

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA24FA077

METEOROLOGY

Specialist's Factual Report

February 1, 2024

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A. ACCIDENT

Location: Marienville, Pennsylvania

Date: 29 December 2023

Time: 2157 eastern standard time (0257 UTC¹ on 30 December 2023)

Aircraft: Type - Zenith STOL CH701; Registration - N4209W

B. METEOROLOGY SPECIALIST

Mike Richards

Senior Meteorologist

Office of Aviation Safety

Operational Factors Division (AS-30)

National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in eastern standard time for 29 December 2023 (based upon the 24-hour clock), directions are referenced to true north, distances are in nautical miles and heights are above mean sea level (msl). The accident site was located at about: 41.45361° north latitude; 79.06972° west longitude at an elevation of about 1,680 feet.

This report provides information on instrument meteorological conditions in the accident region.

D. DETAILS OF THE INVESTIGATION

1.0 Surface Observations

An Automated Surface Observing Station (ASOS) was located at Dubois Regional Airport (DUJ²) in Dubois, Pennsylvania, which was located about 18 miles south-

¹ UTC - abbreviation for Coordinated Universal Time

² This report uses the 3-digit International Air Transport Association format for airport identification, which does not use the geographic designating digit (e.g., "K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the 4-digit International Civil Aviation Organization (ICAO) identifier format. Weather observations from airports in this report are referenced by their reporting station's identifier (using ICAO format that includes the geographic designating digit), not by the airport at which the reporting station is located.

southeast of the accident site at an elevation of about 1,815 feet. Automated longline³ reports from the DUJ ASOS during the times surrounding the accident time are presented here.

[2103] KDUJ 300203Z AUTO 26008KT 10SM BKN014 OVC024 02/M02 A2969
RMK AO2 T00171022

[2150] KDUJ 300250Z AUTO 25007KT 5SM BR OVC008 01/M01 A2968 RMK
AO2 CIG 006V014 I1000

**[2153] KDUJ 300253Z AUTO 24008KT 4SM BR OVC008 01/M01 A2968
RMK AO2 CIG 006V011 SLP064 I1000 I3000 T00111011 57002**

[2238] KDUJ 300338Z AUTO 25006KT 1 3/4SM -SN BR OVC005 01/M01 A2968
RMK AO2 SNB21 CIG 004V010 P0000 T00111011

[2248] KDUJ 300348Z AUTO 26008KT 2 1/2SM -SN BR OVC005 01/M01 A2968
RMK AO2 SNB21 CIG 004V008 P0000

At 2153, the DUJ ASOS reported a wind from 240° at 8 knots, visibility of 4 statute miles, mist, ceiling overcast at 800 feet above ground level (agl), temperature of 1°C and dew point temperature of -1°C, altimeter setting of 29.68 inches of mercury; Remarks: automated station with a precipitation discriminator, ceilings variable between 600 and 1,100 feet agl, sea level pressure of 1006.4 hectopascals (hPa), trace amount of ice since 2053, trace amount of ice since 1853, temperature of 1.1°C and dew point temperature of -1.1°C, pressure has risen 0.2 hPa since 1853.

An Automated Weather Observing Station (AWOS) was located at St Marys Municipal Airport (OYM) in St Marys, Pennsylvania, which was located about 26 miles east of the accident site at an elevation of about 1,935 feet. Automated longline reports from the OYM AWOS during the times surrounding the accident time are presented here.

[2115] KOYM 300215Z AUTO 27006KT 10SM OVC016 01/M02 A2971 RMK
AO2 PWINO

[2135] KOYM 300235Z AUTO 27006KT 10SM BKN016 OVC030 01/M01 A2970
RMK AO2 PWINO

**[2155] KOYM 300255Z AUTO 27008KT 10SM BKN014 OVC022 01/M01
A2970 RMK AO2 PWINO**

³ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases (effectively, the whole world) and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline-dissemination of weather observations is the primary vehicle through which the general global public has access to surface weather observations, particularly outside of the aviation community.

[2215] KOYM 300315Z AUTO 27004KT 10SM BKN014 OVC021 01/M01 A2970
RMK AO2 PWINO

[2235] KOYM 300335Z AUTO 27005KT 4SM OVC012 01/M01 A2970 RMK AO2
PWINO

At 2155, the OYM AWOS reported a wind from 270° at 8 knots, visibility 10 statute miles or greater, ceiling broken at 1400 feet agl, overcast clouds at 2,200 feet agl, temperature of 1°C and dew point temperature of -1°C, altimeter setting of 29.70 inches of mercury; Remarks: automated station with a precipitation discriminator, precipitation identifier information not available.

2.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁴ sounding (Figure 1) for near the accident site⁵ at 2200 with an elevation of 512 feet was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. RAOB identified cloudy conditions between about 3,000 and 6,000 feet. The freezing level was at about 2,000 feet. RAOB identified light to moderate clear or rime ice between about 2,500 and 5,700 feet. The wind near the surface was from the west at about 5 knots. Above this level through 5,000 feet the wind remained generally westerly. Between 3,000 and 5,000 feet the wind was at a magnitude of about 20 knots.

⁴ 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.

⁵ Coordinates used for the model were latitude: 41.45°N; longitude: 79.07°W.

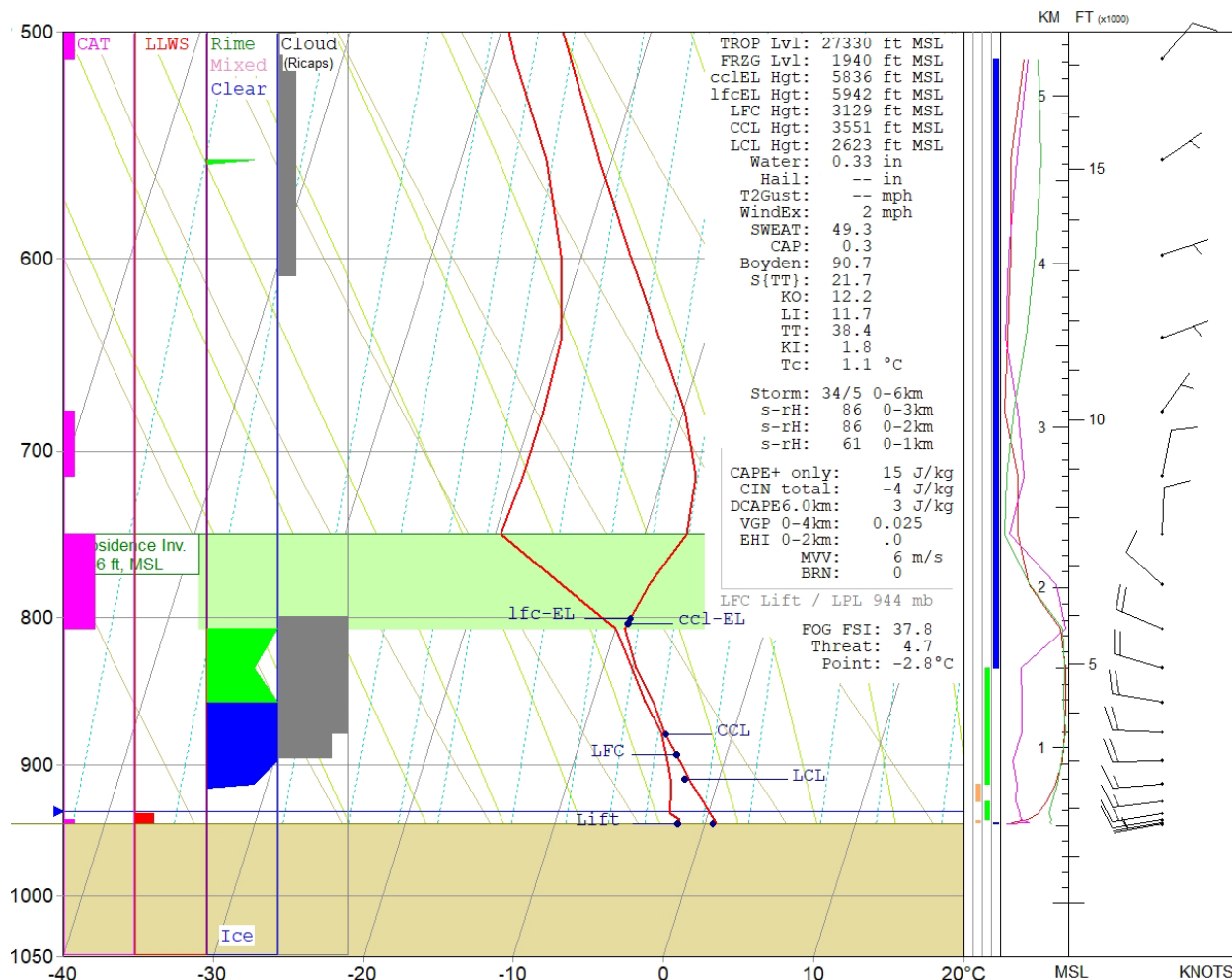


Figure 1 - HRRR model sounding data in SkewT/LogP format for 2200 near the accident site, surface to 500 hPa.

3.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-16 infrared (10.3 μ m) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. An image of these data is presented in Figure 2. Brightness temperatures over the accident location were about -29°C, which, when considering the 2200 HRRR sounding, corresponded to a height of about 19,000 feet (not shown in Figure 1).

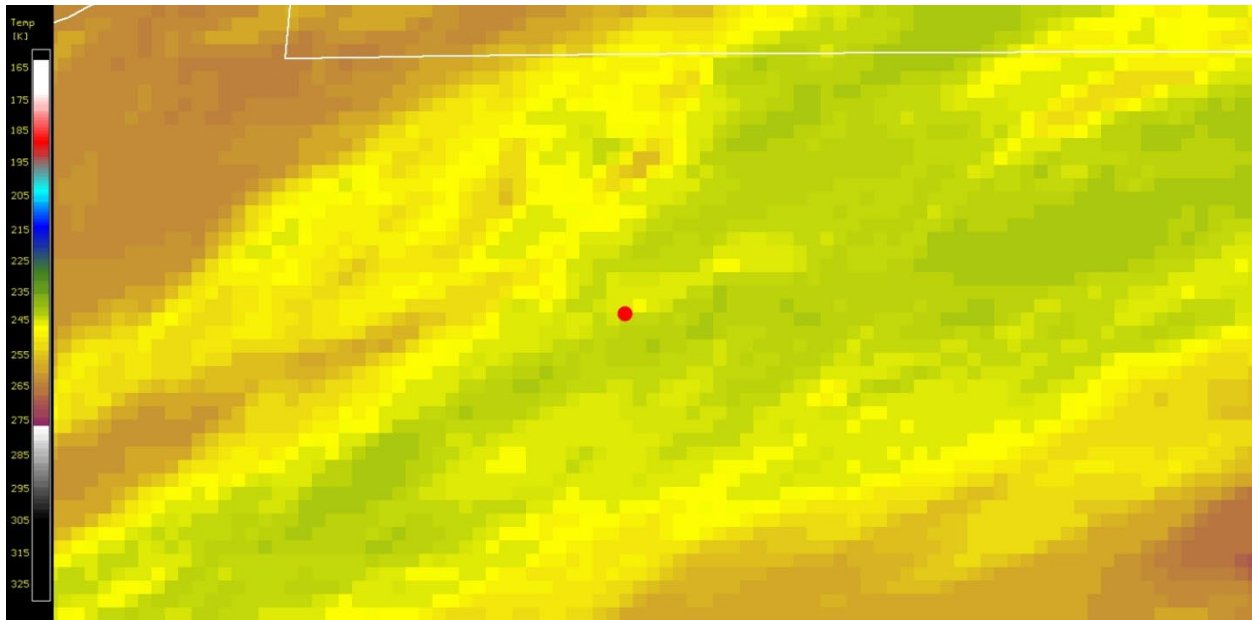


Figure 2 - GOES-16 infrared imagery from 2156. Image is not corrected for parallax error. The accident location is denoted by the red dot.

4.0 Weather Radar

WSR-88D⁶ Level-II base reflectivity weather radar imagery from the State College site in Pennsylvania (site KCCX) is presented in Figure 3. KCCX was located approximately 43 miles east of the accident location with an antenna elevation of about 2,485 feet. Assuming standard refraction and considering the 0.95° beam width⁷ for the WSR-88D radar beam, the KJGX 0.483° tilt would have “seen” altitudes above the accident location of between about 3,950 and 5,900 feet. Light⁸ values of reflectivity were seen along the very final portion of the accident aircraft’s flight path.

⁶ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁷ Here we define the angular width of the radar beam as the region of transmitted energy that is bounded by one-half the maximum power. The maximum power lies along the beam centerline and decreases outward from the radar antenna.

⁸

https://www.faa.gov/sites/faa.gov/files/other_visit/aviation_industry/airline_operators/airline_safety/in_FO07008.pdf

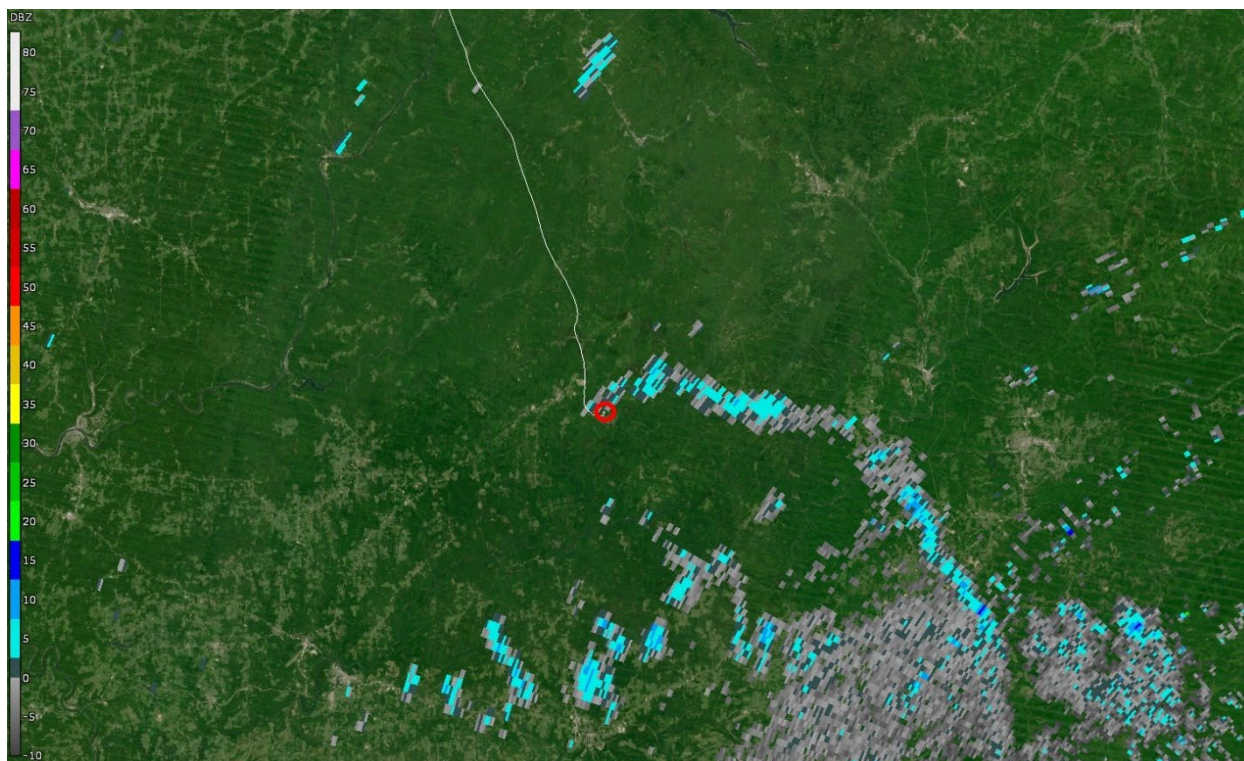


Figure 3 - KCCX 0.483° Level-II base reflectivity product from a sweep initiated at 2155:07. The accident aircraft's flight path is represented by the thin white line. The accident location is denoted by the red circle.

5.0 Pilot Reports

The following are the longline-disseminated pilot reports⁹ (PIREPs) reported between 2000 and 0000 on the following day (a four-hour period) within 75 miles of the accident location. All PIREPs included reports of light or moderate icing at or below 7,000 feet.

LBE UA /OV LBE/TM 0241/FL030/TP C25/IC LGT RIME/RM LGT RIME FOR SEVERAL THOUSAND FEET DURD ENDING AT THE BASES 030 NO TEMP DURD ILS RWT 24 LBE

DUJ UA /OV CIP/TM 0402/FL070/TP C208/TA UNKWN/IC MOD MX

JST UA /OV JST280020/TM 0405/FL070/TP CRJ2/TA M9/IC LGHT-MOD RME

AGC UA /OV 3 E AGC/TM 0437/FL025/TP PC24/SK BASES 025/TA +2/IC LGT MIXED 025 AND ABV

⁹ These do not include pilot reports only broadcast via radio.

6.0 Terminal Aerodrome Forecasts

At 1946 a Terminal Aerodrome Forecast (TAF)¹⁰ was issued for DUJ, that forecasted from 2100 until 0100 on the following day (a four-hour period): a wind from 250° at 5 knots, visibility greater than 6 statute miles, light snow and ceiling overcast at 2,500 feet agl.

KDUJ 300046Z 3001/3024 25007KT P6SM OVC035
FM300200 25005KT P6SM -SN OVC025
FM300600 26010KT 6SM -SHSN OVC007
FM300900 26009KT 4SM -SHSN OVC007
FM301500 27009KT P6SM VCSH OVC007
FM302100 27010KT P6SM OVC015=

At 1826 a TAF was issued for John Murtha Johnstown/Cambria County Airport (JST) in Johnstown, Pennsylvania, which was located about 70 miles south of the accident location at an elevation of about 2,300 feet. The JST TAF forecasted from 1900 until 2200: a wind from 270° at 10 knots, visibility greater than 6 statute miles, ceiling broken at 2,000 feet agl and overcast clouds at 3,000 feet agl.

JST 292326Z 3000/3024 27010KT P6SM BKN020 OVC030
FM300300 28010G18KT 6SM -SHSN BR OVC015
FM300800 27012G18KT 3SM -SHSN BR OVC008
FM301100 27012G18KT 2SM -SN BR OVC005
FM302200 27012KT 3SM -SHSN BR OVC007=

7.0 Area Forecast Discussion

At 2106 the National Weather Service's (NWS) Pittsburgh, Pennsylvania, Weather Forecast Office (WFO) issued the following Aviation section of an Area Forecast Discussion.

FXUS61 KPBZ 300206
AFDPBZ
Area Forecast Discussion
National Weather Service Pittsburgh PA
906 PM EST Fri Dec 29 2023

¹⁰ According to National Weather Service (NWS) Instruction 10-813: "A NWS TAF consists of the expected meteorological conditions significant to aviation at an airport for a specified time period. For the U.S., this is the area within five (5) statute miles (SM) of the center of an airport's runway complex." See: www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

.AVIATION /02Z SATURDAY THROUGH WEDNESDAY/...

Mainly MVFR, with local IFR, conditions are expected this evening. Areas of light snow, mixed with rain at times, will continue with an upper low across WV, and a 700 mb low across SW PA.

The upper low will track ewd overnight, as another shortwave trough crosses the Upper Ohio Valley region. Deterioration to IFR is expected with the trough, as additional light snow moves across the region.

The shortwave trough will slowly exit the region from late Saturday morning into the afternoon. Improvement back to MVFR cigs is expected after the passage of the trough, with Ohio airports likely seeing a return to VFR stratocu during the afternoon in dry advection.

At 1943 the NWS State College, Pennsylvania, WFO issued the following Aviation section of an Area Forecast Discussion.

FXUS61 KCTP 300043

AFDCTP

Area Forecast Discussion

National Weather Service State College PA

743 PM EST Fri Dec 29 2023

.AVIATION /01Z SATURDAY THROUGH WEDNESDAY/...

Mostly VFR across Central PA this evening, although some lower clouds are beginning to approach from the west and JST is reporting MVFR ceilings as of 23Z. Expect -SHSN to develop at KBFD and KJST over the next few hours, continuing to spread eastward into the afternoon on Saturday. As the snow showers move in, ceilings will continue to lower and BFD and JST will likely see a period of IFR ceilings through tomorrow afternoon. VFR conditions will hold on longest across the Lower Susquehanna Valley, but model soundings suggest that there will be a few hour period of MVFR ceilings beginning around 14Z at MDT and 16Z at LNS.

Any heavier snow showers that develop will have the potential to drop cigs/vsby lower than what is currently forecast, but confidence in any specific time frame for these heavier snow showers is low, so have maintained a general IFR in -SHSN for a large part of the forecast period.

Expect gradual improvement, with the exception of JST, after 18Z tomorrow. VFR conditions will return across the southeast and potentially for the northeast, though the HREF and SREF suggest a 40-60% chance of IPT remaining MVFR through 00Z.

8.0 SIGMETs

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

9.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the Center Weather Service Units (CWSU) at the Cleveland Air Route Traffic Control Center that were active for the accident region at the accident time.

10.0 G-AIRMETs for IFR Conditions and Mountain Obscuration

A Graphical-Airmen's Meteorological Information (G-AIRMET) is a graphical advisory of weather that may be hazardous to aircraft but are less severe than SIGMETs. They are only valid at specific time "snapshots". G-AIRMETs are issued at discrete times three hours apart for a period of up to 12 hours into the future (i.e., 00-, 03-, 06-, 09- and 12-hour forecasts). They are issued at 0300 UTC, 0900 UTC, 1500 UTC and 2100 UTC (with updates issued as necessary).

At about 1600, G-AIRMETs were issued for mountain obscuration that were valid at both 1900 and 2200 for regions that included the accident location. At about 1730, a G-AIRMET was issued for mountain obscuration that was valid at 2200 for a region that included the accident location.

There were no G-AIRMETs for instrument flight rule (IFR) conditions¹¹ that had been issued at about 1600 that were valid for the accident location.

Submitted by:

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Senior Meteorologist

¹¹ IFR conditions - Ceilings less than 1,000 feet agl and/or surface visibility less than three statute miles.