

AMERICAN SOCIETY OF SAFETY ENGINEERS NORTH FLORIDA CHAPTER

AUGUST 2016 NEWSLETTER

Lightning, Michael Faraday, and a Famous DeLorean

Many of you reading this article live in Florida. As Floridians, you've likely become accustomed to seeing lightning on a regular basis. Various sources estimate the number of strikes in Florida to be between 1.0 and 1.5 million per year. Estimates of deaths from lightning in Florida hover just above five per year. And you may be interested to know that Florida is typically thought of as the lightning capital of the United States, followed by Louisiana, Mississippi, and Alabama. Go SEC! Relatedly, Lake Maracaibo in Venezuela has recently come to be recognized as the lightning capital of the world; lightning strikes here can be seen and felt roughly 67 percent of the year.

According to *National Geographic*, cloud-to-ground lightning bolts are a common phenomenon; about 100 strike the Earth's surface every single second. Their power is extraordinary in that each bolt of lightning can contain from

100 million to one billion volts of electricity. Also, according to *National Geographic*, lightning is extremely hot; a flash can heat the air around it to temperatures as high as five times greater than that of the sun's surface. And in case you've forgotten, it is approximately 10,000 degrees Fahrenheit there. This extreme heat causes surrounding air to rapidly expand and vibrate, which creates the booming thunder we hear a short time after seeing a lightning flash.

This massive electrical discharge known as lightning is caused by an imbalance between positive and negative charges. During a storm, colliding particles of rain, ice, or snow increase this imbalance and often negatively charge the lower reaches of storm clouds. Objects on the ground, like tall buildings, trees, and the Earth itself, become positively charged. Nature seeks to remedy this imbalance by passing current, which is the lightning that we often see, between the two charges.

Lightning is undoubtedly spectacular; but along with that awesomeness comes a high level of danger. It is estimated that 2,000 people are killed worldwide by lightning on an annual basis. Hundreds more are struck and fortunately survive; but they suffer from a variety of lasting symptoms that include memory loss, dizziness, weakness, numbness, and other life-altering ailments.

Inquisitively, many people may wonder how likely they are to be struck by lightning. The answer to this particular question is quite complex. Essentially, the answer is that it depends. According to Palm Beach County's website, the average annual per capita strike rate in the United States is 1 in 600,000. However, this does not indicate that any individual's odds of being struck are precisely 1 in 600,000. The probability of being struck varies from person to person and is determined by considering a number of different factors. Among the most significant factors are their personal

lifestyle, their hobbies, where they are located geographically, and what the climate is.

So, the question that likely arises in your mind about now is how to avoid being part of this errant, unharnessed billion volt electrical circuit. Well, many of the current words of wisdom are likely the same ones that your parents detailed to you back in the day. Namely, during a storm, avoid open high ground and isolated large trees. Avoid large bodies of water and being on a boat. Stay away from doors, windows, and metal objects, including pipes and faucets. If you have a land line, stay off of it. Avoid using electrical devices. And monitor NOAA weather radio. If you are suddenly confronted by a storm, seek shelter inside of a building or an automobile. However, automobiles constructed of fiberglass or plastic will not protect you; only

those constructed completely of metal will. Convertibles are also of no use as far as protection from lightning. However, Thelma and Louise, plus the Rain Man, all looked good in one.

Now, you may ask, just why are automobiles considered to be a safe haven from lightning? Much of the reasoning can be traced back to Michael Faraday, a great English scientist born in 1791. Mr. Faraday discovered electromagnetic induction, performed experiments in gas liquefaction and refrigeration, discovered benzene, and gave us what is commonly referred to as a Faraday cage. Mr. Faraday's work also influenced the choosing of my college major. If he were alive today, I'm sure that he would brag about that.

So a Faraday cage, like the one inside your microwave oven, functions as a protective

barrier from electricity. Brave men and women who perform maintenance work on high voltage power lines wear a metal mesh suit based on the remarkable Faraday cage. You can observe it here:

<https://www.youtube.com/watch?v=FGoaXZwFIJ4>. And this is what a car becomes when it is struck by lightning – a Faraday cage. And although it is not a perfect one because of windows and other things, it works; the outer metal surface carries most of the electrical current to the ground if struck.

In closing, I would be remiss if I did not mention lightning's contribution to the famous 1.21 gigawatts of electricity that enabled Marty and Doc Brown to do a bit of time travel in a DeLorean. And as fun as it may have looked in the movie, don't attempt it at home.

Bob Dooley

ASSE Local Chapter Meeting Schedule

Our next membership meeting will be held at the Northeast Florida Safety Council on September 21 at 11:30 a.m. Please RSVP to Steve Wilson at steven_wilson1@me.com.

Contact the ASSE Local Chapter

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<http://nfl.asse.org/>

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Article Sources and Hyperlinks of Interest

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