

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR23FA083

METEOROLOGY

Specialist's Factual Report

February 8, 2023

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A. ACCIDENT

Location: New Harmony, Utah

Date: January 4, 2023

Time: 1456 mountain standard time (2156 UTC¹)

Aircraft: Type - Piper PA-34-220T; Registration - N814WT

B. METEOROLOGY INVESTIGATOR

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 mountain standard time for January 4, 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: 37.520518° north latitude; 113.28055° west longitude at an elevation of about 6,575 feet.

This report provides information on the weather conditions and forecasts applicable to the accident time and location. It also provides some information related to the accident aircraft's prior flight.

D. WEATHER INFORMATION

1.0 Surface Observations

An Automated Surface Observing Station (ASOS) was located at Cedar City Regional Airport (CDC²), which was located about 14 miles north-northeast of the accident site

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),

at an elevation of about 5,620 feet. It had a magnetic variation of about 11° east. Automated longline³ reports from the CDC 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.

[1053] METAR KCDC 041753Z AUTO 29003KT 10SM CLR M02/M04 A3021 RMK
AO2 SLP252 T10171044 11006 21072 50010=

[1153] METAR KCDC 041853Z AUTO 22011KT 10SM CLR 01/M01 A3019 RMK
AO2 SLP243 T00111011=

[1253] METAR KCDC 041953Z AUTO 21013KT 10SM CLR 02/00 A3018 RMK
AO2 SLP235 T00170000=

[1353] METAR KCDC 042053Z AUTO 21013KT 10SM CLR 02/00 A3017 RMK
AO2 SLP231 T00170000 56010=

**[1453] METAR KCDC 042153Z AUTO 22011KT 10SM FEW120 02/00
A3017 RMK AO2 SLP234 T00170000=**

[1553] METAR KCDC 042253Z AUTO 22009KT 10SM OVC090 02/00 A3016
RMK AO2 SLP230 T00170000=

At 1453, the CDC ASOS reported a wind from 220° at 11 knots, visibility 10 statute miles or greater, few clouds at 12,000 feet above ground level (agl), temperature of 2° Celsius (C) and dew point temperature of 0°C, altimeter setting of 30.17 inches of mercury; Remarks included: automated station with a precipitation discriminator, sea level pressure of 1023.4 hectopascals (hPa), temperature of 17.0°C and dew point temperature of 0.0°C.

An Automated Weather Observing Station (AWOS) was located at St George Regional Airport (SGU), which was the accident airplane's departure airport and located about 31 miles south-southwest of the accident site at an elevation of about 2,885 feet. It had a magnetic variation of about 11° east. Automated longline reports from the SGU AWOS during the times surrounding the accident airplane's departure time of about 1441 are presented here.

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 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.

[1256] METAR KSGU 041956Z AUTO 00000KT 10SM BKN045 OVC050 06/02
A3024 RMK AO2 RAB42E56 SLP247 P0000 T00610022=
[1356] METAR KSGU 042056Z AUTO 21003KT 10SM BKN037 BKN044 OVC060
07/03 A3024 RMK AO2 SLP245 60000 T00670033 56013=
**[1456] METAR KSGU 042156Z AUTO 00000KT 10SM -RA SCT041 BKN065
07/03 A3022 RMK AO2 RAB54 SLP241 P0000 T00670028=**
[1556] METAR KSGU 042256Z AUTO 00000KT 10SM FEW055 BKN090 OVC120
07/03 A3021 RMK AO2 RAE53 SLP233 P0000 T00670033=

At 1456, the SGU AWOS reported a calm wind, visibility 10 statute miles or greater, light rain, scattered clouds at 4,100 feet agl, ceiling broken at 6,500 feet agl, temperature of 7°C and dew point temperature of 3°C, altimeter setting of 30.22 inches of mercury; Remarks included: automated station with a precipitation discriminator, rain began at 1454, sea level pressure of 1024.1 hPa, trace amount of precipitation since 1356, temperature of 6.7°C and dew point temperature of 2.8°C.

2.0 Pilot Reports

The following are the longline-disseminated pilot reports⁴ (PIREPs) reported between 1300 and 1700 within 50 miles of the accident location.

CDC UA /OV UTI010025 /TM 2152 /FL105 /TP F900 /TA M06 /IC LGT RIME
105 /RM ON APCH RY 19 SGU AWC-WEB:

3.0 Weather Radar

WSR-88D⁵ Level-II base reflectivity weather radar imagery from the Cedar City, Utah, site (KICX) is presented in Figure 1. KICX was located approximately 20 miles east-northeast of the accident location with an antenna elevation of about 10,750 feet. Assuming standard refraction and considering the 0.95° beam width⁶ for the WSR-88D radar beam, the KICX 0.131° tilt would have “seen” altitudes above the accident location of between about 10,300 and 12,300 feet.

⁴ These do not include pilot reports only broadcast via radio.

⁵ Weather Surveillance Radar 88 Doppler (WSR-88D)

⁶ 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.

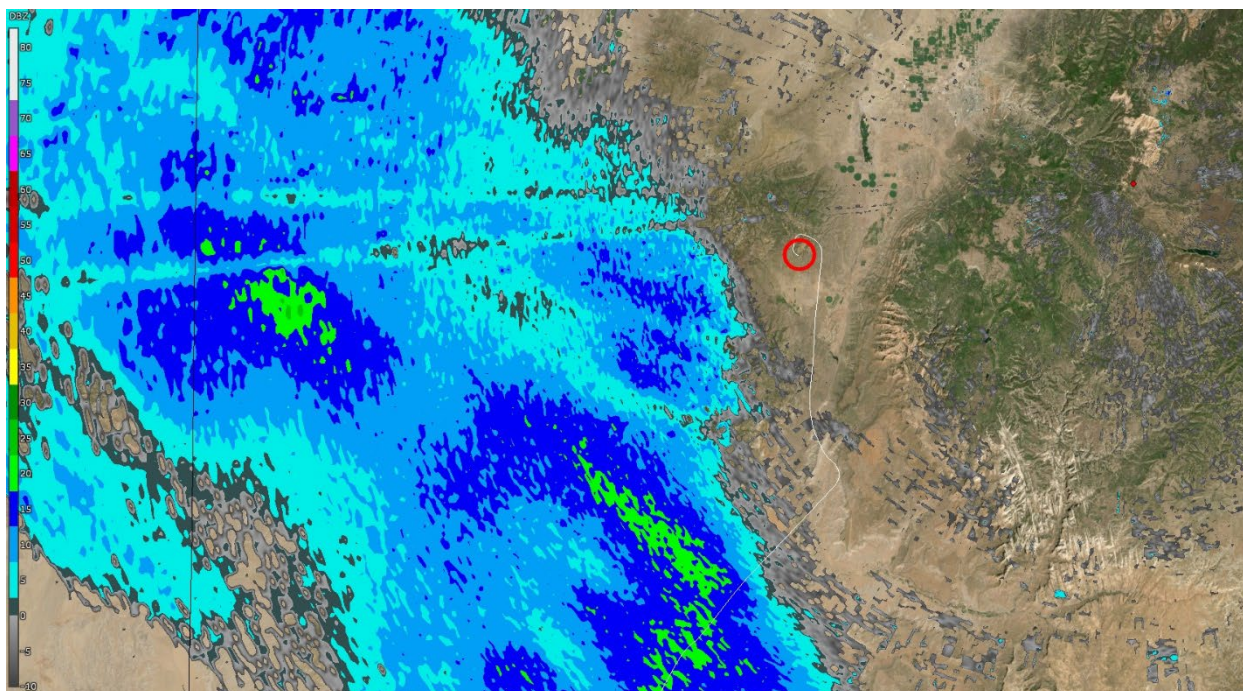


Figure 1 – KICX 0.131° Level-II base reflectivity product from a sweep initiated at 1455:42. The accident location is identified by the red circle. The final portion of the accident aircraft's flight path is depicted by the thin white line.

4.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁷ sounding (Figure 2) for near the accident site⁸ at 1500 using an elevation of 6,323 feet was retrieved from the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Clouds were identified by RAOB in the lower atmosphere from about 6,500 feet through 9,300 feet with the potential for freezing fog below that. The freezing level was noted at about 6,300 feet. The potential for light rime icing was identified below about 8,800 feet with moderate clear icing identified in about the lowest 100 feet of the atmosphere. Light low level wind shear was also identified within the lowest 100 feet. The wind nearest the surface was from the south at a magnitude of about 10 knots, but the wind increased in magnitude to a westerly wind of about 30 knots near 15,000 feet.

⁷ 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.

⁸ Coordinates used for the model were latitude: 37.52; longitude: -113.28.

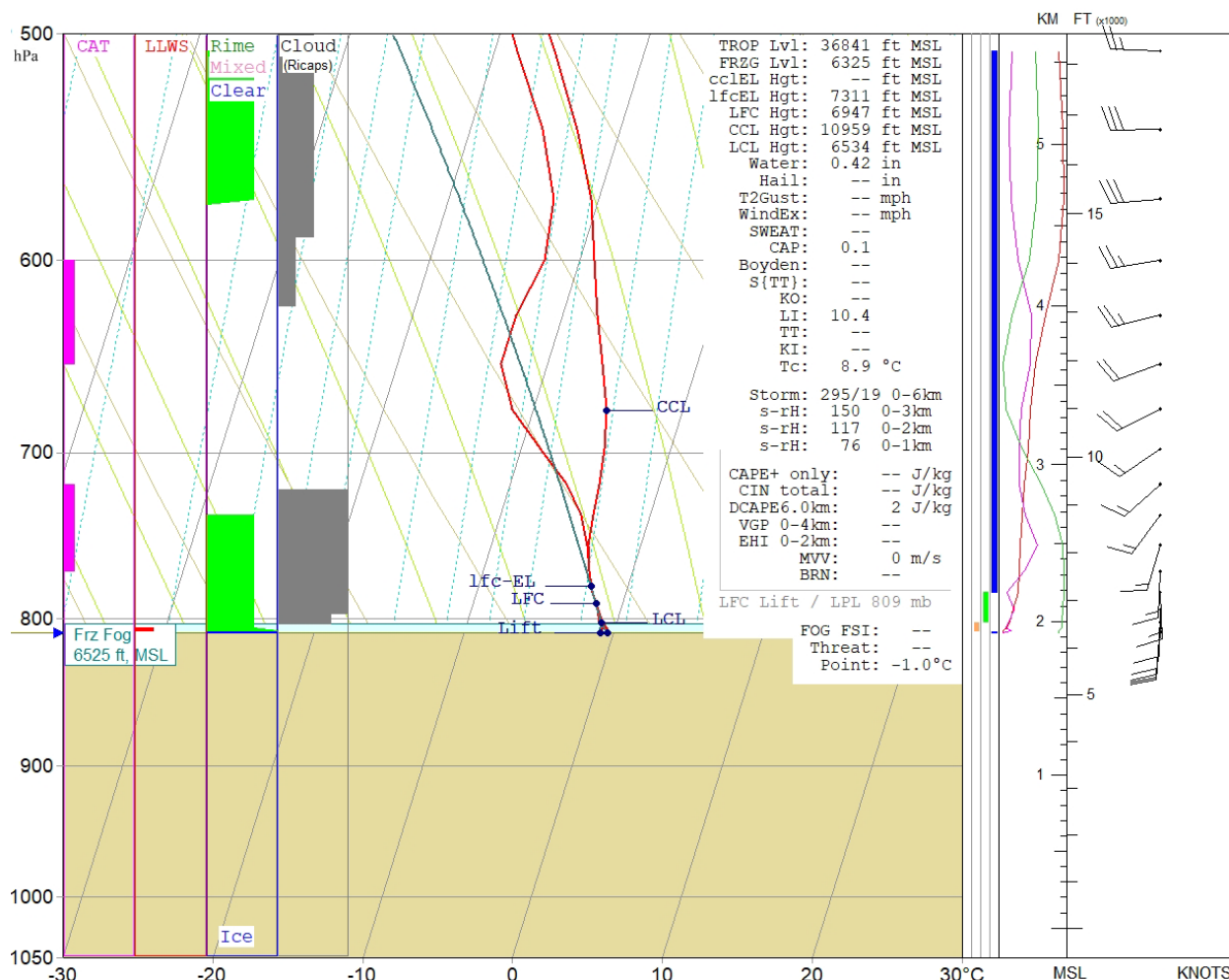


Figure 2 - HRRR model sounding data in SkewT/LogP format for 1500 near the accident site, surface to 500 hPa.

A HRRR model sounding (Figure 3) for along the accident aircraft's previous flight path⁹ (which was in the accident region) at 1200 using an elevation of 5,405 feet was retrieved from the NOAA Air Resources Laboratory and analyzed by the RAOB program. The potential for few to broken clouds was identified between about 6,300 and 8,500 feet.

⁹ Coordinates used for the model were latitude: 37.49; longitude: -113.23.

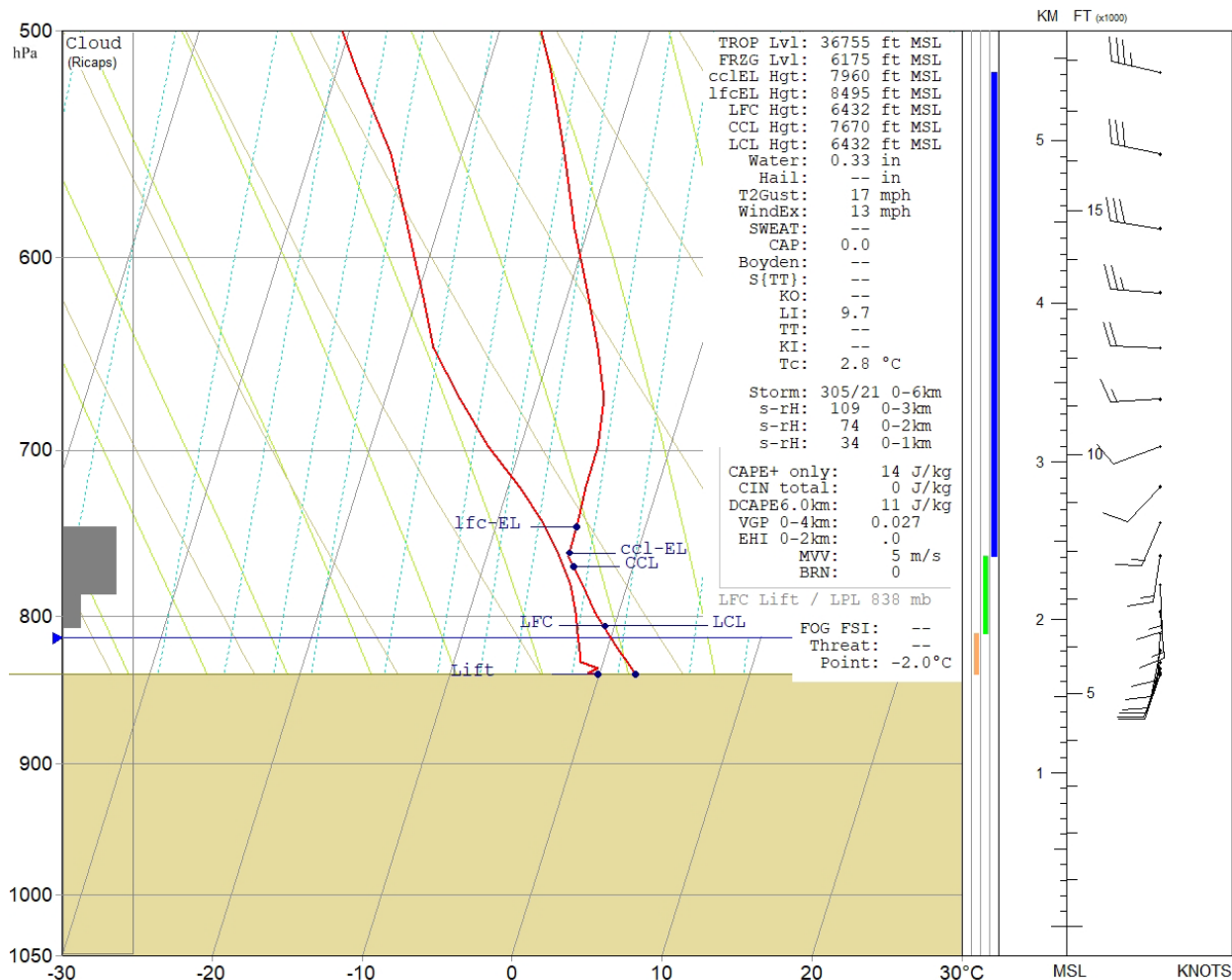


Figure 3 – HRRR model sounding data in SkewT/LogP format for 1200 for a point along the accident aircraft's prior flight path, surface to 500 hPa.

5.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-18 visible ($0.64\mu\text{m}$) and infrared ($10.3\mu\text{m}$) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. GOES-18 visible and infrared imagery from 1456 is presented in Figures 4 and 5. Clouds were depicted over the accident region. Infrared cloud-top temperatures over the accident site were about -38°C , which, when considering the 1500 HRRR sounding, corresponded to cloud top heights of about 28,000 feet (not depicted in Figure 2).

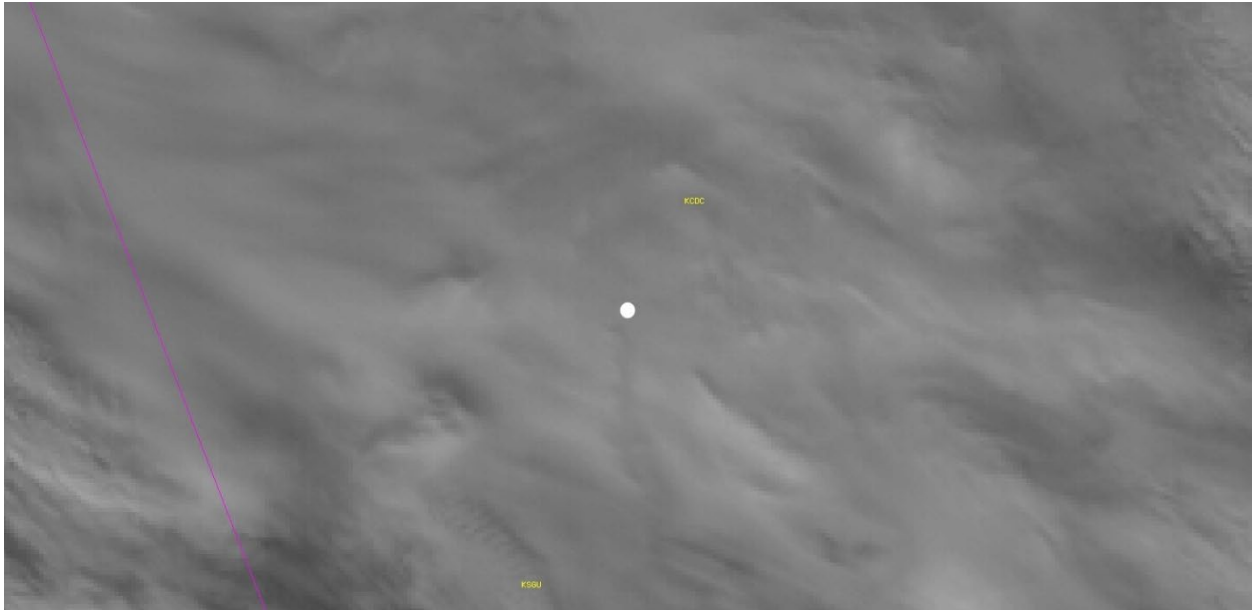


Figure 4 - GOES-18 visible imagery from 1456. Accident location denoted by the white dot. Image is not corrected for parallax error.

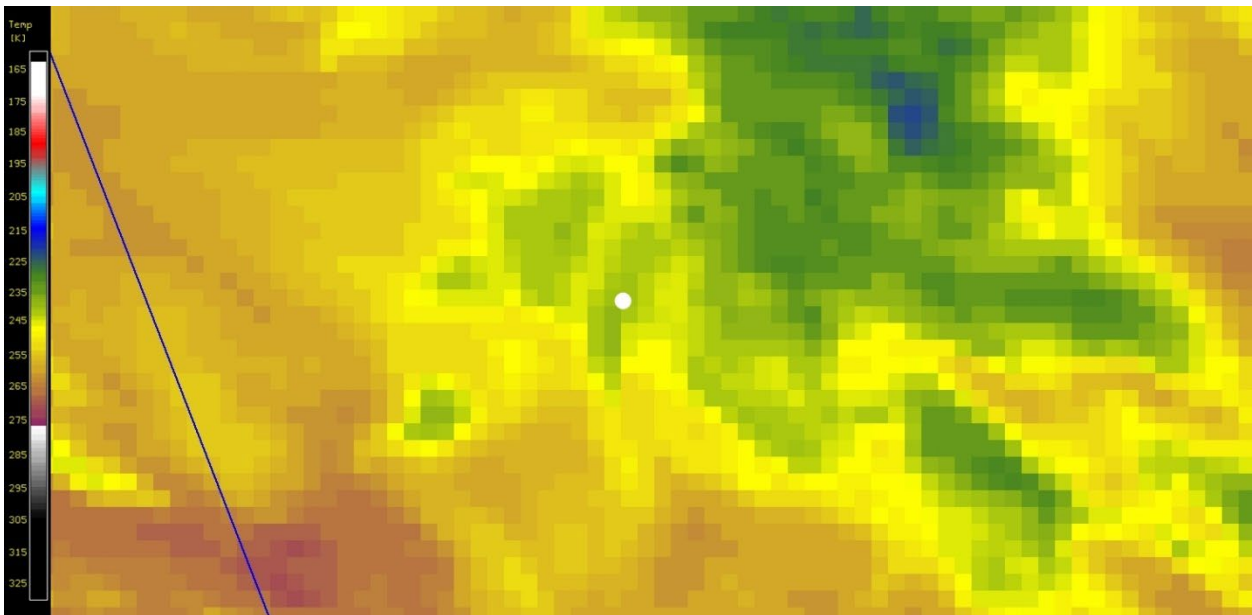


Figure 5 - GOES-18 infrared imagery from 1456. Accident location denoted by the white dot. Image is not corrected for parallax error.

6.0 Terminal Aerodrome Forecasts

At 1046 a Terminal Aerodrome Forecasts (TAF) was issued for CDC that forecasted for the accident time: a wind from 210° at 11 knots, visibility of more than 6 statute miles, scattered clouds at 3,500 feet agl, ceiling broken at 20,000 feet agl.

*TAF KCDC 041746Z 0418/0518 **21011KT P6SM SCT035 BKN200**
FM050200 15007KT P6SM BKN070
FM051600 20014G20KT P6SM BKN050=*

At 1046 a TAF was issued for SGU that forecasted for the departure and accident time: a variable wind at 4 knots, visibility of more than 6 statute miles, scattered clouds at 5,000 feet agl, ceiling broken at 7,000 feet agl. The SGU TAF was not applicable to the accident location. 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

*TAF KSGU 041746Z 0418/0518 **VRB04KT P6SM SCT050 BKN070**
FM042000 VRB05KT P6SM SCT070 BKN200
FM050800 VRB04KT P6SM BKN080=*

7.0 Area Forecast Discussion

The National Weather Service (NWS) Weather Forecast Office in Salt Lake City, Utah, issued the following Aviation section of an Area Forecast Discussion at 0412, applicable for a region that included the accident location.

*FXUS65 KSLC 041112
AFDSLCLC
Area Forecast Discussion
National Weather Service Salt Lake City UT
412 AM MST Wed Jan 4 2023*

.AVIATION...KSLC...VFR conditions will persist through the TAF period for the KSLC terminal. Low clouds look to hang around for a little while longer that could cause mountain obscuration at times. CIGs look to raise gradually over the day with high based overcast conditions settling in for the rest of the day while winds remain light and diurnally driven.

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

REST OF UTAH AND SOUTHWEST WYOMING...VFR conditions will persist through the TAF period for all terminals in Utah and SW Wyoming. Low clouds look to hang around for a little while longer for the northern TAF sites that could cause mountain obscuration at times. Low based clouds look to gradually rise over the day with a blanket of high based clouds rolling in and creating overcast conditions for CWA for the remainder of the day. Winds remain light and diurnally driven for the day.

8.0 G-AIRMETs below 18,000 Feet

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 with valid 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 G-AIRMET ZULU advisories for moderate icing below 18,000 feet active for the accident location at 1400 and 1700. There was a G-AIRMET SIERRA advisory for mountain obscuration active for the accident location at 1700.

9.0 SIGMETs

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

10.0 CWSU Products

There were no Center Weather Advisories issued by the NWS Center Weather Service Units at the Los Angeles and Salt Lake City Air Route Traffic Control Centers (ARTCC) that were active for the accident location at the accident time.

At 1001 the following Meteorological Impact Statement was issued by the CWSU at the Los Angeles ARTCC.

*FAUS20 KZLA 041701
ZLA MIS 02 VALID 041700-050430
...FOR ATC PLANNING PURPOSES ONLY...*

*A STRONG PACIFIC WEATHER SYSTEM WILL APPROACH THE REGION
TODAY AND MOVE ACROSS THE REGION TONIGHT INTO THU BRINGING*

STRONG SOUTHERLY TO SOUTHEASTELY WINDS OF 30-50 KNOTS WITH GUSTS TO 65 KNOTS TO THE CA COASTAL MOUNTAINS AND HIGH DESERTS LEADING TO AREAS OF SEVERE TURBULENCE...STRONG UP AND DOWN DRAFTS...AND LLWS BELOW FL120. AREAS OF MODERATE TURBULENCE BELOW FL450 CAN BE EXPECTED ACROSS MUCH OF THE ZLA AIRSPACE WITH MODERATE TO SEVERE ICING ALOFT ABOVE FREEZING LEVEL. STRONG EAST TO SOUTHEAST WINDS GREATER THAN 10KTS ARE EXPECTED AT LAX THROUGH THU MORNING. LOW CLOUDS WITH CEILINGS BELOW 5,000 FEET WILL CONTINUE TO IMPACT LAS TRACON AIRSPACE THROUGH THU.

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11.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) are intended to provide the necessary aviation weather information to give users a complete picture of the weather that might impact flight in the continental United States. Hourly model data and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS are available, however only certain imagery are archived by the NWS.

Figures 6-9 depict GFA forecast information on sky condition, icing, mountain obscuration, instrument flight rule (IFR)¹¹ condition and surface wind Graphical Airmen's Meteorological Information (G-AIRMET) advisories, surface visibility, surface wind, precipitation, and other obscurations and hazards, valid for a time near the accident time. The GFA forecast imagery valid for 1400 (Figure 6) depicted clear sky conditions to few/scattered clouds immediately near the accident site. A G-AIRMET for mountain obscuration was active over the accident site, and a G-AIRMET for icing was active for the accident site or an area very close to the accident site. The GFA surface forecast valid for 1400 (Figure 7) depicted a southwesterly surface wind of 5 knots to the northeast of the accident location, a surface visibility of greater than 5 statute miles at the accident location and rain/snow nearby.

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

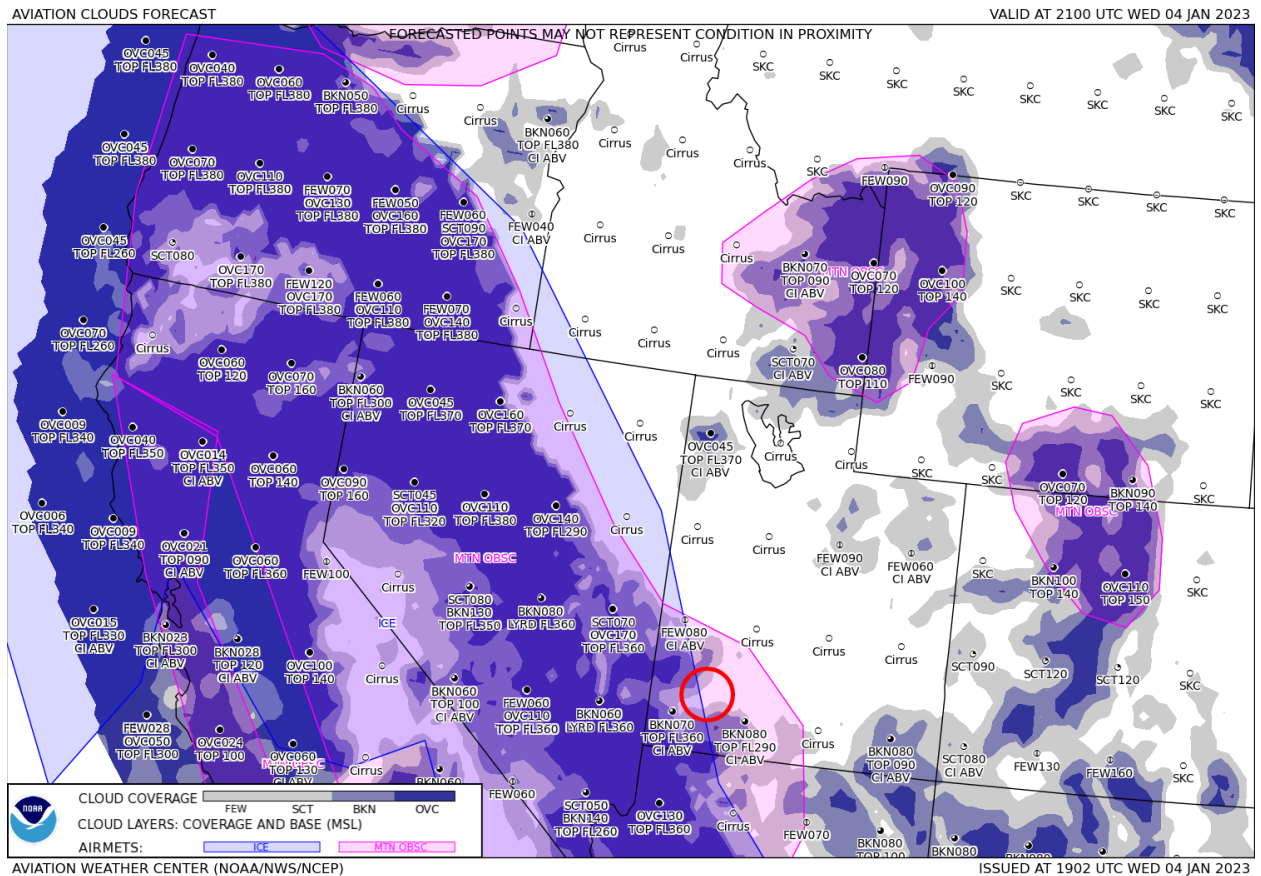


Figure 6 - GFA forecast imagery depicting sky condition and icing and mountain obscuration G-AIRMETS issued about 1200 and valid for 1400. The accident location is located within the red circle.

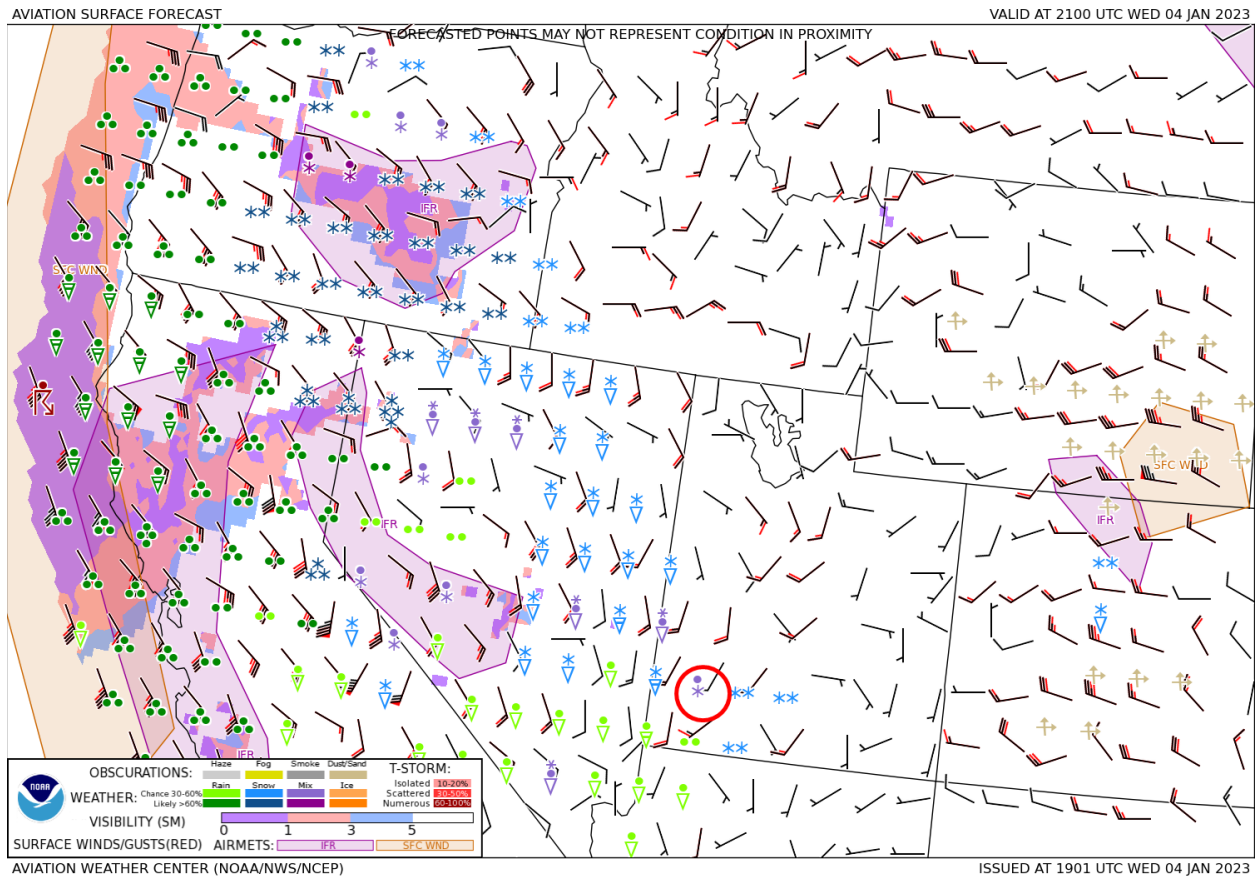


Figure 7 - GFA forecast imagery depicting IFR conditions and surface wind G-AIRMETs, surface visibility, surface wind, precipitation, and other obscurations and hazards. Issued about 1200 and valid for 1400. The accident location is located within the red circle.

The GFA forecast imagery valid for 1700 (Figure 8) depicted clear to overcast sky conditions near the accident site. A G-AIRMETs for mountain obscuration and icing were active over the accident site. The GFA surface forecast valid for 1700 (Figure 9) depicted a southerly surface wind of 5 knots to the northeast of the accident location, a surface visibility of greater than 5 statute miles at the accident location and continuous light snow nearby.

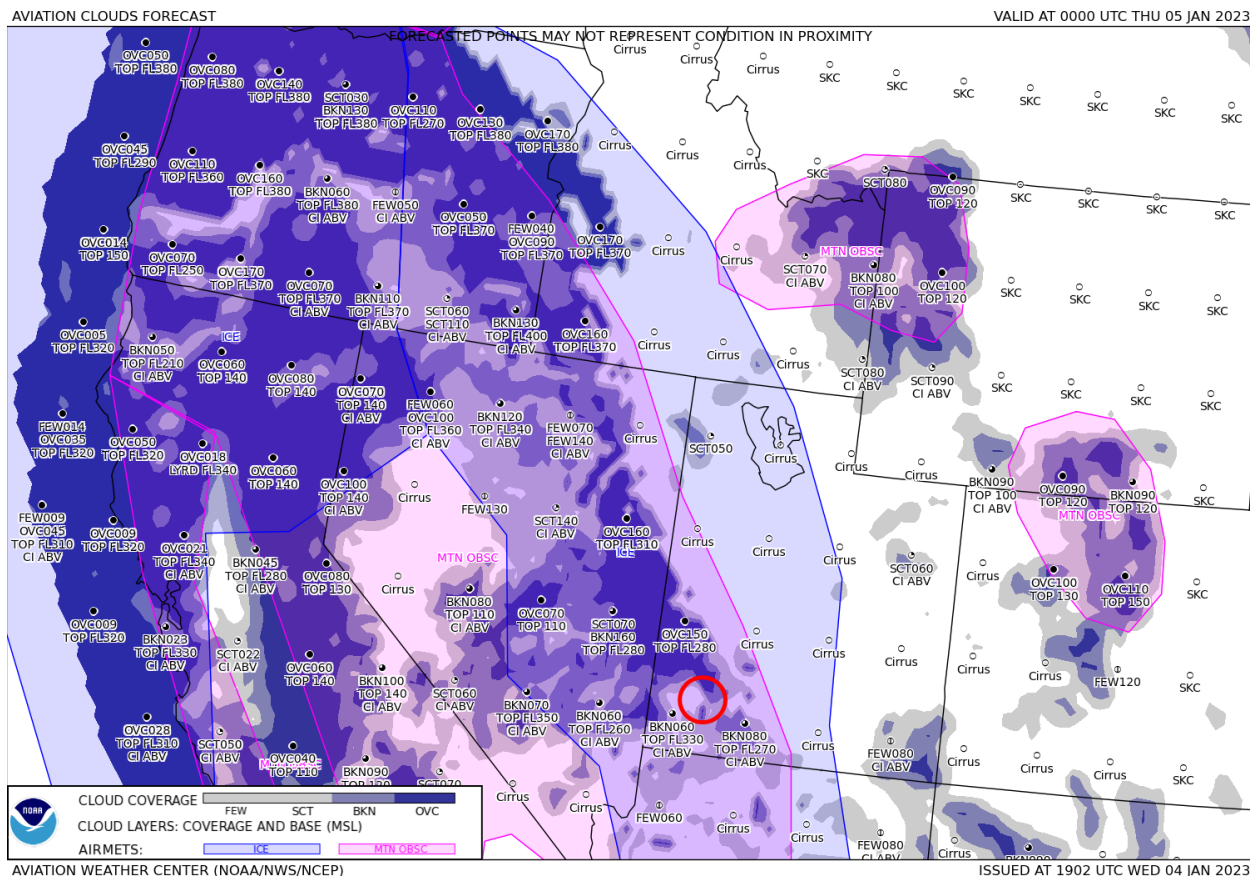


Figure 8 – GFA forecast imagery depicting sky condition and icing and mountain obscuration G-AIRMETs issued about 1200 and valid for 1700. The accident location is located within the red circle.



ISSUED AT 1901 UTC WED 04 JAN 2023

METEOROLOGY

SPECIALIST'S FACTUAL REPORT

12.0 Preflight Weather Briefings

According to Leidos, Leidos Flight Services (LFS) and its third-party vendors utilizing the LFS system had no contact with the accident aircraft on the day of the accident or the day before the accident.

The following information was provided by ForeFlight:

No flight plans were filed through ForeFlight for N814WT.

Prior to the flight these routes were entered into the app:

Date/Time (UTC)	Updated Route String
1/4/2023 21:29:31	KCDC KPVU KSLC 9500FT
1/4/2023 21:29:23	KCDC KPVU KSL 9500FT
1/4/2023 21:28:40	KSLC KCDC 9500FT
1/4/2023 18:07:38	U14 KCDC KSGU 9500FT
1/4/2023 18:02:46	KCDC KSGU 9500FT
1/4/2023 14:27:47	KSGU KPVU KSLC 20230104T15:00:00Z
1/4/2023 14:27:31	KSLC KPVU KSGU N814WT 9500FT 20230104T15:00:00Z
1/4/2023 14:20:34	KSLC KCDC KSGU 22UT N814WT 10500FT 20230104T15:00:00Z
1/4/2023 4:09:27	KSLC KCDC KSGU 22UT N814WT 10500FT 20230105T03:00:00Z
1/4/2023 4:09:26	KSLC KCDC KSGU 22UT N814WT 10500FT 20230105T04:00:00Z
1/4/2023 4:09:23	KSLC KCDC KSGU 22UT N814WT 10500FT 20230105T04:10:00Z
1/4/2023 4:09:22	KSLC KCDC KSGU 22UT N814WT 10500FT 20230106T04:10:00Z
1/4/2023 4:09:20	KSLC KCDC KSGU 22UT N814WT 10500FT 20230104T04:10:00Z
1/4/2023 4:00:24	KSLC KCDC KSGU 22UT N814WT 10500FT

Prior to the flight this airport was viewed in the app:

Last viewed (UTC)	Airport ID
1/4/2023 14:28:01	KSGU

Prior to the flight the following Weather Imagery products were viewed in the app. NOTE: ForeFlight does not archive Weather Imagery so the Imagery you see when you click on each link is the current image as of the time you click it.

Last viewed (UTC)	Weather Imagery Link to CURRENT version of that Weather Imagery
-------------------	---

1/4/2023 14:24:08 DAY 3 Ending at 12Z
<https://cloudfront.foreflight.com/imagery/prod/7659da1a-764b-4ff3-b63c-ae37c19f3dce.gif>

1/4/2023 14:23:51 12 HR
<https://cloudfront.foreflight.com/imagery/prod/b34bcc3b-1fa9-4225-a077-53b8bc5525b7.png>

1/4/2023 14:23:46 9 HR
<https://cloudfront.foreflight.com/imagery/prod/4de449dd-315b-419d-b522-0ddd24182065.png>

1/4/2023 14:23:18 3 HR
<https://cloudfront.foreflight.com/imagery/prod/4435e920-02a7-4db3-b60f-963ff6f50fa5.png>

1/4/2023 14:23:05 SW Weather & Sky
<https://cloudfront.foreflight.com/imagery/prod/e6db3981-25ba-411e-9f4b-83f694edce2b.gif>

1/4/2023 14:22:43 Max Turbulence (Initial)
<https://cloudfront.foreflight.com/imagery/prod/4b2071f1-bbf6-4146-9909-87a94ef9605f.gif>

1/4/2023 14:22:39 Max Turbulence (3 HR)
<https://cloudfront.foreflight.com/imagery/prod/db93206b-e46f-48a8-a444-d09fbf93e56e.gif>

1/4/2023 14:22:26 3 HR
<https://cloudfront.foreflight.com/imagery/prod/26f711f8-d75f-408f-b4aa-c8868481666f.gif>

1/4/2023 14:22:12 Convective
<https://cloudfront.foreflight.com/imagery/prod/c603a1c4-2863-4dd8-81fc-842fdadbb631.png>

1/4/2023 14:21:59 Surface (9 HR)
<https://cloudfront.foreflight.com/imagery/prod/a7489c48-6dc1-40be-ba62-51bbbc40db98.gif>

1/4/2023 14:21:17 15,000' MSL (Initial)
<https://cloudfront.foreflight.com/imagery/prod/92903cda-81ed-4163-a70b-19bbb610d2e6.gif>

1/4/2023 14:21:01 3 HR
<https://cloudfront.foreflight.com/imagery/prod/dafe5a60-86f8-4481-b711-b46c12d21fc7.png>

1/4/2023 14:20:57 9 HR
<https://cloudfront.foreflight.com/imagery/prod/fadacde4-3f49-492b-b54a-45306cf48176.png>

1/4/2023 14:20:48 12 HR
<https://cloudfront.foreflight.com/imagery/prod/76e7dc93-ddda-4727-b9ef-0e8e812565b9.png>

Submitted by:

Mike Richards
Senior Meteorologist