



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

April 6, 2018

Factual Report

METEOROLOGY

DCA17FA076

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A. ACCIDENT

Location: Ypsilanti, Michigan
Date: March 8, 2017
Time: about 1452 eastern standard time (1952 UTC)¹
Airplane: Type: Boeing MD-83; Registration: N786TW

B. METEOROLOGIST

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C. SUMMARY

On March 8, 2017, about 1452 eastern standard time (EST), Ameristar Air Cargo, Inc. dba Ameristar Charters flight 9363, a Boeing MD-83, N786TW, ran off the end of runway 23L after executing a rejected takeoff at Willow Run Airport (YIP), Ypsilanti, Michigan. (The MD-83 was manufactured by McDonnell Douglas, which merged with Boeing in August 1997.) All 110 passengers and 6 crewmembers evacuated the airplane. One passenger was reported to have received a minor injury. The airplane sustained substantial damage (no post-crash fire occurred). The airplane was operating under the provisions of 14 *Code of Federal Regulations* Part 121 as an on-demand charter flight and was destined for Washington Dulles International Airport, Dulles, Virginia. Daytime visual meteorological conditions prevailed at the time of the accident.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Meteorology Group Chairman for this investigation traveled to Michigan on the morning following the accident. Meteorological information for this investigation was gathered on site as well as remotely. Unless otherwise noted, all times are in EST for March 8, 2017, directions are referenced to true north, distances are in nautical miles and heights are above mean sea level (msl).

Coordinates used for the accident location: 42.22814° north latitude, 83.54242° west longitude, elevation of about 715 feet.

¹ UTC – abbreviation for Coordinated Universal Time

E. WEATHER INFORMATION

1.0 Synoptic Conditions

The northcentral portion of the National Weather Service (NWS) Surface Analysis Chart for 1600 EST is presented in figure 1. The surface analysis chart identified a northeast-southwest oriented cold front over central lower Michigan that was advancing southeast.² A trough³ extended southwest from Ontario, Canada, into the accident region. Temperatures ahead of the cold front in Michigan, northern Ohio and northern Indiana were generally in the 50's Fahrenheit (F), with temperatures behind the cold front in northern lower Michigan in the high 20's F to mid-40's F. Winds ahead of the cold front across lower Michigan, northern Ohio and northern Indiana were generally from the west or west-southwest, with many station models depicting winds magnitudes at or above 25 knots.

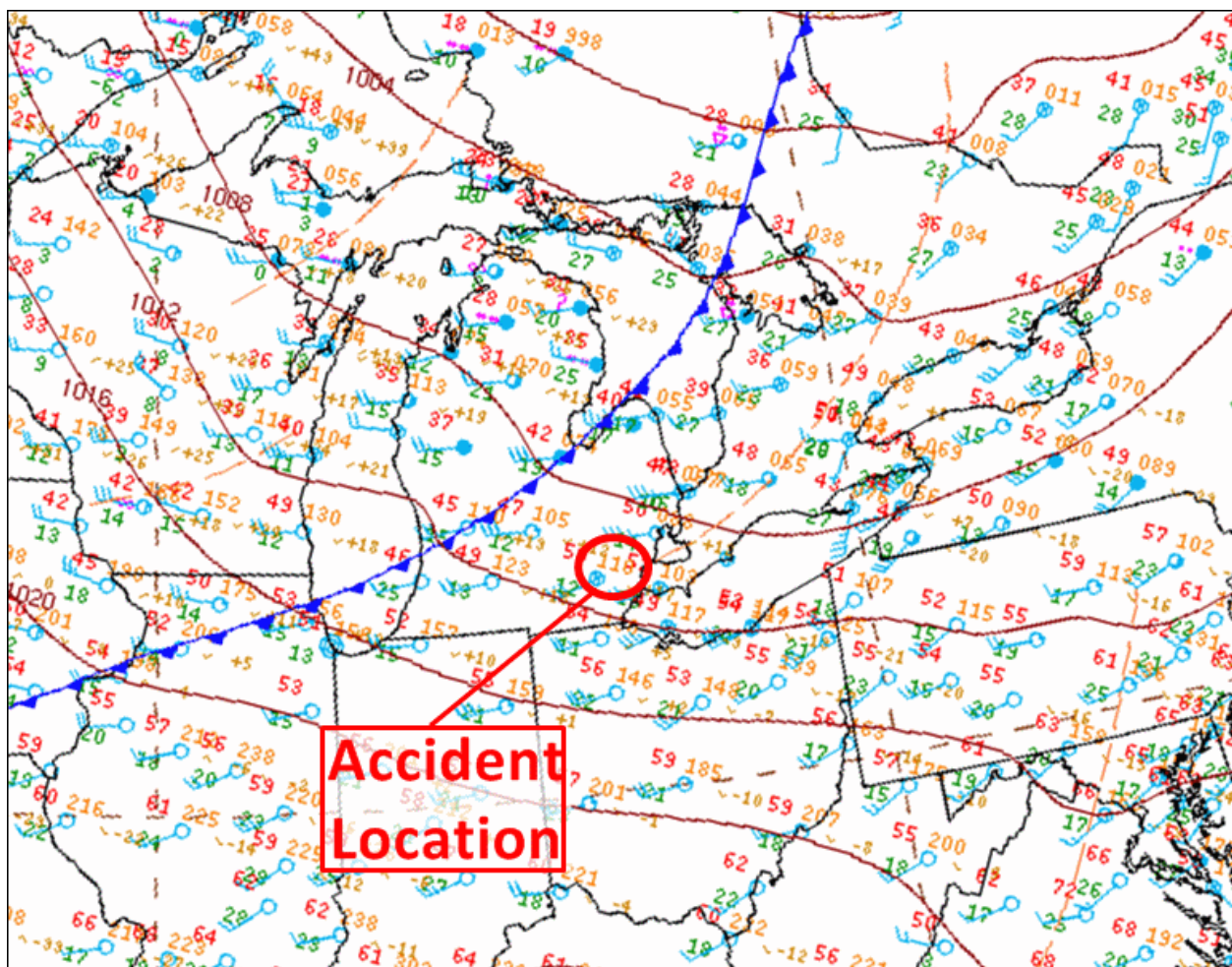


Figure 1 - NWS Surface Analysis Chart for 1600 EST.

² It should be noted that the NWS Area Forecast issued at 1445 EST put the cold front farther southeast and closer to the accident region.

³ Trough - An elongated area of relatively low atmospheric pressure, usually not associated with a closed circulation, and thus used to distinguish from a closed low. The opposite of ridge.

A WSR-88D regional radar composite reflectivity mosaic obtained from the National Centers for Environmental Information (NCEI) for 1445 EST (figure 2) did not depict any echoes across the accident region.

Geostationary Operational Environmental Satellite (GOES)-13 visible ($0.63\mu\text{m}$) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from 1445 EST is presented in figure 3. No clouds were identified over the accident site at the accident time.

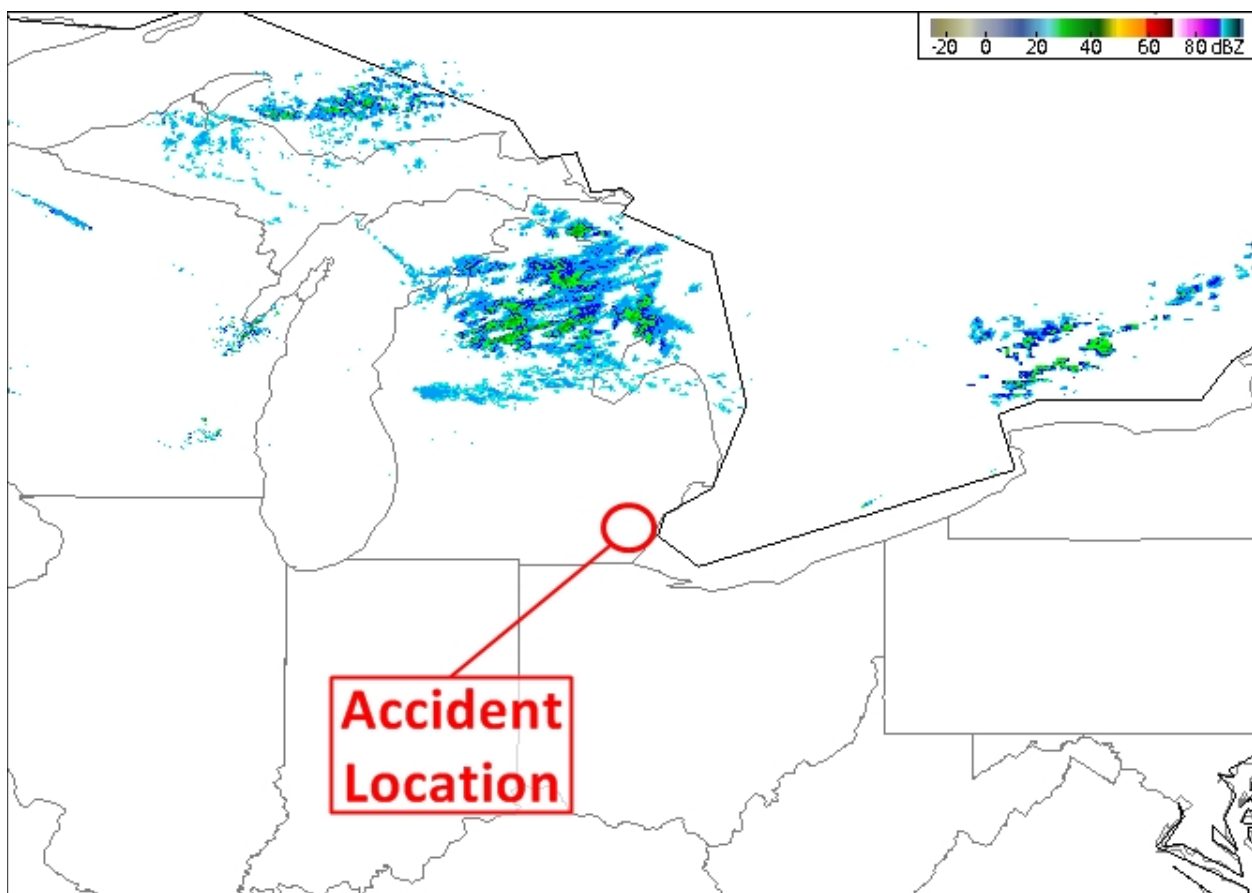


Figure 2 – NCEI WSR-88D mosaic from 1455 EST.

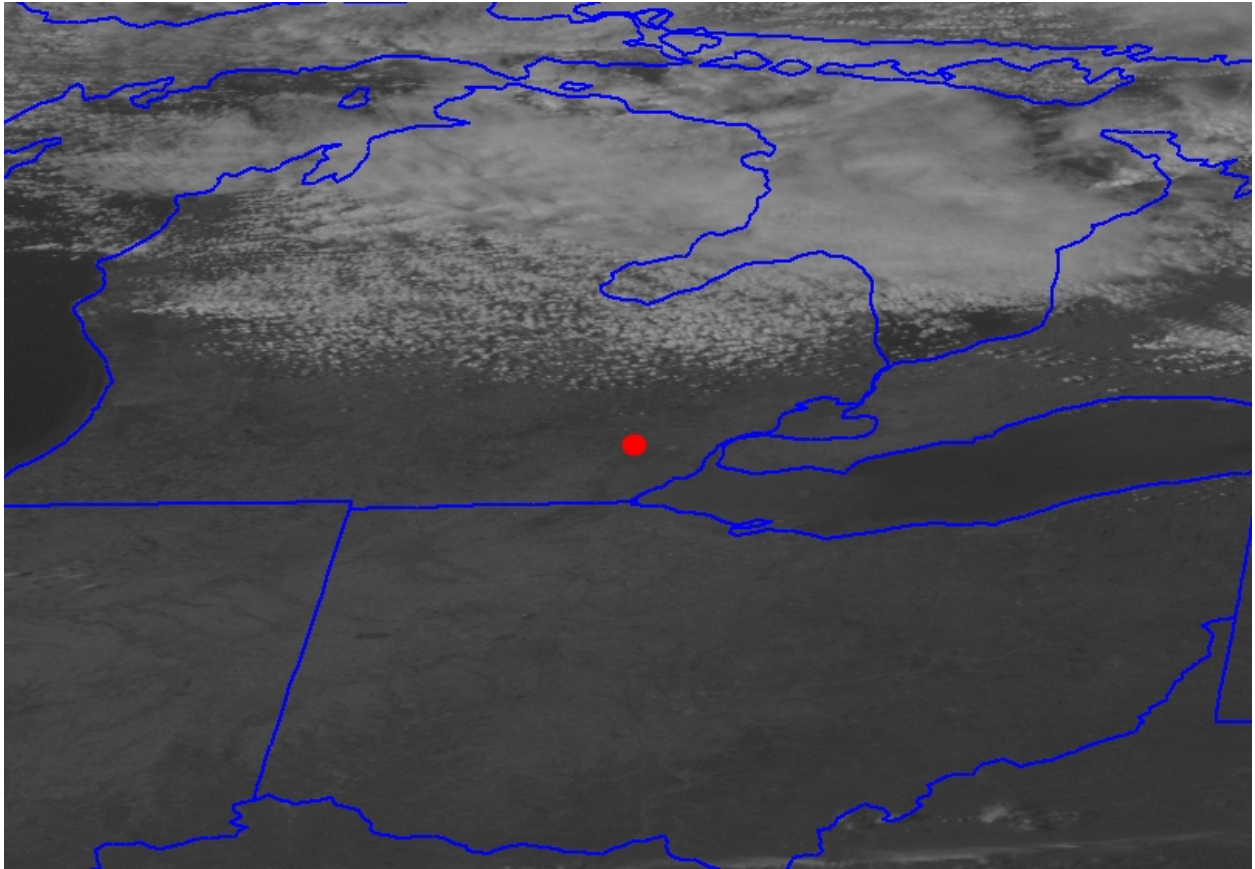


Figure 3 – GOES-13 0.63 μm (visible) imagery from 1445 EST. Red dot denotes accident location. Image is not corrected for any parallax error.

2.0 Surface Observations

2.1 YIP ASOS

An Automated Surface Observing System (ASOS) was located at YIP⁴ in Detroit, Michigan, (also see figures 4 and 7). Publicly-disseminated reports from YIP during the times surrounding the accident time, which were issued while a LAWRS⁵ Observer was logged into the ASOS augmentation system, are presented below.

[1053 EST] METAR KYIP 081553Z AUTO 26033G48KT 10SM CLR 10/M09 A2982
RMK AO2 PK WND 26051/1537 SLP098 T01001089=

[1153 EST] METAR KYIP 081653Z 26035G50KT 10SM CLR 11/M11 A2981 RMK
AO2 PK WND 26055/1639 SLP095 T01061106=

[1253 EST] METAR KYIP 081753Z A2979 RMK AO2 PK WND 24046/1656 SLPNO
58012 \$=

[1353 EST] METAR KYIP 081853Z A2977 RMK AO2 SLPNO \$=

[1453 EST] METAR KYIP 081953Z A2980 RMK AO2 SLPNO \$=

[1553 EST] METAR KYIP 082053Z A2983 RMK AO2 SLPNO 53013 \$=

At 1153 EST, YIP reported a wind⁶ from 260° at 35 knots with gusts to 50 knots, visibility 10 statute miles or greater, sky clear below 12,000 feet above ground level (agl), temperature of 11° Celsius (C) and a dew point temperature of -11°C, altimeter setting of 29.81 inches of mercury; Remarks: station with a precipitation discriminator, peak wind from 260° of 55 knots occurred at 1139 EST, sea level pressure of 1009.5 hectopascals (hPa), temperature of 10.6°C and dew point temperature of -10.6°C.

At 1253 EST, YIP reported an altimeter setting of 29.79 inches of mercury; Remarks: station with a precipitation discriminator, peak wind of 46 knots from 240° occurred at 1156 EST, sea level pressure not available, over last 3 hours pressure decreased (was steady or increasing then decreased, or was decreasing then decreased more rapidly) by 1.2 hPa, maintenance needed on the system.

At 1353 EST, YIP reported an altimeter setting of 29.77 inches of mercury; Remarks: station with a precipitation discriminator, sea level pressure not available, maintenance needed on the system.

⁴ The NWS uses the 4-digit International Civil Aviation Organization (ICAO) format for station identifiers (as seen in the body of some formatted weather observations). This report uses the 3-digit International Air Transport Association format for station identification, which does not use the geographic designating digit ("K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the ICAO format.

⁵ Limited Aviation Weather Reporting Station (LAWRS) - A facility where observations are taken, prepared, and transmitted by certified Federal Aviation Administration (FAA) control tower personnel, FAA-contract control tower personnel, or Flight Service Station (Alaska only) personnel on a limited basis to support aviation requirements.

⁶ The wind reported in the main body of the observation is a two-minute averaged wind

At 1453 EST, YIP reported an altimeter setting of 29.80 inches of mercury; Remarks: station with a precipitation discriminator, sea level pressure not available, maintenance needed on the system.

See Attachment 1 for all YIP ASOS publicly-disseminated reports between 1900 EST on March 5, 2017 through 2200 EST on March 8, 2017.

According to the ASOS User's Guide⁷, the two-minute average wind and wind gusts are calculated as follows:

Two-minute average wind - Every 5 seconds a running 2-minute average wind (direction and speed) is computed and used to further compute wind character. If the computed 2-minute average wind speed is 2 knots or less, the 2-minute average wind direction and speed is reported as "calm"...Once each minute the current 2-minute average wind is stored in memory for 12 hours and made available for reporting in the OMO [one minute observations], the computer generated voice messages (i.e., the ground-to-air radio and telephone dial-in message), the METAR/SPECI reports, and OID [Operator Interface Device] displays.

Wind gust - Once every 5 seconds, the ASOS computes the greatest 5-second average wind speed (and corresponding direction) during the past minute, and once each minute stores this information in memory for 12 hours. Once every 5 seconds the ASOS computes the current 2-minute average wind speed and compares it with the greatest 5-second average wind speed during the past minute. If the current 2-minute average wind speed is equal to or greater than 9 knots and the greatest 5-second average wind speed (during the past minute) exceeds the current 2-minute average speed by 5-knots or more, then the greatest 5-second average speed observed during the past minute is stored in memory as a gust for 10 minutes. Once every 5 seconds, the ASOS compares the highest gust stored in memory for the past 10 minutes with the current 2-minute average wind speed. If the difference between the two is 3 knots or more, the current reported wind speed is greater than 2 knots, and the highest gust exceeds the minimum 5-second wind speed in the past 10 minutes by 10 knots or more, then the highest gust stored in memory is designated as the reportable gust. This value is appended to the current wind direction and speed reported in the OMO, computer-generated voice messages, and the METAR/SPECI reports. The minimum gust speed reported by ASOS is 14 knots. Wind speeds from 3 knots and 11 knots may be reported with gusts to 14 knots.

On the day following the accident, the NTSB Meteorology Group Chairman met with the Meteorologist In Charge, the Warning Coordination Meteorologist and the Electronic Systems Analyst responsible for the YIP ASOS maintenance from the NWS' Detroit/Pontiac Weather Forecast Office (WFO) located in White Plains, Michigan. According to the NWS, at 1139 EST the YIP ASOS' Data Collection Package (DCP)⁸ lost power⁹. The DCP's battery-provided backup power engaged, but went "low" at 1201 EST, and completely lost power at 1202 EST. The last ASOS observation data disseminated by the DCP (to the ASOS' Acquisition Control Unit [ACU]) occurred at 1202 EST. According to the NWS, nominal backup battery life for this type of ASOS

⁷ <http://www.nws.noaa.gov/asos/pdfs/aum-toc.pdf>

⁸ The DCP collects raw data from most of the ASOS sensors on the field.

⁹ According to the NWS, the YIP ASOS' DCP was tied into commercial power.

is one hour, however it is common to see the battery backup power only last 15-20 minutes. The ASOS DCP resumed normal operations at 2101 EST. There was no indication of malfunction or “misperformance” of the YIP ASOS prior to the loss of power.

Although the ASOS DCP was not providing weather observations during its power outage, METARs were being issued for YIP during this period, including the times surrounding the accident time. These observations did not contain any “live” weather information except for the altimeter setting, as well as the three-hour pressure tendency (in the “remarks” section).¹⁰ According to the NWS, observations can still be publicly disseminated when the ASOS DCP is not functioning because the METARs are publicly disseminated from the ASOS’ ACU (the METARs just won’t contain any information provided directly by the DCP). According to the NWS, the ASOS’ ACU was located in the first floor equipment room of the YIP air traffic control tower (ATCT). The ASOS’ three pressure sensors were located inside the ACU cabinet, and the pressure sensors and ACU were on the same power source as the ATCT. According to YIP ATCT personnel, the YIP ATCT did not lose power during the period.

When asked about their thoughts on what the wind situation was at YIP during the accident time, the NWS indicated that it would have been consistent with what was being experienced over the entire region during the period.

YIP ATCT is a LAWRS facility and augmentation/backup of the ASOS automated observations is performed by certified FAA control tower personnel. According to FAA JO 7900.5¹¹ section 2.5, *“Certified observers are responsible for the completeness and accuracy of the weather observation. If the complete automated observation is unavailable due to sensor/system malfunction, communications failure, and/or non-representative data, backup information must be provided in accordance with the guidelines in the following subsections. Backup refers to the observer providing the same reporting capability as that provided by the automated weather sensor, consistent with service level standards specified in Appendix D Service Standards...”* FAA JO 7900.5 further defines how backup of automated weather observations shall be conducted.

LAWRS augmentation was not available for part of the accident day (including the accident time) due to the YIP ATCT being evacuated (“ATC Zero”) because of high winds. However, the YIP METARs disseminated during the times the YIP ATCT was evacuated did not contain an “AUTO” designator in the main body of the METAR. According to the ASOS User’s Guide, the AUTO designator *“signifies an unattended observation (i.e., [certified observer] not logged onto ASOS for back-up or augmentation).”* Although an observer may be logged into the ASOS OID for augmentation, automated observations may still be “physically unattended.” A review of the YIP ATCT facility evacuation procedures did not identify any required or “if able, do...” actions regarding logging out of the ASOS OID.

¹⁰ During the ASOS DCP’s power loss, observations of altimeter setting and three-hour pressure tendency were issued, however sea level pressure was remarked as not available. According to the NWS, “To calculate and thus report sea level pressure...the 12-hour mean temperature, station elevation and pressure sensor reading are all required. So without power to the DCP [there is] no temperature readings. This is the reason we see SLPNO in the metar.”

¹¹ <https://www.faa.gov/documentLibrary/media/Order/JO%207900.5C.pdf>

Five-minute data from the YIP ASOS for about the accident time is provided here. All expected main report body data aside from the altimeter setting is missing. See Attachment 2 for all YIP ASOS five-minute data between 1900 EST on March 5, 2017 through 1855 EST on March 8, 2017.

[1455 EST] 5-MIN KYIP 081955Z A2980 M M M M /M RMK AO2 \$

At 1455 EST, the YIP ASOS five-minute report indicated an altimeter setting of 29.80 inches of mercury, various data missing; remarks: station with a precipitation discriminator, maintenance needed on the system.

OMO wind data¹² from the YIP ASOS for the accident time is provided here. Wind data is missing. See Attachment 3 for all YIP ASOS OMO wind, temperature and dew point temperature data between 1900 EST on March 5, 2017 through 1900 EST on March 8, 2017.

<u>Time</u>	<u>W Dir</u>	<u>W Mag</u>	<u>G Dir</u>	<u>G Mag</u>
1452	M	M	M	M



Figure 4 – YIP ASOS.

¹² W_Dir = Direction of two-minute averaged wind (true); W_Mag = Magnitude of two-minute averaged wind (knots); G_Dir = Direction of five-second averaged wind (true); G_Mag = Magnitude of five-second averaged wind (knots)

2.2 YIP Runway Weather Information System

The Wayne County Airport Authority owned and operated several Vaisala Pavement Runway Weather Information System (RWIS) at YIP that recorded measurements of runway surface temperature. One of the Remote Processing Units (RPU) for these sensors, which was located near the touchdown zone for runway 5R (5R/TD; see figures 5 and 7), contained a suite of atmospheric sensors that observed various parameters including air temperature, wind speed and wind direction (anemometer height was 9-10 feet agl). These sensors continued to record data after power to the ASOS DCP was lost. According to the airport authority, “design plans confirm RPU power is fed from [the] FAA transformer at [the] 5R glide slope shelter.” Data from these sensors were not publicly available, and according to the airport authority these data were “collected from the pavement sensors and RPUs and transmitted to the Vaisala website. The site is customized to our airport and is login protected. Only the [Airport Operations/Security Manager], the Airport Director and Maintenance Manager have log-ins.”

At the NTSB’s request, both the Wayne County Airport Authority and Vaisala provided archived data from these sensors for the days leading up to and including the accident day. These data have been consolidated and selected parameters for the accident day are provided in Attachment 4. It should be highlighted that in the RWIS 5R/TD RPU data, temperatures are in °F, wind magnitudes are in miles-per-hour (mph) and wind direction is referenced to magnetic north (there is a negative magnetic declination of 6° at YIP). Further, according to Vaisala, “the RPU samples info from the wind sensor direction in intervals of less than 10 seconds” and “the wind speed is counted by a counter on the A/D board and said counter is sampled in the same time frame.” The two-minute average wind magnitude and direction are calculated considering the previous two minutes of observations and the “gust” magnitude is the maximum *instantaneous* wind observed over the previous 10 minutes. These parameters are reported each polling cycle.¹³

Wind from around the time of the accident are presented here:

<u>Time (EST)</u>	<u>Two-Minute Average Wind Magnitude (mph)</u>	<u>Two-Minute Average Wind Direction (°mag)</u>	<u>Gust Magnitude (mph)</u>
1438	33.1	255	50.6
1443	36.0	235	56.4
1448	29.5	250	49.4
1453	28.0	255	42.3
1458	35.1	240	47.4
1503	27.7	245	47.4

At 1453 EST, the YIP RWIS 5R/TD RPU reported a two-minute average wind magnitude of 28.0 mph (24.3 knots), a two-minute average wind direction of 255° magnetic, and a maximum instantaneous wind magnitude over the previous 10 minutes of 42.3 mph (36.8 knots).

¹³ In the case of the YIP RWIS 5R/TD RPU data the polling cycle is five minutes

Attachment 5 provides comparisons of the ASOS and RWIS 5R/TD RPU wind data sets for the time period 0703-1158 EST on the accident day.



Figure 5 – YIP RWIS 5R/TD RPU.

2.3 YIP Stand Alone Weather Station

There was an FAA-owned and operated Stand Alone Weather Station (SAWS) operating at YIP on the accident day (see figures 6 and 7). The SAWS sensor suite includes an anemometer and provided “backup” weather information to the ASOS. The YIP anemometer pole height is 35 feet agl. Realtime data from the SAWS are sent to the air traffic control tower via ultra-high frequency radio link, however these data are not archived. According to the FAA, no formal archiving of SAWS data exist across the national airspace system. According to the FAA (see Attachment 6), the YIP SAWS went out of service at 1138 EST on March 8, 2017, due to a “power outage caused by high winds.” The YIP SAWS had no backup source of power.



Figure 6 – YIP SAWS.

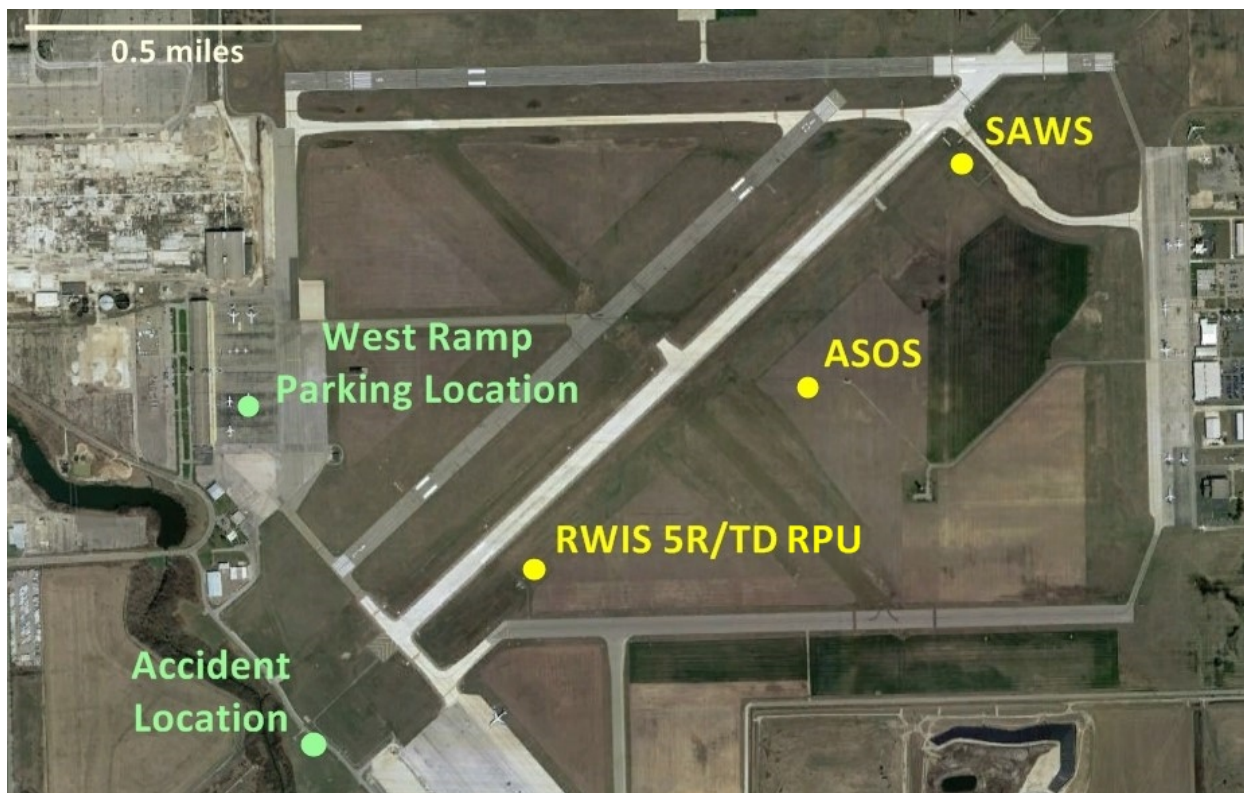


Figure 7 – Map of YIP surface observation stations along with accident location and accident aircraft's parked location on the west ramp prior to the accident.

2.4 Additional Observations

An ASOS was located at Detroit Metropolitan Wayne County Airport (DTW) in Detroit, Michigan, which was located about 8 miles east of the accident location. Publicly-disseminated reports from DTW during the times surrounding the accident time, which were issued while a Weather Observer was logged into the ASOS augmentation system, are presented here. A review of publicly-disseminated reports from DTW identified the peak wind for the day was 59 knots from 250° and occurred at 1137 EST.

[1153 EST] METAR KDTW 081653Z 25029G52KT 10SM FEW050 11/M13 A2982
RMK AO2 PK WND 25059/1637 SLP100 T01061128 \$=

[1253 EST] METAR KDTW 081753Z 25031G44KT 10SM FEW050 12/M11 A2981
RMK AO2 PK WND 26051/1712 SLP096 T01221111 10122 20033 \$=

[1353 EST] METAR KDTW 081853Z 25034G45KT 10SM FEW050 13/M16 A2978
RMK AO2 PK WND 24052/1823 SLP086 T01281156 \$=

[1453 EST] **METAR KDTW 081953Z 26033G44KT 10SM FEW050 12/M14 A2980**
RMK AO2 PK WND 24051/1926 SLP095 T01171144=

[1553 EST] METAR KDTW 082053Z 26031G47KT 10SM FEW050 11/M13 A2983
RMK AO2 PK WND 25053/2033 SLP105 T01111133 53009 \$=

At 1453 EST, DTW reported a wind from 260° at 33 knots with gusts to 44 knots, visibility 10 statute miles or greater, few clouds at 5,000 feet agl, temperature of 12°C and a dew point temperature of -14°C, altimeter setting of 29.80 inches of mercury; Remarks included: station with a precipitation discriminator, peak wind from 240° of 51 knots occurred at 1426 EST, sea level pressure of 1009.5 hPa, temperature of 11.7°C and dew point temperature of -14.4°C.

An ASOS was located at Ann Arbor Municipal Airport (ARB) in Ann Arbor, Michigan, which was located about 9 miles west of the accident location. Publicly-disseminated reports from ARB during the times surrounding the accident time, which were issued while an observer¹⁴ was logged into the ASOS augmentation system, are presented here. A review of publicly-disseminated reports from ARB identified the peak wind for the day was 54 knots from 220° and occurred at 1045 EST.

[1053 EST] METAR KARB 081553Z 22032G54KT 10SM CLR 09/M09 A2983 RMK
AO2 PK WND 22054/1545 SLP104 T00891094 \$=

[1153 EST] METAR KARB 081653Z 23031G49KT 10SM CLR 10/M10 A2981 RMK
AO2 PK WND 23053/1605 SLP100 T01001100 \$=

[1253 EST] METAR KARB 081753Z 23026G42KT 10SM CLR 11/M12 A2979 RMK
AO2 PK WND 23048/1657 SLP093 T01111117 10111 20039 58010 \$=

[1353 EST] METAR KARB 081853Z 23034G50KT 10SM CLR 11/M14 A2979 RMK
AO2 PK WND 22050/1851 SLP092 T01111139 \$=

**[1453 EST] METAR KARB 081953Z 23029G46KT 10SM CLR 11/M12 A2982 RMK
AO2 PK WND 23053/1914 SLP102 T01061122 \$=**

[1553 EST] METAR KARB 082053Z 25029G44KT 10SM 10/M11 A2984 RMK AO2
PK WND 24046/2014 SLP110 T01001111 53017

At 1453 EST, ARB reported a wind from 230° at 29 knots with gusts to 46 knots, visibility 10 statute miles or greater, sky clear above 12,000 feet agl, temperature of 11°C and a dew point temperature of -12°C, altimeter setting of 29.82 inches of mercury; Remarks included: station with a precipitation discriminator, peak wind from 230° of 53 knots occurred at 1414 EST, sea level pressure of 1010.2 hPa, temperature of 10.6°C and dew point temperature of -12.2°C.

3.0 YIP Windsocks

Figure 12 provides the locations of windsocks¹⁵ closest to the accident aircraft during its taxi and departure roll on runway 23L immediately prior to the accident, which include the midfield “primary” windsock and two “supplemental” windsocks. Figure 9 identifies the runway 23L

¹⁴ The type of observer is not known.

¹⁵ In this report, the term “windsock” refers to the fabric tube on the windcone used to identify wind direction and magnitude. “Windcone” refers to the assembly and framework that support the windsock.

Approach windsock/windcone to be compliant with FAA Advisory Circular (AC) 150/5345-27¹⁶, and according to the Wayne County Airport Authority, the YIP 27 Approach supplemental windcone/windsock has the same design concept.

With regard to the minimum wind magnitude required for full extension of a windsock, FAA AC 150/5345-27 section 3.2.2 states *“The taper or the fabric windsock from the throat to the trailing end must be designed to cause the windsock to fully extend when exposed to a wind of 15 knots (28 km/hr or 17 mph).”*

With regard to the midfield windsock (see figures 10 and 11), according to the airport authority, “...windsocks are universal and used on all of our windcones. They are FAA certified...”

In the days following the accident, the airport authority tested the runway 27 Approach and runway 23L Approach windcones and indicated that they both rotated freely. According to the airport authority, the midfield windsock was too high to reach, but it “appeared to rotate freely during the hefty winds [on the evening the windsock was checked].”



Figure 8 – YIP Runway 23L Approach supplemental windsock.

¹⁶ http://www.faa.gov/documentLibrary/media/Advisory_Circular/150_5345_27e.pdf



Figure 9 – Manufacturer’s stickers located on the YIP Runway 23L Approach supplemental windsock pole.



Figure 10 – YIP Runway 5R/23L Midfield primary windsock.



Figure 11 – Manufacturer's stickers located on the YIP Runway 5R/23L Midfield primary windosck pole.



Figure 12 – Map of YIP windcones discussed in this section along with the accident location.

4.0 Boeing Wind Model Analysis

At the NTSB's request, Boeing conducted an analysis of wind conditions at the accident aircraft's west ramp parking location (see figure 7) on the accident day. Their report is presented in Attachment 7.

5.0 RTMA Temperature

The Real-Time Mesoscale Analysis (RTMA) is a National Oceanic and Atmospheric Administration high-spatial and temporal resolution analysis system for near-surface weather conditions. According to the FAA's Information for Operators (InFO) 15006 (dated June 3, 2015)¹⁷: *In response to the issue of missing surface temperature reports due to failed sensors, the [FAA] solicited the assistance of the NWS in developing an alternative system for reporting surface temperature that operators, pilots, and aircraft dispatchers could easily use. The NWS responded by developing an RTMA surface temperature report that provides a simple hourly report of surface temperature at an airport, every hour, 24 hours a day...Operators may begin using these reports immediately.*

RTMA airport temperature analyses for the contiguous United States issued between 0800 and 1500 EST on March 8, 2017, are presented in Attachment 8.

6.0 Terminal Aerodrome Forecasts

Terminal Aerodrome Forecasts (TAF) were issued for YIP by the NWS Detroit/Pontiac WFO. Presented here is the most recently issued YIP TAF prior to the accident time. Attachment 9 contains all YIP TAFs issued between 0000 EST on March 6, 2017, and the accident time.

KYIP 081722Z 0818/0918 **25032G48KT P6SM FEW060**
FM082100 26031G46KT P6SM SCT070
FM082300 26024G36KT P6SM SKC
FM090100 27014KT P6SM SKC
FM090800 25008KT P6SM BKN150
FM091600 26008KT P6SM SCT060 OVC080=

At 1222 EST a TAF was issued for YIP that forecasted for the accident time: wind from 250° at 32 knots with gusts to 48 knots, visibility greater than six statute miles, few clouds at 6,000 feet agl.

¹⁷ https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2015/InFO15006.pdf

7.0 SIGMETs

At 1441 EST a Significant Meteorological Information (SIGMET) advisory for occasional severe turbulence below 12,000 feet was issued by the Aviation Weather Center (AWC) for an area that included the accident location. It indicated that the occasional severe turbulence was due (in part) to strong low level winds.

WSUS03 KKCI 081941
WS3O
-CHIO WS 081941
SIGMET OSCAR 1 VALID UNTIL 082340
LM MI IN PA OH LE WV
FROM 20SE MKG TO 30SSW ECK TO 50ENE FWA TO 20NNE SLT TO HAR TO
40SW ROD TO 30WNW GIJ TO 20SE MKG
OCNL SEV TURB BLW 120. **DUE TO STG LOW LVL WNDS** AND STG UDDFS
AND LLWS. RPTD BY ACFT. CONDS ENDG 2340Z.

No Convective SIGMETs were issued for the accident region.

8.0 AIRMETs

This report only considers Airmen's Meteorological Information (AIRMET) advisories issued by the AWC on surface wind conditions. At 0945 EST, an AIRMET TANGO for strong surface winds that advised of sustained surface winds greater than 30 knots expected, was issued by the AWC for an area that included the accident location at the accident time.

WAUS43 KKCI 081445
WA3T
_CHIT WA 081445
AIRMET TANGO UPDT 2 FOR TURB STG WNDS AND LLWS VALID UNTIL
082100
.
AIRMET STG SFC WNDS...MN IA WI LM MI LH IL IN
FROM 40SSE BRD TO 40SSE RHI TO ASP TO 30SE ECK TO FWA TO 40NE AXC
TO 40S DBQ TO 40NNW MCW TO 40SSE BRD
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS CONTG BYD
21Z ENDG 21-00Z.

At 1441 EST, an AIRMET TANGO for strong surface winds that advised of sustained surface winds greater than 30 knots expected, was issued for an area that included the accident location at the accident time.

WAUS43 KKCI 081941 AAA
WA3T
_CHIT WA 081941 AMD

AIRMET TANGO UPDT 3 FOR TURB STG WNDS AND LLWS VALID UNTIL 082100

.
AIRMET STG SFC WNDS...MN IA WI LM MI LH IL IN
FROM 40SSE BRD TO 40SSE RHI TO ASP TO 30SE ECK TO FWA TO 40NE AXC
TO 40S DBQ TO 40NNW MCW TO 40SSE BRD
SUSTAINED SURFACE WINDS GTR THAN 30KT EXP. CONDS CONTG BYD
21Z ENDG 21-00Z.

9.0 CWSU Products

At 0703 EST, the Center Weather Service Unit (CWSU) at the Cleveland Air Route Traffic Control Center (ZOB) issued the following Meteorological Impact Statement (MIS), which advised (in part) of frequent surface wind gusts between 30-40 knots after 0900 EST, and isolated surface wind gusts between 40-50 knots after 1200 EST, for the entire ZOB airspace (the accident location was under ZOB airspace).

FAUS20 KZOB 081203
ZOB MIS 01 VALID 081203-082000
...FOR ATC PLANNING PURPOSES ONLY...
ENTIRE ZOB.. FRQ MOD-ISOL SEVERE TURB 020-120. AFT 14Z FRQ SFC GUSTS 30-40KT. AFT 17Z ISOL SFC GUSTS 40-50KT. N 1/2 ZOB.. FRQ MOD TURB 120-FL360. S 1/2 ZOB.. PTCHY MOD TURB 120-FL360. LAKE ERIE/N OH/N PA/W NY.. ISOL LGT ICE 030-100. ISOL CIG BLW 050.

At 1305 EST, the ZOB CWSU issued the following MIS, which advised (in part) of surface wind gusts between 40-50 knots for the entire ZOB airspace.

FAUS20 KZOB 081805
ZOB MIS 02 VALID 081805-090230
...FOR ATC PLANNING PURPOSES ONLY...
ENTIRE ZOB.. SFC WIND GUSTS 40-50KT. MOD - PTCHY SEVERE TURB BLW 130. OCNL MOD TURB 130-FL360. SAGINAW BAY REGION.. ISOL CIG BLW 050. ISOL LGT ICE 030-120.

There were no Center Weather Advisories (CWA) identifying surface wind issued by the ZOB CWSU that were active for the accident site at the incident time. At 1318 EST, the ZOB CWSU did issue a CWA for a region that included the accident location that advised of moderate to severe turbulence below 12,000 feet.

10.0 Area Forecast Discussion

An Area Forecast Discussion (AFD) was issued at 1213 EST by the NWS Detroit/Pontiac WFO. This AFD, which consisted of only an aviation section, indicated the environment had been supporting southwest wind gusts between 45 and 55 knots over the previous few hours, and that these “intense” winds would remain through the afternoon. A “quick drop” in the winds was expected to occur between 1800 and 2000 EST. Attachment 9 contains all AFDs issued between 0000 EST on March 6, 2017, and the accident time.

FXUS63 KDTX 081713
AFDDTX
Area Forecast Discussion
National Weather Service Detroit/Pontiac MI
1213 PM EST Wed Mar 8 2017

.AVIATION...

A strong low level wind field courtesy of a 970mb low near Hudson Bay and a deepening mixed layer has been supporting southwest wind gusts between 45 and 55 knots over the last few hours. Mixing depths and the low level wind fields will remain high through the afternoon sustaining these intense winds. The deepening of the mixed layer will result in a slight veering of the wind toward the west (around 270 deg) around 21Z. The loss of daytime heating will result in a quick drop in the winds between 23Z and 01Z. Further nocturnal cooling and a weakening of the pressure gradient will lead to a steady decrease in the winds during the course of the evening and overnight, with gusts likely falling below 20 knots shortly after 01Z.

For DTW...The latest guidance supports a slight shift toward a more westerly wind direction around 21Z. Gusts should then steadily decrease after 23Z.

//DTW THRESHOLD PROBABILITIES...

* High in crosswind thresholds on the NE-SW runways being exceeded through 23Z this evening. Moderate between 23Z and 01Z.

11.0 Area Forecast

An NWS Area Forecast that included Lake Michigan, lower Michigan and Lake Huron was issued at 1445 EST by the AWC. Cloud heights are above msl. With regard to surface wind in the accident region, the Area Forecast forecasted a west wind at 30 knots with gusts to 45 knots. Attachment 9 contains all Area Forecasts issued between 0000 EST on March 6, 2017, and the accident time.

FAUS43 KKCI 081945
FA3W
_CHIC FA 081945
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 091400
CLDS/WX VALID UNTIL 090800...OTLK VALID 090800-091400
ND SD NE KS MN IA MO WI LM LS MI LH IL IN KY

.
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...20Z CDFNT ALG A YYZ-DXO-GIJ-DSM-OBH-40N BFF-SHR LN.
14Z CDFNT ALG A 30N CVG-AXC-20N MCI-MCK-DDY LN.

.
LM LWR MI LH
N HLF...SCT030 BKN050 TOPS 130. WDLY SCT -SHSN. WND W 20G40KT.
BECMG 0003 BKN070 TOPS 100. WND NW G25-30KT. OTLK...VFR.
S HLF...SCT070. OCNL BKN070 TOPS 100 NRN SXNS. WND W 30G45KT.
BECMG 2301 SKC. OTLK...VFR.

12.0 Other NWS Products

Attachment 10 contains other weather products discussing high wind conditions issued by the NWS Detroit/Pontiac WFO in the days leading up to and including the accident day (prior to the accident time).

At 1220, the NWS Detroit/Pontiac WFO issued the following Special Weather Statement, which was applicable to the accident location, that advised that a High Wind Warning was in effect. The Special Weather Statement stated that “Winds will continue to gust between 50 and 65 MPH [between 43 and 56 knots] this afternoon.”

WWUS83 KDTX 081720
SPSDTX
Special Weather Statement
National Weather Service Detroit/Pontiac MI
1220 PM EST Wed Mar 8 2017
MIZ047>049-053>055-060>063-068>070-075-076-082-083-082030-
Midland- Bay-Huron- Saginaw- Tuscola- Sanilac- Shiawassee- Genesee- Lapeer-St.
Clair- Livingston- Oakland- Macomb- Washtenaw- Wayne- Lenawee- Monroe-
Including the cities of Midland, Bay City, Bad Axe, Saginaw, Caro, Sandusky, Owosso,
Flint, Lapeer, Port Huron, Howell, Pontiac, Warren, Ann Arbor, Detroit, Adrian, and
Monroe
1220 PM EST Wed Mar 8 2017

...HIGH WIND WARNING IN EFFECT...

Winds will continue to gust between 50 and 65 MPH this afternoon. There have been reports of large trees, tree limbs and wires being blown down all over Southeast Michigan. Extensive power outages have also been reported. The persistent winds will lead to additional trees and power lines being blown down. Motorists will also have difficulty driving, especially high profile vehicles. If you must travel this afternoon, be alert to debris in the roads. As a reminder, never go near downed power lines.

F. LIST OF ATTACHMENTS

- Attachment 1 - All YIP ASOS publicly-disseminated reports between 1900 EST on March 5, 2017 through 2200 EST on March 8, 2017.
- Attachment 2 - All YIP ASOS five-minute data between 1900 EST on March 5, 2017 through 1855 EST on March 8, 2017.
- Attachment 3 - All YIP ASOS OMO wind, temperature and dew point temperature data between 1900 EST on March 5, 2017 through 1900 EST on March 8, 2017.
- Attachment 4 - YIP RWIS 5R/TD RPU data (selected parameters) for the accident day.
- Attachment 5 - Comparisons of the ASOS and RWIS 5R/TD RPU wind data sets for the time period 0703-1158 EST on the accident day.
- Attachment 6 - FAA SAWS outage ticket.
- Attachment 7 - Boeing analysis of wind conditions at the accident aircraft's west ramp parking location on the accident day.
- Attachment 8 - RTMA airport temperature analyses for the contiguous United States issued between 0800 and 1500 EST on March 8, 2017.
- Attachment 9 - All YIP TAFs, Area Forecast Discussions and Area Forecasts issued between 0000 EST on March 6, 2017, and the accident time.
- Attachment 10 - Additional weather products discussing high wind conditions issued by the National Weather Service Detroit/Pontiac WFO in the days leading up to and including the accident day (prior to the accident time).

Submitted by:

Mike Richards
Senior Meteorologist