National Transportation Safety Board

Office of Aviation Safety

Washington, D.C. 20594-2000

September 9, 2011

WEATHER STUDY

WPR11FA236

A. Accident

Location: Sedona, Arizona
Date: May 25, 2011
Time: approximately 1550 mountain standard time (2250 UTC[1])
Aircraft: Embraer S.A. EMB-500, N224MD

B. Meteorological Specialist

Paul Suffern
Meteorologist
National Transportation Safety Board
Operational Factors Division, AS-30
Washington, D.C. 20594-2000

C. Summary

On May 25, 2011, about 1550 mountain standard time, an Embraer S.A. EMB-500, N224MD, sustained substantial damage during a runway overrun during landing at the Sedona Airport (SEZ), Sedona, Arizona. The airline transport rated captain, who was the flying pilot, and two of the three passengers were not injured. The airline transport rated first officer and one passenger sustained serious injuries. The airplane was registered to a private individual and operated by Superior Air Charter LLC., doing business as Jet Suite, Long Beach, California, under the provisions of Title 14 Code of Federal Regulations Part 135 as an on demand air charter flight. Visual meteorological conditions prevailed and an instrument flight rules (IFR) flight plan was filed. The cross-country flight originated from San Jose, California, about 1420 Pacific daylight time, with an intended destination of SEZ.

[1] UTC – is an abbreviation for Coordinated Universal Time.

D. Details of Investigation

The National Transportation Safety Board's (NTSB) Meteorologist was not on scene for this investigation and gathered all relevant weather data from the Washington D.C. office from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Climatic Data Center (NCDC). All times are mountain standard time (MST) on May 25, 2011, and are based upon the 24-hour clock, where local time is -7 hours from UTC, and UTC=Z. Directions are referenced to true north and distances are in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 34.85° N, longitude 111.79° W; elevation: 4,830 feet.

1.0 Synoptic Situation

The synoptic or large scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction (NCEP) located in Camp Springs, Maryland. These are the base products used in describing weather features and in the creation of forecasts and warnings. Reference to these charts can be found in the joint NWS and Federal Aviation Administration (FAA) Advisory Circular "Aviation Weather Services", AC-0045G CHG 1.

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart for 1700 MST is provided as figure 1, with the approximate location of the accident site marked. The chart depicted a trough[2] west of the accident site, stretching from southern Nevada southward into southwest Arizona. A surface low pressure center was located in southeastern California and southern Nevada with a surface pressure of 1005-hectopascals (hPa). The station models to the north and west of the accident site depicted temperatures from the low 70's to mid 80's Fahrenheit (F), with temperature-dew point spreads of 50° F or more, a southwest wind around 10 knots, and clear skies. Station models to the east of the accident site had temperatures from the mid 70's to low 80's F, with temperature-dew point spreads of 50° F or more, an east wind of 5 to 10 knots, and clear skies. Station models to the south of the accident site had temperatures in the low to mid 90's F, temperature-dew point spreads of 60° F or more, a northwest wind of 5 to 15 knots, and clear skies.

The accident site was located east of a surface trough in the Desert Southwest where clear skies and daily afternoon surface wind increases along the terrain would normally be expected.

[2] Trough - An elongated area of relatively low atmospheric pressure or heights.

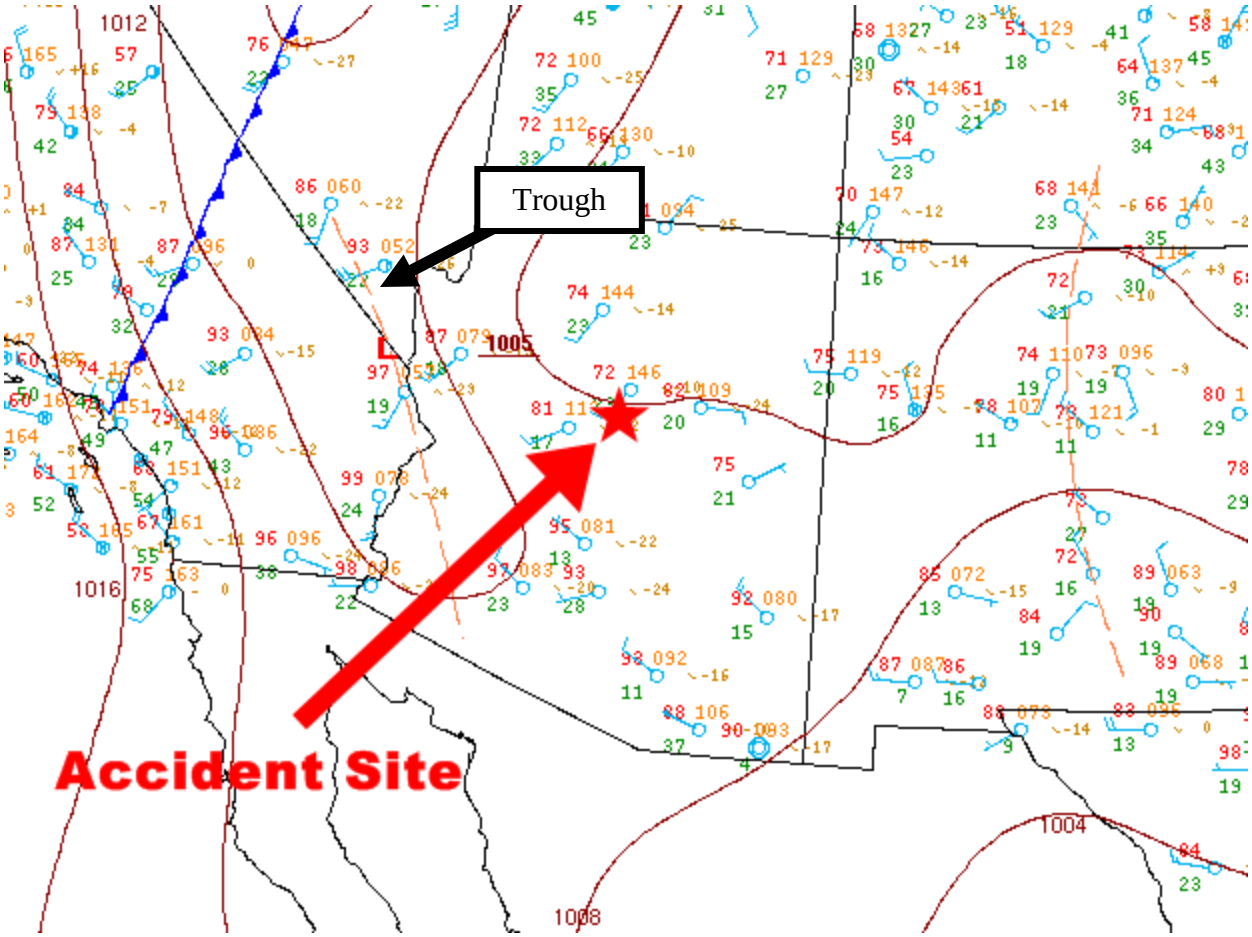

Figure 1 – NWS Surface Analysis Chart for 1700 MST

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) archive Constant Pressure Charts for 1700 MST are presented for 700-, 500-, and 300-hPa in figures 2 through 4. The charts depicted a mid level ridge[3] at 700- and 500-hPa just east of the accident site (figures 2 and 3). Near a mid-level ridge, clear skies are normally expected with surface winds heavily influenced by a diurnal cycle and local terrain features.

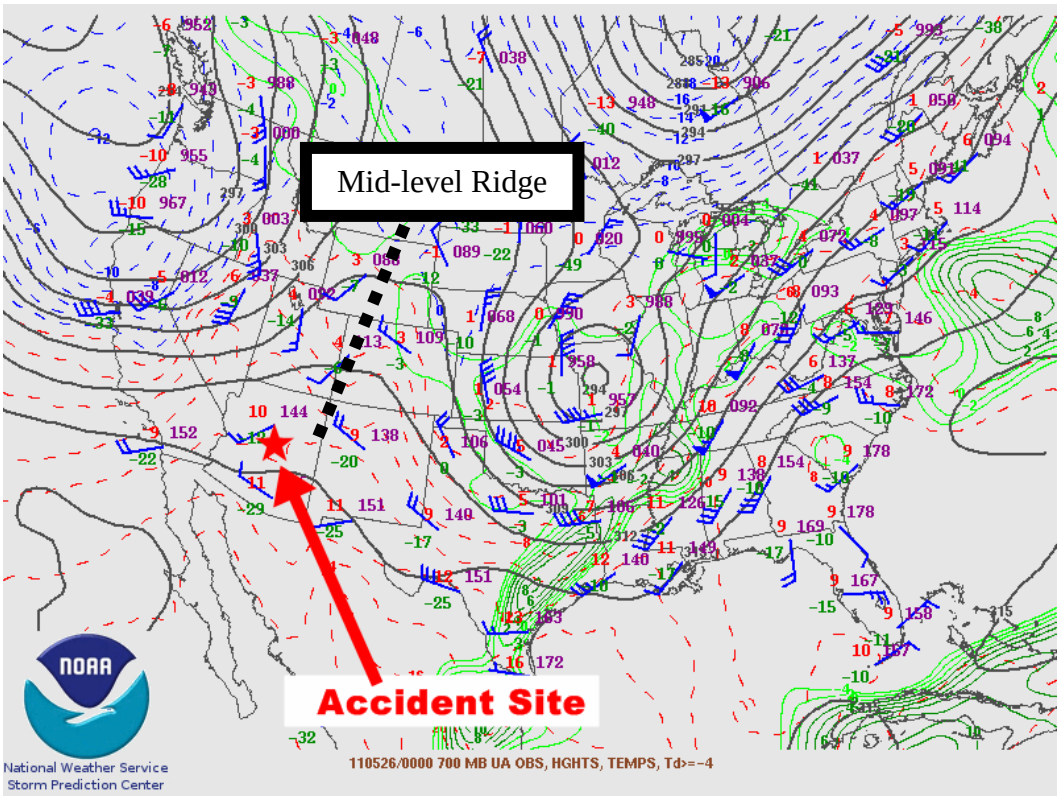

Figure 2 – 700-hPa Constant Pressure Charts for 1700 MST

[3] Ridge – An elongated area of relatively high atmospheric pressure or heights.

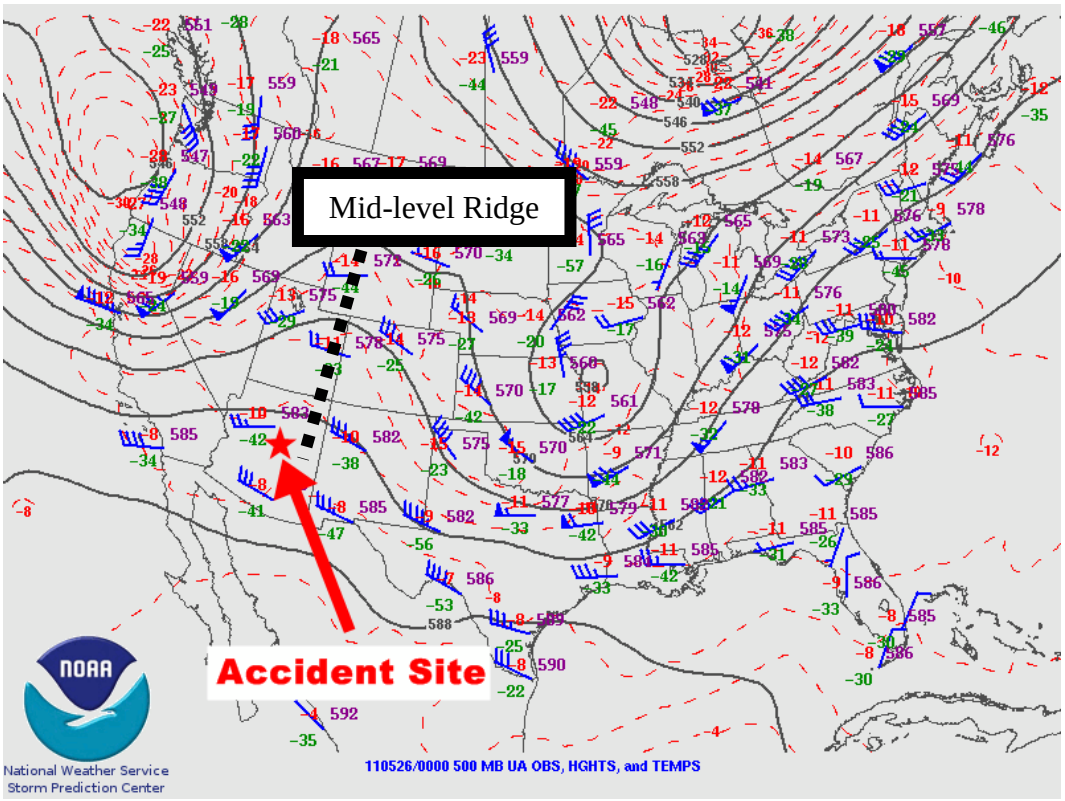

Figure 3 – 500-hPa Constant Pressure Charts for 1700 MST

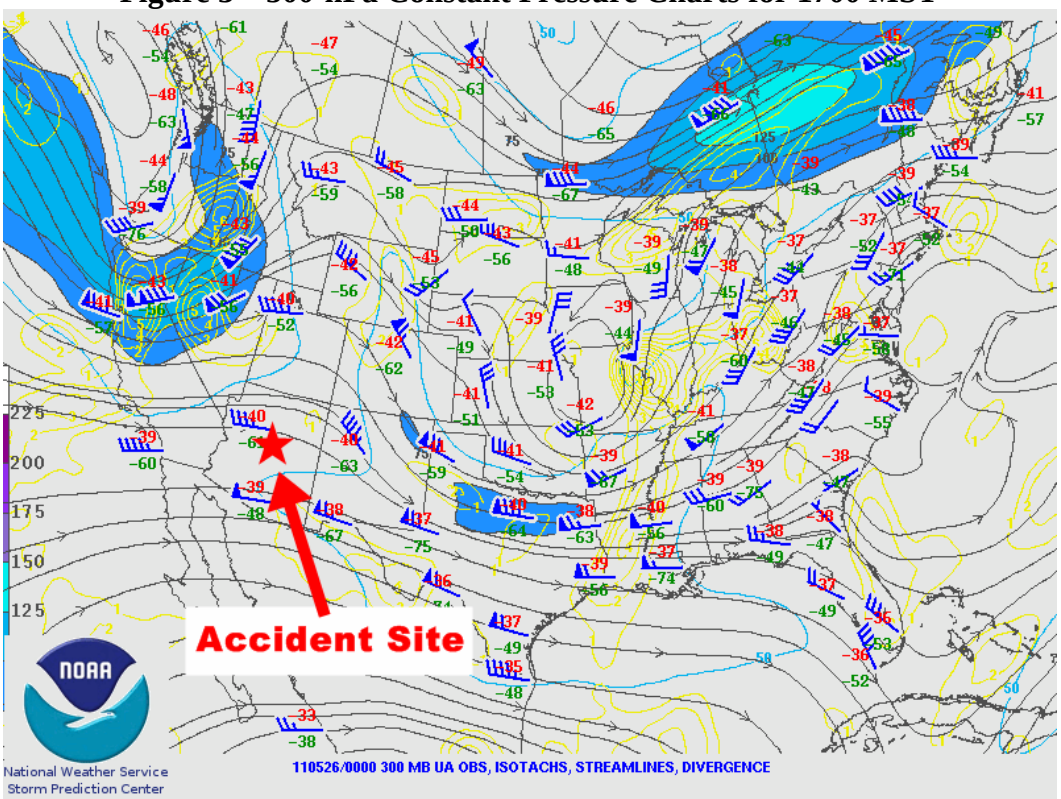

Figure 4 – 300-hPa Constant Pressure Charts for 1700 MST

2.0 Surface Observations

The area surrounding the accident site was documented utilizing official NWS Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). The following observations were taken from standard code and are provided in plain language, with cloud heights reported above ground level (agl).

The closest weather reporting to the accident site was from an Automated Weather Observing System (AWOS[4]) located at Sedona Airport (KSEZ) 2 miles southwest of Sedona, Arizona. These observations were taken from automated equipment and were not supplemented by a human observer. KSEZ had an elevation of 4,830 feet, and had a 13° easterly magnetic variation[5] (figure 5). The following observations were disseminated around the time of the accident:

[4] AWOS – Automated Weather Observing System is equipped with meteorological instruments to observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to twelve thousand feet, and altimeter setting.

[5] Magnetic variation – The angle (at a particular location) between magnetic north and true north.

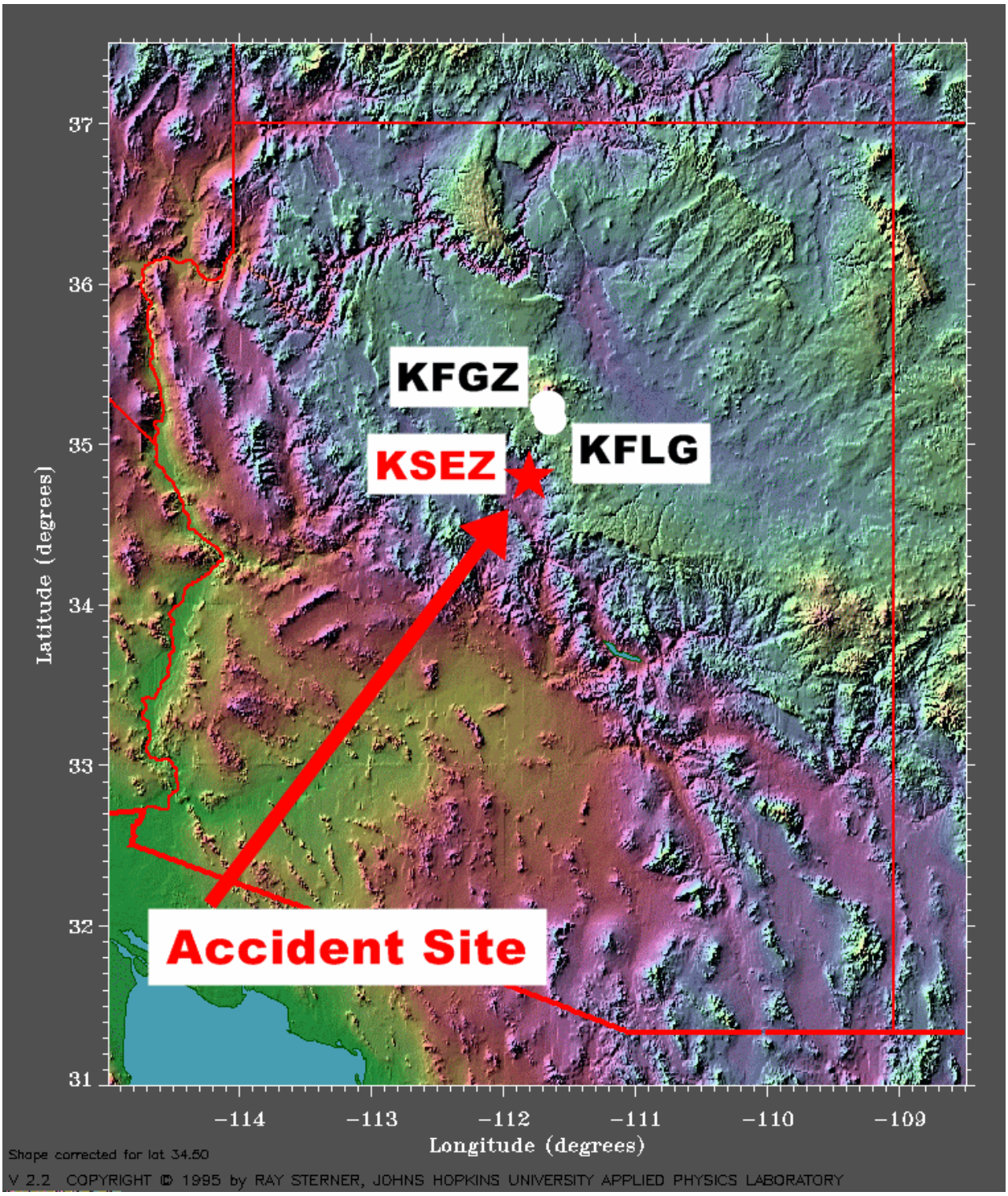

Figure 5 – Topography with NWS METAR stations and upper-air sounding site

[1355 MST] KSEZ 252055Z AUTO 24005KT 10SM CLR 28/M03 A3008 RMK AO2
[1415 MST] KSEZ 252115Z AUTO 21005KT 10SM CLR 27/M03 A3008 RMK AO2
[1435 MST] KSEZ 252135Z AUTO 00000KT 10SM CLR 27/M04 A3006 RMK AO2
[1455 MST] KSEZ 252155Z AUTO 23006G16KT 10SM CLR 28/M03 A3006 RMK AO2

[1515 MST] KSEZ 252215Z AUTO 22005KT 10SM CLR 27/M04 A3005 RMK AO2
[1535 MST] KSEZ 252235Z AUTO 25003KT 10SM CLR 27/M04 A3004 RMK AO2

ACCIDENT TIME 1550 MST

[1555 MST] KSEZ 252255Z AUTO 25005G14KT 10SM CLR 28/M04 A3004 RMK AO2
[1615 MST] KSEZ 252315Z AUTO 22006G15KT 10SM CLR 28/M04 A3003 RMK AO2
[1635 MST] KSEZ 252335Z AUTO 00000KT 10SM CLR 28/M05 A3003 RMK AO2

KSEZ weather at 1515 MST, wind from 220° at 5 knots, 10 miles visibility, clear skies below 12,000 feet, temperature of 27° Celsius (C), dew point temperature of -4° C, altimeter setting of 30.05 inches of mercury.

KSEZ weather at 1535 MST, wind from 250° at 3 knots, 10 miles visibility, clear skies below 12,000 feet, temperature of 27° C, dew point temperature of -4° C, altimeter setting of 30.04 inches of mercury.

KSEZ weather at 1555 MST, wind from 250° at 5 knots with gusts to 14 knots, 10 miles visibility, clear skies below 12,000 feet, temperature of 28° C, dew point temperature of -4° C, altimeter setting of 30.04 inches of mercury.

KSEZ indicated that VFR[6] conditions prevailed surrounding the period of the accident with a gusty southwest wind.

3.0 Satellite Data

Visible data from the Geostationary Operational Environmental Satellite number 11 (GOES-11) was obtained from the NCDC and processed with the NTSB's Man-computer Interactive Data Access System (McIDAS) workstation. Visible imagery (GOES-11, band 1), at a wavelength of 0.65 microns (µm), retrieved brightness temperatures for the scene. Satellite imagery surrounding the time of the accident, from 1300 MST through 1700 MST, at approximately 15-minute intervals, were reviewed and the closest image to the time of the accident is documented here.

Figure 6 presents the GOES-11 visible imagery at 1545 MST at 3X magnification with the accident site marked. The image depicted no cloud cover over the accident site at the accident time.

[6] Visual Flight Rules (VFR) – Refers to the general weather conditions pilots can expect at the surface. VFR criteria means a ceiling greater than 3,000 feet agl and greater than 5 miles visibility.

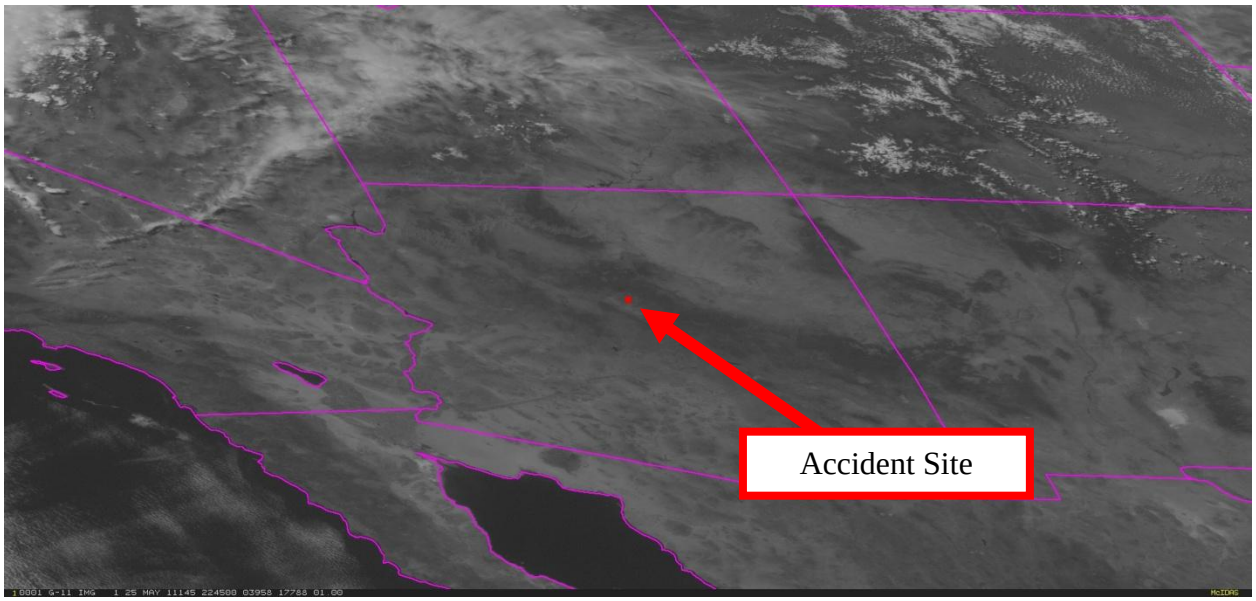

Figure 6 – GOES-11 visible image at 1545 MST

4.0 Upper Air Sounding Data

The closest upper air sounding to the accident site was from Flagstaff, Arizona (KFGZ) (figure 5), site number 72376, located 23 miles north-northeast of the accident site with a station elevation of 7,192 feet. The 1700 MST sounding from KFGZ was plotted on a standard Skew-T log P diagram[7] with the derived stability parameters included in figure 7 (with data from the surface to 500-hPa, or 19,000 feet msl). These data were analyzed utilizing the RAOB[8] software package. The sounding depicted a dry vertical environment with the Lifted Condensation Level (LCL)[9] at 19,601 feet and a Convective Condensation Level (CCL)[10] of 22,695 feet. The tropopause height was identified at about 43,000 feet. The freezing level was located at 13,881 feet. The precipitable water value was 0.21 inches.

[7] Skew T log P diagram – is a standard meteorological plot using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

[8] RAOB – (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Environmental Research Services, Matamopras, Pennsylvania.

[9] Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

[10] Convective Condensation Level (CCL) – The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.

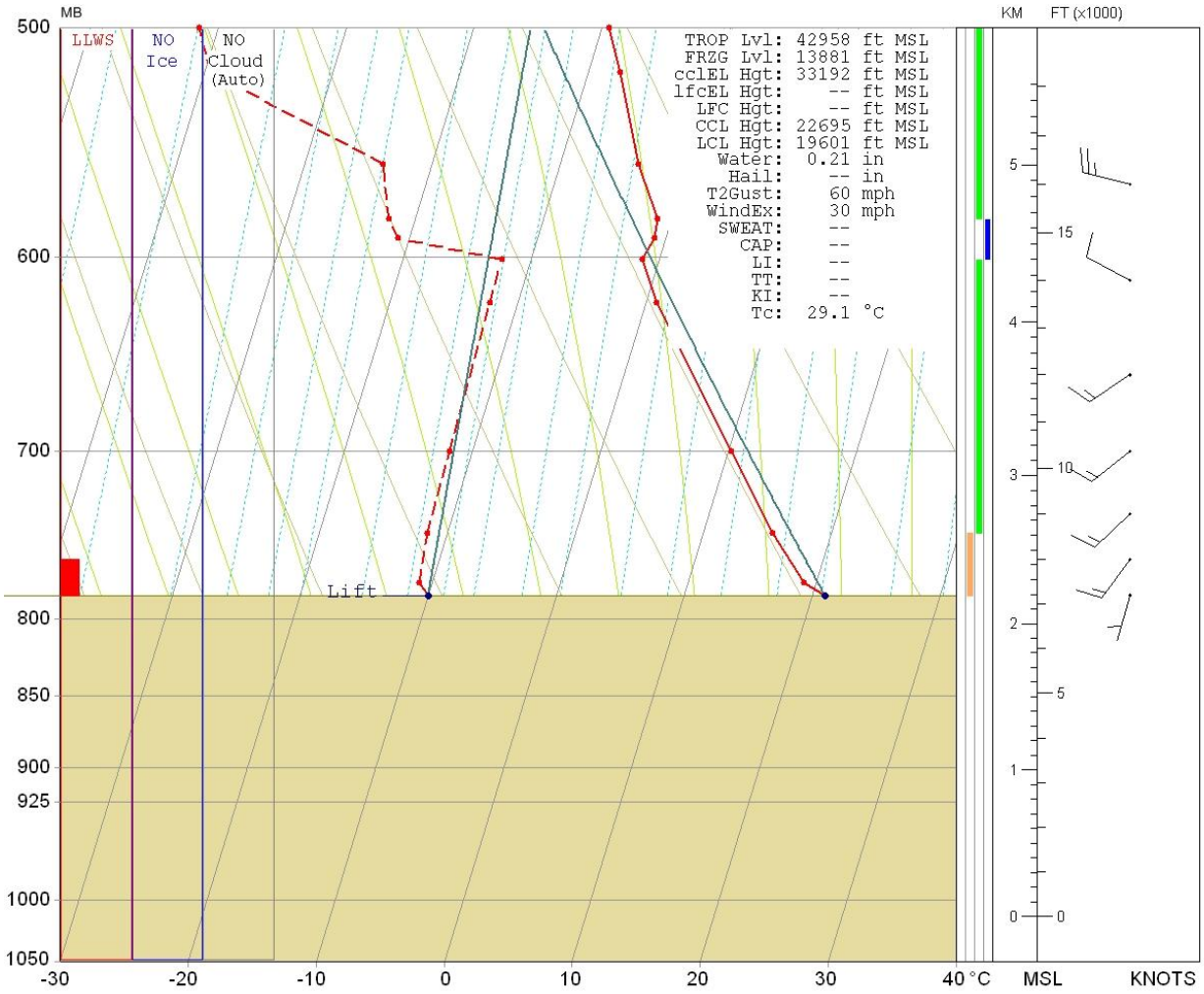

Figure 7 – KFGZ 1700 MST sounding

The KFGZ sounding was too dry for cloud formation. In addition, no icing conditions were identified by RAOB.

The sounding wind profile indicated a surface wind from 195° at 5 knots with the winds veering[11] to the west by 16,000 feet. The wind speed also increased from 5 knots at the surface to 26 knots at 16,000 feet. Low-level wind shear was identified by RAOB from the surface to 8,000 feet, which indicated the potential for turbulence.

5.0 Pilot Reports

No pilot reports were recorded or disseminated over Arizona from five hours before the accident time to five hours after the accident time.

[11] Veering wind – Wind which changes in a clockwise direction with time at a given location, or which changes direction in a clockwise sense with height.

6.0 SIGMETs and AIRMETs

No SIGMETs or AIRMETS were active for the accident site at the accident time.

7.0 Terminal Aerodrome Forecast

The closest NWS Terminal Aerodrome Forecast[12] (TAF) reporting location to the accident was Flagstaff Pulliam Airport (KFLG) located 18 miles north-northeast of the accident site with a station elevation of 7,014 feet (figure 5). The TAF obtained for the accident time was issued at 1020 MST and valid for a 24-hour period beginning at 1100 MST. The TAF forecast for KFLG was as follows:

KFLG 251720Z 2518/2618 VRB04KT P6SM SKC
FM252000 22012G18KT P6SM SKC
FM260200 23005KT P6SM SKC
FM261400 22015G22KT P6SM FEW250=

The forecast valid at the time of the accident expected wind from 220° at 12 knots with gusts to 18 knots, visibility greater than 6 miles, and clear skies.

8.0 Area Forecast

At 1540 MST the following Area Forecast was issued and discussed expected flying weather conditions across much of the Mountain West including Arizona. The Area Forecast for Arizona forecasted clear skies with scattered cirrus clouds expected between 1900 and 2100 MST:

FAUS45 KKCI 252240 AAA
FA5W
_SLCC FA 252240 AMD
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 261400
CLDS/WX VALID UNTIL 260800...OTLK VALID 260800-261400
ID MT WY NV UT CO AZ NM
.
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...ALF...20Z TROF FM STG LOW OVR INTL WTRS OFF N OR CST ACRS N CA CSTL SXNS-S SIERNEV. RDG CNTRL ALTA-W MT-W WY-N AZ. 14Z TROF FM STG LOW OVR INTL WTRS OFF N WA CST ACRS S WA-CNTRL ID-CNTRL WY. RDG W ND-W NEB-SW TX. ...SFC...20Z CDFNT FM LOW W WA ACRS CNTRL OR THRU LOW NW NV CONTG ACRS N PTNS CNTRL CA-CNTRL CA CSTL WTRS CONTG WWD. TROF NW MT-S CNTRL MT THRU LOW CNTRL WY

[12] Terminal Aerodrome Forecast (TAF) – These forecasts apply to a five statute mile radius from the center of the airport runway complex where the TAF is valid.

CONTG ACRS N CNTRL CO-NERN NM. TROF XTRM S NV-SW AZ CONTG SSEWD. HIGH NW CO. 14Z CDFNT FM LOW NW MT-N CNTRL WY-SW WY-SW UT-N PTNS S CA. WRMFNT N CNTRL WY-N CNTRL CO-SE CO. STNR FNT N CNTRL CO-CNTRL NM-XTRM W PTN FAR W TX CONTG SSEWD. TROF FM LOW NW MT TO LOW S BC.

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ID

N...BKN100 TOP FL250. WDLY SCT -SHRA. BECMG 0305 BKN040 OVC060. OCNL -RA. OTLK...MVFR CIG RA BR.

CNTRL MTNS...SCT100 BKN120 TOP FL250. ISOL -SHRA. BECMG 0103 BKN080 OVC100. SCT -SHRASN. OTLK...MVFR CIG SHRASN.

SW...BKN080 OVC100 TOP FL250. ISOL -SHRA. WND S G25KT. 23Z BKN080 OVC100. SCT -SHRA/ISOL -TSRA. CB TOP FL300. WND S 20G30KT. 03Z OVC060. SCT -SHRA/ISOL -TSRA. WND W 20G30KT. OTLK...MVFR CIG SHRA WND.

SE...SCT080 BKN150 TOP FL250. 03Z BKN120. ISOL -SHRA. OTLK...VFR SHRA BECMG AFT 10Z MVFR CIG SHRASN.

.

MT

CONTDVD WWD...BKN100 TOP FL250. BECMG 0002 BKN060 OVC100. SCT -SHRA. OTLK...MVFR CIG SHRA.

SW MTNS...SCT090 BKN120 TOP FL250. WDLY SCT -SHRA. BECMG 0103 BKN080 OVC100. SCT -SHRASN. OTLK...MVFR CIG SHRASN.

E SLOPES OF CONTDVD-CNTRL..BKN080 TOP FL200. ISOL -SHRA. 00Z BKN120. ISOL -SHRA. OTLK...MVFR CIG SHRA.

E...SCT120 BKN CI. OTLK...VFR.

.

WY

PLAINS...BKN080 TOP FL250. BECMG 0406 OVC060. OTLK...MVFR CIG BR.

MTNS E OF CONTDVD...BKN100 TOP FL250. TIL 03Z WDLY SCT -SHRA. OTLK...VFR.

MTNS W OF CONTDVD...SCT150 SCT-BKN CI. 02Z SCT-BKN CI. OTLK...VFR.

.

NV...UPDT

NWRN...

N 1/2...BKN100 TOP FL250. TIL 03Z WND W 25G35KT. 01Z BKN060 OVC100. SCT -SHRA. OTLK...MVFR CIG SHRA.

S 1/2...SCT-BKN CI. TIL 03Z OCNL VIS 3-5SM BLDU/WND SW 30G45KT. 22Z BKN100 TOP FL250. WDLY SCT -SHRA. 03Z SCT080 BKN120. OTLK...VFR.

NERN...BKN CI. WND SW 20G30KT. 21Z WND W 30G40KT. 23Z BKN150 TOP FL250. WND W 30G40KT. OTLK...VFR.

SRN...SCT CI. AFT 22Z WND SW 20G30KT. OTLK...VFR WND.

.

UT

N 1/3...SCT150 SCT-BKN CI. 03Z SCT-BKN150 TOP FL250. OTLK...VFR.
S 2/3...SKC. OTLK...VFR.
.
CO
PLAINS...BKN090 TOP 150. WND NW 20G30KT. BECMG 0002 SCT CI.
OTLK...VFR.
FOOTHILLS-MTNS E OF CONTDVD...BKN150 TOP FL250. 21Z SCT150 SCT
CI. OTLK...VFR.
CNTRL CO MTNS...BKN110 TOP FL250. 23Z SKC OR SCT CI. OCNL SCT150.
OTLK...VFR.
RMNDR...SKC OR SCT CI. OTLK...VFR.
.
AZ
SKC. BECMG 0204 SKC OR SCT CI. OTLK...VFR.
.
NM
PLAINS...SKC. OTLK...VFR.
MTNS AND WEST...SKC OR SCT CI. TIL 00Z OCNL SCT150. OTLK...VFR.
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9.0 National Weather Service Discussion

At 0920 MST, the NWS forecast office in Flagstaff, Arizona, issued the following Area Forecast Discussion for central and northern Arizona, including the accident site, which discussed the clear skies expected, along with southwest to west surface winds between 10 and 20 knots between 1100 and 1900 MST:

FXUS65 KFGZ 251624
AFDFGZ
AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE FLAGSTAFF AZ
920 AM MST WED MAY 25 2011
.SYNOPSIS...DRY AND WARM WEATHER IS EXPECTED THROUGH SATURDAY WITH INCREASING SOUTHWEST WINDS. STRONG WINDS ON THURSDAY MAY PRODUCE AREAS OF BLOWING SAND AND DUST WITH LIMITED VISIBILITIES ACROSS PORTIONS OF THE LITTLE COLORADO RIVER AND CHINLE VALLEYS. STRONGER WINDS WILL CONTINUE ON SATURDAY AND SUNDAY AS ANOTHER TROUGH MOVES INTO THE REGION FROM THE NORTHWEST.
&&
.DISCUSSION**...CLEAR SKIES NOTED ACROSS THE STATE THIS MORNING UNDER A PASSING RIDGE OF HIGH PRESSURE. WARMER TEMPERATURES AND LIGHTER WINDS ARE EXPECTED TODAY.** TEMPERATURES SHOULD RUN ABOUT 5 TO 10 DEGREES WARMER THAN YESTERDAY. STRONGER SOUTHWEST WINDS ARE EXPECTED THURSDAY AS A TROUGH MOVES THROUGH THE WESTERN STATES. CRITICAL FIRE WEATHER CONDITIONS ARE ALSO POSSIBLE THURSDAY AS THE INCREASING WINDS COMBINE WITH DRY CONDITIONS. A

FIRE WEATHER WATCH IS IN EFFECT...SEE DISCUSSION BELOW FOR FURTHER DETAILS. CURRENT FORECAST LOOKS GOOD AND NO UPDATES ARE NEEDED.
&&
.PREVIOUS DISCUSSION (330 AM)...UPPER AIR ANALYSIS SHOWS A S/W RIDGE MOVING ACROSS THE SOUTHWEST AHEAD OF A LARGE CUTOFF TROUGH OFF THE PAC NW COAST. **EXPECT FAIR WEATHER TODAY ACROSS NORTHERN AZ WITH SW TO W WINDS 15 MPH OR LESS.** FOR THURSDAY...A S/W TROUGH WILL EJECT OUT OF THE CUTOFF TROUGH AND PASS BY TO OUR NORTH. THE MAIN IMPACT FOR US WILL BE INCREASED SW WINDS...ESP FROM THE MOGOLLON RIM NORTHEASTWARD...WITH SPEEDS 20-30 MPH WITH HIGHER GUSTS. LATER SHIFTS MAY HAVE TO CONSIDER A WIND ADVY FOR AFFECTED PORTIONS OF THE CWA. BLOWING DUST IS POSSIBLE ACROSS MUCH OF NORTHERN AZ NORTH AND EAST OF FLAGSTAFF.
FRIDAY...THE L/W TROUGH WILL BEGIN TO DEEPEN ALONG THE WEST COAST AND THE ZONAL UPPER JET AXIS WILL BE TO OUR NORTH. IT WILL REMAIN DRY OVER OUR REGION ALONG WITH SW WINDS 15-20 MPH WITH HIGHER GUSTS.
FOR SATURDAY...EXPECT INCREASING WINDS AS THE TROUGH BOTTOMS OUT OVER THE GREAT BASIN AS IT APPROACHES NORTHERN AZ. WIND SPEEDS OF 25-40 MPH WITH HIGHER GUSTS CAN BE EXPECTED ALONG AND NE OF THE MOGOLLON RIM WITH 20-30 MPH WINDS ELSEWHERE. BLOWING DUST IS EXPECTED ONCE AGAIN MAINLY NORTH AND EAST OF FLAGSTAFF.
SUNDAY AND SUNDAY NIGHT...THE TROUGH AXIS WILL MOVE ACROSS THE NORTHLAND LATE IN THE DAY. UNTIL THEN...GUSTY W-SW WINDS WILL CONTINUE WITH BLOWING DUST. THE DEEPEST MOISTURE IS STILL PROGGED TO REMAIN WELL NORTH OF I-40...THUS WILL CONTINUE SLIGHT CHANCE POPS FROM THE KAIBAB PLATEAU E TO PAGE. THE TROUGH WILL EXIT TO OUR E MONDAY MORNING...WITH DIMINISHING WIND AND DRIER AIR IN ITS WAKE.
TEMPS THROUGH THE REST OF THIS WEEK WILL BE NEAR NORMAL...THEN ABOUT 5-10 DEGREES BELOW NORMAL SUNDAY AND MONDAY ASSOCIATED WITH THE TROUGH PASSAGE. TEMPS WILL RETURN TO NEAR NORMAL NEXT TUESDAY AS SW FLOW INCREASES OVER THE AREA.
&&
.**AVIATION...FOR THE 18Z PACKAGE...EXPECT CLEAR SKIES THROUGH 06Z THU THEN SCT CIRRUS. BTWN 18Z-02Z THU... SFC WINDS SW-W 10-20KT.** AVIATION DISCUSSION NOT UPDATED FOR AMENDMENTS.
&&
.FIRE WEATHER...HIGH PRESSURE WILL PASS OVERHEAD TODAY...WITH LIGHTER WINDS THAN TUESDAY AND WARMER TEMPERATURES. ON THURSDAY...A TROUGH WILL PASS NORTH OF OUR STATE WITH AN INCREASE IN SOUTHWEST WINDS EXPECTED. CRITICAL FIRE WEATHER CONDITIONS ARE POSSIBLE ACROSS EAST CENTRAL ARIZONA AND A FIRE WEATHER WATCH IS IN EFFECT.
FRIDAY THROUGH SUNDAY...DRY CONDITIONS WILL CONTINUE AS ANOTHER LARGE LOW PRESSURE SYSTEM APPROACHES NORTHERN ARIZONA. EXPECT BREEZY SOUTHWEST WINDS FRIDAY THOUGH BELOW CRITICAL THRESHOLDS. FORECAST WINDS FOR THE WEEKEND ARE SOUTHWESTERLY...WITH

INCREASING SPEEDS SATURDAY AND BREEZY CONDITIONS SATURDAY NIGHT FOR AREAS ABOVE 6500 FEET. SUNDAY SHOULD SEE THE FASTEST WINDS. SUNDAYS MIN RH FORECAST IS UP A FEW POINTS...NOW IN THE 15-25% RANGE FOR MOST AREAS ABOVE 5500 FEET. CRITICAL FIRE WEATHER CONDITIONS ARE PROBABLE FOR AREAS NORTH OF THE MOGOLLON RIM SATURDAY AND POSSIBLE ON SUNDAY. .FGZ WATCHES/WARNINGS/ADVISORIES...FIRE WEATHER WATCH IN EFFECT FOR THURSDAY MORNING THROUGH THURSDAY EVENING FOR ARIZONA FIRE WEATHER ZONES AZZ111>114-116-117-140.
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PUBLIC.....MCS/NP
AVIATION/FIRE WX.....DL
FOR NORTHERN ARIZONA WEATHER INFORMATION VISIT
WEATHER.GOV/FLAGSTAFF.

10.0 Astronomical Data

The astronomical data obtained from the United States Naval Observatory for coordinates 34.85° N, longitude 111.79° W on May 25, 2011, indicated the following for the accident location:

SUN	
Begin civil twilight	0449 MST
Sunrise	0518 MST
Sun transit	1224 MST
Sunset	1931 MST
End civil twilight	2000 MST

Paul Suffern
NTSB Meteorologist