



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

August 4, 2022

Specialist's Factual Report

METEOROLOGY

WPR21FA270

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A. ACCIDENT

Location: Monterey, California
Date: July 13, 2021
Time: 1042 Pacific daylight time (1742 UTC¹)
Aircraft: Type – Cessna 421C; Registration – N678SW

B. METEOROLOGIST

Mike Richards
Senior Meteorologist
Operational Factors Division (AS-30)
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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 Pacific daylight time (PDT) for July 13, 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 about: 36.575343° north latitude; 121.82523° west longitude at an elevation of about 140 feet.

This report provides information on the weather conditions and forecasts applicable to the accident time and location.

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Surface Observing System (ASOS) was located at Monterey Regional Airport (MRY²) in Monterey, California, and was located one mile northwest of the accident location at an elevation of about 255 feet and had a magnetic variation of about 13° east. Augmented longline³

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.

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

reports from the MRY 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.

[0854 PDT] KMRV 131554Z 26005KT 10SM OVC005 14/12 A2996 RMK AO2 SLP158
T01390117

[0954 PDT] KMRV 131654Z 26006KT 9SM OVC006 14/12 A2997 RMK AO2 SLP161
T01440117

**[1054 PDT] KMRV 131754Z 28007KT 9SM OVC008 15/11 A2999 RMK AO2
SLP166 T01500111 10150 20133 51013**

[1152 PDT] KMRV 131852Z 26008KT 10SM OVC010 17/11 A3000 RMK AO2

[1154 PDT] KMRV 131854Z 27009KT 10SM OVC010 17/11 A3000 RMK AO2 SLP169
T01670111

At 1054, the MRY ASOS reported a wind from 280° at 7 knots, visibility of 9 statute miles, ceiling overcast at 800 feet above ground level (agl), temperature of 15° Celsius (C) and dew point temperature of 11°C, altimeter setting of 29.99 inches of mercury; Remarks: automated station with a precipitation discriminator, sea level pressure of 1016.6 hectopascals (hPa), hourly temperature of 15.0°C and hourly dew point temperature of 11.1°C, highest temperature during previous 6 hours of 15.0°C, lowest temperature during previous 6 hours of 13.3°C, over the previous 3 hours the pressure has increased 1.3 hPa.

2.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁴ sounding (figure 1) for near the accident site⁵ at 1100 using an elevation of 140 feet was retrieved from the National Oceanic and Atmospheric Administration's Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Cloudy conditions were identified by RAOB from about 1,100 to 1,700 feet. The freezing level was noted at about 17,000 feet. The wind below 2,000 feet was from the west at magnitudes less than 10 knots. A temperature inversion was noted between 1,600 and 4,600 feet.

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 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 36.58, -121.83.

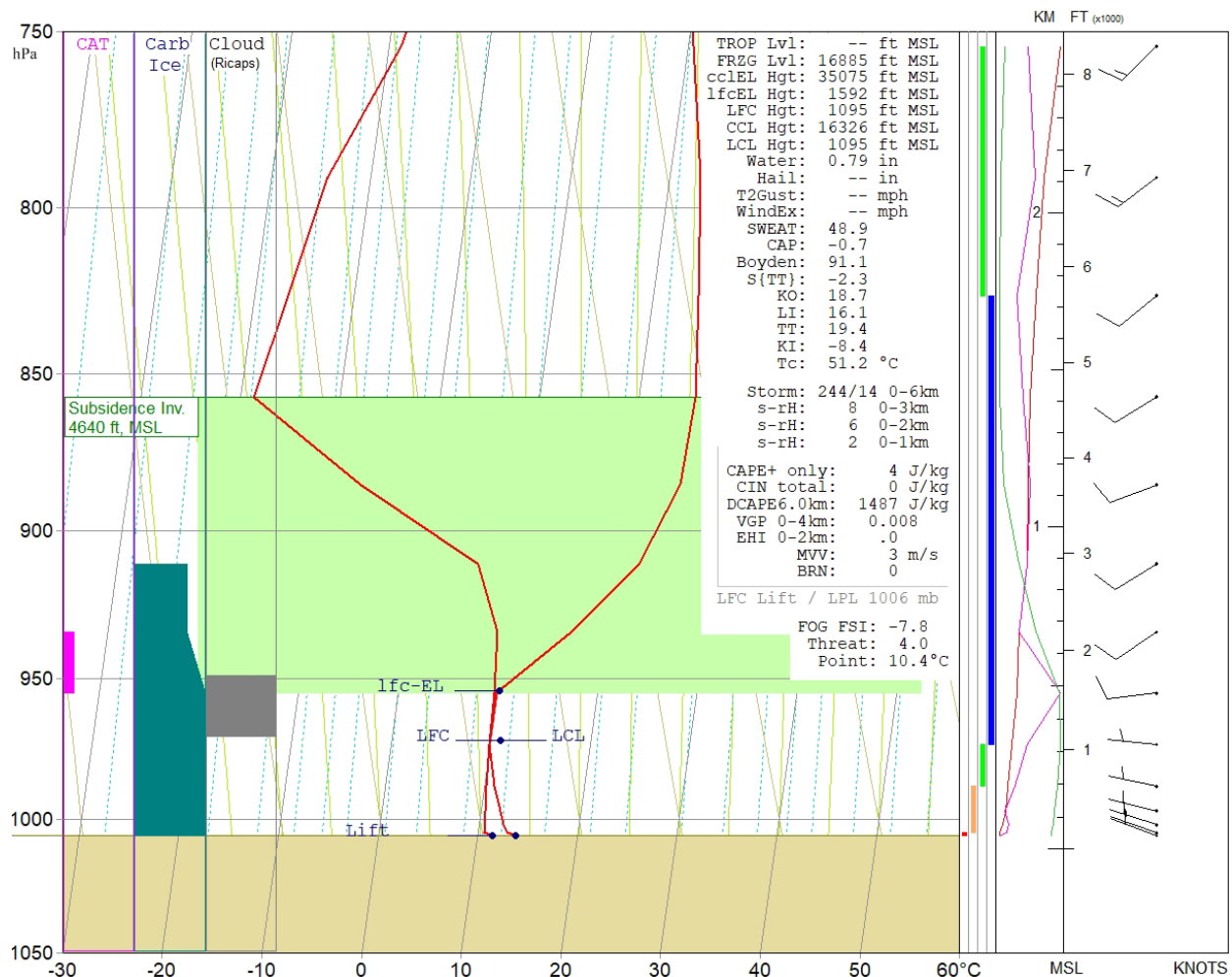


Figure 1 – HRRR model sounding data in SkewT/LogP format for 1100 near the accident site, surface to 750 hPa.

3.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-17 visible (0.64 μ m) and infrared (10.3 μ m) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Images from 1041 are presented in figures 2 and 3. The GOES-17 visible imagery depicted cloudy conditions over the accident region. Infrared cloud-top temperatures over the accident site were about 9°C, which, when considering the 1100 HRRR sounding, corresponded to cloud top heights of about 2,200 feet.⁶

⁶ Because the temperature profile was near-isothermal below this level, the cloud top temperature may have corresponded to heights as low as about 1,000 feet.

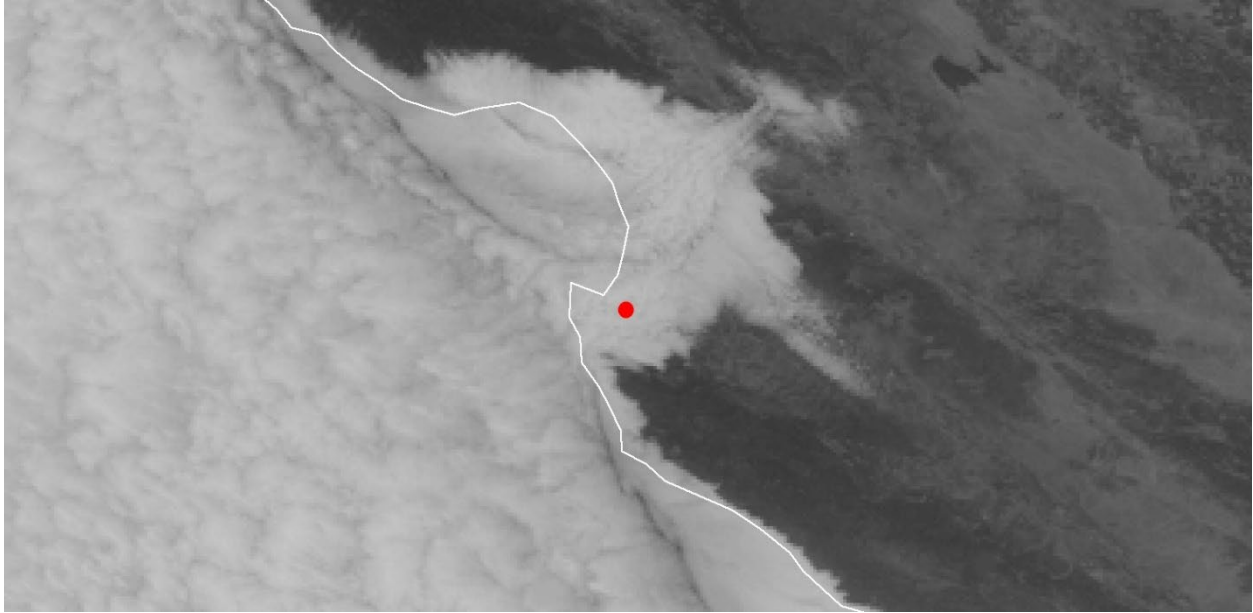


Figure 2 – GOES-17 visible imagery from 1041. Accident location denoted by the red dot. Image is not corrected for parallax error.

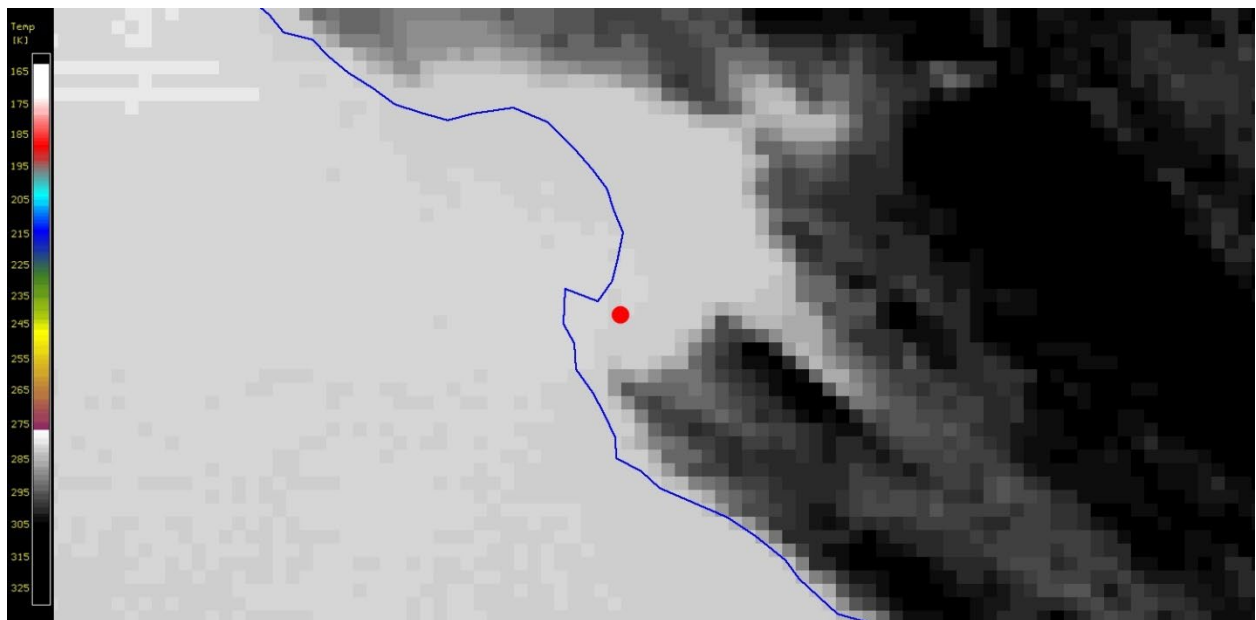


Figure 3 – GOES-17 infrared brightness temperature imagery from 1041. Accident location is denoted by the red dot. This image has not been corrected for any parallax error.

4.0 Weather Radar

WSR-88D⁷ Level-II base reflectivity weather radar imagery from near Santa Cruz, California, site (KMUX) is presented in figure 4. KMUX was located about 35 miles north of the accident location at an elevation of about 3,550 feet. Assuming standard refraction and considering the 0.95° beam width⁸ for the WSR-88D radar beam, the KMUX -0.044° tilt would have “seen” altitudes over the accident location of between about 2,400 and 6,000 feet.

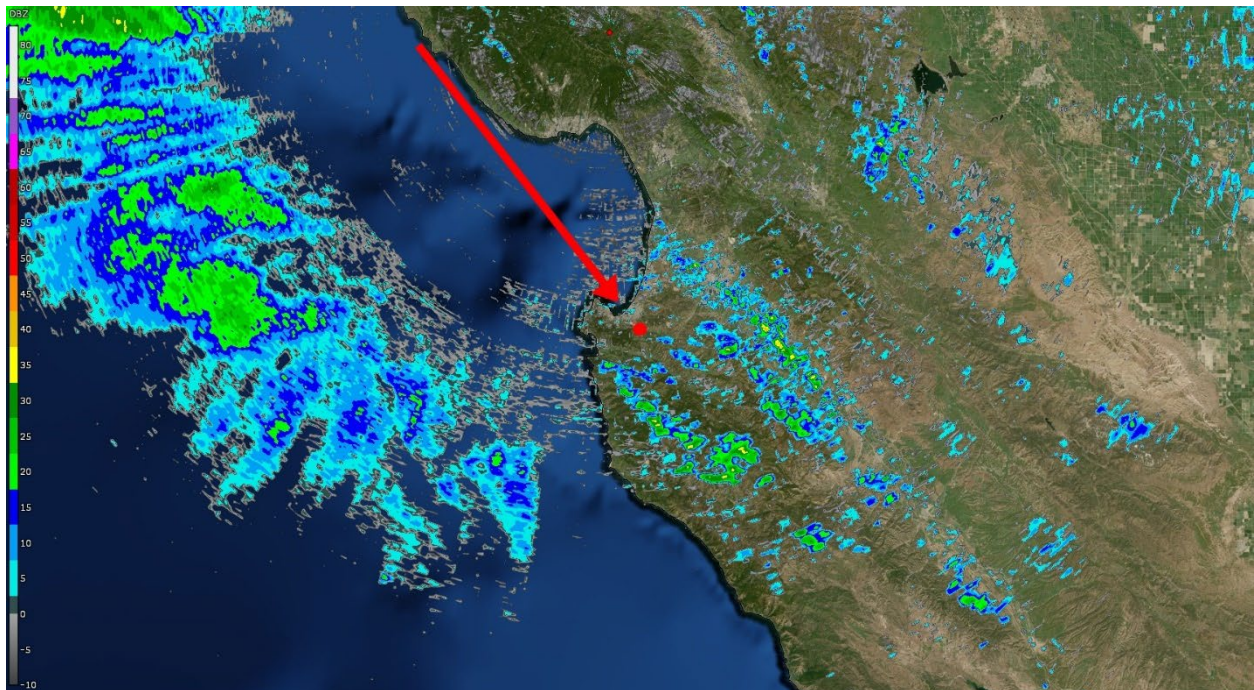


Figure 4 – KMUX -0.044° Level-II base reflectivity product from a sweep initiated at 1047:57. Accident location denoted by the red circle.

5.0 Pilot Reports

The following longline-disseminated pilot reports⁹ (PIREPs) disseminated within about 2 hours of the accident time and were applicable within 20 miles of the accident location.

SNS UA /OV SNS/TM 1530/FL021/TP BE35/SK OVC/RM DURD BASES OVC009
TOPS OVC021

⁷ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁸ 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.

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

MRY UA /OV MRY/TM 1540/FL007/TP GLF4/SK OVC006/WX 5 SM/RM
INBOUND TO RWY 10R AND REPORTED TOPS/BASE AT FL 020/007

MRY UA /OV MRY/TM 1540/FL007/TP GLF4/SK OVC006-TOP020/WX 5SM/RM
DURD RY10R. ZOA CWSU

MRY UA /OV MRY/TM 1550/FL019/TP C25A/SK OVC005/WX 5 SM/RM
DEPARTED RWY 10R AND REPORTED TOPS/BASE AT FL 019/006

MRY UA /OV MRY/TM 1658/FL008/TP CRJ9/SK BKN005 OVC008-TOP020/WX
FV07SM/RM DURD RY10R. ZOA CWSU

MRY UA /OV MRY/TM 1658/FL008/TP CRJ9/SK BKN005 OVC009/WX 7SM/RM
INBOUND TO RWY 10R AND REPORTED TOPS/BASE AT FL 020/008

OAR UA /OV OAR/TM 1721/FL008/TP SR22/SK OVC008-TOP022/RM DURD

SNS UA /OV SNS/TM 1845/FL017/TP SR22/SK OVC/RM TOPS OVC018 BASES
OVC017

WVI UA /OV WVI200004/TM 1949/FL011/TP SR22/SK OVC011-TOP018/RM
DURC

6.0 Terminal Aerodrome Forecasts

The National Weather Service (NWS) produced Terminal Aerodrome Forecasts (TAF) for MRY. 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."¹⁰

At 0422 a TAF was issued by the NWS for MRY that forecasted for the accident time: a wind from 260° at 5 knots, visibility greater than 6 statute miles, ceiling broken at 700 feet agl.

TAF KMRY 131122Z 1312/1412 25007KT 6SM BR OVC004

TEMPO 1312/1314 4SM BR OVC00

FM131700 26005KT P6SM BKN007

FM132100 29009KT P6SM BKN015

FM140100 26007KT P6SM OVC007

FM140500 24006KT 4SM BR OVC005=

¹⁰ www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

7.0 Area Forecast Discussion

The NWS Weather Forecast Office in Monterey, California, issued the following Aviation section of an Area Forecast Discussion at 0938.

FXUS66 KMTR 131638

AFDMTR

Area Forecast Discussion

National Weather Service San Francisco Bay Area

938 AM PDT Tue Jul 13 2021

.AVIATION...as of 04:26 AM PDT Tuesday...For the 12z TAFs. The marine layer sits right around 2,000 ft deep while low clouds have moved inland around the SF Bay and down the valleys overnight. MVFR/IFR, locally LIFR, conditions through mid to late morning (~17z-19z). Patchy coastal drizzle will also be possible early this morning. VFR conditions for most areas by this afternoon before low clouds are forecast to return again this evening. Light winds in the morning then increasing onshore winds again in the afternoon around 10-15 kt with locally higher gusts.

Vicinity of KSFO...IFR/MVFR through mid to late tomorrow morning 17z-18z. VFR to return for the afternoon before low clouds are expected once again in the evening. Increasing onshore winds in the afternoon with gusts around 20-25 kt anticipated.

KSFO Bridge Approach...Similar to KSFO.

Monterey Bay Terminals...A nearly 2,000 ft marine layer is in place with stratus filled in around the bay and down the Salinas Valley. IFR/LIFR conditions through mid to late morning with patchy coastal drizzle possible early this morning. Once again, KMRY may see some brief clearing in the afternoon but will likely remain under BKN conditions for most of the forecast period. Should any clearing occur, expect low clouds to return by the early evening. Onshore this afternoon around 10-15 kt.

8.0 SIGMETs

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

9.0 G-AIRMETs

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 include forecasts for discrete times that are three hours apart for a period of up to 12 hours into the future (i.e., when G-AIRMETs are issued, they include 00-, 03-, 06-, 09- and 12-hour forecasts). This suite of forecasts is issued at 0300 UTC, 0900 UTC, 1500 UTC and 2100 UTC (the G-AIRMET issuance times), with updates issued as necessary.

A G-AIRMET SIERRA advisory for instrument flight rule (IFR) conditions¹¹ was issued at 0745 and was valid for the accident location at 1100.

10.0 CWSU Products

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

Submitted by:

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