



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

December 2, 2019

Weather Study

METEOROLOGY

ERA20FA020

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A. ACCIDENT

Location: Colonia, New Jersey
Date: October 29, 2019
Time: 1058 eastern daylight time
1458 Coordinated Universal Time (UTC)
Aircraft: Cessna 414; Registration: N959MJ

B. METEOROLOGIST

Paul Suffern
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. 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 official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Centers for Environmental Information (NCEI). All times are eastern daylight time (EDT) based upon the 24-hour clock, where local time is -4 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 miles. NWS airport and station identifiers use the standard International Civil Aviation Organization 4-letter station identifiers versus the International Air Transport Association 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports.

The accident site location used was at latitude 40.5903° N, longitude 74.3108° W at an approximate elevation of 82 feet (ft).

D. FACTUAL INFORMATION

1.0 Synoptic Situation

The synoptic or large scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction and the 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 (FAA) Advisory Circular "Aviation Weather Services", AC 00-45H change 2¹.

¹

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1030

1.1 Surface Analysis Chart

The eastern section of the NWS Surface Analysis Chart for 1100 EDT is provided as figure 1 with the location of the accident site marked within the red circle. The chart depicted a high pressure ridge² extending over the area, with no frontal boundaries in the immediate vicinity of the accident site.

The station models around the accident site depicted air temperatures in the upper 50 degrees Fahrenheit (°F), dew point temperatures in the mid 60's °F with a temperature-dew point spread of 3° or less, a northeast wind at 5 to 10 knots, overcast cloud cover, and haze.

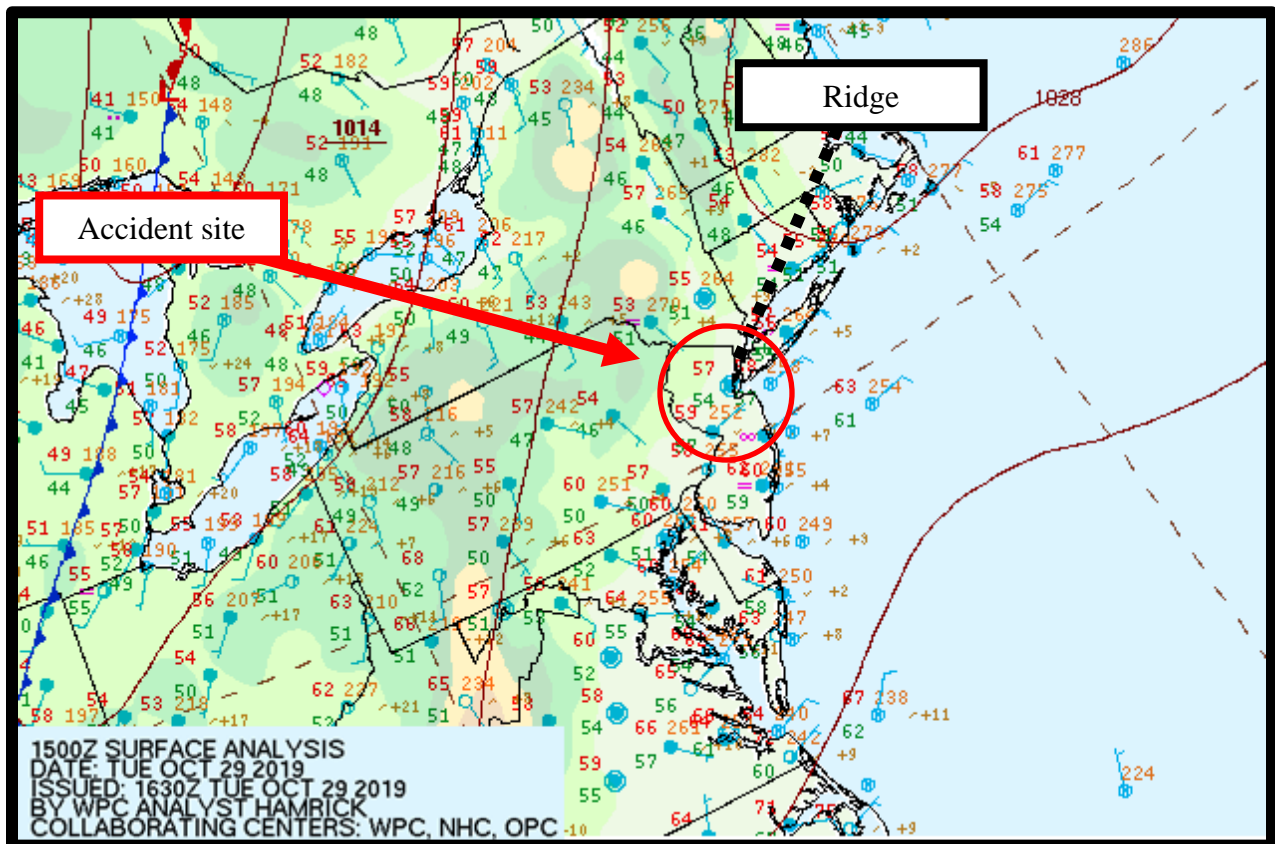


Figure 1 – NWS Surface Analysis Chart for 1100 EDT

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 0800 EDT at 925-, 850-, 700-, 500-, and 300-hectopascals (hPa) are presented in figures 2 through 6. There was a low- and mid-level trough³ located near and above the accident site at 850- and 700-hPa (figures 3 and 4). Low- and mid-level troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present. The wind was from the south at 30 knots at 925-hPa (figure 2) with the wind remaining southerly at 25 knots by 700-hPa (figure 4). At 300-hPa, the wind was from the west at 50 knots (figure 6).

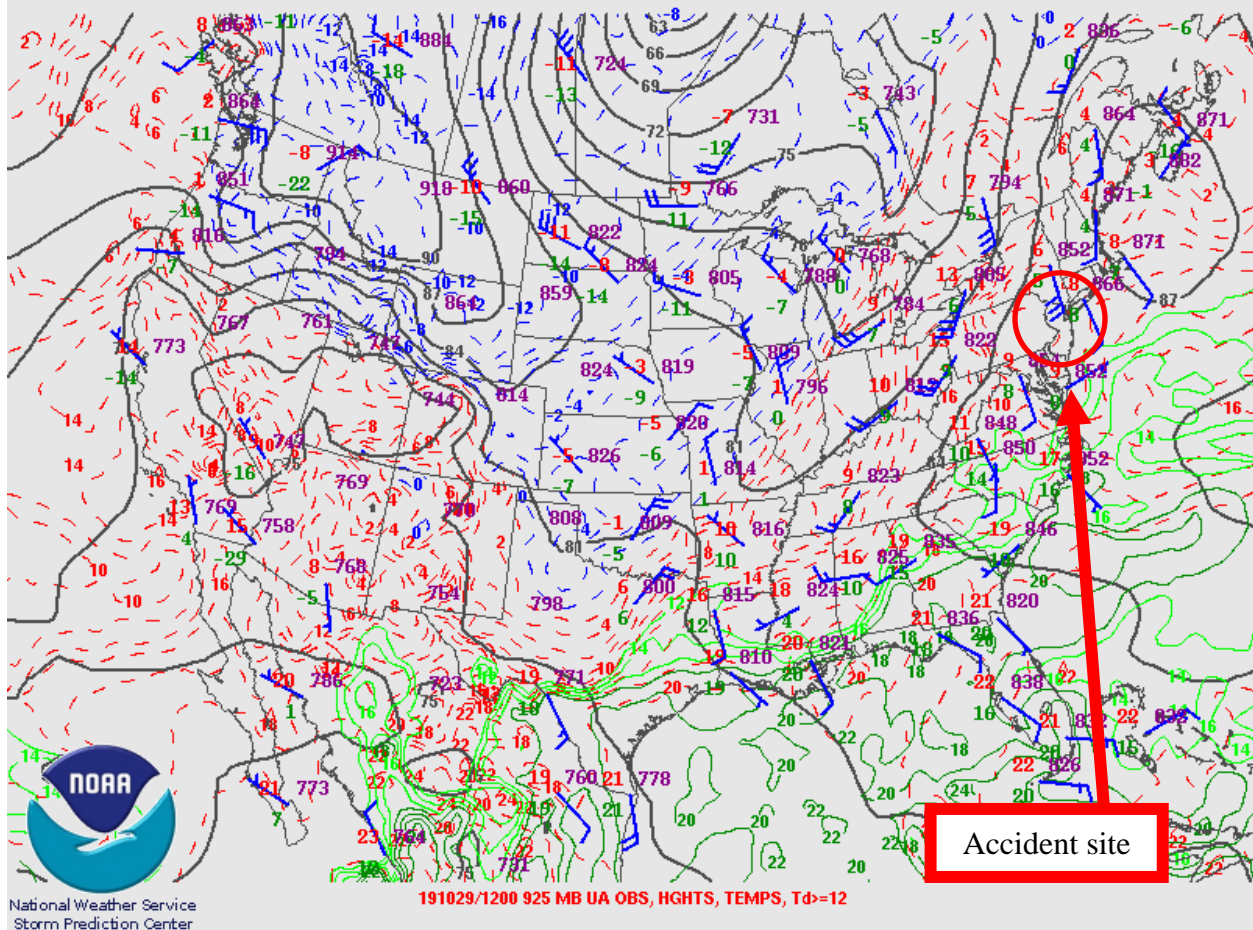


Figure 2 – 925-hPa Constant Pressure Chart for 0800 EDT

³ Trough – An elongated area of relatively low atmospheric pressure or heights.

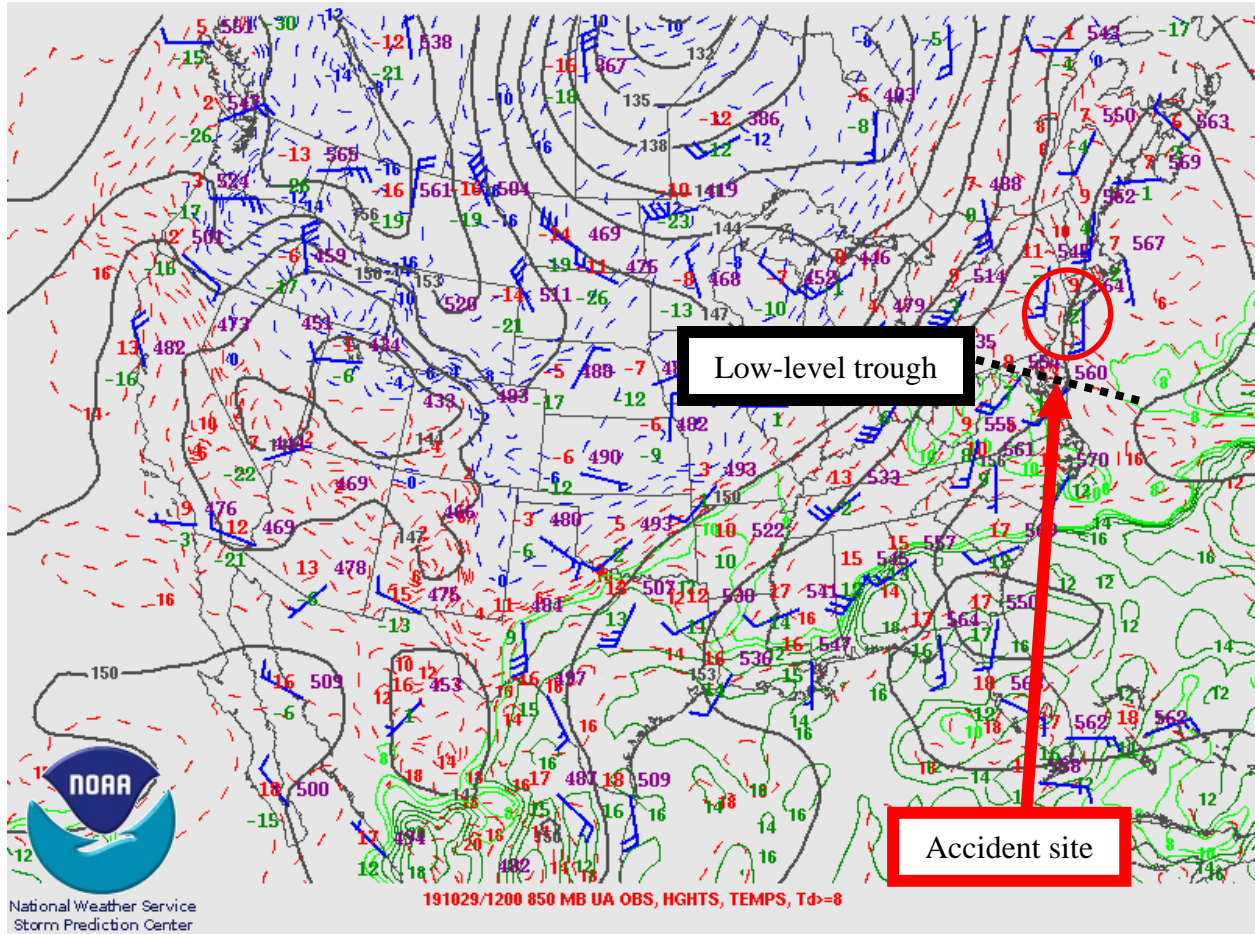


Figure 3 – 850-hPa Constant Pressure Chart for 0800 EDT

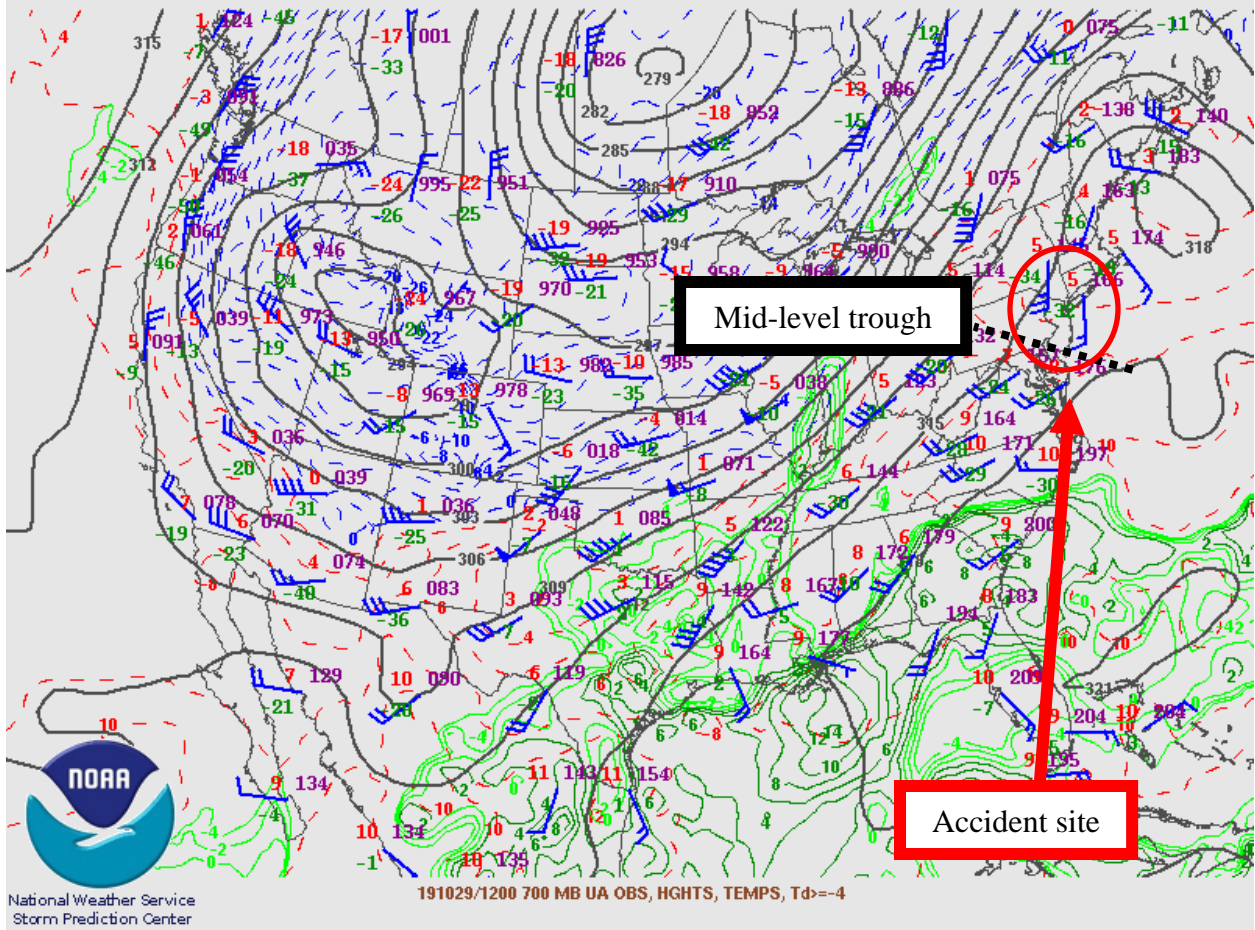


Figure 4 – 700-hPa Constant Pressure Chart for 0800 EDT

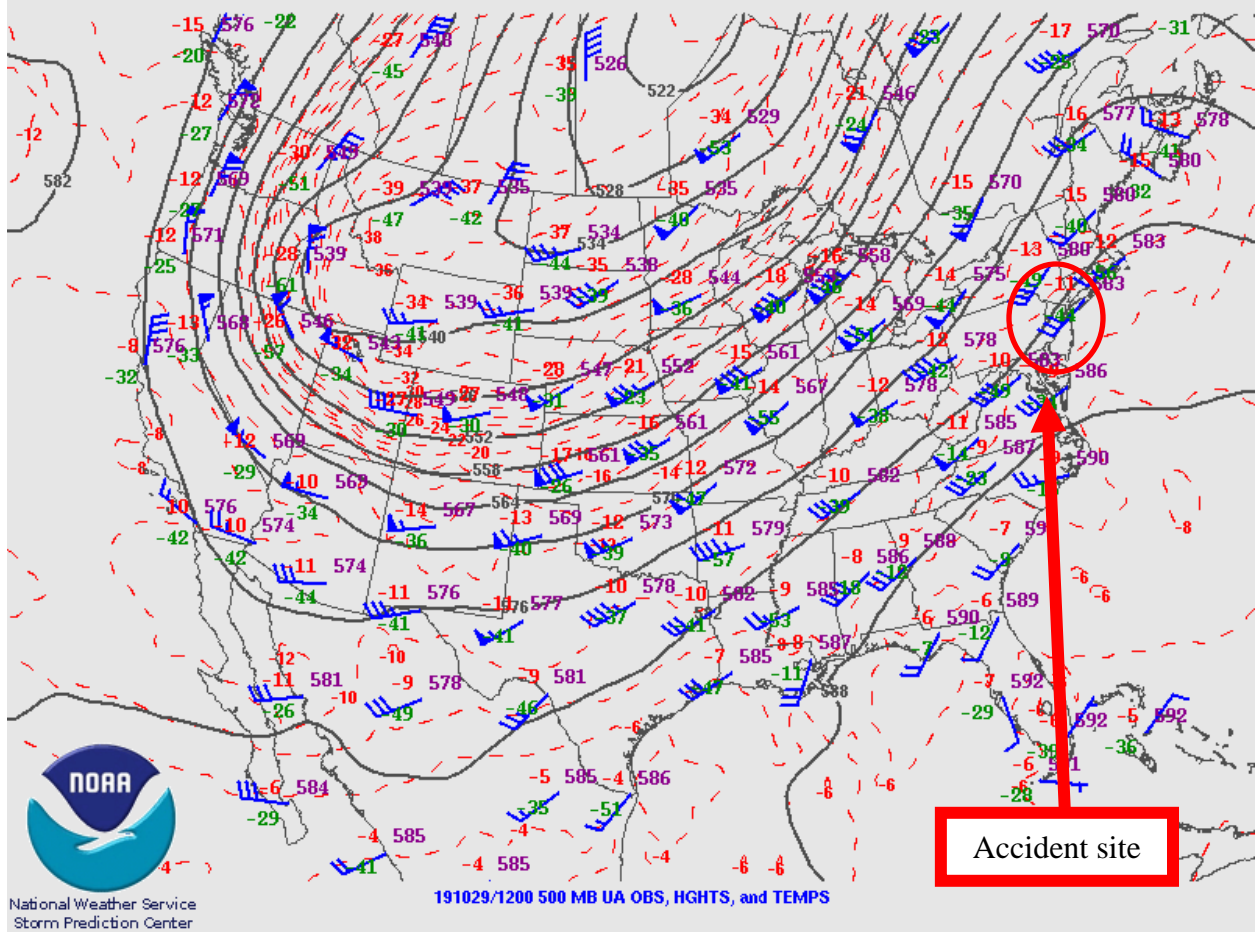


Figure 5 – 500-hPa Constant Pressure Chart for 0800 EDT

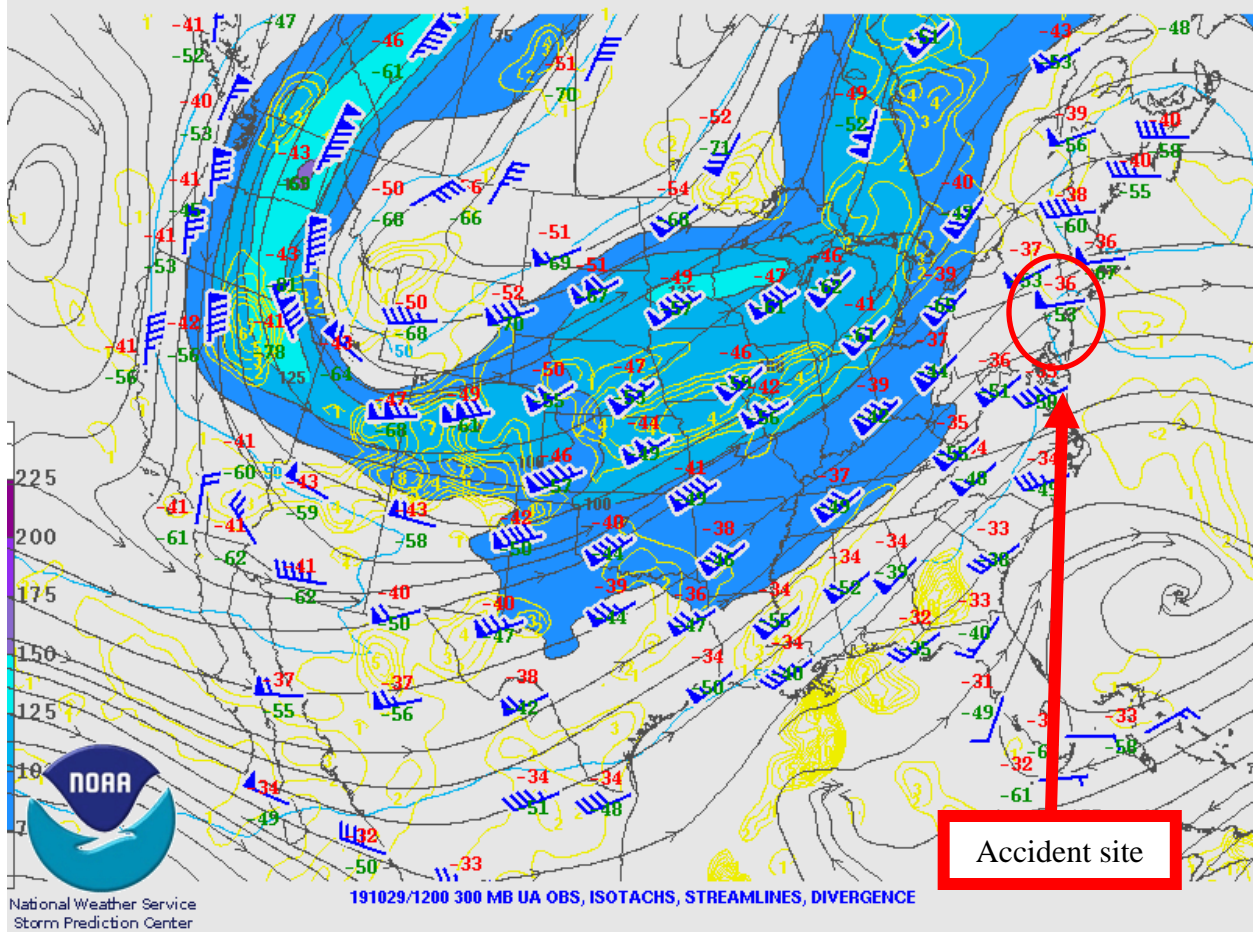


Figure 6 – 300-hPa Constant Pressure Chart for 0800 EDT

2.0 SPC Convective Outlook

No thunderstorms were forecast for the accident site at the accident time.

3.0 Surface Observations

The area surrounding the accident site was documented using official Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). Figure 7 is a sectional chart with the accident site and the closest weather reporting location to the accident site marked.

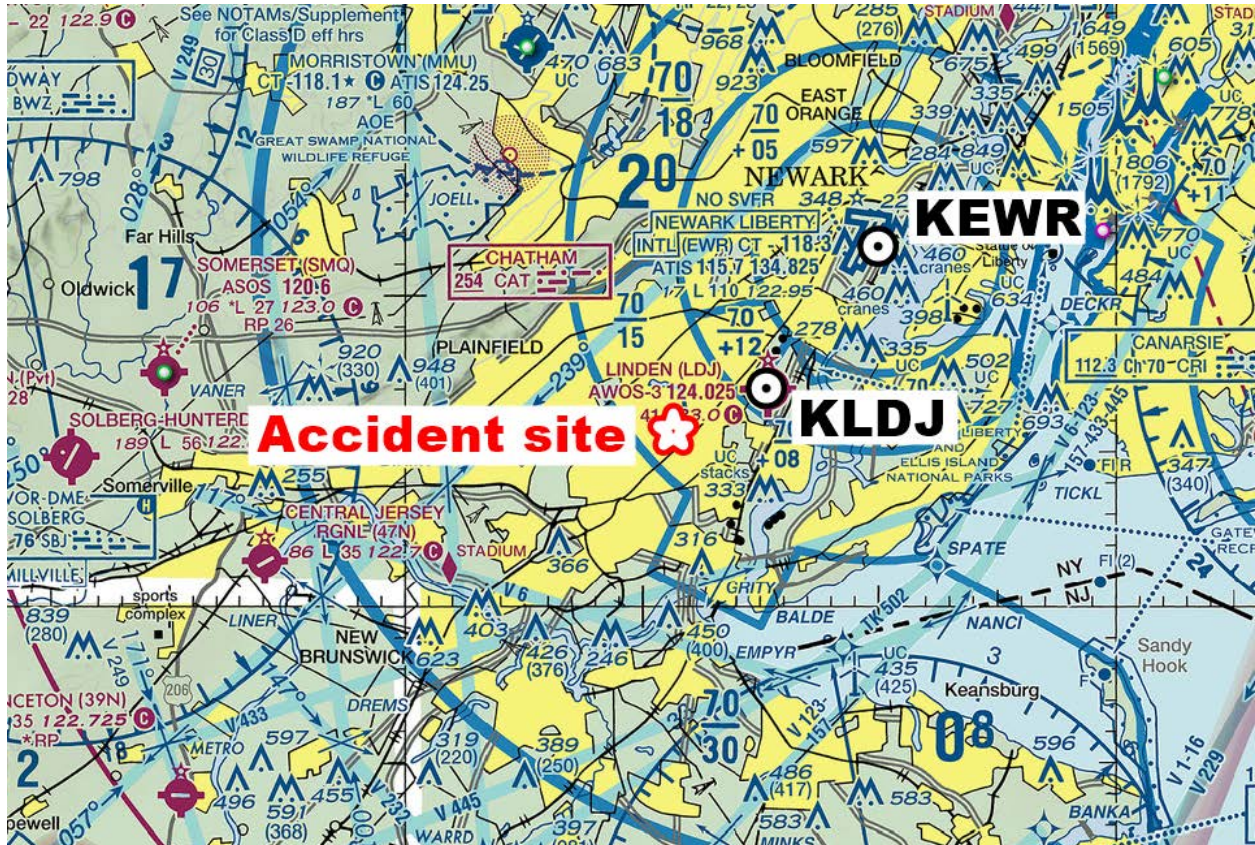


Figure 7 – Sectional chart of accident area with the location of the accident site and the closest surface observation site

The closest official weather reporting facility to the accident site and the intended destination was from Linden Airport (KLDJ), Linden, New Jersey, at an elevation of 22 ft, located 3 miles northeast of the accident site (figure 7). KLDJ had an Automated Weather Observing System (AWOS⁴) whose reports were not supplemented. KLDJ had a 13° westerly magnetic variation⁵. The following observations were taken and disseminated during the times surrounding the accident:⁶

[0835 EDT] METAR KLDJ 291235Z AUTO 0000KT 4SM BR BKN007 OVC016 13/11 A3030 RMK AO2 T01300113=

[0855 EDT] METAR KLDJ 291255Z AUTO 0000KT 2 1/2SM BR OVC007 13/12 A3031 RMK AO2 T01300115=

⁴ 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.

⁵ Magnetic variation – The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>

⁶ Bolded sections in this report highlight information that directly reference the weather conditions that affected the accident location around the accident time.

[0915 EDT] METAR KLDJ 291315Z AUTO 00000KT 10SM OVC007 13/12 A3031 RMK AO2 T01320119=

[0935 EDT] METAR KLDJ 291335Z AUTO 00000KT 10SM OVC007 14/12 A3031 RMK AO2 T01360121=

[0955 EDT] METAR KLDJ 291355Z AUTO 00000KT 7SM OVC007 14/12 A3030 RMK AO2 T01370120=

[1055 EDT] METAR KLDJ 291455Z AUTO 00000KT 10SM OVC007 14/12 A3031 RMK AO2 T01410123=

ACCIDENT TIME 1058 EDT

[1115 EDT] METAR KLDJ 291515Z AUTO 00000KT 2SM BR OVC007 14/13 A3031 RMK AO2 T01420128=

[1135 EDT] METAR KLDJ 291535Z AUTO 00000KT 1 1/4SM BR OVC007 14/13 A3032 RMK AO2 T01410128=

[1215 EDT] METAR KLDJ 291615Z AUTO 00000KT 1 1/4SM BR SCT003 OVC009 14/13 A3031 RMK AO2 T01430131=

KLDJ weather at 1055 EDT, automated, wind calm, 10 miles visibility, an overcast ceiling at 700 ft above ground level (agl), temperature of 14°Celsius (C), dew point temperature of 12°C, and an altimeter setting of 30.31 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator, temperature 14.1°C, dew point temperature 12.3°C.

KLDJ weather at 1115 EDT, automated, wind calm, 2 miles visibility, mist, an overcast ceiling at 700 ft agl, temperature of 14°C, dew point temperature of 13°C, and an altimeter setting of 30.31 inHg. Remarks: automated station with a precipitation discriminator, temperature 14.2°C, dew point temperature 12.8°C.

The observations for KLDJ surrounding the period indicated IFR⁷ conditions with calm winds.

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

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

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

4.0 Upper Air Data

The NWS Brookhaven/Upton, New York, (KOKX) was the closest site with an upper air sounding and was 68 miles east of the accident site at 66 ft, and had a station ID of 72501. The 0800 EDT KOKX sounding was plotted on a standard Skew-T Log P diagram⁸ with the derived stability parameters included in figure 8 with data from the surface to 700-hPa (or approximately 10,000 ft msl). This data was analyzed using the RAOB⁹ software package. The sounding depicted the lifted condensation level (LCL)¹⁰ at 83 ft agl (149 ft msl), the level of free convection (LFC)¹¹ at 384 ft agl (450 ft msl), and the convective condensation level (CCL)¹² at 1,382 ft agl (1,448 ft msl). The sounding had a greater than 90% relative humidity from the surface through 4,500 ft msl. The freezing level was located at 13,249 ft msl. The precipitable water value was 0.67 inches.

⁸ 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.

⁹ RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania.

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

¹¹ 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 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.

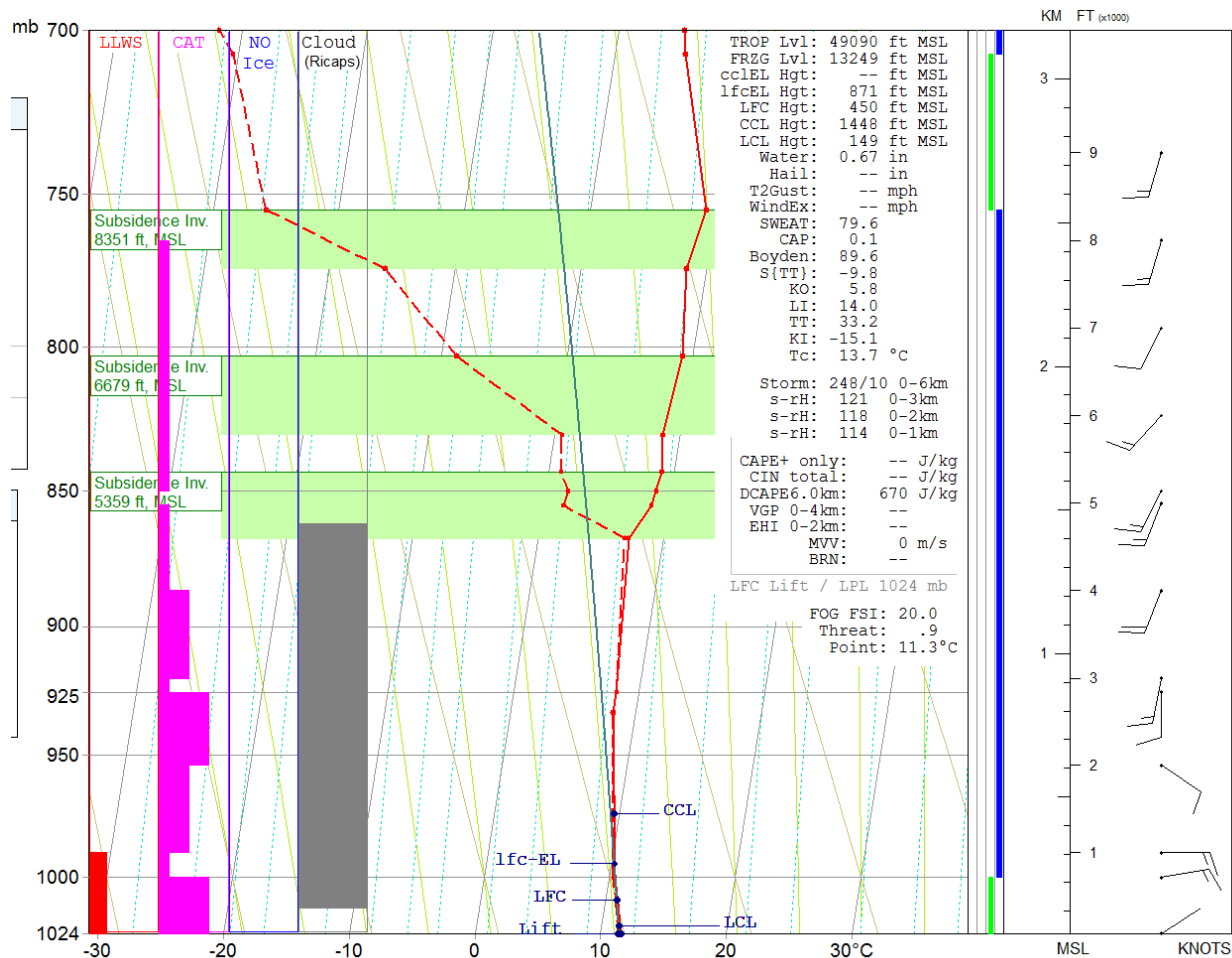


Figure 8 – 0800 EDT KOKX sounding

The 0800 EDT KOKX sounding indicated a layer of conditional instability from the surface through ~700 ft agl, then a stable layer from ~700 ft agl through 8,000 ft msl. RAOB identified the possibility of clouds from ~500 ft agl through ~5,000 ft msl. RAOB did not indicate the possibility of icing conditions below 10,000 ft msl. RAOB indicated an inversion¹³ due to subsidence from about 4,500 ft through 8,351 ft.

The 0800 EDT KOKX sounding wind profile indicated a surface wind from 055° at 2 knots with the wind veering¹⁴ to the south by 3,000 ft msl. The wind speed increased to 15 knots by 3,000 ft. RAOB indicated the possibility of light low-level wind shear (LLWS) between the surface and ~1,000 ft agl. RAOB indicated the possibility of light to moderate clear-air turbulence (CAT) existed in several layers between the surface and 8,000 ft msl.

¹³ Inversion – A departure from the usual decrease of the value of an atmospheric property with increasing altitude; also, the layer through which this departure occurs (the "inversion layer"), or the lowest altitude at which the departure is found (the "base of the inversion").

¹⁴ A clockwise turning of the wind with height in the northern hemisphere.

5.0 Satellite Data

Data from the Geostationary Operational Environmental Satellite number 16 (GOES-16) data was obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. Visible (band 2) and infrared (bands 13) imagery at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period. Satellite imagery surrounding the time of the accident, from 0800 EDT through 1400 EDT at approximately 5-minute intervals were reviewed, and the closest images to the time of the accident are documented here.

Figure 9 is the GOES-16 visible imagery from 1100 EDT at 2X magnification with the accident site highlighted with a red square. Inspection of the visible imagery indicated cloud cover over the accident site at the accident time with the cloud cover moving from south to north (attachment 1). Figure 10 is the GOES-16 infrared imagery from 1100 EDT at 7X magnification and with a temperature enhancement curve applied with the accident site highlighted with a red square. Inspection of the infrared imagery indicated cloud cover over the accident site at the accident time with a relatively uniform cloud top given the similar brightness temperatures throughout figure 10. Based on the brightness temperatures above the accident site (280 Kelvin) and the vertical temperature profile provided by the 0800 EDT KOKX sounding, the approximate cloud-top heights over the accident site were 8,000 ft at 1100 EDT. It should be noted these figures have not been corrected for any parallax error.

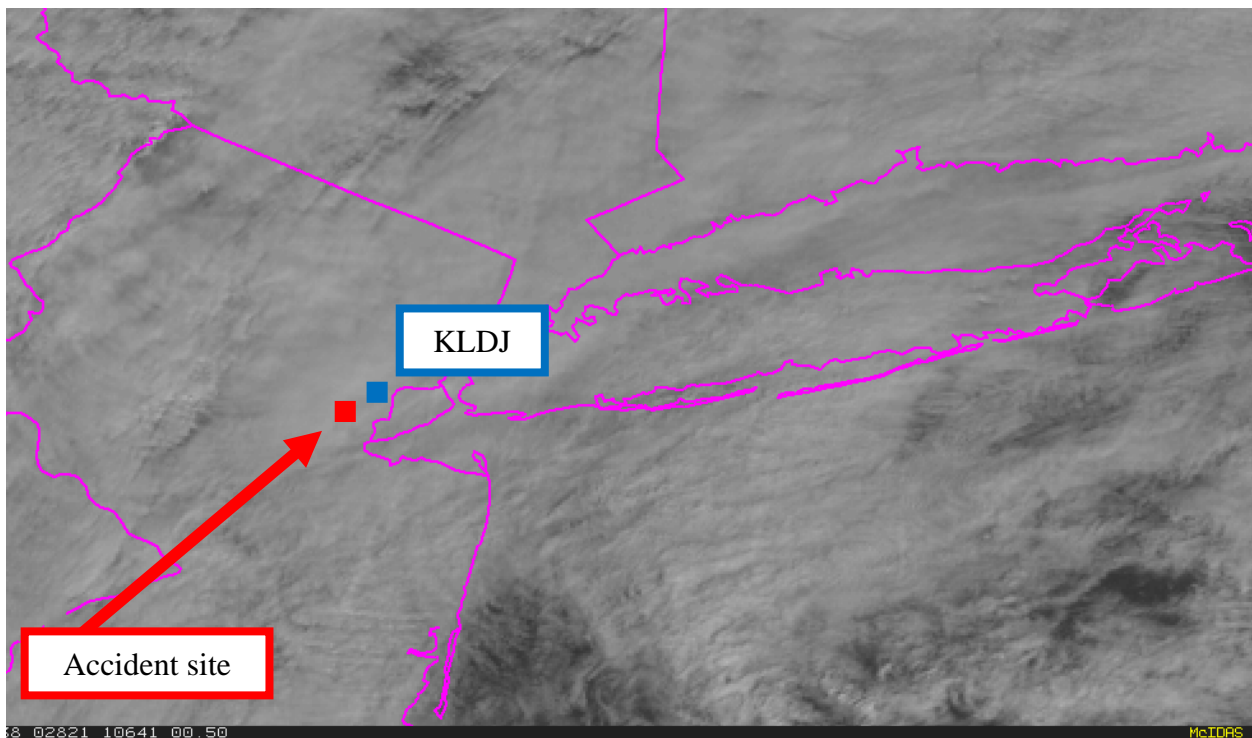


Figure 9 – GOES-16 visible image at 1100 EDT

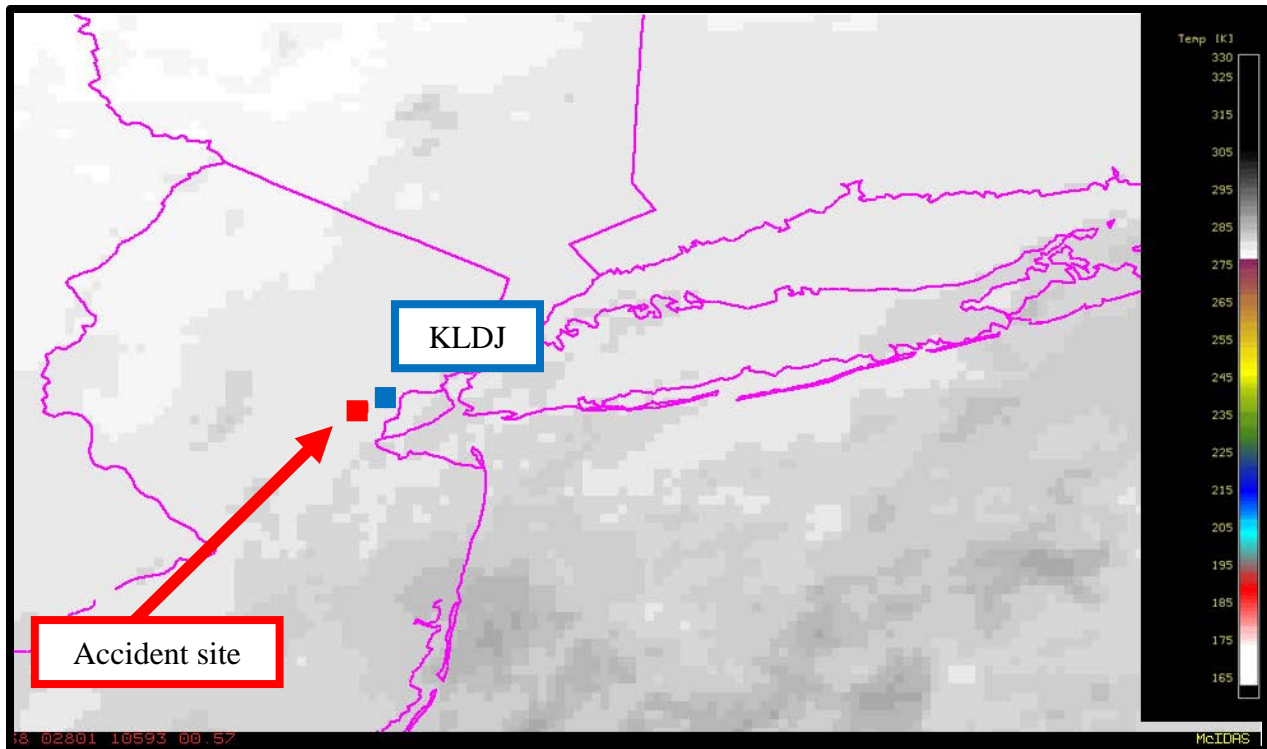


Figure 10 – GOES-16 infrared image at 1100 EDT

6.0 Regional Radar Imagery Information

A regional view of the NWS national composite radar mosaic is included as figure 11 for 1100 EDT with the approximate location of the accident site marked within a red circle. The image depicted no precipitation echoes over the accident site at the accident time.

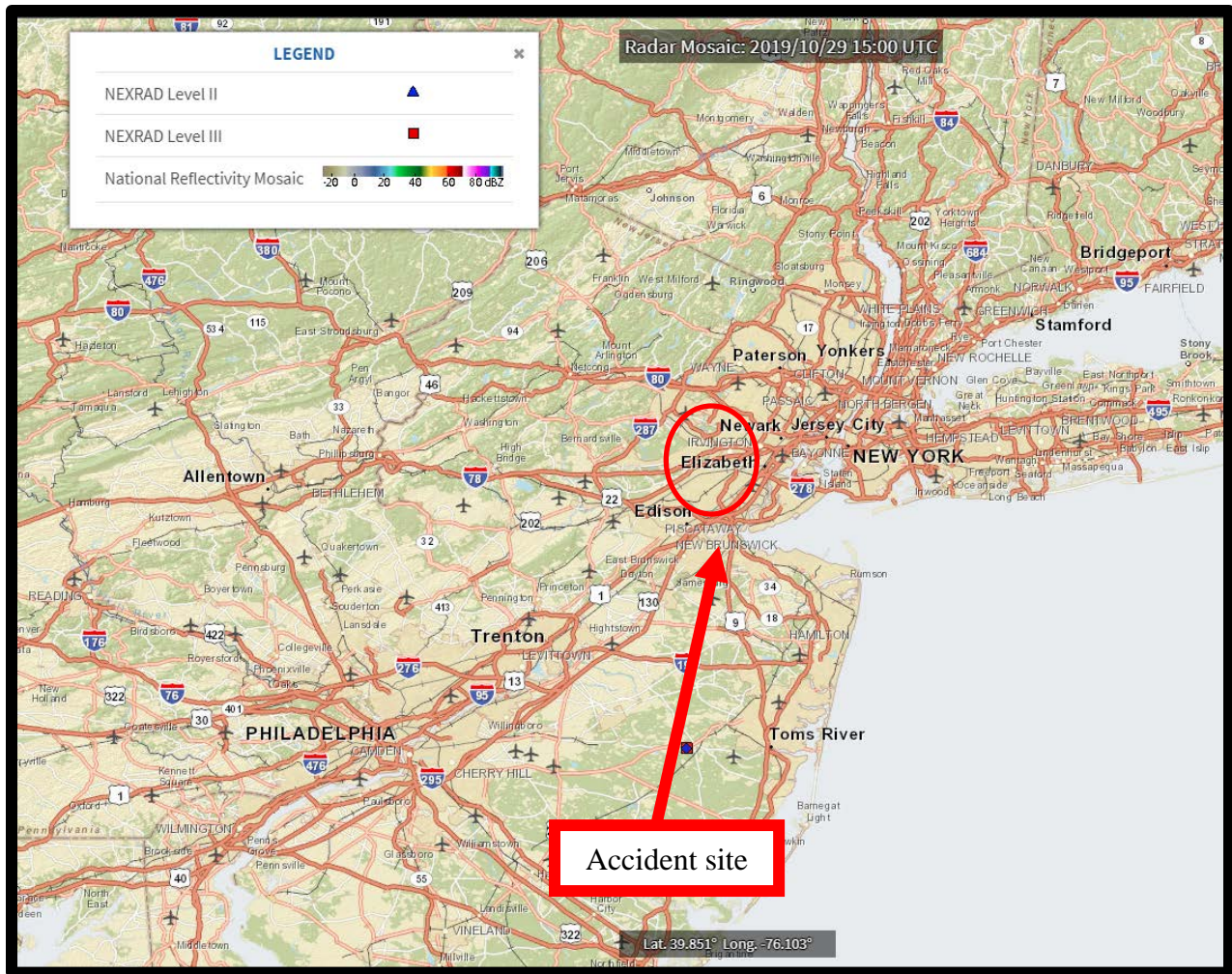


Figure 11 – Regional Composite Reflectivity image for 1100 EDT

7.0 Pilot Reports

All pilot reports¹⁵ (PIREPs) within 100 miles of the accident site from about two hours prior to the accident time to about two hours after the accident time for below 18,000 ft are provided below:

OXC UA /OV OXC/TM 1312/FL002/TP PC24/SK OVC002-TOP020/SKC

TEB UA /OV TEB/TM 1316/FL007/TP G550/SK OVC007

ISP UA /OV BDR050005/TM 1317/FL030/TP PA46/SK 015 OVC/RM TOPS 038

JFK UA /OV JFK100010/TM 1340/FL045/TP B738/SK OVC004-TOP041

HPN UA /OV HPN/TM 1340/FLDURGD/TP E190/SK OVC003/RM ILS16 RWY AT MINIMUMS

LGA UA /OV LGA/TM 1340/FLDURGC/TP A320/SK OVC-TOP039

¹⁵ Only pilot reports with the World Meteorological Organization (WMO) header UBNJ**, UBNY**, UBPA**, UBCT**, UBMA**, and UBRI** identifier were considered.

KWRI UA /OV KWRI/TM 1347/FLUNKN/TP C17/SK OVC013/RM DURC RWY 06
LGA UA /OV LGA/TM 1410/FLDURGC/TP B737/SK OVC-TOP048/IC NEG
EWR UA /OV BWZ360005-VOR/TM 1415/FL7000/TP B738/TA 10/WV 229/16/TB SMOOTH/RM ON TOP
EWR UA /OV RY4L/TM 1415/FL008/TP MD11/SK 008OVC/RM RY4L DEP
LGA UA /OV FINAL RWY 4/TM 1425/FL006/TP E145/SK BASES REPORTED 600 FT
PHL UA /OV PHL270001/TM 1427/FL004/TP A320/SK OVC004
PHL UA /OV PHL270001/TM 1430/FL005/TP E145/SK OVC005
EWR UA /OV RY 4R FINAL/TM 1430/FL007/TP B717/SK 007 OVC
EWR UA /OV RY 4R FINAL/TM 1435/FL006/TP B737/SK 006 OVC
JFK UA /OV JFK100004/TM 1438/FLDURGC/TP B737/SK OVC/RM BASES 007 // TOPS 050
PHL UA /OV ARD135002/TM 1443/FLAPPR/TP A320/SK BASES 007
EWR UA /OV RY 4R FINAL/TM 1448/FL005/TP A320/SK 005 OVC
MMU UA /OV MMU/TM 1449/FL010/TP CL60/SK OVC008-TOPUNKN
EWR UA /OV BWZ120/003/TM 1452/FL060/TP E145/TA 10/WV 226/018/TB SMOOTH/RM ON TOP
PHL UA /OV PHL270001/TM 1500/FL005/TP B737/SK OVC005
MMU UA /OV KMMU/TM 1532/FL005/TP F2TH/SK OVC003
EWR UA /OV BWZ090/008/TM 1535/FL060/TP B78X/WV 238/018/TB SMOOTH/RM ON TOP
BDR UA /OV 1/4SM SW KBDR/TM 1545/FL003/TP SR22/SK OVC003
EWR UA /OV 2NM FINAL RY4R/TM 1545/FL006/TP B737/SK 006BKN/RM ILS RY4R
EWR UA /OV 3NM SW EWR/TM 1600/FL010/TP A320/SK 004BKN/RM ILS RY4R
JFK UA /OV JFK100010/TM 1621/FL050/TP CRJ2/SK OVC006-TOP007 BKN049-TOPUNKN
EWR UA /OV RY4R FINAL/TM 1622/FL004/TP E45X/SK 003BKN/RM ILS RY4R
HPN UA /OV CMK270015/TM 1635/FL070/TP CRJ7/SK OVC-TOP056
PNE UA /OV FINAL RWY 33/TM 1640/FL007/TP P28A/SK OVC007
EWR UA /OV MMU240/005/TM 1645/FL040/TP C172/SK ABV THE LAYER/WX VMC/TA 11/RM IMC AHEAD

The last 3 PIREPs with flights going into Newark Liberty International Airport (KEWR), Newark, New Jersey, located approximately 8 miles northeast of the accident site (figure 7), are provided in plain language taken from standard code and abbreviations, with cloud heights in msl and were as follows:

EWR, routine pilot report (UA); Over – On final to Runway 4R; Time – 1030 EDT (1430Z); Altitude – 700 ft; Type aircraft – Boeing 717; Sky – Overcast clouds at 700 ft.

EWR, routine pilot report (UA); Over – On final to Runway 4R; Time – 1035 EDT (1435Z); Altitude – 600 ft; Type aircraft – Boeing 737; Sky – Overcast clouds at 600 ft.

EWR, routine pilot report (UA); Over – On final to Runway 4R; Time – 1048 EDT (1448Z); Altitude – 500 ft; Type aircraft – Airbus A320; Sky – Overcast clouds at 500 ft.

8.0 SIGMET

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

9.0 CWSU Advisories

There were no Center Weather Service Unit (CWSU) Meteorological Impact Statements (MIS) or Center Weather Advisories (CWA) valid for the accident site at the accident time.

10.0 AIRMETS

Airmen's Meteorological Information (AIRMET) advisory Sierra was issued at 0445 EDT and valid through 1100 EDT and was the only AIRMET valid for the accident site at the accident time for below 10,000 ft msl. AIRMET Sierra warned of IFR conditions due to mist:

WAUS41 KKCI 290845

WA1S

-BOSS WA 290845

AIRMET SIERRA UPDT 1 FOR IFR AND MTN OBSCN VALID UNTIL 291500

.
**AIRMET IFR...ME NH VT MA RI CT NY NJ PA WV MD DC DE VA AND CSTL
WTRS**

**FROM 70NW PQI TO 30NNE PQI TO 50WSW YSJ TO 50SE ENE TO 20WNW ACK
TO 40S SIE TO 50SSE DCA TO 40S RIC TO HMV TO EKN TO 30ESE JHW TO
50SSW MSS TO 30S YSC TO 70NW PQI**

CIG BLW 010/VIS BLW 3SM BR. CONDS CONTG BYD 15Z THRU 21Z.

.
AIRMET IFR...OH LE WV

FROM 40SSW DXO TO 30SW CLE TO HNN TO CVG TO 40SSE FWA TO 40SSW
DXO

CIG BLW 010/VIS BLW 3SM BR/FG. CONDS ENDG BY 15Z.

.
AIRMET MTN OBSCN...ME NH VT MA NY PA WV MD VA NC SC

FROM 70NW PQI TO MLT TO CON TO HAR TO CLT TO 20SSE SPA TO HMV TO
HNN TO EWC TO JHW TO SYR TO MSS TO YSC TO 70NW PQI
MTNS OBSC BY CLDS/BR. CONDS CONTG BYD 15Z THRU 21Z.

....

11.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products made available before the accident flight are shown in attachment 2. The GFA surface forecast products indicated VFR to MVFR surface visibilities conditions would be likely for 1100 EDT with a chance of mist (between 30 to 60 percent chance) with a surface wind from the east at 5 knots. The GFA cloud forecast products indicated an overcast cloud ceiling at 600 to 1,500 ft msl with cloud tops to 7,000 ft msl. For more information please see attachment 2.

The reason for the differences between the GFA surface forecast and the GFA cloud forecast is the two are computed automatically by two different weather models. The Rapid Refresh (RAP) weather model is used for the cloud forecast and the Localized Aviation MOS¹⁶ Program (LAMP) weather model is used for the surface forecast charts, and both forecasts are issued with no human intervention. The only human-generated information reflected in the two GFA products are the G-AIRMETs (graphical AIRMETs) and the GFA is “human-over-the-loop.”

12.0 Terminal Aerodrome Forecast

KEWR was the closest site with a NWS Terminal Aerodrome Forecast (TAF) and the KEWR TAFs issued surrounding the period were as follows:

TAF KEWR 291139Z 2912/3018 06007KT P6SM SCT008 SCT012 OVC030
TEMPO 2912/2915 5SM -DZ BR SCT008 BKN012
FM291600 07009KT P6SM SCT012 OVC030
FM292300 05005KT 5SM -DZ BR SCT012 OVC020
FM300500 03003KT 2SM -DZ BR OVC008
FM301400 07006KT 6SM BR SCT008 OVC020=

The TAF current prior to the accident airplane’s departure was issued at 0739 EDT expected wind from 060° at 7 knots, visibility better than 6 miles, scattered clouds at 800 ft agl, scattered clouds at 1,200 ft, and an overcast ceiling at 3,000 ft agl. Temporary conditions between 0800 and 1100 EDT of visibility 5 miles in light drizzle and mist, scattered clouds at 800 ft, a broken ceiling at 1,200 ft agl.

The forecast was amended at 0946 EDT or approximately at the time the accident airplane departure and became as follows:

AMD TAF KEWR 291346Z 2914/3018 06008KT 6SM -DZ OVC008
TEMPO 2917/2921 6SM -DZ BR SCT008 BKN015
FM300000 05005KT 5SM -DZ BR OVC008
FM300500 03003KT 2SM -DZ BR OVC007
FM301400 07006KT 6SM BR SCT008 OVC020=

The amended TAF issued at 0946 EDT expected a wind from 060° at 8 knots, 6 miles visibility, light drizzle, and an overcast ceiling at 800 ft agl.

¹⁶ Model Output Statistics: https://www.weather.gov/mdl/mos_home

13.0 NWS Area Forecast Discussion

The NWS Office in New York, New York, issued the following Area Forecast Discussion (AFD) at 1033 EDT (closest AFD to the accident time with an aviation section). The aviation section of the AFD discussed continued IFR conditions today with potential for MVFR into the evening and possible periods of drizzle:

FXUS61 KOKX 291433
AFDOKX

Area Forecast Discussion
National Weather Service New York NY
1033 AM EDT Tue Oct 29 2019

.SYNOPSIS...

A disturbance approaches today as weak low pressure remains just offshore of the Delmarva tonight into Wednesday. A strong frontal system will impact the area Thursday into early Friday. High pressure then builds in from the southwest during the weekend, and settles over the region on Monday.

&&

.NEAR TERM /UNTIL 6 PM THIS EVENING/...

The forecast remains on track this morning with patchy drizzle working across the area. Made only minor updates to temperatures, dew points, and winds with this update.

Onshore flow continues with shallow moisture in place and a weak surface trough offshore to our southeast. This will continue to result in mist, drizzle, and very light rain. Farther inland this activity is expected to be more patchy and less consistent during today. Any precipitation will be light due to the lack of moisture above 800 mb. Humidity levels will be high for this time of the year with dew point readings mainly in the middle 50s south, and lower 50s north. The combination of higher than normal humidity and cloud cover will keep temperatures fairly uniform and near normal as daytime highs will be in the upper 50s to about 60.

&&

.SHORT TERM /6 PM THIS EVENING THROUGH 6 PM WEDNESDAY/...

More of the same is expected tonight with a surge of slightly warmer and more humid air creeping up from the south. The surface trough is now progged to light further north late tonight and into Wednesday morning. Tweaked minimum temperatures up just a touch as the guidance continues to trend a touch warmer. With an even further increase in lower level humidity some fog is expected to develop. Guidance is not suggesting anything dense with visibilities likely running 2 to 5 miles much of the time for Tuesday night into the first half of Wednesday. Then the precipitation gradually goes over to perhaps a more showery nature into the afternoon on Wednesday as the warmer air surges in as the surface trough begins to behave more like a pseudo warm front. The winds will contain more of a southerly

component later in the day, especially further east across the region. Temperatures on Wednesday should average close to 5 degrees above normal with mainly middle 60s for daytime maximums. Precipitation amounts will continue to be light through the day on Wednesday, with perhaps some localized totals approaching a quarter inch.

&&

.LONG TERM /WEDNESDAY NIGHT THROUGH MONDAY/...

Unsettled weather pattern will be in place for the remainder of the week. Deterministic models have slowly come into better agreement over the last few days, and confidence is now high that a strong cold front will move across Thursday night, setting the stage for improving conditions through the day Friday, and dry conditions into the weekend, but with one caveat to be mentioned below.

Showers with the weakening system along the coast will continue into Wed night into Thu morning. Models are forecasting a band or two of heavier associated rainfall over southern New England but disagree on the exact position. As this feature weakens, WAA precip with the frontal system approaching from the west should begin to move in later Thu. Main push of showers should be late Thu night, possible into early Fri morning out east, as a narrow band of low- topped convection moves quickly across. Rainfall could be locally moderate to heavy as K indices increase to well over 30 and air mass becomes weakly unstable, with Showalter indices lowering to 0C ahead of the cold front. Have not included thunder in the forecast, but ultimately that may depend just as much on forced ascent with the front as with stability. S winds may gust to 35-40 mph along the coast ahead of fropa as a 65-70 kt H8 LLJ develops just E of NJ, then after fropa on Fri via a tight post-frontal pressure gradient and strong sfc pressure rises.

High pressure returns Friday night into the much of the weekend, with the mean upper trough hanging back across the Eastern states. Model consensus still keeps conditions dry, but will have to see if the front that moves offshore Friday attempts to retrograde and near the coast on Sunday as a wave of low pressure develops along it.

&&

.AVIATION /15Z TUESDAY THROUGH SATURDAY/...

A trough of low pressure remains in the vicinity into this evening.

Mainly IFR today into tonight with tempo or potentially prevailing MVFR. Periods of drizzle as well.

ENE winds mostly around 10 kt today, backing more towards the NE overnight and becoming lighter.

NY Metro Enhanced Aviation Weather Support...

Detailed information, including hourly TAF wind component forecasts,

can be found at: <http://www.weather.gov/zny/n90>

KJFK TAF Comments: Potential prevailing MVFR this afternoon.
Also a chance that IFR prevails all day.

The afternoon KJFK haze potential forecast is GREEN...which implies
slant range visibility 7SM or greater outside of cloud.

KLGA TAF Comments: Potential prevailing MVFR this afternoon.
Also a chance that IFR prevails all day.

The afternoon KLGA haze potential forecast is GREEN...which
implies slant range visibility 7SM or greater outside of cloud.

KEWR TAF Comments: Potential prevailing MVFR this afternoon.
Also a chance that IFR prevails all day.

The afternoon KEWR haze potential forecast is GREEN...which implies
slant range visibility 7SM or greater outside of cloud.

KTEB TAF Comments: Potential prevailing MVFR this afternoon.
Also a chance that IFR prevails all day.

KHPN TAF Comments: Tempo MVFR possible this afternoon.

KISP TAF Comments: Tempo MVFR possible this afternoon.

.OUTLOOK FOR 12Z WEDNESDAY THROUGH SATURDAY...
.Wednesday...IFR conditions possible early in the morning,
otherwise conditions improve to MVFR in light rain and
drizzle.
.Thursday-Friday...Rain likely with MVFR or lower conditions. S
winds G25-30 kt Thursday night into Friday.
.Friday night-Saturday...VFR.

&&

.MARINE...
Marginal SCA conds expected on the ocean into this evening, with
seas hovering around 4 to 5 feet on an easterly swell.
Elsewhere sub SCA conditions take place for today as easterly
winds average around 10 knots. Later tonight seas should come
down slightly out on the eastern ocean with sub SCA seas
expected into Wednesday. The winds will begin to shift late in
the day on Wednesday to the southeast.

Increasing S flow ahead of a cold front on Thu should lead to SCA
conds by Thu afternoon on the ocean, then possible gales late Thu
night and into Fri in post-frontal W-NW flow. Meanwhile SCA conds
are expected on the non ocean waters Thu night into Fri.

Any lingering SCA conds on the eastern Sound and the bays Fri night
should subside by midnight, with hazardous ocean seas lingering
a bit longer into the overnight Fri night, possible into Sat
morning out east.

&&

.HYDROLOGY...

Any precipitation through the day on Wednesday will be light with amounts only up to a quarter of an inch.

A frontal system Thursday into early Friday could produce 1 to 2 inches of rain, with locally higher amounts. At this time urban and poor drainage flooding is a possibility.

&&

.TIDES/COASTAL FLOODING...

Astronomical tides are running high due to recent new moon and easterly fetch and lingering easterly swells.

Coastal flood advisories remain in effect for morning's high tide cycle. Recent high tides have come back up over the past cycle for the most part, thus have decided to keep all advisories and statements in place.

Widespread minor to locally moderate coastal flooding is likely with today's daytime high tide cycle for mainly just the south shore back bays of Nassau County and Queens. The remainder of the western south shore of Long Island (Brooklyn), New York Harbor, and western Long Island just minor coastal flooding is more likely.

Forecast water levels with tonight's high tide are lower and look to fall short of minor benchmarks. The next cycle of concern is for Wednesday daytime with minor coastal flooding possible. Minor flood benchmarks could also be reached on the Thursday daytime cycle as well.

&&

.EQUIPMENT...

NYC NOAA Weather Radio Station KWO35 (162.55 MHz) is operating at reduced power until further notice.

&&

.OKX WATCHES/WARNINGS/ADVISORIES...

CT...Coastal Flood Advisory until 2 PM EDT this afternoon for CTZ009.

NY...Coastal Flood Advisory until 2 PM EDT this afternoon for NYZ071-078-176-177.

Coastal Flood Advisory until noon EDT today for NYZ072-074-178-179.

NJ...Coastal Flood Advisory until noon EDT today for NJZ006-106-108.

MARINE...Small Craft Advisory until midnight EDT tonight for ANZ350-353.

&&

14.0 Winds and Temperature Aloft Forecast

The NWS 0952 EDT Winds and Temperature Aloft forecast valid for 1400 EDT for the closest point to the accident site is included below:

```
FBUS31 KWNO 291352
FD1US1
DATA BASED ON 291200Z
VALID 291800Z    FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT  3000    6000    9000    12000    18000    24000    30000    34000    39000
JFK 1919 2211+09 2415+07 2519+02 2633-11 2743-21 266736 278445 770556
```

The accident site was closest to the John F Kennedy International Airport, New York (JFK) forecast point. The JFK forecast for use between 1000 and 1700 EDT indicated a wind at 3,000 ft from 190° at 19 knots and at 6,000 ft a wind from 220° at 11 knots with a temperature of 9°C.

15.0 Pilot Weather Briefing

The accident pilot did request and received a weather briefing through the FAA contract Automated Flight Service Station provider Leidos at 0920 EDT (attachment 3). The Leidos weather briefer provided all the standard weather briefing package information and additional weather information requested (attachments 4, 5, and 6).

A search of archived ForeFlight information indicated that the accident pilot also requested weather information via ForeFlight Mobile (attachments 7 and 8) at 1206 EDT on October 28 with a planned departure of 0830 EDT on October 29. The 1206 EDT on October 28 weather briefing information contained all the standard weather information valid at that time, but the weather forecast information only went to 0500 EDT on October 29 (attachments 7, 8, and 9). The accident pilot did access NWS radar mosaic weather imagery and turbulence forecast information at 0729 EDT on October 29 (attachment 7). There is no record of the accident pilot receiving or retrieving any other weather information during the flight.

16.0 Video Imagery

Additional video imagery was obtained for this investigation and that video imagery showed the accident flight below the cloud bases after 1057:57 EDT as the accident flight was heading northward.¹⁷

¹⁷ For additional information regarding the video imagery please see the docket for this investigation.

17.0 Astronomical Data

The astronomical data obtained for the accident site on October 29, 2019, indicated the following conditions:

SUN	
Begin civil twilight	0655 EDT
Sunrise	0723 EDT
<i>Accident</i>	<i>1058 EDT</i> ¹⁸
Sun transit	1241 EDT
Sunset	1758 EDT
End civil twilight	1826 EDT

Cloud cover (sections 4.0 and 5.0) would have obscured sunlight below 8,000 ft msl.

E. LIST OF ATTACHMENTS

Attachment 1 – GOES-16 visible imagery animation from 1001 to 1131 EDT

Attachment 2 – GFA products available before the accident flight for around the accident time

Attachment 3 – Leidos contact information

Attachment 4 – Leidos text weather briefing information

Attachment 5 – GFA weather briefing information graphics provided

Attachment 6 – Leidos weather briefing

Attachment 7 – ForeFlight Weather Briefing Information

Attachment 8 – Text ForeFlight Weather Briefing Information part 1

Attachment 9 – Text ForeFlight Weather Briefing Information part 2

Submitted by:

Paul Suffern
Senior Meteorologist

¹⁸ Inserted accident time for reference and context.

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