



**Glen Green**  
**Unit Commissioner**  
**Garden State Council**

# ***LIGHTNING SAFETY***



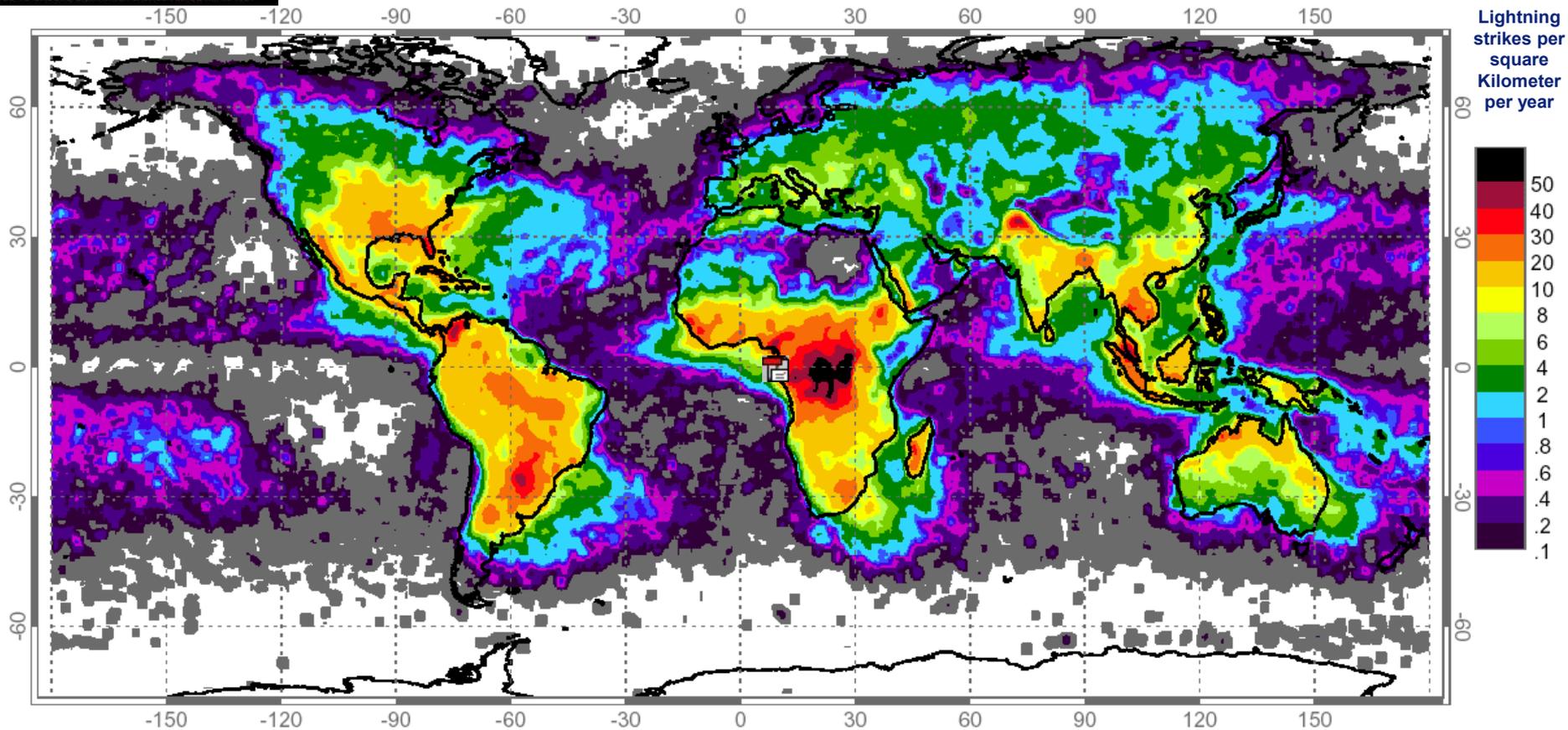
**Lightning is a capricious and random event. It cannot be predicted with any accuracy. It cannot be prevented. Advanced planning is the best defense. Immediate evasive action could save a life.**







Map courtesy of NASA



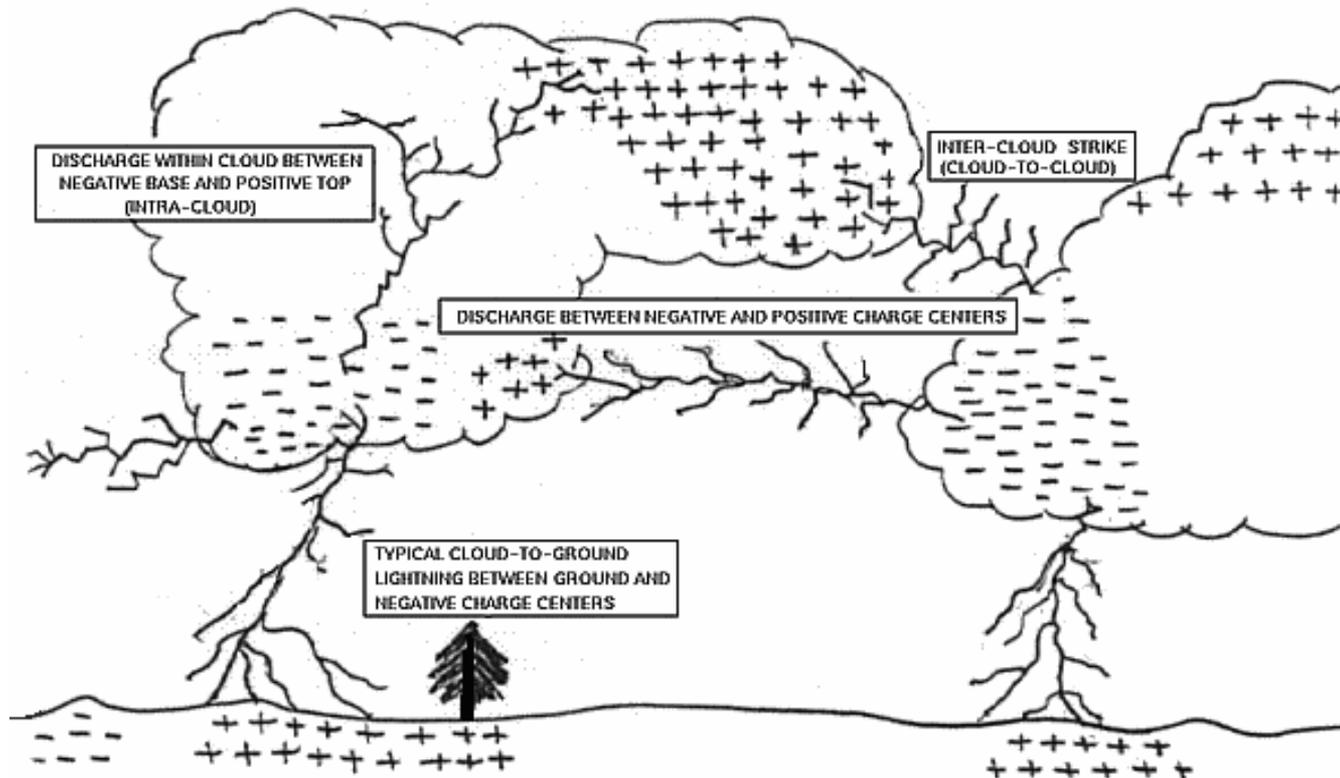
At any given moment there are approximately 2,000 thunderstorms on the planet earth. Lightning strikes the surface 100 times per second. Generally speaking, lightning activity increases with altitude and as you get close to the equator. An estimated 40 million lightning strikes account for upwards of 100 deaths annually (13 are aboard boats) in the United States, making lightning considerably more worrisome than hurricanes and sharks.



# Lightning Safety



Sketch courtesy of NASA



The lower part of a thundercloud is usually negatively charged. The upward area is usually positively charged. Lightning from the negatively charged area of the cloud generally carries a negative charge to Earth and is called a negative flash. A discharge from a positively-charged area to Earth produces a positive flash.





## **Cloud-to-Cloud Lightning**

**75% of the  
lightning**

# Cloud-to-Ground Lightning



# Ground-to-Cloud Lightning







Both cloud-to-cloud, and  
cloud-to-ground lightning

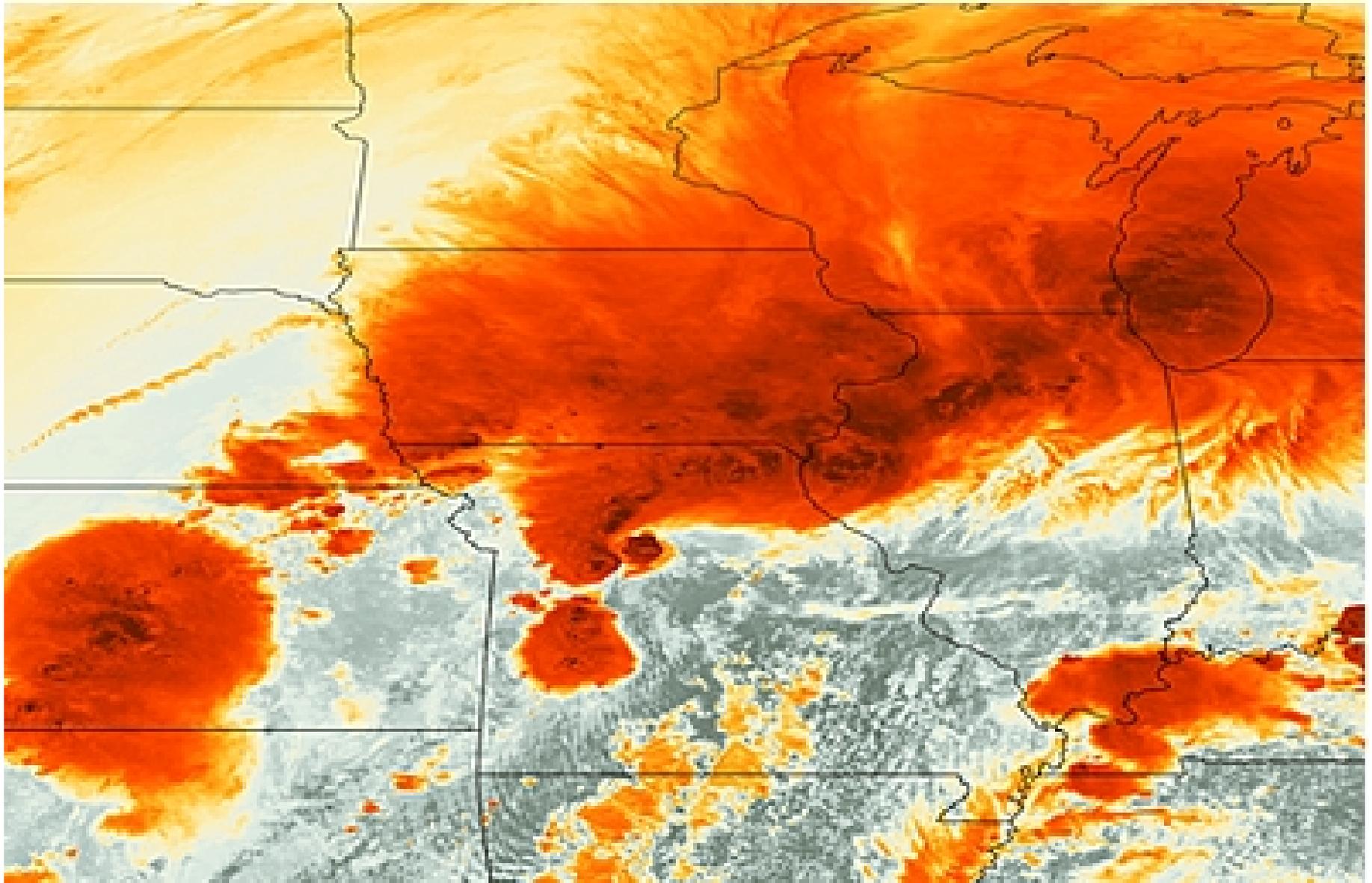
# Upward-moving Lightning



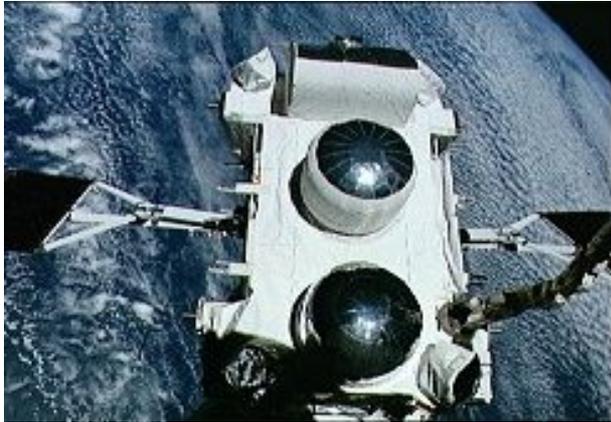
Cameras onboard the Space Shuttle have photographed “red sprites” and “blue jets” – huge colorful emissions associated with upward-moving lightning coming from the tops of massive thunderstorms

# What a Thunderstorm look like from Space

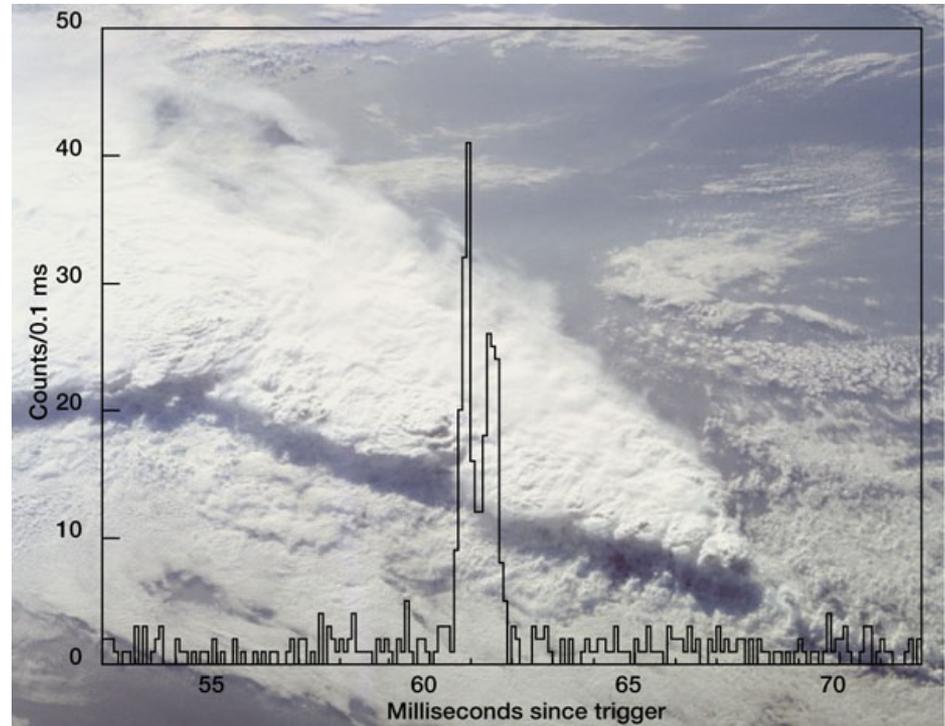
Infrared photo



# Dark Lightning



## Terrestrial Gamma-ray Flashes known as “DARK LIGHTNING”



Just as powerful and fascinating as what comes out of the bottom of storm clouds are the flashes of gamma-rays that have been observed coming out of the top. Terrestrial gamma-ray flashes (or TGFs) are short blasts of gamma-ray energy associated with thunderstorms. They only last a few milliseconds - about as long as the sound from a snap of the fingers - and can only be detected by satellites orbiting the Earth. NASA scientists inadvertently discovered TGFs while they were monitoring bursts of gamma-ray energy coming from the depths of space.



ICIAL **CNN** TRAYVON MARTIN'S FAMILY RESPONDS TO LETTER FROM

3:32 PM ET





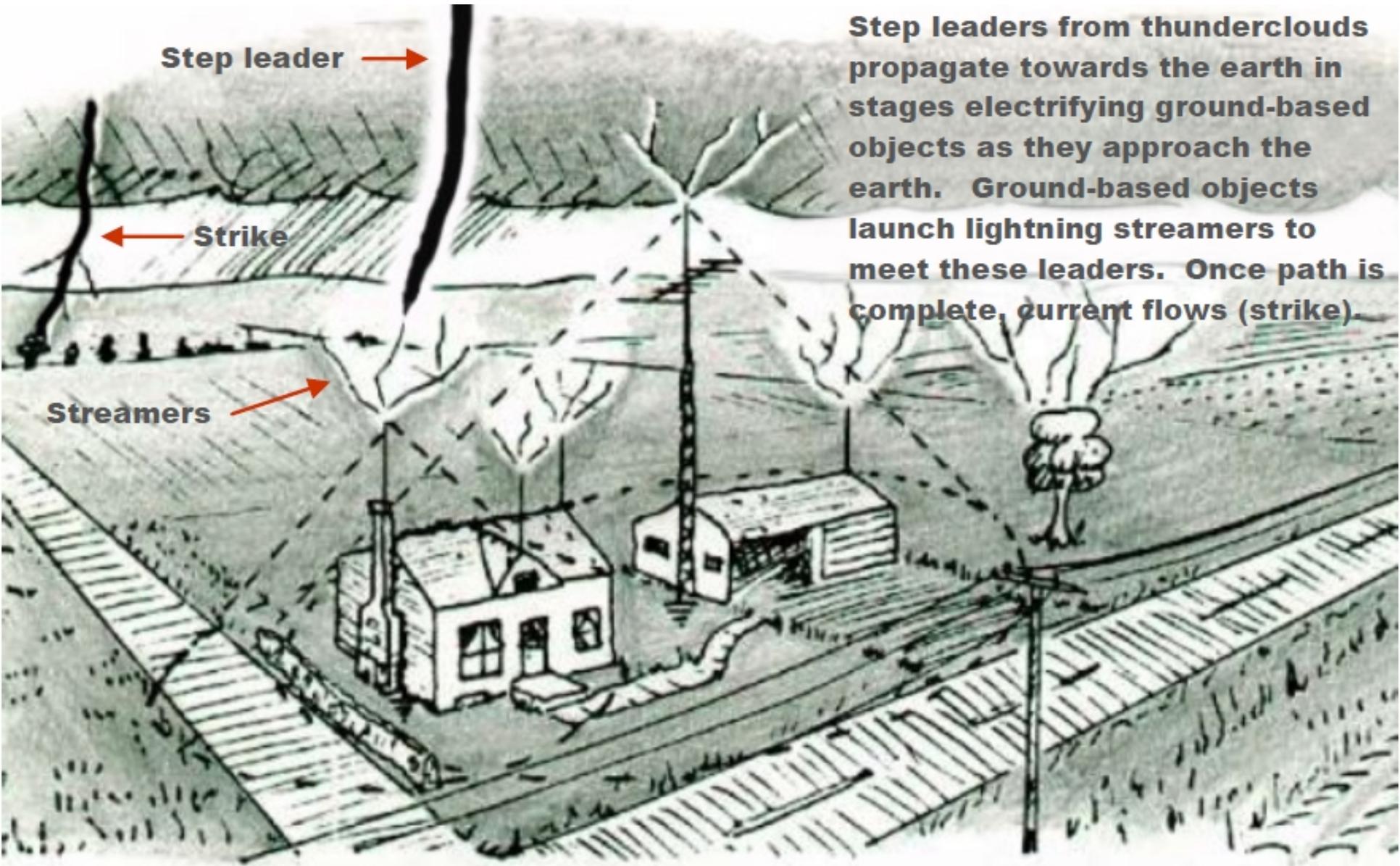
**Tornado Lightning**



**Volcano Lightning**



*Martin Rietze (Alien Landscapes on Planet Earth)*



**Step leader** →

← **Strike**

**Streamers** →

**Step leaders from thunderclouds propagate towards the earth in stages electrifying ground-based objects as they approach the earth. Ground-based objects launch lightning streamers to meet these leaders. Once path is complete, current flows (strike).**



## Other Misconceptions:

- Surge protectors will save your electronics if lightning strikes your power line. No way! Surge protectors provide protection for power surges in the line from the power company, but not for lightning.
- Lightning can set you on fire. The "*crispy critter*" myth. This is the belief that the victim struck by lightning bursts into flames or is reduced to a pile of ashes. In reality, lightning often flashes over the outside of a victim, sometimes blowing off the clothes but leaving few external signs of injury and few, if any, burns.



## Common Misconceptions and Myths:

- Lightning never strikes twice. It strikes the Empire State Building 22-25 times per year!
- Rubber tires on a car, motorcycle or bicycle will offer some protection from lightning. It takes about 10,000 volts to create a one inch spark. **Lightning has several million volts, and easily can jump 10-20 feet!** In strong electric fields, rubber tires actually become more conductive than insulating. **It's not the rubber tires that make a vehicle safe – it's the metal enclosure (Convertibles with canvas tops, cars with fiberglass bodies, motorcycles and bicycles offer no lightning protection!)** When in a vehicle during a lightning storm, close the windows and keep your hands on your lap.
- A person after being struck by lightning can carry an electrical charge for a short period of time. Injured persons do not carry an electrical charge and can be handled safely. Deaths from lightning are a function of cardiac arrest and stopped breathing. Administer first aid procedures immediately to a lightning victim, and call 911 or send for help immediately. **CPR is the recommended first aid** followed by treating for electrical burns.

## Lightning Safety





The 1,442 foot Empire State building is struck by lightning about 23 times a year which demonstrates that lightning usually strikes the highest object in the area, but only 23 times a year also highlights the fact that lightning sometimes strikes objects in the area that are not as tall, since there are many times that number of thunderstorms that occur a year in New York City.



These first photo shows the 1,451 foot high Willis Tower (formerly Sears Tower) being struck by lightning bolt traveling sideways from a distance, and a photo of the Willis Tower being struck will a smaller building nearby being struck by another lightning bolt. The antenna is not being hit directly, instead a corona of charged ions which pools up around the antenna is interacting with a charge descending form above to give off the light that is seen in these lightning strikes.





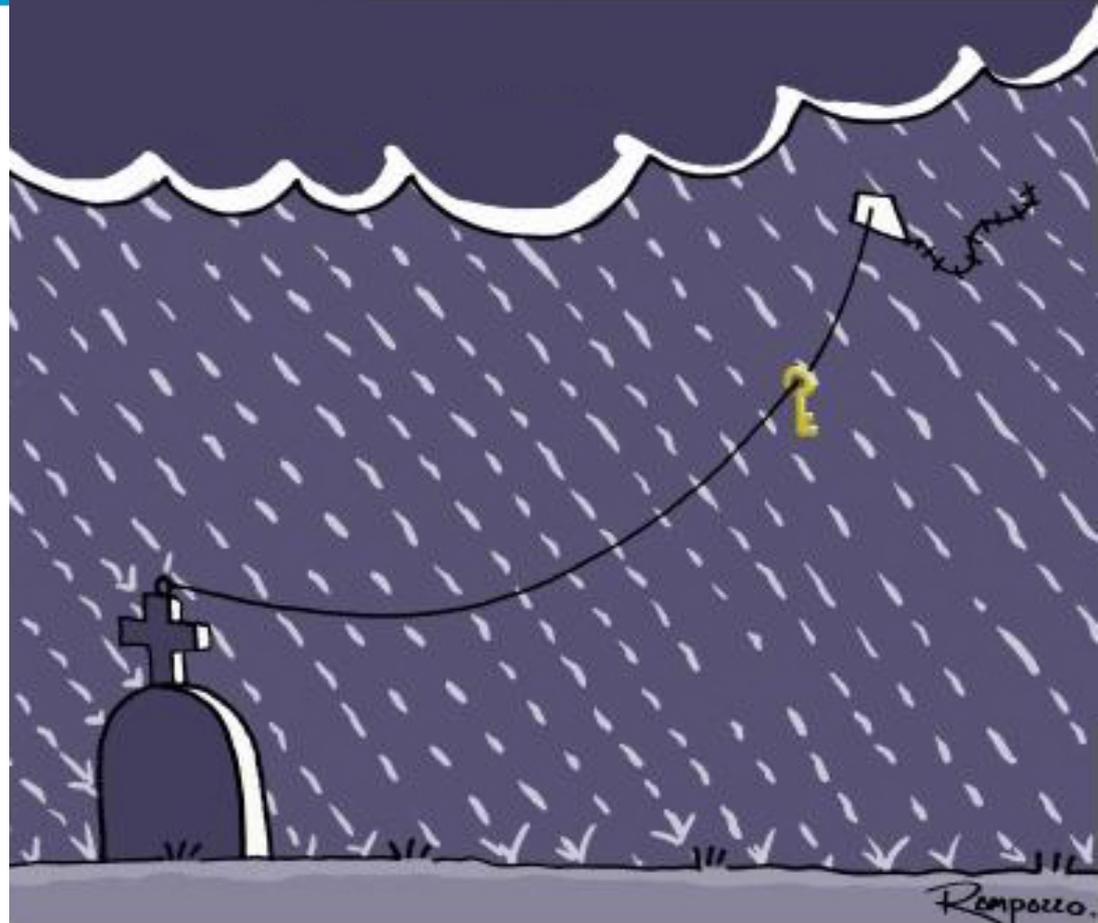
“Struck by lightning, twice.”

## Misconception:

# Lightning Safety



- Ben Franklin's kite was struck by lightning. No way! Contrary to popular school teachings, Mr. Franklin was very lucky to survive his experiment. The spark he saw was a product of the kite/key system being in a strong electric field. Had the kite/key actually been struck, Mr. Franklin would surely have been killed. As we all know now, his experiment was extremely dangerous and should not be repeated.



- Don't try this at home.

AND WHAT DO YOU DO FOR A LIVING RICHARD?

I'M A "LIGHTNING CONDUCTOR."





A man-made lightning strike created by sending a model rocket with a thin copper wire into a storm cloud. The lightning follows the wire down, vaporizing it

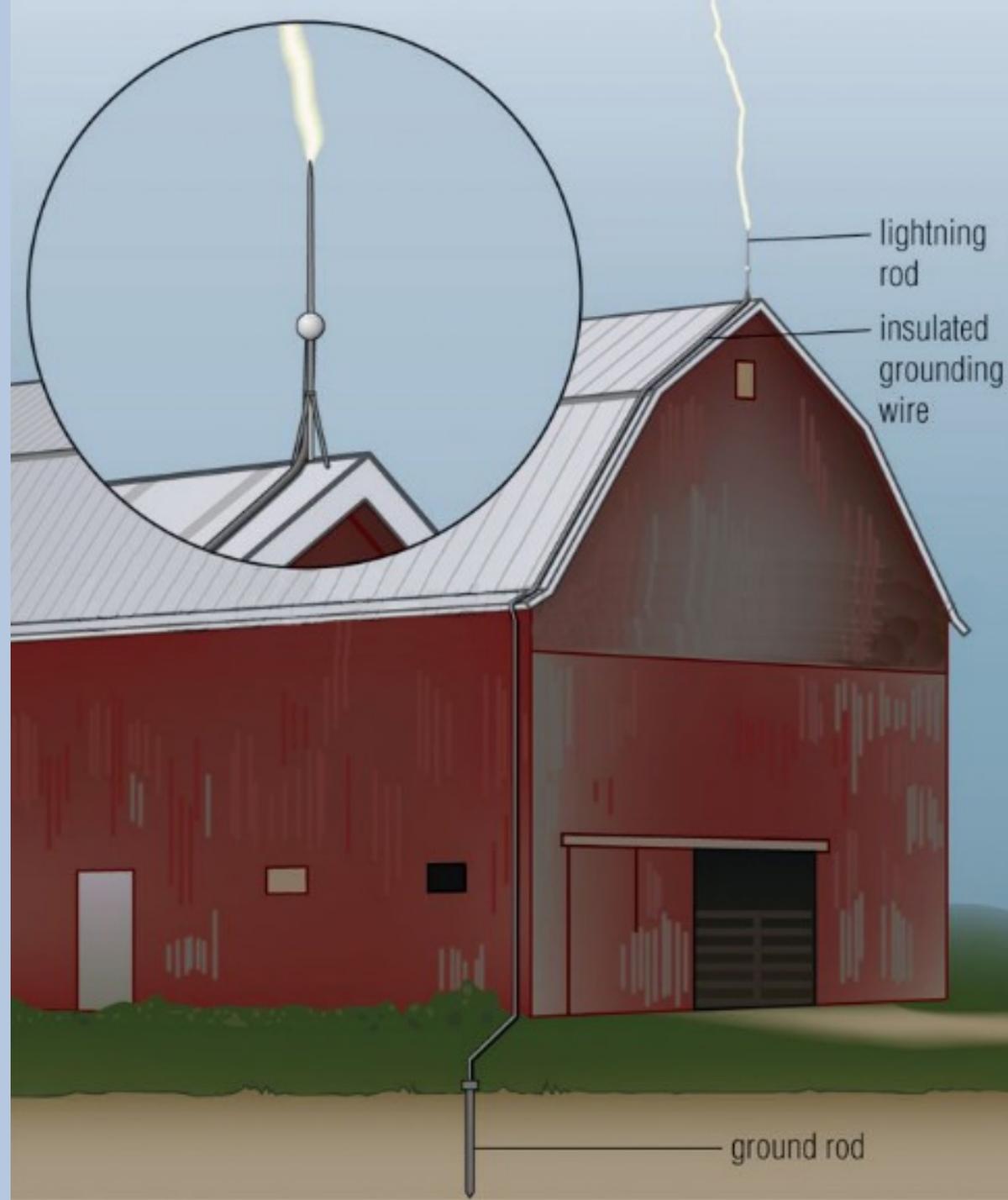


"That's perfect Barry, hold it right there!"

## Misconception:



- Lightning rods "attract" lightning. Why would anyone purposely attempt to attract a phenomenon this dangerous to a location near the structure that they are trying to protect? Lightning rods provide a low resistance path to ground that can be used to conduct the enormous electrical currents when lightning strikes occur, diverting the strike current to ground before it can do any more damage. Regardless of whether or not a lightning rod system is present, the strike will still occur.



## LIGHTNING RODS

### Ridge Strap Lightning Rod and Mount

With 12" Solid Rod.

Copper or aluminum strap mount with cable clamp for use on ridge, flat or sloping roofs.— Shipped flat but may be easily formed to fit any roof slope.

**Copper:**

Catalog #C-4-12 with 12" Rod \$27.00  
With 18" Rod #C-4-18 \$33.00

**Aluminum:**

#A-4-12 with 12" Rod \$18.00  
With 18" Rod #A-4-18 \$21.00

Longer length rods add \$1.00 per inch



### Swivel Lightning Rod with clamp base

With 12" solid Rod.

Great for installing behind Ridge Vent

Heavy cast copper or aluminum.  
For use on back side of roof to hide mount from view.

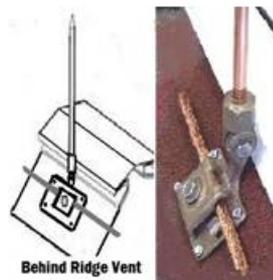
**Copper:**

Catalog #C-16-12 with 12" Rod \$34.50  
With 18" Rod #C-16-18 \$40.50

**Aluminum:**

Catalog #A-16-12 with 12" Rod \$24.50  
With 18" Rod #A-16-18 \$27.50

Longer length rods add \$1.00 per inch



### Deluxe Bolted Metal Bonding Lug

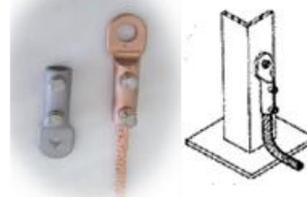
Heavy cast copper or aluminum lug with stainless steel bolts for connecting to metal objects.

**Note:** If connecting copper to aluminum, a stainless steel washer can be inserted between the two metals to avoid corrosion.

**Copper: # C-20 \$ 8.00**

**Aluminum: # A-20 \$ 6.25**

Bolted connectors allow for Easy removal when re-roofing.

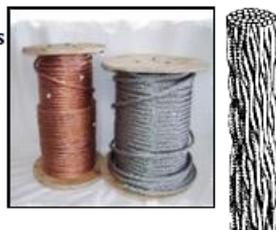


## Lightning Conductor Cable's

**Class 1—Standard of the industry for buildings under 75' high (Other sizes available).**

**Copper Conductor Cable:**

Catalog #C-1 Copper **\$2.35 per ft.**  
Braided approx., 7/16" diameter Copper Cable in smooth Basket weave configuration.



### Economy Crimp Double Cable Splicer

Fingers are crimped over the cable with pliers or hammered over the cable.

(For a better bolted splicer see #10-Z at right)

**Copper: Catalog # C-6 \$2.90**

**Aluminum: #A-6 \$1.90**



Typical use on parallel splice

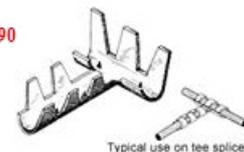
### Economy Crimp TEE Splicer

Fingers are crimped over the cable with pliers or hammered over the cable.

(For a better bolted splicer, see #19 at right)

**Copper: Catalog # C-8 \$2.90**

**Aluminum: #A-8 \$1.90**



Typical use on tee splice

## GROUNDING RODS

### Ground Rods and Ground Rod Clamps

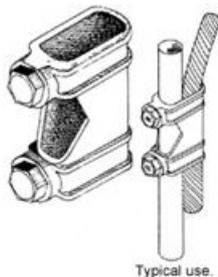
**LEFT:** Ground Rod is 1/2" x 8' long made of copper clad hardened steel. Long life corrosion resistant. **Note:** Never connect aluminum underground.

**8' Ground Rod (Left) #22 \$19.00 (Note: Additional shipping due to high shipping costs, ground rods may be available locally at less cost).**

**Copper Ground Clamp (Right) # C-23-A for 1/2" or 5/8" ground rods \$11.00**

**# C-23-B for 3/4" ground rods \$12.00**

Used for connecting copper cable to ground rod. Will fit 1/2" - 5/8" - 3/4" ground rods. Two stainless steel bolts with 2" contact length along axis of the grounding rod.



Typical use.

### Copper Ground Plate with Clamp

2 square foot x 0.032 thick copper flat plate.

Comes complete with attached clamp for ground cable.

**Copper: # C-24 \$ 62.00**

Use in place of Ground Rods where shallow top soil is encountered -  
For soil depths of 1 to 2 ft.



2 SQ. Ft. Ground Plate Bury 1 to 2 Feet Deep

### Cable Loop Fasteners

Strap Copper or Aluminum loop type cable fastener requiring one nail or screw—1/2" wide. Use one for every 3 feet of cable.

**Copper: Catalog #C-2 .30 each**  
**Tinned Copper #C-2-T .35 each**

**Aluminum: Catalog #A-2 .24 each**



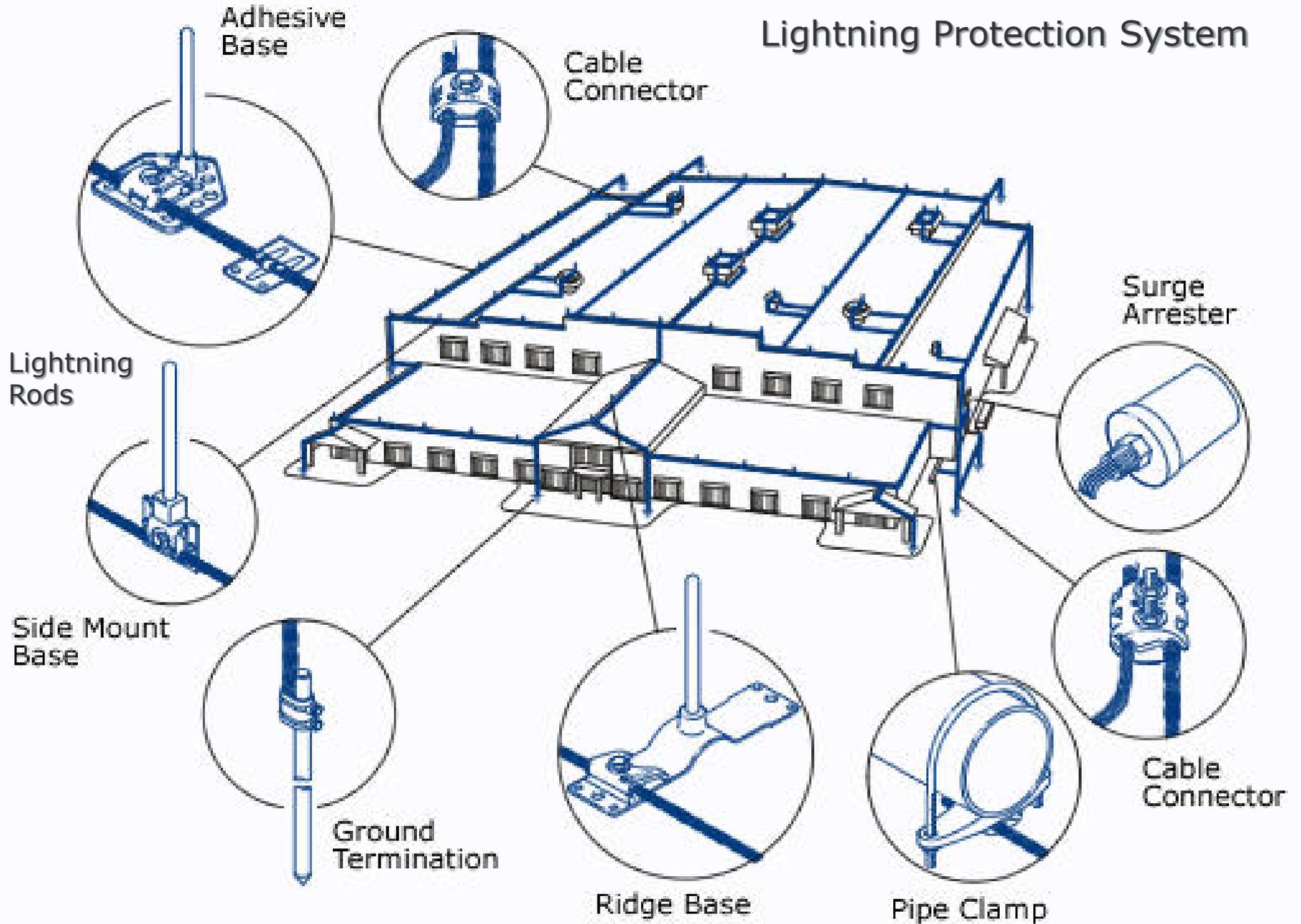
### Adhesive Cable Holder's for Flat Roofs

Used for Commercial type membrane roof applications and where roof penetrations are not desirable. Tabs are bent or hammered over the cable.

**Copper: # C-13 \$1.20 ea.**

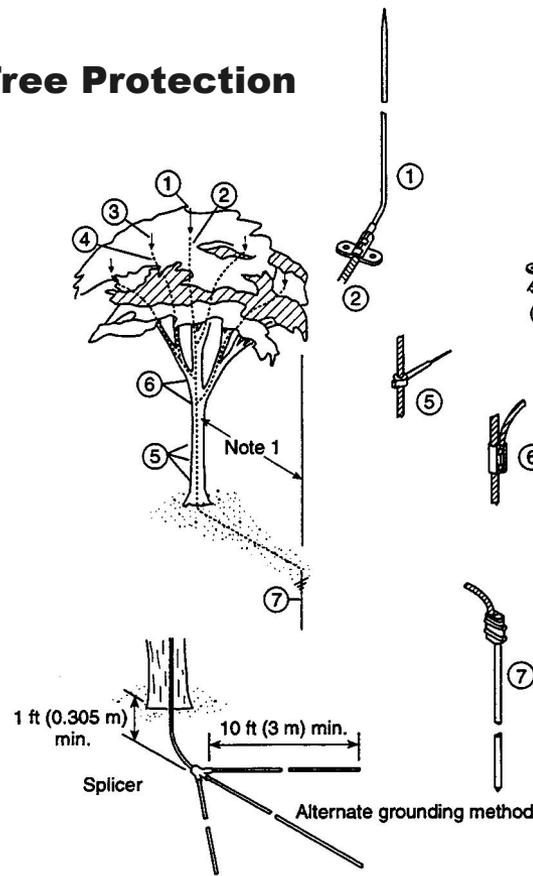


# Lightning Protection System

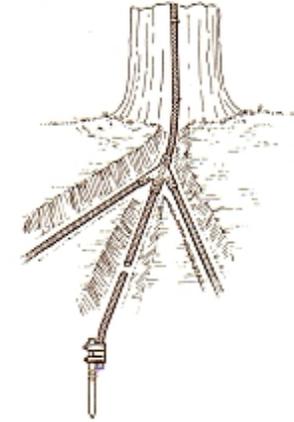




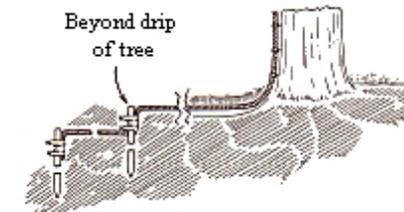
## Tree Protection



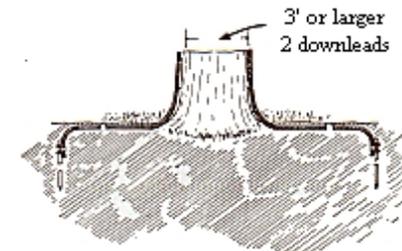
In sandy, rocky, or very dry soils, an extensive ground system may be necessary.



Underground sprinkler systems, water pipes and other metal objects are very good grounds



Large trees with trunks measuring three (3) feet or more in diameter should have two (2) ground cables extending beyond spread of branches and connecting to proper ground system



Ground cable should be buried to a sufficient depth to avoid displacement or damage.



**FACT: Tall trees DO NOT PROTECT.** As a matter of fact, they could actually make things worse. Lightning usually jumps from the tree to the house because of all the grounded metal items inside and outside the house. Metal is a MUCH better conductor of electricity than a tree.

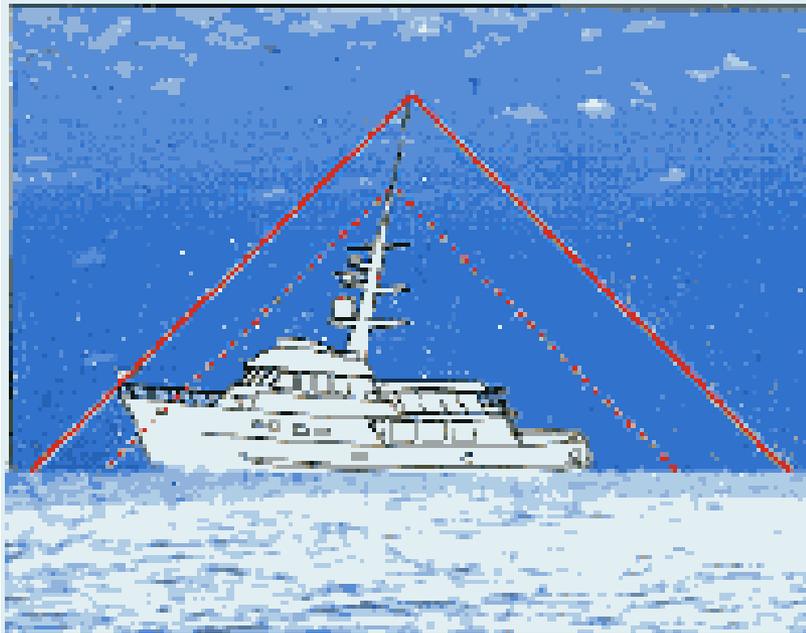
# Installing a Lightning Protection System



- 1. Purchase one or more lightning rods with mounting bases to be attached to the highest points of the roof of the building.
- 2. Purchase braided copper cable of the correct gauge and sufficient length to connect the lightning rods to the grounding rods or grounding plate(s).
- 3. Purchase a grounding rod to go along with each lightning rod, or purchase a copper ground plate(s).
- 4. Drive the grounding rod into the ground, or bury the copper ground plate at the proper depth (An earth ground meter <http://tinyurl.com/kq8nf6e> with earth potential gauge can tell if adequate conductivity to ground has been met).
- 5. Connect the braided copper cable to each of lightning rod's clamp at the mounting base.
- 6. Connect the braided copper cable to the ground rods using ground rod clamps, or to the copper ground plate(s) using their attached clamp.



*"Just between you and me, Roy, I don't know how much longer I can keep doing this company lightning-rod thing."*



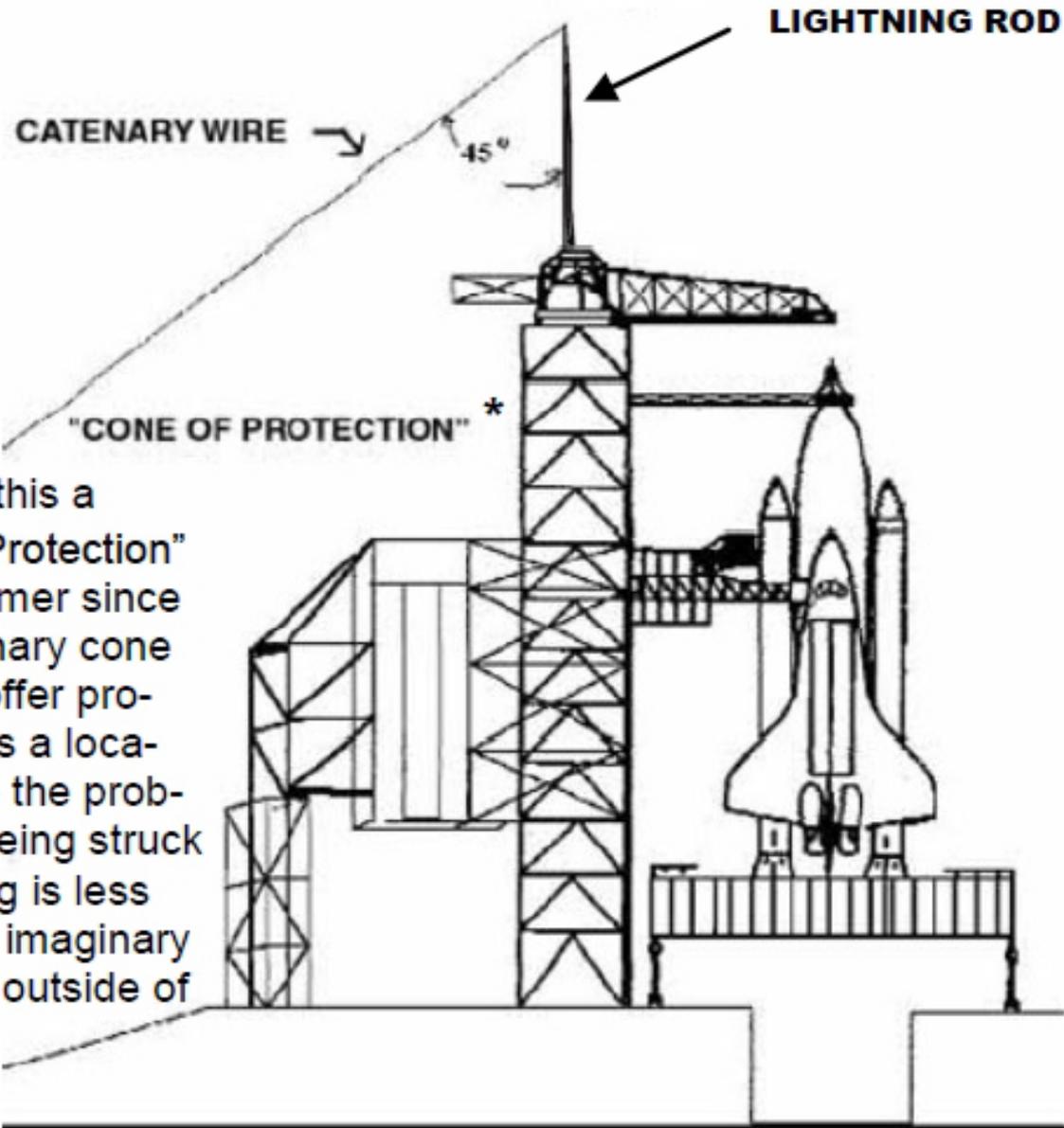
**Cons:**

**<http://www.marinelighting.com>:** “Idea of a ‘cone of protection’. This somewhat flawed idea holds that a vertical conductor forms an effective cone of protection, the apex of the 90 degree cone being at the top of the conductor, and protects the circular area of the cone's base. The idea is flawed in that a vertical conductor does not eliminate the electric field on the ground within this "protected" circular area. Any conductors inside the area, people included, may give rise to upward streamers if this electric field reaches breakdown strength.”

**Pros:**

**<http://www.boatsafe.com>:** “It is generally accepted that this cone of protection extends 45 degrees, all around, from the tip of the metal protrusion. This means that if the aluminum mast of the average sailing vessel is properly bonded to the vessel's other major metal masses and is given a direct, low-resistance conductive path to ground, the entire boat should fall within the protected zone. If the vessel has a wooden or composite mast, a marine electrician can achieve the same effect by installing a 6 to 12 inch metal spike at the top and running a heavy conductor down the mast and as directly as possible to ground, usually through the engine and propeller shaft.”

# ROCKET SCIENTISTS BELIEVE IN A CONCEPT THEY CALL THE "CONE OF PROTECTION"



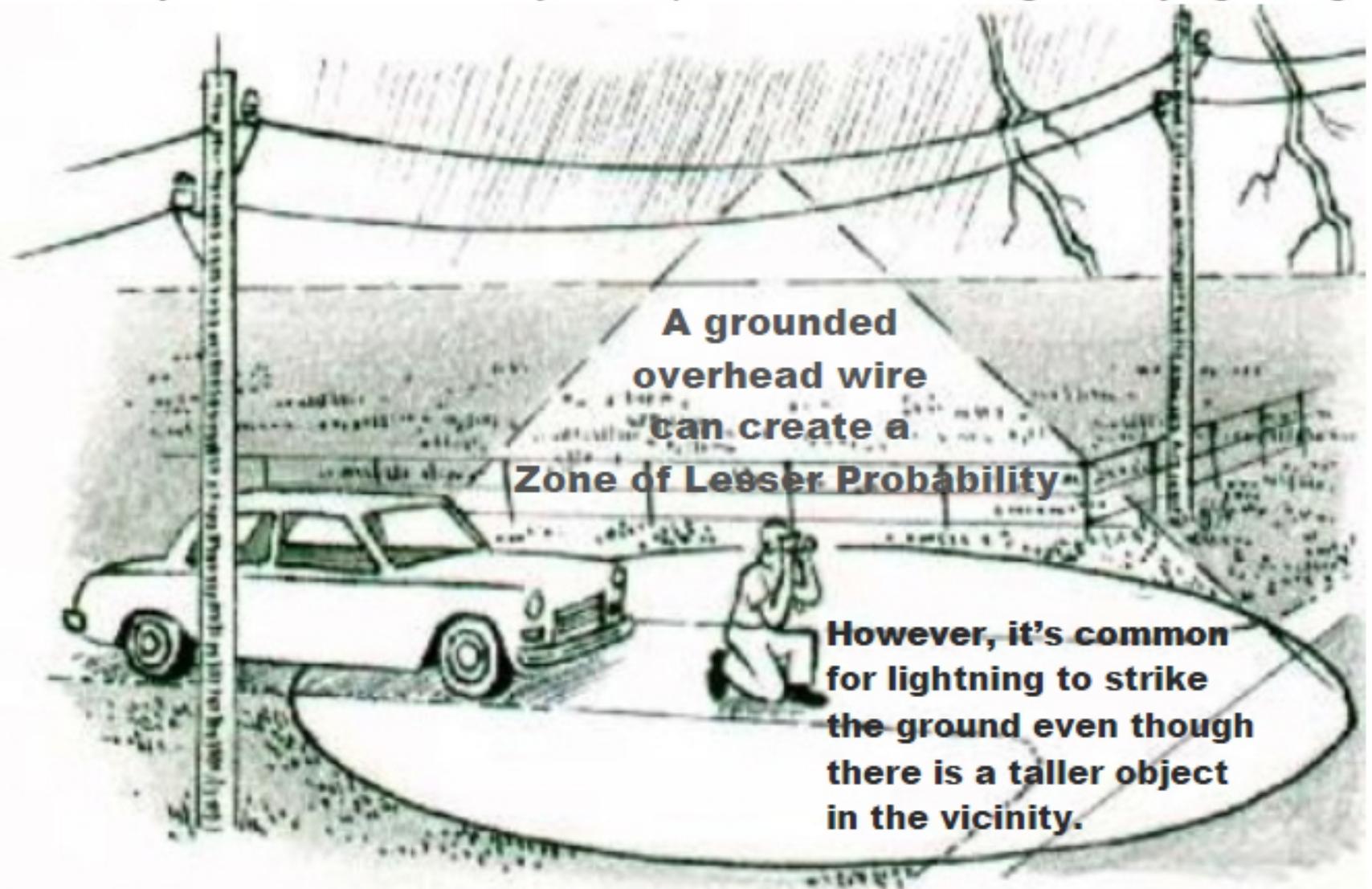
\* Calling this a "Cone of Protection" is a misnomer since this imaginary cone does not offer protection, it is a location where the probability of being struck by lightning is less inside this imaginary cone than outside of the cone.

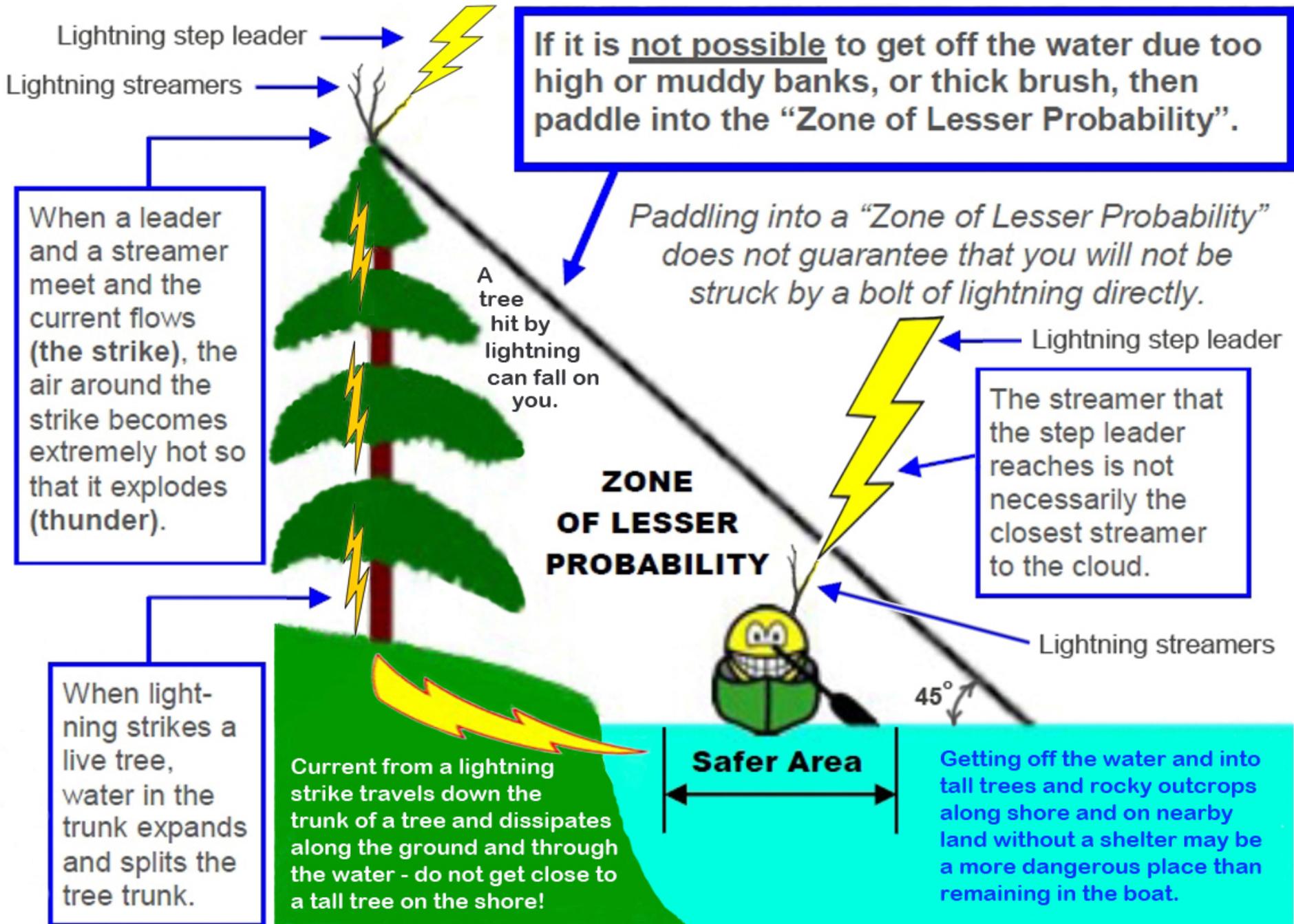


As we were saying in the previous slide, calling this a **“Cone of Protection”** is a misnomer. Although the Space Shuttle launching pad has a grounded lightning rod attached to the highest point on the gantry, as you can see in the photo, lightning struck inside this imaginary **“Cone of Protection”**. This zone is better described as a **“Zone of Lesser Probability”** of being struck by lightning. You can be struck by lightning when you are inside this zone, you just have a reduced chance of being struck if you are within this zone.

## **No place outside is safe in a thunderstorm.**

If it is raining especially hard, lightning may not be readily visible and thunder may be drowned out. If the atmosphere has enough energy to make it rain really hard, it could easily be capable of unleashing deadly lightning.





If it is not possible to get off the water due too high or muddy banks, or thick brush, then paddle into the "Zone of Lesser Probability".

When a leader and a streamer meet and the current flows (the strike), the air around the strike becomes extremely hot so that it explodes (thunder).

Paddling into a "Zone of Lesser Probability" does not guarantee that you will not be struck by a bolt of lightning directly.

A tree hit by lightning can fall on you.

The streamer that the step leader reaches is not necessarily the closest streamer to the cloud.

When lightning strikes a live tree, water in the trunk expands and splits the tree trunk.

Current from a lightning strike travels down the trunk of a tree and dissipates along the ground and through the water - do not get close to a tall tree on the shore!

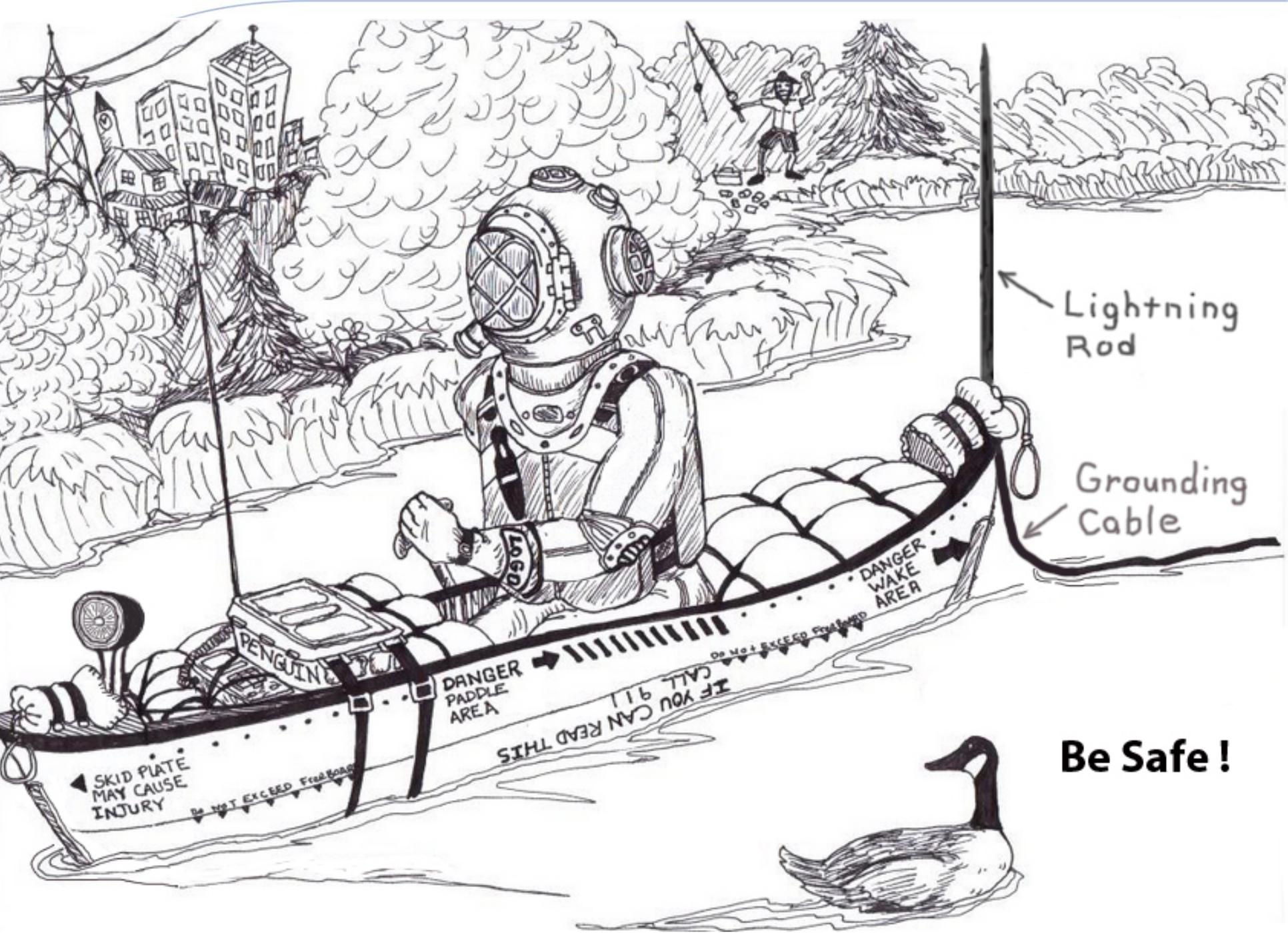
**Safer Area**

Getting off the water and into tall trees and rocky outcrops along shore and on nearby land without a shelter may be a more dangerous place than remaining in the boat.

45°

**Lightning doesn't  
always strike the  
highest objects  
on the water**





Lightning Rod

Grounding Cable

SKID PLATE MAY CAUSE INJURY

PENGUIN

DANGER PADDLE AREA

IF YOU CAN READ THIS CALL 911

DANGER WAKE AREA

**Be Safe!**



"Odd . . . Right about here on the map the name changes from 'Schuylkill River' to 'Lower Schuylkill River'..."



GLEN F. GREEN

## Facts:

# Lightning Safety



Charles Allison © 1998

### > Human Fatalities by natural hazards 1940-1981

Lightning 7,741

Tornado 5,268

Flood 4,481

Hurricane 1,923\*

*\*Note: Hurricane deaths seem to be on the rise – in 2005 Hurricane Katrina killed more than 1,200 people.*

- > Gender: 84% male 16% female.
- > 70% of strikes happen between June and August.
- > Most strike occur between 2 PM- 6PM
- > Number of victims:
  - One 91%
  - Two or more 9%
- > Victims: 85% are children or men ages 10 - 35 engaged in recreation or work.
- > 25% of strike victims die.
- > 70% of survivors suffer serious long-term after effects.



## WHERE MOST LIGHTNING DEATHS OCCUR

**54%**  
Open Fields,  
Ball Parks,  
Golf Courses

**23%**  
Under  
Trees

**12%**  
Beach  
& Boats

**7%**  
Operating  
Farm  
Equipment

**4%**  
Other: Near  
Open Windows,  
Bicycling, etc.



**Approaching  
thunderstorm**

# Lightning Safety



**When you start to hear thunder it is time to be alert. Look for the signs of an impending thunderstorm. High thin clouds streaking overhead, dark rising columns of "cotton balls" with shredded tops or dark bases with jagged torn bottoms.**





## Avoid and Evade

- Step 1** Pay attention to the weather. Check the forecast before heading out on a hike. Weather can change quickly in the mountains. So always be mindful of the clouds. Dark underbellies, changing winds, and a scent of rain all portend bad weather. Watch the leaves too; the low pressure associated with rains turns leaves over.
- Step 2** Be willing to turn around. If you are hiking to the summit of a mountain, be sure to yield to weather conditions, especially if you are above the tree line.
- Step 3** Take caution, be prudent, and stay mindful. React before the weather changes, not afterward. Always respect the wilderness, and never go toe to toe with a thunderstorm. It is better to be late in this world than early in the next.

### Things You'll Need:

- Quick feet Good sense Watchful eye
- Quick feet
- Good sense
- Watchful eye



Quick feet



## When hiking and a thunderstorm is approaching:

- Step 1** Turn off all electrical equipment. Cell phones and GPS devices make for good conductors.
- Step 2** Make sure nothing metal is protruding from your body, backpack, or gear.
- Step 3** Find shelter fast. Get below the tree line immediately, and continue to descend quickly.
- Step 4** Keep moving. Don't stop. The chances of being struck decrease the more you move. Keep heading down the mountain, back to shelter, or away from the storm. Additionally, trees, once struck, can shatter, sending out lethal shrapnel. Don't stay under any one tree too long.
- Step 5** Look for shelter. Find a cave, a low lying depression, anything that is out of the wind and unlikely to be struck. In a worst case scenario, lie down between some rocks.

**You are in danger from lightning if you can see it or hear thunder.**



# TEMPEST IN A TEACUP





if you can see it,  
**flee it.**

if you can hear it,  
**clear it.**

when thunder roars,  
**go indoors!**



"Todd, have you ever noticed how thunder sounds like the angels are bowling?... Todd?"



Charles Allison © 2001

**Lightning can travel sideways for up to 10 miles, so it is possible for a, "bolt from the blue," on the edge of a storm. At least 10% of lightning occurs without visible clouds in the sky. If you can hear thunder, lightning is close enough that it could strike your location at any moment. Go to a safe shelter immediately. If you wait until you see lightning, it may be already too late to take action. Most people struck by lightning are not in the rain!**



**Lightning  
can  
come  
from  
the side  
and  
then  
strike  
down**



**Common misconception:**

**1 second = 1 mile.**

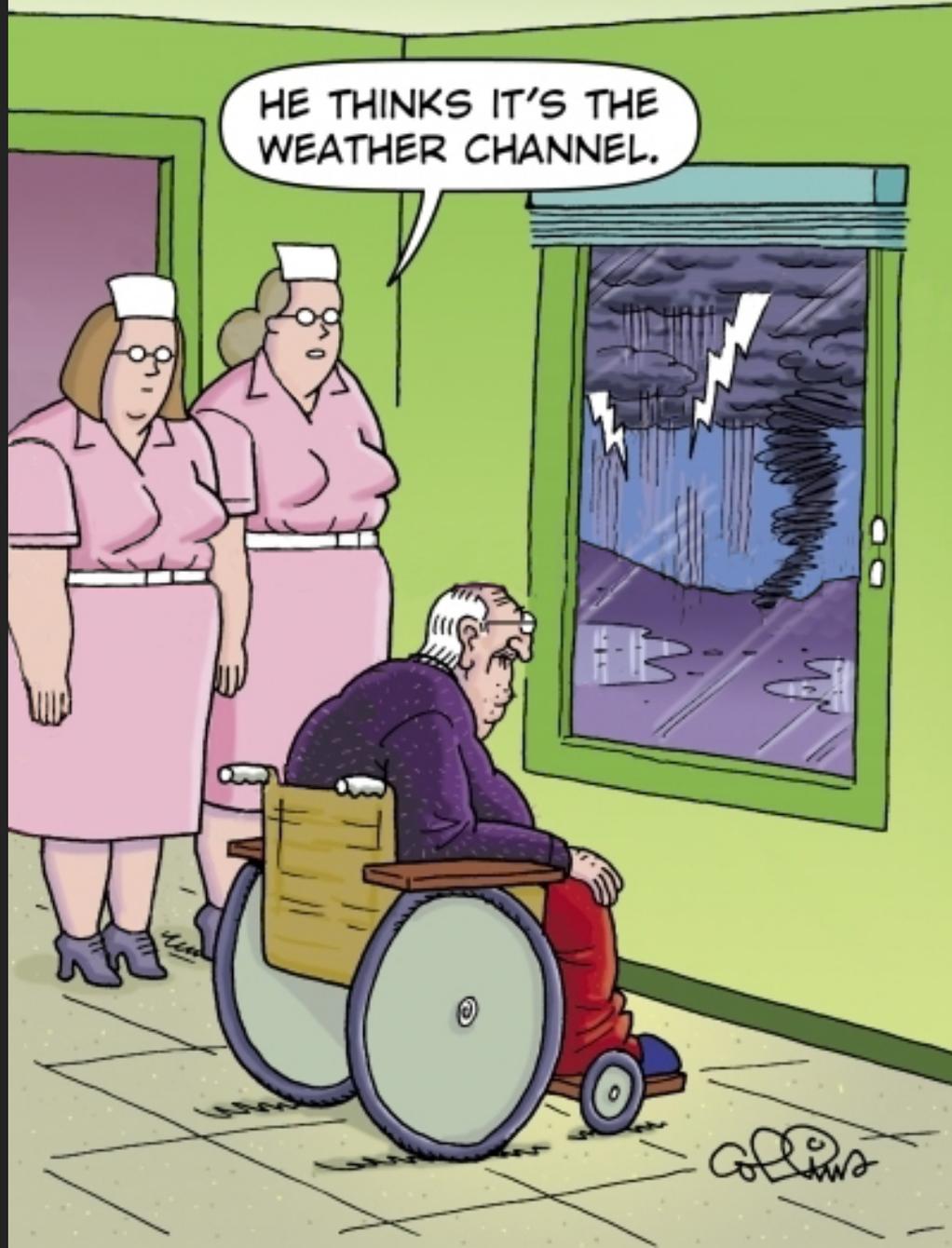
**Actually:**

**5 seconds = 1 mile**

**If 30 seconds or less “Flash To Bang”- Seek Shelter (“30/30 Rule):**

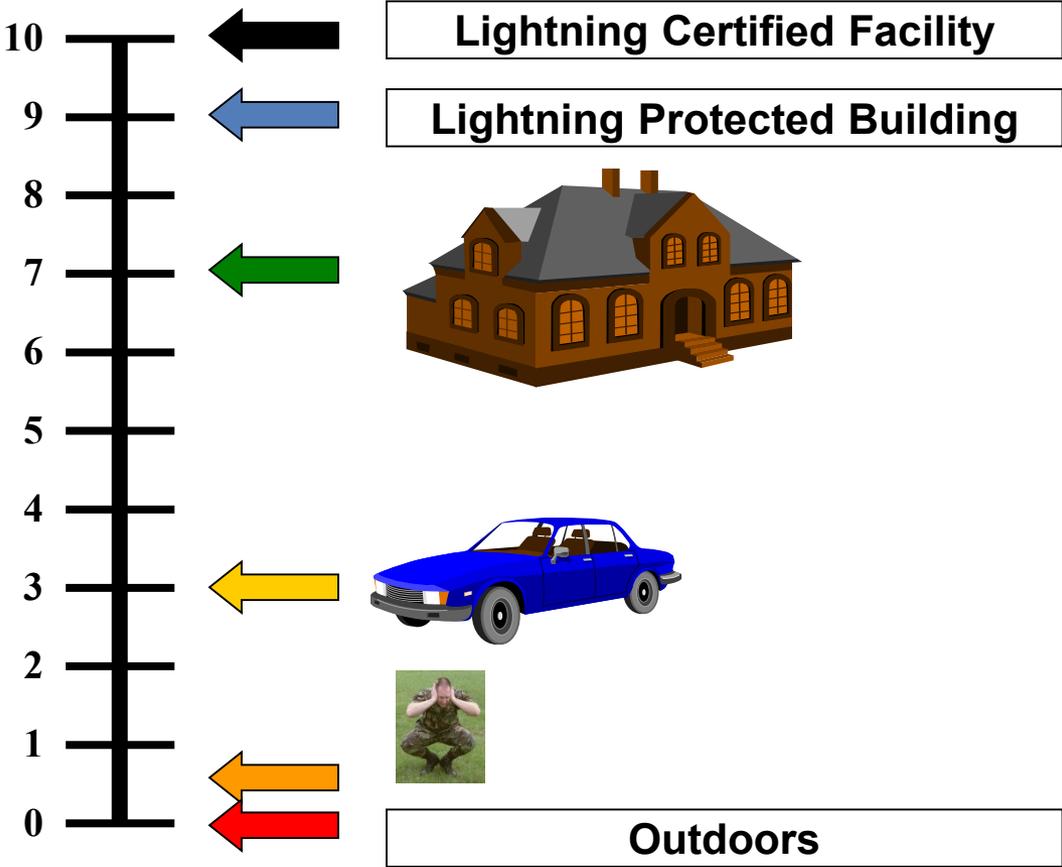
- **When you see lightning, count the time until you hear thunder.**
- **If this time is 30 seconds (6 miles) or less, seek proper shelter.**
- **If you do not see the lightning, hearing thunder is a good back-up rule.**
- **Wait 30 minutes after hearing the last thunder before leaving shelter.**

HE THINKS IT'S THE WEATHER CHANNEL.





Relative Lightning Protection



No place **outside** is safe near a thunderstorm

Near  $\equiv$  6-8 miles



ANOTHER  
ALL STEEL HOME  
BUILT BY  
WIT CONSTRUCTION

*T. No'craker*  
95

**When thunderstorms nearby, avoid these activities like your life depends on it, because it does!**



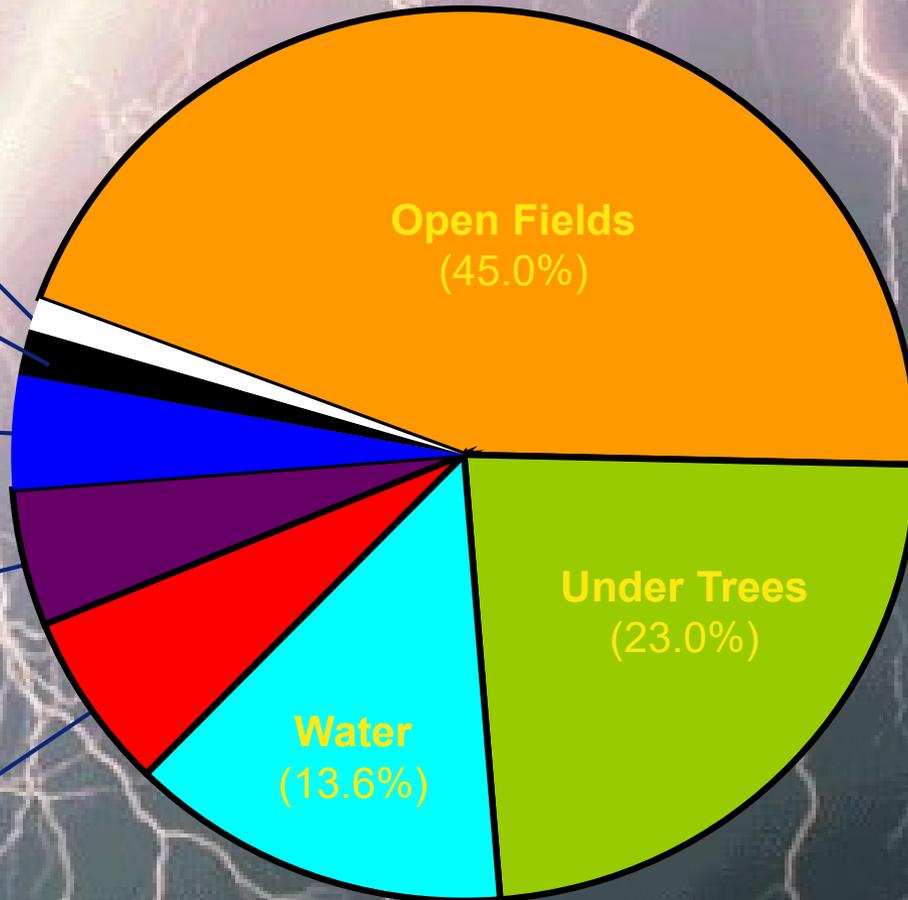
**Radio and Radio Equipment**  
(1.2%)

**Golf and Trees**  
(1.7%)

**Telephone**  
(4.0%)

**Farm and Heavy Equipment**  
(5.0%)

**Golf**  
(6.5%)



**Lightning Casualties In U.S. (1959-1994)**

## Top five states producing lightning:

Fatalities: FL, MI, TX, NY, TN

Injuries: FL, MI, PA, NC, NY



### Probability

- Lightning is the 2<sup>nd</sup> leading cause of weather deaths (behind that of flooding) of all weather phenomena.
- With exception of the year 2005 which included Hurricane Katrina, each year lightning kills more people than tornadoes and hurricanes combined.
- Lightning strikes are most common in the Southeast.
- 73% of incidents happen in June, July or August.
- Most lightning strikes occur in the afternoon--70 % between noon and 6 P.M.

### Severity

- 12 volts boosted from a car battery boosted to 200 volts by the ignition coil causes a ¼ inch spark.
- A Lightning bolt carries up to *100 million volts* and can jump over many miles vaporizing its path with 30,000 °F plasma.

## If Indoors:

- Stay away from doors and windows.
- Do not use the telephone! Lightning could follow the wire. Many lightning injuries occur from using phones during electrical storms. (Mobile or cordless phones are O.K.)
- Do not use your desktop computer, or a laptop computer plugged into the wall AC or with a modem connected to a telephone line. *(Your surge protector may not protect you!)*
- Unplug your television from the cable outlet or conventional antenna.
- Take off head sets connected to hard-wired phones or AC powered stereo music systems.
- Do not take a shower, bath, or use the sink. Water and copper tubing are excellent conductors of electricity
- If there is a power failure, turn off all electrical appliances and switches before the power comes back on. This may avoid damage if there is a power surge.

## Lightning Safety



## If Caught Outdoors:

- Find a low spot away from trees and poles. Stay low (crouch) in a ditch or depression. Other options include a low area, ravine, or foot of a hill. Do not go to picnic shelters.
- In the woods, find a low spot under short brush or a small tree among several large ones.
- Stay at least six feet away from the tree trunk to minimize a side strike and step voltage. **NEVER** be under an isolated tree.
- Squat low to the ground on balls of your feet. Have your heels touch. Place your hands over your ears, eyes closed. Sight and hearing injuries are very common among lightning strike victims. Hold your breath if you anticipate an immediate close strike to prevent breathing in superheated air that surrounds a lightning bolt.
- Avoid close proximity (minimum 15ft) of other people.

## Lightning Safety



### **DO NOT LIE FLAT ON THE GROUND**

*Although lying flat on the ground gets you as low as possible, it increases your chance of being hit by a ground current, which is bad.*



## When lightning is about to strike:

### If you get that feeling...

- Step 1** Being struck by lightning is often preceded by a sensation of all your hair standing on end, along your arms and the back of your neck. If you have this feeling, and you are in (or near) a thunderstorm, the chances are you have sent up a "positive streamer." If this sudden charge connects with the electrons pooling beneath the clouds, lightning will strike. If you feel this sensation, either run as fast as you can, or drop down on your knees, bend forward and place both hands on the ground.
- Step 2** Do not lie down completely. If lightning strikes you, you want it to take the shortest path to the ground. This will be through your arms, and hopefully will miss your vitals.
- Step 3** Use good sense and judgment. It is best to preempt the weather rather than get trapped in it. In those times when the potential to be struck by lightning is high, run quickly to low lying areas and wait out the storm.

# Lightning Safety



*Lightning is often preceded by a sensation of all your hair standing on end, along your arms and the back of your neck – you are probably going to be struck in the next few seconds.*

*If you have this feeling run as fast as you can, don't stop – the chances of being struck decrease the more you move. If you can't run, drop down on your knees, bend forward and place both hands on the ground. Do not lie down completely. If lightning strikes you, you want it to take the shortest path to the ground. This will be through your arms, and hopefully will miss your vital organs.*

*If you are on a river, lake, or ocean, paddle as fast as you can, or dive deep into the water (action of last resort because current from lightning travels through the water).*

## **Testimonial:**

- Moments after this photo was taken, this young woman was struck and killed by a bolt of lightning, and several of her friends, including the person taking this picture, were severely injured by the same bolt of lightning. Notice the absence of rain, clearly illustrating lightning can strike several miles away from thunderstorm activity.



National Oceanic & Atmospheric Administration (NOAA)

National Severe Storms Laboratory (NSSL) latest projects and research data:



NSSL has a strategic research partnership with CIMMS, the University of Oklahoma's Cooperative Institute for Mesoscale Meteorological Studies, one of NOAA's joint institutes.

The Geostationary Operational Environmental Satellite-R Series ([GOES-R](#)) is the next generation of geostationary weather satellites, scheduled to launch in 2015. This satellite will be equipped with a Geostationary Lightning Mapper ([GLM](#)) that will detect both cloud-to-ground and inter-cloud lightning. This will help severe weather forecasters identify rapidly intensifying thunderstorms so they can issue accurate and timely severe thunderstorm and tornado warnings.

NSSL/CIMMS scientists simulated realistic cloud-to-ground lightning flashes for the first time using a 3-D cloud model that generates complex precipitation such as graupel (soft hail), which is known to affect lightning production. They also use the model to make comparisons between simulated and observed flashes, and analyze lightning more closely.

Lightning mapping has shown that some supercell thunderstorms have “lightning holes” where updrafts are located and precipitation is scarce, just before a storm becomes severe.

Rapid increases in total lightning activity are often observed tens of minutes in advance of severe weather occurring at the ground. These rapid increases in lightning activity have been termed “lightning jumps.”

This woman might not be laughing if she understood her risk of being struck by lightning was incredibly high. Her “electrified” hair should have been a dead giveaway that lightning from a nearby mountain thunderstorm put her life in extreme danger.





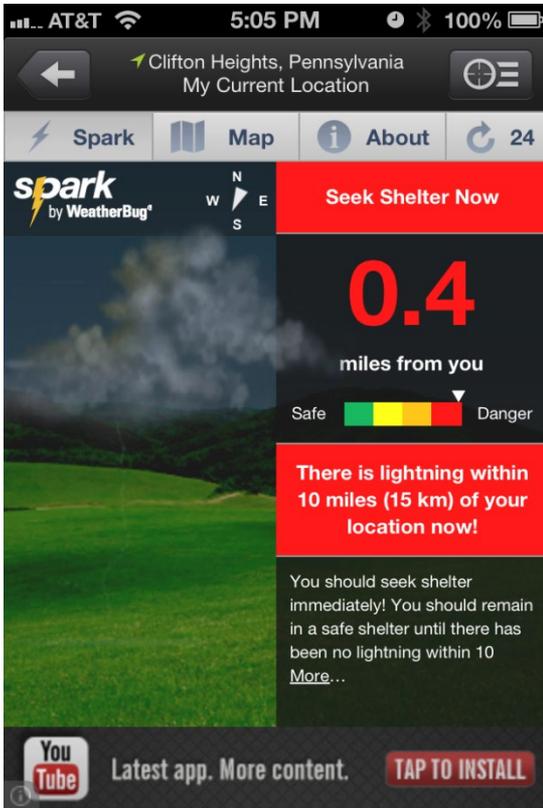
© 2010 William Nguyen Phuoc



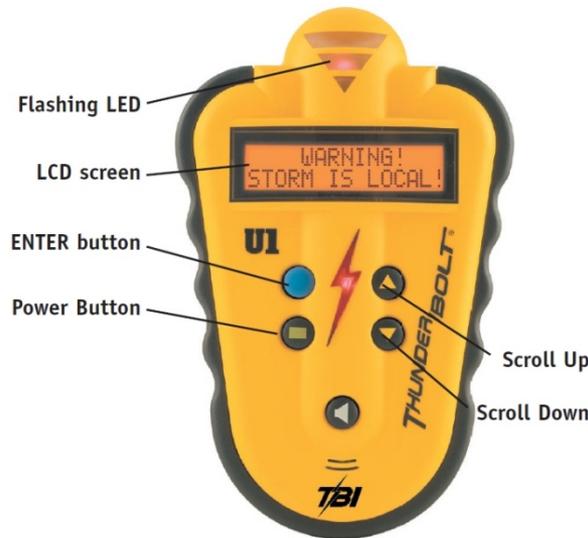
FunnyOnYouTube.com



## Smart Phone “Weatherbug” App *(refreshes every 60 seconds)*



## “ThunderBolt” Lightning Detector Personal Unit *(immediate response to a strike, 75 mile range)*



## “Strike Alert II” Personal Lightning Detector *(immediate response to a strike, 40 mile range)*



There is absolutely no safe place outdoors for lightning protection. Your best bet is an early warning system that will allow you time to get off or out of the water, or away from an open field, and away from any lone tall trees or tall objects, and to get safely to a substantial building or a metal bodied vehicle.



**"Studies have concluded that there exists no safe time interval during which a human is free from direct strikes."** In an area with a radius of 500 meters (1,640 ft), most of the intervals between lightning strikes range from 0 to 600 seconds, with a maximum frequency of 40 seconds.



**Unlike high voltage electrical injuries where massive internal tissue damage may occur, lightning seldom causes substantial burns. In fact, most of the burns are caused by other objects (rainwater, sweat, metal coins and necklaces, etc) being heated up and causing the burn rather than caused by the lightning itself.**

**Lightning tends to be a nervous system injury and may affect any or all parts of the nervous system: the brain, the autonomic nervous system, and the peripheral nervous system. When the brain is affected, the person often has difficulty with short-term memory, coding new information and accessing old information, multitasking, distractibility, irritability and personality change.**

**Do not delay CPR if the person is unresponsive or not breathing. Use an Automatic External Defibrillator if one is available. Call 9-1-1.**



Source: Men's Health

# Annual Lightning Strike Victims Conference



## **Name / Activity / Medical Impact**

**Jennifer** Hit inside on while on her home phone.

*Numbness, cold, temporary lower body paralysis. Recovering slowly.*

**Dave** Struck by lightning while out fishing

*Burns on 60% of his body. Recovered over long period.*

**Mike** Struck by lightning on a Cape Cod golf course.

*Completely paralyzed. Steadily recovering and resuming normal life.*

**Cheryl** Home, calling husband on home telephone to warn him about the coming storm.

*Petit mal seizures.*

**David** 911 Medical Dispatcher on duty in southern Florida.

*Severe headaches, deafness, short and long term memory loss, and insomnia.*

**Todd** Inside his garage, repairing the exhaust system of his car.

*Burns, chronic pain, and short-term memory loss.*

**Robert** Returning home from ice fishing on Moosehead Lake in Maine.

*Memory loss, joint pain, and headaches.*

**Doug and Susan** Hiking near Greer, Arizona.

*Doug: Both eardrums broken.*

*Susan: Spider web tracks across stomach & side.*

U.S. Department of Commerce  
National Oceanic and Atmospheric Administration  
National Weather Service,  
Office of Climate, Water, and Weather Services



**"It was a rare accident. Lightning struck his bed pan."**



**Struck flag pole  
and dispersed**



Tree root system



'We're safe here - it's a rubber tree'

# Lightning Safety

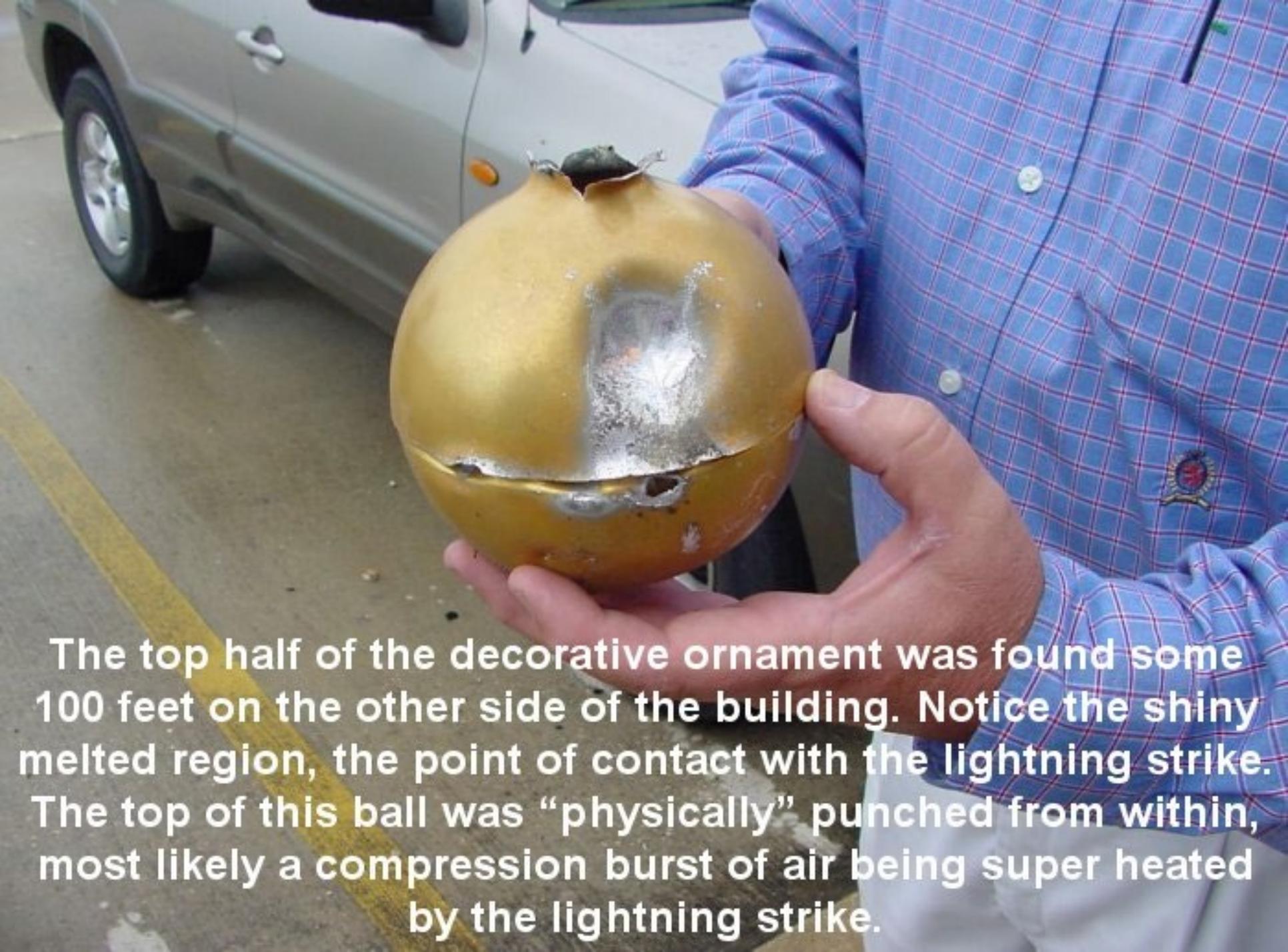


**Lightning can strike several locations almost simultaneously**





**Around 3 P.M. on October 25, 2003, a positive stroke of lightning struck a flagpole in front of the LSU Agricultural Center. Dick Gremilion, Emergency Manager of Calcasieu Parish, is holding the bottom half of the decorative ornament blasted off the top of the flag pole.**

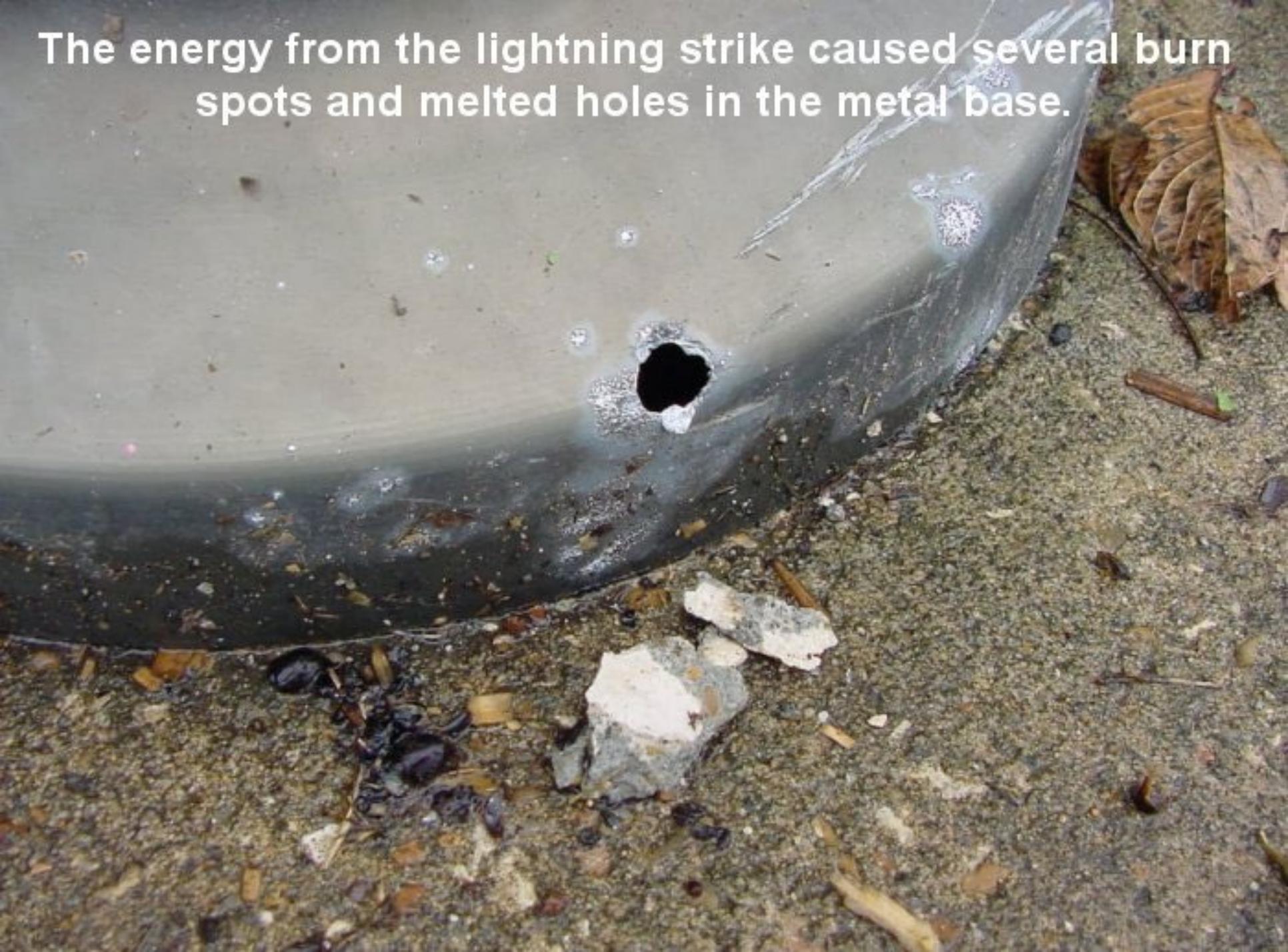


The top half of the decorative ornament was found some 100 feet on the other side of the building. Notice the shiny melted region, the point of contact with the lightning strike. The top of this ball was “physically” punched from within, most likely a compression burst of air being super heated by the lightning strike.



**The concrete near the base of the flagpole was damaged from underneath, near the settlement cracks and groves.**

The energy from the lightning strike caused several burn spots and melted holes in the metal base.





**Other pieces of concrete and landscaping timber blown some 10 feet away from the exit region.**



Damage to the front concrete walk and flower bed.



**This was the exit region of the lightning strike, which traveled underground from the flagpole. This concrete is 6 inches thick with wire mesh and rebar re-enforcement.**



A closer look at the exit "hole" of the lightning. Two ends of the landscaping timber was completely removed.



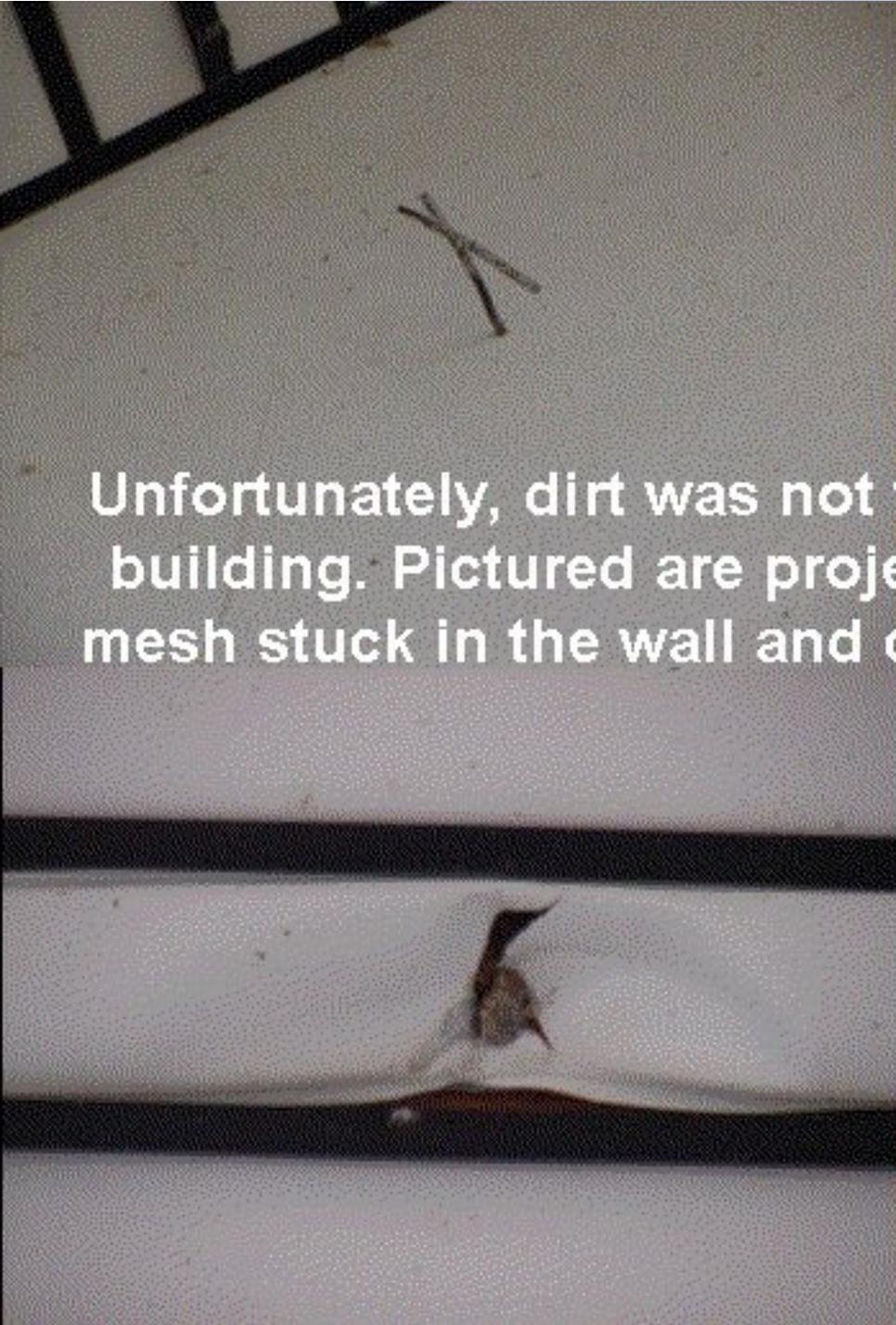
Notice the wire mesh was completely severed and melted in this chunk of concrete.

Dirt from the flowerbed portion of the exit region blown upward onto this lamp and the side of the building.



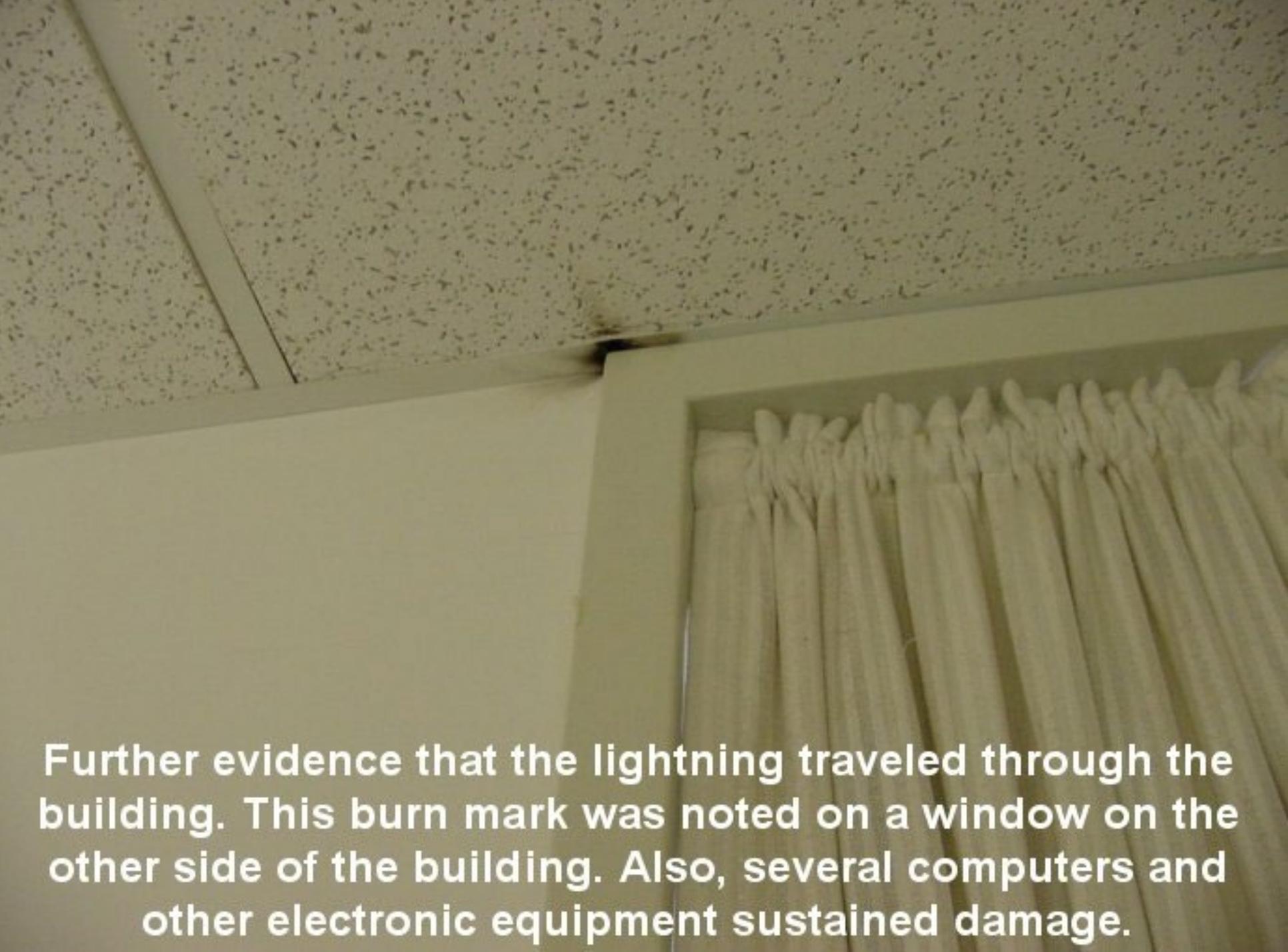


A secondary exit region of the lightning shattered the concrete near the sidewalk and parking lot interface.



Unfortunately, dirt was not the only thing blown on the building. Pictured are projectiles of concrete and wire mesh stuck in the wall and ceiling of the front entrance.





**Further evidence that the lightning traveled through the building. This burn mark was noted on a window on the other side of the building. Also, several computers and other electronic equipment sustained damage.**



*"Try not to fret dear, things always look much worse than they really are at 3 oclock in the morning."*

During an electrical storm, we had best observe Bre'r Fox' advice closely:

**“Lay low, an’ don’t say nuffin.”**

