

HI-2 “Lightning Rods”

Sean's Understanding of “Lightning Rods” as they relate to HI-2



Question from owner, presented at the March 2015 meeting, researched and prepared for the May 2015 meeting

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SCOPE of this Presentation



BACKGROUND: At the March 2015 meeting, a good question was reiterated (from prior, post-fire email),

“Why don’t we have lightning rods?”

I didn’t know the answer – and this seemed like another good question, to me...

- The question was inspired by the Fall 2014 lightning strike which burned much of one roof in HI2
- As an engineer, I also wanted to know... and I began to wonder of the pros & cons (cost, aesthetics, maintenance, reduction of damage, etc)
- I learned there are currently TWO TYPES of “lightning rods”...
 - “Ben Franklin Lightning Rods” (the familiar “spikes” that ring the perimeter of a roof)
 - “Early Streamer Emission (ESE)” lightning rods (a theorized “ion-path generator”, to attract hit)

GOAL: Present the options, pros & cons, and probabilities for the presence (or absence) of “lightning rods” ...

References: National Fire Protection Association (NFPA), National Weather Service, 45th Space Wing Weather Squadron, 7-May-2015 quote from “Florida Lightning Protection” (a division of Windemuller Technical Services, Sarasota, FL), and various other technical references.

The TWO TYPES of Lightning Rods

(A) "Ben Franklin"

(a traditional "spike", to "get hit")



(B) "ESE" (Early Streamer Emission)

(a theorized "ion-path generator", to ATTRACT a hit)



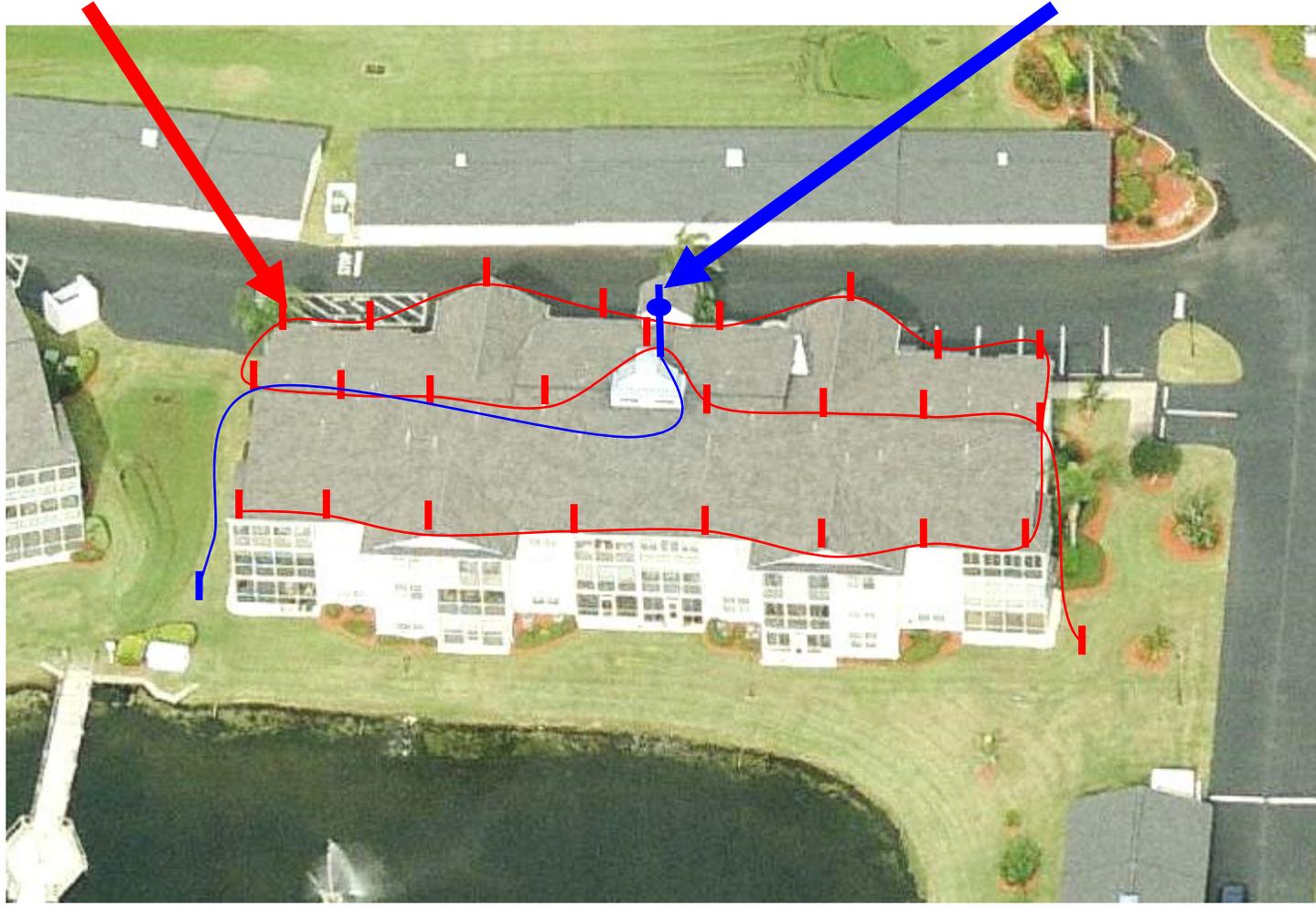


The TWO TYPES of Lightning Rods on a Harbor Isles Building (the one that got hit)...



(A) "Ben Franklin"
(a traditional "spike", to "get hit")

- About 2-dozen spikes around an HI-2 roof (to protect a ~150x50ft roof)
- Some maintenance (corrosion, roofing adjustments, etc)
- About \$10,000 per building, upfront installation cost



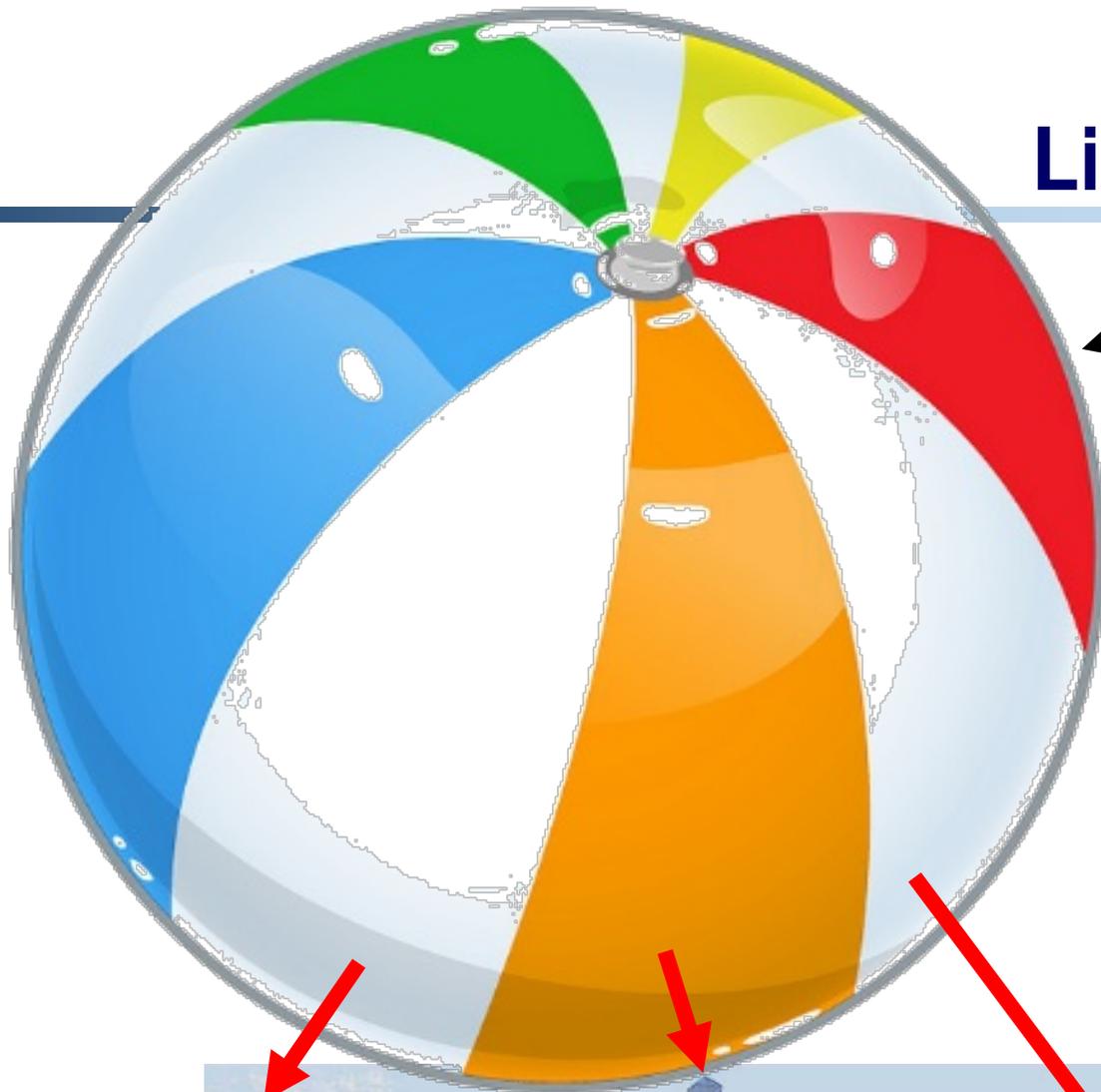
(B) "ESE" (Early Streamer Emission)
(a theorized "ion-path generator", to ATTRACT a hit)



- ONE (large) "UFO-shaped Spike"; a ~2ft spherical ball on a ~20ft mast above the cupola
- Low maintenance (minor corrosion, no roofing adjustments, etc)
- About \$6,000 per building, installed



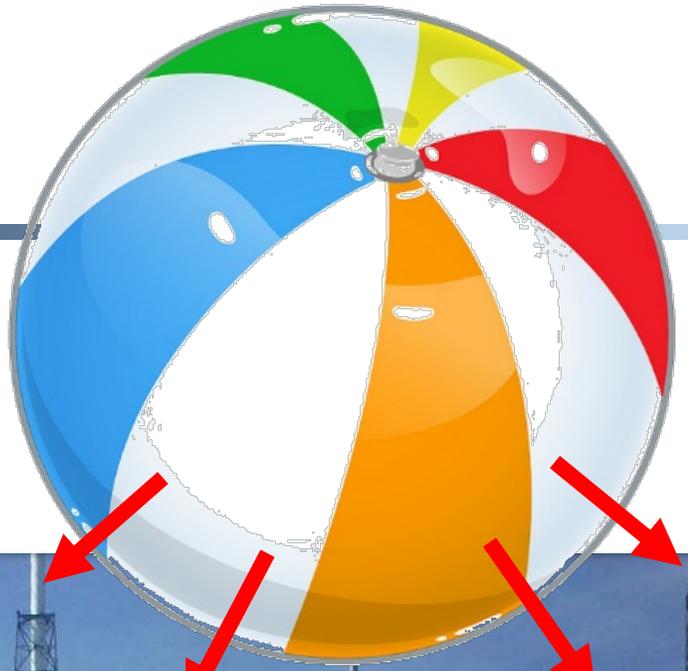
DISCUSSION: Lightning's Behavior



- Lightning is kinda like a ~180ft diameter "Beach Ball", rolling over the terrain...**
- Anything the ball can touch can be hit by lightning.
 - That's why we got hit on the END of our building; since our buildings are ~150ft long... we can either get hit on the cupola (middle) – or on either end.
 - That's why "Ben Franklin" (short; 1-2ft) lightning rods have to be placed about every ~20-30ft (to intercept the "beach ball")
 - That's why most studies indicates the "Early Streamer Emission" (ESE) theory is mostly "junk science"; the fancy UFO-shaped ESE works merely because its single mast is much TALLER (~20-30ft) than the Ben Franklin spike (not because of a unique "ion path generation")

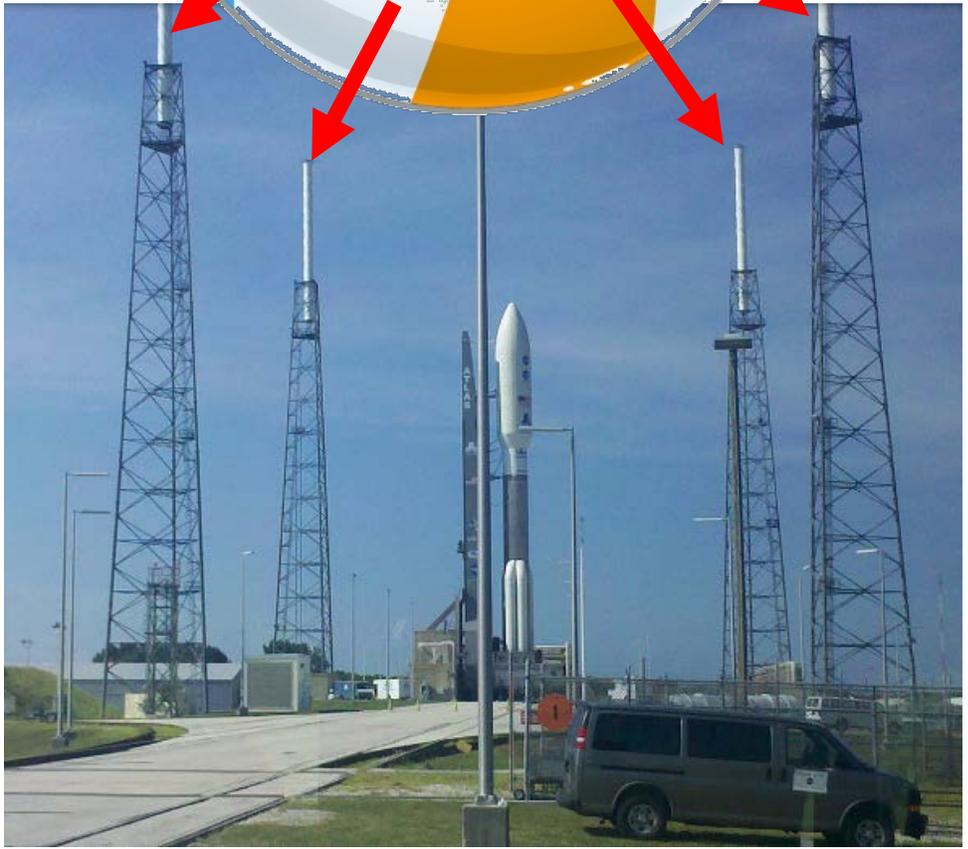


DISCUSSION: Lightning's Behavior



That's also why Cape Canaveral's lightning masts have that height & position... to try to intercept this 180ft "beach ball", without it being able to touch the rocket (which is full of fuel & electronics)

➤ BUT, STILL... ROCKETS GET HIT (there's no guarantee; lightning is probabalistic)...



DISCUSSION:

Some Pros & Cons of Lightning Rods

PROS:

- 1) They probably work (I don't know).
 - Maybe the lightning rod drains much of a lightning strike's energy into the ground, before it heats the wood of the roof enough to ignite a fire.
- 2) Maybe we would "sleep easier", if we knew we installed the best system we could imagine?
- 3) Maybe (I don't know) our insurance company would give us a discount that pays off the system in a few years... due to a lower rate of lightning-driven fires?

CONS:

- 1) Some say they DON'T really work (I don't know)
 - Odds of ANY building (except the Empire State Building) getting hit are small, so... there's not a lot of good data ("hit with" vs. "hit without" a Lightning rod; whether the lightning system drained enough energy to prevent a fire, etc). i.e. You still MAY get hit, and burned to the ground; lightning is probabilistic.
 - Salesmen will always promote their product
 - ESE systems are probably "junk science" (-45th Space Wing Weather Squadron), and have NOT been recommended by the National Fire Protection Association (NFPA).
- 2) Their cost is small, but not trivial (~\$6k for an ESE, ~\$10k for a traditional Ben Franklin system... PER BUILDING). This cost may be more than the deductible on an insurance claim – which itself may only occur every couple decades... while you're doing maintenance on those lightning rods every year during that period – so the rods may never "pay off")
- 3) Aesthetics: Some say the "cage" look ringing around the roof – or the 20-30ft ESE "UFO spike" on the cupola – detract from the building.
- 4) Maintenance: Another item to repair & WD-40 each year

CONCLUSION



NONE.
(Open for discussion)