LIGHTNING

Lightning has terrified and mystified observers for centuries. The early Romans and Greeks believed lightning bolts were thrown by the gods themselves and any site struck by lightning was sacred. The Norse god Thor was believed to produce thunder and lightning bolts to use against demon enemies by banging an anvil with a hammer while riding across the skies in his chariot.

Cloud-to-ground lightning is a powerful static electricity discharge between the base of the cloud and the earth's surface. The static electricity discharged is no different than the annoying static shock you receive touching a metal door handle after scuffing your feet over a carpeted floor, except for the fact that a lightning bolt is the discharge of 100 million volts with a 5,000 to 200,000 amp current. The National Weather Service estimates there are over 25 million cloud to ground strokes in the United States every year with Florida receiving the most per year of any state. From 1996 to 2005, South Carolina averaged over 459,000 cloud-to-ground strokes per year.

Lightning is formed in tall thunderstorm clouds, also known as cumulonimbus clouds, that frequent spring and summer. Strong updrafts/downdrafts circulate ice particles and hail within the cloud, building concentrations of positively charged particles in the upper reaches and negatively charged particles at the base of the cloud. Lightning can also be produced by heavy snow storms, volcanic eruptions, and the smoke clouds of intense forest fires.

Cloud-to-ground lightning forms as the clouds move and the negatively charged cloud base builds a pool of positively charged particles at the earth's surface beneath the cloud. When the electric charge becomes great enough between the positively charged earth's surface and the negatively charged cloud base, streams of charged particles called stepped leaders from the ground and the cloud base move toward each other. When these stepped leaders meet, a rapid, massive positive discharge of static electricity rockets upward in as little as two microseconds. This discharge arcs upward at temperatures estimated above 50,000 degrees Fahrenheit rapidly vaporizing its way through the atmosphere, causing the electric blue flash and the deafening crack as the atmosphere rushes back to fill the hole punched by the massive electrical discharge.

Complete with the crack and rumble of thunder, lightning is an awesome display of the sheer power of the atmosphere. The instantaneous arc-blue bolt is as startling as it is deadly. Every year lightning causes more fatalities than tornadoes. Forty to 60 people are killed by lightning annually in the United States. South Carolina had two lightning fatalities in 2006 and is one of the top ten states for lightning fatalities. Florida is the leading state for lightning deaths and injuries every year. Another curious statistic: annually, four to eight times more men than women are killed by lightning.

The safest place to take shelter from lightning is inside a well-built building, away from windows and exterior doors. When lightning strikes a substantial building the current passes via pipes, wires, metal air ducts, and gutters into the ground. Injuries have occurred when lightning has hit a house and an occupant was either on the phone or in the shower. Indoor phone use is the leading cause of lightning injuries in the U.S. People should also avoid concrete floors or walls in garages or basements as dangerous lightning currents will pass through the embedded reinforcing mesh. The danger of a lightning strike is considered to have passed 30 minutes after either the last thunder is heard or the lightning storm is more than 30 miles away.

Open sheds or open picnic pavilions found at parks and on golf courses offer no lightning protection. Hardtop cars and trucks with doors closed and windows shut offer lightning protection due to the surrounding metal chassis and body. There have been cases of cars being struck by lightning both while parked and while driving on the highway. Cars with fiberglass bodies are not considered lightning-safe by the National Lightning Safety Institute. A convertible automobile provides no protection from lightning because there is no continuous cage or metal skin surrounding the occupants. Rubber tires offer absolutely no lightning protection.

Wes Tyler

Pine tree bark stripped by lightning strike.

Sailboats, if properly equipped with a mast grounding circuit, generally offer greater protection than powerboats. Lightning protection is also increased for sailboats in saltwater, which is a better conductor of electricity than fresh water. Aircraft are also vulnerable to lightning strikes while on the ground and in flight. Fortunately, aircraft are normally diverted around active lightning storms, but when aircraft have been struck by lightning the metal fuselage dissipates the lightning current, protecting the passengers inside.

If caught outside during a lightning storm, seek shelter in a substantial building or vehicle immediately. If such shelter is not available there are some measures that will reduce the chance of lightning injury. Avoid all electrical conductors such as bodies of water, wet ropes, trees, metal fences, and towers. Remain well away from any trees. Lightning can arc outward sixty feet from where it strikes. The safest position if caught out in the open is crouched low to the ground with feet together, away from any metal items such as frame backpacks, umbrellas, and golf clubs. A common myth is a person who has been struck by lightning is electrified and shouldn't be touched. This is incorrect. First aid should be rendered immediately. All lightning injuries should be considered life threatening, and the victim should be taken to the emergency room immediately, even if the injuries do not appear to be severe. Lightning commonly causes serious internal injuries that are not immediately apparent.

Much remains to be known about the high-energy physics of lightning. The warm, humid South Carolina summers guarantee frequent afternoon and evening lightning storms that are triggered by passing cold fronts and squall lines, and by the afternoon sea breeze along the South Carolina coast. Lightning is fascinating to watch but should be treated with the utmost respect for its capricious yet deadly power. Additional information on lightning and lightning safety may be found on NOAA's lightning safety Web page: http://www.lightningsafety.noaa.gov/science.htm and the Web page of the National Lightning Safety Institute: http://www.lightningsafety.com.