

The Power Of Lightning

By Jim Crosby

Lightning is one of the more powerful forces of nature that a boater can confront. It is also the one powerful force of nature that is least understood by almost everyone. It is said that the best protection from lightning is to avoid it whenever possible. Unfortunately, boaters cannot always avoid lightning. If you boat enough, sooner or later you are going to have to ride out a thunderstorm on the water.

Knowing the probabilities of such an event, the wise skipper will seek advance knowledge and make preparations to cope with such an eventuality. Understanding lightning is the first step to reducing your vulnerability.

A bolt of lightning carries up to 30 million volts of electricity at 100,000 amperes. That sudden, vast amount of energy released into the air will heat it up to 30,000 degrees Kelvin – white, hot heat that will char a large oak tree in a 50-microsecond exposure.

Warm, moisture-laden air rises and evaporates, forming fluffy, white cumulus clouds. As more moisture accumulates, the clouds darken and change into cumulus nimbus clouds – thunderstorm clouds. Frequently, they have a flattened top or anvil shape, reaching to 40,000 feet or more.

The interaction (friction) between cold and warm air creates a static electrical charge. The upper portion of the cloud develops a positive charge, and the lower portion develops a negative charge. The air, a poor conductor, restricts the flow of electricity between these electrical charges, between clouds and the clouds and ground. This allows the charges to build until they can breach the air insulator and explode into a lightning flash – flashes that can be cloud-to-cloud or cloud-to-ground.

These charges consist of negative and positive ions. Negative ions (charges) repel negative ions and attract positive ions and vice versa to say opposites attract and similar ions repel each other. Therefore, as a thundercloud passes overhead, a concentration of positive ions accumulate on objects below the cloud because they are attracted by the negative ions in the lower portion of the cloud. The

positive ions tend to accumulate at the top of the highest ungrounded objects around such as antenna masts, buildings and even people standing.

Earth ground represents a negative charge of ions. Therefore, if the tallest object around is electrically grounded, it becomes negatively charged and repels the clouds positive charge of ions. If the metal mast of a sailboat is negatively grounded to the water it lies in, the mast will repel the negative ion charge in the thundercloud overhead. However if it does not have a bonded ground to the water, it will accumulate a charge of positive ions that will attract the positive ions in the base of the cloud.

If that grounded object is tall enough, it can offer a cone of protection to everything under it that falls within a 45-degree angle in all directions from the top down, just like a pyramid. A sailboat mast or a radio antenna can offer this cone of protection as long as they have a bonded ground. Most radio antennas have a bonded ground through the radio to which they are attached, however, you must not disconnect the radio because if you do, you will attract lightning to it

Think about this theory and figure out a way to establish a cone of protection against a lightning strike on your vessel. And lastly, always make certain that you are not the highest object around in a thunderstorm because no one on this planet can offer you a guarantee against a lightning strike!