

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR21FA258

METEOROLOGY

Specialist's Factual Report

November 17, 2022

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A. ACCIDENT

Location: Missoula, Montana

Date: July 1, 2021

Time: 1149 mountain daylight time (1749 UTC¹)

Aircraft: Type - Cessna 172R; Registration - N2388L

B. METEOROLOGY INVESTIGATOR

Mike Richards

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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 mountain daylight time for July 1, 2021 (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: 46.840465° north latitude; 114.2859° west longitude at an elevation of about 4,925 feet.

This report provides information addressing the potential for turbulence below 10,000 feet applicable to the accident region at the accident time.

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Surface Observing System (ASOS) was located at Missoula Montana Airport (MSO²) which was in Missoula, Montana, about 9 miles northeast of the accident

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.

location at an elevation of about 3,200 feet. It had a magnetic variation of about 13° east. Augmented longline³ reports from the MSO ASOS during the times surrounding the accident time are presented here, and the observation closest in time to the accident time is highlighted by bold text.

[0953] METAR KMSO 011553Z 00000KT 10SM CLR 26/09 A2994 RMK AO2
SLP110 T02560094=

[1053] METAR KMSO 011653Z 20005KT 10SM CLR 28/11 A2992 RMK AO2
SLP102 T02780106=

**[1153] METAR KMSO 011753Z 00000KT 10SM CLR 31/11 A2992 RMK AO2
SLP097 T03110111 10311 20167 58010=**

[1253] METAR KMSO 011853Z VRB03KT 10SM CLR 33/11 A2990 RMK AO2
SLP091 T03280111=

At 1153, the MSO ASOS reported a calm wind, visibility 10 statute miles or greater, clear skies, temperature of 31° Celsius (C) and dew point temperature of 11°C, altimeter setting of 29.92 inches of mercury; Remarks included: automated station with a precipitation discriminator, sea level pressure of 1009.7 hectopascals (hPa), temperature of 31.1°C and a dew point temperature of 11.1°C.

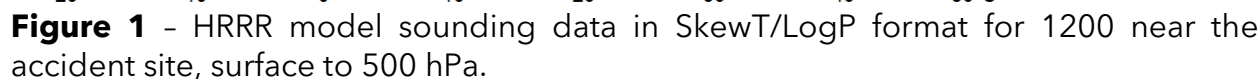
2.0 Weather Radar

A review of WSR-88D⁴ Level-II base reflectivity weather radar imagery did not identify any pertinent meteorological returns in the accident region around the accident time.

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.

⁴ Weather Surveillance Radar 88 Doppler (WSR-88D)

A High-Resolution Rapid Refresh (HRRR) model⁵ sounding (Figure 1) for near the accident site⁶ at 1200 using an elevation of about 4,927 feet was retrieved from the National Oceanic and Atmospheric Administration's Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. The freezing level was noted at about 15,000 feet. The wind below 10,000 feet was 5 knots or less from variable directions. No turbulence or low-level wind shear was identified by RAOB below 10,000 feet, except the potential for light thermal turbulence below about 7,000 feet.



⁵ 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.

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4.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-17 visible (0.64 μ m) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. An image from 1151 is presented in Figure 2. The GOES-17 visible imagery depicted mostly clear conditions across the accident region.

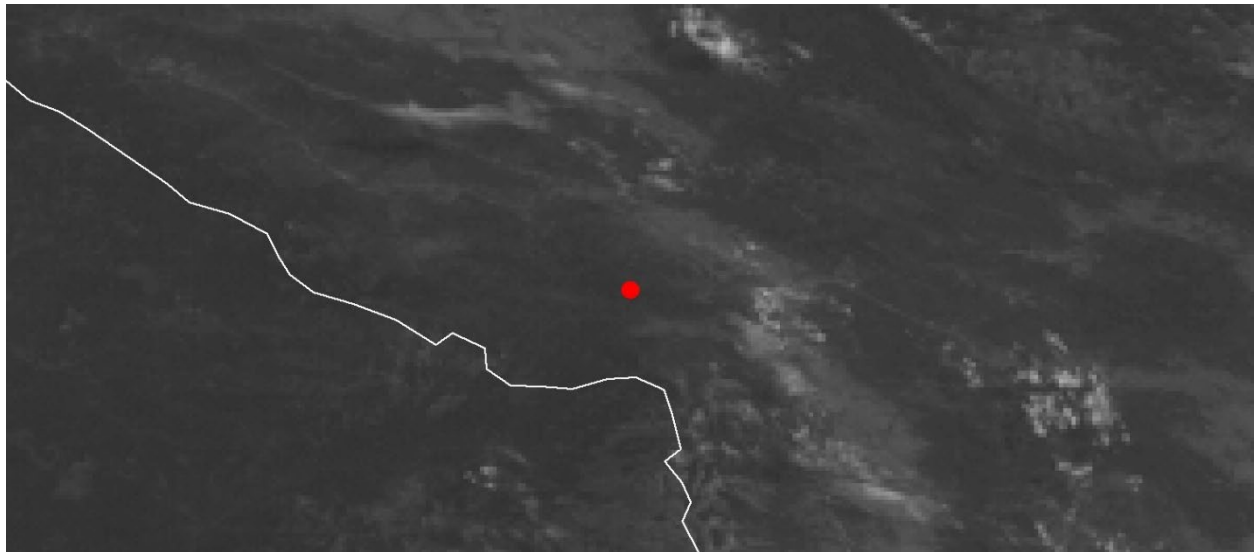


Figure 2 - GOES-17 visible imagery from 1151. Accident location denoted by the red dot. Image is not corrected for parallax error.

5.0 Pilot Reports

There were no longline-disseminated pilot reports⁷ (PIREPs) reported between 1000 and 1300 that were applicable within 100 miles of the accident location.

6.0 Terminal Aerodrome Forecasts

The National Weather Service (NWS) produced Terminal Aerodrome Forecasts (TAF) for MSO. According to 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."⁸

⁷ These do not include pilot reports only broadcast via radio.

⁸ www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

At 1127 a TAF was issued by the NWS for MSO that forecasted for the accident time: a wind from 200° at 5 knots, visibility greater than 6 statute miles, sky clear.

TAF KMSO 011727Z 0118/0218 **20005KT P6SM SKC**
FM012000 34009KT P6SM SCT100
FM012300 20011KT P6SM VCTS BKN100CB
FM020100 35007KT P6SM VCSH OVC100
FM020500 VRB03KT P6SM SCT250=

7.0 SIGMETs

There were no Significant Meteorological Information (SIGMET) advisories active for turbulence for the accident location at the accident time.

8.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the NWS Center Weather Service Unit (CWSU) at the Salt Lake City Air Route Traffic Control Center that were active for the accident location at the accident time.

9.0 G-AIRMETs TANGO

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).

There were no G-AIRMET TANGO advisories active for the accident location at 0900 or 1200.

Submitted by:

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