EMP and Ham Radio

By Dr Stuart Naulty

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What is EMP?

EMP stands for electromagnetic pulse and is sometimes called TED, transient electromagnetic disturbance. It is an intense burst of electromagnetic energy. The EMP can be as innocuous as RFI on your ham radio or it can be intense enough to destroy all the electronic equipment you own in a fraction of a second. It occurs at low to high frequencies and multiple frequencies are common.

Types of EMP

EMP can be created naturally or artificially. There are four types, electromagnetic field, electric field, magnetic field or as conducted electric current. Conducted electric current refers to electrical resistivity of an object. It is a measure of how much the conductive material resists electric current. EMP lowers the resistivity and allows more electric current to flow down a wire.

Naturally occurring EMP

1. Electrostatic discharge: Walking on a carpet and reaching to a metal door knob.

2. Lightning

3. Coronal mass ejection causing a geomagnetic storm in Earth's atmosphere.

Carrington Event

In 1859, the largest geomagnetic storm in recorded history occurred. Beautiful auroras were reported all over the world. Astronomers Carrington and Hodgson reported a solar flare/coronal mass ejection. It is believed that when the flare pointed in the direction of Earth, it caused a worldwide geomagnetic storm. The use of electricity was in it's infancy but it did cause some black outs.

Telegraphs were greatly affected. The EMP caused the telegraph machines to spark and papers nearby caught fire. Telegraph offices in Boston, Massachusetts and Portland Maine, reported that something was causes surges of electricity that interfered with their messages. Both operators turned their batteries off and were still able to communicate for two hours before the charged atmosphere dissipated.

Artificial or Manmade EMP

1: Switching pulses: Relays, solenoids, and brushes all cause a radiating pulse of EMP.

2. A broken spark plug wire that is arcing and causing a tapping sound on your radio.

3. Nuclear EMP: The initial explosion causes a very intense pulse of electromagnetic radiation. But there are also gamma rays produced by the nuclear explosion that cause a secondary EMP. The gamma rays radiate out and hit atoms in the air, causing electrons or positrons to be knocked off. This ionization of the atmosphere releases more EMP. The Ions are unstable and interact with other atoms causing a cascading effect that radiates out affecting an area much larger than you would expect.

4. Ground level explosions have a limited EMP range, but scientists theorized that exploding the nuclear bomb high in the atmosphere would create a larger radius of destructive EMP. In the 1960's the US and USSR did experiments exploding nuclear bombs in space. It worked better than expected.

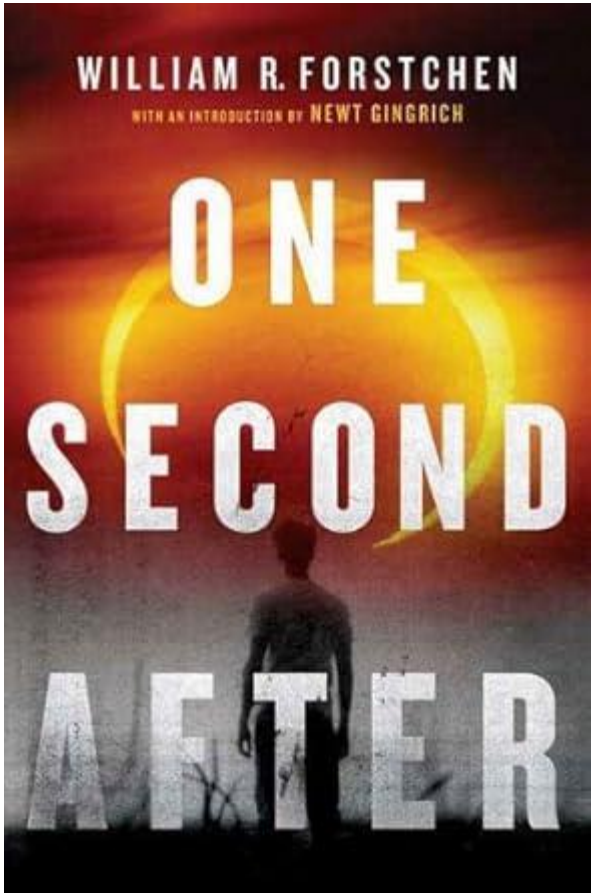
5. Non-nuclear EMP bombs were developed. These can be put on a cruise missile and focus their destruction to a limited area like a major city. This also eliminated the spread of radioactive material in the jet stream.

One Second After

By

William Forstchen

2009



A Must Read

If you have not read this book, you need to. I always considered an EMP strike as just another temporary disaster. This book takes it to the extreme portraying what could happen if the United States was hit with a large scale EMP strike.

This fictional story is based on two Congressional studies on the effects of an EMP strike.

– Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack Volume 1: Executive Report 2004

– Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack Critical National Infrastructures 2008

The Story

A rusting old cargo ship lumbers into the Gulf of Mexico. Suddenly three medium range nuclear missles launch in different directions to the north. Soon there after, they explode 50-100 miles above the east coast, midwest and the west coast. Most everything running on electricity just stops. Suddenly nothing works. Things cannot be fixed. Electronic spare parts are fried. There are no cars, trucks, trains, or planes anymore to resupply the grocery stores or pharmacies. The stores are robbed and emptied in less than one week by desperate people with useless plastic cards. Our entire economy and infrastructure is gone. Unless your city water supply is fed from the top of a hill, there is no water pressure. People start to die from the lack of medicine and hospital supplies. All crops, domestic animals and wildlife are consumed by 6 months. We are literally sent back to the 18th century and few can cope with this. The military finally shows up after one year. Due to budget restraints the military has been concentrating on EMP protection for offensive weapons like jets, tanks, etc. After the attack the military concentrated on preparing for an invasion. Then they started giving aid and supplies to the large cities. Small rural college towns came last.

Some Starlink satellites would probably survive a massive EMP hit. They can be moved to new locations to restore the grid if some of the ground stations survived. But people would need new undamaged receivers for communications to resume. This truly falls in the category of "When all else fails, there is still ham radio." We possess a skill that few people have today. With a minimal effort and expense, we can protect radio equipment from an EMP strike. In the short time some of us would have, we could teach the young people how to use, maintain our radios and survive.

Why are communications so important?

Establishing communication can bring help. It can also inform a centralized regional command what is happening in our area. Tell them what are needs are and prioritize them. It will bring news from the nation and world to us. Communication and information gives us hope and a reason to fight and survive. On the negative side, communication makes you a target for roving armed gangs. We aren't the only ones who practice fox hunts.

What Equipment And How To Protect It

At a minimum you will want one dual band HT, a good antenna and a way to charge it. For many of us, some variation of the Baofeng UV5R was our first radio. This is a good starting point after you blow off the 1/4 inch of dust on it. It has a rubber duck antenna, but a longer antenna like the Nagoya NA-771 or Signal Stuff Signal Stick make a big difference in reception and range.

The BAOFENG BL-5 3800mAh Extended Battery with USB charging cable is as cheap as $11.00 on Amazon. Finally you will need a power bank with solar panels or a solar panel that has USB ports on it.


BAOFENG
Li-ion Battery
7.4V 3800mAh/28.12Wh
MODEL BL-5L
GT-5R
Stuart Naulty
1581 Mockingbird Dr
Murray, KY 42071-3281
BAOFENG
A/B
BAND
MENU
EXIT
on the B Side (lower
operation.
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Storage

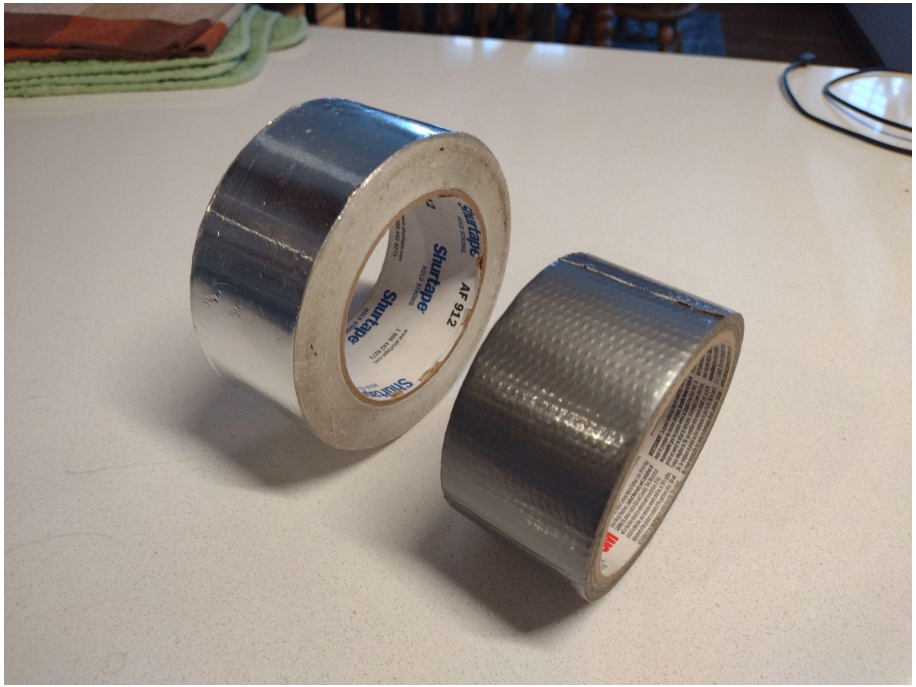
You protect your equipment in a metal enclosure called a Faraday cage. Fortunately, heavy duty aluminum foil provides adequate protection for electronics. One layer gives 50dB attenuation. Two layers give 80dB attenuation, which meets military standards. The more layers you have, the more protection you get. Each layer of aluminum foil needs to be insulated from the next, i.e. an old t-shirt, bubble wrap.

You need to line the can with cardboard to insulate it from the contents.

I know, measure twice, cut once. I simply glued in a strip of cardboard to fix the gap. The card board does not offer any protection from EMP, it is just insulating the layers of metal.

Seal The Container

You do not want any gaps in the container. Seal the lid with silver duct tape (has powdered aluminum) or metal duct tape.



Bigger metal cans hold more stuff

Other Items You May Need

Roll up J-pole, 50-100ft of rope, arborer throwing weight, 25-50 feet of RG213 or RG58 coax, a bag full of adapters, rechargeable flash light. A small laptop that you can charge with your solar panels or power bank. Consider an old cellphone or tablet. Store manuals, survival guides, medical books, knot tying guide, camp style cookbook, edible plants book, etc. Store as much as you can on the phone storage card, including books to read for pleasure and relaxation. You cannot have too much reference material.

HF Radio

Few of us can afford to store a HF radio. However, the club has several HF radios that only get used once or twice a year. How much trouble would it be to store one of the radios in a small garbage can with a couple of wire antennas and coax? Just take it out of the can the few times of the year it is needed. The hard part is finding an affordable renewable power source. Lead acid batteries do not need to be protected but LiFePO4 batteries would due to the internal BMS. Solar panels may also need to be protected. Old vacuum tube radio are much less susceptible to EMP.

Preventative Medicine or Pure Paranoia?

Only you as individuals can decide that. North Korea and Iran do not have super nuclear bombs and lack sophisticated ICBM technology. But they don't need it to cripple the US with EMP.

A repeat of the Carrington event is completely out of our control. While it had little effect on civilization in 1859, it would be devastating in today’s world.

Maybe a little paranoia is healthy.

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