National Transportation Safety Board

Office of Aviation Safety
Washington, D.C. 20594-2000
August 11, 2004

METEOROLOGY FACTUAL REPORT

CHI04MA182

A. ACCIDENT

Location: Newberry, South Carolina
Date: July 13, 2004
Time: 0535 eastern daylight time (0935 UTC[1])
Aircraft: Bell 407 helicopter, registration: N503MT

B. METEOROLOGICAL SPECIALIST

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C. SUMMARY

On July 13, 2004, at 0535 eastern daylight time (EDT), a Bell 407 helicopter, N503MT, operated by Med-Trans Corporation, was on an emergency medical services (EMS) mission when it collided with trees shortly after takeoff from interstate highway I-26 near Newberry, South Carolina. The pilot, flight nurse, flight paramedic, and patient received fatal injuries. The helicopter was destroyed by impact and post-crash fire. The 14 CFR Part 135 EMS flight was en route to the Spartanburg Regional Medical Center where it had departed at 0502 EDT. Night visual meteorological conditions with mist and fog prevailed in the area of the accident site. The flight was on a company flight plan and was receiving flight following from Regional One Communications provided by Spartanburg 911.

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

C. DETAILS OF INVESTIGATION

The National Transportation Safety Board's (NTSB) meteorologist specialist was not on scene for this investigation. Weather data for this investigation was collected from official National Weather Service (NWS) sources including the National Climatic Data Center (NCDC). All times are Coordinated Universal Time (UTC) based upon the 24 hour clock. Local time of eastern daylight time (EDT) is +4 hours to UTC, and UTC is abbreviated or referred to as "Z" time. Directions are referenced to true north and distances 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 34.4197 N and longitude 81.7100 W.

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 00-45.

1.0.1 Surface Analysis Chart

The southeast section of the NWS Surface Analysis Chart for 0900Z on July 13, 2004, is included as Figure 1. A red cross marks the approximate location of the accident site. The chart depicted the primary features as a low pressure system over New Jersey with a stationary front extending from the low southwestward into Delaware, Maryland, Virginia, and then northwestward into West Virginia and Pennsylvania. A trough of low pressure was also depicted extending southwestward from Virginia, North Carolina, through central South Carolina. The accident site was in the general vicinity of this trough of low pressure. A second trough was also depicted over southwestern Georgia, into the Florida panhandle into the Gulf of Mexico.

The station models on the surface analysis chart from Virginia, North and South Carolina, into Georgia depicted light winds, with temperatures in the 70's (degrees Fahrenheit (F)), with dew point temperatures within 3 degrees F, with several stations reporting mist/fog. In the vicinity of the trough, sky conditions were reported as broken to overcast, with sky conditions clearing to the east and west from the trough.

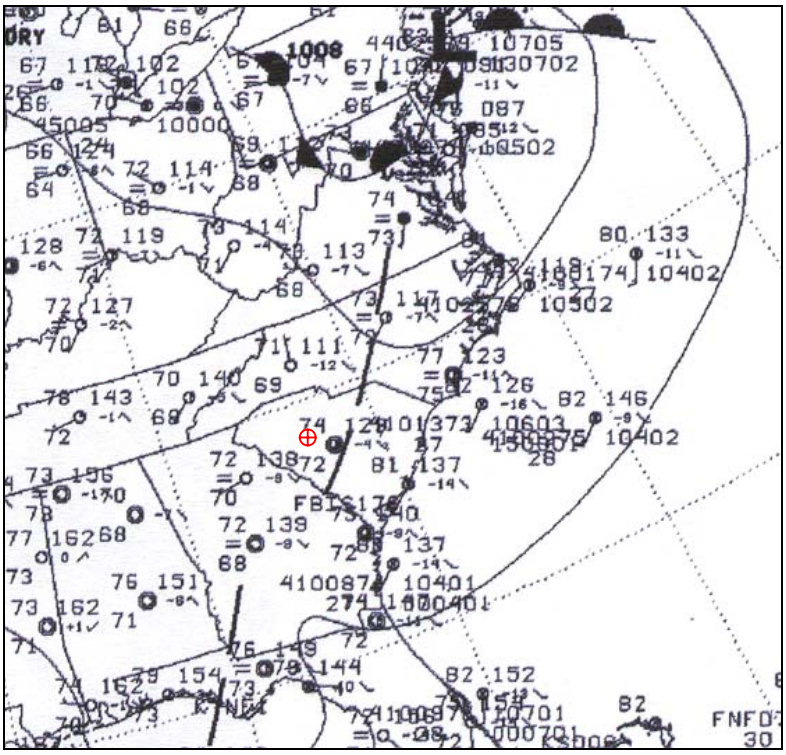

Figure 1 – NWS Surface Analysis Chart for 0900Z

1.0.2 Weather Depiction Chart

The southeastern section of the NWS Weather Depiction Chart for 1000Z is included as Figure 2, depicting conditions within the hour of the accident. The chart depicted a large area of instrument flight rule (IFR) conditions[2] by a shaded contour line north of the accident site over North Carolina, Virginia, Maryland, Delaware, and New Jersey. Another area of IFR conditions was depicted along the Georgia and South Carolina border and over northern Georgia, to the west-southwest of the accident site. Surrounding the IFR areas was an area of marginal visual flight rules (MVFR) conditions[3] depicted by an unshaded contour line extending into South Carolina in the vicinity of the accident site. Visual flight rule (VFR) conditions[4] were depicted without any contour over northern South Carolina and portions of North Carolina. The accident site bordered between the VFR and MVFR areas.

[2] IFR conditions – are defined as a ceiling or lowest height of a broken or overcast layer of clouds, or the vertical visibility into a surface based obscuration of 1,000 feet or less and/or visibility less than 3 statute miles.

[3] MVFR conditions – are defined as a ceiling between 1,000 and 3,000 feet inclusive and/or visibility 3 to 5 statute miles inclusive.

[4] VFR conditions – are defined as no ceiling or a ceiling above 3,000 feet and visibility greater than 5 miles.

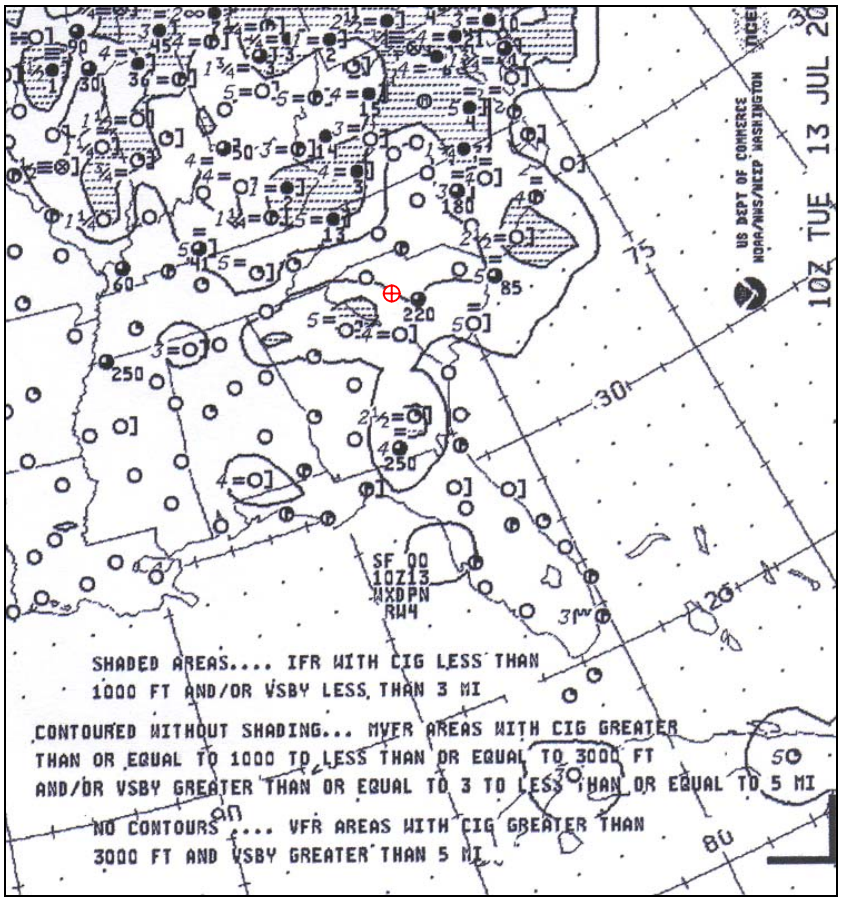

Figure 2 – NWS Weather Depiction Chart for 1000Z

The station models on the weather depiction chart to the southeast, south, and west-southwest of the accident site indicated reduced visibility in mist[5] with clear skies.

[5] Mist – is defined by the American Meteorological Society as a suspension in the air consisting of an aggregate of microscopic water droplets or wet hygroscopic particles (of diameter not less than 0.5 mm or 0.02 in.), reducing the visibility at the earth's surface to not less than 1 km or 5/8 mile. The term mist is used in weather reports when there is such obscurity and the associated visibility is 1000 m or more, and the corresponding relative humidity is 95% or more, but is generally lower than 100%. These hydrometeors form a thin greyish veil that covers the landscape. It also reduces visibility, but to a lesser extent than fog. In popular usage in the United States, same as drizzle.

1.0.3 Radar Summary Chart

The southeast portion of the NWS Radar Summary Chart for 0920Z on July 13, 2004, is included as Figure 3. The chart depicted several areas of echoes extending over Tennessee, Kentucky and western North Carolina, and an area over the coastal section of South Carolina. No echoes were identified in the vicinity of the accident site.

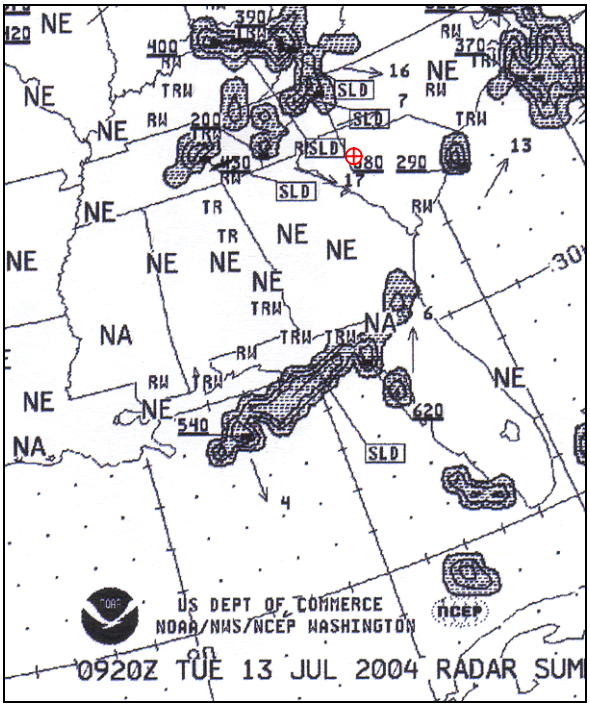

Figure 3 - NWS Radar Summary Chart for 0920Z

2.0 Surface Observations

There were no official weather reporting facilities in Newberry, so the surrounding area was documented utilizing official NWS Meteorological Aerodrome Reports (METARs) and Specials (SPECIs). The following observations are taken from standard code provided in plain language, with cloud heights reported above ground level (agl).

2.0.1 Greenwood County Airport (KGRD), Greenwood, SC

The closest reporting location was from Greenwood County Airport (KGRD), located approximately 24 miles southwest of the accident site at an elevation of 193 feet msl. The following conditions were reported surrounding the time of the accident:

KGRD weather observation at 0856Z, automated[6], wind calm, visibility 5 miles in mist[7], sky clear below 12,000 feet, temperature 22 degrees Celsius (C), dew point 21 degrees C, altimeter 29.94 inches of Mercury (Hg). Remarks: automated observation system, sea level pressure 1013.0-mb, temperature 21.7 degrees C, dew point 21.1 degrees C.

KGRD weather observation at 0956Z, automated, wind from 200 degrees at 6 knots, visibility 4 miles in mist, ceiling broken at 300 feet, temperature and dew point 22 degrees C, altimeter 29.95 inches of Hg. Remarks: automated observation system, sea level pressure 1013.5-mb, temperature 22.2 degrees C, dew point 21.7 degrees C.

KGRD special weather observation at 1004Z, automated, wind from 210 degrees at 4 knots, visibility 1 3/4 miles in mist, ceiling broken at 300 feet, temperature and dew point 22 degrees C, altimeter 29.95 inches of Hg. Remarks: automated observation system.

KGRD weather observation at 1056Z, automated, wind calm, visibility 2 miles in mist, ceiling broken at 300 feet, temperature and dew point 22 degrees C, altimeter 29.97 inches of Hg. Remarks: automated observation system, sea level pressure 1014.2-mb, temperature and dew point 21.7 degrees C.

2.0.2 Greenville-Spartanburg International Airport (KGSP), Greer, SC

The next closest weather reporting facility was from Greenville-Spartanburg International Airport (KGSP), located in Greer, South Carolina, 38 miles northwest of the accident site, at an elevation of 964 feet msl. The airport was also equipped with an ASOS system and reported the following conditions surrounding the time of the accident:

KGSP special weather observation at 0813Z, automated, wind calm, visibility 6 miles in mist, sky clear below 12,000 feet, temperature and dew point 22 degrees C, altimeter 29.93 inches of Hg. Remarks: automated observation system.

KGSP special weather observation at 0843Z, automated, wind calm, visibility 1 1/2 miles in mist, sky clear below 12,000 feet, temperature and dew point 21 degrees C, altimeter 29.93 inches of Hg. Remarks: automated observation system.

KGSP weather observation at 0853Z, automated, wind calm, visibility 1 mile in mist, sky condition missing, temperature and dew point 21 degrees C, altimeter 29.93 inches of Hg. Remarks: automated observation system, sea level pressure 1012.5-mb, 6-hour precipitation amount missing, temperature 20.6 degrees C, dew point 20.6 degrees C, 3-hour pressure tendency decreased 1.0-mb over the period, precipitation identifier information not available, maintenance required.

[6] Automated observation – means no human augmentation of the observation has taken place.

[7] Mist is reported when visibility is at least 5/8 statute mile, but not more than 6 miles. Fog is reported with visibility below 5/8 of a mile.

KGSP special weather observation at 0856Z, automated, wind calm, visibility 2 miles in mist, sky condition missing, temperature and dew point 21 degrees C, altimeter 29.93 inches of Hg. Remarks: automated observation system, maintenance required.

KGSP special weather observation at 0905Z, automated, wind calm, visibility 5 miles in mist, sky condition missing, temperature and dew point 21 degrees C, altimeter 29.93 inches of Hg. Remarks: automated observation system, maintenance required.

KGSP weather observation at 0953Z, automated, wind calm, visibility 7 miles in mist, sky clear below 12,000 feet, temperature and dew point 21 degrees C, altimeter 29.94 inches of Hg. Remarks: automated observation system, sea level pressure 1012.8-mb, temperature 20.6 degrees C, dew point 20.6 degrees C, maintenance required.

3.0 Upper Air Data

The closest upper air sounding or RAwinsonde OBservation (RAOB) was from the NWS Charleston (KCHS), South Carolina, site number 72208, located approximately 125 miles southeast of the accident site at an elevation of 46 feet msl. The 1200Z sounding on July 19, 2004, from KCHS plotted on a standard Skew-T log P diagram[8] with the observed and derived stability parameters and is included as Figure 4 from the surface to 500-mb or 18,000 feet. The significant levels and inversions are plotted in blue on the sounding, with the observed stability parameters and other derived features plotted in the box on the right hand side of the plot. The wind profile is plotted on the far right side of the chart with the color bar indicating the individual stability of the layers (green – unstable, blue – stable).

[8] 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.

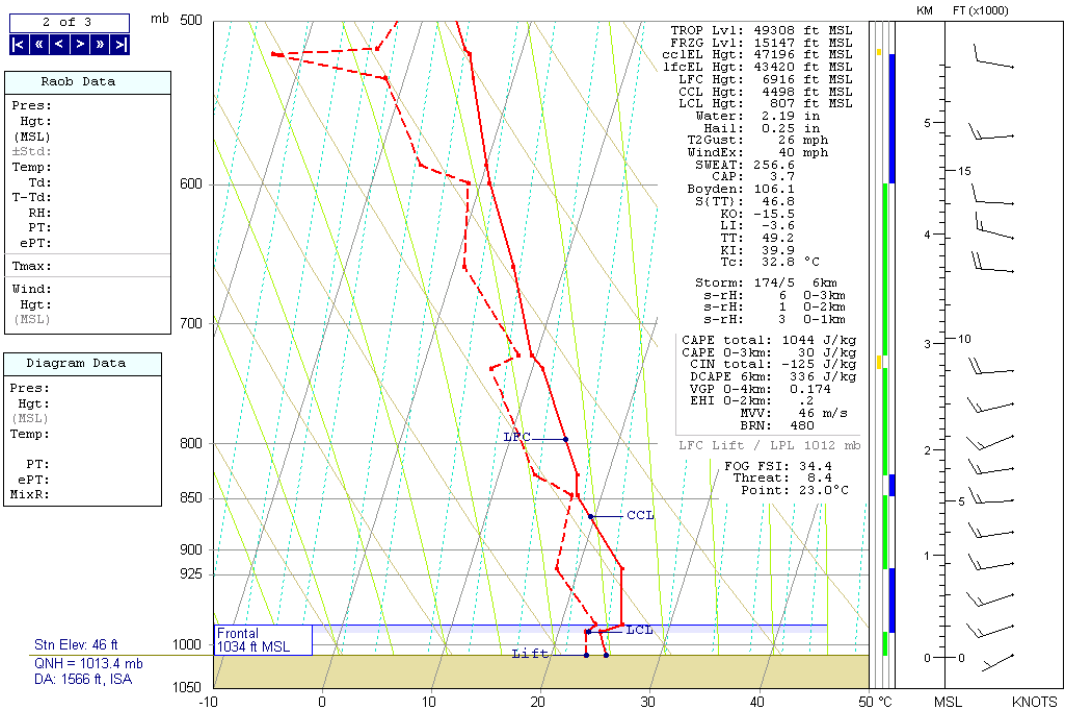

Figure 4 –KCHS 1200Z sounding

The sounding indicated a low-level temperature inversion above the surface where temperature increased with height to 1,034 feet. Below the inversion relative humidity (RH) was greater than 75 percent, and above the inversion the RH dropped to 69 percent and then increased again between 5,000 and 6,000 feet. The Lifted Condensation Level (LCL)[9] was observed at 986-mb or 807 feet.

The wind profile indicated surface wind from the southwest at 7 knots, with winds veering to the west with height. Wind speeds increased to 15 knots at the top of the inversion and remained below 20 knots through 5,000 feet.

Several fog indices[10] were available on the sounding for radiation type fog[11] situations. The Fog Stability Index (FSI) of 34.4, provided a moderate likelihood of fog, with the Fog Point or temperature initiation of 23.0 degrees C. The Fog Threat score of 8.4 indicated a low threat score for fog.

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

[10] Fog indices are discussed in USAF Air Weather Service (AWS) FM-90/001 and USAF technical publication 2WW/TN-79/008.

[11] Radiation type fog - Fog that is created when radiational cooling at the earth's surface lowers the temperature of the air near the ground to or below its dew point. Formation is best when there is a shallow surface layer of relatively moist air beneath a drier layer, clear skies, and light surface winds. This primarily occurs during the night or early morning. It may also be called ground fog.

4.0 Satellite Data

The Geostationary Operational Environmental Satellite number 12 (GOES-12) data was obtained from the National Climatic Data Center (NCDC) and displayed on the National Transportation Safety Board's Man-computer Interactive Data Access System (McIDAS) workstation. The infrared imagery was obtained surrounding the time of the accident. The infrared imagery long-wave (band 4) at a wavelength of 10.7 microns (μm) and short-wave (band 2) at a wavelength of 3.9 μm, provided a 4-kilometer (km) resolution with radiative cloud top temperatures. The satellite imagery surrounding the time of the accident from 0900Z through 1000Z, at approximately 15-minute intervals were reviewed and the closest images documented below.

Both long and shortwave infrared bands depicted no convective clouds over the area. The shortwave band was documented due to its advantages in depicting low stratiform clouds and fog in this case.

Figure 5 is the GOES-12 infrared band 2 short-wave window image used for nighttime cloud identification image at 0932Z at 6X magnification with a standard MB temperature enhancement curve applied to highlight the higher and colder cloud tops associated with deep convection. The accident site is marked by a red square. The image depicts a band of mid to high stratiform clouds oriented in an east-west direction over the southcentral portion of South Carolina with several areas of low stratiform clouds and/or fog extending over the northern and western portions of the state. The accident site bordered one of the areas of low stratiform clouds and/or fog. The radiative cloud top temperature over the accident site was observed at 288.5 degrees Kelvin (K) or 15.34 degrees C, which according to the KCHS sounding indicated cloud tops below 6,000 feet.

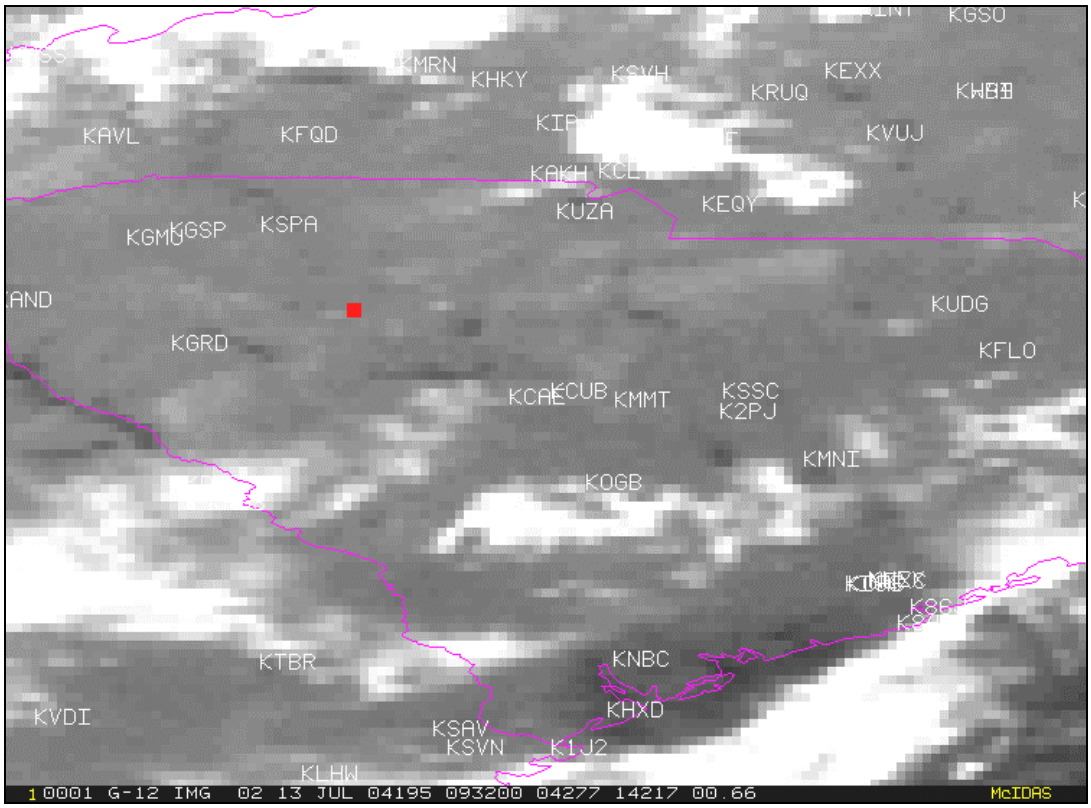

Figure 5 – GOES-12 infrared image at 0932Z

5.0 Terminal Aerodrome Forecast (TAF)

The Terminal Aerodrome Forecast (TAF) provides a time specific forecast of wind, visibility, weather conditions, and clouds, was examined for the general forecasts for the area. TAFs are airport specific and are only valid within 5 nautical miles of the airport. The forecast issued for Greenwood County Airport (KGRD), the closest forecast to the accident site was for as follows:

KGRD TRAF issued at 0539Z and valid of a 24-hour period beginning from 0600Z. From 0600Z winds calm, visibility 6 miles in mist, scattered clouds at 25,000 feet. Temporarily between 0700Z and 0800Z, visibility 5 miles in mist. From 0800Z, winds variable at 2 knots, visibility 4 miles in mist, and scattered clouds at 25,000 feet. Temporarily between 1000Z and 1200Z of visibility 2 miles in mist, and scattered clouds at 25,000 feet. From 1400Z, wind from 300 degrees at 5 knots, visibility better than 6 miles, scattered clouds at 25,000 feet. From 2100Z, wind from 260 degrees at 7 knots, visibility better than 6 miles with showers in the vicinity, scattered clouds at 5,000 feet in cumulonimbus clouds, scattered clouds at 20,000 feet. From 0100Z, wind from 310 degrees at 5 knots, visibility better than 6 miles, and scattered clouds at 20,000 feet.

6.0 Area Forecast (FA)

The Area Forecast (FA) is an aviation forecast of general weather conditions over an area the size of several states. It is used to determine forecast en route weather and to interpolate conditions at airports that do not have Terminal Aerodrome Forecasts (TAFs) issued. The NWS Aviation Weather Center (AWC) located in Kansas City, Missouri, issues the FA at regular intervals and issues special reports as necessary usually in the form of an AIRMET. The region that covers South Carolina is under the Miami (KMIA) regional forecast. The forecast valid for this accident was issued at 0845Z, and was valid until 2100Z.

Northern South Carolina forecast: scattered clouds at 3,000 to 5,000 feet, and scattered at 8,000 to 10,000 feet, with visibility 3 to 5 miles in mist, with patches of stratus and fog/mist ending between 1200Z and 1500Z. Isolated thunderstorms and light rain and/or light rain showers, with cumulonimbus cloud tops to 35,000 feet. Thunderstorms and moderate rain increasing and becoming widely scattered by 1800Z to 2100Z. The outlook from 2100Z through 0300Z was for VFR conditions to prevail.

7.0 In-Flight Weather Advisories

The NWS issues in-flight weather advisories designated as Severe Weather Forecast Alerts (AWW's), Convective SIGMET's (WST's), SIGMET's (WS's), Center Weather Advisories (CWA's), and AIRMET's (WA's). In-flight advisories serve to notify en route pilots of the possibility of encountering hazardous flying conditions, which may not have been forecast at the time of the preflight briefing. Whether or not the condition described is potentially hazardous to a particular flight is for the pilot to evaluate on the basis of experience and the operational limits of the aircraft.

AIRMET Sierra update 2 issued at 0744Z for IFR conditions over portions of North Carolina, South Carolina, and Georgia valid until 1400Z. The area was enclosed by the navigation fixes from 50 miles northeast of Raleigh-Durham (RDU), North Carolina, to Florence (FLO), South Carolina, to La Grange (LGC), Georgia, to Chattanooga, Tennessee (GQO), to Toccoa (ODF), Georgia, to 40 miles east of Knoxville (VXV), Tennessee, to Holston Mountain (HMV), Tennessee. The advisory warned of occasional ceilings below 1,000 feet and visibility below 3 miles in clouds, mist, and fog. The conditions were expected to end over most of the sections by 1400Z. The accident site was enclosed within the boundary of the advisory.

The advisory was amended or corrected at 0921Z by AIRMET Sierra update 3, which corrected the navigation fix totally enclosing area back to 50 miles northeast of Raleigh-Durham (RDU). The advisory continued to warn of occasional ceilings below 1,000 feet and visibility below 3 miles in clouds, mist, and fog.

No other NWS weather advisories or warnings were current for the area for aviation or the general public.

8.0 Pilot Reports

There were no pilot reports (PIREPs) recorded over South Carolina during the period from 0030Z to 1200Z over the region relevant to the case.

9.0 Statements

Several witnesses at the location where the helicopter made the emergency pickup of the patient described a light fog in the area, with the fog "hanging in the tree tops like sheets" and lesser at the surface. Several of the witnesses also indicated that they could some additional layers of fog in the helicopter's landing light when it arrived and departed. None of the witnesses indicated that the fog or visibility changed dramatically during the time surrounding the accident.

10.0 NWS Forecast Discussion

The NWS Regional Forecast Office in Columbia, South Carolina, issued an area forecast discussion at 1047Z describing the conditions influencing the area during the period. The aviation section of the discussion indicated that there were no significant problems with fog or low stratiform clouds expected during the morning. The forecaster expected scattered to broken cumulus clouds to develop with the daytime heating with a slight chance of afternoon and evening rain showers and thunderstorms.

There were no Severe Weather Forecast Alerts, Convective SIGMETs, SIGMETs, or Center Weather Advisories current for South Carolina surrounding the period of the accident.

11.0 Astronomical Data

Data from the U.S. Naval Observatory in Washington, DC, provided the following astronomical data for Newberry, South Carolina, for July 13, 2004:

Beginning civil twilight:	0956Z (0556 EDT)
Sunrise:	1025Z (0625 EDT)
Elevation of Sun:	More than 9 degrees below the horizon
Moonrise:	0705Z (0305 EDT)
Moon phase:	Waning crescent 13% of the Moon's visible disk illuminated
Moon elevation:	27 degrees above horizon

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