THE AMERICAN CIVIL DEFENSE ASSOCIATION
TACDA™

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Radiation

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RADIATION
GLOSSARY OF TERMS

- **Acute Doses:** Radiation Doses occurring during the first 24 hours of exposure.
- **Attenuation:** Decrease in radiation level
- **Alpha particle:** Positively charged radiation particle emitted from the nuclei of a radioactive element, consisting of 2 protons and 2 neutrons.
- **Beta particle:** Negatively charged radiation particle identical to an electron, but originating from the nucleus.
- **Chronic Doses:** Radiation doses occurring over extended lengths of time.
- **Decay:** Decrease of activity of radioactive material due to the emission of an alpha or beta particle from the nuclei.
- **Gamma Rays:** Radiation with no measurable mass accompanying alpha and beta emissions. Identical to an x-ray, but originating from the nucleus.
- **Half-Life:** The time required for the activity of a radioactive species to decrease to half of its initial value due to decay.
- **Protection Factor:** Ratio of measured radiation levels 3 ft. above surface, down to the radiation level below the surface.
- **Radiation:** Radiation is the term given to the particles and/or energy emitted by radioactive material as it disintegrates.
- **Ionizing radiation:** Ionizing radiation is radiation with enough energy so that during an interaction with an atom, it can remove tightly bound electrons from their orbits, causing the atom to become charged or ionized. Examples are gamma rays and neutrons.
- **Non-ionizing radiation:** Non-ionizing radiation is radiation without enough energy to remove tightly bound electrons from their orbits around atoms. Examples are microwaves and visible light.
- **Radioactivity:** Radioactivity is the spontaneous transformation of an unstable atom and often results in the emission of radiation. This process is referred to as a transformation, a decay or a disintegrations of an atom.
- **Rad (radiation absorbed dose):** The rad is a unit used to measure a quantity called absorbed dose. This relates to the amount of energy actually absorbed in some material, and is used for any type of radiation and any material. One rad is defined as the absorption of 100 ergs per gram of material. The unit rad can be used for any type of radiation, but it does not describe the biological effects of the different radiations.
- **Roentgen (R):** The roentgen is a unit used to measure a quantity called exposure. This can only be used to describe an amount of gamma and X-rays, and only in air. One roentgen is equal to depositing in dry air enough energy to cause 2.58E-4 coulombs per kg. It is a measure of the ionizations of the molecules in a mass of air. The main advantage of this unit is that it is easy to measure directly, but the measurement is limited because it is only for deposition in air, and only for gamma and x-rays.
- **Rem (roentgen equivalent man):** The rem is a unit used to derive a quantity called equivalent dose. This relates the absorbed dose in human tissue to the effective biological damage of the radiation. Not all radiation has the same biological effect, even for the same amount of absorbed dose. Equivalent dose is often expressed in terms of thousandths of a rem, or mrem. To determine equivalent dose (rem), you multiply absorbed dose (rad) by a quality factor (Q) that is unique to the type of incident radiation.

Message From The President

Dear TACDA Members,

We hope you and yours had a glorious Christmas season. Our faith in the Savior and our love of this great country bring continuing hope of ultimate peace and safety for all. May faith, hope and charity and the pure love of Christ bring comfort to you all.

This month's issue of the JCD offers articles on various aspects of nuclear radiation. Nuclear radiation is a power that we cannot see, smell or feel, though the consequences of exposure to radiation can affect every aspect of our lives.

Radiation is used to detect and heal illness and can be used for the good of man in many ways. My research, as a nuclear engineer, has led me to conclude that radiation in small doses can even be beneficial. Dr. Gerald Looney, a long-time member of TACDA's Board of Directors, has recently written an article on the Hormesis of Radiation (Hormesis; *the beneficial effect of small doses of Radiation where large doses are considered harmful*). Dr. Looney is a physician; therefore our health is his driving motive. You can find a full-length copy of his article in the Resource area of the TACDA web site. To quote Dr. Looney:

"Such zeal for a radiation-free environment could lead in the future to actual radiation deficiency, since living organisms depend on low-level exposure to stimulate immune system functioning."

Radiation, however, just like every other source of power; if not understood or managed well, can be destructive. Radiation, as a consequence of nuclear weapons, must be understood in order to seek the best protection from its effects.

The general public should have a basic understanding of the elementary concepts of radiation. They should know the meaning of 'matter' and 'energy'; the language, terms, signs, and symbols used for description; the structure of the atom; the nature of and behavior of its parts; and how radiation is measured. This issue of the JCD will address these concepts.

We hope you will remember to STOP (Study, Think, Observe and Prepare). Study all you can about the basics of radiation. Observe the threats around you and make a risk assessment for the possibility of a nuclear event. Think through the consequences of ionizing radiation to you and your family; and finally prepare to mitigate the effects of radiation by the concepts of time, distance and shielding.

Best Regards,
Sharon Packer
TACDA President

Remember, If you are prepared, you have no need to fear.

Alex Coleman - TACDA Journal of Civil Defense Editor

Dear Reader,

Have you ever heard the statement, "What they don't know, won't hurt them?"

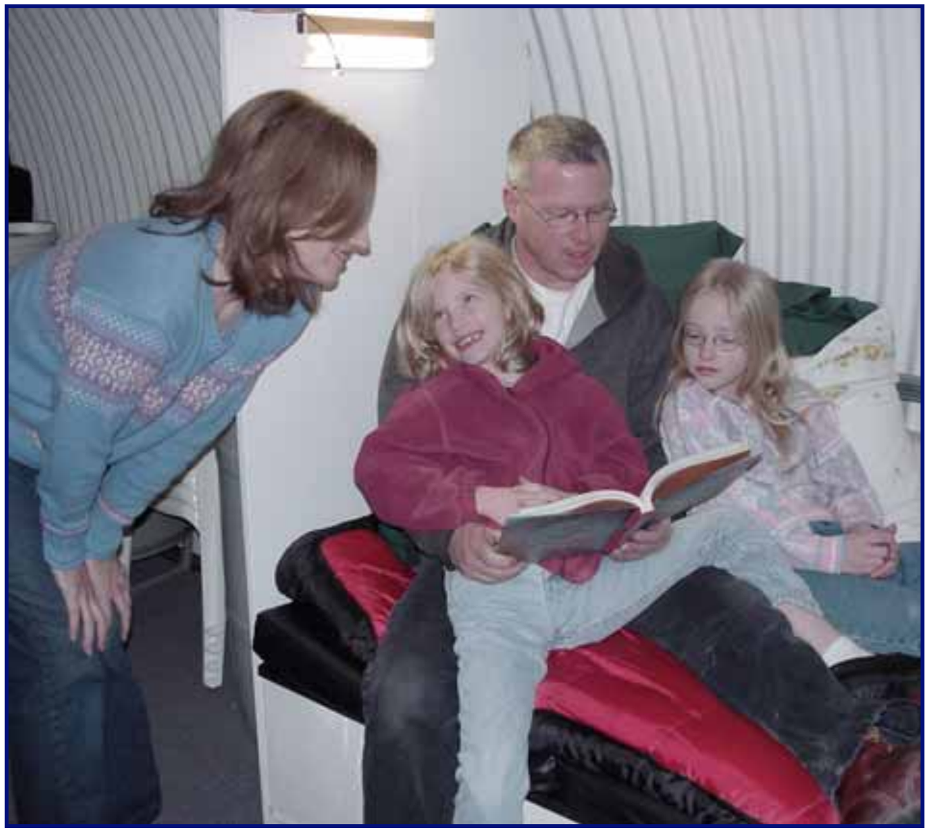
Have you ever made such a statement about disaster pre-paredness issues?

Unfortunately, the majority of Americans have a tendency to adopt this concept of denial, when it comes to giving serious thought and discussion to the possibilities of a large-scale disaster affecting "their world." What is even more disturbing is an open rejection to the concept of spending time in preparation for these unseen events.

It seems as though the general population is of the mindset, "If I can't see it right now, it must not be a threat." Or "If it hasn't happened in the past, then it probably won't happen today. I'm safe at least until tomorrow." Or even, "It hasn't happened in a few years, so the threat must not be real anymore."

The harsh reality seems to be that we are more concerned with how our favorite ball team ranks after that last "big win," rather than embracing and focusing in on the "important" and more critical issues at hand.

I suppose that the sheer discomfort that comes along with considering and dwelling on issues of wide-scale disaster are enough to steer us in the opposite direction; the direction of Denial. However, the truth is that we are surrounded daily by real and potential threats, even though we may not see them directly in our day-to-day lives.



We would like to take this opportunity to encourage you to spend some time learning about the possible threats that we face as individuals, families and Americans, and to then make some specific preparations that will help you, your family and your community be ready should disaster strike.

We have received quite a bit of positive feedback concerning the Threat / Solution approach that we have taken with the Journal of Civil Defense, and hope that you will use the information, concepts and ideas found in its covers as a basis for your disaster preparedness plans.

Spend time with your spouse, your children, your friends and family talking about the threats that are real in your area, and then begin developing a solid preparedness strategy against those threats. In the long-run, you will be glad that you did.

On behalf of the entire TACDA team, I hope that each of you had a safe and Merry Christmas season and wish you a wonderful and happy New Year.

Take care, and may God bless the United States of America.

Kindest Regards,
Alex Coleman, Editor
alex@tacda.org

THE ABC's & 123's OF RADIATION
By Sharon Packer
TACDA President

Fallout:
Nuclear fallout is the most far reaching of all the weapons effects. Nuclear explosions occurring near the surface of the earth cause huge amounts of debris and dirt to be drawn up into the fireball where they are vaporized and fused with fission products and radioactive residues.

As the fireball cools, the vaporized material begins to condense into liquid droplets, which eventually solidify into glasslike particles. These particles constitute what we call fallout.

We can see fallout as an accumulation of dust and small particles falling onto the ground and buildings. We cannot, however, see, feel, hear or taste the radiation that is being emitted from the fallout.

Distribution of Fallout:
Fallout is carried in the nuclear cloud and is moved by winds. The direction of fallout is determined by winds up to at least 80,000 feet and the velocity of the wind governs how far the cloud will travel. The United States has a variety of upper air winds. They are predominantly from west to east during the fall, winter and spring. In the summer, the winds are more variable. Surface winds cannot be used as an indication of direction for the flow of high atmosphere winds.

In addition to the wind, precipitation will affect the radioactive deposition. Rain and snow "wash "or "scrub" the air of the radioactive particles. The result is that contaminated material, which would be spread over a much larger area by the dry weather patterns, is rapidly brought down in local rain or snow areas. This is referred to as "rainout."

Terrain features also play a part in deposition. Large mountains or ridges could cause significantly more fallout on the sides facing the surface wind.

Nuclear fallout from areas across the oceans will not pose a large threat to the United States. Small yield weapons deposit most of the fallout locally. The radioactive isotopes from larger yield weapons remain in the stratosphere until the short-lived isotopes decay, and the longer-lived isotopes are significantly reduced.

Radiation:
The basic building blocks of the atom are protons, neutrons, and electrons. Nuclear radiation is an 'eruption' or' emission' of these particles from the nucleus of the radioactive elements. These high-energy emissions constitute radioactive 'decay'. Fallout from fission type nuclear weapons carries these radioactive particles to the ground where they continue to decay.

Radiation from a nuclear explosion consists of gamma rays, neutrons, beta particles and a small portion of alpha particles.

Alpha particles:
Alpha particles are positively charged and relatively large, consisting of two protons and two neutrons. Alpha particles are completely stopped by a sheet of paper or the outside layers of our skin and are not an external hazard. Internally, however, they will dissipate their entire energy within a small volume of body tissue, causing considerable damage.

Beta Particles:
The beta particle is very small compared to an alpha particle, and is spontaneously emitted from the neutron of certain radioactive elements. It is identical to a high-energy electron and has a negative charge.

Most fission products are beta emitters. Beta will pose a small external hazard if fallout comes into actual contact with the skin and remains for an appreciable time. This causes a burn referred to as "beta burn". Fallout should be brushed or washed from the hair and skin as soon as possible. Beta will, however, do considerable damage if it enters the body.

Certain chemical elements tend to concentrate in specific cells. The body cannot distinguish between the pure element and the radioactive isotope of that element. Radioactive strontium and barium are similar in chemical nature to calcium and will seek the bones. These elements pose a small hazard if inhaled but care should be taken not to eat food contaminated with fallout. Animals which have been exposed to radiation may have significant levels of strontium and barium in their bones. These animals, if healthy appearing, may be slaughtered and eaten if the bones and organs are discarded before the meat is cooked.

Foods contaminated with fallout should not be eaten unless they can be washed or peeled. All cans containing food should be washed before opening. Please see Volume 38, Issue 5 of the JCD for additional information on foods and farming in a post war environment.

Iodine 131, which poses the largest threat, will seek the thyroid. Thyroid blocking agents (TBA) are available commercially. They are inexpensive and have a long shelf life. Iodine 131 has a half-life of 8 days and would be a threat for 10 half-lives or approximately 80 days. Enough thyroid-blocking agent should be stored for each person for a 3-month period. Care should be taken to keep fallout contamination from the lungs, eyes, and open wounds and to wash any food that is to be ingested.

Gamma rays:
Gamma rays have no measurable mass or charge. They travel at the speed of light and originate from inside the nucleus. The emission of an alpha or beta particle from the nucleus of an atom will almost invariably be accompanied by the emission of gamma rays.

Gamma radiation will penetrate through the body and does pose an internal danger for two weeks after a nuclear detonation. In most areas, after two weeks there is no appreciable level of gamma radiation remaining.

Neutrons:
Neutron radiation is part of the initial radiation that occurs in the first moments after the detonation. Neutrons are not contained in fallout. Neutrons have a range of 1-½ miles from the detonation and are very penetrating. The blast levels at that range are indeed fatal if people are not in hardened shelters. All shelter entrances must contain 6 feet of shielding if the shelter is within that range of a target, and the dirt cover on top of the shelter must exceed 6 feet.

Radioactive Half-Life:
Radioactive elements vary greatly in the frequency with which their atoms erupt. Some have only infrequent emissions (decay) while others are very active and radiate frequently. The rate of radioactive decay is measured in half-life. The half-life is the time required for the radioactivity of a given amount of a particular material to decrease to half its original value. The half-life of a radioactive material may range from fractions of a second up to millions of years. After 10 half-lives, radioactive elements decay to a level that is no longer considered to be a human hazard.

Measuring Radiation:
When dealing with exposure levels from fallout, radiation is normally measured in rads or rems. Some dosimeters and meters will measure in Roentgens. Numerically, the rad is very similar to the Roentgen. We will be using these terms interchangeably in this discussion.
Radiation meters are used to monitor radiation exposure rates. Like the speedometer in a car, which tells how many miles per hour the car is traveling, a survey meter would tell how many roentgens per hour are being received. Dosimeters are used to measure the accumulation of radiation, just as your odometer would measure the accumulation of miles traveled in your car. Both instruments are very helpful in a radioactive environment. Good metering devices are invaluable in a nuclear environment.

Wartime rate meters must measure in rads or (roentgens) up to a level of 500 rads per hour, and wartime dosimeters must measure to a total accumulation of 200 rads (or roentgens).

Some meters and dosimeters measure only in mili-roentgens (mr). A milli-roentgen is 1,000th of a roentgen. These meters and dosimeters are useful in a post-war situation to monitor contamination of food and equipment. The most useful of these low-rate meters will have a 'wand' capable of reading beta contamination.

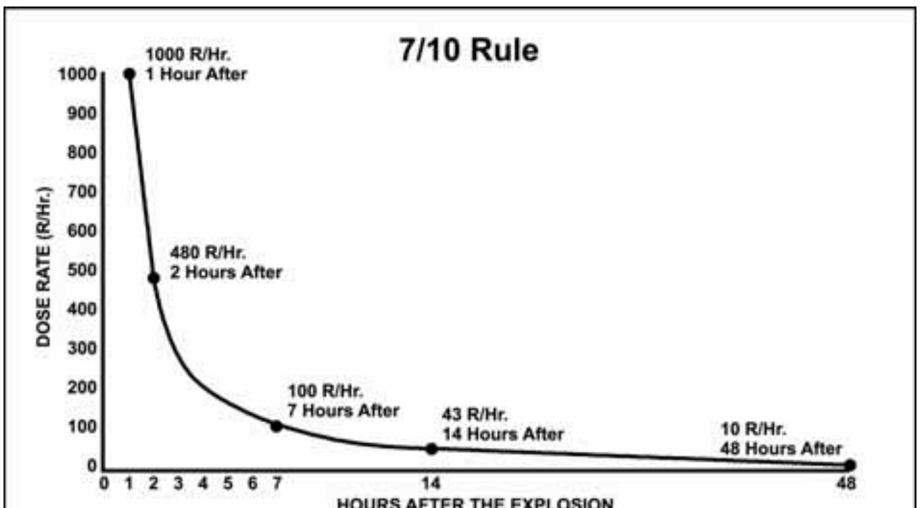
Fallout Protection Factors (PF):
The fallout protection factor (PF) is a ratio of the fallout exposure rate that would be measured by a meter at a height of 3 feet above a surface, to the exposure rate that could be

Protection Factor (PF) Using Shelter	High Fallout Risk Area	Med. Fallout Risk Area	Low Fallout Risk Area
PF 5	1200-3000	600-1200	600 rads or less
PF 10	600-1500	300-600	300 rads or less
PF 20	300-750	150-300	150 rads or less
PF 30	200-500	100-200	100 rads or less
PF 40	150-375	75-150	75 rads or less
PF 60	100-250	50-100	50 rads or less
PF 80	75-188	38-75	38 rads or less
PF 100	60-100	30-60	30 rads or less
PF 200	30-75	15-30	15 rads or less
PF 500	12-30	6-12	6 rads or less

expected in a given location in an area below that surface. A PF 50 would indicate that the radiation level above the surface is fifty times the value of the radiation level below the surface. Protection factors are a function of distance, geometry and shielding, but not of time.

Principals of Protection:
The three basic principals, which give protection from radioactive fallout, are time, distance and shielding.

Time:
All radiation decays with time. During the fission process in a nuclear detonation, many isotopes with different decay patterns are produced. It has been found that the average decay rate behaves exponentially and can be estimated with the 7 / 10 rule. Simply stated, this rule says that for every seven-fold increase in time after detonation, there is a ten-fold decrease in the exposure rate.



Decay of the dose rate of radiation from fallout, from the time of the explosion, not from the time of fallout deposition.

This rule can be used to roughly estimate the future exposure rates. As an example, if the exposure rate were found to be 1000 R/hr. at 1 hour after the explosion, if there were no other explosions, the forecast for the future would be a rate of 100 R/hr after 7 hours; 10 R/hr after 49 hours (roughly 2 days); and 1 R/hr after 2 weeks. In all but the highest radiation levels, this decrease should allow for activities outside the shelter during much of the day. People should be taught to stay inside the best shelter that can be found for at least two weeks.

Distance:
The dose rate of radiation falls off with increasing distance in air, even though attenuation by air is negligible. The inverse square law states that the dose is inversely proportional to the square of the distance in air from a point of a gamma-ray source.

This law is not applicable to other than a point source. However, fallout does act as a point source in long, narrow entryways.

Children are more vulnerable to the affects of radiation because of their rapidly dividing cells. Heavy people are somewhat protected by layers of fat. With this fact in mind, it would be wise to put small children and thin adults at the lowest point of the shelter during high radiation levels.

Shielding:
The damaging effect of gamma rays comes from their ability to ionize. Shielding materials containing large numbers of electrons will filter (attenuate) gamma rays. The more massive the material, the greater will be the attenuation factor .

It has been found that certain amounts of shielding material will attenuate half the gamma radiation. This amount is referred to as the "half-value thickness" for that particular material. The material is said then to give a protection factor (PF) of 2. The protection factors are multiplicative. Two half-value thick-nesses will give a PF of 4. Three half-value thicknesses will give a PF of 8. It takes 10 half-value thick-nesses to reach a protection factor (PF) of slightly greater than 1,000.

APPROXIMATE EFFECTIVE HALF VALUE THICKNESSES

Material	Density (lb / cu ft)	Half Value Thickness (inches)
Steel	490	1
Concrete	146	3.3
Earth	100	4 to 4.8
Water	62.4	7

Good radiation shelters should have at least a PF of 1000. Ten half-value thicknesses of earth will give a PF of 1,000 and will require about 48 inches of earth cover.

Biological Effects:
Large exposures to nuclear radiation can cause acute sickness or death, whereas small daily exposure may be tolerated without causing radiation sickness.

An exposure of 600 Roentgens ('R) will usually be lethal when received as a brief exposure. The same ex-posure accumulated over a number of years would have no recognizable effect.

Doses occurring during a 24-hour period are considered 'acute' doses. If the exposure is over longer lengths of time, it is considered 'chronic' exposure.

Ionizing radiation may cause an increase of the permeability of the cell membrane, alter or destroy cells, inhibit the process of cell division ('mitosis') and break chromosomes.

Radiation Sickness:
The symptoms of radiation sickness are nausea, vomiting, headache, dizziness, and a generalized feeling of illness. There is an initial stage of these symptoms that lasts 1 to 2 days, followed by a latent stage with few if any symptoms that lasts between 2 and 4 weeks. The final phase is characterized by a recurrence of the symptoms noted during the initial phase, and in higher doses the individual may experience skin hemorrhages, diarrhea, loss of hair and seizures. The final stage lasts between 1 to 4 weeks and results in either recovery or death.

The symptoms of the initial phase are similar to symptoms of stress and fear. If you have been well shielded, do not assume radiation sickness to be the cause of these symptoms.

Penalty charts have been developed to show the consequences in expected number of deaths of radiation exposure. Most of these deaths will occur from the very young, the frail and the elderly. Survivors will see an increase in cancer deaths, as well as some mutations in progeny.

In a full-scale attack, almost all areas of the country would be affected by high, medium or low levels of radiation. Charts showing required protection factors show very little difference in the number of survivors in these three risk levels. Sheltering indoors in a one level home would provide a PF of about 5. There would be no expected survivors in a medium or high fallout risk area with a PF of 5, and very few in low risk areas. Unexposed basements offer a protection factor between 16 and 20. These charts should impress us for the need of shelters throughout the entire nation with PFs of 500 to 1,000 and more. Acceptable peacetime levels of radiation are set by governing agencies to be less than 1 R per year. Why should we settle for any less during war-time, when the technology is there for our protection?

We hope this brief introduction to the effects of radiation will be helpful to you in your preparations.

RADIATION PENALTY TABLE

Acute Effects	Accumulated Exposure (R) 1 Week	Accumulated Exposure (R) 1 Month	Accumulated Exposure (R) 4 Months
Medical Care Not Needed	150	200	300
Some Need Medical Care Few if Any Deaths	250	350	500
Most Need Medical Care 50% + may die	450	600	600
Lethal Dose	600		

The accumulated exposure should not exceed those in the first row. If radiation levels reach 10/R/hr in the sheltered area, the doses in the first row will probably be exceeded. In this eventuality, the shielding in the sheltered area should be increased. In a full scale attack, about 35% of our population would be expected to exceed the above doses. A PF of 500 is recommended for all fall out shelters.

EXPOSURE AT 30 MILES DOWNWIND
(500 KT surface burst, 15 mph wind)
(Roentgens)

Time	In Open	In Shelter PF 15	In Shelter PF 40
1 Week	3450	230	86
1 Month	4100	273	103
4 Months	4500	300	113

A PF of 40, in this scenario will give the minimum protection not to exceed row one of the Penalty Table above.

THREAT ANALYSIS RESOURCE

Before, During and After a Nuclear Emergency

By Sharon Packer, TACDA President

Before a Nuclear Attack:

- Store a one year supply of food, clothing, fuel and other necessities (Including batteries).
- Prepare as you would for Earthquake, Fire, High winds, Power Outage or any other major disaster.
- Prepare a shelter according to proximity to blast and radiation effects.
- Store 55 gallons of water per person.
- Purchase or construct a chemical toilet, radiation meter and water filter.
- Prepare a 72 hour kit for your car.
- Store Potassium Iodide Crystals for thyroid protection from radioactive iodine.
- Prepare emotionally not to expect help from outside emergency services.
- Learn and teach your family about NBC effects including blast, EMP, fire, radiation, & chemical/ biological warfare.
- Purchase or construct a power drop alarm to warn of possible EMP blast.
- Purchase battery powered CB, shortwave, or Ham radio.
- Refuel vehicles when they are half empty.

In an Escalating Crisis:

- Check flash lights & radios (charge batteries).
- Check 72 hour car kit.
- Pull Blinds.
- Dig a pit for garbage.
- Start Potassium Iodide tablets as directed by your physician.
- Choose Shelter location. If you have no shelter, go to your basement and place two feet of heavy shielding overhead, and several feet on each side. Use books, bricks, food supply, dirt, or anything heavy.
- Gather supplies (include medications, gas masks, rubber gloves, & radiation meter.)

During a Nuclear Attack:

- At home...Go to your shelter. If there is time, turn off utilities.
- At work or school...Drop and cover next to a heavy object. Do not lean against the wall. If there is time, go to a basement, stay away from windows, and take a face down fetal position, shielding face.
- In your car...If time, drive to nearest basement, culvert, tunnel, parking garage, etc. Shield from the thermal pulse below ground or behind heavy structures. Take your 72 hr. kit with you. Place as much shielding over head as possible.
- Do not look at the fireball, as the light may blind you.

After a Nuclear Attack:

- Stay sheltered for two weeks.
- Monitor radiation levels. After leaving shelter, filter and purify all water exposed to fallout, before drinking. Do not drink swimming pool water as chemicals, acids, and salts cause kidney damage. Use this water for sanitation purposes, only.
- Eat perishables first, frozen foods second, and canned foods third. Wipe any dust from cans before opening.
- After 2 days, turn on battery powered radios for short periods. Without interference, AM radios may reach as far as Europe.
- If in expedient shelters, prepare to take water from water heaters, toilet holding tank, storage, etc. Drink only water stored in covered containers for first 2 weeks.

Radiation & Shelters

By Sharon Packer
TACDA President

STUDY:

Shelter design must incorporate protection from all weapons effects-blast, thermal pulse, radiation and EMP. All of these effects will eventually be covered in issues of our journal. We hope you will study the information in this journal to help you better understand the effects of radiation.

The main function of fallout shelters is to shield from gamma rays. Alpha and beta particles are not an issue in a sheltered environment. Proper fitting doors and high efficiency particulate air filters will protect the occupants, equipment, food, water and the air you breathe from the alpha and beta particles.

Gamma radiation is attenuated by mass. Most people understand the need to cover the shelter body with at least 4 feet of dirt (or equivalent) to protect the occupants from the effects of gamma radiation. The exposure, therefore, will not come from the top of the shelter—it will come from the entrances. One of the least understood design concepts, is the crucial role that proper geometry of entrances plays in radiation attenuation.

The importance of proper size and geometry was affirmed by scientists and engineers during early nuclear weapons tests. Underground corrugated-steel shelters were used to prove and document these concepts. The engineers discovered that radiation entering small diameter entrances followed the inverse square law, and that every 90-degree turn attenuates (decreases) the gamma radiation by a factor of 10 (PF10). It was their recommendation that entrances should be no more than 48 inches in diameter, and that they should have a length of at least 22 feet, incorporating a 90-degree turn near the half-way mark. Entrances of larger diameter would need to be significantly longer and the design stipulated by an engineer.

Initial radiation, as discussed in another article of this journal, and the prompt neutrons associated with this effect will not follow the same rules and formulas as those for the attenuation of gamma rays. Neutrons have a range of 1 ½ miles and are very penetrating. Shelters near targets that may be within a radius of 1 ½ miles from a potential blast should have at least 8 feet of dirt cover and incorporate additional shielding material into the horizontal runs of their entrances.

Ninety-degree turns provide very little additional protection against neutrons. One entrance should contain a full 6 feet of shielding at all times. Rice, wheat, water and anything with high hydrogen content make good neutron shields. In high-risk areas for initial radiation, we suggest that you leave sacks of rice inside the shelter near the entrance, ready to put into place after everyone has entered. We also have designs for entrance trolley's that can roll 55-gallon water drums into place. If you are within this neutron range, there may be some 'neutron activation' of the shielding materials. Your low-range milliroentgen meter should then be used to test any foods in the entrances that have been used for shielding. If there is a reading above the level found in the shelter, the foods should be discarded and not eaten.

In most areas, after the first two weeks from the time of the detonation, gamma radiation is no longer a threat, and people can leave their shelters. At that point, alpha and beta contamination (though they still persist in small amounts) are only an issue of incorporating proper hygiene techniques and careful preparation of food.

THINK:

FEMA documents have stated that whole body exposure must be limited to 175 rems in order to save more than 50 percent of the population. To attenuate the exposure anticipated in a full scale nuclear attack to this level, a minimum protection factor of 40 would be required. A protection factor (PF) of 40 can be achieved with 24” of dirt cover for shielding. This 50% level of fatalities may be acceptable to FEMA, but it is not acceptable to me. Dirt is ‘dirt cheap’. Use 40-inches of cover and you will achieve a PF of 1,000, and expect ‘zero’ fatalities. Each 4 inches of dirt will provide one doubling. Forty inches of dirt will give the required 10 doublings for a PF of 1,000. (Refer to the penalty chart on page 9). Blast becomes a major factor within 5 miles of a target. If you are near a prime target, you will need a shelter with an ‘arched’ top and dirt cover that is double the diameter of your shelter. We will provide more information concerning blast effects in a future issue.

Most basements with minimum exposure will provide a PF of 16 (4 doublings) or better. If you are constructing a fallout shelter in the basement of your home, you will need 6 more doublings, as the mass of your home above will provide the extra 4 doublings required for a total PF of 1,000.

OBSERVE:

Become aware of your surroundings. A nuclear event may occur while you are away from your shelter. Areas such as caves, tunnels and high-rise buildings provide good shielding from radiation. Please refer to JCD Volume 38, Issue #4 for more information on expedient sheltering.

Contact your state’s office of emergency management for information on targets in your area. If you are near a prime target you will not be able to survive in a basement shelter.

PREPARE:

We hope you will use the information we have provided to you to further prepare against the effects of radiation. Information becomes ‘knowledge’ when you put the information to use. Don’t wait until you can afford a deep, underground hardened shelter. Start now with whatever assets you have at hand. If you live in an apartment, make friends with people in your neighborhood who have a good basement or shelter. Ask them if you can store some of your food, clothing and supplies at their home; and offer to contribute with time or finances in preparing their shelter. If you are able to reach their home in the emergency, you are a helping hand and an asset. If you don’t make it to their home, they have extra food. Very few people will turn you down if they think through that scenario.

We appreciate the support and encouragement you give to us in our efforts to serve you better. If we can be of help to you, please email, write or call us at the TACDA office, and continue to write to us with your suggestions.

WE WANT YOU TO SUBMIT TO THE TACDA JOURNAL OF CIVIL DEFENSE™

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The Journal of Civil Defense presents articles that cover the wide spectrum of civil defense and disaster preparedness and mitigation issues on both the personal and the professional levels.

For more information, or to submit to the TACDA Journal of Civil Defense™, email: info@TACDA.org.

TACDA Board of Directors "Up Close"™

Jay Whimpey

Jay Whimpey currently serves as a member of our Board of Directors and holds the office of Secretary / Treasurer for TACDA. Jay is also in his sixth year serving as President of TACDA Chapter #1; The Civil Defense Volunteers of Utah (CDVU). With just over 400 members, CDVU conducts monthly training seminars in Salt Lake City and surrounding areas, and provides education, information and radiation detection equipment to citizens interested in civil defense issues.

Jay has adopted a Civil Defense oriented lifestyle for himself, his family, his friends and his community. His lifelong study, training and commitment to understanding and teaching these principles has well qualified him as an instructor and an author. Jay has written many articles on Civil Defense and preparedness topics over the last fifteen years. In fact, Jay and several of the CDVU members were instrumental in providing the framework and base content for our new TACDA Academy. Jay has compiled and written a highly comprehensive book called "The Civil Defense Guidebook." We hope to be selling his book in the TACDA Store next year.

Jay earned a Bachelor of Science Degree in Chemical Engineering from the University of Utah, Cum Laude, in 1982 and his professional engineering license in 1995. He holds certifications in Hazardous Materials Management and Production & Inventory Management (CPIM). He is currently working on his Master's degree in Hazardous Waste Management.

Jay has been managing Environmental Operations for Thiokol Propulsion Group since 1997, overseeing the organization's complex hazardous waste treatment and disposal facilities. Prior to this assignment, Jay has also functioned as a Senior Engineer in Thiokol Corporation's Research and Development department, and made significant contributions to other noteworthy organizations such as Hercules, Inc. and Phillips Petroleum.

Jay lives in Utah, is 47 years old and happily married with five children. His interests include private aircraft, metalwork, machining, and mechanical work. Jay can be reached via email at: jwhimpey@tacda.org

Radiation Detection - By Jay Whimpey

"The ability to detect harmful radiation is critical for survival in a nuclear war environment and may also be very important for protecting yourself in the event that a 'dirty bomb' is used by a terrorist organization to spread radioactive materials in a localized area. Since this is such an important capability, it is reasonable to prepare for redundant capability by having several radiation detection instruments.

The most reliable instrument for detecting radiation is the 'dosimeter.' There are many of the original civil defense program dosimeters that still function reliably. The program dosimeters must be accompanied by a dosimeter charger to be useful since background radiation and a small amount of charge 'leakage' will occur over an extended period of time. The dosimeters are usually very accurate and reliable since the principle of operation is so simple. The instruments measure dissipation of an electrical charge on an isolated element caused by ionizing radiation. There are many newer laboratory dosimeters that are available but many of them rely on fairly sophisticated electronics and they may be susceptible to EMP.

There are also a variety of survey meters on the market. Most of them also were manufactured many decades ago. The meters are also quite rugged and reliable but they are not normally as accurate as the dosimeters. There are survey meters that are designed to detect radiation in lower ranges and high ranges. Many of the low-range meters also have the ability to detect alpha and beta radiation and would be helpful in measuring for possible contamination on food and other items after a nuclear event. The high-range meters usually only detect gamma radiation but are more resistant to saturation in a high-intensity radioactive environment and can give more accurate readings at high ranges. It is important to follow the instructions for using the meters and measure radiation at the highest range first then decrease the range settings gradually until the lowest range is attained where a reading can be taken from the meter.

Since this ability is so important, it is advisable to return old meters to the manufacturer for testing and calibration. A reliable local meter calibrator may also be good, yet such services are rather rare. Such services can cost over $100 per meter.

It is hoped that this information will be useful to members of TACDA. Please direct any additional questions to TACDA or representatives from your local chapter."

*In our next issue, we will be introducing you to another distinguished member of the TACDA Board of Directors, Dr. G*erald Looney.

FACING A "WORST CASE SCENARIO"

With Barbara Salsbury

The practical part of this month's theme – that of the possibility of having to cope with a nuclear attack or severe problem – may seem as if it were a mission impossible for most of us. To deny the fear and lack of knowledge as to what to do would be foolish. So the practical personal part is for you to do the best you can, with what you have and what you can obtain, as soon as you can. Also for most of us, we will not have a concrete shelter to retreat to. That does not mean that it would be impossible for us to survive – and even live through it.

So let's share a few thoughts on facing a "Worst Case Scenario," what that might mean, and what you can do about it in your home.

A Worst Case Scenario is a situation where conditions are so bad that there might not be food or supplies available. Most likely a Worst Case Scenario would be a long-term, all encompassing occurrence where everyone is struggling and perhaps suffering. You could not acquire food and supplies available at any price because there aren't any. Sheer existence may be the challenge. Many things could precipitate a dismal situation such as this. In such an event your survival depends on being able to rely only on yourself and your preparations for an extended time.

Some may suggest that preparing for the worst requires you to completely alter your lifestyle and adopt a "Survivalist" mentality. They would suggest that in order to survive the grim future you must be prepared to be isolated, armed and able to totally provide all necessary commodities for life by yourself, even to the extent that most of your provisions, medications and equipment may have to be homemade. Being prepared for the worst in the "survivalist" mode is not practical or desirable for most people. It's not even possible for many. If you told some city dwellers they needed to prepare to "flee to the hills to survive," they would think you were crazy. In some cities you'd have to go a hundred miles just to get to the suburbs, let alone "the hills."

At the other end of the scale, "Don't Worry, Be Happy," has become the motto of the day for many. These people are confident that their church, or the major charitable organizations, or the government will bail them out if things get bad. Neither attitude is particularly accurate or reasonable. Being ready to survive the worst life can dish out does not mean "taking to the hills" for isolation and survival. Nor does it mean burying your head in the sand and assuming someone else will care for you in a time of trial. It means planning ahead now, calmly and logically. It means being aware of what could happen, yet not letting fear of the future overwhelm living fully today. You can be ready for the worst (as best you can) without fanaticism or denial. Sometimes a tiny investment of effort today will reap huge dividends in the future. This is one of those situations. And should you never need your worst-case preparations, so much the better. All you'll be out is that original tiny investment of effort.

Is Your Emergency Cupboard Bare?

First and foremost in this column, the discussion is about Disaster Preparedness, NOT home storage, or stocking up!

Usually in a worst case scenario, such as a Nuclear Disaster, you will be living in a powerless situation *(pun intended).* The old stand-bys of dry, uncooked beans and grains will leave you mighty hungry for a long time. Even then, the drastic thoughts of chewing on grain, leaves a lot to be desired.

Balanced meals, planned menus and counting calories are not necessarily the main concern as you prepare to deal with an emergency situation.

Besides providing nourishment, the "eating of meals" during a crisis has a positive psychological effect. It helps us feel as if we have some control in an otherwise out-of-control situation. Being prepared assures existing as close to the security of normalcy as possible.

Just like in the other sections of personal preparedness, the food you choose to store will be based on individual factors that make your selections appropriate for your own situation, and different from what your neighbors would select. There is no one type of food or food program that is "best" or better than all of the others for everyone! The best food choices for you are the ones that suit your needs.

Foods that require no refrigeration, little or no cooking and little preparation are a must. It is extremely important to assess the individual needs of your household members. Will you be providing for an infant, invalid, elderly person or someone with a severe allergy? (I'm not talking about simple hay-fever here. These are life threatening food triggers.) It will make a huge difference as to what kinds of food products you keep in your emergency cupboard.

Do not be misled into complacency because you happen to have several candles and one container of canned-heat. Remember to choose food and food preparation methods that will get you through tough situations where you have to do without those essential services that we take for granted, such as power, running water, light and a supermarket on the corner to run to for supplies. In an emergency situation you may be limited to cooking on a Sterno stove by the light of a flashlight. Your fuel usage may be restricted, your water cautiously rationed, and you may be dealing with these in the middle of chaos. Your food choices should be a comforting relief, not an added catastrophe.

And be sure to remember the goodies. During crises, especially ongoing ones, treats are not a luxury! The morale boosting power of something that tastes good to cheer you up is not to be underestimated. I guarantee that chocolate covered wheat just won't work. I would even suggest that you begin with your next shopping trip. As you fill the emergency cupboard, consistently fill the treat shelf. It should be up high, out of sight and difficult to access. That will insure that there is something on it when the need arises. If you buy chocolate, buy double, just in case you can't resist the temptation.

Will the Major Crisis Leave You Powerless?

One of the things that usually accompanies a crisis, and is a standard part of our technologically impacted world, is the power outage. By themselves they usually do not fall into the category of "disaster," but when the main event has mellowed many times we are left to deal with being powerless. If we remain in our homes, and the home is fairly intact darkness can cause a mini-crises of its own. There are warnings to alert us that there are dangers outside. But perhaps we need to be reminded, that since there aren't warnings to alert us to the normal increased dangers in the dark inside our homes, we might tend to become complacent. So the warning for today is that hazards and dangers can lurk in the long-term unfamiliar darkness, even in familiar places.

For example, I learned the hard way. We were in the middle of the rolling blackouts of northern California. They had been occurring for several weeks so that I was used to them. With my preparedness plans and lanterns in place I made the mistake of allowing false security to take over and push common sense and safety out the window. It was dusk and getting darker by the minute. And it was even darker inside the house and windowless hallways. As I was walking down the hall, with papers in hand, from our home-office to the living room, I was paying more attention in my attempts to see what was in my hand than what was on the floor. "SPLAT," I was what was on the floor! I had not remembered to pay attention to black dogs lying in darkened rooms, on darkened floors. For days I had a bruised chin, elbows, wrists and ribs to remind me of the dangers of having a false security in the darkness of a power outage.

Common sense says that we should pay attention. Yes, many of us are used to walking around at night in the dark, in our homes. So what's the difference? The difference comes when we are attempting to do those tasks and chores in the dark that are normally done with sufficient light. We attempt to accomplish just as much, in just as short a period of time – but without the benefits and conveniences that we are used to. This is what can cause serious problems.

So as part of your preparedness planning, recognize that you may have to deal with more than your share of power outages. Use caution and do not allow yourself or family members to become complacent, just because your surroundings may be familiar. Have family or household meetings to review how to live through the inconveniences safely. For instance, safety must be a first priority consideration if you are using a light source with an open flame. It could prove to be a deadly mistake to do something seemingly inconsequential as to trip over a dog if you were carrying an oil lamp. Be sure to be aware of "darkness procedures" and review them often with the members of your household. Blame the dog again, but broken bones could be a hard price to pay for false security. Think about it, could there be a "Splat" in your future?

You'll want to Check These Out:

This is your preparedness equipment hint for this issue. Have you discovered the LED flashlights yet? Go check them out. You will find them in Super-Discount Department Stores, Sporting Goods Stores, Hardware Stores, and so on. The LED lights burn much brighter and longer than standard battery-powered flashlights. There are new LED flashlights that function without batteries and just need to be shaken to activate the lighting capacity. They have come down in price in the last year or so and are now affordable. They range in size from small, which are perfect for 72-hour kits, to huge that can make sure there are no monsters in the closet or under the beds when the light switch fails.

Be Practical in What You Think …

When working on your preparedness programs, be practical in what you think, as well as what you buy. This was a difficult column for me to write and to try to tell you to not be afraid in thinking about a Nuclear Disaster. My personal opinion is that fear can be very real, but it doesn't have to be debilitating. In fact it can be a force for good. It might be the thing to encourage you to do all you can to be ready to take care of you and yours. I have to confess, after living through the 7.2 in the Bay Area I am still terrified of earthquakes. But I have my supply of chocolate to get me through any up to a 5.5.

[If you have any comments concerning this column, or if you would like to share your own personal preparedness experiences, suggestions or solutions, please email me at barbara@tacda.org.]

"RADIO" ACTIVE™

How To Approach Schools About Offering Amateur Radio (FAQ)

Source: American Radio Relay League (ARRL)

Introduction:
The most frequently asked question about "The Big Project" is: How do I approach a school to introduce Amateur Radio curriculum and convince them to consider including the curriculum as part of their school program? This question comes from hams outside the educational system who would like to see Amateur Radio included as an accepted program in their local schools.

As Ham Radio operators, we recognize the numerous benefits from including Amateur Radio as an enrichment program in schools. We are aware of the relationship between the knowledge base of our hobby and the concepts in science, math, geography and other subject matter taught in schools. We have observed how the use of Amateur Radio can improve young people's verbal and social skills. We are familiar with the sense of accomplishment gained by passing an FCC exam and operating on the air.

What If The School Isn't Interested?

Today, schools are expected to take on more and more of society's responsibilities. Not only are schools responsible for providing a safe stimulating educational environment, they are also required to provide community and social services as well. Schools are under the microscope to meet state and national educational standards and to increase student performance on standardized tests. Added to these duties are staff issues, union issues, budget issues, local election issues, privacy issues, school-community based management issues, and the list goes on. Perhaps you may understand the tremendous variety of responsibilities schools deal with daily.

We may perceive the school staff and administration as not interested, but in fact they are very interested in new ideas to help students learn. They are extremely busy and often don't have the luxury of time, so when we do have an opportunity to meet with them we need to be able to show them how Amateur Radio helps students learn.

How Do Some Schools Do It?

How then did the present schools now using Amateur Radio in the classroom manage to start their Ham Radio programs? It is not usually a top down decision. Virtually all public schools using Amateur Radio for instruction began with a teacher within the school deciding to share his/her hobby with students. Some magnet schools and academies have made an administrative decision to use Amateur Radio as a focus but they are the exceptions rather than the rule.

What's The Solution?

1. Find a Teacher
To succeed in convincing a school to implement an Amateur Radio program, I would recommend finding either a teacher at that school with an Amateur Radio license, or one who is innovative and willing to eventually become licensed. Have this interested person pursue it from within the system, with your support from the community. Where do you find a teacher? Bring the topic up at a club meeting. Some member or someone's spouse, parent, or neighbor is a teacher. If you are invited into one classroom, let other teachers know you can arrange for a demo in their room also, on another day. Leave a flyer at teacher workshops, museums, or other places that serve teachers. Offer to be a guest speaker (or demonstrator) on "technology night," or "science night," or "career day," or "public service day" ... Often the PTA people are the ones to contact. Demonstrate, don't teach. Don't push licensing. Pretend you are taking to a zoning board. You want to generate interest in ham radio, not recruit them. Eventually, some teacher will get hooked and want to become involved. It may take many little

projects before a teacher will want to do a "Big Project."

2. Other Implementation Models
Schools that do not have a teacher with an Amateur Radio license can offer Amateur Radio as an enrichment program. This requires a licensed volunteer from the community coming into the school several times per week to teach the class. A teacher within the school usually sponsors the program and supervises the volunteer. Some schools have regular enrichment periods several times per week. Other schools have specific teachers offer enrichment programs during their regular class activities.

Another possibility is to have an Amateur Radio volunteer offer an after school program. Keep in mind that many schools will not allow unsupervised adults to work with children unless they have undergone fingerprinting, a background check, and often, training in youth issues. Yet another possibility is to concentrate on Short Wave Listening (SWL) where no license is required.

3. Show Them
How do we inform the educational community how Amateur Radio can help young people learn? Don't Tell Them, Show Them. Show them a classroom where students are actively studying scientific concepts through Amateur Radio. Show them an active contesting station. Show them how to construct a dipole antenna, emphasizing the math and physics involved.

4. Student Demonstration
A good way to get the attention of educational officials or teachers is to have students perform a demonstration. A small group of 6th or 7th graders, demonstrating an HF QSO or satellite contact can have a profound affect on educators. Allowing students to demonstrate the depth of their knowledge through several layers of questions will leave a lasting impression.

What Justification Is There For Including Ham Radio In Schools?

- Amateur Radio provides integration of technology, math, science, geography, writing, reading, and speaking through hands-on application of these concepts either individually or in a group

- Amateur Radio encourages investigation and experimentation as a basis for understanding technical subjects

- Amateur Radio encourages communications via a variety of methods: voice, various digital techniques, Morse code, and even Amateur Television. They also communicate by using satellites and bouncing signals off the moon

- Amateur Radio encourages public service through the links with state and federal disaster preparedness agencies

- Amateur Radio holds few roadblocks for people with disabilities. Many people who are physically challenged or visually impaired are able to participate in communicating with simple adaptive devices

- Amateur Radio offers a platform for life-long-learning through an active hobby that encourages competition in contesting, spreading international goodwill through friendships developed over years of communicating and advancement in technology by experimentation

[TACDA encourages you to be an advocate for Amateur (HAM) radio in your local schools. Be a part of bringing this wonderful educational and practical tool into our children's lives.]

Biased ABC Errs Badly in Clip on Nuclear Reactor at U.

By Gary Sandquist

Earlier this month ABC-TV aired a one-hour program on assessing security of university nuclear reactors in the United States. There are 25 such reactors sited in various states, including a TRIGA nuclear reactor at the University of Utah in the Merrill Engineering Building (MEB). The overall impact and conclusion of the ABC presentation was that such facilities pose major terrorist risks as potential "dirty bombs" and even atom bombs. Because of the inaccuracies and harm that such a biased national broadcast creates, it is critical to assess the motivation and content of the ABC presentation and describe the actual situation at and purpose of these reactor facilities.

The Carnegie organization funded a visit by selected non-science student teams to attempt to gain improper access to the reactors and test security measures. The Carnegie organization is very critical of the nuclear enterprise. ABC has a long history of anti-nuclear bias, including recent coverage of security at Los Alamos National Laboratory and purported dangers at nuclear facil-ities. Upon previewing the Carnegie reactor security investigation, ABC elected to air only those university reactors with perceived security deficiencies.

The claim that the student team breached security at the University of Utah reactor was particularly misleading and deceitful. The reactor is sited in the MEB that houses four major departments, each with graduate and undergraduate students. These several thousand students have access to the building 24 hours a day for class work and research studies. The ABC student team entered the outside doors to MEB and approached the entrance door to the reactor laboratory that is accessible to anyone. ABC incorrectly presented this on national television as unsecured, immediate access to the nuclear reactor. In reality, the nuclear reactor fuel core resides over 100 feet from this entrance door and is located 25 feet below ground level in a double-wall reactor tank filled with water. The entrance door is a high-security locked door that allows passage only to authorized persons. Furthermore, final access to the reactor itself requires passage through three more locked doors. The last two doors are alarmed, and forced or unauthorized passage through these doors alerts campus security, and armed officers familiar with the facility immediately respond. Testing of these alarm systems and officer response is performed as required by the NRC on a monthly basis.

It is well-established that all nuclear reactors including university reactors cannot serve as atom bombs or nuclear weapons. Nevertheless, ABC implied that many of these university reactors possessed sufficient quantities for one or more nuclear weapons.

The path for producing a functional nuclear weapon from the uranium fuel in these reactors is extremely difficult and complex. Separation and refinement of the uranium is necessary, followed by casting of metal billets for machining. Then the pyrophoric uranium must be machined into highly precise geometries for insertion into a complex weapon assembly device. Indeed, there is less potential for a terrorist to produce bombs from uranium in university reactor fuel than to produce assault weapons from metal in scrap metal yards. Since most American fatalities in Iraq arise from assault weapons, perhaps we should impose security measures upon all scrap metal sites in the United States and world.

The University of Utah TRIGA reactor has operated since 1975 and trained more than 500 students in nuclear engineering. These students are now in nuclear fields including work at national laboratories, nuclear plants, naval reactors and defense installations. One of these Utah students served as the commanding officer of the USS Los Angeles attack submarine and rose to the rank of Rear Admiral. U.S. national defense is based upon nuclear weapons. Nuclear reactors are as essential to training nuclear engineers as computers are to training computer engineers.

Most importantly, the economic and political security of the nation is the recognized capacity of nuclear plants for transition from an oil-dependent economy to a hydrogen economy. This production of hundreds of millions of tons of hydrogen can be accomplished economically, without greenhouse gas emissions, and with existing domestic uranium resources.

Is nuclear energy important to the United States? The answer is an emphatic "yes." Nuclear power provides 20 percent of U.S. electrical power without greenhouse gases. The average customer cost for nuclear-generated electricity is less than natural gas, oil and many coal-fired facilities. The U.S. Energy Act of 2005 recognizes this fact and provides support and government reform to encourage vigorous growth of advanced nuclear power plants.

[Gary Sandquist currently serves on the TACDA Board of Directors and is a professor and former director of nuclear engineering at the University of Utah.]

THE NEWS STAND™

Chertoff: Personal Disaster Preparedness 'A Matter of Civic Virtue'

By LARA JAKES JORDAN
Associated Press Writer
October 31, 2005

WASHINGTON - Stockpiling supplies and developing family response plans in case disaster strikes not only might save lives — it's also a civic duty, Homeland Security Secretary Michael Chertoff said Monday in an interview with The Associated Press.

Two months of hurricanes ravaging the Gulf Coast should prove that people need to make preparations so emergency officials can focus on those who are poor, elderly or otherwise can't help themselves, Chertoff said.

"For those people who say, 'Well, I can take care of myself no matter what, I don't have to prepare,' there is an altruistic element — that to the extent that they are a burden on government services, that takes away from what's available to help those who can't help themselves," Chertoff said. "That is a matter of civic virtue."

Chertoff's comments mark a new stage in Homeland Security's "Ready" campaign — which was widely ridiculed two years ago for urging homeowners to stock up on duct tape and plastic sheeting to safeguard their homes against a chemical or biological attack.

Now, Chertoff said, the department plans to reach out to school students to carry the preparedness messages home to their parents. Additionally, Homeland Security and the Ad Council launched a newspaper and radio campaign Monday pitched at small businesses to develop disaster plans for workplaces.

Whether the public will listen, however, is another matter. Even with a week's notice of Hurricane Wilma, many Floridians failed to evacuate areas the storm flooded or to stock up on food, water and other essentials. The cavalier attitude prompted Republican Gov. Jeb Bush to scold constituents, noting that people who sought relief from Wilma "had ample time to prepare."

"It isn't that hard to get 72 hours worth of food and water," Bush said last week.

But Dr. Vincent Ferrandino, executive director of the National Association of Elementary School Principals, cautioned against using the schools as messenger except "when it's absolutely necessary, and we consider it an issue of national importance."

"Schools need to be a place where important issues are discussed," Ferrandino said. "But we need to be careful that we don't use the schools constantly for everybody's latest and greatest new idea."

*[**Editor's Note:** Personal preparedness and self-sufficiency is not the "latest and greatest new idea." And as far as being a matter of national importance, wouldn't you say that it ranks at the top of the list?]*

Chertoff's plans are an optimistic and pragmatic mix.

Michael A. Wermuth, homeland security director at the RAND Corp. in Arlington, Va., said getting the public to participate will be a struggle lasting years.

"Even something like Katrina — where everybody watched that unfold and understood what those poor folks were going through — as compelling as that was, we're all busy people. And how long does it stick if you don't get reminded again and again and again?" Wermuth said.

Pitching the preparedness campaign to school children could be very successful, he said, noting the fire prevention and anti-smoking programs that targeted students.

If gas stations keep power generators on hand, Chertoff argues, they can pump fuel for commuters to drive to work. If utility company employees can get to work, they can provide power to grocery stores. Once grocery stores are open, households can restock food, water and first aid needs while emergency responders focus on people who can't get their own.

"The great lesson of all of these events is interdependence," Chertoff said. "We're all dependent on everybody else. Everybody has their role to play, and if people fail in their role, it's going to have a cascading effect."

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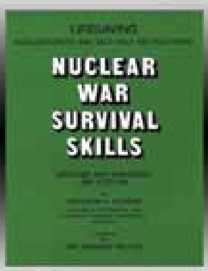

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By Cresson Kearny, (ISBN: 094248701X)

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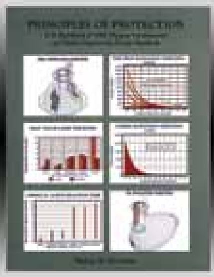

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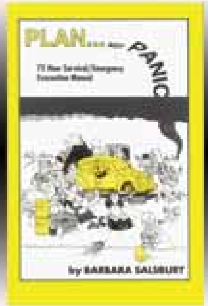

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by Barbara Salsbury

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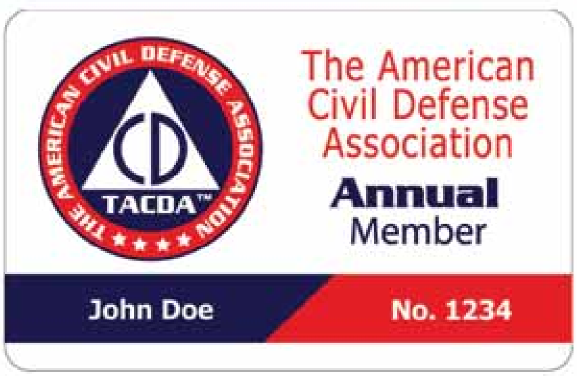

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