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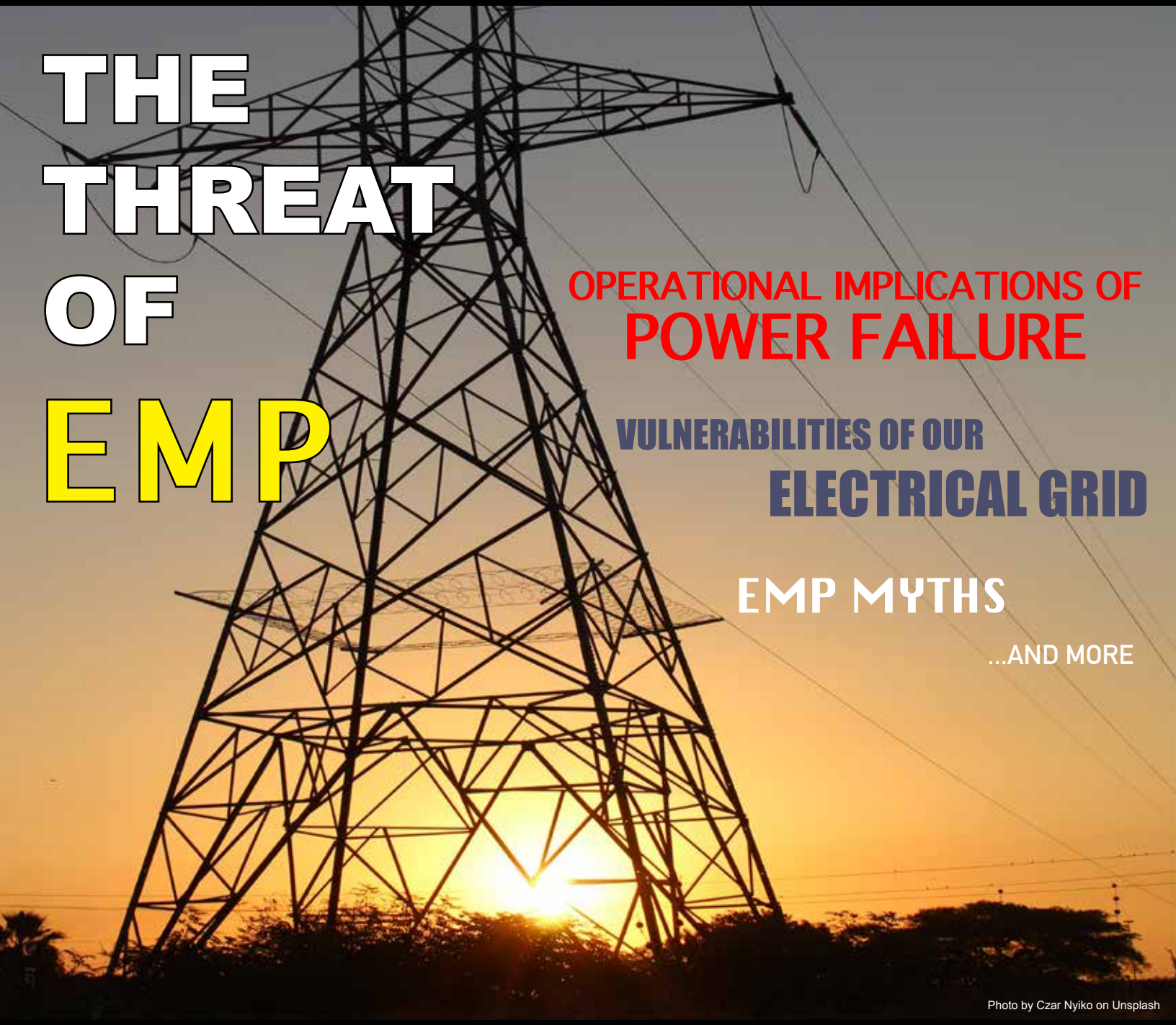

THE THREAT OF EMP

OPERATIONAL IMPLICATIONS OF POWER FAILURE

VULNERABILITIES OF OUR ELECTRICAL GRID

EMP MYTHS

...AND MORE

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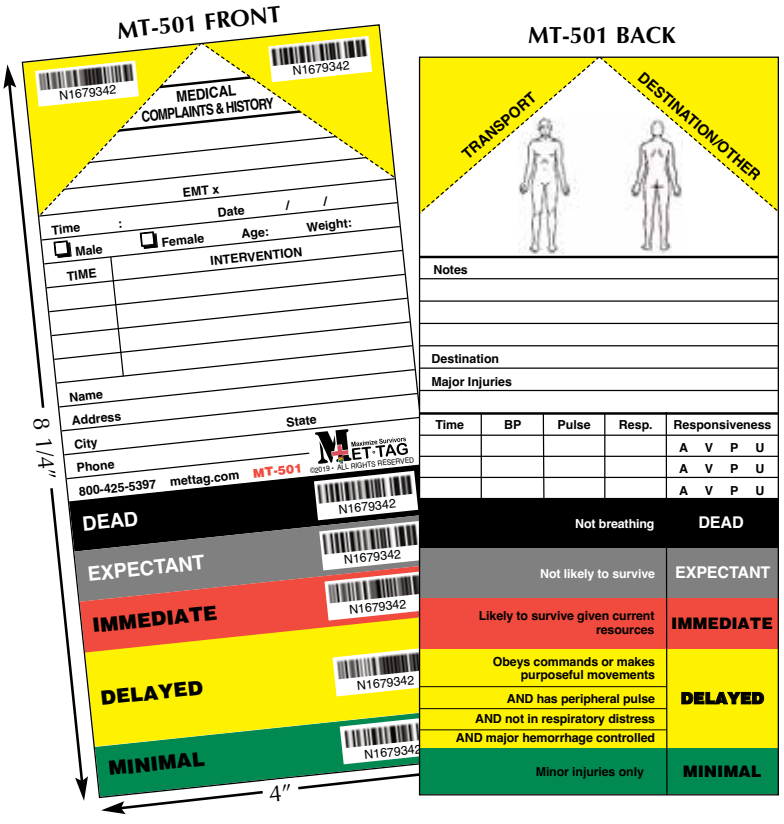

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PRESIDENT'S MESSAGE

I hope all is well with you and yours.

We have been recommending that everyone prepare for natural or man-made disasters for some time, and I hope that you are well on your way to becoming self-reliant for your basic living needs. It looks like we could be facing multiple challenges in the near future.

Much of the Western United States is in a severe drought situation, and many reservoirs are cu rently at multi-decade lows. There is not enough water to support normal agricultural activity so agricultural production will be affected.

The US Government spending seems to be out of control. They are currently planning for record spending even though there is already a record deficit. Monetary inflation is already significant and does not seem to be slowing down. History indicates that this situation tends to cause accelerating inflation and an eventual collapse of the fiat currency in question. If this happens in the United States, the economic repercussions will be felt over the entire world.

The best course of action at this time is personal preparation for possible food shortages, economic turmoil, and the accompanying civil unrest. I wish you the best in your efforts.

Sincerely,

Jay Whimpey, PE
TACDA President

FROM THE EDITOR

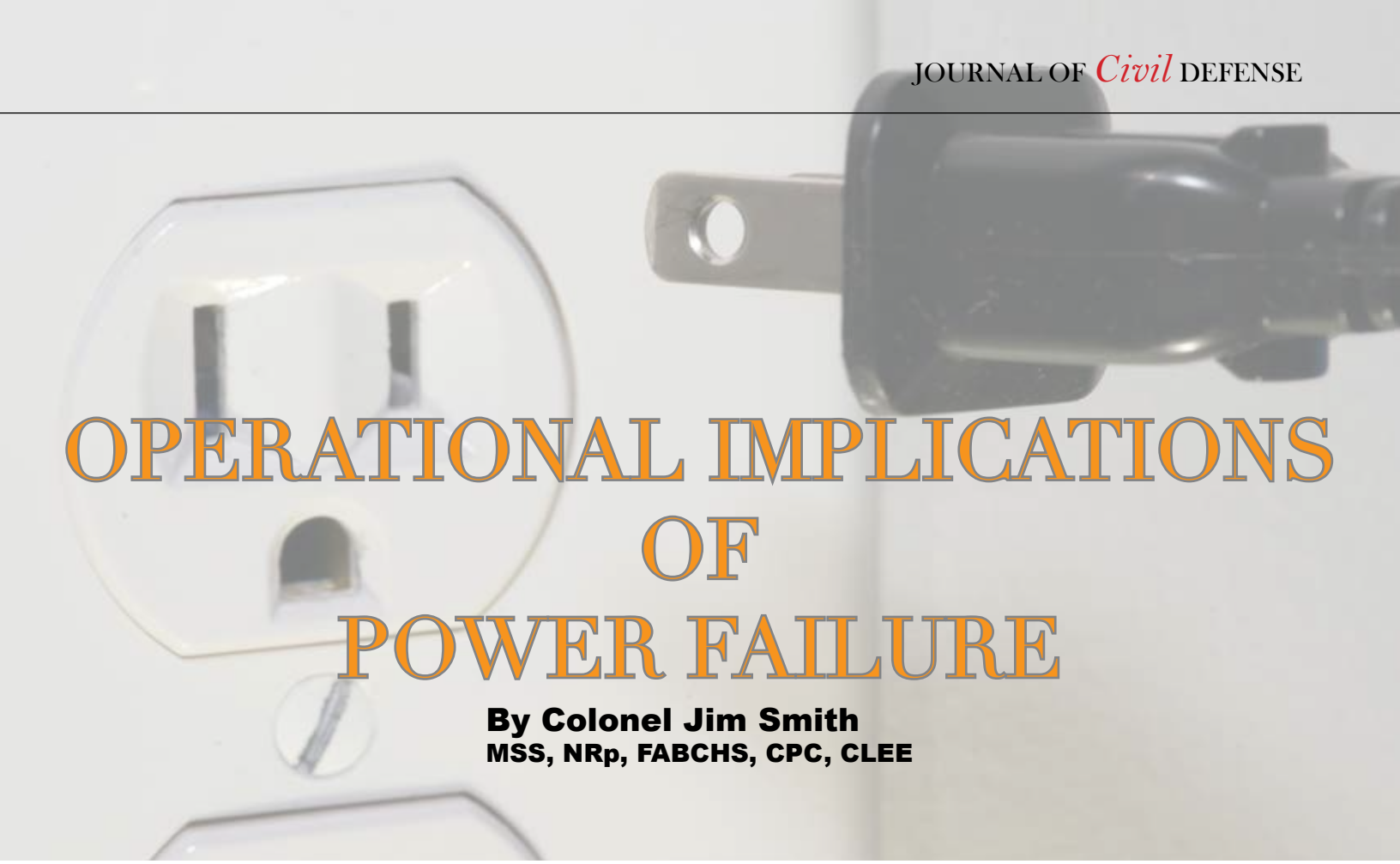
Learn the Effects of EMP!

By Roseanne Hassett
Executive Director

We are pleased to present "The Threat of EMP (Electromagnetic Pulse)" in this edition of the Journal of Civil Defense! This topic has been one of the most sought-after topics in the last decade and the most purchased journal theme of record. If you don't know a lot about the effects of an EMP, you might wonder why this subject is so popular, and why it is so concerning.

In a nation that relies heavily upon electricity, an EMP attack could be devastating. It would destroy many of our electronic devices and could significantly damage many of our high voltage transformers causing massive power outages across the country. Unfortunately, most of these transformers are not made here in the USA. Replacing them would take months if not years. Long-term power outages would bring much suffering to our people and cause many deaths.

Because of our vulnerability to an EMP attack, many scholars and government officials have teamed up to attempt to initiate changes to our infrastructure to withstand such an attack, but so far, no federal programs have been initiated. What can you do to stay safe and survive if this were to occur? There are many things you can do to protect yourself, your family, and your belongings. Empower yourself through education. Be proactive, study, and prepare!



OPERATIONAL IMPLICATIONS OF POWER FAILURE

By Colonel Jim Smith
MSS, NRp, FABCHS, CPC, CLEE

Photo by Clint Patterson on Unsplash

Power failure is a common issue, but in most instances, the failure is short lived. However, with certain events such as severe weather, large earthquakes, civil unrest, coronal mass ejections (CMEs) such as the 1859 Carrington event, or an electromagnetic pulse (EMP) from a man made device, the incident could be prolonged. This article presumes one has shelter and protection so addresses the need for survival with the loss of commercial power.

Power Sources: "Whole house" generators are one possible answer in the medium term (weeks to a month) as they facilitate almost normal conditions. However, one must assure a ready supply of fuel (diesel, natural gas, propane, etc.). Fortunate are those who have a source of natural gas on their property. Generators are a great option, and 2 to 10 Kw generators are reasonably priced. They may become damaged, however, in an EMP-type event or by severe weather. If possible, keep your generator shielded in a metal building.

Long term events (months to years), such as those caused in wars, EMP, or CMEs can possibly be mitigated with other alternative power systems. If living near a river or fast moving stream, consider the use of a water generator. Solar systems only provide power during sunny and daylight hours. It is mandatory, therefore, that good batteries be maintained for electrical storage of the solar and other systems. Solar panels are susceptible to severe weather such as wind, hail, and lightning. In an EMP event, the panels could be damaged. EMP-hardened solar panels are available for purchase. Even small solar arrays can be used to charge small appliances, radios, flashlights, or tools. In many instances, it may take several hours to partially charge a small device. Small solar stills can be used for cooking food and also for water pasteurization through boiling. Small solar devices are reasonably priced and easy to use. They do require sunlight on a consistent basis. One would do well to have several to be able to both cook and pasteurize water.

Sanitation: We will most likely be faced with sanitation issues in medium- to long-term power loss events. Public sewer systems in most cities will fail as backup power systems run out of fuel. Chemical toilets or even a bucket with a tight fitting lid are good short- to medium-term solutions, but will eventually need to be emptied. Please note that some chemicals used in chemical toilets may poison septic tanks. Composting toilets are a good solution if you have at least 55^0 F temperatures year round. Partial composting toilets can be used inside during cold weather and emptied outside in a pit to complete the composting process. Be prepared to dig outside latrines for

long-term power loss events, but consider the use of inside portable potties for nighttime hours. In any event, it is critical that we carefully prevent contamination of surface water and wells as we empty sewage containers.

Wet garbage, such as leftover food, attracts rodents and insects. It should be kept separate from "trash". Wet garbage should be buried in a pit, while dry trash should be burned.

Latrines for large groups should be dug 6-8' deep, 3' wide, and several feet long. The hole for sitting should not be more than 9" to prevent children from falling in. Take note if possible of ground water levels. Care should be taken to mitigate the potential of contamination.

Photo by Daniel Lincoln on Unsplash

Water: Short-term failures of days to a week can be more of an issue if dependent on an electrically-powered water source, such as a well. The emergency allocation is usually one gallon of water per day per person (do not forget your pets' need for water and food), but even more water would be needed to flush toilets. One flush of a toilet uses almost a day's supply of drinking water.

People sometimes use their household gutters to collect water in a cistern for use in toilet flushing and other non-potable uses. Cistern water can be contaminated even though it appears to be clear and clean. If used for bathing or washing, contaminants could enter the body by way of the eyes or other bodily openings. Water from these sources must be filtered and purified if used for personal hygiene .

Consider preparing both portable and long-term water storage. Clean, food-grade, 55-gallon drums make good water containers but must be carefully cleaned and sanitized before filling. Obviously, you should fill these containers at their final storage spot, as they are extremely heavy. Use a dedicated, white water hose for filling the containers.

In long term disasters, our water storage will eventually run out. You may want to purchase a good water filtration system. Chemical purification is feasible, but in many instances, renders water unpalatable. These systems also have a shelf life.

Food: In short-term power failures, use refrigerated foods first, frozen foods next, and then pantry foods. Carefully assess these foods for spoilage. Make it a habit to regularly purchase additional canned foods that are normally used in your diet, along with bottled water. Remember, these items do have shelf lives and must be rotated. For longer-term power outage events, store freeze dried foods, MREs, and bulk foods such as rice, wheat, beans, oats, and corn. Oil is extremely important to our diet. Some oils store longer than others. Consider storing extra virgin coconut oil, such as the Kirkland brand found at Costco. It has a very long shelf life.

Barter: Gold and silver coins are good barter items, but it is not practical to purchase small items with gold pieces. People are usually willing to take cash or coinage. Other items that should be considered for barter are alcoholic beverages, cigarettes, canned foods, and ammunition. After an EMP or large-type disasters, assume banks will be closed and that credit cards will not work.

Security: Rechargeable or solar powered security systems are a wise investment. Solar powered flood lights which are motion sensitive are good deterrents and can alert us to intruders during darkness. Many people store firearms for self-defense purposes, but this should only be an option if you are well trained in their use.

Medications & First Aid: If possible, store at least a month's supply of all mandatory medications. Ask your physician to prescribe a 90-day supply if insurance allows. Store over-the-counter items such as antibacterial ointments, bandages, pain relievers, insect repellant and anti-diarrheal medications, and organize a good first aid kit.

Household Items: Store extra expendable items such as toilet paper, paper towels, paper plates, disposable utensils, hand cleaning products, personal hygiene items, dish washing liquids, clothes washing solutions, and soap. Fire extinguishers and battery smoke detectors should be checked on a regular basis. Local fire services may not be available when needed.

Washing facilities for clothing will likely be limited, so extra underwear, socks, and other clothing items are recommended. This allows rotation of the clothing and more time between cleaning periods. Extra rugged footwear, work gloves, cold weather clothing, and rain gear are essential.

Deciding Storage Needs: Make a list of items purchased and used for one summer month and one winter month. This list can be extrapolated for the cooler months and warmer months to determine what is needed on a monthly, quarterly, or annual basis. Check water usage to determine how much water is used and estimate the amount used in cooking, drinking, and bathing to provide the amount which needs to be stored. The key to a survival program is to incrementally acquire and store the items identified.

Colonel Jim Smith is the public safety director for a rural town in the southeastern US and has served in public safety for more than 45 years. He has been incident commander and directed relief efforts in two category-three and one category-five hurricane. Smith has written several textbooks in the public safety arena and teaches for the University of Phoenix and Troy University.

THE VULNERABILITIES OF OUR ELECTRICAL GRID

By John D. Hoyle, Sr.

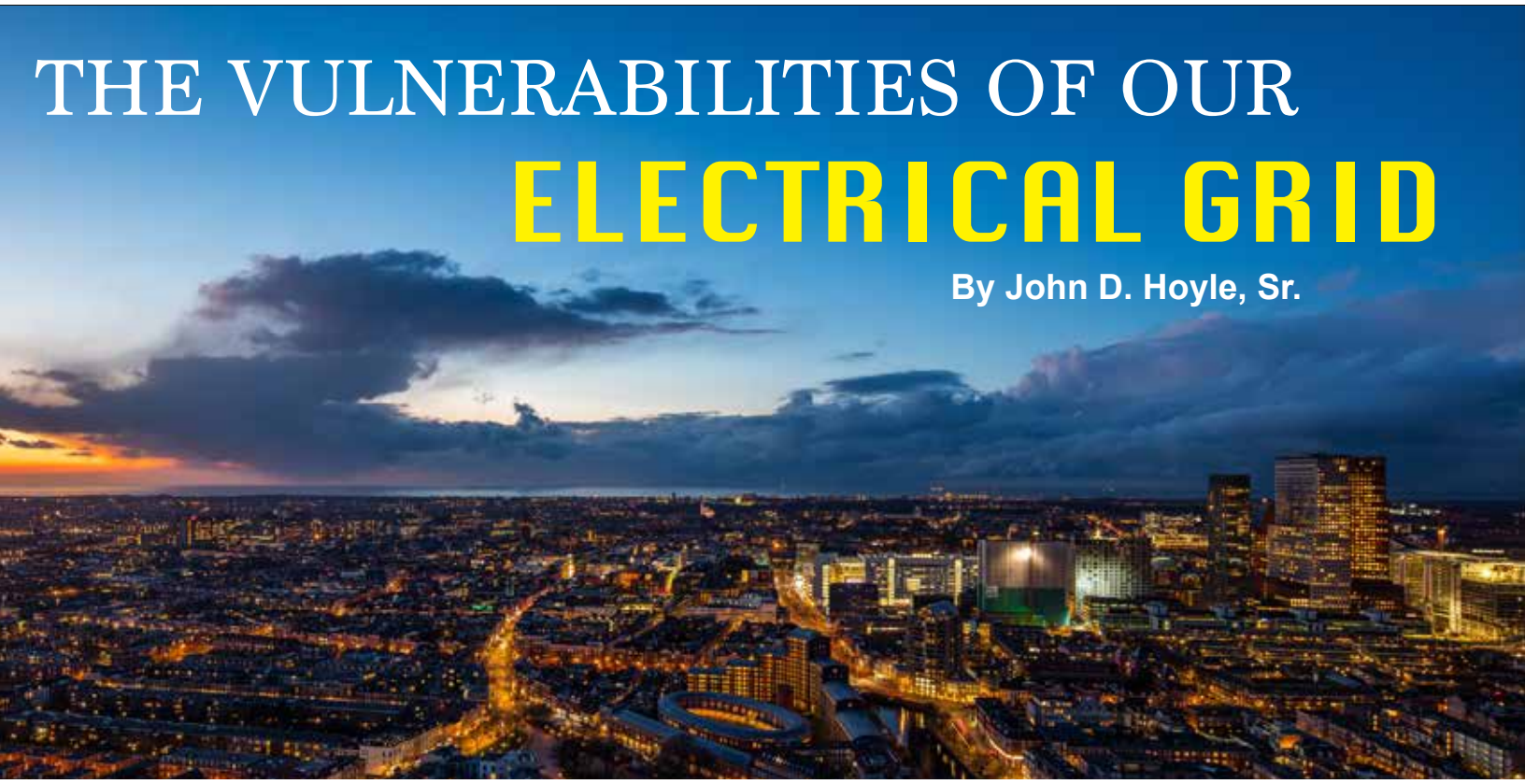


Photo by Gerrit Vermeulen on Unsplash

Electricity is truly the lifeblood of our nation. We continue to use more electricity each year, and the current administration is now making a push for electric vehicles. However, electricity is not fully reliable. We have seen grid failures such as in Texas during winter storms. California has told citizens not to charge their electric cars at night as the solar farms cannot produce the required electricity.

The United States' electrical grid is made up of numerous utility companies in several regions. They operate linked together with the exception of Texas, which has its own grid. Our electrical grid is old. Poor maintenance and equipment have caused problems on a large scale such as massive wildfires in California.

We are also currently faced with at least four ways to destroy the grid: an electromagnetic pulse (EMP), solar storms producing geomagnetic disturbances, cyberattacks, and physical attacks on key nodes. Any of these methods can render the grid inoperable, and EMP and solar storms can do damage to high voltage transformers. Replacing parts on damaged transformers would require many months since the US only manufactures a limited number of them.

The Threat of an EMP

Prior to the Starfish Prime nuclear test in July 1962, Enrico Fermi, the distinguished nuclear physicist, anticipated that this nuclear explosion could cause a local EMP, which is now known as a source region EMP (SREMP).

The nuclear device was detonated at 400 kilometers above the ocean. It created a high altitude EMP (HEMP) which reached the Hawaiian Islands, 900 miles away, and damaged street lights and microwave links, disrupted radio communications, and caused other failures. Its effects were somewhat blunted due to vacuum tube electronics of that day which were much less vulnerable than today's chips and circuits. The effects remained classified until 2017, and the Defense Department report, "Electrical Effects Noted During U.S. High Altitude Tests", is still unavailable to electric utility companies[1].

Photo by Alexander Antropov from Pixabay

The US Air Force Weapons Lab and the Defense Nuclear Agency paved the way in EMP studies. Both conducted numerous EMP tests and thousands of HEMP calculations. EMP waves were classified as E1 HEMP, E2 HEMP, and E3 HEMP. E1 HEMP is created from gamma rays which excite electrons from atmospheric atoms. These free electrons then travel at the speed of light in Earth's magnetic field. This phenomenon is called the Compton Effect. It can impact long wires, railroad tracks, house wiring, automobiles, aircrafts, and the electrical grid that powers our homes, hospitals, businesses, and public safety organizations. E2 HEMP then follows with enough energy to damage electronics that are not protected against lightning. E3 HEMP can last for seconds or minutes depending on nuclear yield. E3 HEMP targets electric grid power lines, pipelines, and railroad tracks. It can also melt Extra High Voltage (EHV) transformers[2].

Natural EMP, also called geomagnetic disturbances, is created by solar storms. These have been heavily studied, and theEMP Commission of scientific experts has warned that their threat is no less severe than a nuclear EMP attack.

EMP Disasters Throughout History

In 1859, a mass coronal ejection dubbed the Carrington Event caused fires in telegraph stations and surrounding forests on several continents. If this event occurred today, it would collapse our entire electrical grid and destroy communications.

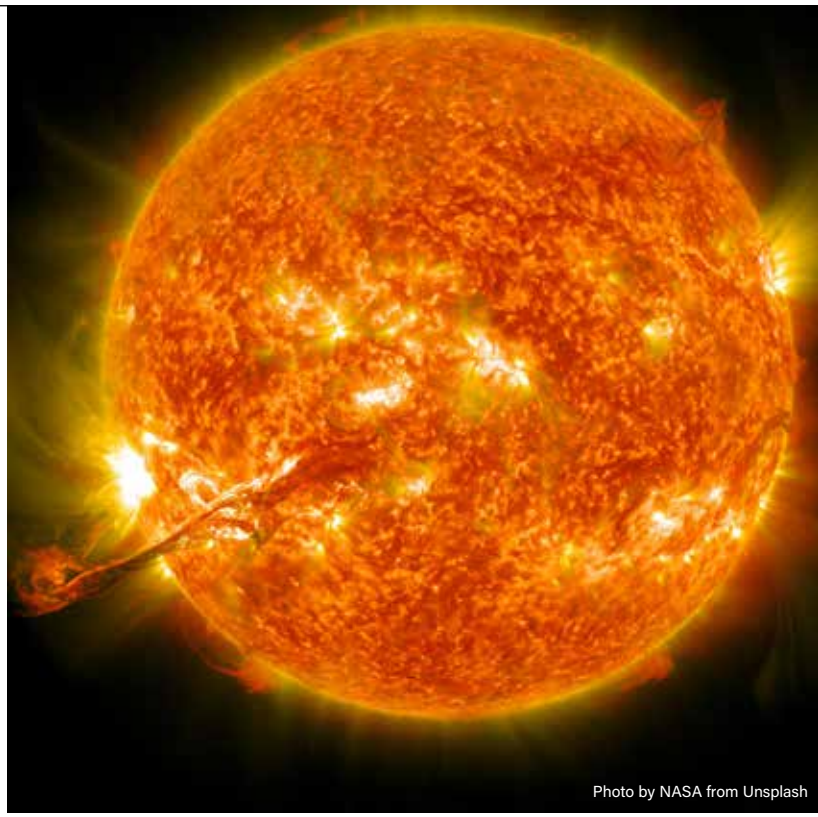
The 1921 "Railroad Storm" was caused by a solar mass ejection (Figure 2) causing the collapse of the entire signal and switching system of the New York Central Railroad. The US telegraph system was also taken out by blown fuses and damaged equipment.

In 1989, a solar storm caused a geomagnetic disturbance, melting an EHV transformer in New Jersey that was designed to carry 750,000 volts. An EHV transformer was also destroyed at the same time in Montreal.

In July 2012, we had a near miss from a coronal mass ejection which, according to NASA, would have collapsed our electrical grid.

Moving Forward

During its tenure, the EMP Commission continued studying EMP effects and advocated for protection of our military and the grid. They found that protecting the grid from a geomagnetic storm would not protect the grid from nuclear HEMP. Other electric industry groups fought against the EMP Commission's recommendations. During the Obama Administration, the EMP Commission was eliminated despite being the national experts on all things related to EMPs and solar storms[3].



A coronal mass ejection can launch plasma into space causing magnetic storms and severe electrical disruption on Earth[6].

So where do things stand today? In short, we are not protected. Various industry groups have opposed the standards of the EMP Commission despite not having the expertise or data to support this position. In the case of solar mass ejections, over reliance on several satellites for warning is still being used. Once notified, utility groups handle things operationally by shutting down certain parts of the grid. There may not be time for this, however, with the large number of utility companies in the US and lack of a quick warning system. According to Dr. Peter Vincent, previous Chief of Staff to the EMP Commission, "the war to achieve national EMP preparedness can still be lost"[4].

To fully comprehend how deep our reliance on the electrical grid goes, the EMP Commission has noted that the loss of the grid for one year would result in the death of 90% of the U.S. population[5]. There would be starvation, lack of medicine, and minimal water purification. Societal collapse and resulting violence would kill many. Only those prepared with reserves of food, water, purification equipment, etc. would stand a chance to survive.

Footnotes:

1. Pry, P. (2020). *The Power and the Light*. Peter V. Pry.
2. Ibid
3. Ibid
4. Ibid
5. Ibid
6. Crocket, C. (2020, Dec. 9). *What are coronal mass ejections?* EarthSky. https://earthsky.org/space/what-are-coronal-mass-ejections/

Recommended reading sources:

The Power and the Light by Dr. Peter Vincent Pry. This is the definitive report on the EMP Commission and its work.

EMP Commission Unclassified Reports are available at: www.firstempcommission.org.

Powering Through: From Fragile Infrastructure to Community Resilience. Edited by Mary Lasky, William Harris and Stephen Volandt.

Electric Armageddon by Dr. Peter Vincent Pry.

One Second After by William R. Fortschen, A novel, highly realistic, on the effects of an EMP attack which hit Black Mountain, NC.

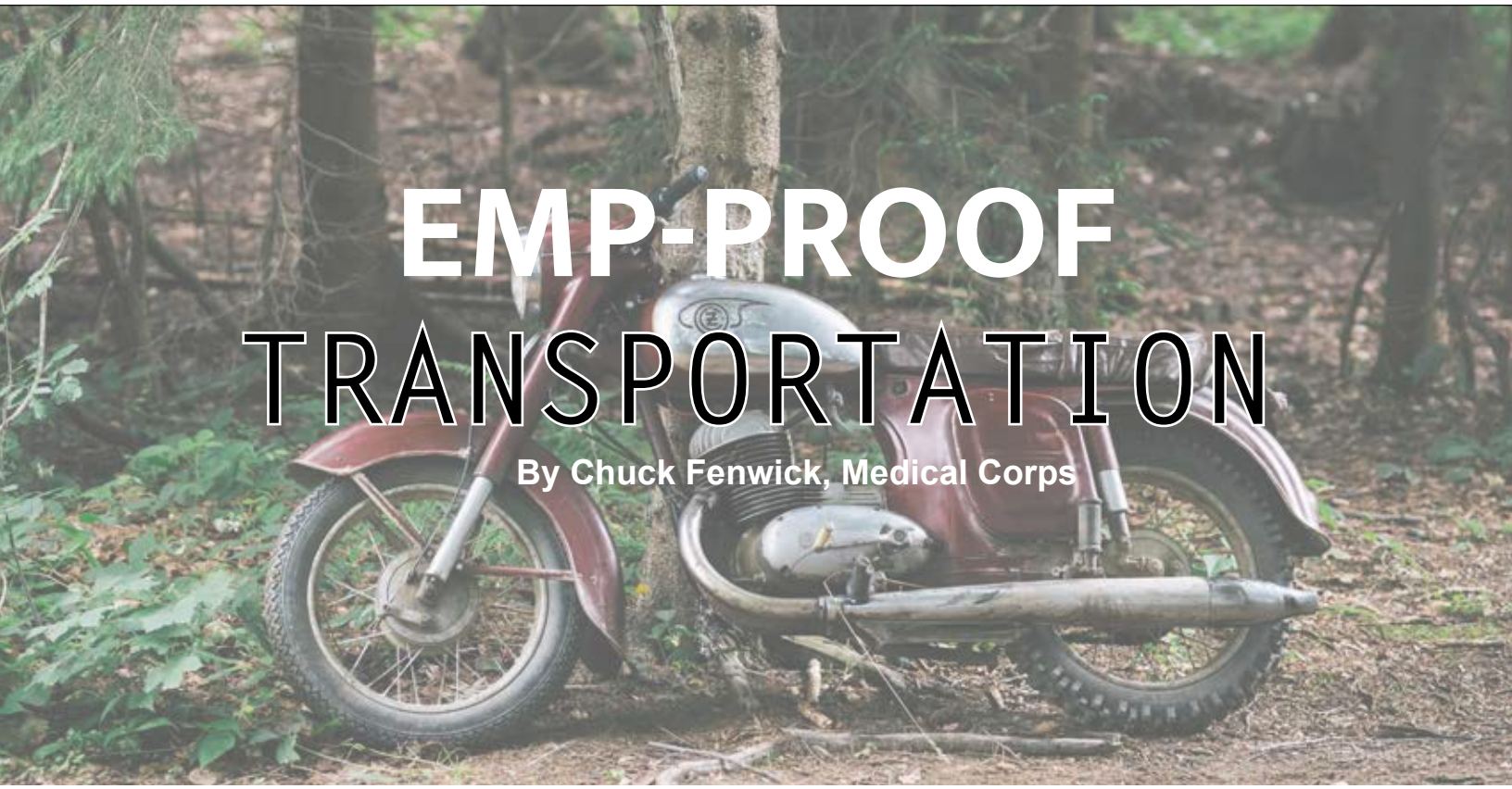
One Year After also by William R. Fortschen, a continuation of the first book.

The Long Sunday: Nuclear EMP Attack Scenarios by Dr. Peter Vincent Pry.

Lights Out: A Cyberattack, A Nation Unprepared, Surviving the Aftermath by Ted Koppel.

A Nation Forsaken: EMP: The Escalating Threat of An American Catastrophe by F. Michael Maloof.

John D. Hoyle, Sr. was a hospital executive for 31 years. In 1999, he took over the former Noble Army Hospital at Ft. McClellan, AL, converting it into a mock hospital training environment to teach mass casualty care, WMD, and triage. He founded the first paramedic training program in Northern Kentucky and installed the first hospital to ambulance radio system in the Tri-State. He was a member of the State of Kentucky EMS Advisory Council for seven years, Kentucky State Medical Examiners Disaster Team, the Disaster Preparedness Committee of the Kentucky Hospital Association, and the Medical Planning Committee for the Central United States Earthquake Consortium. He has responded to numerous disasters over the years including the Beverly Hills Supper Club fire, two airliner crashes, Hurricanes Andrew, Floyd, Francis, Ivan and Katrina, the Northeast ice storm, and the World Trade Center attack. He was part of the medical preparedness operations for the Olympics in Atlanta and Salt Lake City. He is a radiation monitoring instructor and FEMA/NFD Certified Disaster Mortuary Coordinator and spent eight years as a volunteer firefighter and EMT.



EMP-PROOF TRANSPORTATION

By Chuck Fenwick, Medical Corps

Photo by Michal Matlon on Unsplash

Are there actually EMP-proof vehicles and transportation? And if there are, which 'makes and models' are they? Where do you get them? Which is the best?

Bicycles:

An un-motorized bicycle is absolutely, 100% EMP proof. It is easy to store, won't run out of fuel, and will go about anywhere a person can walk or run. In many countries, bicycles are used like pack horses to carry huge loads. A bicycle is very quiet transportation and can be pushed through rough terrain. The tires should be the larger dirt tires (or balloon tires). You may want to consider a product like Green Slime. Doing so will make your tires virtually flat proof. The same product can be used on all tires no matter what the vehicle. However, it is difficult to keep tires on high-speed vehicles properly balanced when using this type of product.

Bicycles can be motorized with either an electric motor or a gasoline engine. If they are motorized, an EMP could damage the system. Fortunately, the electric drive and gasoline systems are small, and duplicate parts can be put into EMP-proof storage. Usually the drive motor for an electric bike is in the wheel itself, but the controls and battery are easy to remove for storage. After an EMP event, the motor can be taken out of its protected area and remounted on the bicycle.

Depending on the battery, the range of the bicycle's electrical motor system is about 20 miles, and the speed of the bike could reach about 20 mph. The range of a bicycle with a gasoline engine is considerably further because it uses liquid fuel. The drive system is often mounted on the back of the bike and drives the bicycle with a smaller friction wheel on the gas engine. With minor mechanical work, the gas engine can be mounted on different bicycle frames.

One of a bicycle's drawbacks is the rider's health and ability. A damaged leg, back or arm can render the bike all but useless. Another serious drawback is the rider's security. With your hands doing the steering, your ability to protect yourself is limited. A thrown rock or a vicious dog can snowball into something lethal. Weather is also a factor to consider.

A bicycle is good back-up transportation for a vehicle, and it can be carried on top of your EMP-proof car or pickup. As a backup, it would still have the same shortcomings but would be preferable to walking. Walking is the backup for a bicycle.

Note: A Coronal Mass Ejection or Super Flare will likely be a one-time affair. An EMP caused by human warfare, however, may be repeated several times over a period of days or weeks. If you remove items from the EMP-protected status too soon, and another event occurs, your

electronics will be rendered useless. An EMP event could be followed by a nuclear attack. If possible, it would be better to stay in a protected area for several weeks before traveling.

EMP-proof or EMP-resistant gasoline powered transportation:

The older the car, motorcycle, or truck, the more likely it will survive an EMP. Even though you may believe they are EMP proof, it is best to consider them 'resistant', and your plans should include the chance that they might fail. An EMP pulse will not damage the spark plugs, incandescent lights, or wet cell batteries. Vehicles built before 1980 are most likely to be EMP hardy. Those gasoline engines have points, coils, condensers, diodes, fuses, and other parts in the wiring and ignition system, but it is unlikely they will have printed circuits. Even some printed circuits may survive, such as the radio or tape players. After the early 1980s, printed circuits and computer chips started to appear in cars, and eventually almost everything in an automobile became computer controlled. Even the mighty diesel, which requires no electricity to run now, has onboard computers and circuit boards to increase power and fuel economy. Before the 80s, a diesel engine either ran or it didn't. It had no ignition problems because it had no ignition.

Both newer and older vehicles' ignition parts are usually kept on hand at shops because they can fail of their own accord or simply wear out. Without much extra effort, they can be stored in EMP-proof containers (and should be). Another obvious downside with ignition parts and other electronics is the knowledge and ability of the owner to fix or replace them. Therefore, spare parts should also include 'fix it' books and the measures it will take to analyze what is not working.

Note: A rule of thumb should be that any electrical part on which your life may depend should be considered 'EMP Resistant' and not EMP Proof.

Motorcycles, pre-1980, EMP resistant:

There are hundreds of different makes and models of motorcycles. Keep in mind that like a bicycle, the motorcycle is hard to defend and if the rider is injured, riding can be difficult. Ones built for off-road only will be dirt bikes but can be ridden on pavement. The Enduro is a particular type of motorcycle which can be used for both dirt and pavement. There is also the Trials motorcycle which is made for rocky and hilly terrain. Trials motorcycles have a small saddle for one person and can go where a human would have trouble going. There are other specialty off road motorcycles which are two-wheel-drive (front and rear drive) and even carry fuel in the tire hubs if needed. Lastly, there are the older trail bikes, most notably the Honda Trail 90. Honda also made a Trail 70 and Trail 110. The number denotes the size of the engine.

The Trail 90 can be driven around town or through the forest. They were designated for one rider but could carry two. They have three speeds, and the clutch is automatic, so shifting is easy. Honda no longer makes them, but they are considered a classic and sell from $500 to $2,500, used.

Road bikes:

Road bikes are made to be driven on roads and make for lousy dirt bikes. A road bike gets good gas mileage, can carry two adults, and is fast. They can be outfitted with a side car which will enable the rider to carry more passengers or even a disabled passenger. If a road bike is all you have, you should consider using dirt tires to help on gravel and dirt roads.

Again, as with any transportation, spare parts for electronics as well as extra tires should be kept on hand.

Pre-1992 Dodge Cummins

EMP-resistant antique or classic automobiles:

In the book, "The Effects of Nuclear Weapons—1977", pictures of the nuclear weapons test sites and weapons effects are found throughout. Several of the vehicles shown were actually overturned by the blast. What is interesting is that some of these vehicles were righted and driven away. The EMP at a blast site is more profound and damaging than a high altitude pulse (HEMP). The localized blast is called the SREMP. These vehicles survived the pulse of the SREMP. This means that early model cars and trucks were robust enough to survive the electromagnetic pulse which would cause the electrical system of any currently new vehicle to be destroyed.

At the time these pictures were taken, the nature of the EMP was unknown. Later, when the effects were realized, the potential of the EMP as a weapon would be classified. This leads us to some safe conclusions about what to use or buy for backup transportation.

All 1930-era cars and trucks, such as the Model A Ford, would almost certainly be EMP proof. If the reader ever needed a good reason to buy a classic or antique vehicle, this is it. The same reasoning would hold true for 1930s, 1940s, and 1950s vintage automobiles including older trucks, pickups, and sedans. Older surplus or restored military vehicles such as the Jeep would no doubt be excellent EMP-proof or -resistant vehicles. This does not mean that spare parts would not be needed, however, and they may be difficult to find. Ignitions fail of their own accord and a weakened part might be rendered useless after a pulse.

Note: Carefully plan for enough fuel storage to get you to your destination. Five-gallon metal fuel containers can be safely stored in a garage or other outside building. Do not store gasoline in plastic containers.

Tractors – the perfect EMP-proof survival vehicle:

For those living in the country or in an area where relocation to hideaway acreage in the boonies is possible, the farm tractor is by far one of the best survival vehicles which could be purchased. Older tractors, such as the Ford 9N, 8N, or even later models, have so many advantages it would be hard to list them. Several other makes of tractors to consider are the Massey Ferguson or the Farmall. Every farmer has their favorite tractor and reason for it. All reasons are good and should be mentioned because it does pertain to survival in a post-EMP world.

Photo by Wikipedia

Ford 9N Tractor

1. First and foremost, a tractor from the 40s and 50s is likely EMP proof, or at the very least, EMP resistant.
2. Not only will it plow a garden, but it will pull or drag most any load which needs to be moved.
3. The 3-point hitch on the rear of a tractor will lift heavy loads better than any hydraulic jack or pully system.
4. A tractor will pull or push a trailer.
5. The power take off (PTO) at the rear will run numerous tools or equipment including a generator.
6. A large output alternator can be installed on the front belts and used as a DC generator for charging batteries, running DC lights, or even welding.

As stated there are many other attributes of the older tractors that are too numerous to list. Older tractors have survived in great shape for over 50 years and are still running strong on many farms. If they are treated with a bit of TLC, a tractor could easily outlast you and your children.

Older motor homes — EMP-proof 'housing' which can serve as transportation:

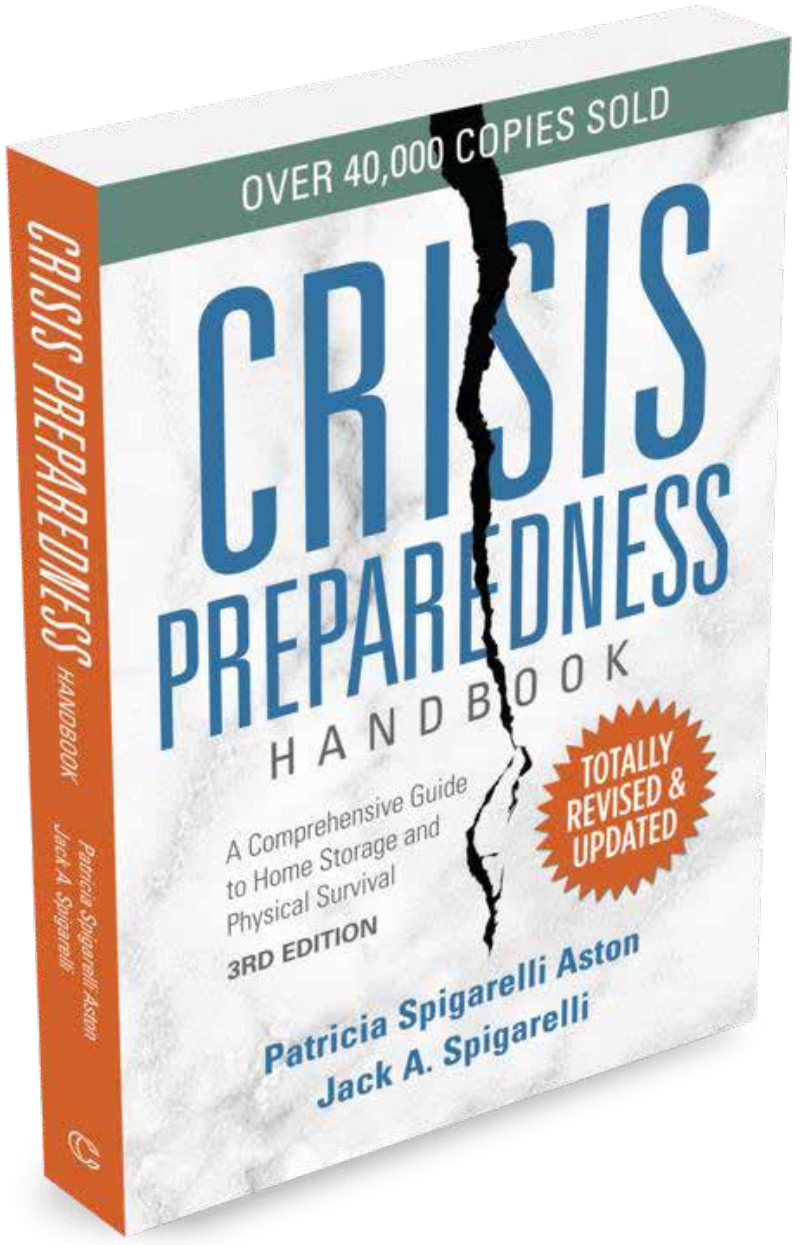
The motorhome is another type of transportation which should be considered. It is a survival home and vehicle all in one. New ones would be next to impossible to protect from an EMP, but older motorhomes can be retrofitted with EMP-proof equipment and appliances making them the best answer for survival on a budget. Their appliances are propane driven and can be altered to use natural gas with little difficulty.

Many older motorhomes have small tri-fuel generators attached, and as with the tractor, a high amperage alternator can be installed on the engine. The lowly motorhome can become transportation, a home, a welder, the friendly neighborhood clinic, or whatever the imagination might conjure up.

Luxury motorhomes are very inexpensive and not hard to locate. Brand names such as Airstream and Argosy from the 1970s can be purchased for as little as $3,000 to $7,000 and are usually well taken care of. In addition, a motorhome can tow a vehicle or another travel trailer.

In closing, please note that only a few examples of EMP-proof and -resistant transportation have been mentioned. Transportation is a small but extremely important aspect to survival of EMP aftermath. Transportation is not the whole story. These are the lifeboats to get you to safety.

HOW PREPARED ARE YOU?



Recently updated and expanded! **This best-selling guide** will help you prepare for natural and man-made disasters by showing you how to:

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- Learn how to purify and store water
- Prepare your home for earthquakes and other natural disasters
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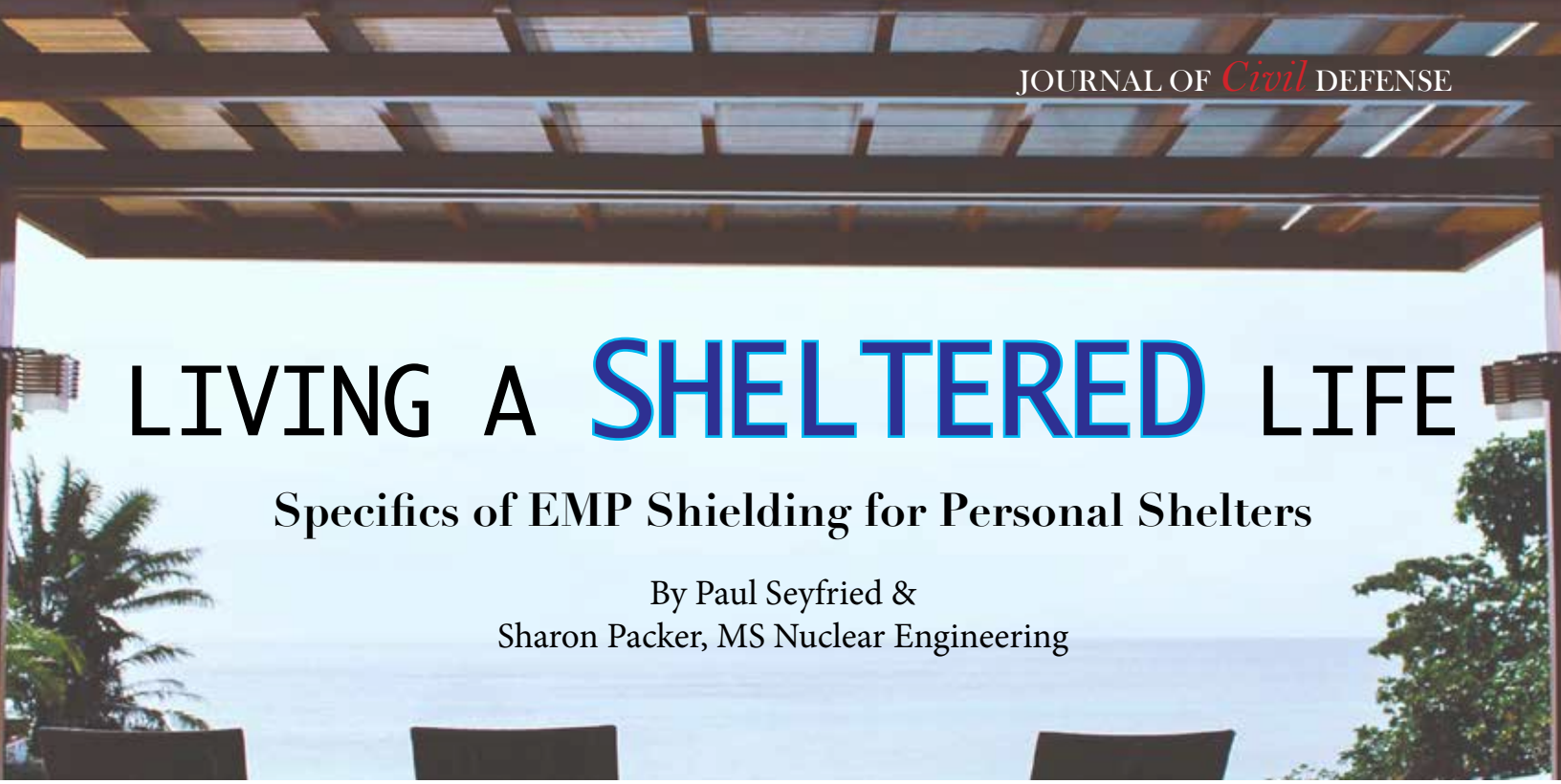


LIVING A SHELTERED LIFE

Specifics of EMP Shielding for Personal Shelters

By Paul Seyfried &
Sharon Packer, MS Nuclear Engineering

Photo by Bryan Agua on Unsplash

Since the 1970s, Switzerland's building codes have required the incorporation of NBC-hardened shelters into the construction of all new apartment buildings, homes, businesses, churches, hospitals, and factories. Shelters must be built to rigid government specifications and utilize only components approved by the Swiss Federal Office of Civil Defense (BZS). This demand for approved shelter equipment created a national industry in Switzerland, which continues to this day. If threatened, and on short notice, the Swiss can shelter its entire population of seven and one half million citizens in blast hardened shelters.

The population of Switzerland is well trained in subjects ranging from weapons effects, EMP hardening, first aid, shelter management, and rescue techniques. In order to familiarize the citizenry to shelter life, the government conducts shelter drills, along with large-scale civil defense exercises. It only follows that many millions of man-hours of experience have been gained from these exercises, and modifications to shelters and related equipment designs have evolved into today's proven shelter component lineup. In addition, the Swiss government testing agencies have conducted numerous (and on-going) destructive testing of shelter designs and components. Because of this fierce determination to remain neutral and free, the Swiss are driven to produce only the finest shelter equipment to be found.

EMP Shielding for Concrete Shelters

The following directions for EMP shielding (hardening) of concrete shelter rooms was written from information received in a personal interview with Michael Riedo, the President of ANDAIR Shelter Components in Andelfingen, Switzerland.

- Form the walls of the shelter room requiring EMP shielding.
- Grade and smooth the dirt floor within the parameter of the room.
- Form a closed loop of 4/0 copper wire that fits the inside dimensions of the shielded area, and place it on the ground.
- Connect two lengths (3 feet each) of copper wire to opposite ends of the 4/0 copper loop.
- Pour a thin layer of concrete over the copper loop to protect the wire while completing the construction of the room. This layer does not require the insertion of rebar. Hold the two, 3-foot lengths of wire out of the concrete layer.
- Form apertures for plumbing, electrical, communications, etc., using metal conduit, metal-sheathed wire and dielectric and other forms of isolation techniques where necessary.
- Pour the concrete walls, ceiling and floor of the room (all of which require at least two curtains of rebar).
- Frame the concrete walls and ceiling with wooden studs.
- Place a water barrier on the concrete floor.
- Cover the studs (walls and ceiling) and the floor with copper or 12-gauge steel. If using steel, paint the inside wall of the steel with a rust inhibitor.
- All metal seams must be welded.

- Power lines coming from the commercial power grid must be protected with an isolation transformer. There most probably will NOT be an alert to an EMP attack, and it is advisable when not in use to physically disconnect the commercial power source from the sheltered area, leaving a 3-foot separation between the power source and the connecting line to the sanctuary. (The E1 component of an EMP can jump 22 inches in dry air, so conventional disconnects make flashover a certainty.) Use battery and generator power whenever possible to limit the threat posed by the outside commercial power source. Always keep an extra charge controller, inverter, and critical support components inside a Faraday cage in the shelter.
- Doors must be solid steel or copper and be electromagnetically sealed around the door periphery. Most EMP doors use metal finger stock or EMI/RFI gaskets. These doors are available from manufacturers specializing in this market. Most are located in Scandinavia and Europe.
- The Swiss never use gasoline or propane generators in their shelters because of the explosive nature of these fuels. Public shelters in Switzerland are powered by EMP-hardened, diesel generators. It is very difficult to find EMP-hardened generators in the United States. Non-hardened generators should be placed in steel-lined, EMP-hardened mechanical rooms or in separate steel enclosures. If this is not possible, extra solid-state components for the generators should be stored in Faraday cages, along with instructions for replacement. Placing the entire generator in a separate steel container is much less expensive than trying to harden a room of a concrete shelter. These steel containers should be large enough to house both the generator and the diesel fuel. If the generators are kept in hardened rooms within the shelter, the room must be accessed through an airlock to manage the hazards of fire and exhaust fumes.
- Some shelter companies are using conductive, concrete-containing steel fibers and shavings to form EMP-hardened rooms. This is unproven technology. The Swiss require full steel coverage for EMP rooms. We have only one chance to get it right.

It is difficult and expensive to harden an entire shelter or even single rooms against an EMP. The large magnetic pulse component in HEMP and SREMP may penetrate metal wrapped rooms, and two such enclosures may be required to weaken the pulse to the levels needed to protect very sensitive equipment. Every opening in the room and device entering the room is a possible point of EMP entry. It is far easier and less expensive to keep multiple pieces of critical equipment (chargers, regulators, radios, electric starters, etc.) in individual Faraday cages.

Please note that you cannot block the magnetic pulse component of an EMP. The metal lining is designed to carry the magnetic pulse around the area and away from the interior. Solid steel walls have a greater shielding effect (SE) than enclosures with metal rebar or wire mesh reinforcement. The field that does reach the inner region of a shielded enclosure is basically a low-frequency magnetic field.

EMP Shielding for Corrugated Steel Pipe Shelters

Corrugated Steel Pipe (CSP) shelters provide excellent EMP protection if constructed properly. For extra assurance, we place critical communication equipment (extra solar power system components, ignition system components, etc.) into small Faraday cages inside the shelter, though simulator testing has shown that small devices such as laptop computers, cellular phones, and handheld radios have shown remarkable robustness after multiple insults at 50,000 volts per meter. Devices that shut down during insult have been successfully rebooted, sometimes requiring the removal and reinstallation of the battery. This is because they have very short conductive circuits and are not connected to the power grid. Laptops connected to the power grid will likely not fare well.

End Plates: Steel end plates must be welded to both ends of the corrugated steel shelter pipe. Don't use entrances or connecting tunnels constructed of concrete or other building mediums.

Doors & Openings: Use steel doors or hatches.

- If using CSP entrances, steel hatch-type doors must be welded to a round, heavy gauge, steel disk that is slightly larger in diameter than the CSP entrance. Limit CSP entrances to 54" or less (Figure 1).
- Reinforced concrete is poured around the door to a diameter of about seven feet, and two feet in thickness (Figure 2).

Steel Ventilation Pipes: Some people think that the steel air pipes might introduce EMP into the shelter. We do not believe this to be so. The pipes usually protrude only 18 inches above ground and should not act as an antennae.

We sometimes use rock filled cribs to attenuate blasts, but these cribs may also add further EMP protection.

Rock Filled Crib: All air pipes must be constructed of heavy gauge steel. We suggest using 6" diameter, ¼" walls

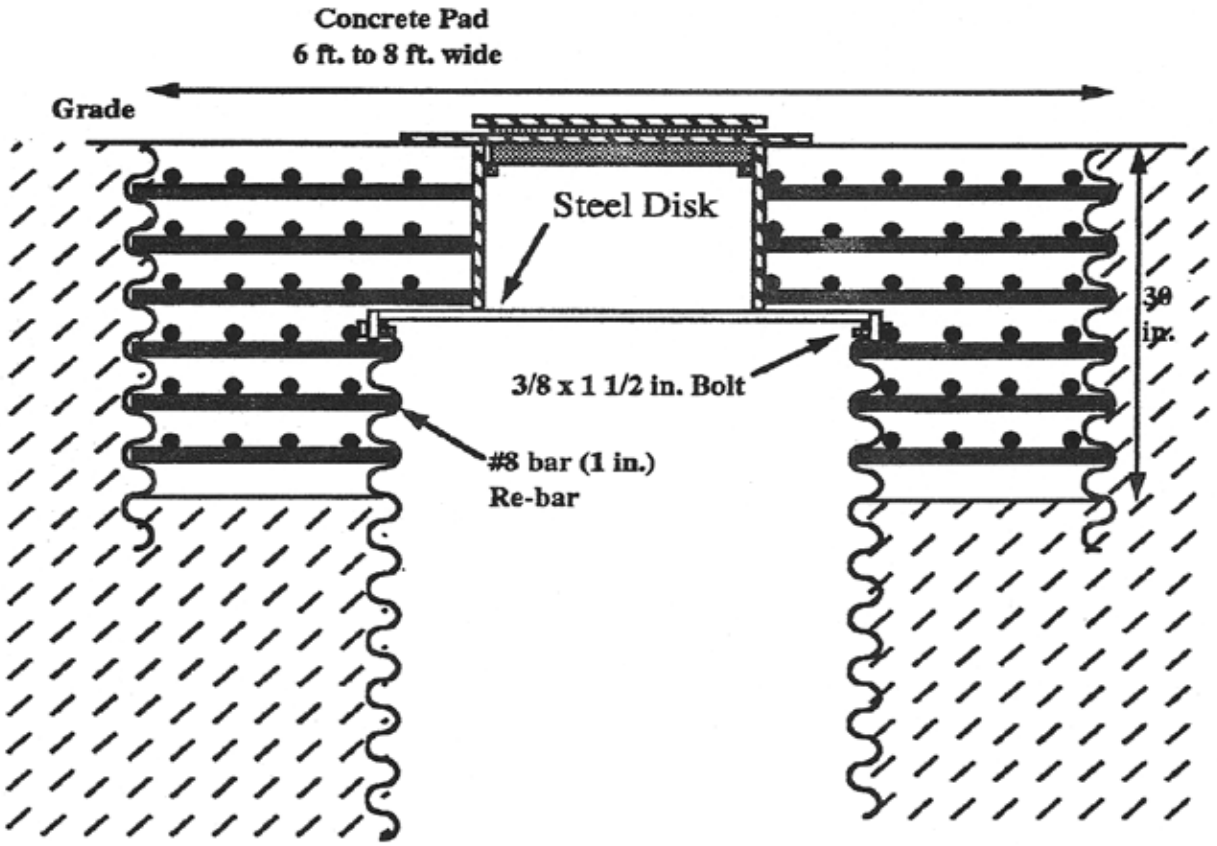


Figure 1. Door and steel disk.

Figure 2. Concrete pad.

(schedule 40), and placing the pipes into a steel, rock filled "crib" (Figure 3).

- The air pipes must be carefully welded in a full circumferential weld to the end plate of the shelter pipe at about 72" from the finished shelter floor.
- The air pipes should come out of the end plate, run horizontally to the desired location, and turn 90 degrees towards grade. The air pipes should end in a gooseneck configuration at about 12" below grade.
- Weld a heavy gauge, small mesh, steel screen to the ends of each of the air pipes.
- Make a gravel drain field around the air pipes at about 30" below grade. The rock crib will sit on top of this drain field.
- Cut a 24" diameter piece of corrugated steel pipe to a length of 30" to form the crib and place it over each of the air pipes with the top of the CSP crib at just above ground level. The bottom of the crib should rest on the gravel drain field.
- Fill the CSP crib with grapefruit sized rocks to the entire 30" depth (there will be about 12" of rocks above the goose neck of the air pipe).
- Weld a heavy gauge, small mesh, steel grill to the top

of each of the CSP cribs. The mesh grill and the CSP crib should not come into contact with the air pipes.
- Backfill around the outside of the CSP crib with dirt, to grade.

Figure 3. Rock crib before it has been filled with rocks, and before the screens have been welded in place.

Other Tips:

- Do not bring municipal power into the shelter.
- Do not bring water pipes into the shelter.
- ALL wiring for solar equipment and generators should be enclosed in steel or aluminum conduit, whether above or below ground to reduce or eliminate signal coupling which endangers electronic components.
- Solar panels are inherently resistant to damage to EMP effects if they are not connected to unshielded wiring, as the unshielded wiring acts as an efficient antenna, routing RF energy into the panels. Store spare solar panels unwired with their connecting cables coiled tightly.
- Stock several copies of spare well motors/pumps, inverters, and charge controllers deemed essential for life support systems. The supply chains that make these readily available now will NOT be standing by, waiting for your order after grid failure. Reference the burned-out cities last summer and the Texas blizzard last February for small examples, except that these were short term problems limited to very small areas.

In the overall picture, Americans will have to deal with the much larger effects of an EMP attack including complete destruction of food, water, energy, and medicine supply chains resulting in total loss of medical/dental care (when was your last checkup?).

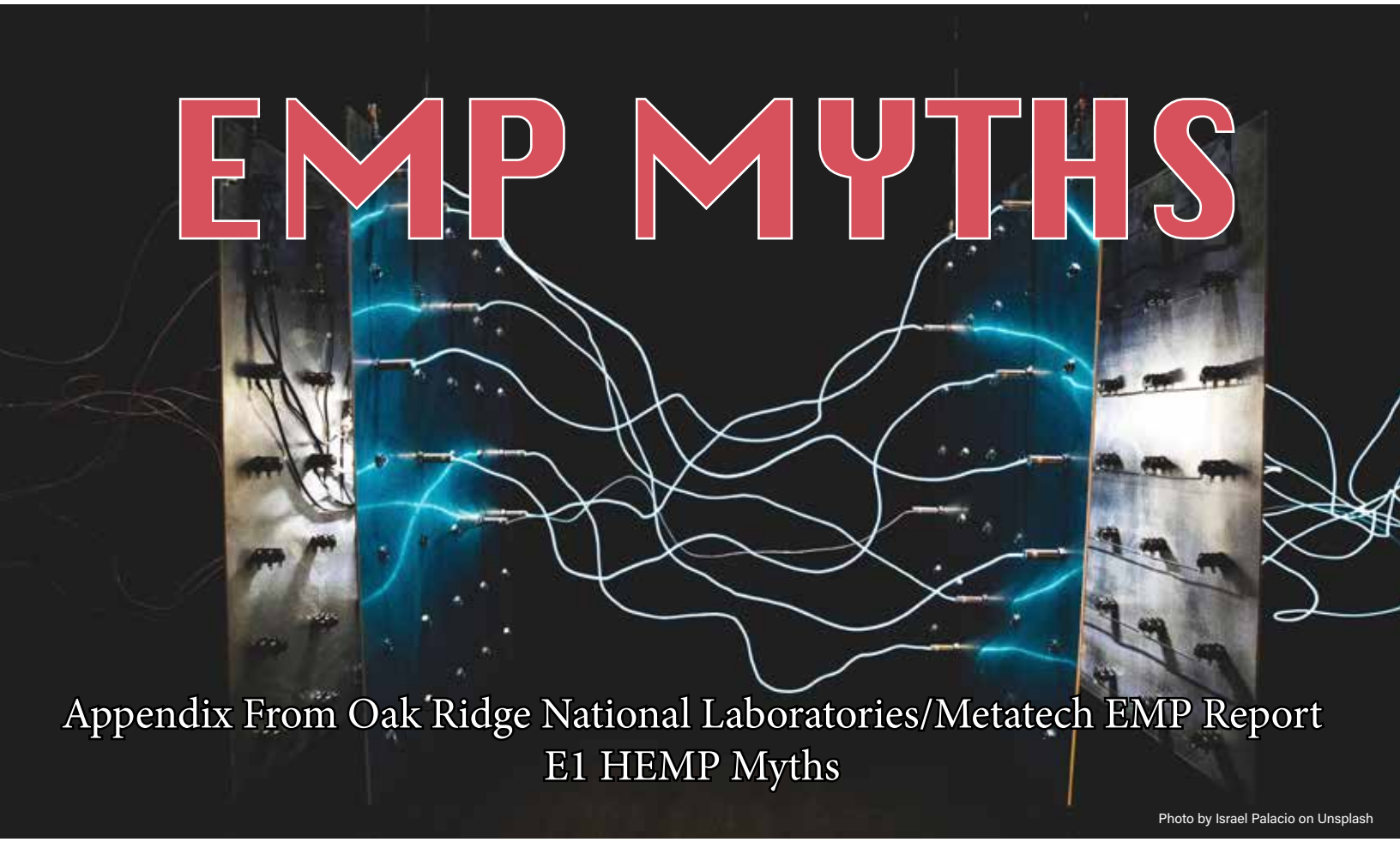
These issues will likely kill hundreds of millions of Americans who depend on all of this for every facet of life.

Plan accordingly. No rescue will be coming. Help will NOT be on the way. You are ON YOUR OWN.

Sharon Packer has a Bachelor's degree in Mathematics with a minor in Physics, and a Master's degree in Nuclear Engineering. She has served on the TACDA board of directors for over 20 years in several different capacities. Sharon is an expert in civil defense and in NBC shelter design.

Paul Seyfried has been interested in national security affairs since his enrollment at Missouri Military Academy and later, New Mexico Military Institute. His interest in self-help civil defense intensified during the height of the Cold War in the late 1980s. After building his first shelter with Sharon Packer he became acquainted with several nuclear weapons physicists involved with the creation of the nuclear age including Edwin York, Dr. Conrad Chester, and others who had hands-on experience in field testing of nuclear weapons and their effects upon buried shelter structures. His main interest is in the development and construction of cost-effective blast and fallout shelters within the reach of middle-class Americans. Paul builds and designs all hazard NBC shelters throughout the nation as a co-owner of Utah Shelter Systems. Paul also serves on the Advisory Board of The American Civil Defense Association.

EMP MYTHS



Appendix From Oak Ridge National Laboratories/Metatech EMP Report
E1 HEMP Myths

Photo by Israel Palacio on Unsplash

Much of the literature on HEMP is either classified or not easily accessible. Probably because of this, some of what is openly available tends to vary in accuracy -- some, especially from the Internet, has major inaccuracies. Some discussions of HEMP have the right words and concepts, but do not quite have them put together right, or have inaccurate interpretations. Here we will discuss some common misunderstandings.

HEMP has also appeared in some movies, and there are on-line discussions about possible errors in their depiction of HEMP. Here we will be concerned with E1 HEMP, and ignore misunderstandings about other types of EMP.

Extremists: Some general emphasis of comments fall into either "the world as we know it will come to an end" if there is a high altitude nuclear burst, or the other extreme: "it's not a big deal, nothing much will happen". Since we really have never had a nuclear burst over anything like our current modern infrastructure, no one really knows for sure what would happen, but both extremes are not very believable.

Yield: There appears to be an assumption that yield is important -- it is not for E1. The assumption that E1 is an issue only for cold war type situations, but not for terrorists or rogue nations, is false. Very big bombs might have better area coverage of high fields by going to higher burst heights, but for peak fields the burst yield is only a very minor consideration.

1962 experience: Some point to the Starfish event, and the rather minor HEMP effects produced at Hawaii by it. However, there are many problems with extrapolating that experience:

1. That was about half a century ago. Since then, the use of electronics has increased greatly, and the type of sensitive electronics we currently use did not really exist back then.
2. The burst was fairly far away from Hawaii, and the incident E1 HEMP was much less than worse case.
3. The island is small -- if over the continental U.S., long transmission lines would be exposed (especially an issue for late-time HEMP). In addition, widely separated substations would have been exposed, although with electromechanical relays (not solid state).

Also, the yield argument has been used -- Starfish was

a very big weapon, yet it did very little -- see the previous item, yield is not really very significant.

Cars dying: Some say that all vehicles traveling will come to a halt, with all modern vehicles damaged because of their use of modern electronics (and one movie even had a bulk, non-electronic part dying). Most likely there will be some vehicles affected, but probably just a small fraction of them (although this could create traffic jams in large cities). A car does not have very long cabling to act as antennas, and there is some protection from metallic construction. As non-metallic materials are used more and more in the future to decrease weight and increase fuel efficiency, this advantage may disappear.

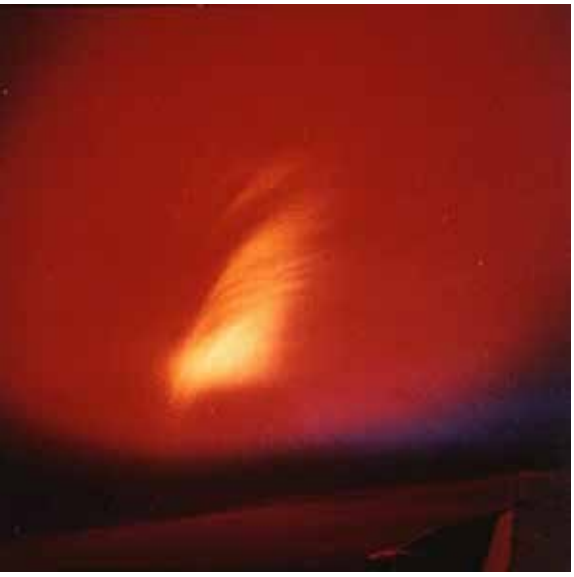
Wristwatch dying: One movie critic pointed out that electronics in a helicopter were affected, but not the star's electronic watch. A watch is much too small for a HEMP to affect it.

Electrons present: One critic, with some awareness of the generation process, said that HEMP could not be present unless there were also energetic electrons present. This is true when one is within the source region, which exists for all types of EMP; there are energetic electrons present. However, for the HEMP, the radiation and energetic electrons are present at altitudes of 20 to 40 km, not at the ground.

Turn equipment off: There is truth to this recommendation (if there were a way to know that a burst was about to happen). Equipment is more vulnerable if it is operating because some failure modes involving E1 HEMP trigger the system's energy to damage itself. However, damage can also happen, but not as easily, to systems that are turned off.

Maximum conductor length: There is a suggestion that equipment will be OK if all connected conductors are less than a specific length. Certainly, shorter lengths are generally better, but there is no magic length value, with shorter always being better and longer not. Coupling is much too complex for such a blanket statement -- instead it should be "the shorter the better, in general". (There can be exceptions, such as resonance effects, which depend on line lengths.)

Stay away from metal: There is a recommendation to be some distance away from any metal when a HEMP event occurs (assuming there was warning), because very high voltages could be generated. Metal can collect E1 HEMP energy, and easily generate high voltages. However, the "skin effect" (a term not really derived from the skin of humans or any other animal) means that if a human were touching a large "antenna" during an E1 HEMP event, current flow would not penetrate into the body. Generally, an E1 HEMP is considered harmless for human bodies.



Left: Photograph of the Starfish Prime high-altitude nuclear test explosion in course of Operation Dominic on July 9, 1962. Yield 1450 kilotons. In 1962 (the year TACDA was established) the US government initiated a series of nuclear tests called Operation Fishbowl near the Hawaiian islands which produced many unexpected results. Starfish Prime was the largest of five high altitude tests. The operation was in response to the end of the Soviet 3 year moratorium on nuclear testing.

Images courtesy of US Govt. Defense Threat Reduction Agency

Left: The flash created by the explosion as seen through heavy cloud cover from Honolulu, 900 miles (1,450 km) away.

Right: Another view of Starfish Prime through thin cloud, as seen from Honolulu.

EMP Q & A

By Dave Male, Electrical Engineer, and
Sharon Packer, MS Nuclear Engineering

Question:

What is an EMP? What is the meaning of E1, E2 and E3?

Answer:

A high altitude electromagnetic pulse (HEMP) is caused when gamma radiation created in a high altitude nuclear detonation interacts with a pancake shaped layer of atmosphere between 12 and 25 miles high. Electrons are knocked from the atoms in the atmosphere and spiral in a downward direction at near the speed of light. The earth's magnetic field attracts the electrons and causes a short, electromagnetic pulse called the Compton electron pulse over an area that is in line of sight of the explosion.

A nuclear weapon detonated at a height of 150 miles over the center of the country could cause an EMP over the entire continental United States. Typical EMP levels at near ground level reach a maximum of 50,000 volts per meter with a peak power density of 6.6 megawatts per square meter. The average current density is about 48 amperes per square meter. There may be super EMP weapons that can exceed this saturation point, but most EMP hardening in the civilian world is still done to the 50,000 volts per meter range.

All explosions, chemical or nuclear, create an EMP. A nuclear EMP, however, creates a very complex 'multi-pulse' consisting of three components: E1, E2 and E3.

E1

The first component, E1, is very brief (just a fraction of a second), but it is this component that damages our computers and communication equipment, as it produces very high voltages in electrical conductors. The E1 pulse will bypass the resistors and surge protectors designed to protect electronic systems against lightning. Lightning travels at about 3,700 miles per second. Light travels at 186,300 miles per second. The E1 component of an EMP travels more than 90% of the speed of light.

The E1 component ends in about 1 microsecond. If solid state electrical equipment is not protected inside a Faraday cage, this fast rise-time pulse must be attenuated by a special transient protector designed for this purpose. These devices are becoming more common and can be purchased by the general public.

E2

The E2 component lasts from about 1 microsecond to 1 second and is very similar to pulses caused by lightning. A very close lightning strike may be even larger than this E2 component. E2 alone could be attenuated by lightning protection technology, but since it is always associated with E1, the lightning suppressors will be damaged and will not give the wanted protection, adding additional damage to the devices.

E3

The E3 component acts much like a coronal mass ejection (CME) from the sun. It couples with long conductors such as power lines and acts like a direct current (DC). This will cause severe damage to our alternating current (AC) power grid, which is not designed to handle direct currents. If not protected, our huge system of power transformers will be destroyed by this component. Because of the small number of transformers in stock in America, our power grid would not be functional for many years.

The Chicken and the Egg Problem

If we have a chicken, it can lay an egg. If we have an egg, the chicken can be hatched. Think of the chicken as the "electrical grid power" and think of the egg as our "solid state electronic equipment". With power, we can eventually recreate the electrical equipment. If we have

electrical equipment, we can recreate the power grid. With neither the chicken nor the egg, it may be years before we again have a functioning society as we know it today.

Question:

Can an EMP really happen, or is it a myth?

Answer:

The threat of an EMP is not a myth. Our own government considers EMPs to be the greatest threat there is to our civilized society. There are MANY variables that determine a device's susceptibility to an EMP. Among them are wire length, wire proximity, circuit size, powered/unpowered, open/closed circuit, loop lengths, shielding, orientation to the field, signal shadowing, signal reflection, grounding, open circuit air gap, etc. to name a few. Unfortunately, you cannot predetermine whether an exposed device will survive an EMP strike or not. The only sure method to protect a device is to have an extra copy and store that copy in a Faraday container. In a grid-down situation, however, some devices may be pointless. Your cell phone will likely be rendered useless with no phone system to connect it to. The best devices to protect would be communication radios, broadcast receiver radios, rechargeable batteries, and methods to keep them charged, especially solar. In any event, should a massive EMP strike the U.S., be prepared to live like you are back in the 1800s for quite a while.

Question:

What are the effects of an EMP?

Answer:

An EMP is basically a massive, high voltage, high current radio frequency (RF) spike that induces high voltage and current in any conductor it passes through. Any time a nuclear device is detonated, it generates a massive EMP field. Some nuclear devices have been specifically designed to maximize this effect. Enemies of the United States do possess these weapons. A solar flare from the sun is also capable of generating massive EMPs.

Question:

Can an EMP come from the ground?

Answer:

Electromagnetism travels in and on the surface of conductors, depending on frequency (low-in and high-on), and passes through insulators. Soil and rock can be both conductive and insulative, so yes.

Question:

Is there a device that detects an EMP?

Answer:

No device will detect an EMP before it occurs. There are some protective devices that can sense the nearly instantaneous voltage spike and open a circuit to limit damage.

Question:

How do I know if a power outage is an EMP or just a common outage?

Answer:

Test your telephone to see if it is in service. A common power outage usually won't affect your phone service, as they have backup power. Most radio stations will not function after an EMP, so turn on your battery powered radio to see if there is transmission. You may also see arcs come from your electrical outlets in an EMP.

Question:

Does our military have an anti-EMP missile?

Answer:

No, not specifically. However, they do have anti-missile missiles, which may or may not stop an enemy missile carrying a nuclear device.

Question:

Does an EMP cause injury to people?

Answer:

An EMP does not directly hurt people. EMPs last just seconds. However, long-term exposure to intense electromagnetic fields is thought to cause harm to humans. The damaging effects of an EMP on our electricity-based lifestyle are what hurt people.

Question:

What is a Faraday cage?

Answer:

A Faraday Cage is a sealed metal container of any size which is intended to keep electromagnetic radiation from penetrating to the inside. Electromagnetic currents will travel in the walls and on the surfaces of the cage, but they cannot propagate to the interior. Massive Faraday cage rooms are used frequently in the electronics industry for testing of sensitive electronic equipment. If you are using a small metal container such as an ammunition can as a faraday cage, make sure that all gasket material is removed, and that the paint is sanded away from the lid area so that you have full metal to metal contact. A metal trash can makes an excellent Faraday cage. Make sure that the lid to the trash can is sealed shut with aluminum duct tape.

Question:

Does leaving the batteries out or unplugging a device protect it from an EMP?

Answer:

Because electricity can only travel in a closed circuit, this may have some limited benefit. There may still be loop circuits in the device that are affected, however. Extremely high voltages in an EMP can jump air gaps too, so this may also defeat unpowered/unplugged devices.

Question:

What kinds of devices can survive an EMP?

Answer:

Smaller electronic devices without much circuit area are least likely to be affected. Devices that are most susceptible are those with long wiring, external wires, or radio antennae.

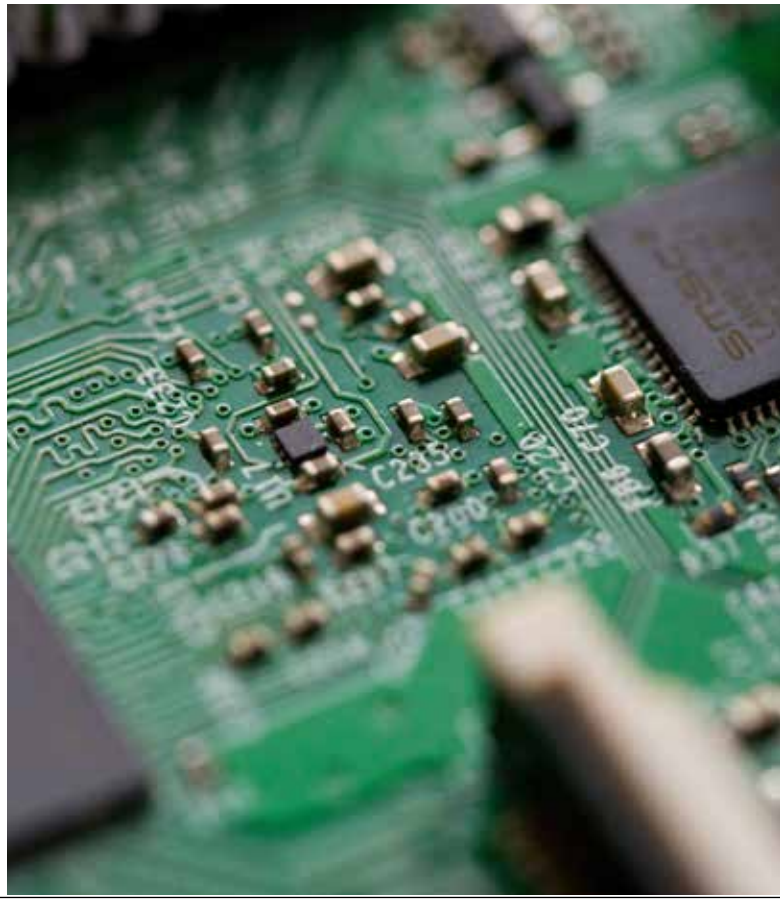
Question:

Do electronic devices recover from an EMP?

Answer:

If the electronics of the device are physically damaged by the pulse, it will not recover. If the circuit is configured or shielded such that only an upsetting voltage is generated instead of a destructive one, then the circuit may be reset and continue to operate. Disconnecting the cables from vehicle batteries may allow computerized ignitions to reset after the cables have been reconnected.

Photo by Chris Reid on Unsplash



Question:

If my car fails in an EMP, can it be restarted?

Answer:

In a personal interview with Bron Chikotis, he stated that he believes just a few cars will be disabled by a high altitude EMP (HEMP). Mr. Cikotas was a TACDA board member for many years, and up until his death in 2014, he served as a consultant on EMP and infrastructures for the US EMP commission. Mr. Cikotas said that the metallic construction of most vehicles will give them some protection, and the short runs of electrical wiring and cables is not long enough to act as an antenna. He believed the greatest danger will be the traffic jams caused by those few vehicles that are affected.

Mr. Cikotas oversaw EMP simulations on various makes of vehicles. He reported that after several tests on each vehicle, only a few did not restart. However, after removing the battery cables for a few minutes to allow the battery to discharge, the cables were reconnected, and the vehicle was able to be restarted. He suggested that we keep a tool in our vehicles that can be used to disconnect our batteries in the event of an EMP.

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Dave Male has worked as an electrical engineer in the defense engineer industry for over 40 years and has extensive knowledge and experience in electrical components. He also worked as an aircraft electrical engineer. Dave serves on the TACDA Advisory Board as the EMP expert.

Sharon Packer has a Bachelor's degree in Mathematics with a minor in Physics, and a Master's degree in Nuclear Engineering. She has served on the TACDA board of directors for over 20 years in several different capacities. Sharon is an expert in civil defense and in NBC shelter design.

HISTORY OF CIVIL DEFENSE COLUMN

Early Civil Defense Films:
Beyond "Duck and Cover"

By Nicholas M. Studer, MD, Director, National Museum of Civil Defense & Angela J. Moretti, MA

The history of civil defense in the United States is closely related to the ever-changing military and political circumstances of the time. During World War II, the Office of Civilian Defense quickly adjusted its mission from preparing for the real threat of enemy air raids to focusing on maintaining the morale of the civilian population for the war effort[1]. With the Korean War well underway in 1951, the Federal Civil Defense Administration (FCDA) would find itself charged with developing new strategies considering how planners expected the next conflict would threaten American civilians.

In January 1951, deeply worried after the stunning defeat of American expeditionary forces in Korea, the federal government anticipated a potential for its proxy war to rapidly progress out of control. At the time, the Soviets were expected to have a rather limited arsenal of fission weapons, like what the U.S. had used to end the war in Japan. Delivery of this limited supply of weapons would come by lumbering bomber aircraft. However, in 1951, the U.S. had yet to develop the extensive air defense radar networks it would have by the end of the decade. It was a realistic concern that a "sneak attack" by enemy bombers would catch American target areas by surprise. Knowing that the Soviet Union would wish to maximize the effects of its limited nuclear arsenal, planners anticipated major civilian population centers would be a primary target[2]. These facts combined to result in FCDA emphasizing the potential for attack without warning, encouraging civilians to be always alert for the ever-present threat.

FCDA published pamphlets, supported stories and articles in the newspaper and magazines, encouraged local meetings and educational outreach, and at one point even sponsored a massive, traveling, Army-supported road show known as the Alert America Convoy. However, no aspect of FCDA's public education campaigns is more visible and enduring today than the short films it produced shortly after its inception. Aimed at various audiences and topics, the intent of training films is generally to standardize delivery of a message rather than leave it to the interpretation of an instructor. Additionally, with the increasing popularity of television in American homes, public information could be broadcast directly to the families FCDA hoped to inform.

Figure 1. "Survival Under Atomic Attack" filmstrip in box.

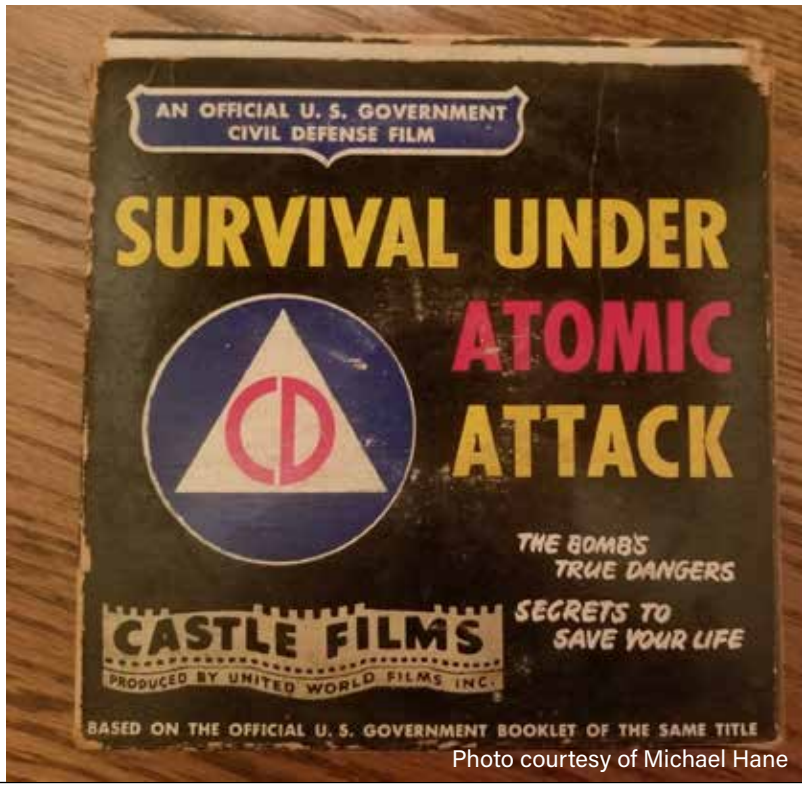

Photo courtesy of Michael Hane

The first FCDA film was "Survival Under Atomic Attack", released in April 1951 and lasting under nine minutes (Figure 1). Corresponding to a booklet of the same name and narrated by famed broadcaster Edward R. Murrow, it describes the basic understanding of the primary fission bomb effects: blast, thermal pulse, and prompt nuclear radiation. The fission bombings of Hiroshima and Nagasaki are referenced and shown for example. "Survival Under Atomic Attack" then transitions into instructions on how best to prepare for and respond to an enemy attack. Instructions to stock food and water, flashlights, a portable radio, and a first aid kit with the knowledge on how to stop bleeding are familiar parts of any disaster preparedness instructions even today. FCDA policy of the time primarily encouraged private shelters in homes, but the film recommends looking for public shelters in the community. By 1957, however, "Survival Under Atomic Attack" was considered obsolete[3].

"Firefighting for Householders" (Figure 2) soon followed "Survival Under Atomic Attack" and also contained an accompanying booklet of the same title with a nine-minute running time. It's not surprising that it is very similar in content to the World War II Office of Civilian Defense's 1942 issued "Fight That Fire". "Firefighting for Householders" describes tactics and equipment that would be available and useful to the average person, such as fire extinguishers and blankets. The film emphasizes

Figure 2. "Firefighting for Householders" filmstrip in box.

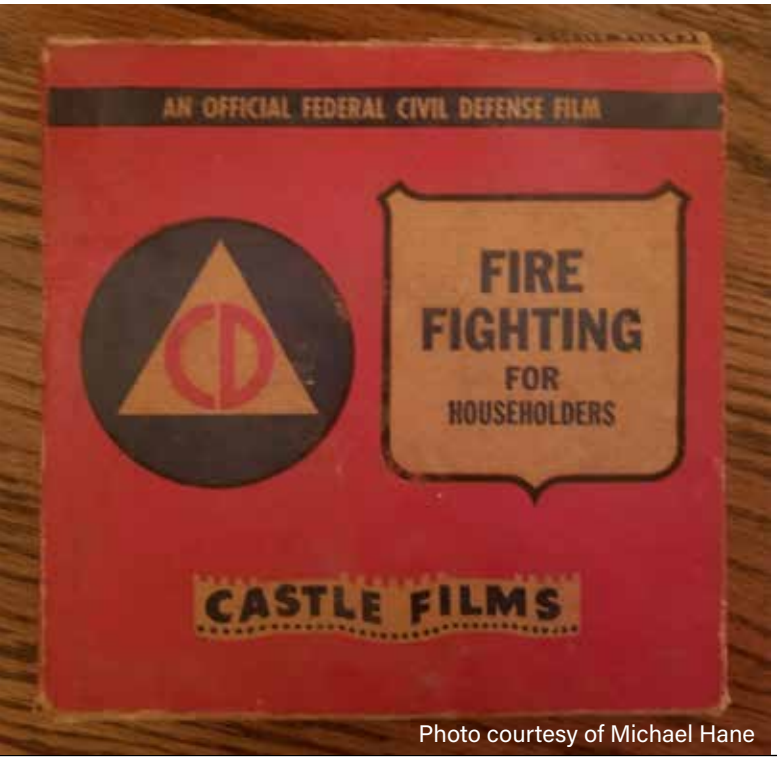

Photo courtesy of Michael Hane

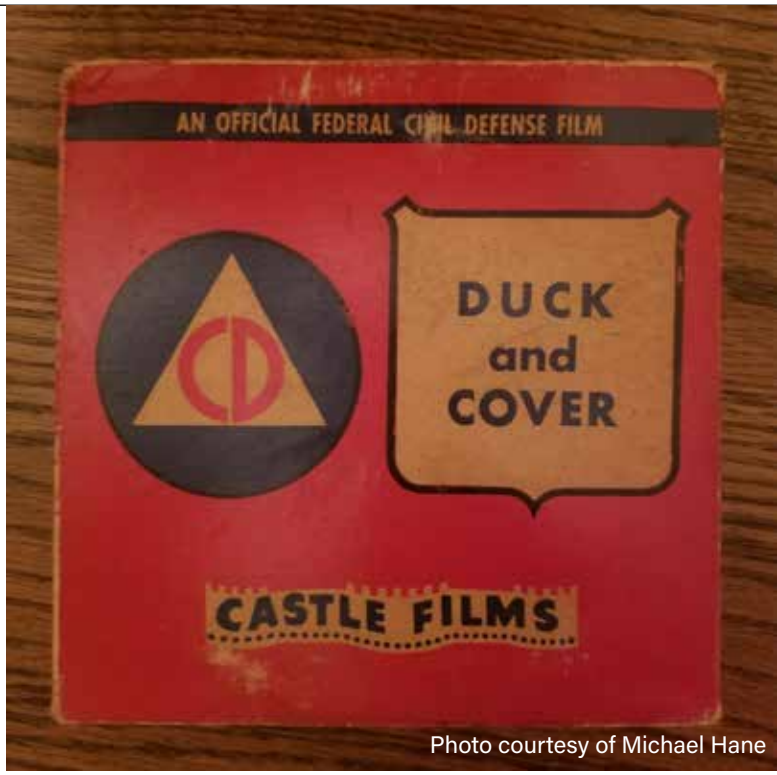

Photo courtesy of Michael Hane

Figure 3. "Duck and Cover" filmstrip in box.

early and aggressive action, noting that large fires might be prevented if extinguished early while they are small. FCDA also encouraged "fireproof housekeeping", suggesting cleanup of oily rags, yard waste, and loose papers to prevent fires. This film was also listed as obsolete by 1957.

Of these films, only one became a cultural touchstone, "Duck and Cover" (Figure 3). Produced by Archer Productions during the fall of 1951, the nine-minute film was released in January 1952 with much enthusiasm by FCDA. A cornerstone of FCDA's efforts was directed at schools and children, as FCDA prioritized their safety in this early phase of the program. FCDA further believed that children could be a vehicle to increasing awareness and education in their parents, thus providing an even greater return on investment. Filmed primarily in New York City, the film's star is an anthropomorphic turtle named Bert, wearing a Civil Defense helmet and bowtie. Interspersed with live action sequences of children responding to a potential enemy attack, the film has the unenviable task of attempting to convey the effects of fission bombing to an elementary school population. The film passes along the instructions to minimize the risk of injury from the blast wave's flying debris by getting as low as possible, protecting one's head with hands/arms, and utilizing any form of cover.

"Duck and Cover" was considered an obsolete title by 1957, as the changing nature of weapons and delivery

systems resulted in significant alterations to priorities and the general approach to civil defense. In 1955, the well-publicized plight of the "Lucky Dragon No. 5" crew's significant radiation exposure from the Castle Bravo fusion weapons test had brought radioactive fallout to the forefront of civil defense priorities. Recognizing that increasingly large percentages of the country would be threatened by radioactive fallout, FCDA began to reorient itself away from focusing on direct weapons effects[4]. It wasn't that these weren't seen as threats anymore, merely a pragmatic understanding that FCDA could not waste its limited (and dwindling) resources on what was no longer the primary threat to the largest proportion of the population. By 1959, "Duck and Cover" was among the other early films "recalled" for destruction by the Office of Civil & Defense Mobilization (OCDM), FCDA's successor[5]. There is anecdotal discussion that the film was shown in an official capacity by local civil defense and schools into the 1980s, but the National Museum of Civil Defense (NMCD) is not aware of any clear evidence. That should have been the end of the story, with "Duck and Cover" forgotten like most other civil defense films.

How then, did this individual film obtain such notoriety in popular culture and contemporary history, with Bert serving as the icon for the entire U.S. Civil Defense program across the Cold War? That answer comes from yet another film, the cynical "Atomic Café", released in 1982 at the height of the Nuclear Freeze movement. The "Atomic Café" features several FCDA films, but "Duck and Cover" stands out. Like other early 1950s films – "Duck and Cover's" animation, announcer, and contemporary setting seem dated and campy in the more modern view. Aimed at young children in particular, "Duck and Cover" also carries with it a certain sense of cheeriness that is easily noted and distinct from the films aimed at adults. The upbeat tone of the film is in stark contrast to the admonition for children to remain perpetually alert for an attack at any time. Juxtaposed against the modern scenarios involving thousands of incredibly destructive fusion weapons, the film is easily seen as misguided, uninformed, or at worst, intentionally manipulative propaganda for children. In short, "Duck and Cover" well serves a general public consciousness that conflates the complex timeline of poorly documented and ever-changing civil defense program efforts.

These films were generously donated to the NMCD by Rebecca and Kimberly Hane in August 2020. Michael Hane found these three films and a civil defense helmet at the Pottstown, PA Army National Guard Armory during the 1970s. As a child, Mr. Hane would routinely visit his father, First Sergeant David Hane, who served as the Service Support Administrator for the Armory. The younger Hane found the artifacts in a disused storage area under a staircase during one of these visits. It is possible the Armory was used for storage of Civil Defense items by the local organization, but further details are unknown.

Pottstown, PA. Army National Guard Armory.

Photo courtesy of Michael Hane

Acknowledgements:

The authors would like to thank Mr. Jake Hughes of "Atomic Theater" for his assistance with the Motion Pictures on Civil Defense reference.

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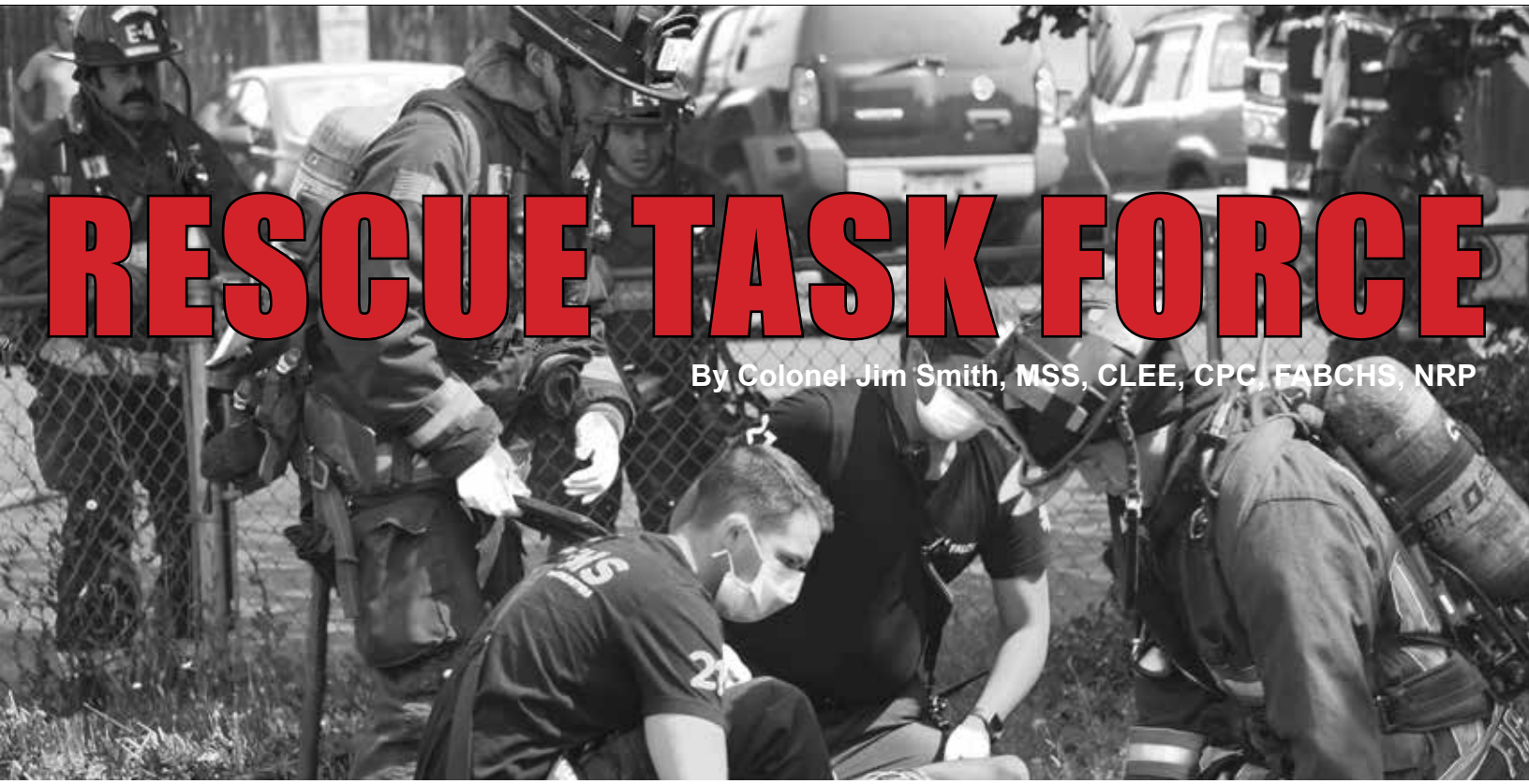
Dr. Studer is a practicing Emergency Medicine physician and the founding Director of the National Museum of Civil Defense, the only 501(c)(3) nonprofit museum dedicated to the historical preservation and interpretation of the United States Civil Defense program. The terrorist attacks of 9/11 first catalyzed Dr. Studer's interest in the history of our Nation's Civil Defense program, which grew into a desire to share his research with others. He volunteered for the Brevard County (FL) Office of Emergency Management during the early 2000s, and later served at the Florida Department of Health - Bureau of Radiation Control's Radiological Instrument Maintenance & Calibration Laboratory prior to attending medical school at the University of South Florida. Dr. Studer's primary interests within Civil Defense history include the Chemical/Biological Warfare, Radiological Defense, and Packaged Disaster Hospital programs.



RESCUE TASK FORCE

By Colonel Jim Smith, MSS, CLEE, CPC, FABCHS, NRP

Photo by Andrew Coop on Unsplash

The "Rescue Task Force" concept was developed using techniques from the Tactical Medicine Essentials textbook (endorsed by the American College of Emergency Physicians) and TacMed courses. It is nothing new to place trained EMS providers by the side of victims following an active aggressive behavior or active assailant mass casualty incident (AAMCI). In 1970, the Wound Data and Munitions Effectiveness Team (WDMET) published a study summarizing the principle of rapid medical response, which necessitates aid to wounded victims be given "within a few seconds to minutes".

AAMCIs are rare Per FBI data, only 100 people are killed annually. This low-frequency, high-consequence event can be planned for in terms of response with training and equipment, thus preventing unneeded deaths. Plus, these same techniques are useful in natural events such as tornadoes or earthquakes where multiple persons are injured and in need of care in a potentially dangerous setting.

Coupling the TacMed Downed Operator Care course for officers and EMS personnel with these concepts led to the development of the "Rescue Task Force". This program teaches EMS providers to interface with law enforcement and enter the "warm zone" (which has been cleared of assailants) to treat wounded individuals. Law enforcement will ignore the wounded until the active aggressive behavior or active assailant is stopped, then if trained, they may engage in emergency medical care.

Key points to understand include risks involved, assailant behavior, cover and concealment, expedient bleeding control with tourniquets and "battle dressings", and moving the wounded to evacuation points or casualty collection points. Tactically trained EMS personnel team up with law enforcement as soon as both are available. They then move to the "warm zone".

The acronym **"Call A CAB N Go Hot"** is used:

- **Call** the team (if noise discipline allows) to alert of a casualty,
- **a**bolish any threats present,
- treat the patient by **c**ompressing killer bleeds, opening the **a**irway, and checking **b**reathing.
- The follow-on team then conducts a brief **n**eurological exam,
- **moves** the patient for evacuation,
- and prevents **hypothermia**.

This rapid assessment and removal from the scene help the victim reach definitive care as quickly as possible. Many scenes are cleared in less than 20 minutes once this operation begins.

The emergency medical assessment is simple. If the victim is speaking and moving, they are given a self-care kit with a "battle dressing", tourniquet, self-adhering gauze, tape, and simple printed directions (Figure 1). If speaking but not moving, they are assessed for life-threatening conditions. Those not speaking are rapidly assessed for

Figure 1. Individual first aid kit (IFAK) with tourniquet and "battle dressing".

breathing. If breathing, they are assessed for uncontrolled bleeding (which is then controlled), placed in the recovery position, and a follow-on team evacuates them while the entry team pushes ahead. Time is critical in saving lives. Those obviously dead with brain avulsion injuries, evisceration of vital organs, incineration, injuries inconsistent with life, or apnea after opening the airway are passed by. Follow-on teams confirm deaths but do not move bodies for evidentiary purposes.

Tactical medics treat a downed officer.

EMS personnel must learn the tactical language and tactics of law enforcement. Some examples include understanding cover (stops bullets) versus concealment (hides the person), how to "pie" doors and corners, expedient entry/exit, how bullets perform when fired (ricochets versus wall and floor following rounds), injuries from firearms or explosives, use of body armor/ballistic helmets, light and noise discipline, and booby traps/IEDs.

In summary, a rescue task force performs rapid entry to the "warm zone" to assess and treat those with life threatening injuries. This entry team pushes through the entire venue seeking the wounded. Those with non-life-threatening injuries, the dead, and those treated are left for follow-on teams who then perform additional assessment and treatment and evacuate the injured to an evacuation or casualty collection point. A brief overview of this concept can be seen in the FBI produced YouTube® video "The Coming Storm" (https://www.youtube.com/watch?v=9jgS7jBXZU4).

Colonel Jim Smith is a registered paramedic and has been involved in law enforcement and public safety for more than 45 years. He is the coauthor of several textbooks including "Tactical Medicine Essentials", and was one of the developers of the "Tac-Med Essentials Downed Operator Care Course" and "Rescue Task Force" programs based on the textbook. He has a master's degree from the University of Southern California and teaches criminal justice courses for the University of Phoenix and Troy University. Smith is a certified police chief and certified law enforcement executive. He is a former police SWAT member.

PRECISION AIR RIFLES

By Jay Whimpey, PE,
TACDA President

Photo by mani_xD from Pixabay

An accurate and reliable small-bore rifle is almost a necessity in many survival situations for small game hunting, pest control, and even discouraging intruders. Many people don't think of air rifles for such needs. It is definitely worth considering a small-bore pre-charged pneumatic air rifle for your preparations.

Air rifles can be superior in many respects to a more common cartridge-type, powder-burning 22 rifle. The air rifles are much more accurate than powder-burning rifles because the amount of air used for each shot can be precisely delivered. They also provide more repeatable muzzle velocities than the powder-burning, cartridge guns. The air rifle is unregulated in most states and requires very little cleaning and maintenance compared to powder-burning weapons. Ammunition is currently in good supply and very affordable at about $0.03 per projectile. They are quiet and can be fitted with unregulated sound moderators that reduce the report from a shot even further. You can get up to 100 shots from a single charge of the air reservoir. Large magazines also allow multiple shots with easy cycling of a small level between shots.

There have been many technological advances recently for pre-charged, pneumatic air rifles resulting in roughly the same performance as a 22 rifle. Air rifles have precise air pressure regulation and trigger mechanisms that offer superior repeatability and accuracy and are far superior to other types of BB and pellet rifles. Many people are very familiar with lever-action BB guns, break-action pellet guns, and pump style single-shot pellet guns, but compared to the air rifle, they leave much to be desired.

Projectiles come in many different varieties including standard pellet shapes and slugs. The projectiles tend to be rather short, and therefore, require lower twist rates in the barrel to stabilize them. They also tend to be quite stable up to about 600 yards. Ballistic coefficient information of the projectiles is available, and bullet drop information can be precisely determined out to these long ranges. Muzzle velocities for projectiles in pre-charged air rifles tend to range between 800 and 1000 feet per second with bullet weights in the 15-to-30-grain range for .22 caliber rifles. Rifles are available in calibers from 0.17 to 0.50. Air rifles can be "tuned" to provide more air for heavier projectiles and adjusted to the desired muzzle velocity. They also have air rifles that are designed to use full-sized arrows as projectiles.

Photo by Brigitte Klenner from Pixabay

There are many different types of pre-charged, pneumatic air rifles including some with integral air pumps, others that require a separate source for air, magazine fed, single shot, and many types of loading actions. External manual air pumps, electric pumps, and larger external recharging cylinders can be used to provide air for recharging them.

These rifles range from roughly $300 up to $2000, which is similar to small caliber, powder-burning rifles. There are also many accessories such as scopes and sights, bipods and tripods, and various types of ammunition.

Air rifles are sold by both domestic and foreign providers. Utah Airguns in Orem, Utah carries many different types of air rifles and accessories. They also ship rifles all over the United States. You can contact them at www.utahairguns.com.

Jay Whimpey is the president of The American Civil Defense Association and the president of The Civil Defense Volunteers of Utah. He is a licensed chemical engineer with a vast amount of knowledge and experience in civil defense, developing new techniques and teaching preparedness skills. Jay received a Bachelor of Science Degree in Chemical Engineering from the University of Utah in 1982 and a professional engineering license in 1995.

EMERGENCY COMMUNICATIONS (part 1)

By Randall Smith

Photo by Mehmet Turgut Kirkgoz on Unsplash

This is the first in a series of articles that will be published in the Journal of Civil Defense. At the end of this series, the information will be available to you in the TACDA Academy, on our TACDA web site.

Introduction:

This article is not intended to be a comprehensive guide to EMCOMM or Emergency Communications. Its goal is to provide sufficient information to allow Civil Defense personnel to communicate with others in order to provide relief, enhance resilience, and minimize casualties in the event of a disaster, regardless of cause. If this information facilitates communications among Civil Defense personnel, preppers, survivalists, and other patriots, then it will have achieved its goal. A second goal is to increase the probability of connecting with like-minded groups and individuals in the event of a major regional or national catastrophic occurrence. Such communication will be invaluable in the response to an event and, particularly, provide the communicative infrastructure for recovery and rebuilding efforts afterward. Much of the information presented herein is drawn from both amateur radio and military communications sources.

Reliable, current information during a disaster or escalating crisis is paramount to survival. It is extremely

important for people to be apprised of the scope of the disaster.

The term "communication", unlike the term "broadcasting", entails the two-way exchange of relevant information. This information includes, but is not limited to, evacuation routes and where to find food, water, and medical help. People affected need to know if and when help is arriving. They also need to know about imminent threats to their well-being, security, and survival. Two-way communication is required in order to facilitate and mitigate the needs of disaster victims in an efficient, effective, and timely manner.

It has been said that, if one understands the language of a science, then he or she, in effect, knows that science. Therefore, an underlying theme of what follows involves defining key terminology associated with the science of electronic telecommunications.

The Challenges:

Depending upon the scope of the crisis, some forms of communication which we rely on normally will, in all likelihood, become unusable. Traditional, hard-wired "land lines", cellular systems (cell phones, cellular repeaters, antennas), and the internet may no longer function. Power system failures, regardless of cause (e.g. severe storms, tornados, hurricanes, floods, terrorist attacks, earthquakes, electro-magnetic pulse [EMP] detonations) could cause power failures over large portions of our country. In the absence of alternative power sources, cellular phones and other devices which rely on rechargeable batteries could become useless since their batteries could not be restored to functional capacity.

Electromagnetic Pulses or EMPs:

An electromagnetic pulse (EMP) is an intense burst of electromagnetic energy caused by an abrupt, rapid acceleration of charged particles, usually electrons. An EMP can contain energy over a very large segment of the electromagnetic spectrum, from very low radio frequencies (VLF) to ultra-violet (UV) frequencies. In short, EMPs can interfere with or disrupt all forms of radio communications. Studies have demonstrated this, though higher frequencies tend to be less affected than lower frequencies during an EMP detonation. An EMP explosion or "burst" has the potential to destroy any and all unprotected electrical and electronic device circuitry including that found in all telecommunications equipment, personal, mainframe and vehicular computers, cellular phones, and repeaters. Along with our electronics, an EMP attack can destroy one or more of our nation's three principal electrical power grids (Eastern, Texas, Western) resulting in the loss of our main power source over vast areas of the United States.

The Faraday Cage:

It is possible to protect vulnerable and valuable electronic equipment from the electronic ravages of an EMP by enclosing it in a metallic container called a "Faraday cage" (named after the scientist, Michael Faraday, who studied the properties of electro-magnetism). The values of basic electronic components called capacitors which store electrical energy, are measured in units called "Farads" in recognition of his pioneering work. A Faraday cage essentially and effectively blocks ionizing radiation from EMP blasts from reaching electronic equipment stored inside. Any metal container will act as a Faraday cage. It is imperative that the lid or cover of the container achieves metal-to-metal contact with the container itself. Any paint which might insulate the cover from the container must be removed. In most cases, sanding may be all that is required to satisfy this important requirement. Small, metal garbage cans with lids are common types of Faraday cages. To assure the safety of the enclosed equipment, some people recommend purchasing a metal screen about 6 inches in width with a length that equals the circumference of the lid of the container. The screen is folded in half lengthwise and placed around and over the lip of the container. The lid should then fit snugly against the screen and container. The screen will help to assure that an effective metal and electrical seal is achieved between the container and its lid.

Solutions: Radio Communications

Experience has taught us that we cannot rely, in part or in whole, upon traditional communications systems during emergency situations. The only viable option is to familiarize ourselves with alternative communications technology, equipment, and operating practices.

Amateur (ham) radio.

Photo by Lawrie Richardson from Pixabay

Those who are serious about providing effective communications capability for themselves, their families, their communities, and this Nation should give serious consideration to obtaining an amateur (often referred to as a "ham") radio license. Issued by the Federal Communications Commission, these licenses provide a legal means to develop communication skills and capabilities required in an actual emergency situation. The requirements exact a small expense in terms of effort, time, and money.

Many youngsters with no background or experience in electronic communications pass FCC amateur radio license examinations every year. The cost to register for and complete a license examination is approximately $20. Effective study guides such as "AMA for amateur radio operators" are available from the American Radio Relay League (ARRL) for approximately $35. The internet also provides a sizable number of free websites dedicated to helping aspiring, amateur radio operators study for and pass their FCC license examinations. See https://www.fcc.gov/amateur-radio-service for more information. Most communities have amateur radio clubs which provide both training and examination sessions. If you reside in a community that lacks an amateur radio club, often a nearby, experienced, licensed "ham" (sometimes referred to as an "Elmer") is more than willing to help guide your studies in preparation for successfully completing the examination. Knowledge of Morse code is no longer a requirement for licensing in the amateur radio service. Completion of training and licensing requirements will prepare one to set up, operate, maintain, and protect electronic equipment used in an amateur radio station.

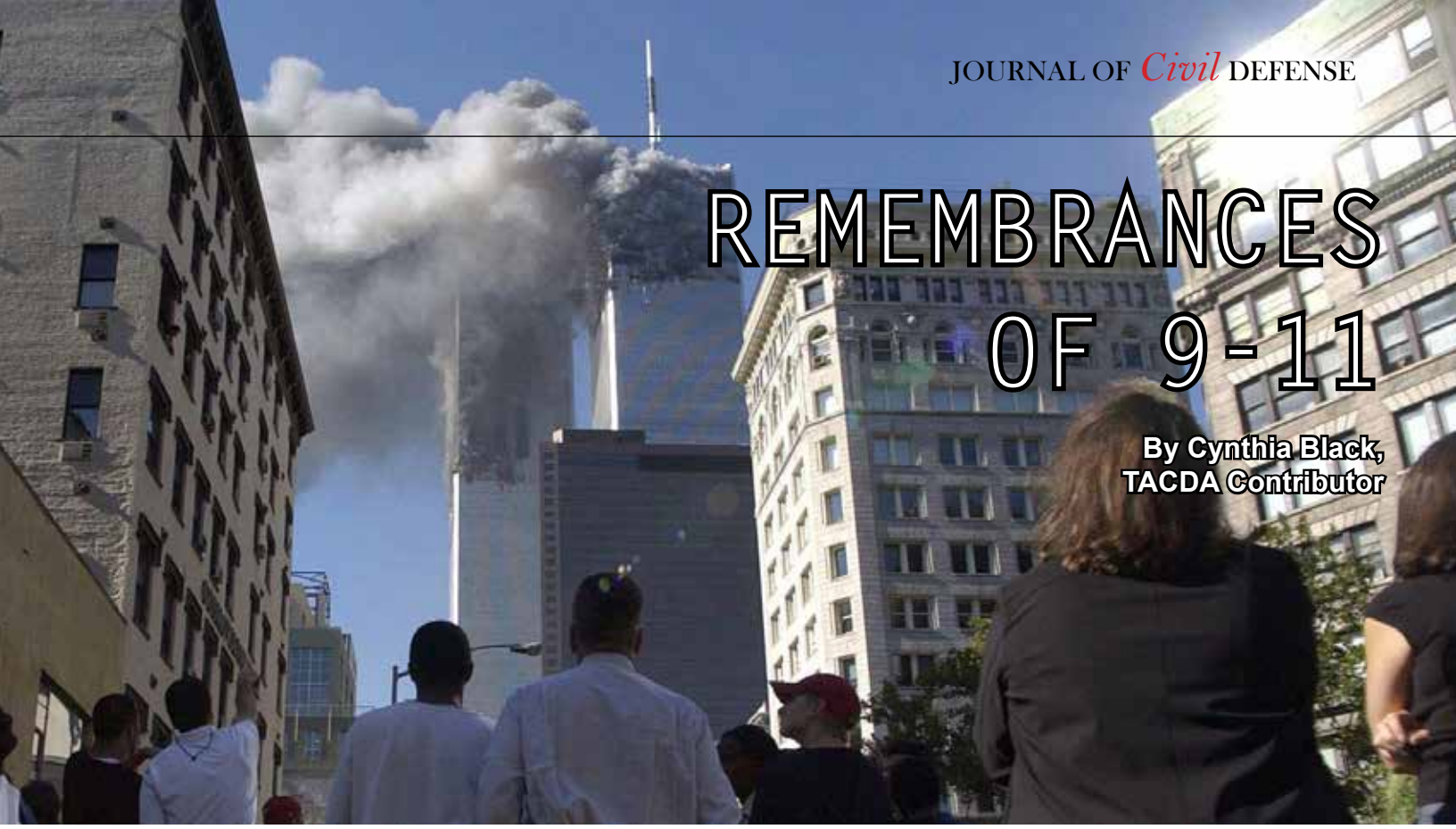
In addition to the amateur radio service, the Federal Communications Commission (FCC) has designated several other radio services. Some of these require an FCC license; others do not. These other services suffer from several significant limitations when compared to the privileges extended to licensed, amateur radio operators. These other radio services will be discussed in greater detail in the next articles of this series.

In the next article, look for discussions on "Components of Electronic Communications Systems" (Radio Transmitters and Receivers, Handi-Talkies, Base Stations, Antenna Gain, Mobile Transceivers, and Scanners).

We hope you will consider making "Emergency Communications" an essential part of your disaster preparations.

My background is as a speech-language pathologist, professor of Communication Sciences and Disorders and of Neuroscience at the University of Arkansas College of Medicine. The first several years of my career were spent serving veteran patients at Department of Veterans Affairs Medical Centers in St. Louis, Memphis, Cincinnati, and Tampa. My interest in human communication disorders grew out of my observations of young American soldiers in Viet Nam who sustained closed-head or traumatic brain injuries which impaired or deprived them of the ability to use speech, language, cognitive abilities, swallowing, hearing, and related processes. Personal interests include amateur radio in which I have held an FCC license since 1984. Based upon both military experience as a United States Air Force electronics officer and my interest in electronics and communications, I have taken a keen interest in emergency communications. Along the way, I served as a radio operator in the U.S. Army's Military Affiliate Radio System, and with the IBM Corporation first as a field engineer, then as a systems engineer and finally as a marketing representative. Interest in Civil Defense began at the age of 17 while an undergraduate student at Southeast Missouri State University where I volunteered time at our local Civil Defense Agency. I participated in the construction of the emergency communications portion of the St. Louis Civil Defense Agency's underground emergency command center. In addition to volunteering, I taught courses in radiological monitoring, radiological defense, shelter management and medical self-help during the academic years. In 1965, I received a Distinguished Service award from then Missouri Governor, Warren Hearnes. In addition, through Dr. Lawrence Bahn, professor of physics at my alma mater, I was granted by-products materials handler's licenses. I operate a radio station that has both transmission and reception capabilities on all amateur radio, public service, MARS, high frequency citizens' band (CB), family radio service (FRS), general mobile radio service (GMRS) and multi-use radio service (MURS) frequencies. I have installed a commercial FM transmitter for use on 90.3 MHz. during a declared state of emergency in my community. I participated in facilitating communications between EMS and U.S. Coast Guard personnel during hurricane Katrina in 2005 and from that learned the critical importance of having effective, lines power independent electricity to power emergency communications equipment. That experience served only to reinforce a saying used universally in the military: "If you don't have effective communications, you don't have...'anything."

Photo by Sigmund on Unsplash



REMEMBRANCES OF 9-11

By Cynthia Black,
TACDA Contributor

Photo by Amy Sancetta on AP Photo

I will always remember the first phone call telling me to turn on the news when the first plane hit; then watching the second plane hit and the feeling of terror and confusion. I will always remember covering my babies' mouths and noses with bandanas, loading them into the double stroller, running to the store for milk and diapers and money in order to be prepared for who knew what might be coming next. I will always remember the smell in the air, and the ash raining from the smoke-filled sky as the firemen urged us to get inside quickly. I will always remember hunkering down with dear friends, […] waiting out the day, wondering who made it out and who we lost. I will always remember the walk in the dark late that night and standing vigil on the promenade, lit by thousands of candles from the tearful community, watching the fire in the sky as the towers burned, with the Brooklyn Bridge in the backdrop... and the overwhelming feeling of loss and sadness, combined with an outpouring of fellowship and community and healing.

I can recall it as if it were yesterday. It's as palpable as the smell of a cake baking in my oven. I recall collecting burnt tickertape and charred office documents from my fire escape the next morning (which I still have, inciden tally). It was frightening. It was tragic. It was scary. Everything about it was so foreign and unknown to all of us. And yet, as tragic as it was, I feel that all of us that were so close to it were given a gift of perspective – of how precious life is – of how much we cherish people we love […]. This event touched our lives in such a profound way. It was a remarkable time to be a New Yorker and to be part of that collective, to feel that divinity of spirit and compassion and camaraderie.

My son was two years old at the time (my daughter five months old) and […] loved firetrucks and diggers. As a result of his passion, […] we used to visit our local station several times a week, and they would put him up in the truck, turn on the flashing lights, and let him honk the horn and turn on the sirens. They laughed. I laughed. [My son] felt so special; he thought he was on top of the world! Our local firemen were part of our weekly routine, and they were our friends. On September 12th, we went to the firehouse as the fires burned continuously and learned we had lost the entire company. They were among the first responders. I still ache to think of their goodness and kindness on a very personal level to my little two-year-old […] who already knew they were heroes. I, for one, am grateful to have known them and celebrate[d] their generosity, as well as their dedication to helping in a disaster without giving a second thought […].

This anniversary is a reminder to me of what's important, and how easy it is to become complacent and take for granted how precious life truly is. So on this anniversary, I celebrate life. I celebrate what a precious gift it is to live. And I celebrate what a precious gift it is to love.

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