TACDA ACADEMY – CIVIL DEFENSE BASICS

5. EMP & POWER FAILURE

5.01 Short & Long Term Power Failures:
Many disasters, both man-made and natural, will cause a failure of our power system.

Local power failures are manageable, as outside help should arrive within hours or days. In the event of short-term outages, few, if any, deaths would be expected from starvation. Extreme weather, however, is an immediate threat. Other associated factors from the disaster may also complicate the problem.

Widespread power failures, on the other hand, will be devastating for those who have failed to prepare. Help from outside sources may take weeks, months or even years to arrive, depending on the cause of the failure.

5.02 Electro Magnetic Pulse (EMP):
An electromagnetic pulse (EMP) is a strong electrical field, associated with all explosives. Induced currents and voltages from EMP cause malfunctions of electrical equipment. An EMP, the intensity of which is dictated by the yield, type and height of the detonation, accompanies nuclear explosions of all types.

5.03 High Altitude EMP (HEMP):
Any nuclear detonation above 25 miles will cause a high altitude EMP called HEMP. A nuclear weapon detonated at an altitude of 200 miles could affect all unprotected electrical equipment within the continental United States. Nuclear weapons at that altitude could be detonated from a satellite or from an intercontinental ballistic missile. Depending on the location and size of the blast, the effect would be to knock out the power grid across most, if not all, of the continental United States.

5.04 Risk of HEMP:
Numerous terrorist organizations and countries have the ability to deploy nuclear weapons via smaller range missiles at altitudes capable of causing devastating consequences. Both Iran and North Korea have reported tests describing mid-flight detonations of such missiles. Intelligence analysts have stated they believe these tests were designed to exercise HEMP capabilities. The United States is at significant risk from even moderately sized weapons. A terrorist country or organization might have trouble putting a nuclear warhead "on target" with a Scud, but it could easily launch a missile from a freighter in international waters, and detonate a crude nuclear weapon in the atmosphere high above one of our coastal cities.

In a recent briefing to the congress, Senator Jon Kyl said, "A single Scud missile, carrying a single nuclear weapon, detonated at the appropriate altitude, would interact with the Earth's atmosphere, producing an electromagnetic pulse radiating down to the surface at the speed of light. Depending on the location and size of the blast, the effect would be to knock out already stressed power grids and other electrical systems across much or even all of the continental United States, for months if not years."

5.05 Consequences of a HEMP:

In a recent briefing to the House Armed Services Committee, a congressional commission reported that "HEMP is one of a small number of threats that can hold at risk the continued existence of civil society within the United States, and our ability to maintain national security and project military power anywhere it is needed . . .This threat also places our national economy and worldwide military forces at risk." Another distinguished scientist said, "An electromagnetic pulse (EMP) attack on the American homeland, is one of only a few ways that the United States could be defeated by its enemies – terrorist or otherwise, and it is probably the easiest."

The report stated, "The loss of power beyond emergency power supplies may well cripple financial systems, telecommunication, health care, emergency response, government control, water and food supplies and other critical societal functions -- a potentially escalating rather than diminishing situation".

The commission said a blackout of the power grid would be "virtually certain" following such an attack. Moreover, the briefing states, the panel predicted a "high proportion of computers" and other systems would be affected; major telecommunications would be interrupted; many high-frequency, VHF and UHF receivers would be damaged; and cell phone, satellite and Internet communications would be hindered.

Other infrastructure impacts could include damage to fuel supply and refineries, the transportation system, water supply and sanitation, chemical plants, financial systems, health care, emergency response and "government integrity."

After the briefing Senator Jon Kyl reported, "Few if any people would die right away. But the loss of power would have a cascading effect on all aspects of U.S. society. Communication would be largely impossible. Lack of refrigeration would leave food rotting in warehouses, exacerbated by a lack of transportation as those vehicles still working simply ran out of gas (which is pumped with electricity).

The inability to sanitize and distribute water would quickly threaten public health, not to mention the safety of anyone in the path of the inevitable fires, which would rage unchecked. And as we have seen in areas of natural and other disasters, such circumstances often result in a fairly rapid breakdown of social order…. Not only would there be nobody nearby to help, it could take years to replace destroyed equipment."

5.06 EMP Protective Measures:

Listed below are seven anti-EMP actions that should be considered:

1. Maintain a supply of spare parts for radios and automobile computerized ignitions.
2. Always keep ham radio base stations disconnected from their power source when not in use.
3. Purchase several inexpensive CB and short wave radios and store your radios and other sensitive equipment in a faraday cage such as a metal drum with tightly fitting lid.
4. In an escalating crises, shift to emergency power at the earliest possible time.

5. If radio communication is essential during threat period, use only one system at a time. Disconnect all other systems from antennas, cables and power.
6. Purchase 40 to 80 meter amateur radios. These frequencies do not rely on relay stations and would continue to function if protected in a faraday cage.
7. Protect your generators by placing metal wire screen under and around the generator. Keep the cords wound and inside the wire cage.

5.07 Building a Faraday Cage:
Build a simple faraday cage from a small metal garbage can and lid. The lid must fit snugly over the can. If the lid does not make good metal-to-metal contact, the open area could act as a 'slot antennae' and allow EMP to damage your equipment.

To further protect your equipment, purchase a metal screen about 6 inches wide and as long as the circumference of the can. Fold the metal screen in half-length wise and place it around and over the lip of the garbage can. The lid should then fit snugly against the screen and can, protecting all equipment contained inside the can.

Any metal can act as a Faraday cage. However, good metal-to-metal contact is imperative. Remove all gasket material from the lid. If the can has been painted, make sure to remove the painted area around the lid with sand paper.

5.08 Full-scale Nuclear War with HEMP:
In the event of a full-scale nuclear war, the enemy would most likely initiate the attack with a high-altitude EMP weapon. This type of weapon would be deployed from an ICBM or by satellite. The HEMP from the detonation could affect an area of several thousand miles in diameter. Neither blast nor radiation damage would be associated with the detonation. The obvious purpose of the HEMP attack would be to hinder or cripple our retaliatory capability.

5.09 EMP as an Early Warning System:
The flight time of a missile from a submarine varies with the distance from the coast. Washington D.C. may only have a two minute warning. Mid-continent states would receive about 8 minutes warning time before the first submarine launched ballistic missiles (SLBMs) could arrive. The ICBMs would arrive in that area about 25 minutes later.

These few minutes should be used to find expedient sheltering if away from home, or to quickly access a permanent shelter. Since the end of the cold war, Soviet submarines are seldom seen in our costal waters; therefore, SLBMs would have a flight time similar to the ICBM's. However, all haste should be made to reach shelter as quickly as possible.

An EMP can act as an early warning system. Commercial power is likely to be lost, so every instance of power failure should be suspected as a possible attack warning. Certain simple tests will quickly reveal an EMP:

1. You may see an unusually bright light, which lasts longer than lightning. If this light is associated with a power failure, it should be considered as a possible EMP detonation. Do

not look directly at the light, as it may damage your eyes. Not all areas of the United States would see the light.

2. Check the telephone for a dial tone. A telephone usually does not fail in a simple power failure, but it would most probably fail in an EMP. However, some phones do fail regularly and test #3 should be used to confirm this failure.
3. Only 5 percent of the radio stations in the nation have been hardened against EMP. After an EMP most of the radio stations would loose transmission. Whenever there is a power drop, a battery-powered radio should be used to check for loss of transmission.
   A simple lightning strike could take out one station, but only an EMP would take out a large numbers of the radio stations. This transmission failure would be a good indication that an attack is eminent. Small transistor radios (with antenna down) will most probably survive the EMP, but as an extra precaution, keep the emergency radio wrapped in aluminum foil.
4. If several vehicles on the roadway should quit running at the same time, you should consider the possibility that an EMP has occurred. Vehicles with computerized ignitions could be damaged by an EMP. Older vehicles manufactured before 1965, and most new vehicles manufactured after the year 2000 would probably remain functional, but some models may be affected.
   EMP simulations have indicated that if your car does quit running during an EMP, you may be able to restart your car if you remove the battery cables from the battery for a few moments to allow the computerized ignition to reset itself. Keep a properly sized wrench for removing battery cables in your automobile at all times.

5.10 Power Drop Alarm:

If the EMP were to occur during the night or early morning, people may not be aware of the resulting loss of power. A simple power drop alarm can be constructed from a 12-volt battery, a relay switch and a motorcycle horn.

Do not use any solid-state electronics in the alarm, and store all of the components of the alarm in a faraday cage (such as an ammo box). Keep the alarm plugged into the house current at all times, and check the charge on the battery at regular intervals.

5.11 Consequences of long-term power failure:

- There is no safe drinking water.
- Food is no longer available in stores
- There is no ability to cook or refrigerate food
- Toilets, sinks, & showers do not operate
- No furnace or air conditioning
- No lights
- Computers, radios, televisions and phones may stop functioning. Communication ceases.
- Gas stations stop functioning and transportation ceases.
- The Emergency Medical System would fail and hospitals and doctor's offices would close.
- No Police response

5.12 Consequences of a HEMP

Possible Effects

- No potable drinking water
- Thirst, Disease, Death
- No food
- Hunger, Illness, Death
- No Power to cook or refrigerate food
- Hunger, disease
- No sanitation system
- Filth, Disease
- No furnace or air conditioning
- Discomfort, death
- No lights
- Fear, Danger
- No Communication System
- Frustration, anxiety, danger
- No transportation
- Isolation
- No emergency medical system
- Illness, Disease, Death
- No Police
- Crime, Danger, Injury

5.13 Solutions - Concepts to be taught in coming lessons:

- **Lesson 8 - Food Storage** (Basic food list, alcohol stove, wide mouth thermos, etc.)
- **Lesson 9 - Water & Sanitation** (Importance of water storage, clarification, and purification)
- **Lesson 10 - Cold Weather Survival** (Foam clothing, and making patterns and articles of clothing)
- **Lesson 11 - Evacuation & 72 Hour Kits** (Importance of always having car half-full of gas, basic items for 72-hour kits, etc.)
- **Lesson 12 - Alternative Energy** (Transistor radios, flashlights, etc.)
- **Lesson 13 - Medical Preparedness** (importance of having medical first aid training, extra prescription medicines & eyeglasses)
- **Lesson 14 - Communications** (Amateur (HAM) Radio and anntenas, power supplies, etc.)

5.14 What to do before, during and after a power failure:

Before the Power Outage:

- Learn location of fuse box or circuit breaker
- Store candles, flashlights, extra flashlight bulbs batteries, CB and shortwave radios.
- Know the location of all camping equipment (stove, lantern sleeping bags). Make sure equipment is operable.
- Keep adequate supplies of fuel on hand. Propane, white gas, gasoline or briquettes should not be used in the house or garage, as they are volatile. Kerosene and cooking alcohol may be used in the house with proper ventilation.
- Store cooking alcohol and purchase an alcohol burner.
- Purchase a good pressure cooker to economize cooking fuel.
- Dress warmly to conserve fuel.
- Consider purchasing a generator & use a stabilizer when storing gasoline or diesel.

During the Power Outage:

- If there has been an EMP, retrieve your flashlight and go directly to your shelter.
- Ascertain the safety of your location and leave if necessary.
- If there is no indication of an EMP, turn off all major appliances, as the surge of power that comes when power is restored could damage your appliances.
- Turn off all but one light switch. Do not allow small children to carry candles or lanterns.
- If the power outage persists, call the power company and report your location. Report any downed power lines.
- Start your generator or alternative power systems.
- Retrieve your emergency supplies.
- Use refrigerated food first, frozen foods second, canned foods last.

After power has been restored:

- To prevent an overload on the system, plug in appliances one by one, waiting a few minutes between each one. There may continue to be 'brown outs' for several hours. Wait to turn on major appliances until power is steady.
- Examine your frozen food. IF IN DOUBT, THROW IT OUT! If the meat still contains ice crystals, it may be refrozen. If meat is off-color or has an odd odor, throw it away.

5.15 In conclusion:

The threat of an EMP is a real and present danger. There are irresponsible terrorist organizations and government leaders throughout the world that have both the intent and the capability to initiate a high altitude EMP against the United States. This threat is acknowledged by the highest government agencies.

The consequences of a HEMP would be devastating, creating total and long-lasting power failure of electronics and electronic systems. A HEMP against the United States has the potential to destroy our existence as an independent nation and our capability to support our population with the most basic of needs. There are protective measures that must be taken. It is essential that we plan, equip and prepare for this eventuality.

Practical EMP Protective Measures

By Sharon Packer, TACDA President

The electromagnetic pulse (EMP) is a strong electrical field, associated with all high explosives. These induced currents and voltages cause malfunctions of electrical equipment. Nuclear explosions of all types are accompanied by an EMP, the intensity and duration of which are dictated by the height of the detonation.

The energy from an EMP is collected in any long runs of wire, exposed cable runs, piping or conduit, large antennas, power and telephone lines, or long runs of electrical wiring in buildings and can be of the order of 60,000 volts per meter.

The collectors act to magnify the weak EMP just as a magnifying glass does to sunlight. The longer the collector, the greater the amount of energy collected. The energy collected is sufficient to cause damage to attached electrical and electronic equipment. All unprotected solid- state electronics systems are vulnerable. It is possible that some of the computerized ignitions in our vehicles would fail. Most relay stations required by 2-meter amateur radios and mobile phones would cease to function.

It is likely that a large yield, high-altitude EMP weapon would be detonated during the first minutes of a nuclear attack. It could affect an area of several thousand miles in diameter. This type of weapon could be deployed on a ballistic missile or by satellite. Neither blast nor radiation damage would be associated with a high altitude electro magnetic pulse (HEMP).

It is also possible that a smaller range EMP attack could come via terrorists. Several rogue nations and terrorist groups have or will soon have this capability.

Listed below are seven anti-EMP actions that should be considered:

1. Maintain a supply of spare parts for radios and automobile computerized ignitions.
2. Always keep ham radio base stations disconnected from their power source when not in use.
3. Purchase several inexpensive CB and short wave radios and store your radios and other sensitive equipment in a faraday cage such as a metal drum with tightly fitting lid.
4. In an escalating crises, shift to emergency power at the earliest possible time.
5. If radio communication is essential during threat period, use only one system at a time. Disconnect all other systems from antennas, cables and power.
6. Purchase 40 to 80 meter amateur radios. These frequencies do not rely on relay stations and would continue to function if protected in a faraday cage.Protect your generators by placing metal wire screen under and around the generator. Keep the cords wound and inside the wire cage.

Build a simple faraday cage from a small metal garbage can and lid. The lid must fit snugly over the can. If the lid does not make perfect metal-to-metal contact, the open area will act as a 'slot antennae' and allow EMP to damage your equipment. To further protect your equipment,

purchase a metal screen about 6 inches wide and as long as the circumference of the can. Fold the metal screen in half-length wise and place it around and over the lip of the garbage can. The lid should then fit snugly against the screen and can, protecting all equipment contained inside the can.

Any metal can will act as a Faraday cage. However, good metal-to-metal contact is imperative. If the can has been painted, make sure to remove the painted area around the lid with sand paper.

EMP can act as an early warning system. Commercial power is likely to be lost, so every instance of power failure should be suspected as a possible attack warning. Certain simple tests will quickly reveal an EMP.

1. You may see an unusually bright light, which lasts longer than lightning. If this light is associated with a power failure, it should be considered as a possible EMP detonation. Do not look directly at the light, as it may damage your eyes. Not all areas of the United States would see the light.
2. Check the telephone for a dial tone. A telephone usually does not fail in a simple power failure, but it would most probably fail in an EMP. However, some phones do fail regularly and test #3 should be used to confirm this failure.
3. Only 5 percent of the radio stations in the nation have been hardened against EMP. After an EMP most of the radio stations would loose transmission. Whenever there is a power drop, a battery-powered radio should be used to check for loss of transmission. A simple lightning strike could take out one station, but only an EMP would take out a large numbers of the radio stations. This transmission failure would be a good indication that an attack is eminent. Keep a small transistor radio wrapped in aluminum foil for this purpose.

The flight time of a missile from a submarine varies with the distance from the coast. Washington D.C. may only have a two minute warning. Mid-continent states would receive about 8 minutes warning time before the first submarine launched ballistic missiles (SLBMs) could arrive. The ICBMs would arrive in that area about 25 minutes later. These few minutes should be used to find expedient sheltering if away from home, or to quickly access a permanent shelter. If time permits, gas lines to the home should be turned off and curtains or drapes closed to protect against the thermal pulse. Since the end of the cold war, indications are that the Soviet submarines are no longer at close range and the SLBM's would have a flight time similar to the ICBM's. However, all haste should be made to reach shelter as quickly as possible.

If the EMP occurs during the night, it would be difficult to observe. A simple power drop alarm can be constructed from a battery and horn to awaken those who are sleeping. Look for directions for this alarm in coming issues of the JCD.

[Source: The American Civil Defense Association (TACDA)]

Unready For This Attack

Senator Jon Kyl
Saturday, April 16, 2005; Page A19
Washington Post

Recently a Senate Judiciary subcommittee of which I am chairman held a hearing on a major threat to the American people, one that could come not only from terrorist organizations such as al-Qaeda but from rogue nations such as Iran and North Korea.

An electromagnetic pulse (EMP) attack on the American homeland, said one of the distinguished scientists who testified at the hearing, is one of only a few ways that the United States could be defeated by its enemies -- terrorist or otherwise. And it is probably the easiest. A single Scud missile, carrying a single nuclear weapon, detonated at the appropriate altitude, would interact with the Earth's atmosphere, producing an electromagnetic pulse radiating down to the surface at the speed of light. Depending on the location and size of the blast, the effect would be to knock out already stressed power grids and other electrical systems across much or even all of the continental United States, for months if not years.

Few if any people would die right away. But the loss of power would have a cascading effect on all aspects of U.S. society. Communication would be largely impossible. Lack of refrigeration would leave food rotting in warehouses, exacerbated by a lack of transportation as those vehicles still working simply ran out of gas (which is pumped with electricity). The inability to sanitize and distribute water would quickly threaten public health, not to mention the safety of anyone in the path of the inevitable fires, which would rage unchecked. And as we have seen in areas of natural and other disasters, such circumstances often result in a fairly rapid breakdown of social order.

American society has grown so dependent on computer and other electrical systems that we have created our own Achilles' heel of vulnerability, ironically much greater than those of other, less developed nations. When deprived of power, we are in many ways helpless, as the New York City blackout made clear. In that case, power was restored quickly because adjacent areas could provide help. But a large-scale burnout caused by a broad EMP attack would create a much more difficult situation. Not only would there be nobody nearby to help, it could take years to replace destroyed equipment.

Transformers for regional substations, for example, are massive pieces of equipment that are no longer manufactured in the United States and typically take more than a year to build. In the words of another witness at the hearing, "The longer the basic outage, the more problematic and uncertain the recovery of any [infrastructure system] will be. It is possible -- indeed, seemingly likely -- for sufficiently severe functional outages to become mutually reinforcing, until a point at which the degradation . . . could have irreversible effects on the country's ability to support any large fraction of its present human population." Those who survived, he said, would find themselves transported back to the United States of the 1880s.

This threat may sound straight out of Hollywood, but it is very real. CIA Director Porter Goss recently testified before Congress about nuclear material missing from storage sites in Russia that may have found its way into terrorist hands, and FBI Director Robert Mueller has confirmed new intelligence that suggests al Qaeda is trying to acquire and use weapons of mass destruction. Iran has surprised intelligence analysts by describing the mid-flight detonations of missiles fired from ships on the Caspian Sea as "successful" tests. North Korea exports missile technology around the world; Scuds can easily be purchased on the open market for about $100,000 apiece.

A terrorist organization might have trouble putting a nuclear warhead "on target" with a Scud, but it would be much easier to simply launch and detonate in the atmosphere. No need for the risk and difficulty of trying to smuggle a nuclear weapon over the border or hit a particular city. Just launch a cheap missile from a freighter in international waters -- al Qaeda is believed to own about 80 such vessels -- and make sure to get it a few miles in the air.

Fortunately, hardening key infrastructure systems and procuring vital backup equipment such as transformers is both feasible and -- compared with the threat -- relatively inexpensive, according to a comprehensive report on the EMP threat by a commission of prominent experts. But it will take leadership by the Department of Homeland Security, the Defense Department, and other federal agencies, along with support from Congress, all of which have yet to materialize.

The Sept. 11 commission report stated that our biggest failure was one of "imagination." No one imagined that terrorists would do what they did on Sept. 11. Today few Americans can conceive of the possibility that terrorists could bring our society to its knees by destroying everything we rely on that runs on electricity. But this time we've been warned, and we'd better be prepared to respond.

The writer is a Republican senator from Arizona and chairman of the Senate Judiciary subcommittee on terrorism, technology and homeland security.

POWER FAILURE

Potential causes of power failure:

- Power Surges or brown outs
- High Winds, Hurricanes or Tornadoes
- Lightning Storms
- Wild Fires or Floods
- Earthquake
- Pandemics
- Terrorist EMP or War

Effects of long term power outages:

- There is no safe drinking water
- Food is no longer available in stores
- There is no ability to cook or refrigerate food
- Toilets, sinks, & showers do not operate
- No furnace or air conditioning
- No lights
- Computers, radios, televisions and phones may stop functioning…communication ceases
- Gas stations stop functioning and transportation ceases
- The Emergency Medical System would fail and hospitals and doctor's offices would close
- No Police response

Solutions:

- Water storage & purification methods
- Food Storage & hunting skills
- Solar Ovens & Alcohol Stoves
- Outhouses, septic tanks and hand pumps for wells
- Ability to survive cold or hot weather and to find safe shelter from the elements
- Flashlights, batteries, generators, solar panels, kerosene or oil lamps & alternative fuel sources
- Ham Radios, CBs, Shortwave (all battery powered)
- Bicycles, horses, scooters
- First Aid Training, storage of medicines
- Home and personal security measures