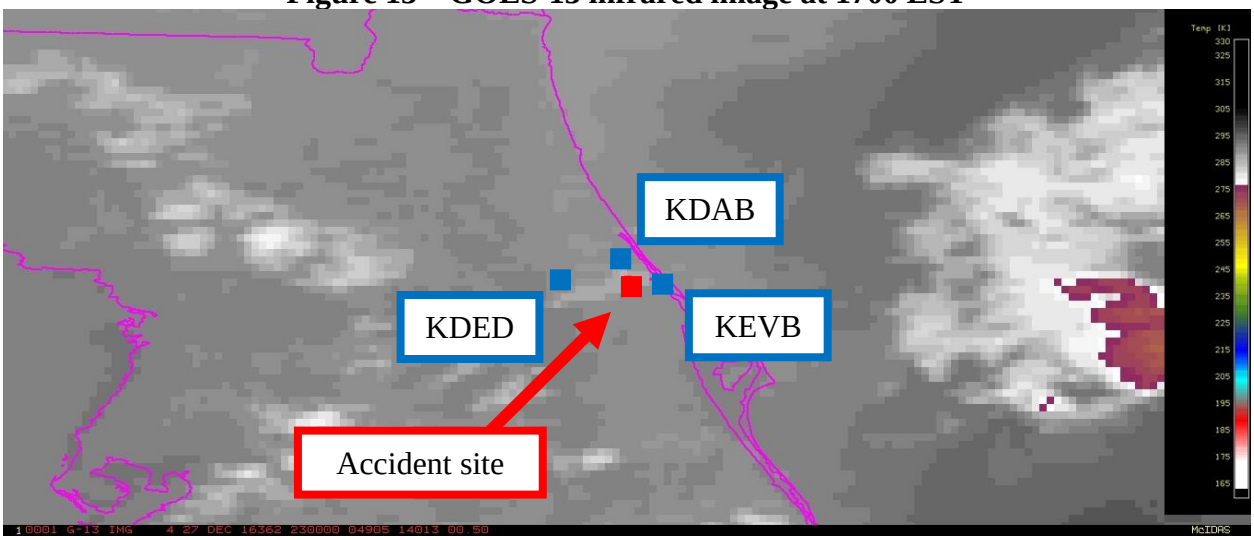

Figure 14 – GOES-13 infrared image at 1800 EST

6.0 Radar Imagery Information

The closest NWS Weather Surveillance Radar-1988, Doppler (WSR-88D)[18] to the accident site was the Melbourne, Florida, radar (KMLB), which was located 62 miles south-southeast of the accident site at an elevation of 36 feet. Level II and III archive radar data were obtained from the NCEI utilizing the NEXRAD Data Inventory Search and displayed using the NOAA's Weather and Climate Toolkit software. No reflectivity targets were seen above the accident site around the accident time.

7.0 Pilot Reports[19]

All pilot reports (PIREPs) close to the accident site from about two hours prior to the accident time to about four hours after the accident time were reviewed. Only PIREPs for below FL180[20] are provided below:

DAB UA /OV DAB/TM 2155/FL004/TP C414/SK OVC004-TOP007

DAB UA /OV OMN10NW/TM 2237/FL30/TP BE35/SK SKC/WX FG/TA NA/WV NA/TB NA/IC NA/RM FGEXTENDS10MILESWDABTOCOAST

DAB UA /OV DAB070003/TM 2255/FL005/TP CRJ9/SK OVC/RM BASES003TOPS005

MCO UA /OV ORL070005/TM 2327/FL025/TP A320/SK SCT033

MLB UA /OV MLB/TM 0001/FL045/TP PA34/SK FEW035 FEW045

SFB UA /OV SFB/TM 0240/FL001/TP A320/SK OVC001/WX FG

Routine pilot report (UA); Over Daytona Beach, Florida; Time – 1655 EST (2155Z); Altitude – 400 feet; Type aircraft – Cessna 414; Sky – Overcast ceiling at 400 feet with tops at 700 feet.

Routine pilot report (UA); 10 miles northwest of Ormond Beach, Florida; Time – 1737 EST (2237Z); Altitude – 3,000 feet; Type aircraft – Beechcraft Bonanza; Sky – Clear skies; Weather – Fog; Temperature – Not available; Wind – Not available; Icing – Not available; Remarks – Fog extends 10 miles west of Daytona Beach to the coast.

Routine pilot report (UA); 3 miles from Daytona Beach, Florida, on the 070° radial; Time – 1755 EST (2255Z); Altitude – 500 feet; Type aircraft – Canadair Regional Jet CRJ900; Sky – Overcast ceiling; Remarks – Bases at 300 feet with tops at 500 feet.

---

[18] 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.

[19] Only pilot reports with the WMO header UBFL** identifier were considered.

[20] Flight Level – A Flight Level (FL) is a standard nominal altitude of an aircraft, in hundreds of feet. This altitude is calculated from the International standard pressure datum of 1013.25 hPa (29.92 inHg), the average sea-level pressure, and therefore is not necessarily the same as the aircraft's true altitude either above mean sea level or above ground level.

Routine pilot report (UA); 5 miles from Orlando, Florida, on the 070° radial; Time – 1827 EST (2327Z); Altitude – 2,500 feet; Type aircraft – Airbus A320; Sky – Scattered clouds at 3,300 feet.

Routine pilot report (UA); Over Melbourne, Florida; Time – 1901 EST (0001Z); Altitude – 4,500 feet; Type aircraft – Piper PA-34 Seneca; Sky – Few clouds at 3,500 feet, few clouds at 4,500 feet.

Routine pilot report (UA); Over Orlando, Florida; Time – 2140 EST (0240Z); Altitude – 100 feet; Type aircraft – Airbus A320; Sky – Overcast ceiling at 100 feet; Weather – Fog.

8.0 SIGMET and CWSU Advisory

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

No Center Weather Service Unit (CWSU) Meteorological Impact Statements (MIS)s were valid for the accident site at the accident time.

A CWSU Center Weather Advisory (CWA) was valid for the accident site at the accident time (CWA 107). The CWA was issued at 1700 EST and valid through 1900 EST and warned of LIFR conditions with ceilings below 500 feet agl and visibilities below a half mile in fog:

FAUS21 KZJX 272200
ZJX1 CWA 272200
ZJX CWA 107 VALID UNTIL 280000
FROM 35ENE ORL-5E CRG
AREA 35NM WIDE LIFR CIGS BLW 005 AND VIS BLW 1/2SM IN FG.
CONDS CONTG THRU PD.
=

In addition, a CWA warning of the LIFR conditions was valid for the accident site after the accident time. CWA 108 was issued at 1757 EST and valid from 1800 through 2000 EST. CWA 106 was also valid for the accident site warning of LIFR conditions. CWA 106 was issued at 1555 EST and valid from 1555 through 1755 EST:

FAUS21 KZJX 272257
ZJX1 CWA 272300
ZJX CWA 108 VALID UNTIL 280100
FROM CHS-25E ORL-35W CRG-35SW CAE-CHS
AREA PATCHY LIFR CIGS BLW 005 AND VIS BLW 1/2SM IN FG.
CONDS SPRDG INLAND OVR SRN SC/GA/FL PEN THRU PD.
=

FAUS21 KZJX 272055
ZJX1 CWA 272055
ZJX CWA 106 VALID UNTIL 272255
FROM 25NE CHS-15N SAV-55SE AMG-25NE ORL
AREA 40NM WIDE LIFR CIGS BLW 005 AND VIS BLW 1/2SM IN FG.
CONDS CONTG THRU PD.

=

9.0 AIRMETs

No Airmen's Meteorological Information (AIRMET) advisories were valid for the accident site at the accident time. AIRMET Sierra issued at 1545 EST, and valid at the accident time (red line figure 15), was valid for areas just north of the accident site and warned of IFR conditions due to mist and fog. An AIRMET Sierra valid from 1250 through 1600 EST was valid for north of the accident area before the accident flight departed from Millington, Tennessee, (NQA) and this AIRMET warned of IFR conditions due to mist (green line figure 15):

WAUS42 KKCI 272045
WA2S
_MIAS WA 272045
AIRMET SIERRA UPDT 4 FOR IFR AND MTN OBSCN VALID UNTIL 280300
.
AIRMET IFR...FL AND CSTL WTRS
FROM 50ENE CEW TO 60SSE CEW TO 60SE SJI TO 40W CEW TO 50ENE CEW
CIG BLW 010/VIS BLW 3SM BR. CONDS DVLPG 00-03Z. CONDS CONTG BYD
03Z THRU 09Z.
.
AIRMET IFR...NC SC GA FL AND CSTL WTRS
FROM 50ESE ORF TO 70SE ECG TO 90E ILM TO 110SSE ILM TO 50ENE OMN
TO 20SE CTY TO 40E MCN TO LGC TO 30S GQO TO 20NW ODF TO 20S HMV
TO GSO TO 50ESE ORF
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 03Z THRU 09Z.
.
AIRMET MTN OBSCN...NC SC GA
FROM 30SSE PSK TO 20SSW CLT TO ATL TO GQO TO HMV TO 30SSE PSK
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 03Z ENDG 06-09Z.
.
OTLK VALID 0300-0900Z...IFR NC SC GA FL AND CSTL WTRS
BOUNDED BY 40ESE ORF-100E ECG-100E ILM-110SSE ILM-50SE OMN-40WNW
ORL-20WNW CTY-70SSW TLH-50SW PZD-LGC-30SSW GQO-30WNW CLT-20WNW
RDU-40ESE ORF
CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG THRU 09Z.
....
WAUS42 KKCI 271750 AAA
WA2S
_MIAS WA 271750 AMD
AIRMET SIERRA UPDT 3 FOR IFR AND MTN OBSCN VALID UNTIL 272100
.
AIRMET IFR...SC GA FL AND CSTL WTRS...UPDT
FROM 20N CHS TO 70E CHS TO 20E OMN TO 30WSW CRG TO 20NE AMG TO
40NNW SAV TO 20N CHS
CIG BLW 010/VIS BLW 3SM BR. CONDS CONTG BYD 21Z THRU 03Z.
.
AIRMET IFR...NC SC GA FL AND CSTL WTRS...UPDT
FROM 60SSW RIC TO 90S ECG TO 70E CHS TO 20N CHS TO 40NNW SAV TO
20NE AMG TO 60SSW AMG TO 70SSW TLH TO 70SSE SJI TO 40W CEW TO
50SW PZD TO GQO TO HMV TO 60SSW RIC
CIG BLW 010/VIS BLW 3SM BR. CONDS ENDG 18-21Z.
.
AIRMET MTN OBSCN...NC SC GA

FROM 40SE PSK TO CLT TO ATL TO GQO TO HMV TO 40SE PSK
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.
.
OTLK VALID 2100-0300Z...IFR NC SC GA FL AND CSTL WTRS
BOUNDED BY 20NW RDU-40SW ECG-80SSE ECG-90ESE ILM-110SSE ILM-
60ENE OMN-30W OMN-30SSW TLH-60SE SJI-40W CEW-50SW PZD-30SSW AMG-
50W SAV-50S LGC-30S GQO-20NW SPA-20NW RDU
CIG BLW 010/VIS BLW 3SM BR. CONDS CONTG THRU 03Z.
....

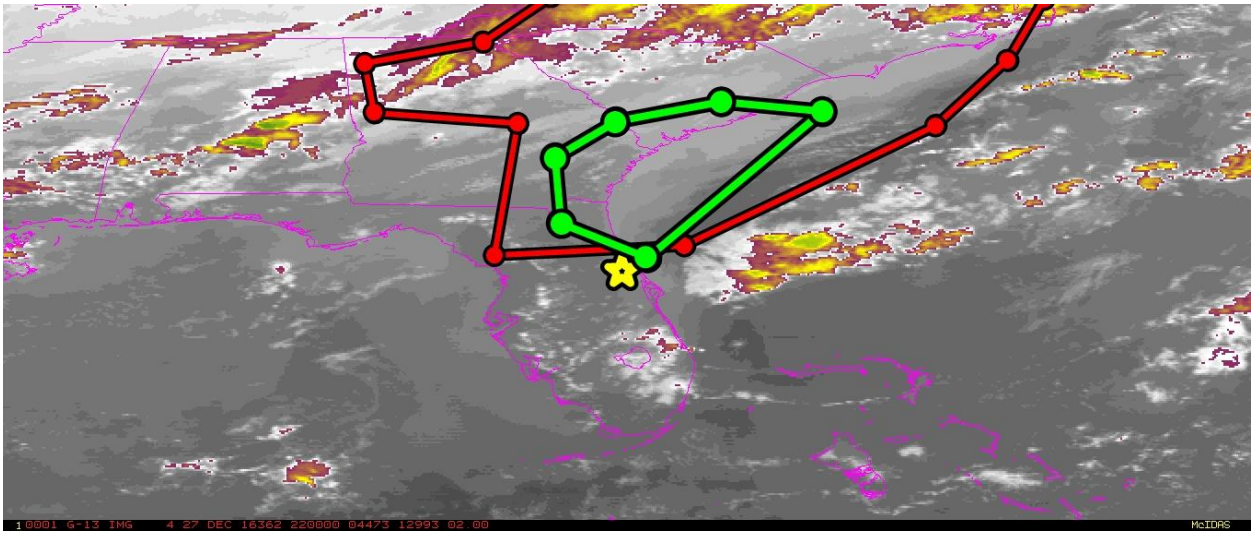

Figure 15 – AIRMETs valid at (red line) and before (green line) the accident time

10.0 Area Forecast

The Area Forecast issued at 1345 EST, valid at the accident time, forecasted a broken ceiling at 4,000 feet, with an overcast ceiling at 1,000 feet not returning until 2000 EST:

FAUS42 KKCI 271845
FA2W
_MIAC FA 271845
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 281300
CLDS/WX VALID UNTIL 280700...OTLK VALID 280700-281300
NC SC GA FL AND CSTL WTRS E OF 85W
.
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...19Z CDFNT SERN NOVA SCOTIA-MA CSTL WTRS-SRN DE-S CNTRL
VA-SWRN NC-CNTRL AL CONTG WSWWD. HIGHS ARND 70SW CTY AND 230E
OMN. 13Z CDFNT FM INTL WTRS OFF SRN NC CST ACRS NERN SC-CNTRL
GA-SRN AL CONTG WSWWD AS STNR FNT. HIGH OVR E CNTRL FL CSTL WTRS.
.
NC
N 1/2 MTNS...OVC060 TOP 150. TIL 21Z WDLY SCT -SHRA. 00Z SCT CI.
OTLK...VFR.

S 1/2 MTNS...OVC060 TOP FL250. WDLY SCT -SHRA. 23Z BKN050 TOP
150. 03Z SCT CI. OTLK...VFR.
N 1/2 PIEDMONT...OVC025 TOP FL250. ISOL -SHRA. 21Z BKN050 TOP
150. 03Z SKC OR SCT CI. OTLK...VFR.
S 1/2 PIEDMONT...OVC025 TOP FL250. 23Z BKN030 TOP 150. 03Z
BKN020. OTLK...VFR.
N 1/2 CSTL PLAIN...OVC020 TOP FL250. 21Z OVC040. ISOL -SHRA. 03Z
OVC015. OTLK...IFR CIG BR.
S 1/2 CSTL PLAIN...OVC020 TOP 150. 21Z OVC040. 01Z OVC010.
OTLK...IFR CIG BR.
.
SC
MTNS...OVC020 TOP FL250. TIL 23Z WDLY SCT -SHRA. 04Z BKN050 TOP
150. OTLK...VFR.
PIEDMONT...OVC015 TOP 150. 21Z BKN030. 03Z OVC010. VIS 3-5SM BR.
OTLK...IFR CIG BR BECMG 1012 VFR.
N 1/2 CSTL PLAIN...OVC020 TOP 150. 21Z OVC040. 03Z OVC010.
OTLK...IFR CIG BR.
S 1/2 CSTL PLAIN...OVC010 TOP 080. VIS 3-5SM BR. 21Z BKN010.
OTLK...IFR CIG BR.
.
GA
NRN...OVC020 TOP 150. WDLY SCT -SHRA/ISOL -TSRA. CB TOP FL330.
23Z BKN030. 03Z OVC020. VIS 3-5SM BR. OTLK...IFR CIG BR BECMG
1012 VFR.
CNTRL...BKN020 TOP 080. 03Z OVC010. VIS 3-5SM BR. OTLK...IFR CIG
BR.
SWRN...BKN040 TOP 080. 00Z SCT CI. 05Z OVC010. VIS 3SM BR.
OTLK...IFR CIG BR FG.
SERN...OVC010 TOP 080. VIS 3-5SM BR. 21Z BKN010. 03Z VIS 3SM BR.
OTLK...IFR CIG BR FG.
.
FL
W 1/3 PNHDL...OVC010 TOP 080. 21Z BKN015. 02Z OVC010. VIS 3SM
BR. OTLK...IFR CIG BR FG.
E 2/3 PNHDL...BKN040 TOP 080. 00Z SCT CI. 03Z OVC010. VIS 3SM
BR. OTLK...IFR CIG BR FG.
**NRN PEN...OVC015 TOP 080. 20Z BKN040. 01Z OVC010. 03Z VIS 3SM
BR. OTLK...IFR CIG BR FG.**
W CNTRL-SWRN...SCT050. OTLK...VFR.
E CNTRL-SERN...SCT020 BKN060 TOP 080. WDLY SCT -SHRA. 00Z
SCT030. OTLK...VFR.
FL KEYS...SCT030. OTLK...VFR.
.
CSTL WTRS
ATLC WTRS
NRN 2/3 NC...BKN030 TOP 150. SCT -SHRA/ISOL -TSRA. CB TOP
FL400. WND SW 20G30KT. 06Z BKN020. WDLY SCT -SHRA/ISOL
-TSRA. OTLK...MVFR CIG SHRA.
SRN 1/3 NC/SC/GA/NRN FL
W OF 30ESE ILM-20SSE OMN LN...OVC010 TOP 080. OTLK...IFR CIG
BR.
E OF 30ESE ILM-20SSE OMN LN...SCT020 BKN040 TOP 150. SCT
-SHRA/ISOL -TSRA. CB TOP FL400. 00Z BKN020. WDLY SCT
-SHRA/ISOL -TSRA. OTLK...MVFR CIG SHRA.
CNTRL FL

W 1/2...SCT020 BKN050 TOP 080. WDLY SCT -SHRA. 00Z SCT030.
OTLK...VFR.
E 1/2...SCT030. OTLK...VFR.
SRN FL...SCT030. TIL 00Z ISOL -SHRA. OTLK...VFR.
GULF WTRS E OF 85W
N OF 20WSW CTY-80SWW TLH LN...SCT020. 03Z BKN010 TOP 080. VIS
3-5SM BR. OTLK...IFR CIG BR.
S OF 50NE EYW-90WSW EYW LN...SCT030. OTLK...VFR.
RMNDR...SKC. OTLK...VFR.
....

11.0 Terminal Aerodrome Forecast

KDAB was the closest site to the accident site with a NWS Terminal Aerodrome Forecast (TAF). The TAF valid at the time of the accident was issued at 1235 EST and was valid for a 24-hour period beginning at 1300 EST. The TAF for KDAB was as follows:

TAF KDAB 271735Z 2718/2818 **06006KT P6SM FEW003 SCT025 SCT040**
FM280100 VRB02KT 5SM BR SCT004
FM280400 00000KT 1SM BR OVC003
FM281500 28004KT P6SM FEW003=

The forecast expected a wind from 060° at 6 knots, greater than 6 miles visibility, few clouds at 300 feet agl, scattered clouds at 2,500 feet agl, and scattered clouds at 4,000 feet agl.

12.0 NWS Area Forecast Discussion

The NWS Office in Melbourne, Florida, issued the following Area Forecast Discussion (AFD) at 1537 EST (closest AFD to the accident time with an aviation section). The aviation section of the AFD discussed that sea fog along the beaches of Volusia County would likely spread inland during the evening hours and settle back in KDAB. The fog was expected to persist through the night:

FXUS62 KMLB 272037
AFDMLB
Area Forecast Discussion
National Weather Service Melbourne FL
337 PM EST Tue Dec 27 2016
.DISCUSSION...
...Above normal temperatures will continue through Thursday, then turning colder/drier for a few days...
Currently-Tonight...Sea breeze was pushing inland and will act to generate isolated showers that last until around sunset especially around Okeechobee. Sea fog has persisted along the Volusia beaches and after daytime mixing settles down on the mainland, the fog should start to spread back inland.
The axis of the Atlantic high pressure ridge will be across central Florida overnight. Winds will be light and the low levels very moist. We will have to see how much and how late stratocumulus lingers, but would expect that by late tonight areas of dense fog will develop. The HRRR shows the dense fog getting down to Orlando and Cape Canaveral. Decided to go closer to the local WRF

which was showing mainly Lake/Volusia, since MOS hit the fog hardest there. Elsewhere will carry patchy fog.
Wed...Axis of low level ridge will extend across the area. After some early morning fog/stratus, it will be another warm late December day with high temperatures in the lower 80s and possibly a few interior spots touching the mid 80s. Precipitable water looks a little lower than today and MOS POPs are mostly below 15 percent. Will only carry small afternoon shower chances around Lake Okeechobee.
Wed night-Thu night...Zonal flow pattern aloft into Thu as weak surface ridge axis drops from central peninsula to the Keys. Light winds and pre-frontal moisture pooling within boundary layer should allow fog to develop late at night and persist into Thu morning. Areas of fog likely areawide, with some dense fog possible across the interior. GFS/ECMWF consistent with strong cold front quickly pushing through CWA Thu evening. Frontal moisture band and associated low coverage of showers will reach northern counties late afternoon, central counties during the evening and clear southern counties shortly after midnight. FROPA will usher in a 24-48 hour period of noticeably colder and drier conditions Friday and Friday night. Cold advection behind the front will produce lows in the mid to upper 40s north of Orlando and low to mid 50s elsewhere, except near 60 along the Martin coast. These mins are right at there seasonal norms, something that has only occurred a few times within the past two weeks.
Fri-Mon...Highs Friday will range from around 60 north to mid/upper 60s south. While noticeably colder, these high temps will only be slightly below normal. Model output statistics (MOS) from both GFS and ECMWF show the coldest temps will be Sat morning with model blend showing upper 30s north Lake/NW Volusia with widespread 40s elsewhere, except lower/mid 50s along the Treasure Coast.
The surface high will continue to track steadily east into the Atlantic with a return flow of E-SE winds moderating temperatures next weekend. High temperatures are forecast to be back above normal for New Years Day in the upper 70s/near 80. Increased moisture in the deep layer southerly flow will produce a chance for showers on Monday.
&&
.AVIATION...
Sea fog lingered along the beaches of Volusia county this afternoon. Once the weak sea breeze circulation abates this evening, would expect the fog to settle back into KDAB. Areas of late night dense fog should form elsewhere around the Ocala National Forest, so fog/low stratus will likely persist most of the night in Volusia. Additional terminals will likely be affected especially KLEE and KSFB. Would not be surprised for IFR-LIFR to make it down to KMCO/KISM/KTIX towards sunrise. Did not forecast the low ceiling/visibility that far south yet as MOS has been most emphatic about it just north of there.
&&
.MARINE...
Tonight-Wed...Areas of sea fog persisted along/offshore the Volusia coast and will likely continue overnight so will go with a dense fog advisory for the nearshore zone tonight.
Otherwise, the pressure gradient will continue to ease as surface ridge nudges south over the waters. Winds will be less than 10

knots, while an east swell will persist to keep seas elevated to 5 feet offshore.
Wed night-Thu night...weak pressure field will keep winds light/variable Wed night, then increasing from the SW Thu in advance of front. W/NW wind shift will occur by sunset over the northern waters with rapid increase toward solid SCA/20-25 kt quickly developing south across all waters by shortly after midnight. Seas 3-5 ft Wed night/Thu will build rapidly Thu night, reaching 4-6 ft near immediate coast by early Fri,and 6-10 ft offshore.
Fri-Sun...Hazardous boating contitions will persist through the day Fri, then wind/seas improve rapidly by early Sat as post frontal surface high moves steadily eastward into the Atlc allowing winds to quickly veer E-SE by Sat aftn with subsiding seas, becoming SE/S Sat night/Sun and increasing toward 15 kt.
&&
.FIRE WEATHER...
Fri...Quick shot of cooler and very dry air, with dewpoints dropping into the 20s across NW half of CWA and 30s across SE half. Although max temps will only reach low/mid 60s, the low dewpoints will result in min RH falling to critical fire wx threshold, with long duration below 35 percent across the interior and a short duration near 35 percent along the coast. NW winds near 15 mph with higher gusts mainly during the morning, then lessening some during period of lowest afternoon RH.
&&
.PRELIMINARY POINT TEMPS/POPS...
DAB 62 79 62 81 / 10 10 10 30
MCO 64 82 62 81 / 10 10 0 10
MLB 64 81 64 81 / 10 10 10 10
VRB 63 81 62 81 / 10 10 10 10
LEE 64 82 63 79 / 10 10 0 20
SFB 63 81 63 82 / 10 10 0 20
ORL 65 82 65 80 / 10 10 0 20
FPR 63 81 61 81 / 10 10 10 10
&&
.MLB WATCHES/WARNINGS/ADVISORIES...
FL...None.
AM...Dense Fog Advisory until 4 AM EST Wednesday for Flagler Beach to Volusia-Brevard County Line 0-20 nm.
&&
$$

13.0 NWS Short Term Forecast

The NWS Office in Melbourne, Florida, issued the following Short Term Forecast (NOW) at 1325 EST. The NOW warned that the dense sea fog near the Volusia County coast would likely expand westward and onshore around sunset, causing a considerable reduction in visibility:

FPUS72 KMLB 271825
NOWMLB
Short Term Forecast
National Weather Service Melbourne FL
125 PM EST TUE DEC 27 2016
AMZ550-552-555-570-572-575-FLZ041-044>047-053-054-058-059-064-141-

144-147-272300-
Coastal Volusia-Flagler Beach to Volusia-
Brevard County Line 20 NM to 60 NM Offshore-Flagler Beach to Volusia-
Brevard County Line Out to 20 NM-Indian River-Inland Volusia-Martin-
Northern Brevard-Northern Lake-Okeechobee-Orange-Osceola-
Sebastian Inlet to Jupiter Inlet 20 NM to 60 NM Offshore-
Sebastian Inlet to Jupiter Inlet Out To 20 NM-Seminole-
Southern Brevard-Southern Lake-St. Lucie-Volusia-
Brevard County Line to Sebastian Inlet 20 NM to 60 NM Offshore-
Volusia-Brevard County Line to Sebastian Inlet Out to 20 NM-
125 PM EST TUE DEC 27 2016
.NOW...
Dense sea fog will linger very near the Volusia County coast through the afternoon...from just along or offshore the beaches to 20 miles offshore. Visibility will vary greatly along the coast as areas of fog occasionally move onto the beaches. The area of sea fog will likely expand back onshore and inland around or a little before sunset...causing a considerable reduction of visibility. Elsewhere...
isolated showers will develop over land...inland from the beaches...
from Brevard County southward and inland to eastern Orange...Osceola
and Okeechobee Counties. The rain will be brief and relatively light
where it does occur.
&&
Additional details...including graphics are available online at:
http://www.weather.gov/mlb/blog
$$

14.0 NWS Hazardous Weather Outlook

The NWS Office in Melbourne, Florida, issued the following Hazardous Weather Outlook (HWO) at 1524 EST. The HWO stated areas of fog would affect the coast of Volusia County this evening, then likely spread inland overnight:

FLUS42 KMLB 272024
HWOMLB
HAZARDOUS WEATHER OUTLOOK
NATIONAL WEATHER SERVICE MELBOURNE FL
324 PM EST TUE DEC 27 2016
AMZ550-552-555-570-572-575-FLZ041-044>047-053-054-058-059-064-141-
144-147-281000-
FLAGLER BEACH TO VOLUSIA-BREVARD COUNTY LINE 0-20 NM-
VOLUSIA-BREVARD COUNTY LINE TO SEBASTIAN INLET 0-20 NM-SEBASTIAN
INLET TO JUPITER INLET 0-20 NM-FLAGLER BEACH TO VOLUSIA-BREVARD
COUNTY LINE 20-60 NM-VOLUSIA-BREVARD COUNTY LINE TO SEBASTIAN INLET
20-60 NM-SEBASTIAN INLET TO JUPITER INLET 20-60 NM-INLAND VOLUSIA
COUNTY-NORTHERN LAKE COUNTY-ORANGE-SEMINOLE-SOUTHERN BREVARD COUNTY-
OSCEOLA-INDIAN RIVER-OKEECHOBEE-ST. LUCIE-MARTIN-COASTAL VOLUSIA
COUNTY-SOUTHERN LAKE COUNTY-NORTHERN BREVARD COUNTY-
324 PM EST TUE DEC 27 2016
THIS HAZARDOUS WEATHER OUTLOOK IS FOR EAST CENTRAL FLORIDA.
.DAY ONE...TONIGHT.
.DENSE FOG/SMOKE IMPACT...
AREAS OF FOG, POTENTIALLY DENSE AT TIMES, WILL AFFECT THE COAST OF VOLUSIA COUNTY THIS EVENING, THEN LIKELY SPREAD INLAND OVERNIGHT, AFFECTING MUCH OF VOLUSIA AND LAKE COUNTIES. PATCHY DENSE FOG WILL

BE POSSIBLE ELSEWHERE, ESPECIALLY AROUND METRO ORLANDO AND CAPE CANAVERAL. SUDDEN CHANGES IN VISIBILITY CAN PRODUCE HAZARDOUS DRIVING CONDITIONS. USE LOW BEAM HEADLIGHTS AND INCREASE FOLLOWING DISTANCE IF YOU ENCOUNTER FOG ON ROADWAYS.
.DAYS TWO THROUGH SEVEN...WEDNESDAY THROUGH MONDAY.
LONG PERIOD EAST SWELLS WILL IMPACT THE BEACHES THROUGH THURSDAY BRINGING DANGEROUS RIP CURRENTS.
CONDITIONS WILL BE FAVORABLE FOR LOCALLY DENSE FOG AGAIN THURSDAY MORNING, ESPECIALLY ACROSS THE INTERIOR.
A STRONG COLD FRONT WILL PASS SOUTHWARD ACROSS EAST CENTRAL FLORIDA THURSDAY OVERNIGHT. POOR TO HAZARDOUS CONDITIONS FOR SMALL CRAFT OPERATION WILL FOLLOW BEHIND IT THROUGH FRIDAY NIGHT. MUCH COOLER AND DRIER CONDITIONS WILL ALSO FILTER DOWN THE FLORIDA PENINSULA BEHIND THE FRONT FOR THURSDAY NIGHT THROUGH SATURDAY MORNING.
.SPOTTER INFORMATION STATEMENT...
SPOTTER ACTIVATION WILL NOT BE NEEDED TONIGHT.
$$

15.0 Winds and Temperature Aloft Forecast

The NWS 1459 EST Winds and Temperature Aloft forecast valid for the accident flight is included below:

```
FBUS31 KWNO 271959
FD1US1
_DATA BASED ON 271800Z
VALID 280000Z   FOR USE 2000-0300Z. TEMPS NEG ABV 24000
FT  3000    6000    9000   12000   18000   24000  30000  34000  39000

_MLB 1005 2808+12 3011+06 2610+02 2726-11 2828-22 293938 284045 285353
```

The accident site was closest to the MLB (Melbourne, Florida) forecast point. The 1459 EST MLB forecast indicated a wind at 3,000 feet from 100° at 5 knots, a wind at 6,000 feet from 280° at 8 knots with a temperature of 12° C, and a wind at 9,000 feet from 300° at 11 knots with a temperature of 6° C.

16.0 Pilot Weather Briefing

A search of official weather briefing sources, such as Lockheed Martin Flight Service (LMFS) and Direct User Access Terminal Service was done and the accident pilot did receive an official weather briefing from LMFS. The accident pilot received a weather briefing at 1249 EST from LMFS before departing Willmar, Minnesota, (BDH) on the accident day, for NQA (attachment 1). In the 1249 EST LMFS weather briefing, the weather briefer discussed the AIRMET Tango for turbulence above FL280, discussed the AIRMET Sierra for IFR conditions for areas mainly north of 7FL6, discussed the CWA for LIFR conditions, and discussed that thunderstorms were forecast for Alabama and Georgia areas, but those thunderstorms were forecast to be done by 1600 EST. The accident pilot responded that he looked at the weather, but appreciated the weather briefer looking at any adverse conditions. The weather briefer specifically mentioned that the accident pilot should recheck weather enroute to see if AIRMETs or CWAs would be updated, because CWAs are only valid for 2 hours at a time and new AIRMETs would be released around 1545 EST, if not amended earlier. At the end of the weather briefing, the accident pilot stated that "weather briefings will last forever if you let them." The standard LMFS weather briefing packages were provided to the accident pilot at both 1252 and 1336 EST (attachments 2 and 3). The standard LMFS weather briefing package from 1252 EST contained AIRMET Sierra for IFR conditions due to mist valid at the accident site (but later AIRMETs, section 9.0, removed the destination airport from AIRMET Sierra). The standard LMFS weather briefing packages from both 1252 and 1336 EST also contained the AIRMET Tango valid enroute, the SPC convective outlook, CWA 104 which was valid for the accident site warning of LIFR conditions, PIREPS, METARs, Area Forecast, TAFs, and a Winds Aloft forecast. In addition, the accident pilot did not request nor receive a weather briefing before the flight from NQA to the intended destination of 7FL6. The accident pilot landed at NQA around 1529 EST and departed NQA around 1558 EST.

A search of ForeFlight weather information revealed that the accident pilot did not request a weather briefing using ForeFlight Mobile prior to his flight. It is unknown if the accident pilot checked or received additional weather information before or during the accident flight.

17.0 Witness Information

Two witnesses were located at 7FL6 at the accident time and reported the weather as a 200 feet agl overcast ceiling and a 150 feet agl overcast ceiling, respectively.[21] A witness located 20 feet off the runway near midfield had a camera and was filming with the accident aircraft coming towards the camera around the accident time. The witness video captured the weather conditions around the accident time and image captures from the video are provided in figures 16, 17, and 18. Figure 16 indicated an overcast ceiling of low clouds with the accident aircraft's lights partially visible through the cloud cover and mist around 1756 EST. Figures 17 and 18 captured the low cloud ceiling at 7FL6 as the tower that holds the 7FL6's light beacon was 50 feet tall. Mist was visible within 7FL6's tower light beacon.

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

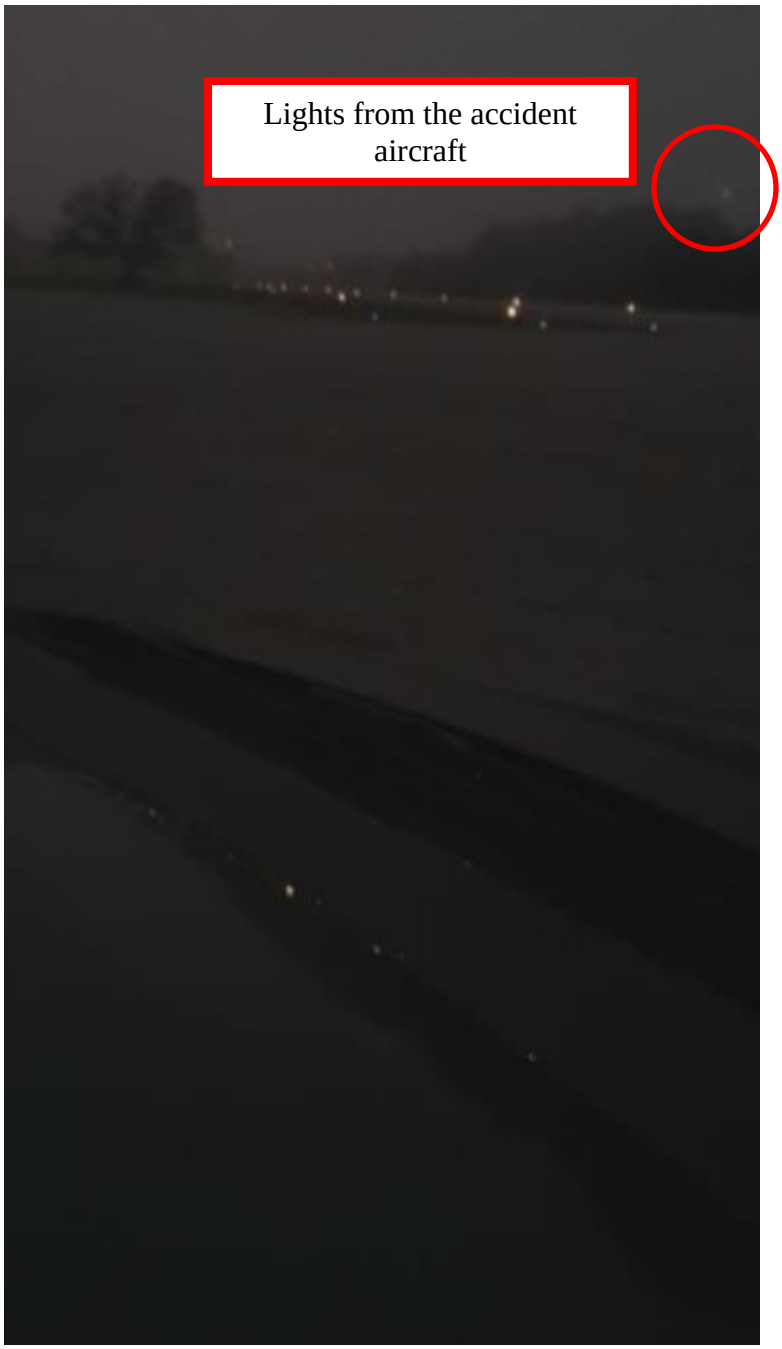

Figure 16 – Witness video screen capture from 1756 EST with camera facing west-southwestward

Figure 17 – Witness video screen capture from 1756 EST with camera facing southwestward

Figure 18 – Witness video screen capture from 1756 EST with camera facing southwestward

18.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for the accident site on December 27, 2016, indicated the following:

SUN	
Begin civil twilight	0651 EST
Sunrise	0717 EST
Sun transit	1226 EST
Sunset	1735 EST
End civil twilight	1801 EST

MOON	
Moonrise	0540 EST
Moon transit	1109 EST
Moonset	1637 EST

The Moon was set over an hour before the accident time.

F. LIST OF ATTACHMENTS

Attachment 1 – LMFS audio weather briefing from 1249 EST

Attachment 2 – LMFS standard weather briefing package from 1252 EST

Attachment 3 – LMFS standard weather briefing package from 1336 EST

Submitted by:

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Paul Suffern
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