



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

March 28, 2018

Factual Report

METEOROLOGY

WPR18FA045

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A. ACCIDENT

Location: Geneva, Florida
Date: December 8, 2017
Time: 1115 eastern standard time
1615 Coordinated Universal Time (UTC)
Airplane: Beech C90, Registration: N19LW

B. METEOROLOGIST

Don Eick
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. SUMMARY

On December 8, 2017, about 1115 eastern standard time, a Beech C90, N19LW, was destroyed when it impacted the waters of Lake Harney, near Geneva, Florida. The airplane was registered to Planemarketing LLC, Vero Beach, Florida, and operated by L3 Airline Academy as CONN900 as a 14 *Code of Federal Regulations* Part 91 instructional flight. The Flight Instructor and two commercial pilots receiving instruction were fatally injured. Instrument and visual meteorological conditions prevailed in the area, and an instrument flight rules flight plan was filed for the flight, which originated from Sanford, Florida, about 0753.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation from the Washington D.C. office, collecting data from official National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). All times are eastern standard time (EST) based upon the 24-hour clock, local time is +5 hours to UTC, and UTC=Z. NWS airport and station identifiers use the standard International Civil Aviation Organization (ICAO) 4-letter station identifiers versus the International Air Transport Association (IATA) 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports. Directions are referenced to true north and distances in nautical miles. Heights are in feet (ft) above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 28.764722° North and longitude 81.061111° West.

E. WEATHER INFORMATION

1.0 Synoptic Conditions

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

1.1 Surface Analysis Chart

The southeast section of the NWS Surface Analysis Chart for 1000 EST (1500Z) on December 8, 2017, is included as figure 1 with the approximate accident site marked by a red star. The chart depicted a low pressure system at 1008-hectopascals (hPa)¹ in the Gulf of Mexico associated with a frontal wave with a cold front extending southward and a warm front east-northeastward across the Gulf of Mexico into central Florida, where the front became stationary and extended into the Atlantic. The accident site was located immediately south of the frontal boundary in an area associated with a col² or a deformation zone in the wind field. The chart also depicted a trough of low pressure off the east coast of Florida, with a weak pressure gradient over central Florida and along the stationary front.

The station models on the chart depicted an extensive area of clouds extending north of the warm to stationary front over Florida, Georgia, Alabama, and South Carolina, with numerous stations reporting rain and fog, and several stations in Alabama and Georgia reporting snow and ice pellets with temperatures at or near freezing. Broken to overcast skies were reported immediately south of the front extending over southern Florida. The chart depicted temperatures ranging from the 80’s degrees Fahrenheit (F) over south Florida, to the low 40’s °F over the Florida panhandle, and in the 30’s °F in Alabama and northern Georgia. The station models in the vicinity of the accident site reported calm winds, overcast clouds, temperatures in the upper 60’s with temperature-dew point spreads of 2° F or less.

¹ Hectopascal (hPa) is the new standard term for reporting pressure and is interchangeable with millibar (mb) with the same units. Standard sea level pressure is 1013.25-hPa at 15° Celsius (C).

² Col - is a neutral point between two low and two high pressures systems on a weather map. It is often associated with a deformation zone in the wind field, where stretching and/or shearing occurs and is a primary factor in frontogenesis (or the evolution of a frontal system) and frontolysis (decay of a front).

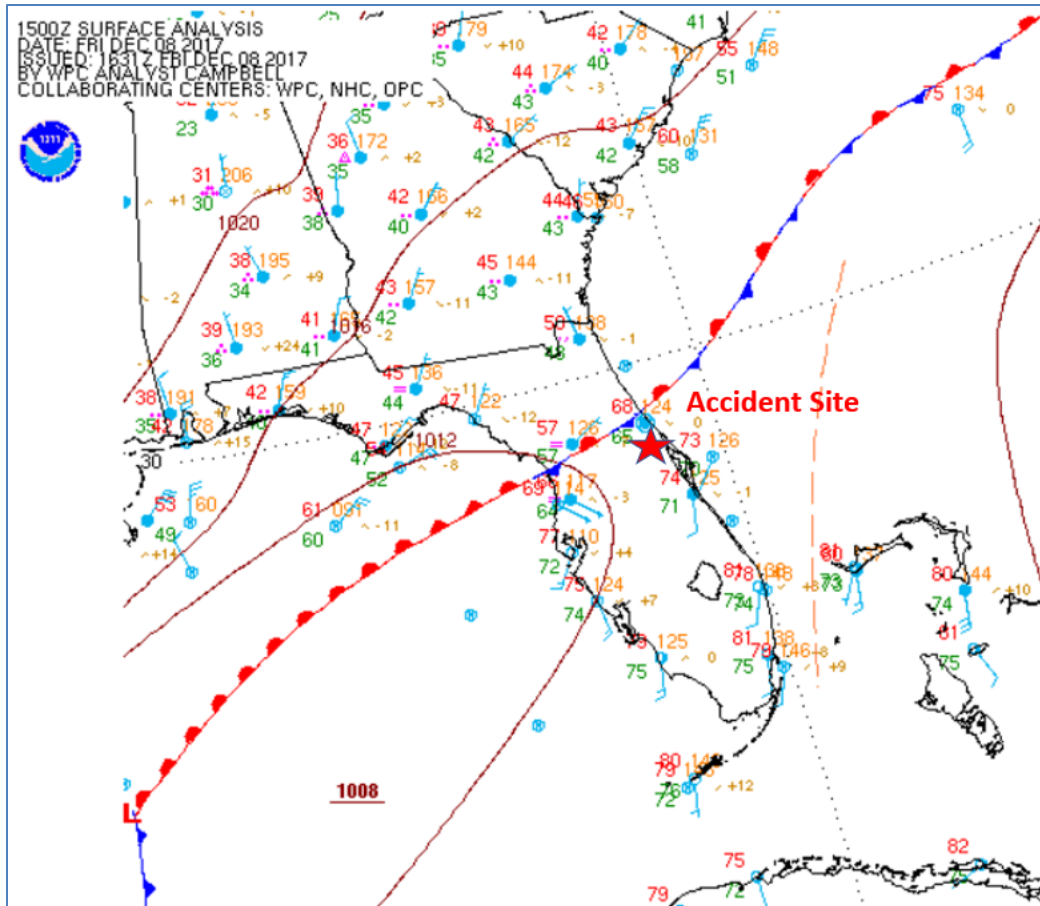


Figure 1 - Southeast section of the NWS Surface Analysis Chart for 1000 EST

1.2 Weather Depiction Chart

Figure 2 is the southeast section of the NWS Weather Depiction Chart for 1100 EST (1600Z) on December 8, 2017, with the accident site located within the red circle and depicted the general flight categories. The chart depicted an extensive area of instrument flight rule (IFR) conditions³ indicated by a shaded contour line extending over the southeastern United States along and north of the warm and stationary front, and extended over the accident site. Marginal visual flight rule (MVFR) conditions⁴ were indicated by an unshaded contour line and extended into south Florida. The closest visual flight rule (VFR) conditions⁵ were depicted outside of any contours about 90 miles south over southern Florida.

³ IFR conditions – is defined as a ceiling or the lowest layer of broken, overcast clouds, or the vertical visibility into a surface based obscuration of less than 1,000 ft agl and/or visibility less than 3 statute miles.

⁴ MVFR conditions – is defined as a ceiling between 1,000 ft agl to 3,000 ft inclusive and/or visibility 3 to 5 miles inclusive.

⁵ VFR conditions – is defined as no ceiling below 3,000 ft agl and visibility greater than 5 statute miles.

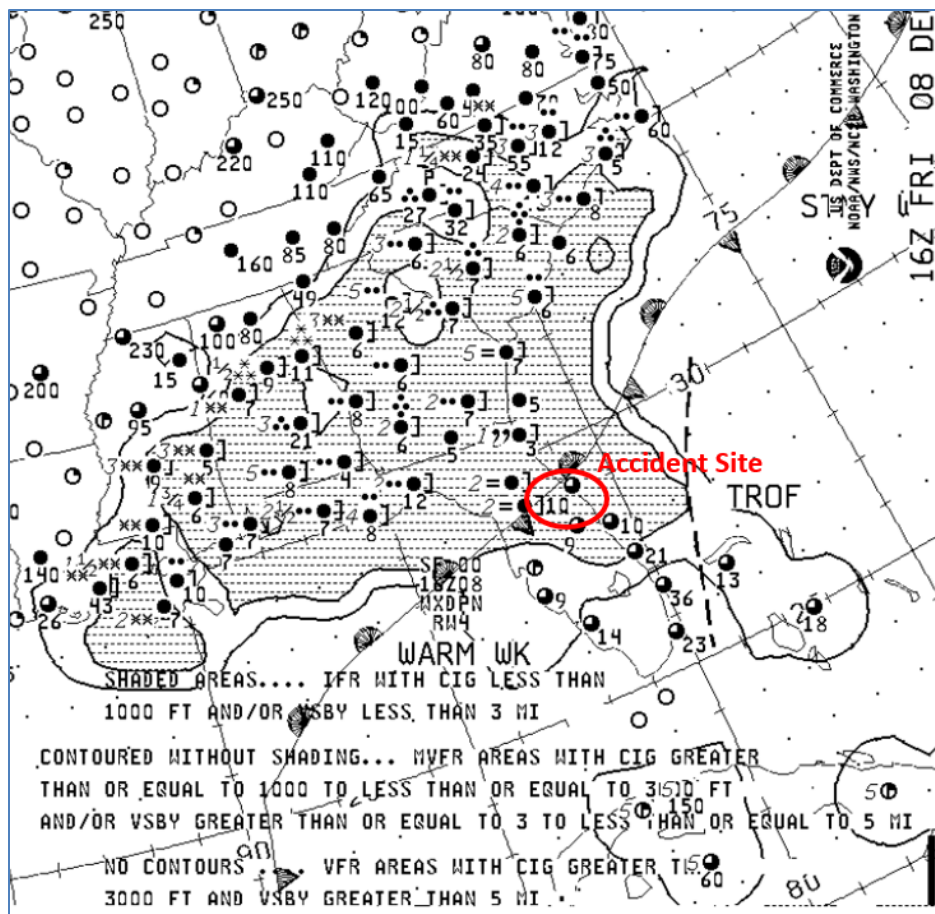


Figure 2 - Southeast section of NWS Weather Depiction Chart for 1100 EST

1.3 Regional Composite Radar Imagery

The southeast section of the NWS National Composite Reflectivity image for 1115 EST on December 8, 2017, is included as figure 3 with the accident site marked by a red star. The image depicted a line of echoes extending from Louisiana northeastward through Mississippi, Alabama, Tennessee, Georgia, into South and North Carolina, and into Virginia, with scattered echoes also in the Florida panhandle and in the Gulf of Mexico off the west coast of Florida. An isolated area of intense echoes were identified approximately 100 miles east of the Titusville area, with no echoes depicted in the vicinity of the accident site.

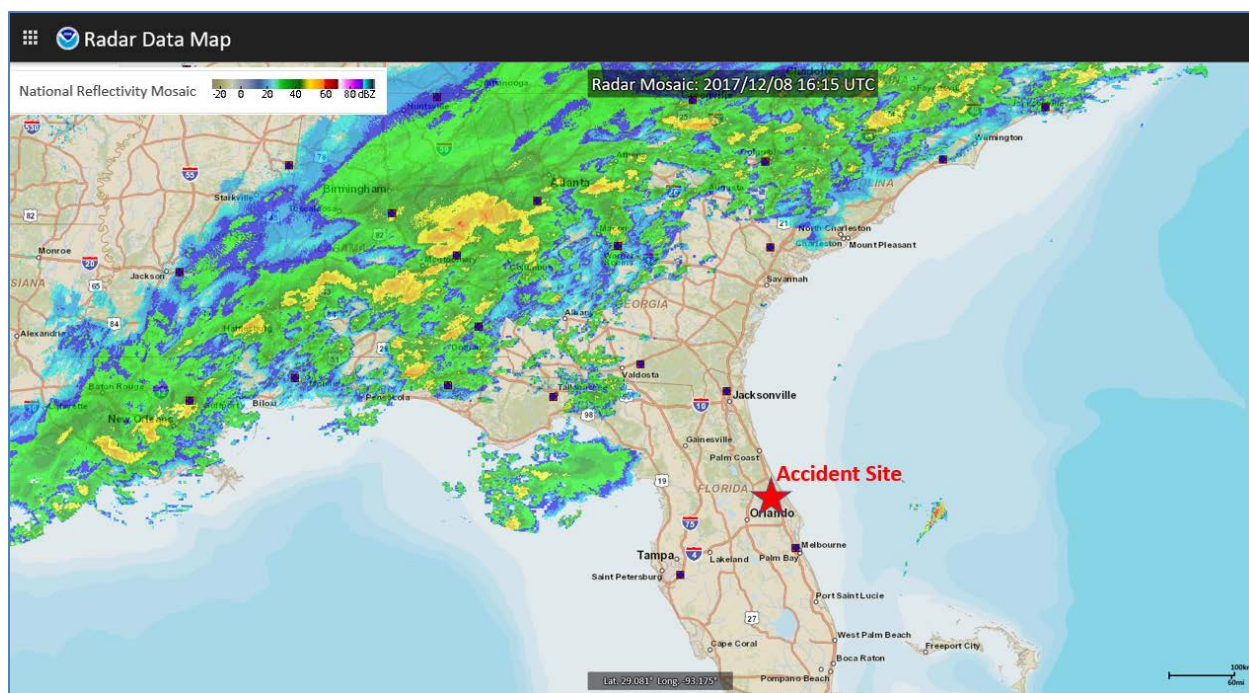


Figure 3 - Southeast section of the National Composite Reflectivity image for 1115 EST

1.4 12-hour Surface Prognostic Chart

Figure 4 is the NWS 12-hour Surface Prognostic Chart issued during the period and valid at 0100 EST on December 9, 2017. The forecast expected the low pressure system off the South Carolina coast with the cold front extending southwestward across central Florida and the accident site with a large area of precipitation expected over Florida, with the potential of thunderstorms. A band of mixed freezing precipitation and snow extended on the northern portion of the band of precipitation extending from extreme southern Alabama and the western Florida panhandle northeastward through northern Georgia, Tennessee, western Carolina's, into Virginia associated with a winter storm.

12 Hours Surface Prognostic

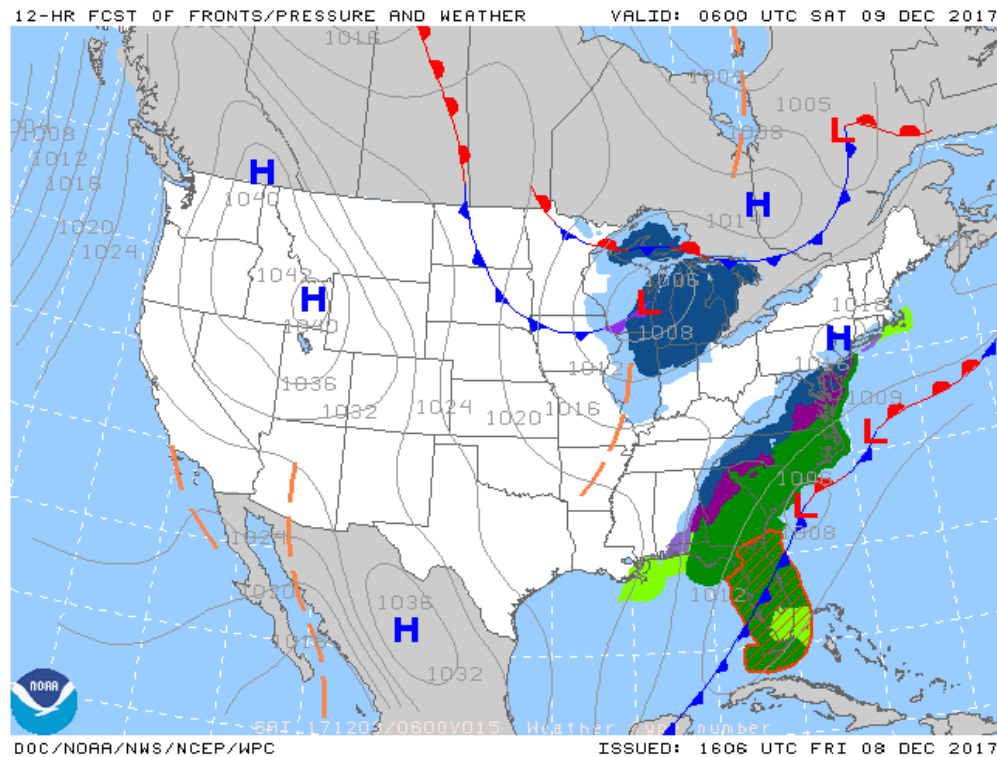


Figure 4 - 12-hour Surface Prognostic Chart valid during the period

1.5 Low-Level Significant Weather Prognostic Chart

The NWS 12- and 24-hour Low Level Significant Weather Prognostic Chart current at the time is included as figure 5 and depicted the general flight categories, turbulence, and the freezing level. The 12-hour Prognostic chart on the left was valid for 1300 EST (1800Z) on December 8, 2017 and depicted a large band of IFR conditions by the red contour line over Louisiana northeastward through Virginia and included northern Florida. The area was surrounded by MVFR conditions indicated by a blue scalloped line which included the accident site and most of Florida, with southern Florida with VFR conditions expected. An area of potential moderate turbulence was depicted over northern Florida by a brown dashed line from 4,000 to 14,000 ft. The freezing level was depicted above 12,000 ft over central Florida and lowered to 4,000 ft over the extreme western Florida panhandle and northern Georgia.

The 24-hour portion of the prognostic chart (right) valid for 0300 EST on December 9, 2017 depicted a slight shift southward in the extent and coverage of the IFR and MVFR conditions. A large area of potential moderate turbulence continued over the southeast from 5,000 to 15,000 ft. The freezing level continued to be depicted above 12,000 ft over central Florida.

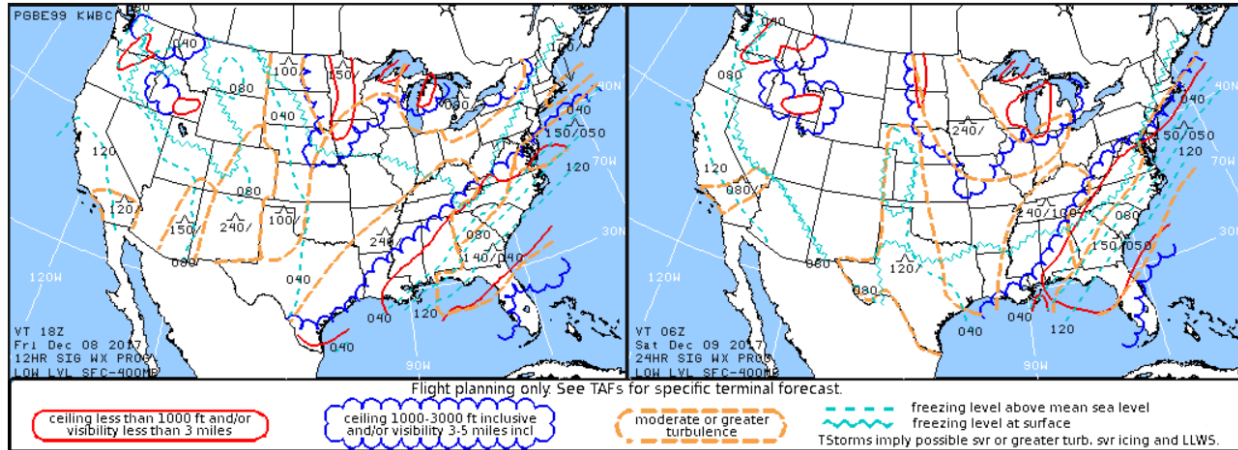


Figure 5 - Low-Level Significant Weather Prognostic Chart

2.0 Observations

The area was documented using official NWS Meteorological Aerodrome Reports (METARs) and specials issued surrounding the area from approximately 3 hours prior to and after the accident, to show any trends in the weather. Cloud heights are reported in height above ground level (agl) in this section.

2.1 Orlando Sanford International Airport

The closest reporting station was from the departure airport of Orlando Sanford International Airport (KSFB)⁶ located about 9 miles west of the accident site at an elevation of 55 ft. The airport had a federally installed and maintained Automated Surface Observation System (ASOS) and was augmented by certified weather observers. The station listed a magnetic deviation of 6° West. The following conditions were reported at the approximate time of the accident:

KSFB weather observation at 1053 EST, wind from 170° at 8 knots, visibility 10 miles or more, ceiling broken at 800 ft agl, overcast at 1,600 ft, temperature 21° Celsius (C), dew point temperature 18° C, altimeter 29.89 inches of mercury (Hg). Remarks; automated observation system with a precipitation discriminator, sea level pressure 1012.0-hPa, temperature 21.1° C, dew point 18.3° C.

KSFB special weather observation at 1131 EST, wind from 180° at 7 knots, visibility 10 miles or more, ceiling broken at 2,200 ft agl, temperature 23° C, dew point temperature 19° C, altimeter 29.87 inches of Hg. Remarks; automated observation system with a precipitation discriminator, temperature 22.8° C, dew point 18.9° C.

⁶ Also referred to locally as Central Florida Regional Airport (KSFB), Sanford.

The general flight categories⁷ and raw reports in standard format and code were as follows between 0500 to 1300 EST, with the flight categories color coded (purple for LIFR, red for IFR, blue for MVFR, and black for VFR conditions) surrounding the period were as follows:

MVFR KSFB 081018Z AUTO 00000KT 10SM BKN013 16/14 A2991 RMK AO2 T01610144

MVFR KSFB 081028Z AUTO 32003KT 10SM SCT009 OVC013 16/14 A2991 RMK AO2 T01610144

MVFR KSFB 081053Z AUTO 00000KT 10SM SCT009 OVC014 16/14 A2990 RMK AO2 SLP124 T01610144

MVFR KSFB 081153Z 00000KT 10SM OVC012 17/15 A2990 RMK AO2 SLP124 T01670150 10172 20156 56010

IFR KSFB 081253Z 00000KT 10SM OVC009 17/16 A2990 RMK AO2 SLP126 T01720156

IFR METAR KSFB 081353Z 00000KT 10SM OVC007 19/16 A2990 RMK AO2 SLP122 T01890161=

IFR METAR KSFB 081453Z 15005KT 10SM BKN008 OVC020 20/17 A2990 RMK AO2 SLP123 T02000167
58001=

IFR METAR KSFB 081553Z 17008KT 10SM BKN008 OVC016 21/18 A2989 RMK AO2 SLP120 02110183=

Accident 1615Z

MVFR SPECI KSFB 081631Z 18007KT 10SM BKN022 23/19 A2987 RMK AO2 T02280189=

VFR SPECI KSFB 081645Z 19006KT 10SM FEW012 SCT022 24/19 A2986 RMK AO2 T02390194=

VFR METAR KSFB 081653Z 18008KT 10SM FEW012 FEW023 24/19 A2985 RMK AO2 SLP108 T02440194=

MVFR SPECI KSFB 081737Z 21008KT 10SM BKN020 26/19 A2983 RMK AO2 T02610194=

VFR SPECI KSFB 081744Z 21010G17KT 10SM FEW021 SCT027 27/19 A2982 RMK AO2 T02670194=

A review of the 24-hours prior to the accident also indicated that LIFR to IFR conditions due to low ceilings and visibility in fog impacted KSFB on December 7 with some improving condition to MVFR ceilings and visibility on the morning of December 8 prior to the accident, with lowering ceilings immediately surrounding the time of the accident, with improving MVFR conditions immediately after the accident.

⁷ As defined by the NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories:

- Low Instrument Flight Rules (LIFR*) – ceiling below 500 ft agl and/or visibility less than 1 statute mile.
- Instrument Flight Rules (IFR) – ceiling between 500 to below 1,000 feet agl and/or visibility 1 to less than 3 miles.
- Marginal Visual Flight Rules (MVFR**) – ceiling from 1,000 to 3,000 ft agl and/or visibility 3 to 5 miles.
- Visual Flight Rules (VFR) – ceiling greater 3,000 ft agl and visibility greater than 5 miles.

* By definition, IFR is a ceiling less than 1,000 ft agl and/or visibility less than 3 miles while LIFR is a sub-category of IFR.

**By definition, VFR is a ceiling greater than or equal to 3,000 ft agl and visibility greater than 5 miles while MVFR is a sub-category of VFR.

2.2 New Smyrna Beach Municipal Airport

The next closest weather reporting location was from New Smyrna Beach Municipal Airport (KEVB), New Smyrna Beach, FL, located 18 miles north-northeast of the accident site at an elevation of 10 ft. The airport had an Automated Weather Observation System (AWOS), which was augmented by tower personnel. The following conditions were reported immediately prior to the accident:

KEVB weather observation at 1047 EST, wind calm, visibility 10 miles or more, ceiling overcast at 1,000 ft agl, temperature 22° C, dew point 19° C, and altimeter 29.90 inches of Hg.

The raw observations and general flight categories were as follows:

MVFR METAR KEVB 081350Z 00000KT 10SM BKN013 19/17 A2990=

IFR SPECI KEVB 081405Z 00000KT 10SM OVC009 19/17 A2991=

IFR METAR KEVB 081450Z 00000KT 10SM OVC009 19/17 A2991=

MVFR METAR KEVB 081547Z 00000KT 10SM OVC010 22/19 A2990=

Accident 1615Z

MVFR METAR KEVB 081647Z 20008KT 10SM OVC012 22/19 A2988=

MVFR METAR KEVB 081750Z 20010KT 10SM BKN015 25/20 A2983=

2.3 Orlando Executive Airport

The next closest station was Orlando Executive Airport (KORL), Orlando, FL, located 19 miles southwest of the accident site at an elevation of 113 ft. The airport had a federally installed and maintained ASOS and was augmented by certified observers. The following conditions were reported:

KORL weather observation at 1053 EST, wind from 170° at 6 knots, visibility 10 miles or more, ceiling overcast at 800 ft agl, temperature 22° C, dew point 19° C, altimeter setting 29.89 inches of Hg. Remarks; automated observation system with a precipitation discriminator, sea level pressure 1012.6-hPa, temperature 21.7° C, dew point 19.4° C.

KORL special weather observation at 1119 EST, wind from 190° at 7 knots, visibility 10 miles or more, ceiling broken at 1,200 ft agl, temperature 23° C, dew point 20° C, altimeter setting 29.88 inches of Hg. Remarks; automated observation system with a precipitation discriminator, temperature 22.8° C, dew point 20.0° C.

The raw observations and general flight categories were as follows:

IFR METAR KORL 081353Z 00000KT 10SM OVC007 19/17 A2990 RMK AO2 CIG 006V010 SLP128 T01890172

IFR METAR KORL 081453Z 19003KT 10SM OVC007 20/18 A2990 RMK AO2 SLP129 T02000183 53001

IFR METAR KORL 081553Z 17006KT 10SM OVC008 22/19 A2989 RMK AO2 SLP126 T02170194

Accident 1615Z

MVFR SPECI KORL 081619Z 19007KT 10SM BKN012 23/20 A2988 RMK AO2 T02280200=

VFR SPECI KORL 081648Z 20011KT 10SM SCT014 25/21 A2986 RMK AO2=

VFR METAR KORL 081653Z 20013KT 10SM FEW014 25/21 A2985 RMK AO2 SLP112 T02500206=

VFR METAR KORL 081753Z 21012G18KT 10SM FEW024 28/21 A2982 RMK AO2 SLP099 T02780206 10278
20172 58026=

2.4 Orlando International Airport

Orlando International Airport (KMCO), Orlando, FL, was the next closest reporting site located 24 miles southwest of the accident site at an elevation of 96 ft. The airport had a federally installed and maintained ASOS and was augmented by certified observers. The following conditions were reported:

KMCO weather observation at 1053 EST, wind variable at 6 knots, visibility 9 miles, a few clouds at 600 ft agl, ceiling broken at 900 ft, broken at 2,300 ft, temperature 22° C, dew point 21° C, and altimeter setting 29.90 inches of Hg. Remarks; automated observation system with a precipitation discriminator, sea level pressure 1012.2-hPa, temperature 22.2° C, dew point 20.6° C.

KMCO special weather observation at 1126 EST, wind from 190° at 9 knots, visibility 10 miles or more, ceiling broken at 1,000 ft agl, broken at 2,300 ft, broken at 25,000 ft, temperature 24° C, dew point 21° C, and altimeter setting 29.88 inches of Hg. Remarks; automated observation system with a precipitation discriminator, temperature 24.4° C, dew point 21.1° C.

The raw observations and general flight categories were as follows:

IFR METAR KMCO 081353Z 12003KT 6SM BR OVC006 18/17 A2990 RMK AO2 SLP124 T01780172

IFR METAR KMCO 081453Z 00000KT 7SM OVC006 19/18 A2990 RMK AO2 DZB04E20 SLP124 P0000
60000 T01940183 58000

IFR METAR KMCO 081553Z VRB06KT 9SM FEW006 BKN009 BKN023 22/21 A2990 RMK AO2 SLP122
T02220206

Accident 1615Z

MVFR SPECI KMCO 081626Z 19009KT 10SM BKN010 BKN023 BKN250 24/21A2988 RMK AO2 T02440211

VFR SPECI KMCO 081642Z 18009KT 10SM SCT013 SCT025 BKN250 24/21 A2986 RMK AO2 T02440211=

VFR METAR KMCO 081653Z 19011KT 10SM SCT013 BKN250 25/21 A2986 RMK AO2 SLP109 T02500211=

VFR METAR KMCO 081753Z 18013G18KT 10SM SCT022 SCT170 BKN250 27/21 A2981 RMK AO2 SLP093
60000 T02670206 10272 20167 58031=

2.5 Space Coast Regional Airport

The Space Coast Regional Airport (KTIX), Titusville, FL, was located 20 miles south-southeast of the accident site at an elevation of 34 ft. The airport had an AWOS and was also augmented by tower personnel. The following conditions were reported prior to the accident:

KTIX weather observation at 1055 EST, wind calm, visibility 5 miles in haze, ceiling overcast at 500 ft agl, temperature 22° C, dew point 21° C, and altimeter setting 29.90 inches of Hg.

The raw observations and flight categories were as follows:

IFR METAR KTIX 081355Z 00000KT 5SM HZ OVC007 20/19 A3001=

IFR METAR KTIX 081447Z 00000KT 7SM OVC005 21/20 A2991=

IFR METAR KTIX 081555Z 00000KT 5SM HZ OVC005 22/21 A2990=

Accident 1615Z

MVFR METAR KTIX 081647Z 21008KT 7SM BKN013 27/21 A2987=

MVFR METAR KTIX 081747Z 21008KT 7SM BKN027 BKN032 28/21 A2983=

2.6 METAR Display

A depiction of the METAR observations at 1120 EST on December 8, 2017, obtained from the NWS Aviation Weather Center (AWC) is included as figure 6 with the approximate accident site marked by the red star.

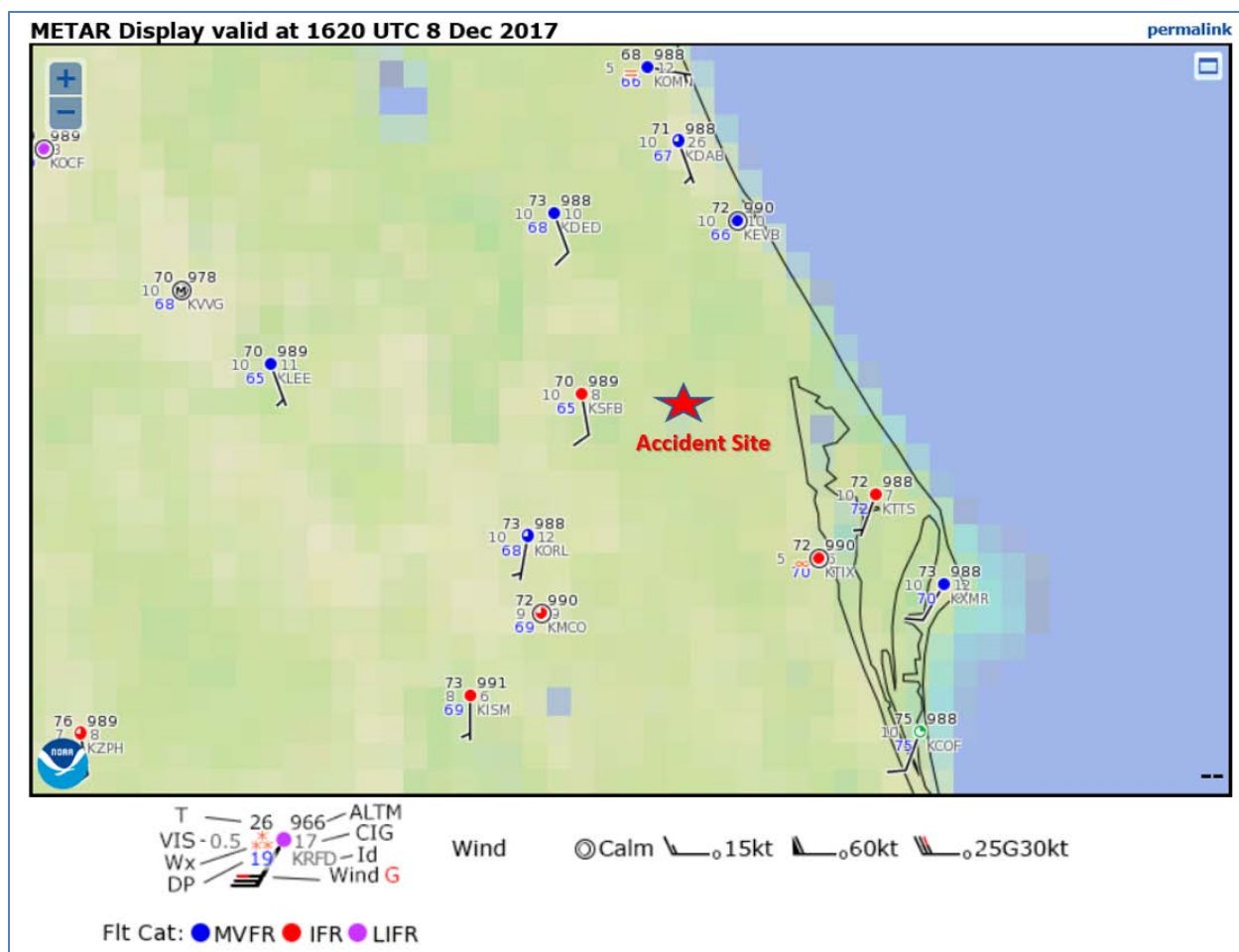


Figure 6 - METAR Display from AWC at 1120 EST

3.0 Sounding

The closest upper air observation or rawinsonde observation (RAOB) was from the United States Air Force Cape Canaveral Weather Station (KXMR), site number 74794, located 31 miles southeast of the accident site at an elevation of 10 ft. The sounding observation for 0700 EST (1200Z) on December 8, 2017, from the surface to 18,000 ft plotted on a standard Skew-T log P diagram⁸ using the RAOB software⁹ is included as figure 7.

⁸ Skew T log P diagram – is a standard meteorological plot or thermodynamic diagram using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

⁹ RAOB software – The complete Rawinsonde Observation program is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania, for plotting and analyzing upper air data.

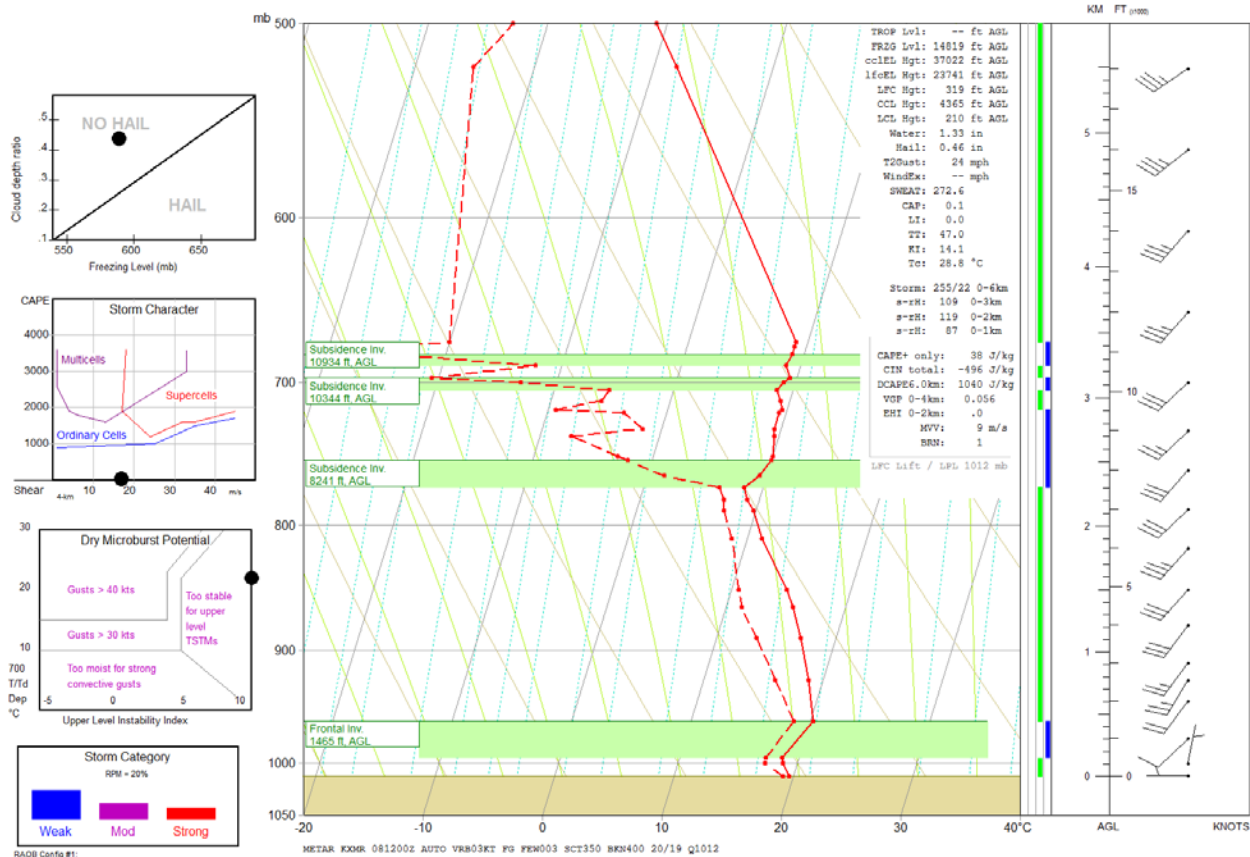


Figure 7 - Cape Canaveral sounding at 0700 EST

The KXMR 0700 EST sounding depicted a surface temperature of 19.6° C, a dew point of 19.1° C, with a relative humidity of 97%, and indicated a precipitable water content of 1.33 inches. The sounding depicted the lifted condensation level (LCL)¹⁰ at 210 ft agl, the level of free convection (LFC)¹¹ or the approximate cloud bases at 319 ft agl, and the convective condensation level (CCL)¹² at 4,365 ft agl. The sounding supported multiple layer of clouds with the relative humidity greater than 85% below 8,000 ft. The freezing level was identified at 14,800 ft well above the accident airplanes operating altitude during the period, and thus no structural icing conditions existed in this case. The equilibrium level (EL)¹³ or expected cloud tops of any convective clouds was at 23,700 ft. Several temperature inversions were also noted with the first immediately above the surface at 1,465 ft, and several between 7,500 through 11,000 ft. The atmosphere was

¹⁰ Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹¹ 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.

¹² Convective Condensation Level (CCL) - The height to which a parcel of air, if heated sufficiently from below, will rise adiabatically until condensation starts. This is typically used to identify the base of cumuliform clouds, which are normally produced from surface heating and thermal convection.

¹³ Equilibrium Level (EL) - On a sounding, the level above the level of free convection (LFC) at which the temperature of a rising air parcel again equals the temperature of the environment. The height of the EL is the height at which thunderstorm updrafts no longer accelerate upward. Thus, to a close approximation, it represents the height of expected (or ongoing) thunderstorm tops. However, strong updrafts will continue to rise past the EL before stopping, resulting in storm tops that are higher than the EL. This process sometimes can be seen visually as an overshooting tops or anvil dome. The EL typically is higher than the tropopause and is a more accurate reference for storm tops.

characterized as conditional unstable with a Lifted Index of 0, which supported a weak potential of thunderstorm development during the period.

The KXMR sounding wind profile indicated a surface wind from 270° at 3 knots, with the wind backing or changing counterclockwise to the southwest immediately above the low-level temperature inversion with wind speeds of 20 knots and a slow increase in wind speed with height. The mean 0 to 6 kilometer (km) or 18,000 ft steering wind was from 225° at 29 knots, and the level of maximum wind from 235° at 106 knots at 40,900 ft.

A table of the observed height, pressure, temperature (T), dew point temperature (Td), relative humidity in percent (RH%), wind direction and speed, and derived clear air turbulence (CAT), low-level wind shear (LLWS), and icing potential from the surface through 8,000 ft is included in figure 8.

Height (ft-MSL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD / FF (deg / kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)
10	1012	19.6	19.1	97	270 / 3	MDT	LIGHT	
348	1000	18.8	17.3	91	10 / 6			
490	995	18.6	17.2	92		SVR	LIGHT	
1000	977				225 / 9			
1475	961	20.2	18.6	91		SVR	LIGHT	
2000	943				215 / 22			
2557	925	18.8	16.0	84	210 / 24			
3000	911				215 / 25			
3675	889	17.0	13.3	79		LGT		
4000	879				215 / 28			
4473	864	15.6	11.3	76				
4928	850	14.6	10.6	77	220 / 29	LGT		
6000	818				220 / 33			
6260	810	11.2	8.7	85		LGT		
6980	789	9.8	7.3	84	225 / 30			
7258	781	9.0	7.0	87				
7573	772	8.4	6.3	87				
7856	764	9.4	1.4	57		LGT		
8000	760				220 / 28			

Figure 8 - Cape Canaveral observed sounding variables at 0700 EST

As noted in figures 7 and 8 the vertical wind profile indicated a potential of moderate to severe turbulence below 2,000 ft due to strong vertical shear immediately above the temperature inversion, and the RAOB program indicated a 99% probability of turbulence.

A High-Resolution Rapid Refresh (HRRR)¹⁴ model sounding was created from data from the NOAA Air Resource laboratory for the accident site for 1000 EST (1500Z) on December 8, 2017 and plotted on a similar skew T log P diagram, which is included as figure 9.

¹⁴ 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.

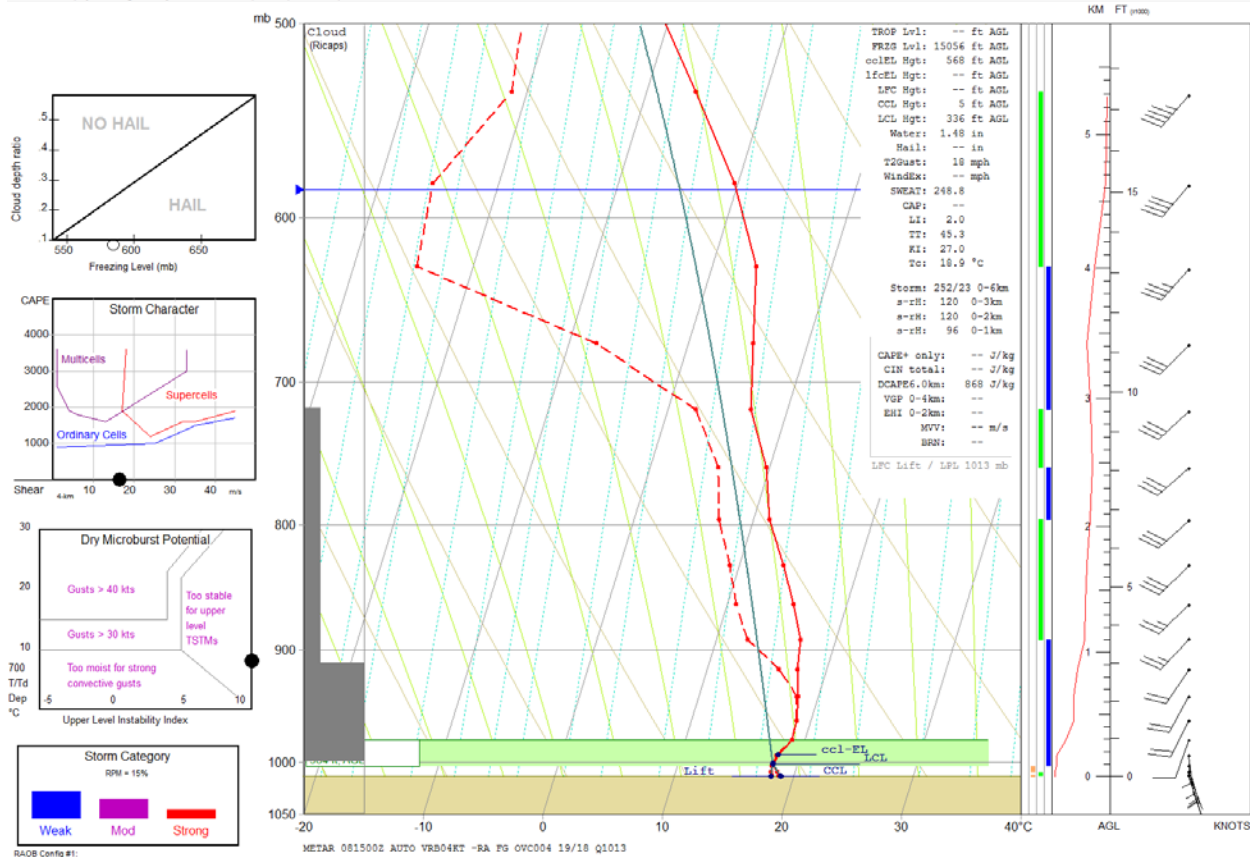


Figure 9 - HRRR numerical model over the accident site at 1000 EST

The HRRR model sounding for 1000 EST depicted a similar vertical structure to the KXMR sounding with a surface temperature of 19° C, dew point temperature of 18° C, with a precipitable water content of 1.48 inches. The significant levels indicated a lifted condensation level (LCL) at 336 ft. The relative humidity was greater than 98% from the surface through 2,800 ft, and supported an overcast layer of clouds with bases at 400 ft with tops near 3,000 ft. A single low-level inversion was noted immediately above the surface to 964 ft. The HRRR wind profile indicated a surface wind from 165° at 4 knots with winds veering clockwise to the southwest with height. A shear occurred near the tops of the frontal inversion and supported a 95% probability for moderate turbulence below 1,000 ft due to the vertical shear of 7.8 kts/1000 ft. With another shear level at 2,800 ft with an 88% probability of moderate turbulence. The mean 0 to 6 km wind was 220° at 31 knots, and the level of maximum wind from 230° at 92 knots at 39,700 ft.

Figure 10 is a table of the HRRR model data variables through 8,000 ft, and depicts the turbulence below 1,000 ft and at 2,800 ft.

Height (ft-MSL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD / FF (deg / kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)
0	1013	18.9	18.1	95	164 / 4			
28	1012	18.7	18.1	96	164 / 4			
112	1009	18.5	18.0	97	161 / 4			
280	1003	18.0	17.9	99	166 / 5			
563	993	18.1	18.0	99	173 / 5	MDT	LIGHT	
964	979	18.9	18.9	100	199 / 12	MDT	LIGHT	
1489	961	18.8	18.8	100	206 / 18			
2114	940	18.3	18.2	99	208 / 18	LGT		
2843	916	17.5	16.0	91	213 / 21	MDT		
3621	891	17.0	12.6	75	222 / 26			
4547	862	15.5	10.7	73	224 / 27			
5565	831	13.7	9.2	74	224 / 28			
6752	796	11.3	7.1	75	226 / 30			
8092	758	9.7	5.7	76	228 / 32			

Figure 10 - HRRR model sounding parameters at 1000 EST

4.0 Aircraft Observation

A review of Aircraft Meteorological Data Relay (AMDAR) instrumented aircraft into the area surrounding the period provided an aircraft observation with a moisture sensor to confirm cloud layers. Figure 11 is a depiction of aircraft #1549 which descended into KMCO and landed at 1049 EST (1549Z) on December 8, 2017. The aircraft derived sounding on the left depicted a low-level temperature inversion with saturated conditions to 3,000 ft or the approximate cloud tops.

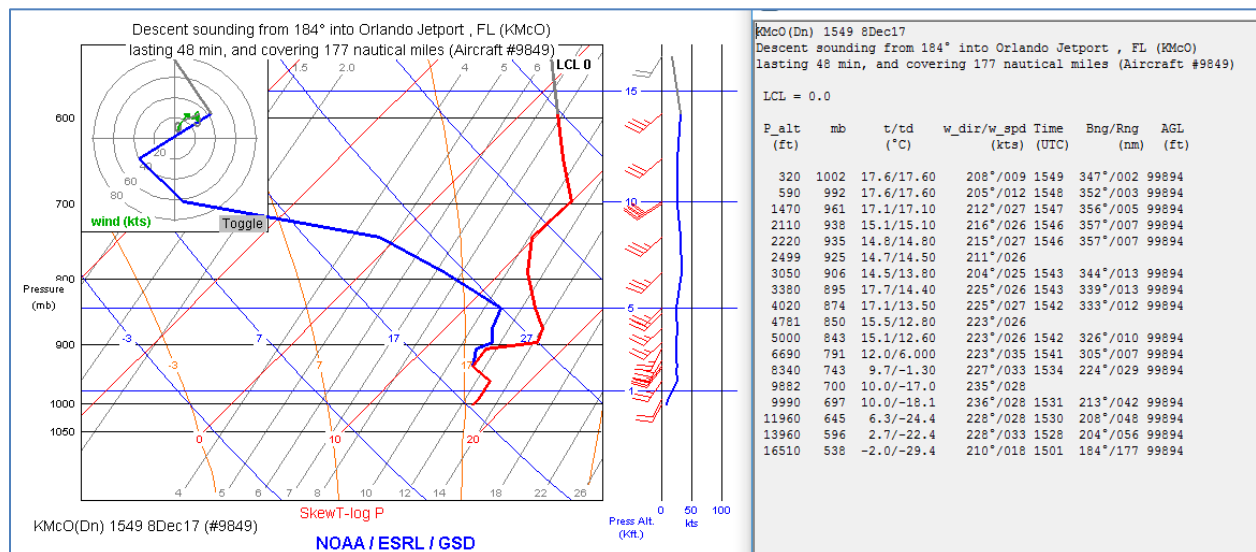


Figure 11 - AMDAR aircraft descent sounding at 1049 EST into KMCO

5.0 Satellite Imagery

The Geostationary Operational Environmental Satellite number 13 (GOES-13) data was obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System (McIDAS) software. The infrared long wave and visible imagery was

obtained surrounding the time of the accident and reviewed. The infrared long wave imagery (band 4) at a wavelength of 10.7 microns (μm) provided standard satellite image with radiative cloud top temperatures with a resolution of 4.0 km, while the visible (band 1) at a wavelength of 0.65 μm provided a resolution of 1 km. Satellite imagery surrounding the period was reviewed and relevant images at the time of the accident documented.

Figure 12 is the GOES-13 infrared image at 1115 EST at 4X magnification and with a standard MB temperature curve applied to highlight the higher and colder clouds tops typically observed with convection clouds and cirrus clouds. The accident site is also marked for reference. The image depicted an enhanced area of clouds over the Gulf of Mexico into northwest Florida, which was associated with the convective echoes noted in the National Composite Reflectivity imagery (figure 3). No enhanced areas of clouds were observed in the vicinity of the accident site. An area of low stratiform type clouds is observed over the accident site and into northeastern Florida. The radiative cloud tops of the low stratiform clouds over the accident site was measured at 288° Kelvin or 14.8° C, which corresponded to cloud tops near 4,900 ft based on the HRRR and KXMR soundings.

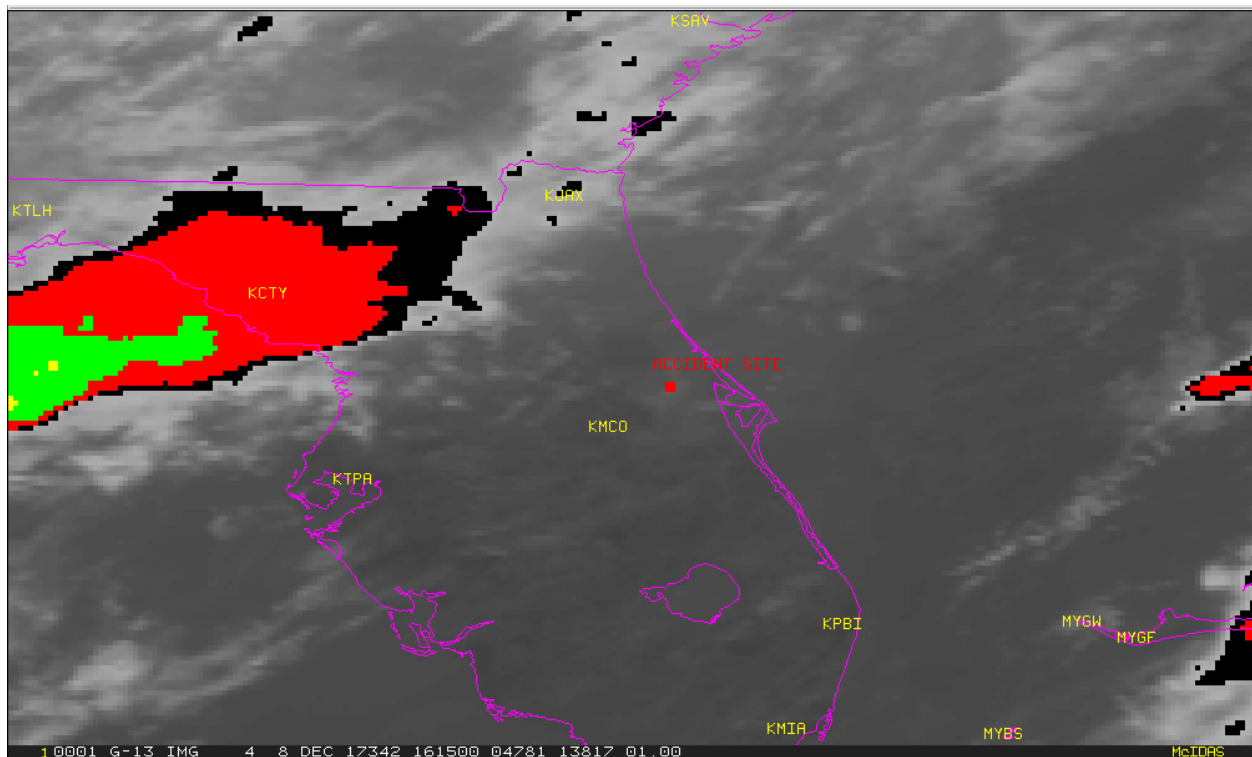


Figure 12 - GOES-13 infrared image at 1115 EST at 4X magnification

Figure 13 is the GOES-13 visible imagery at 1115 EST at 2X magnification with a higher resolution of 1 km and provided a better depiction of the low cloud cover over the area. An extensive area of low stratiform type clouds is observed over most of central and northern Florida, with more scattered stratocumulus clouds south of the Orlando area across southern Florida. The Sanford (KSFB) to New Smyrna Beach (KEVB) area has an area of stratiform clouds extending over the region and the accident site.

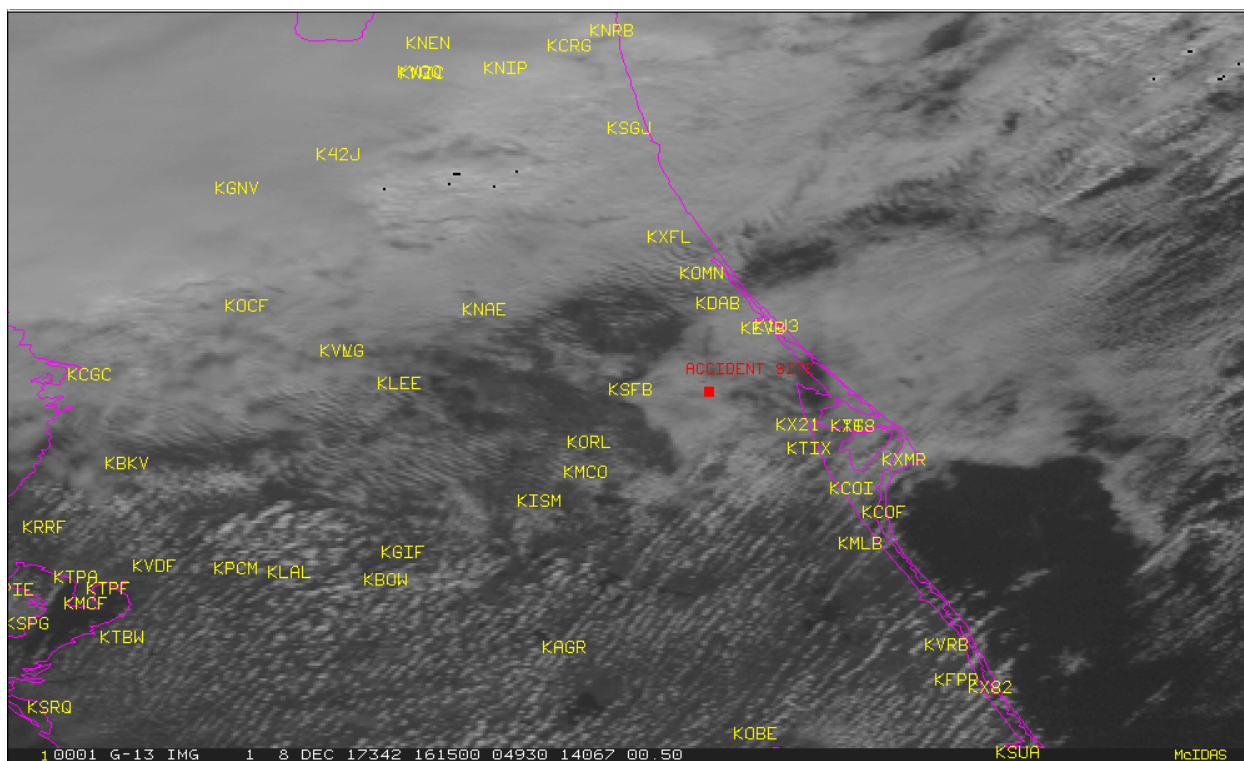


Figure 13 - GOES-13 visible image at 1115 EST at 2X magnification

6.0 Pilot Reports

The following pilot reports or PIREPs were reported surrounding the period from 0700 to 1300 EST on December 8, 2017 over central Florida. Only reports below 18,000 ft have been included below. The reports have been decoded from standard code and abbreviations with time converted to local time. The reports include the general closest airport and the location relevant to that location, and were as follows:

Orlando International Airport (MCO) routine pilot report (UA); Over – MCO, Time – 0734 EST; Altitude - 2,000 ft; Type aircraft – Airbus A319 air carrier jet; Sky cover – broken clouds with bases at 500 ft and tops at 700 ft, with sky clear above.

Orlando International Airport (MCO) routine pilot report (UA); Over – runway 35R on descent; Time – 0745 EST; Altitude - 400 ft; Type aircraft – Boeing 737 air carrier jet; Sky cover – bases of overcast clouds 400 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – runway 17R on climb; Time – 0748 EST; Altitude - 600 ft; Type aircraft – Boeing 737 air carrier jet; Sky cover – bases of overcast clouds 600 ft.

*Orlando International Airport (MCO) routine pilot report (UA); Over – 3 miles north of MCO; Time – 0751 EST; Altitude – 1,300 ft; Type aircraft – Airbus A320 air carrier jet; Sky cover – overcast clouds at 1,300 ft. * likely coding error – reporting cloud top**

Orlando Sanford International Airport (SFB) routine pilot report (UA); Over – SFB; Time – 0810 EST; Altitude – during climb; Type aircraft – McDonald Douglas MD-83 air carrier jet; Sky cover – broken clouds bases at 200 ft with tops at 1,500 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – runway 35L; Time – 0820 EST; Altitude – 500 ft; Type aircraft – Airbus A320 air carrier jet; Sky cover – bases of overcast clouds at 500 ft during climb.

Orlando Sanford International Airport (SFB) routine pilot report (UA); Over – SFB; Time – 0844 EST; Altitude – unknown; Type aircraft – Cirrus SR20 single engine airplane; Sky cover – overcast clouds bases at 600 ft with tops at 3,500 ft; Remarks – during descent runway 09L.

Vero Beach Regional Airport (VRB) routine pilot report (UA); Over – Treasure VORTAC¹⁵ (TRV) 120° radial and distance 2 miles; Time – 0849 EST; Altitude – 500 ft; Type aircraft – Lear 60 business jet; Sky cover – broken clouds bases at 500 ft.

Vero Beach Regional Airport (VRB) routine pilot report (UA); Over – Treasure VORTAC 120° radial and distance 6 miles; Time – 0858 EST; Altitude – 400 ft; Type aircraft – Piper (P28A); Sky cover – overcast clouds bases at 400 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – runway 18R; Time 0900 EST; Altitude – 600 ft; Type aircraft – Boeing 737 air carrier jet; Sky cover – tops of overcast at 600 ft reported during descent.

Vero Beach Regional Airport (VRB) routine pilot report (UA); Over – Treasure VORTAC; Time – 0907 EST; Altitude – 400 ft; Type aircraft – Embraer Phenom 300 business jet; Sky cover – broken bases at 900 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – MCO; Time 0920 EST; Altitude – 2,300 ft; Type aircraft – Boeing 737 air carrier jet; Remarks – on final approach for runway 17L cloud tops 2,300 ft with bases at 600 ft.

Daytona Beach International Airport (DAB) routine pilot report (UA); Over – Ormond Beach VORTAC (OMN); Time – 0921 EST; Altitude – 4,000 ft; Type aircraft – Cessna 172 Skyhawk single engine airplane; Sky cover – broken clouds with bases at 1,600 ft and tops at 3,100 ft.

Orlando Executive Airport (ORL) routine pilot report (UA); Over – MCO; Time – 0929 EST; Altitude – 4,500 ft; Aircraft – Airbus A321 air carrier jet; Sky cover – tops of overcast clouds at 2,000 ft.

Orlando Executive Airport (ORL) routine pilot report (UA); Over – ORL; Time – 0941 EST; Altitude – 2,200 ft; Aircraft – Boeing 737 air carrier jet; Sky cover – cloud bases at 600 ft with tops of overcast clouds at 2,400 ft, flight visibility 1 miles; Turbulence – smooth.

Vero Beach Regional Airport (VRB) routine pilot report (UA); Over – Treasure VORTAC; Time – 0957 EST; Altitude – 800 ft; Type aircraft – Piper Cherokee (P28A) single engine airplane; Sky cover – broken bases at 800 ft.

¹⁵ VORTAC – is a very high frequency (VHF) omnidirectional range (VOR) beacon collocated with a tactical air navigation beacon (TACAN) or distance measuring equipment (DME) that provides azimuth and distance information from the station to for navigational purposes to pilots. Unless otherwise noted, the navigation aid is collocated with the city in the report.

Daytona Beach International Airport (DAB) routine pilot report (UA); Over – DAB; Time – 0959 EST; Altitude – 800 ft; Type aircraft – Piper Cherokee Arrow (P28R) single engine airplane; Sky cover – overcast clouds with bases at 800 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – MCO; Time 1001 EST; Altitude – unknown; Type aircraft – Boeing 737 air carrier jet; Sky cover – tops of overcast clouds at 1,700 ft.

Vero Beach Regional Airport (VRB) routine pilot report (UA); Over – Treasure VORTAC 130° radial and distance of 3 miles; Time – 1006 EST; Altitude – 600 ft; Type aircraft – Piper Seminole (PA44) multiengine airplane; Sky cover – broken bases at 700 ft.

Daytona Beach International Airport (DAB) routine pilot report (UA); Over – DAB; Time – 1021 EST; Altitude – 800 ft; Type aircraft – Cessna Skyhawk (C172) single engine airplane; Sky cover – overcast clouds with bases at 800 ft.

Daytona Beach International Airport (DAB) routine pilot report (UA); Over – Ormond Beach VORTAC 220° radial and distance of 10 miles; Time – 1024 EST; Altitude – 3,000 ft; Type aircraft – Cessna Skyhawk (C172) single engine airplane; Sky cover – overcast clouds with bases at 800 ft and tops at 2,600 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – MCO; Time 1115 EST; Altitude – during descent; Type aircraft – McDonald Douglas MD88 air carrier jet; Sky cover – bases of broken clouds at 1,100 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – MCO; Time 1124 EST; Altitude – 2,500 ft; Type aircraft – Bombardier CRJ2000 regional air carrier jet; Sky cover – bases of broken clouds at 1,500 ft and tops at 2,500 ft.

Daytona Beach International Airport (DAB) routine pilot report (UA); Over – Ormond Beach VORTAC 220° radial and distance of 10 miles; Time – 1157 EST; Altitude – 3,000 ft; Type aircraft – Diamond (DA24) Twin Star multiengine air plane; Sky cover – broken clouds with bases at 1,200 ft and tops at 3,000 ft.

Orlando International Airport (MCO) routine pilot report (UA); Over – 5 miles west of Kissimmee Gateway Airport (ISM); Time 1238 EST; Altitude – 3,000 ft; Type aircraft – McDonald Douglas MD88 air carrier jet; Sky cover – broken clouds at 3,300 ft and broken at 1,800 ft.

7.0 Terminal Aerodrome Forecast

The NWS Melbourne (KMLB) Weather Forecast Office (WFO) was responsible for the issuance of the KSFB Terminal Aerodrome Forecast (TAF). The forecast current at the time of the accident was issued at 0627 EST on December 8, 2017 and valid for a 24-hour period beginning at 0700 EST. The forecast was as follows:

TAF KSFB 081127Z 0812/0912 03003KT P6SM SCT008 OVC015
TEMPO 0812/0814 OVC008
FM081600 19005KT P6SM BKN015
FM081800 21009KT P6SM SCT015 BKN040
FM082300 19006KT P6SM VCSH SCT020 BKN035
FM090300 19010KT P6SM VCTS SCT015CB BKN025
FM090800 25012KT P6SM VCSH SCT008 OVC015=

The forecast from 0700 to 1100 EST was for wind from 030° at 3 knots, visibility better than 6 miles, scattered clouds at 800 ft agl, overcast at 1,500 ft with temporary¹⁶ ceilings of 800 ft agl between 0700 and 0900 EST. From 1100 to 1300 EST wind from 190° at 5 knots, visibility better than 6 miles, ceiling broken at 1,500 ft agl. After 1300 through 2200 EST the forecast expected VFR conditions to prevail with visibility better than 6 miles and scattered clouds at 1,500 to 2,000 ft.

8.0 Area Forecast Discussion

The NWS KMLB Area Forecast Discussion issued at 0953 EST discussing the meteorological conditions over the region, short range and aviation forecast are included below. There was no significant weather discussion about the low cloud cover over the area during the period, the main concern was for potential severe thunderstorms impacting the region during the evening and overnight periods.

*FXUS62 KMLB 081453
AFDMLB*

*East Central Florida Forecast Discussion
National Weather Service Melbourne FL
953 AM EST Fri Dec 8 2017*

*.DISCUSSION...
...Slight Chance for Severe Storms this Evening and Overnight...
...Turning Much Colder This Weekend...*

Today-Tonight... Upstream convection is developing over the eastern gulf with local winds increasing on the Air Force 915 mhz profiler network based near XMR. Low clouds have been hanging tough at mid morning across much of the area, however as the warm sector thickens there should be an opportunity for SB instability to develop during the course of the afternoon. The vigorous disturbance approaching from the gulf today will be the main player in development of organized storms.

modified prev disc...

Models have continued to trend a tad slower with the approaching system. A weak wave of low pressure will move along quasi-stationary frontal boundary in the Gulf of Mexico through this evening then transition northeast of the area after midnight. This will pivot a cold front southeastward through northern sections late tonight with the 00z GFS showing it reaching the Treasure Coast by about daybreak Sat. This is slightly slower than 24 hours ago.

Warm temps will develop in the increasing southwest flow with higher theta air working well northward across central FL. As a result, would expect some late day convection to initiate due to boundary interactions well ahead of cold front.

By tonight, we expect a band of storms along the cold front to approach northern sections and move steadily eastward across the rest of the area through the overnight hours. Deep layer shear will be increasing ahead of an approaching shortwave trough aloft, allowing for some organization of storms within a band of pre-frontal convection. Increasing southerly flow will advect quite high dewpoints near

¹⁶ Temporary – is defined as conditions are expected to last for generally less than an hour at a time (occasional), and are expected to occur during less than half the time period.

70 degrees into the central peninsula, while divergence aloft provides storm evacuation. This looks supportive of the overnight convection being maintained as it traverses the peninsula.

The Storm Prediction Center has much of east central Florida within a slight risk for severe weather. Damaging wind gusts will be the main threat, though a slight chance for tornadoes also exists. We generally expect a steady progression of the squall line across the area during the overnight hours. More recent HRRR model runs suggest the line could be approaching Lake county around 9-10 PM, moving east around 30 mph. This is within a reasonable couple hours of GFS. Any pre-frontal band of convection becomes more prominent over the Gulf, we'll be able to give better estimates of the squall line's timing.

Sat-Sat Night...

Early in the period a cold front will lie south of the Cape with ongoing showers and isolated storms across ECFL. Aloft, an upper trough extending from the FL Panhandle southwestward through the GOMEX will advance eastward and into north-central FL by sunset Sat evening. This upper wave will continue to weaken through the night as it ventures into south FL. Diffluence aloft from the tail end of a 120-130kt upper jet will aid the shower/isolated storm activity. Highest PoPs from north Osceola-Cape southward, initially 70-90pct will decrease from north to south during the day. PoPs north of here 50-70pct and will end much quicker during the morning/early afternoon as the activity spreads southeastward. A few strong storms during the morning cannot be ruled out, especially south of Melbourne. Gusty winds, lightning, coin-size hail, and torrential downpours the main threats. Winds will become west- northwesterly behind the front. Wind speeds will approach 15-20 mph with frequent higher gusts, at times, during the day. Speeds will decrease during the evening/overnight but may remain elevated near 10 mph.

Temperatures on this day will range from the M50s to L60s near/north of I-4. Southward generally 60s, but may see some temperatures around 70 degrees along the St. Lucie/Martin coasts. Cold air advection pours down the peninsula Sat overnight. Lows for most areas may realize down into the 30s, except L-M40s immediate St. Lucie/Martin coasts, and some larger metropolitan areas may be closer to around 40 degrees. Elevated winds Sat night should keep frost concerns low, but lowest wind chills after midnight and towards sunrise Sun morning will be in the L-M30s almost areawide. A Wind Chill Advisory may be necessary for Sat overnight across much of the area.

&&

.AVIATION...

During the late afternoon and early evening there will be a chance of showers and slight chance of storms but the main threat for strong-severe storms looks to begin tonight. The HRRR model is starting to show the line of storms approaching KLEE around 02-03z, moving east near 25 knots. This would sweep the line through KISM-KMCO-KSFB-KDAB by about 04z, reaching KTIK-KMLB by 06-07z and KVRB-KSUA early Saturday morning.

&&

.MARINE...

Today-Tonight...South/southwest flow is progged at 10-15 knots then the gradient will tighten tonight as a weak wave of low pressure in the Gulf of Mexico approaches. Speeds will pick up to 15-20 knots by midnight and 20-25 knots offshore before sunrise Sat behind a cold front. This will necessitate an exercise caution statement this evening and a Small Craft Advisory offshore late. There is a slight chance for offshore moving storms late this afternoon into evening. An organized line of storms is expected to traverse the waters late tonight through the pre-dawn hours of Sat. These storms will be capable of producing wind gusts over 40 knots.

&&

.MLB WATCHES/WARNINGS/ADVISORIES...

FL...None.

AM...Small Craft Advisory from 4 AM Saturday to 10 AM EST Sunday for Flagler Beach to Volusia-Brevard County Line 20-60 nm-Sebastian Inlet to Jupiter Inlet 20-60 nm-Volusia-Brevard County Line to Sebastian Inlet 20-60 nm.

9.0 Inflight Weather Advisories

Inflight Aviation Weather Advisories are forecasts to advise en route aircraft of development of potentially hazardous weather. Inflight aviation weather advisories in the conterminous U.S. are issued by the NWS AWC, as well as from the Center Weather Service Units (CWSU) associated with FAA Air Route Traffic Control Center's (ARTCCs).

There are four basic types of inflight aviation weather advisories: the Significant Meteorological Advisory (SIGMET), the Convective SIGMET, the Airmen's Meteorological Information (AIRMET), and the Center Weather Advisory (CWA). These advisories use the same location identifiers (either VORs, airports, or well-known geographic areas) to describe the hazardous weather areas. The Severe Weather Watch Bulletins (WWs), with the associated Alert Messages (AWW) supplements these advisories.

During the period there were no SIGMETs issued. A Convective SIGMET was issued at 1055 EST for a line of thunderstorms off the Florida Atlantic coast (depicted in figure 14), and several CWA's were also issued for conditions for conditions over the coastal waters. None were applicable for the accident flight.

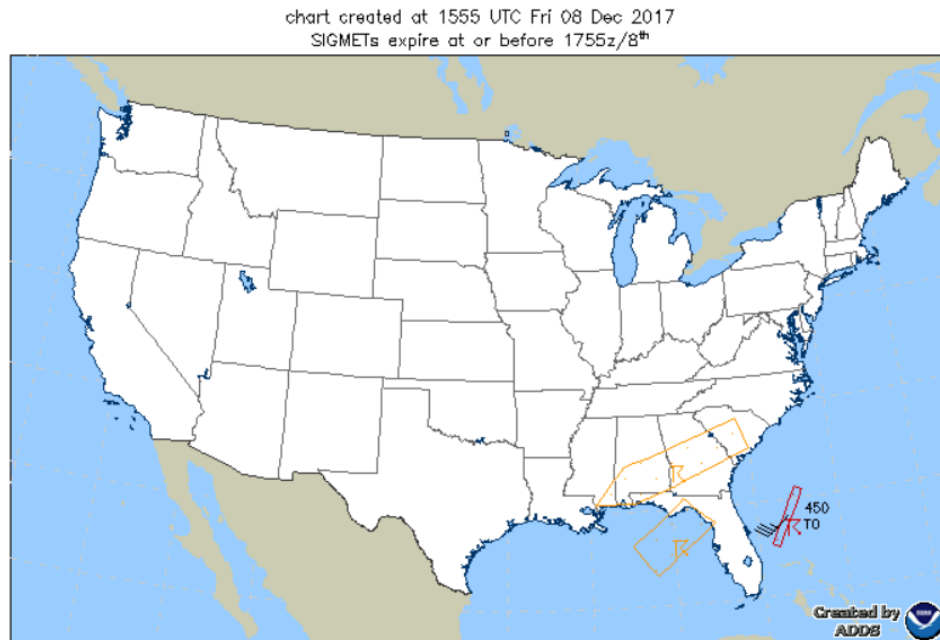


Figure 14 - Convective SIGMET 12E issued for thunderstorms at 1055 EST

WSUS31 KPCI 081555
SIGMET
-MKCE WST 081555

CONVECTIVE SIGMET 12E
 VALID UNTIL 1755Z
 FL GA CSTL WTRS
 FROM 200SE CHS-80E TRV
 LINE EMBD TS 25 NM WIDE MOV FROM 23035KT. TOPS TO FL450.

FAUS22 KZMA 081448
 ZMA2 CWA 081448
 ZMA CWA 202 VALID 081648
 FROM 245N ZLS-195N ZLS-55NNE ZQA-55ENE ZFP-245N ZLS
 AREA OF TS MOV FROM 24010KT. MAX TOPS EST TO FL420. EXP LTL CHG THRU PD.

FAUS23 KZMA 081642
 ZMA3 CWA 081642
 ZMA CWA 301 VALID UNTIL 081842
 FROM 105W SRQ-130WSW RSW-180WSW RSW-150W SRQ-105W SRQ
 AREA OF TS MOV FM 25015KT. MAX TOPS EST TO FL410. EXP LTL CHG THRU PD.
 MS

AIRMET Sierra update 2 is included in figure 15 followed by the text of the advisory. The area enclosed the accident site and expected ceilings below 1,000 ft agl and visibilities below 3 miles in precipitation and mist, with conditions expected to end between 1000 and 1300 EST.

SIERRA 2017-12-08 15:00:00

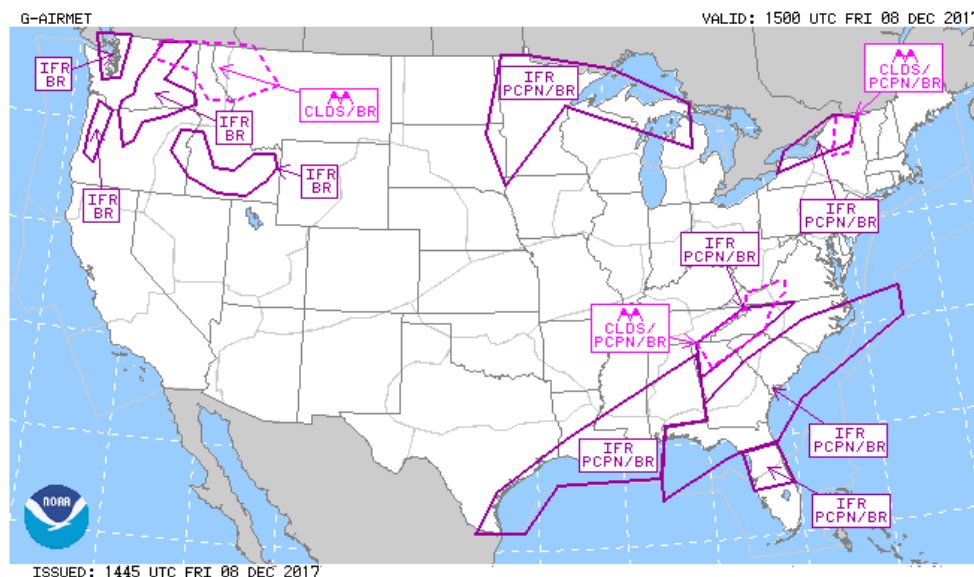


Figure 15 - AIRMET Sierra for IFR conditions valid at 1000 EST

WAUS42 KPCI 081445
 WA2S
 -MIAS WA 081445
 AIRMET SIERRA UPDT 2 FOR IFR AND MTN OBSCN VALID UNTIL 082100
 .
 AIRMET IFR...NC SC GA
 FROM HNV TO 40S PSK TO 20NNE LGC TO GQO TO HNV

CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 21Z ENDG 21-00Z.

AIRMET IFR...FL AND CSTL WTRS

FROM 20NE OMN TO 20SE TRV TO 20SW SRQ TO 40S CTY TO 20NE OMN
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS ENDG 15-18Z.

AIRMET IFR...NC SC GA FL NJ MD DE VA AND CSTL WTRS

FROM 50ESE SIE TO 150ESE SIE TO 190ESE ECG TO 140SSE ILM TO 30NE
OMN TO 40S CTY TO 170SE LEV TO 40W CEW TO 50SW PZD TO 20NNE LGC
TO 40S PSK TO 30SSE CSN TO 50ESE SIE
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

AIRMET MTN OBSCN...NC SC GA WV VA

FROM 20NNW CSN TO 30S CSN TO 20WNW GSO TO CLT TO ATL TO GQO TO
HMV TO 50WSW BKW TO 20NNW CSN
MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

OTLK VALID 2100-0300Z...IFR NC SC GA FL ME NH MA RI NY NJ PA WV
MD DC DE VA AND CSTL WTRS

BOUNDED BY 150ENE ACK-200SE ACK-160SE SIE-190ESE ECG-140SSE ILM-
120SE CHS-70WNW PIE-170SE LEV-120ESE LEV-40W CEW-50SW PZD-GQO-
HMV-20ENE CYN-150ENE ACK
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG THRU 03Z.

There were no AIRMETs for turbulence or icing expected over central Florida during the period.

10.0 Winds Aloft Forecast

The winds and temperature aloft forecast valid for 1300 EST and for use between 0900 and 1600 EST were as follows for central Florida:

WINDS ALOFT FORECASTS

DATA BASED ON 081200Z

VALID 081800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
MLB	2123	2233+14	2334+09	2429+05	2239-09	2443-21	244337	245646	248055
PIE	2130	2234+14	2336+10	2341+03	2246-09	2448-21	245237	235647	247656

The forecast for Melbourne (KMLB) at 3,000 ft was wind from 210° at 23 knots, at 6,000 ft from 220° at 33 knots with a temperature of 14° C.

11.0 Witness Statement

A witness to the accident was located on a boat near the north end of Lake Harney and reported hearing a low flying airplane approach his position at a low altitude. The witness stated that he could not see the airplane initially due to low clouds and light ground fog over the area, however, he observed the airplane below the cloud ceiling at 250 to 300 feet agl, and then climb rapidly.

The witness further stated that they were looking in the general direction of the engine noise when they observed the airplane dive vertically into the lake south of their position.

12.0 Astronomical Conditions

The United States Naval Observatory website provided the following astronomical conditions for Sanford, Seminole County, Florida on December 8, 2017:

Begin civil twilight	0640 EST
Sunrise	0706 EST
Accident	1115 EST
Sun transit	1217 EST
Sunset	1728 EST
End of civil twilight	1754 EST

Submitted by:

Don Eick
Senior Meteorologist