Pauls Nuclear Notebook
A collection of relevant articles, in PDF and Bookmarked
June 2003

(Actually, this first copy only Bookmarked the pages, only. I need to learn more about that. At any rate, this is a collection of good nuclear stuff, in one article. Paul)

Collecting this kind of information is sort of a hobby to me, as many of you know. (Currently I am including some of my relatives in my emails, who do not know.) This article, from the site mentioned, is as good a one that covers basic needs in case of emergencies.
Note that today, 12 Feb, 2002 the government is warning about possible continued terrorist attacks, maybe even today. You do not know where and when this information may be useful. I wish I had written this article myself - it tells a lot in a little space. You can not always do what they recommend, but this is "food for thought." - Paul

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Survival Ring Services, Civil Defense Now! Food and Water
http://www.survivalring.org/cd-foodandwater.htm

Civil Defense Now! - Food and Water / 72 Hour Kit
By Richard A. Fleetwood - May 2001

Friends,
This page is a great start for you on creating a very important tool to help you thru ANY desperate or disaster situation. It was compiled and placed in a report created for the Church of Jesus Christ of Latter-Day Saints, and was published as 86 Page PDF file which you can download from Survival Ring, as well as many other places. The manual states that any or all parts may be copied and distributed to benefit those who would put the information to good use. I present it here in HTML format to help EVERYONE wanting to create the best 72 hour kit they can to take care of their families. My thanks to all the many people in the church, who helped compile and collate this great reference. Please read carefully and act quickly just in case you ever REALLY need to use one of these kits.

Contained on this page is information on 72 hour kits, emergency water supplies, and emergency heating, cooking, and lighting.

72 Hour Kits
The objective of the Family 72-Hour Emergency Preparedness Kit is to have, previously assembled and placed in one location, all of those essential items you and your family will need during a 72-hour time period following an emergency. When an emergency occurs you will probably not have the luxury of going around the house gathering up needed items, especially if you have to evacuate your home on short notice.

Take time now to gather whatever your family needs to survive for three days(72 Hours) based upon the assumption that those items are the only possessions you will have. Store these kits in a closet near the front door or some other easily accessible place where they can be quickly and easily grabbed on the way out the door.

Pack all items in plastic Zip-loc type bags to keep them dry and air tight. This will prevent a liquid item from spilling and ruining other items in your kit and keep rain and other forms of moisture away from the items stored.

Keep a list of the dates when certain items need to be reviewed, especially foods, outgrown clothing and medications so that they may be properly rotated.

Emergency supplies are readily available at preparedness and military surplus stores. Fear may well be responsible for more deaths than exposure, hunger and injury combined. Realizing you have fears and that these are normal emotions in unfamiliar situation, you will be aware of them and better able to cope with them as they appear. Fears can be expected in any outdoor problem situation. Fear of the unknown and fear of your ability to cope with the situation will be foremost, along with a fear of being alone, darkness, suffering, or death. Fear is usually based on lack of self-confidence and lack of adequate preparation and experience. Knowledge and experience(practice sessions), will help to instill confidence and help to control fear.

Container

The container you choose for your kit must be waterproof, have some type of carrying handle, and must be able to be carried easily by family plastic bucket, duffel bag, trunk or footlocker, plastic garbage cans.

Water

Advised amounts of water for a kit vary. The Utah County Sheriff's office recommends a minimum of two quarts per day for each adult. However, a person can survive quite well on less, and the load of carrying six quarts of water with a pack is great. Outdoor survival course veterans agree that a two-liter bottle should be adequate. Water purification tablets or crystals need to be a part of each kit. Refer to Emergency Water Supply for treatment methods and information on portable water filters.

Food

You should include in your kit a three-day supply of non-perishable food. The food items should be compact and lightweight, in sealed packages. MRE's (Meals Ready to Eat) are a good choice because they require little or no preparation. Freeze-dried foods are lightweight but require extra water in your kit. Canned goods are heavy with extra refuse. Plan nutritionally balanced meals, keeping in mind that this is a survival kit. Include vitamins or other supplements, if desired.

Possible foods for a kit might include:

o MRE's o snack crackers o hard candy o dried fruits o instant oatmeal o powdered milk o jerky o bouillon cubes o raisins/nuts o instant rice/potatoes o dried soups o gum o granola bars o instant pudding o powdered drink mixes

Also include a mess kit or other compact equipment for cooking and eating. A can opener may also be useful.

Shelter

The objective of shelter is to provide emergency housing. It is extremely important to be physically protected from nature's weather elements. There are many types of shelter that can be easily included in your 72-hour kit. You may want to consider family tent, backpacker's tent, tube tent, rain poncho, garbage bags, nylon rope or cord, duct tape, space blanket and space sleeping bag.

Bedding

o Bedding should be warm, lightweight, comfortable, waterproof and compact. o Sleeping bag (2 « pound hollow-fill) o Insulation. Under your sleeping bag you will need some insulation to protect you from the cold ground. Though foam pads are generally thought of as an item of comfort, their true importance is in insulating you from the ground. The best types are "closed cell" foam pads about 3/8 of an inch in thickness. They are very light weight and easily attached to the backpack for carrying. You may also use a poncho, plastic ground cloth, newspapers, leaves, or pine boughs, for insulation but they are not nearly as effective as the closed cell foam pads.

o Blankets can be used to make a bed roll but generally they are not as comfortable nor as warm as a sleeping bag. Wool blankets are the best since they retain their warming ability even when wet. However, blankets are very heavy and bulky.

o Space blanket or bag. As explained in the previous section space blankets and space bags (aluminum coated mylar) are very efficient at retaining body heat and are a must for every 72-hour kit. Even when used by themselves, without the added benefit of a sleeping bag they will keep you warm during the night. In cold winter weather they may not be entirely comfortable but they will probably keep you warm enough to keep you alive. Being plastic, however, they are impervious to moisture. This is good for keeping out rain but they also retain sweat and condensation from your breath. you may find that periodically during the night you will have to air them out in order to sleep comfortably. They can also be used during the day to protect from rain, sun and to retain body warmth.

Clothing

Include in your kit one change of clothing and footwear, preferable work clothing. Anticipate severe weather conditions. If you have a growing family remember to update clothing sizes and needs at least once a year. Try to avoid wearing cotton clothing. Tight cotton clothing holds water next to the skin. Wet inner clothing causes freezing. Cotton clothing "wicks" (draws water up the very small individual fibers), thus retaining water and spreading it over the entire body, causing loss of body heat at an ever greater rate. Wool clothing is best. Wool is a natural thermostatic insulator that keeps you warm in the winter and cool in the summer. Wool is naturally durable and can withstand rugged and tough wear. Wool also repels water and has the unique property of keeping the body warm even if it does get wet. Wool dries from the inside out and does not "wick." Include two pairs of wool socks- one pair for wearing and one for keeping your feet warm while sleeping.

Fuel

Every family member should have fire starting materials and know how to start a fire. Several of these items should be assembled into a kit and labeled as "fire starting kit." Teach all family members how to use them and let them practice building fires with all methods until they feel totally confident with their ability to do so. Even little children aged five or six can be safely instructed in correct fire building techniques under proper supervision. Then if an emergency arises, they will not panic or feel overwhelmed or frightened at the prospect of building a fire for their warmth and protection.

Some different sources are:
o Matches. Carry at least two dozen wooden kitchen matches that have been either dipped in wax or nail polish to make them waterproof or carry them in a waterproof container.
o Metal match. Waterproof, fireproof, durable, and non-toxic. Will light thousands of fires. Available at sporting goods stores. o Butane lighters, such as Bic cigarette lighters, are excellent ways to light a fire.
o Magnesium fire starters are good for starting fires with wet or damp wood. Shave magnesium shavings off of a magnesium block with a pocket knife and then strike a spark from a flint starter with a pocket knife. Magnesium burns exceptionally hot and will ignite almost any combustible material. Works even when wet and can be purchased at most sporting goods stores.

Paul's interjected note: the shavings from a magnesium fire starter will blow about with every wind and eddy, even those you can not see. A good trick one author recommended (Outdoor Survival Manual- Maers) might to be to trap the shavings between to decaying leaves, so that the sparks from the striker can fall through the openings in the leaves, and catch the magnesium. You should also note that the black bar on the magnesium fire starter is actually made of flint. You can spark it, alone, if you do not want to use the magnesium. Use the back of your knife blade to create the sparks.

o Small magnifying glass. Use to concentrate sunlight onto paper, shredded bark or other tinder.
o Flint and steel A spark from flint and steel (such as an empty cigarette lighter or flint and steel striking bar), when directed at dry paper (especially toilet tissue), shredded bark, dry grass or other tinder, if persisted in patiently will work very well to start a fire. This is the most reliable "non-match" method of starting a fire. o Commercial fire starter kits. These come in a variety of styles and fuels.
o Steel wool. Fine steel wool (used for scrubbing pots and pans- but not Brillo pads or other types that have soap already impregnated into them) can be used for tinder. Hold two "D" flashlight cells together in one hand (or one 9-volt transistor radio battery) while touching one end of a clump of steel wool to the positive end of the battery and the other end of the steel wool to the negative end of the battery. The current causes the steel wool fibers to glow and then produce a flame. It burns very hot and fairly fast so have lots of other tinder to burn once the steel wool ignites.
ú Candles can be used for warmth, light, and starting fires. To start a fire simply cut a piece of candle about « inch in length and place it on top of the tinder. When lit the wax will run over the tinder making it act as a wick and ignite. You can also place small twigs and other easily burnable materials directly into the fame to build a fire.
ú Car Battery. If you are near your car you can easily put sparks into tinder by attaching any wires to the battery posts and scraping the ends together in the tinder.
ú Sterno fuel and stoves make an excellent cooking fuel when backpacking or in emergencies. Sterno can be lit with a match or by a spark from flint and steel. Slivers of gelled sterno can be cut from the can and placed on top of tinder and lit with flint and steel or with a match. It burns hot enough to ignite even damp tinder. o Cotton balls and gauze from the first aid kit make excellent tinder and can be ignited with sparks or with matches.
o Fuel tablets such as tri-oxane and gelled fuels store well and ignite quickly and easily. Some can be fairly expensive, however. o Butane and propane stoves. These are made especially for backpackers. The fuel is cheaper than sterno, it burns hotter and it heats

better in windy situations than other fuels. Propane, however is more difficult to light as outside temperatures near zero.

First Aid Kit

Update your first aid skills. Keep your first aid kit well supplied. Suggested first-aid supplies for 72-hour kit:

o first aid book o waterproof container o assortment of band-aids o gauze pads o butterfly bandages o cotton balls o small roll of gauze o adhesive tape o cotton swabs (Q-Tips) o safety pins o Pepto-bismol tablets o antacid tablets (good for bee sting) o cold pack o consecrated oil o hydrogen peroxide o alcohol (disinfectants) o smelling salts o medicine dropper tweezers o alcohol wipes o Benadryl capsules o aspirin (promotes healing of burns) o Tylenol (chewable for children) o collapsible scissors o thermometer o crushable heat pack o special prescriptions or equipment o small tube or packets antiseptic cream o ointment o small spool thread/two needles

Miscellaneous

Some other miscellaneous items that may be very helpful are: o light stick o small flashlight o extra batteries o pocket handwarmer o compact fishing kit o compass o pocketknife o 50 ft. nylon cord o plastic poncho o garbage bag o paper or cards o pen, pencil o fine wire o extra plastic bags o small scriptures o favorite songs o small game, toy, etc. o spare glasses o money (small bills and change) o field glasses o toothbrush/toothpaste o metal mirror o comb o razor o pre-moistened wipes o toilet paper o feminine products o sunscreen o soap o lip balm with sunscreen o bandana (may be used for hat, washcloth, mask, sling, tourniquet) o tube soap, bar soap, waterless soap o identification/medical permission card o special blanket or such for little people o portable radio with extra batteries

Family Information Record

In addition to emergency survival supplies you should also collect vital family information. Record and keep it in at least two safe places-a fire resistant "get-away" box that you can take with you if you have to leave the home, and a safe-deposit box at your bank or credit union.

The following items would be useful for you to record and keep in these two locations:
o Genealogy records o Full name and social security numbers of all family members o Listing of vehicles, boats etc. with identification and license numbers o Listing of all charge account card numbers and expiration dates, bank account numbers (both checking and saving), insurance policy numbers, securities, deeds, and loan numbers showing the company name, address and telephone numbers.

o Name, address, and telephone number for each of the following: o employer o schools o fire/paramedics o family contacts o utility company o police o doctor o hospital o attorney o civil defense o Location of important documents o insurance policies o deeds o securities o licenses o loans o will o safe-deposit box key o vehicle titles (pink slips) o birth/death certificates o social security o I.D. cards o citizenship papers o letter of instruction o tax returns (last 5 years)

Infants

When assembling items for your 72-hour kit be sure to include all necessary items for infants. It would be a good idea to include a separate back pack or other container that holds nothing but infant supplies (which can be surprisingly voluminous). This kit should be kept with the kits of other family members so that it will not be forgotten in a moment of haste. As the baby begins to grow, replace clothing and diapers with the next larger size.

Car Mini-Survival Kit
Your car is frequently your home away from home. most of us spend many hours in our cars each month. Anything from a jammed-up freeway to a major disaster could force you to rely on your car for short-term shelter and survival. It is a wise practice to keep simple provision for emergencies in your car. A self-made cold-weather car kit, as described in some preparedness stores, is also good to keep in the car.

At-Work Survival Kit
Many persons stand a 40 percent chance of being at work when an earthquake or other emergency strikes. A mini-survival kit kept at your place of work could make the hours until you are able to get home more comfortable and safer. This kit could be a duplicate of the car mini-survival kit.

Emergency Water Supply
Health department and public water safety officials use many safeguards to protect the sanitary quality of your daily drinking water. However, this protection may break down during emergencies caused by natural disasters. During times of serious emergency, the normal water supply to your home may be cut off or become so polluted that it is undrinkable. A supply of stored water could be your most precious survival item!

You and your family may then be on your own to provide a safe and adequate water supply. Remember that typhoid fever, Dysentery, and infectious hepatitis are diseases often associated with unsafe water.
Don't take a chance! Generally, under serious disaster conditions, no water can be presumed safe--all drinking and cooking water should be purified.

Required Amounts of Drinking Water Per Person
A minimum of two quarts and up to one gallon of water is needed per day, depending on the size of the person, the amount of exertion, weather, and perspiration loss. A minimum of seven gallons pure water per person would be needed for a two-week survival supply. With careful rationing, this amount would be sufficient for drinking, food preparation, brushing teeth, etc. Fourteen gallons per person will allow for hygiene care.

Keep an emergency supply of drinking water in plastic containers. Commercially bottled drinking water is available. It stays pure for months and has the expiration date clearly marked on it.

There are several other sources of water if your water supply is turned off--water drained from the hot water tank (usually contains 30 to 60 gallons of usable water), clear water from the toilet flush-tank, if kept constantly clean (not the bowl !), melted ice cubes, canned fruits and vegetable juices, and liquid from other canned goods.

1. If water is cloudy, smelly, or otherwise polluted, strain it through a paper towel or several layers of clean cloth into a container in order to remove any sediment or floating matter.

2. Water that is boiled vigorously for five full minutes will usually be safe from harmful bacterial contamination.

3. If boiling is not possible, strain the water as above and treat by adding ordinary liquid chlorine household bleach or tincture of iodine. Since liquid chlorine bleach loses strength over time, fresh bleach should be used as a water disinfectant. If the bleach is a year old the amount should be doubled. Two-year-old bleach should not be used as a water disinfectant.

4. Other chemical treatments for water purification also include halzone tablets, iodine tablets or crystals. Mix thoroughly by stirring or shaking the water in its container. Let it stand for 30 Minutes. A slight chlorine odor should be detectable in the water; if not, repeat the dosage and let the water stand for and additional 15 minutes before using. Use an eye dropper to add the chlorine or the iodine to the water. Use it only for this purpose.

How to Prepare and Store Bottles of Purified Water
Keep the drinking water safe from contamination by carefully storing in clean non-corrosive, tightly-covered containers. Use one-gallon containers, preferably made of heavy opaque plastic with screw-on caps. Plastic milk bottles are not recommended. Sterilize the bottles.
Number of drops to be added per quart of water:
Chlorine ––––––––––––––––––– Clean ------ Cloudy
Common household ---------------–– 2 -----------– 4
laundry bleach
Tincture of Iodine -------------- 3 ----------- 6

From medicine chest or first
aid kit (2% chlorine) (Rotate
your iodine each year to
ensure that it will work
when you need it)

Emergency Water Supply
1. Wash bottles with soapy water, then rinse thoroughly.
2. Run about three quarts tap water into one of the containers, then add 3/4 cup bleach to the water.
3. Shake well, turning upside down a time or two so that the stopper will be sterilized also.
4. Let the mixture stand for two to three minutes, then pour it into the next container. You can use the same chlorinated water for several containers.
5. Fill the empty bottle with pure or purified water and seal it tightly close with cap or stopper.
6. Label with "Drinking Water--Purified", and the date of preparation. 7. Water purification tablets may also be used and are available in drug stores and sporting goods stores. They are recommended for your first aid kit. Four tablets will purify one quart of water. 8. Some stored water may develop a disagreeable appearance, taste, or odor. These properties are not necessarily harmful. Inspect your water supply every few months to see whether the containers have leaked or other undesirable conditions have developed. Replace the water if it becomes contaminated.

Portable Water Purification Equipment
A high quality filter system should possess the following characteristics: light-weight; have fewer parts (less to go wrong); a fine pre-filter; a replaceable or clearable filter; tight, well-made pump; high volume output; quick filtration; should screen out organisms over 0.5 microns (0.2 microns is best).

A system with all of these features may not be inexpensive, however. The cost will usually reflect reliability as well as technology of design. Always use a filter properly. Use clearest water available, allowing suspended matter to settle out. Use pre-filter if your system has one. Do not let outlet end of filter come in contact with contaminated water. Be sure vessel you're pumping into is clean.
Sanitize all bottles! ¬ Cup Clorox to 1 Quart Water

Emergency Heating, Cooking & Lighting

HEATING
Coal stores well if kept in a dark place and away from moving air. Air speeds deterioration and breakdown, causing it to burn more rapidly. Coal may be stored in a plastic-lined pit or in sheds, bags, boxes, or barrels and should be kept away from circulating air, light, and moisture. Cover it to lend protection from weather and sun.
Wood.
Hardwoods such as apple, cherry, and other fruit woods are slow burning and sustain coals. Hardwoods are more difficult to burn than softer woods, thus requiring a supply of kindling. Soft woods such as pine and cedar are light in weight and burn very rapidly, leaving ash and few coals for cooking. If you have a fireplace or a wood/coal burning stove, you will want to store several cords of firewood.
Firewood is usually sold by the cord which is a neat pile that totals 128 cubic feet. This pile is four feet wide, four feet high, and eight feet long. Some dealers sell wood by the ton. As a general rule of thumb, a standard cord of air dried dense hardwood weighs about two tons and provides as much heat as one ton of coal. Be suspicious of any alleged cord delivered in a « or 3/4 ton pickup truck.
For best results, wood should be seasoned (dried) properly, usually at east a year. A plastic tarp, wood planks, or other plastic or metal sheeting over the woodpile is useful in keeping the wood dry. Other types of fuels are more practical to store and use than wood or coal. Newspaper logs make a good and inexpensive source of fuel. You may prepare the logs in the following manner:

o Use about eight pages of newspaper and open flat.
o Spread the stack, alternating the cut sides and folded sides. o Place a 1" wood dowel or metal rod across one end and roll the paper around the rod very tightly. Roll it until there are 6-8 inches left to roll, then slip another 8 pages underneath the roll. Continue this diameter.
o With a fine wire, tie the roll on both ends. Withdraw the rod. Your newspaper log is ready to use. Four of these logs will burn about 1 hour.

Propane is another excellent fuel for indoor use. Like kerosene, it produces carbon dioxide as it burns and is therefore not poisonous. It does consume oxygen so be sure to crack a window when burning propane.
Propane stores indefinitely, having no known shelf life. Propane stoves and small portable heaters are very economical, simple to use, and come the closest to approximating the type of convenience most of us are accustomed to using on a daily basis.

The storage of propane is governed by strict local laws. In this area you may store up to 1 gallon inside a building and up to 60 gallons stored outside. If you store more than these amounts, you will need a special permit from the fire marshal.

The primary hazard in using propane is that it is heavier than air and if a leak occurs it may "pool" which can create an explosive atmosphere. Furthermore, basement natural gas heating units CANNOT be legally converted for propane use. Again, the vapors are heavier than air and form "pockets." Ignition sources such as water heaters and electrical sources can cause an explosion.

White gas (Coleman fuel). Many families have camp stoves which burn Coleman Fuel or white gasoline. These stoves are fairly easy to use and produce a great amount of heat. However, they, like charcoal, produce vast amounts of carbon monoxide. NEVER use a Coleman Fuel stove indoors. It could be a fatal mistake to your entire family.
Never store fuels in the house or near a heater. Use a metal store cabinet which is vented on top and bottom and can be locked.
Kerosene (also known as Range Oil No. 1) is the cheapest of all the storage fuels and is also very forgiving if you make a mistake. Kerosene is not as explosive as gasoline and Coleman fuel. Kerosene stores well for long periods of time and by introducing some fuel additives it can be made to store even longer. However, do not store it in metal containers for extended time periods unless they are porcelain lined because the moisture in the kerosene will rust through the container causing the kerosene to leak out.

Most hardware stores and home improvement centers sell kerosene in five gallon plastic containers which store for many years. A 55 gallon drum stores in the back yard, or ten 5 gallon plastic containers will provide fuel enough to last an entire winter if used sparingly. Caution: To burn kerosene you will need a kerosene heater. There are many models and sizes to choose from but remember that you are not trying to heat your entire home. The larger the heater the more fuel you will have to store.

Most families should be able to get by on a heater that produces about 9,600 BTUs of heat, though kerosene heaters are made that will produce up to 25,000 to 30,000 BTUs. If you have the storage space to store the fuel required by these larger heaters they are excellent investments, but for most families the smaller heaters are more than adequate.

When selecting a kerosene heater be sure to get one that can double as a cooking surface and source of light. Then when you are forced to use it be sure to plan your meals so that they can be cooked when you are using the heater for heat rather than wasting fuel used for cooking only. When kerosene burns it requires very little oxygen, compared to charcoal. You must crack a window about 1/4 inch to allow enough oxygen to enter the room to prevent asphyxiation. During combustion, kerosene is not poisonous and is safe to use indoors.

To prevent possible fires you should always fill it outside. The momentary incomplete combustion during lighting and extinguishing of kerosene heaters can cause some unpleasant odors. To prevent these odors from lingering in your home always light and extinguish the heater out of doors. During normal operation a kerosene heater is practically odorless.

Charcoal.
Never use a charcoal burning device indoors. When charcoal burns it is a voracious consumer of oxygen and will quickly deplete the oxygen supply in your little "home within a home." Furthermore, as it burns it produces vast amounts of carbon monoxide which is a deadly poison. If you make the mistake of trying to heat your home by burning charcoal it could prove fatal to your entire family. Never burn charcoal indoors.

Cooking
To conserve your cooking fuel storage needs always do your emergency cooking in the most efficient manner possible. Don't boil more water than you need, extinguish the fire as soon as you finished, plan your meals ahead of time to consolidate as much cooking as possible, during the winter cook on top of your heating unit while heating your home, and cook in a pressure cooker or other fuel efficient container as much as possible. Keep enough fuel to provide outdoor cooking for at least 7-10 days.

It is even possible to cook without using fuel at all. For example, to cook dry beans you can place them inside a pressure cooker with the proper amount of water and other ingredients needed and place it on your heat source until it comes up to pressure. Then turn off the heat, remove the pressure cooker and place inside a large box filled with newspapers, blankets, or other insulating materials. Leave it for two and a half hours and then open it, your meal will be done, having cooked for two and a half hours with no heat. If you don't have a large box in which to place the pressure cooker, simply wrap it in several blankets and place it in the corner. Store matches in waterproof airtight tin with each piece of equipment that must be lit with a flame.

Heaters -----------Amount-----------Burning Time
Catalytic ------- 5 quarts --------- 18-20 hours
----------------- 3 quarts --------- 12 hours
White Gas Stoves
(two burner)----- 2 quarts --------- 18-20 hours
----------------- 3 « pint --------- 4 hours
----------------- aerosol can

Sterno fuel, a jellied petroleum product, is an excellent source of fuel for inclusion in your back pack as part of your 72 hour kit. Sterno is very light weight and easily ignited with a match or a spark from flint and steel but is not explosive. It is also safe for use indoors. A Sterno stove can be purchased at any sporting goods store and will retail between $3 and $8, depending upon the model you choose. They fold up into a very small, compact unit ideal for carrying in a pack. The fuel is readily available at all sporting goods stores and many drug stores. One can of Sterno fuel, about the diameter of a can of tuna fish and twice as high, will allow you to cook six meals if used frugally. Chafing dishes and fondue pots can also be used with Sterno.

Sterno is not without some problems. It will evaporate very easily, even when the lid is securely fastened. If you use Sterno in your 72 hour kit you should check it every six to eight months to insure that it has not evaporated beyond the point of usage. Because of this problem it is not a good fuel for long-term storage. It is a very expensive fuel to use compared to others fuel available, but is extremely convenient and portable.

Coleman fuel (white gas), when used with a Coleman stove is another excellent and convenient fuel for cooking. It is not as portable nor as lightweight as Sterno, but produces a much greater BTU value. Like Sterno, Coleman fuel has a tendency to evaporate even when the container is tightly sealed so it is not a good fuel for long-term storage. Unlike Sterno, however, it is highly volatile; it will explode under the right conditions and should therefore never be stored in the home. Because of its highly flammable nature great care should always be exercised when lighting stoves and lanterns that use Coleman fuel. Many serious burns have been caused by carelessness with this product. Always store Coleman fuel in the garage or shed, out of doors.

Charcoal is the least expensive fuel per BTU that the average family can store. Remember that it must always be used out of doors because of the vast amounts of poisonous carbon monoxide it produces. Charcoal will store for extended period of time if it is stored in air tight containers. It readily absorbs moisture from the surrounding air so do not store it in the paper bags it comes in for more than a few months or it may be difficult to light. Transfer it to airtight metal or plastic containers and it will keep almost forever.

Fifty or sixty dollars worth of charcoal will provide all the cooking fuel a family will need for an entire year if used sparingly. The best time to buy briquettes inexpensively is at the end of the summer. Broken or torn bags of briquettes are usually sold at a big discount. You will also want to store a small amount of charcoal lighter fluid (or kerosene). Newspapers will also provide an excellent ignition source for charcoal when used in a funnel type of lighting device.
To light charcoal using newspapers use two or three sheets, crumpled up, and a #10 tin can. Cut both ends out of the can. Punch holes every two inches around the lower edge of the can with a punch-type can opener (for opening juice cans). Set the can down so the punches holes are on the bottom. Place the crumpled newspaper in the bottom of the can and place the charcoal briquettes on top of the newspaper. Lift the can slightly and light the newspaper. Prop a small rock under the bottom edge of the can to create a good draft. The briquettes will be ready to use in about 20-30 minutes. When the coals are ready remove the chimney and place them in your cooker. Never place burning charcoal directly on concrete or cement because the heat will crack it. A wheelbarrow or old metal garbage can lid makes an excellent container for this type of fire.

One of the nice things about charcoal is that you can regulate the heat you will receive from them. Each briquette will produce about 40 degrees of heat. If you are baking bread, for example, and need 400 degrees of heat for your oven, simply use ten briquettes.

To conserve heat and thereby get the maximum heat value from your charcoal you must learn to funnel the heat where you want it rather than letting it dissipate into the air around you. One excellent way to do this is to cook inside a cardboard oven. Take a cardboard box, about the size of an orange crate, and cover it with aluminum foil inside and out. Be sure that the shiny side is visible so that maximum reflectivity is achieved. Turn the box on its side so that the opening is no longer on the top but is on the side. Place some small bricks or other noncombustible material inside upon which you can rest a cookie sheet about two or three inches above the bottom of the box. Place ten burning charcoal briquettes between the bricks (if you need 400 degrees), place the support for your cooking vessels, and then place your bread pans or whatever else you are using on top of the cookie sheet. Prop a foil-covered cardboard lid over the open side, leaving a large crack for air to get in (charcoal needs a lot of air to burn) and bake your bread, cake, cookies, etc. just like you would in your regular oven. Your results will amaze you.

To make your own charcoal, select twigs, limbs, and branches of fruit, nut and other hardwood trees; black walnuts and peach or apricot pits may also be used. Cut wood into desired size, place in a large can which has a few holes punched in it, put a lid on the can and place the can in a hot fire. When the flames from the holes in the can turn yellow-red, remove the can from the fire and allow it to cool. Store the briquettes in a moisture-proof container. Burn charcoal only in a well-ventilated area. Wood and Coal. Many wood and coal burning stoves are made with cooking surface. These are excellent to use indoors during the winter because you may already be using it to heat the home. In the summer, however, they are unbearably hot and are simply not practical cooking appliances for indoor use. If you choose to build a campfire on the ground outside be sure to use caution and follow all the rules for safety. Little children, and even many adults, are not aware of the tremendous dangers that open fires may pose.

Kerosene.

Many kerosene heaters will also double as a cooking unit. In fact, it is probably a good idea to not purchase a kerosene heater that cannot be used to cook on as well. Follow the same precautions for cooking over kerosene as was discussed under the section on heating your home with kerosene.

Propane.

Many families have propane camp stoves. These are the most convenient and easy to use of all emergency cooking appliances available. They may be used indoors or out. As with other emergency fuel sources, cook with a pressure cooker whenever possible to conserve fuel.

Lighting

Most of the alternatives require a fire or flame, so use caution. More home fires are caused by improper usage of fires used for light than for any other purpose. Especially use extra caution with children and flame. Teach them the proper safety procedures to follow under emergency conditions. Allow them to practice these skills under proper adult supervision now, rather than waiting until an emergency strikes.

Cyalume sticks are the safest form of indoor lighting available but very few people even know what they are. Cyalume sticks can be purchased at most sporting goods stores for about $2 per stick. They are a plastic stick about four inches in length and a half inch in diameter. To activate them, simply bend them until the glass tube inside them breaks, then shake to mix the chemicals inside and it will glow a bright green light for up to eight hours.

Cyalume is the only form of light that is safe to turn on inside a home after an earthquake. One of the great dangers after a serious earthquake is caused by ruptured natural gas lines. If you flip on a light switch or even turn on a flashlight you run the risk of causing an explosion. Cyalume will not ignite natural gas. Cyalume sticks are so safe that a baby can even use them for a teether.

Flashlights are excellent for most types of emergencies except in situations where ruptured natural gas lines may be present. Never turn a flashlight on or off if there is any possibility of ruptured gas lines. Go outside first, turn it on or off, then enter the building. The three main problems with relying upon flashlights is that they give light to very small areas, the batteries run down fairly quickly during use, and batteries do not store well for extended time periods. Alkaline batteries store the best if stored in a cool location and in an airtight container. These batteries should be expected to store for three to five years. Many manufacturers are now printing a date on the package indicating the date through which the batteries should be good. When stored under ideal conditions the shelf life will be much longer than that indicated. Lithium batteries will store for about twice as long as alkaline batteries (about ten years).

If you use flashlights be sure to use krypton or halogen light bulbs in them because they last much longer and give off several times more light than regular flashlight bulbs on the same energy consumption. Store at least two or three extra bulbs in a place where they will not be crushed or broken.

Candles.
Every family should have a large supply of candles. Three hundred sixty-five candles, or one per day is not too many. The larger the better. Fifty-hour candles are available in both solid and liquid form. White or light colored candles burn brighter than dark candles. Tallow candles burn brighter, longer, and are fairly smoke free when compared to wax candles. Their lighting ability can be increased by placing an aluminum foil reflector behind them or by placing them in front of a mirror. However, candles are extremely dangerous indoors because of the high fire danger--especially around children. For this reason be sure to store several candle lanterns or broad-based candle holders. Be sure to store a goodly supply of wooden matches Save your candle ends for emergency use. Votive candles set in empty jars will burn for up to 15 hours. Non-candles (plastic dish and paper wicks) and a bottle of salad oil will provide hundreds of hours of candle light.

Paul's second interjected note: I find the common taper, or dinner candle to be the best. You get as much time burning as you do with the larger candles, for your money, without having to deal with a lot of melted wax. Often you can buy tapers for 25 cents each, at outlet stores. The larger, harder to manage candles cost much more then that, when you consider lit-candle time. Avoid scented candles, if you can. Several of my church friends bought large amounts of candles from a candle factory, cheap. The drawback is that many of them are scented, and at least one member of our church can not be around scented candles. Again, simple candles are best. See if you can find an old-fashioned taper candle holder with a thumb ring.

Trench candles can be used as fireplace fuel or as a candle for light. To make trench

candles:
1. Place a narrow strip of cloth or twisted string (for a wick) on the edge of a stack of 6-10 newspapers.
2. Roll the papers very tightly, leaving about 3/4" of wick extending at each end.
3. Tie the roll firmly with string or wire at 2-4" intervals. 4. With a small saw, cut about 1" above each tie and pull the cut sections into cone shapes. Pull the center string in each piece toward the top of the cone to serve as a wick.
5. Melt paraffin in a large saucepan set inside a larger pan of hot water. Soak the pieces of candle in the paraffin for about 2 minutes. 6. Remove the candles and place on a newspaper to dry.

Kerosene lamps are excellent sources of light and will burn for approximately 45 hours on a quart of fuel. They burn bright and are inexpensive to operate. The main problem with using them is failure to properly trim the wicks and using the wrong size chimney. Wicks should be trimmed in an arch, a "V," an "A" or straight across the top. Failure to properly trim and maintain wicks will result in smoke and poor light.

Aladdin type lamps that use a circular wick and mantle do not need trimming and produce much more light (and heat) than conventional kerosene lamps. These lamps, however, produce a great amount of heat, getting up to 750 degrees F. If placed within 36 inches of any combustible object such as wooden cabinets, walls, etc. charring can occur. Great caution should therefore be exercised to prevent accidental fires.

The higher the elevation the taller the chimney should be. Most chimneys that come with kerosene lamps are made for use at sea level. At about 4500 feet above sea level the chimney should be about 18-20 inches high. If your chimney is not as tall as it should be you can improvise by wrapping aluminum foil around the top of it and extending it above the top. This will enable the light to still come out of the bottom portion and yet provide proper drawing of air for complete combustion. If the chimney is too short it will result in smoke and poor light. Be sure to store extra wicks, chimneys and mantles.
Propane and Coleman lanterns.
Camp lanterns burning Coleman fuel or propane make excellent sources of light. Caution should be used in filling and lighting Coleman lanterns because the fuel is highly volatile and a flash type fire is easy to set off. Always fill them outside. Propane, on the other hand, is much safer. It is not as explosive and does not burn quite as hot. A double mantle lantern gives off as much light as two 100-watt light bulbs. Either propane or Coleman fuel type lanterns are very reliable and should be an integral part of your preparedness program. Be sure to store plenty of extra mantles and matches.

Store lots of wooden matches (1,000-2,000 is not too many). Also store butane cigarette lighters to light candles, lanterns and fireplaces. It would be a good idea for everyone to have a personal fire building kit with at least six different ways to start a fire.

Above all, your home and family must be protected from the ravages of fire by your actions. Study the instructions for any appliance used for heating, cooking, or lighting and understand their features as well as their limitations.

Don't go to sleep with any invented burning device in your home. Your family might not wake up.

Whatever you store, store it safely and legally. In an emergency, survival may cause you to make decisions that are questionable with regard to safety. Become educated to the inherent hazards of your choices and make a decision based on as much verifiable information as possible. You and your family's lives will depend on it.

Consider carefully how you will provide fuel for your family for heating, cooking, and lighting during times of emergencies. Next to food, water, and shelter, energy is the most important item you can store.

Fuel -------------- Amt---------- Burning Time
White gas Lanterns
Two mantle ------- 2 pints ---------10-12 hours
Single mantle ---- 2 pints ----------16-18 hours
Kerosene Lanterns -1 quart ----------45 hours
Candles ---------- X 4" ----------2 1/3 hours
----------------- 7/8 X 4" ---------5 hours

Updated May 2001 - 2001 By Richard A. Fleetwood

21 March, 2002. Yesterday I saw a story about a Viet Nam Vet who was in charge of security for the largest single employer at the Twin Towers, in New York. That company lost only about eight people, including that man.

What he did was think the unthinkable, plan, and train for just such a disaster as September 11, 2001 was.

Please file this text only version about how the military decontaminates food that has been exposed to Nuclear, Biological, and Chemical agents. Don't worry about the charts, or trying to understand everything. Let's hope none of us ever need this. Paul Phillips paulphillips@yadtel.net

FM 8-10-7 Health Service Support in a Nuclear, Biological, And Chemical Environment

http://155.217.58.58/cgi-bin/atdl.dll/fm/8-10-7/Appf.htm#s3

APPENDIX F FOOD CONTAMINATION AND DECONTAMINATION

F-1. General

a. Food Susceptibility. Stored, transported, and prepared food is susceptible to NBC contamination throughout the TO. Planning for any battle or operation must include food protection from contamination; food contamination detection; and contaminated food disposition (decontaminate or destroy).

b. Countermeasures. There are three primary countermeasures to overcome or reduce the NBC hazard to food:

(1) Contamination avoidance.

(2) NBC agent detection.

(3) NBC agent decontamination.

c. Priorities. The priorities for conducting NBC countermeasures are--

(1) Contamination avoidance. Contamination avoidance includes using natural and fabricated barriers to prevent, or significantly reduce the spread of contamination. Also, using specific procedures for entry and exit between contaminated and uncontaminated areas reduce the potential for spreading contamination. Use of these barriers and procedures may reduce the subsequent need for detection and decontamination.

(2) Detection, measurement, and identification. These activities are essential for determining the presence, extent, and nature of NBC contamination. This information is essential in identifying the existence of uncontaminated supplies, or decontamination requirements. (3) Decontamination. Decontamination removes the contaminant and provides food that is safe for consumption.

d. Decontamination. Decontamination efforts require an extensive amount of labor, time, and supplies. The use of hasty decontamination is emphasized. That is, decontaminate just enough to sustain operations and keep fighting, rather than to make a contamination-free environment. Normally, decontamination efforts will be limited to the packaging and packing materials. Food decontamination will only occur in critical situations where other food supplies are not available. Most decontamination is performed in or very near the AO. Before beginning decontamination procedures, divide exposed food items into groups based on protection of item at time of exposure. These groups establish priorities based on ease of decontamination and the ability to monitor the food.

(1) Group I--Canned or packaged items exposed only to a chemical agent vapor.

(2) Group II--Canned or packaged items that are contaminated on the outside with a liquid chemical agent, a biological agent, or radioactive fallout.

(3) Group III--Unpacked or poorly packaged items that have been exposed to any NBC of agent.

(4) Group IV--Food contaminated through the food chain.

F-2. Protection of Food from Contamination

An adequate defensive posture for a chemical attack will also protect food against biological contamination and radiation fallout. a. Operational Rations. Operational rations include, but are not limited to: T rations, meals ready-to-eat (MREs), survival rations, B rations, and medical B rations.

(1) Packaging materials and storage methods normally protect these rations. The packaging and packing of operational rations protect the contents from deterioration. As a result, the contents are protected from moisture, to include chemical liquids, chemical vapors, and biological agents. Operational rations delivered to an AO will usually have increased levels of packaging and/or packing protection. Operational rations are substantially protected while contained in the shipping cases, especially if protected with an overlay of fiberboard, shrink wrap, or film wrap.

(2) Enclosed storage is used whenever possible. Refrigerated warehouses, cold storage rooms, and even prefabricated refrigerators and trailers provide excellent protection. Underground shelters, caves, and tunnels that can be made airtight provide maximum NBC protection. Buildings provide protection depending on how well they can be closed and sealed. The basement of a building is a good storage place. However, keep in mind that chemical vapors tend to seek out low-lying areas. Storing rations indoors will protect them from liquid droplet and fallout contamination unless the building is damaged by an attack. Complete protection against chemical vapors is only offered by airtight closed spaces like cold storage facilities.

(3) Chemical protective measures are to be integrated into daily logistical operation to avoid the contamination of operational rations. Maximum use is made of alarm and detection equipment, overhead shelter, shielding materials, and protective covers. Back up stocks of operational rations should be dispersed to minimize the risk of destruction or contamination.

(4) An NBC Protective Cover or similar equipment will help greatly. The NBC Protective Cover is discarded and replaced upon becoming contaminated; it reduces overall decontamination requirements; and it improves the survivability of supplies and equipment. The NBC Protective Cover provides 24-hour protection against liquid chemical contamination. Detection paper used on the NBC Protective Cover will rapidly identify a contaminated cover.

b. Bulk and Fresh Foods.

(1) Field expedient or improvised storage may be the only choice available under high risk conditions. Expedient storage for food supplies may be a natural or man-made depression lined to protect contents against moisture, and then covered with earth and sod. The earth gives good protection against all forms of chemical or biological contamination and nuclear fallout.

(2) Foods are only stored outdoors or in partially protected areas when absolutely necessary. Only cases of foods packed in cans, bottles, or airtight foil or film wraps, and foods packed in sealed boxes or multilayered wrappings can be subjected to exposed storage. Partial protection is provided by open sheds, temporary roofing, or tents. When subsistence must be stored in the open, give as much protection as possible. Protection material may include NBC Protective Covers, tarpaulins, tarpaulin sheds, or any other available covering such as plastic sheeting. Tarpaulins and other treated or waterproof coverings do not prevent contamination by chemical vapors, but they do reduce contamination from liquid agents. Canvas will keep out more than 95 percent of liquid contamination for a short period of time after the attack. The canvas must be removed soon after the attack to prevent the agent from seeping through onto the subsistence; placement of spacers between the covering and the food will greatly reduce this problem. Even the thinnest material will offer some protection and is better than nothing at all. Therefore, food supplies must be covered by whatever material is available.

F-3. Nuclear

a. Contamination.

(1) Following a nuclear detonation food can become contaminated in three ways:

Direct contamination. Direct contamination results by fallout collecting on plants, animals, and stored food (surface contamination). Fallout has two effects. First, it produces a gamma radiation field over the fallout area. Second, it contaminates the surface of anything on which it is deposited. The whole-body gamma irradiation hazard to an individual far outweighs any potential hazard from food contamination. The basic rule is: If you can safely be in the area to salvage the food, then the food salvaged is safe to use (although slightly contaminated).

Indirect contamination. This form of contamination can be spread throughout the food chain. Humans can ingest contamination by eating plants which have absorbed radioactive isotopes; products (milk or meat) from animals allowed to graze on contaminated pastures; or fish from contaminated water.

Induced radiation. It is possible that food will be exposed to sufficient neutron flux (an increase in the number of free neutrons) as the result of a nuclear explosion to produce considerable induced radioactivity in food without it being destroyed by blast and heat. This is possible with enhanced radiation weapons in the energy range of 1 KT where the radiation kill radius exceeds the blast destruction zone. The elements that are most prominently involved are sodium, potassium, sulfur, copper, bromine, zinc, and especially phosphorous. Thus, in an area of induced radiation, foods requiring the most caution are dairy products, high salt content foods, dry beans, raisins, and ready-mixed cake and biscuit flours. The radioactivity has a short half-life; therefore, the radiation will decay very rapidly. It should be possible to consume foods containing induced radiation within a week or two. Cans, particularly those with "C" enamel, may incur a high level of induced radiation (from zinc in the enamel, not from iron in the can). Glass, because of its high salt content, will show very high levels of activity; clear glass will turn brown. Container radioactivity has no bearing on the food, it is safe to use. The radioactivity is not transferred to the contents. No significant toxic by-products are formed in the exposed canned food. (2) Consumption of food contaminated with radioactive fallout may cause a risk of radiation injuries from internal radiation; that is, radiation from radioactive sources within the body. Most isotopes will pass through the digestive tract or be excreted very quickly. However, the intestinal tract may receive a considerable dose. Some isotopes are more hazardous because they are absorbed from the digestive tract and enter the metabolism of man and animals.

Strontium-89 (Sr-89) and Strontium-90 (Sr-90) are beta emitters and have half-lives of 51 days and 28 years respectively. Therefore, Sr-90 is the greatest radiation hazard in the long term. These two isotopes are absorbed in the body and used in the same way as calcium. They accumulate in bone, where bone marrow with its blood forming cells is vulnerable. Milk and other dairy products are the primary sources of Sr-89 and Sr-90 in the human diet.

Iodine-131 (I-131) is a beta and gamma emitter and has a short physical half-life of approximately 8 days. It is efficiently absorbed and used by the body. Iodine-131 will contaminate plants which will be eaten by grazing animals. Smaller amounts can also be absorbed by breathing contaminated air. Cattle will excrete a large amount of I-131 in milk. Milk and other dairy products are the primary sources of I-131 intake. One can also get smaller amounts by eating contaminated fruits and vegetables. Iodine-131 will be concentrated in the thyroid gland. The intake of I-131 will have its greatest impact the first few days to weeks following a nuclear explosion. Cesium-137 (Cs-137) is a beta emitter and has a half-live of 30 years, but is eliminated relatively quickly from the body. The biological half-live is 70 to 140 days. Cesium-137 is found in most tissues of the body, but it will concentrate in muscle tissue. Cesium-137 is absorbed and used the same way as potassium. Meat and milk are the primary sources of Cs-137. Much precipitation, lack of minerals in the soil, and extensive cultivation increase the plants' absorption of Cs-137; thus, the contamination of plant products. (3) Operational rations are safe when surface decontamination is performed before breaking the package. Operational rations stored close to ground zero may become radioactive from induced radiation. It is more likely, however, that the food will be damaged or destroyed by the blast and thermal effects of the nuclear explosion.

(4) Bulk and fresh food stored in the open without protection will be contaminated. Decontamination is very difficult and time-consuming. Efforts should be made to ensure proper packing to prevent food contamination from radioactive fallout. Packing made from hard and nonporous materials, such as plastic or multilayer cardboard with a smooth surface, should be used. In addition, storage facilities should be enclosed to avoid the entry

of fallout. Any material used as a protective cover will give some protection against nuclear fallout. Protection against induced radiation, blast, and thermal effects requires a hardened shelter or underground storage.

(5) Food supplies require protection throughout the chain of production or procurement. Protection of the civilian based food supply includes countermeasures along the production chain. Meats and milk are the most vulnerable products because of the possibility for concentration of radioactive isotopes (Strontium, Cesium and Iodine). The primary, and possibly the only, protection of animal products is to keep the animals in-doors and to avoid contaminated fodder. Immediate slaughter of food animals is recommended if there is a shortage of uncontaminated fodder. Also, food animals exposed to fallout should be considered fit for consumption and slaughtered using routine procedures. Unharvested crops cannot be protected. b. Inspection and Monitoring.

(1) Fallout close to ground zero, especially after a surface burst, may be visible as dust. The presence of dust is an immediate indicator of contamination. Fallout on unprotected food produces a grittiness which is unpleasant and warns against eating the food. The degree and means of food protection (packaging and storage facilities) must be considered. Food in a building that remains intact should not receive enough contamination to be dangerous when eaten.

(2) Veterinary units have the IM-174A/PD to conduct ground or aerial surveys for gamma radioactive contamination levels in an area. The measurement of the external gamma radiation in the fallout area is an indication, but not a quantitative measure, for the degree of hazard from food contamination. These units also have the AN/PDR27 Radiac Set to detect point sources of gamma and beta radiation and to measure gamma radiation. Food monitoring is conducted in an area with low background radiation. If the storage area is contaminated, the food must be moved to a cleaner area for monitoring. With the AN/PDR27, the initial food monitoring is performed with the probe window closed and the probe passed approximately 6 inches from the surface. If the reading is twice the background dose rate, the food is considered contaminated. If the reading is not above the background level but contamination is still suspected, place the probe closer to the food with the beta shield open. Monitor meat and fish with the probe open; pass the probe approximately one-half inch from the surface of the food.

(3) Monitoring food contaminated through the food-chain is more complicated; depending on the detection instrument used, special procedures must be followed. Gamma and beta emitting radionuclides in small volumes may be detected using radiac sets such as the AN/PDR27; however, alpha emitting ones cannot. They are rough instruments and may be used only for screening surface contaminated food. To evaluate the hazards; the isotopes contributing to the radioactivity must be identified. Surface contaminated food will contain a mixture of isotopes with some more hazardous than others, depending upon whether they are used by the body. Milk will contain mostly I-131, Cs-137, Sr-89, and Sr-90. Meat and fish will contain mostly Cs-137. To verify I-131, Cs-137, Sr-89, and Sr-90 contamination, samples must be sent to laboratories equipped to analyze the samples.

(4) All newly selected food supplies must be surveyed. Begin continuous monitoring immediately following receipt of a fallout warning, or when increased levels of radiation are detected by periodic monitoring.

(5) Periodic monitoring is needed to establish baseline levels of background radiation in the environment and various food products. This monitoring is performed during peacetime, when possible, and throughout the time US forces are deployed in a TO.

NOTE The IM174A/PD and AN/PDR27 are being replaced by the AN/VDR2 Radiac Set. The AN/VDR-2 detects lower levels of gamma and beta radiation than the AN/PDR27 and higher levels of gamma radiation than the IM-174A/PD.

c. Decontamination. There are two methods for nuclear decontamination: aging and removing. Aging is the process of allowing natural radiation decay to occur. The time necessary for this decay to take place depends upon the isotopes present; each has a different decay rate (half-life). Aging may not be possible when there is a short food supply. In some instances, such as with induced radioactivity, it may be the only way to decontaminate. Removing nuclear contamination from areas, personnel, food, or moving equipment to another location eliminates the immediate hazard. To determine which decontamination method is required, food supplies are divided into groups. See Table F-1 for additional information on food items and decontamination.

(1) Group II--Food in sealed and dust-proof packing such as cans, jars, fiberboard, and cellophane. These products are easily decontaminated by removing the radioactive dust covering the packing. This is done by brushing, washing with soap and water, or removing the packing (depending on the type of packing material). If radiation is still detected after removing the dust, repeat the brush/wash procedure and remonitor. If radiation is still present, the food itself is then considered radioactive (induced radiation) and is unfit for consumption. Decontamination of induced radiation is possible only through aging. After aging one to two weeks, the food should be safe for consumption. After surface decontamination, the contents are safe to eat unless the food has induced radiation.

(2) Group III--Unprotected food. The method chosen to decontaminate unprotected food items will depend upon whether or not the food supply is critical. If the food supply is not critical, the contaminated items are isolated and allowed to decontaminate by aging. If the food supply is critical, food with surface contamination can, in principle, be decontaminated by removing the contaminated surface, or by washing.

(3) Some products can be decontaminated by washing, peeling, or trimming the outer skin or leaves. Decontaminate potatoes and hard-skinned fruits and vegetables by washing or scrubbing under running water, followed by peeling or scraping, then washing again. Potatoes, carrots, beets, and turnips can be washed at the supply depot. However, do not wash beans, rice, and onions until they are delivered to the field kitchen; washing reduces their storage quality and shelf life. Citrus fruits, pineapples, corn, peas, beans, melons, pumpkins, cabbage, and nuts can be peeled. Decontaminate cucumbers, tomatoes, cherries, cranberries, grapes, pears, plums, and thin-skinned squash by soaking in a water or detergent solution and rinsing with vigorous agitation or brushing. Apricots, peaches, most berries, asparagus, broccoli, and leafy vegetables cannot be satisfactorily decontaminated because of fuzzy surfaces, irregular shapes, or small size which makes washing difficult.

Fresh carcass meat, sausages, and fish can be decontaminated by several washings with cold water. The exterior layer of the food item is removed if radioactivity is still present. There is, however, a risk of contaminating the inner parts of the foodstuff in the process. Cooking with several changes of water is the last step in decontamination.

Decontaminate hard cheeses, margarine, and butter by cutting off the outer layer to a depth of 2.5 to 3 cm.

Let cooking oils stand for 3 to 5 days, then pour off the contaminated layer; use a funnel to control spillage.

Nonperishable items that are hard to decontaminate, such as flour, sugar, and salt can be set aside allowing natural radioactive decay. When supplies are short, dilute the contamination by mixing with uncontaminated food, This will reduce the total amount of radioactive exposure in foods prepared using these contaminated items. Decontaminate air permeable, double sacked goods by removing the outer sack. If the inner sack is free of radiation, double sack the food again to restore protection. However, when contamination is present on the inside bag, the food in contact with the bag is likely to be contaminated. Three methods can be used to handle this type of contaminated product. The easiest method involves spraying the bag of dry goods (except sugar or salt) with water. This will wet a layer of the food inside the bag. The wet layer can be removed when the bag contents are emptied. The uncontaminated contents are scooped back into clean packaging. Another method involves using melted paraffin to uniformly coat the outside of the bag. The paraffin solidifies after 30 to 40 minutes, then the bag with the radioactive contamination can be removed from the contents. Although this method will seal the radioactive substance in the wax, it probably will not remove the layer of contaminated food product inside the bag. For the third method, form a piece of sheet metal into a cylinder the same height as the bag and 4 to 6 cm smaller in diameter. Insert the cylinder into the bag, then remove the top 3 to 4 cm of the contaminated product. Carefully scoop the remaining product out into a clean sack. With the cylinder still in place, fold the bag down catching the contaminated product on plastic sheeting, or a tarpaulin. When using this method, mixing the contaminated portion with the uncontaminated portion is a problem. Check for contamination remaining in the product. Boiling or cooking has no effect on radioactive contamination. (4) Group IV--Food contaminated through the food-chain. It is not practical to decontaminate this food. Meat and milk are the two most common foodstuffs contaminated in this way.

Milk may be decontaminated to a safe level by a complicated ion exchange process. The I-131 activity will decline rapidly during storage of milk and milk-products, although the Cesium and Strontium activity will remain almost constant for years. In an area with high-level fallout, milk is withdrawn from human consumption. The duration of withdrawal will be dependent upon the type of fallout and levels.

Meat may be decontaminated to a safe level by soaking in water or brine. Cesium is loosely bound in the meat. By repeated soaking of meat cut in small pieces, most of the Cesium activity will be removed. Traditional meat preserving, such as salting with brine, will remove up to 60 to 70 percent of the Cesium activity. See Table F-2. Fruits, vegetables, root-crops, and grain products may also contain hazardous amounts of radioactivity if ingested.

(5) Food animals. Food animals that have been exposed to fallout should be considered fit for consumption and slaughtered using routine inspection and slaughter procedures. In those cases where the animal has been exposed to fallout, but is not scheduled for immediate slaughter, the radiation burden can be reduced by moving the animal to an uncontaminated area (barn if available) and washing it with soap and water. Mild radiation sickness does not necessarily mean that the animals cannot be used for food. If the animals have been exposed to an internal radiation hazard, the meat can be eaten if the internal organs are discarded. Chickens that have eaten radioactive material may lay contaminated eggs, but most of the radioactivity will be concentrated in the shells. The white and yolk will be free of harmful amounts of radiation and can be eaten. Chickens will not lay eggs if the radioactive body burden is large enough that their eggs are unfit to eat.

d. Considerations When Decontamination is Not Possible. When food cannot be decontaminated, sealing the product in a wrapping material or container may be needed. Sealing the product can reduce or shield the emanation of the contamination and/or fix the contamination in place. The hazard from contaminated food is small compared with that from external gamma radiation. Hungry people or animals should not be denied food because of possible fallout contamination. It is not practicable or desirable to pre-set maximum permissible limits of gross fallout radioactivity as a basis for judging whether or not food should be used. Common sense must be applied in establishing priorities for distribution of available food. For example, use the least contaminated and the most protected food first; hold milk products for 1 to 2 weeks before use.

F-4. Biological

a. Contamination. Biological warfare agents exist in the form of toxins and microorganisms. The normal packaging and packing of food (to protect against moisture, dust, and bacterial or other contamination) provides protection against most biological agents. The exception may be toxins and biologically derived substances. However, the protective methods used for chemical agents will also protect against toxins and derived substances. Food in freezers,
refrigerators, and in refrigerated trucks or rail cars will be safe if these containers remain sealed until the outer surfaces are decontaminated.

(1) It is unlikely that a biological agent will affect the appearance, taste, or smell of the food enough for the change to be apparent.

(2) Packaging and packing materials are not life supportive to pathogenic agents and are therefore self-decontaminating with the exception of spore-forming organisms.

(3) Most operational rations are packaged in metal containers, or encased in heavy aluminum laminated plastics that can withstand boiling water; also, they are impervious to arthropod penetration. This food is highly resistant to biological agents.

(4) The use of unpackaged items (unwrapped meats, fresh fruits, and vegetables) should be restricted; use only operational rations. Unprotected fresh food stored in the open and close to the source of dissemination will become contaminated.

b. Detection.

(1) Rapid identification of agents used is absolutely essential to implement effective countermeasures. Agent identification must be achieved quickly; it is the first step in answering critical management questions. What adjustments must be made in food preparation and distribution? What are the essential countermeasures? What is the expected outcome of the incident?

(2) Samples of food that are suspected of being contaminated are transported to the designated supporting laboratory. Samples must be accompanied by a description of the samples, the sample collection procedures, and the circumstances which prompted the collection. The designated medical laboratory in the TO will provide a presumptive identification of the agent(s). Positive identification is accomplished by designated laboratories in CONUS.

c. Decontamination.

(1) Food contaminated with toxins is handled in the same manner as food contaminated with chemical agents. Food contaminated with microorganisms is handled in the same manner as when contaminated with the more common foodborne disease-producing microorganisms. (2) Several methods are available to decontaminate food items contaminated with biological agents. The following decontamination methods are considered to be the minimum. See Table F-1.

(3) Group II food that is sealed in containers that are resistant to the passage of biological agents require only that the exterior of the container be decontaminated. Decontamination of these items are as follows:

For containers made of metal, glass, plastic, or porcelain: 1. Thoroughly wash the container in potable water and soap, or in a disinfectant solution. If the water used for washing is
contaminated, the soap and water wash may increase, not reduce, the contamination hazard. After which, the food containers are immersed in a disinfectant solution for 30 minutes (see Table F-3); then rinsed with potable water, if available and time permits. Chlorine solutions are not as reactive or corrosive as DS2.

2. Place the containers in boiling soapy water for 15 minutes; then rinse with potable water.

NOTE 1. The chemical field decontamination kits do not meet the requirements to decontaminate food supplies exposed to biological agents.

2. The same procedures should be followed even if there is only suspicion of a biological warfare attack.

(b) Thoroughly wipe containers that will not withstand soaking with a cloth soaked in a chlorine-detergent solution. Remove the food from the container and place it in Group III.

(c) Metal or glass containers determined to have trichothecenes (Yellow Rain) present can be decontaminated using DS2. Allow a contact time of 5 to 30 minutes for the DS2 to neutralize the toxin. Then rinse the container with potable water.

(4) Group III food items that are not protected by the packaging material are decontaminated or disposed of as follows:

(a) Decontaminate foods that can be peeled or pared by immersing them in a disinfectant solution for 30 minutes, and then rinsing them with potable water (see Table F-3). Peel or pare the items after decontamination, then wash and, if appropriate, cook before eating. (b) With the exception of certain heat-stable toxins, heat is the most practical means of decontaminating food. Several heating methods may be used, but the method chosen depends upon the type of food to be decontaminated. The key is to apply as much heat as possible without rendering the food unfit.

1. Cook in a pressure-type cooker with 15 pounds of pressure at 250 F (121 C) for 15 minutes.

2. Cook in a low-pressure cooker at 228 F (109 C) for 1 hour. 3. Bake bread or related items at 400 F (204 C) for 40 minutes. Bread made with toxin contaminated flour (especially with trichothecenes) is still toxic. 4. Bake or roast meat at 325 F (163 C) for 2 hours. 5. Boil for at least 15 minutes when no other method is available.

(c) Although decontamination methods are provided above, vegetables such as lettuce, broccoli, and cauliflower, or unwrapped meats that have been exposed to biological agents should not be eaten. (d) Foods, such as butter, ice cream, and bread, that will not withstand any of the above treatments must be destroyed.

(5) Established meat inspection procedures are followed when animals exposed to biological agents must be used for food. The meat must be thoroughly cooked.

F-5. Chemical

a. Contamination.

(1) Contamination of foodstuffs by a chemical agent may occur at any point on the battlefield. This contact may render the food unpalatable also. In many cases,

decontamination is difficult, thus, emphasis must be placed on protection. Keep food supplies covered at all times. Take special precautions to protect food that is not packed in protective packages. Unprotected food, forage, and grain supplies may be so contaminated that their consumption will produce gastrointestinal irritation, or systemic poisoning. Nerve agents, vesicants, and arsenicals are the most dangerous. Field concentrations of phosgene, hydrocyanic acid, irritants, and smokes will seldom be high enough to cause serious food contamination. The effect of CK on food is not known. As a precaution, foods exposed to CK should be considered toxic.

(2) The effects of chemical agents on food depend on the nature of the agent and the type of the food. The extent to which chemical agents penetrate food also depends on the amount, form of dispersal (liquid [droplet size], or vapor) and duration of exposure. Nerve agents and mustard will penetrate deeply into unprotected fatty foods and will readily penetrate granular products such as grain and sugar. Liquid food products can be completely contaminated. Arsenicals readily hydrolyze to poisonous arsenical oxides in some foods. Foods can be divided into three categories based on their water content, fat content, and crystalline structure:

(a) Foods having a high water content, a low fat content, and/or a crystalline structure (fresh vegetables, fruits, sugar, salt, and eggs), will absorb mustard and nerve agents, either as a liquid or as a vapor. Nerve agents will be hydrolyzed slowly.

(b) Foods having a low fat content and an irregular (amorphous) structure (flour, bread, grain, rice, cereals, dried fruits, dried vegetables, tea, coffee, peas, and beans), readily absorb mustard and nerve agent in liquid form. As a vapor, these agents are absorbed to some extent, but are easily removed by airing.

(c) Foods having a low water content and a high fat content such as butter, fat, fatty oils, ham, cheese, milk, bacon, fatty meat, and fish, absorb mustard and nerve agents such that removal of the agents is virtually impossible.

(3) Chemical agents can be physically and chemically absorbed into food. In addition to the toxic effect, they often adversely affect taste, smell, and the appearance of the food. However, chemical agents can cause the food to become very toxic without causing any other changes in the food. Table F-4 shows the effects of a number of chemical agents on food. Since food can be contaminated without any outward change in appearance, the possibility of contamination must be assumed in a chemical agent environment. Treat the food with the same precautions as established for known contaminated items.

(4) The protective properties of packaging materials are dependent upon a number of factors. The factors include the form of the agent (liquid versus vapor); concentration and exposure time; weather (temperature, wind speed, and humidity); and packaging material (the type of material, thickness, and the presence of folds, tears, and small holes). Even the thinnest material will offer some protection and is better than nothing at all. Therefore, always cover food supplies with whatever material is available. Table F-5 summarizes the protection values of various packaging materials against vapors and liquids.

(a) Operational rations (B rations, T rations, and MREs) are substantially protected while contained in the shipping cases and especially if stored in the original palletized unit load with an overlay of fiberboard, shrink wrap, or film wrap. The worst case is pallets of subsistence contaminated by liquid droplets during an attack. After the attack, high vapor concentrations will exist in the vicinity of the palletized loads. If the outer barrier is permeable such as fiberboard, it is possible that a liquid agent can seep through the overlay fiberboard and contact the shipping containers in liquid form. Normally, with seepage resistant materials such as shrink wrap as the outer barriers, only the vapors of the agent are found within the pallet.

(b) While MREs are stored, the food is protected by up to six layers of material. Multilayer barriers result in a complex diffusion process of the agent from the outside towards the interior. Vapor penetration into nonhermetically sealed spaces is a simple gaseous diffusion process. Permeation through packaging is a much more complex process regardless of whether the challenge is a liquid or a vapor. 1. Liquid is adsorbed into permeable materials such as fiberboard or chipboard. With permeation-resistant materials (such as shrink wrap), the agent dissolves into, seeps through, then desorbs from the barrier material. Shrink wrap provides adequate protection. Fiberboard sheathing provides adequate protection against mustard agents, but not against nerve agents.

2. The low density polyethylene used to construct the menu bag can absorb chemical agents and possibly toxins. If the menu bag is removed from the shipping container and is exposed to liquid contamination, enough agent may pass through the bag to create a health hazard. Keep MREs in the shipping container until issued to the soldier. The menu bags should then be kept under the same degree of protection as the soldier.

3. The aluminum laminated materials used to construct the MRE (retort and nonretort) pouches protect food from chemical contamination if hermetically sealed. The only item in the MRE meal bag that is not adequately protected is the spoon.

(5) Mylar and cellophane are resistant to chemical agents. b. Detection.

(1) Currently, a field method for detecting chemical agent contamination in food does not exist. Contamination is not always spread evenly throughout food; this makes it impossible to take a single sample and determine the presence or absence of chemical agents in the entire lot. Additionally, standardized laboratory tests have not been developed for determining levels of chemical agents in food. Until a specific method to detect chemical agents in food is available, reliance will have to be made upon determination of contamination, or lack thereof, on the packaging material; the integrity of the packaging material; the protective qualities of the packaging material; and the penetration characteristics of the suspected chemical agents.

(2) Food may become toxic without any change in outward appearance. Never taste or smell food to determine if contamination is present in food.

(3) Veterinary and subsistence units have the following equipment available to detect chemical agents in the field:

(a) The M8 Automatic Chemical Agent Alarm System consists of the M43 detector unit and the M42 alarm unit. The detector unit is a portable, automatic, point-monitoring device that is designed to be hand carried from point to point. The M8 is used to provide early warning of a toxic agent position and detects the presence of chemical vapors and aerosols. The M43 detects all nerve, blood, and choking agents, and some blister agents. The M43A1 (the replacement for the M43) only detects nerve agents.

(b) The M256 Chemical Agent Detector Kit detects and identifies nerve, blood, and blister agents. The M256 is the most sensitive of the chemical agent vapor detectors available. However, it is not a continuous, real time monitoring system. It requires 15 to 20 minutes for sampling and analysis.

(c) The ABC-M8 VGH Chemical Agent Detector Paper can detect and differentiate between nerve and blister agents by color change. It is intended to be used by blotting and wiping surfaces suspected of contamination. The M8 paper will respond with a visual color change in 10 seconds or less.

(d) The M9 Chemical Agent Detector Paper will detect liquid nerve (G & V) and blister agents (H & L), but will not identify the specific agent or differentiate between nerve and blister agents. The M9 tape is sensitive to droplets as small as 100μ, and will respond with a visual color change in 10 seconds or less.

(4) All subsistence in a chemical attack area are considered contaminated until a survey can be conducted, preferably by veterinary and chemical personnel. Personnel must be at MOPP Level 4 while conducting the survey. Concentrate the initial portion of the survey on the adequacy of the storage facility and other protective measures in preventing chemical agent contact with subsistence items. The area surrounding the storage facility is examined for the presence of animals, rodents, birds, and arthropods acting unusual, or dead in unusual numbers. If animals are present and assistance is required in identifying the NBC agent, specimens can be collected and submitted to the AML. Damage such as broken windows, holes, or loss of structural integrity of the storage facility is noted. This information combined with knowledge of the agent form (liquid or vapor), type of agent (which will indicate the degree of persistency), and approximate time of attack will provide a risk assessment. Liquid agents should not significantly penetrate an intact facility, but may produce vapor contamination by offgassing.

(a) Upon entering the storage facility, the M8 can be used to determine the presence of chemical vapors. However, precautions must be taken. The M42 alarm is not to be used inside shelters, vehicles, vans, or other interior modes. Therefore, when checking food storage facilities, the alarm unit must be left outside, turned off, or disconnected. Do not tilt the M43 detector more than 45 degrees (because of the liquids it contains). This is not a problem with the improved M43A1, but the M43A1 requires attachment of an exit port filter when used indoors. The M256 Chemical Agent Detector Kit can be used to sample the air.

(b) Pre-position M9 chemical agent detector paper in food storage areas; especially on the least protected pallets and in areas where droplets may enter, such as near doors or windows. Examine the M9 paper for indications of liquid chemical agents. If the M9 paper is positive, or if the packaging materials show the presence of liquids or stains, use the M8 detector paper to determine the type of the agent. If an agent is not indicated by the detector paper, then the amount of agent present will be insufficient to cause secondary contamination when the outer package is removed.

(5) Detection procedures become more complicated if a chemical agent has penetrated or permeated through the packaging and packing materials. Unless liquid has seeped through the cardboard, any agent in the interior of the shipping case will be in a vapor form. Liquid seeping should be obvious. The sampler-detectors in the M256 Chemical Agent Detector Kit do not have an aspirator for sampling the interior of the case. However, there are several procedures that can be used. One is to open the case, place the activated sampler-detectors inside the case, and then reclose the case. Another is to punch holes in the case, place the activated sampler-detector over the holes, and cover the sampler-detectors with an empty box or can (open end down) to concentrate the vapors escaping from the case. Alternatively, remove the food from the case and place it in a plastic bag with the sampler-detectors to concentrate the vapors. These procedures require two sampler-detectors; one for blood agents and one for nerve and blister agents. Neither method is very sensitive in low concentrations of vapor as is expected to be present inside shipping containers. A better method is to modify to M43 detector with a field expedient probe of Teflon tubing attached to the detector's air inlet. Insert the open end of the tubing into a hole in the case or package to sample the interior air. When available, the CAM can be used; its design will allow aspiration of air from inside shipping cases. The CAM can also be used to detect and identify liquid agents on a surface provided the agent is vaporizing in

sufficient quantity. The CAM gives a visual representation of a hazard evaluation.

c. Decontamination.

(1) Decontamination is only required for contamination remaining 10 minutes or longer. Decontamination efforts on subsistence items will normally be limited to removal of the containers and carton overwrap material.

(2) The need for decontamination is primarily dictated by the type of chemical agent used. The method of decontamination selected will depend upon the type of packaging material used and the urgency with which the food is required.

(3) Food supplies in storage are not likely to be seriously contaminated if reasonable protection precautions are taken. For this reason, large supplies of food are not to be condemned as a whole simply because they have been exposed to possible chemical contamination. A prompt and careful survey of the supplies may reveal that only a few items have been contaminated to a level that decontamination is required. Prompt segregation of the heavily contaminated portions will prevent, or minimize contamination of the remainder. Foods without protective packages constitute the major difficulty.

(4) Individual decontamination is performed by each soldier on those subsistence items in his possession at the time of the attack. Individual decontamination is limited to operational rations that are in original, intact containers. Unit-level decontamination is performed by unit personnel under the supervision of unit NBC personnel. Support decontamination is attempted at major subsistence storage facilities. Again, decontamination is limited to packing material. Decontamination of food itself is only attempted in emergency situations when alternative supplies are not available. (5) Start decontamination operations with the easiest method and proceed to the most difficult. This allows for the removal of a relatively large portion of the contamination in a minimum of time. The simplest procedure is to allow the materials to age and air ("weather"). Substantial selfdecontamination will occur with most agents. Exception are thickened mustard, thickened GD, and VX. Table F-6 provides the length of time for which contaminated subsistence supplies may present a contact hazard. Weather elements that affect decontamination are--

(a) Warm temperatures speed liquid agent offgassing and hasten the dispersion of chemical agents into the air.

(b) High winds rapidly disperse chemical agent vapors and speed offgassing from surfaces.

(c) Moisture causes chemical agents to react with water to form nontoxic or less toxic chemicals. Heavy rain or rain of long duration can aid decontamination by mechanically removing chemical agents. (d) Even in cold weather, direct sun rays warm surfaces above the air temperature and hasten the offgassing and decomposition of chemical agents.

(6) Active decontamination is attempted only when weathering will not decontaminate the packaging material in sufficient time. Decontamination procedures can be enhanced by using heat to vaporize the chemical agent; by reaction with decontaminants; or by removing with hot soapy water.

(a) The simplest (standard) decontamination materials are water and detergents. An effective decontaminant is hot water used with the addition of soap or detergent and scrubbing. Commercial abrasive powdered cleansers are effective decontaminants for many surfaces (metal, glass, Formica), but not wood or soft plastics.

(b) Water can be used to flush chemical agents from surfaces. High-pressure application produces a better cleansing action than low pressure. If the surface has absorbed the agent, flushing will remove the surface contamination, but will not affect the agent that is absorbed.

(c) Soaking contaminated items in boiling water is an excellent decontamination method for some agents. Water alone will not be sufficient to decontaminate all chemical agents. Soaking in warm or cold water may reduce the contamination slightly; however, the hazard may not be reduced sufficiently even after prolonged soaking. If hot water is not available, or if it might cause damage to the item, other methods of decontamination should be considered, such as decontaminating solutions or a caustic solution followed by thorough rinsing.

(d) Fibrous materials such as cloth and canvas are best decontaminated by washing and scrubbing.

(e) Glass, metal, porcelain, and plastic surfaces are best decontaminated by using hot water or hot soapy water. Some toxic materials are readily removed with no more than slight abrasion or brushing.

(f) Painted, varnished, and waxed surfaces are generally smooth and nonporous. Dust and liquids are readily removed by wiping, brushing, or vacuuming. Absorbed materials are removed by hot water, detergent, or completing agents. None of these surfaces stand up well to heavy abrasive techniques. Agents can be attacked and removed by caustics, acids, and organic chemicals. Some of these surfaces readily absorb agents, so weathering following decontamination is advisable. (g) Rubber is a porous material that can absorb agents. It is not easily decontaminated by abrasive techniques. Warm, soapy water used with brushing is effective since it removes some absorbed contamination. Strong acids, alkalies, and organic solvents may deteriorate and decompose rubber articles.

(7) Operational rations are the primary rations issued; always issue uncontaminated stocks first. This allows for decontamination of contaminated stocks without interrupting supply support. Normally, contaminated stocks are not issued. The decision to issue contaminated items is based on the tactical situation, criticality of the items, type and extent of contamination, and the time and resources available for decontamination. Decontamination efforts on subsistence items are limited to the containers and carton overwrap material.

(a) The MRE retort and nonretort food pouch may be decontaminated with soap and water wash. The chemical agents will be removed by the solutions.

(b) Semipermeable materials (polyethylene menu bag, shrink wrap, and film wrap) may have chemicals deposited not only on the surface, but also dissolved into the matrix of the material. The chemicals can be removed from the surface by washing with hot soapy water, but contaminant dissolved in the material is not removed. The remaining agent can only be removed by weathering which can be accelerated through the use of heat and sweeping the surface with air. (c) Fiberboard is both sorbent and permeable and acts like a blotter. Liquid decontaminants can force the contaminant further into the fiberboard. Any attempt to decontaminate fiberboard would be futile. The only alternatives are to remove the fiberboard, or to allow it to weather.

(d) Palletized unit loads of MRE outerwraps can be decontaminated through the aid of a forced clean air sweep in 4 to 5 days, compared to 3 weeks or more under natural conditions without a forced air sweep.

(8) Contaminated food supplies are only handled by personnel trained in decontamination methods and in MOPP Level 4. Contaminated food items are divided into

three groups as described below (see Table F-1 for additional information).

(a) Group I consists of canned and unopened packaged items which have been exposed only to agent vapors. Most items in this group will be safe to issue after a brief period of outdoor airing to remove clinging vapors. Table F-7 lists the decontamination procedures for packaging materials contaminated with nerve agents, mustards, and arsenical.

(b) Group II consists of canned and unopened packaged items which have been contaminated with a liquid chemical agent.

1. Attempts to decontaminate porous packaging materials, such as cardboard or wood, are likely to be unsuccessful and may result in spreading the contamination. The best procedure in handling such items is to strip off the outer contaminated coverings and examine the inner layer to see if penetration of the agent has occurred. If it has, continue stripping off layers until an uncontaminated layer is reached and place it in Group I. If the agent has penetrated to the food, place it in Group III.

2. Food in cans or in other sealed, impermeable containers is not in danger of chemical contamination. Because contamination is confined to the outer surface of the sealed container, decontamination is accomplished by: immersion in boiling, soapy water for 30 minutes and rinse; immersion in boiling water for 30 minutes; spray with DS2; or to wash in hot soapy water, rinse, and aerate. Under no conditions should contaminated containers be opened before they have been decontaminated and monitored.

3. Supertropical bleach and DS2 can be used on the polyethylene menu bag for up to 24 hours without a significant change in appearance, tensile properties, and size of the plastic. The use of DS2 will cause significant degradative changes to most other plastics, while STB will cause little or no change. Also, DS2 may cause false positive readings when using M8 or M9 paper, or the M256 Detector Kit to check completeness of decontamination.

(c) Group III will consist of unpackaged or poorly packaged items which have been exposed to an agent in either vapor or liquid form. Foodstuffs in this group should be decontaminated only when absolutely necessary. The decision to use foods that have been contaminated is to be made by the commander. Decontamination procedure to be followed, in order, is: trim surface fat and grossly contaminated areas; wash with water or 2-percent sodium bicarbonate solution; then boil in water. 1. Boiling in water may be eliminated when the contamination has been only with the vapors of irritant agents. When such an exposure has been light, aeration for a short time may be used for decontamination.

2. Frying, roasting, or broiling will not remove traces of blister agents from meats. In general, salvage of foods heavily contaminated with droplets of the blister agents, especially the arsenical blister agents, is not practical. Foods of high water or fat content are unfit for consumption and reclamation is not practical when contaminated with liquid mustard or a liquid nitrogen mustard. 3. When foods have been exposed to blister agent vapor, they can be reclaimed by washing with sodium bicarbonate solutions and rinsing with clear water, by intensive cooking, or in the case of dry provisions, by 24 to 48 hours of aeration. Lean meat contaminated with mustard vapor can be reclaimed by boiling in water for 30 minutes or more. With nitrogen mustard vapor contamination, the meat should be boiled in a 2-percent sodium bicarbonate solution. Discard the water used to boil the meat.

4. Nerve agent contamination is treated the same as blister agent contamination.

5. Food such as potatoes and hard-skinned fruits and vegetables can be decontaminated by washing or scrubbing, followed by peeling or scraping, then washing again.

6. Prepared food in open containers will be contaminated; it must be temporarily

isolated, or disposed of (bury or as directed by commander).

7. A food item that is contaminated with irritants can be decontaminated by airing. Consumability is determined by taste rather than toxicity.

8. Phosgene is rapidly hydrolyzed, therefore, washing the food with water or airing it will usually suffice.

9. Food contaminated with white phosphorous should be destroyed. 10. Normally, hydrocyanic acid will have little effect on food supplies. The exposures will most likely be as a vapor. However, foods with a high water content may become unfit for consumption after exposure to high concentrations.

11. The effect of CK on foods is not known. Foods exposed to CK vapors are considered toxic.

12. Table F-8 lists the decontamination procedures for unpackaged food contaminated with a chemical agent.

(9) Decontaminating cattle, poultry, and other livestock is only attempted when other sources of food are not available. Heavily contaminated animals should be destroyed. Livestock contaminated lightly by phosgene, nerve agents, mustards, and arsenicals (such as vapor or liquid) may be slaughtered in the early stages of poisoning before the full effects of exposure are shown. If these animals are slaughtered in the preliminary stages of poisoning and all tissues exposed to the agent (the head, blood, lungs, organs, and local areas) are discarded, there is no danger in consumption of the meat, provided the animal passes a pre-slaughter and slaughter inspection. This is true even of animals poisoned by arsenical agents since the edible tissue will contain amounts of arsenic too small to be toxic. Organs (liver, brain, heart, kidney, and lungs) will contain more arsenic than the musculature and are discarded. The meat must be well cooked. Personnel involved in slaughtering procedures must be careful to prevent spreading contamination to the meat and to themselves. (10) Decontaminating forage and grain exposed to only chemical agent vapors is by aeration. Aerated supplies, especially if mixed with larger amounts of uncontaminated supplies, produces no ill effects when fed to animals. Forage or grain heavily contaminated by liquid vesicants, especially arsenicals, should not be used.

Army Survival Field Manual, after a Nuclear incident: Food Procurement Although it is a serious problem to obtain edible food in a radiation- contaminated area, it is not impossible to solve. You need to follow a few special procedures in selecting and preparing rations and local foods for use. Since secure packaging protects your combat rations, they will be perfectly safe for use. Supplement your rations with any food you can find on trips outside your shelter. Most processed foods you may find in abandoned buildings are safe for use after decontaminating them. These include canned and packaged foods after removing the containers or wrappers or washing them free of fallout particles. These processed foods also include food stored in any closed container and food stored in protected areas (such as cellars), if you wash them before eating. Wash all food containers or wrappers before handling them to prevent further contamination. If little or no processed food is available in your area, you may have to supplement your diet with local food sources. Local food sources are animals and plants. Animals as a Food Source Assume that all animals, regardless of their habitat or living conditions, were exposed to radiation. The effects of radiation on animals are similar to those on humans. Thus, most of the wild animals living in a fallout area are likely to become sick or die from radiation during the first month after the nuclear explosion. Even though animals may not be free from harmful radioactive materials, you can and must use them in survival conditions as a food source if other foods are not available. With careful preparation and by following several important principles, animals can be safe food sources. First, do not eat an animal that appears to be sick. It may have developed a bacterial infection as a result of radiation poisoning. Contaminated meat, even if thoroughly cooked, could cause severe illness or death if eaten. Carefully skin all animals to prevent any radioactive particles on the skin or fur from entering the body. Do not eat meat close to the bones and joints as an animal's skeleton contains over 90 percent of the radio-activity. The remaining animal muscle tissue, however, will be safe to eat. Before cooking it, cut the meat away from the bone, leaving at least a 3-millimeter thickness of meat on the bone. (About 1\4 inch.) Discard all internal organs (heart, liver, and kidneys) since they tend to concentrate beta and gamma radioactivity. Cook all meat until it is very well done. To be sure the meat is well done, cut it into less than 13-millimeter-thick pieces before cooking. Such cuts will also reduce cooking time and save fuel. The extent of contamination in fish and aquatic animals will be much greater than that of land animals. This is also true for water plants, especially in coastal areas. Use aquatic food sources only in conditions of extreme emergency. All eggs, even if laid during the period of fallout, will be safe to eat. Completely avoid milk from any animals in a fallout area because animals absorb large amounts of radioactivity from the plants they eat. Plants as a Food Source Plant contamination occurs by the accumulation of fallout on their outer surfaces or by absorption of radioactive elements through their roots. Your first choice of plant food should be vegetables such as potatoes, turnips, carrots, and other plants whose edible portion grows underground. These are the safest to eat once you scrub them and remove their skins. Second in order of preference are those plants with edible parts that you can decontaminate by washing and peeling their outer surfaces. Examples are bananas, apples, tomatoes, prickly pears, and other such fruits and vegetables. Any smooth-skinned vegetable, fruit, or plant that you cannot easily peel or effectively decontaminate by washing will be your third choice of emergency food. The effectiveness of decontamination by scrubbing is inversely proportional to the roughness of the fruit's surface. Smooth-surfaced fruits have lost 90 percent of their contamination after washing, while washing rough-surfaced plants removes only about 50 percent of the contamination. You eat rough-surfaced plants (such as lettuce) only as a last resort because you cannot effectively decontaminate them by peeling or washing. Other difficult foods to decontaminate by washing with water include dried fruits (figs, prunes, peaches, apricots, pears) and soya beans. In general, you can use any plant food that is ready for harvest if you can effectively decontaminate it. Growing plants, however, can absorb some radioactive materials through their leaves as well as from the soil, especially if rains have occurred during or after the fallout period. Avoid using these plants for food except in an emergency.

Page 553 John " Lofty" Wiseman; The SAS Survival Handbook;
ISBN 0 00 26531407, (unabridged)

IMPORTANCE OF SHIELD TIME, AFTER A NUCLEAR EXPLOSION.
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The radioactivity to which an unprotected person could be exposed in the first few hours will exceed that received during the rest of the week. That in the first week will exceed that accumulated during the

rest of a lifetime spent in the same contaminated area.   It is therefore important to be shielded during the initial stages.
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VENTURING OUT OF YOUR FALLOUT SHELTER FOR WATER

If desperate for water a brief venture out, lasting not more than 30 minutes, is permissible on the third day. On the seventh day a further exposure, of up to half an hour, can be extended on the eighth up to one hour and then from two to four hours for the next four days and from the thirteenth day normal working, followed by rest in the shelter.
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Basic Nuclear War Survival,   SAS Handbook
John " Lofty" Wiseman; The SAS Survival Handbook;
ISBN 0 00 26531407,   (unabridged)
pages 551 to 556

RADIATION

Potentially harmful radiation is used to diagnose and treat illness and radioactive material is used to produce nuclear power. Exposure to x-rays must be carefully controlled. Technicians operating such equipment usually do so from behind suitable screens. Nuclear installations and the fissile materials they use present much greater dangers.

Nuclear radiation from fissile material can be tolerated in small doses -- a low level of background radiation was always present long before man split the atom. Radiation is measured in roentgens per hour (R) and, if a very small portion of the body is exposed, a healthy person can tolerate brief exposure to a charge of 5000R -- but a dose of only 700R to the whole body is lethal.

Nuclear power stations, research plants and nuclear waste processing plants use shields, special clothing and decontamination procedures to protect their staff and prevent contamination of others and the environment. But despite elaborate safety systems and controls leaks and accidents have occurred and the problems associated with the transportation and disposal of radioactive waste have not yet been satisfactorily solved.

In the United States and Britain each community near a nuclear plant has an emergency plan for dealing with a radiological incident. To find out about plans contact your local authority. Local radio stations would be used to issue emergency information and you could be told to evacuate the area. If not, stay inside as much as possible. Exposure to small emissions of radioactive iodine are treated with potassium iodine tablets which delay its absorption.

Anyone who may have been subjected to a radiation leak should wash the WHOLE body thoroughly with soap and plenty of clean water and seek expert help immediately.

NUCLEAR WEAPONS

The offensive use of nuclear power is likely to be preceded by a gradual escalation of the military situation. There is likely to be a period when those who wish could take positive protective measures. However there is no guarantee of warning and proper fall-out shelters cannot be erected rapidly. Many people believe that it is worth building shelters now as a precaution. Others, especially in target areas, may feel the whole operation pointless. Any who escape annihilation will need a survival mentality more than in any other survival situation.

NUCLEAR EXPLOSION

The immediate hazards of a nuclear explosion are blast, heat and radiation. The severity of their effects will depend upon the size and type of weapon, distance or height of the explosion, weather conditions and terrain. Heat and blast are like those produced by conventional explosives, but many times more powerful.

0. BLAST. The detonation causes the initial shock-wave. Even more powerful is the compression of the air produced by the rapid expansion of the fireball. The wave of pressure traveling outwards from the point of detonation will collapse buildings, uproot trees and fill the air with-flying debris, well before the heat follows. Approximately half the total energy of the explosion is expended in this way. When the blast wave has passed, air rushes back to fill the void causing further damage. At distances where the initial blast has only weakened structures this vacuum effect will finish the job.

0. HEAT. The thermal radiation (heat and light) produced by a nuclear explosion reaches temperatures hotter than the sun and includes great intensities of ultraviolet, infrared and visible light rays. Close to the point of detonation all inflammable materials are ignited -- even vaporized. In the case of the Hiroshima bomb, exposed skin was burned at a distance of 4km (2 ½ miles). Today's weapons are MANY times that power and their effects comparably more extensive. Even seeing the flash of the explosion is likely to cause serious eye damage and burns to the skin.

0. RADIOACTIVITY. In addition to the thermal radiation, nuclear fission produces alpha and beta particles and gamma rays. Although radioactive fallout settles to earth, with the appearance of white ash or dust, this is the residue of destroyed matter not the radioactivity itself. That cannot be detected by human senses. A Geiger counter is required to register its presence, indicated by a dial or a sound signal which becomes increasingly agitated as the radiation increases.

ALPHA PARTICLES have low penetrating capabilities and it is easy to shield them off. They cannot penetrate the skin but they do present serious problems if ingested or inhaled.

BETA PARTICLES are only slightly penetrating and heavy clothing and boots will give full protection. On exposed skin they cause burns. If ingested they attack bone, the gastrointestinal tract, thyroid gland and other organs.

GAMMA RAYS are highly penetrating. They travel much slower than alpha and beta rays, damaging all body cells.

Common symptoms of exposure to radioactivity are nausea, vomiting, general weakness. Ulcer-like sores appear on the skin, which tends to take on a grey hue.

RESIDUAL RADIATION

The initial radiation given off during the first minute of a nuclear explosion can kill -- but it lasts only a short time. Once the blast has passed, so has the initial radiation threat. However, exposure to residual radiation can be equally dangerous.

The amount of residual radiation depends on how the bomb was detonated. If it was high above the ground and the fireball did not touch the earth little residual radiation is produced -- what the strategists call a 'clean bomb'. If exploded on or near the ground, a huge quantity of soil and debris is sucked upwards to a great height and falls back to earth as radioactive dust. Heavier particles fall in the vicinity of the explosion, but lighter ones may be carried by wind over a wide area -- spreading the radioactivity.

In time radiation decays -- the cities of both Hiroshima and Nagasaki have been rebuilt and re- inhabited. However, while as much as 70% of these particles remain radioactive for only one day or less, it takes others years for their radiation to decay.

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IMPORTANCE OF SHIELD TIME, AFTER A NUCLEAR EXPLOSION.

** The radioactivity to which an unprotected person could be exposed in the first few hours will exceed that received during the rest of the week. That in the first week will exceed that accumulated during the rest of a lifetime spent in the same contaminated area. It is therefore important to be shielded during the initial stages. **

RADIATION SHELTERS

In default of a deep bunker equipped with air, water and food supplies, in which to sit out a nuclear conflict and its aftermath, the best protection is a deep trench with a roof covered by a meter or more of earth. If the detonation is sufficiently distant not to produce total destruction, the trench and earth will protect from blast, heat and radiation.

Look for terrain that has natural shelter, such as ravines, gullies, ditches and rocky outcrops. If you do not have a trench shelter prepared, start digging -- FAST! As soon as the hole is big enough, get inside it to continue digging, to minimize exposure to radiation if you are caught-out while still digging. Rig up a roof. Even if only of cloth, it will stop dust falling on you. Penetrating rays can still reach you so try to get a meter of earth above you.

If caught in the open get to your shelter as quickly as possible. Once under cover, remove outer garments and bury them under a foot of soil at one end of the bottom of the shelter. Do not venture out until absolutely necessary and do not re-use your discarded garments. Under no circumstances move out of the shelter in the first 48 hours.

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^^^ VENTURING OUT OF YOUR FALLOUT SHELTER FOR WATER

If desperate for water a brief venture out, lasting not more than 30 minutes, is permissible on the third day. On the seventh day a further exposure, of up to half an hour, can be extended on the eighth up to one hour and then from two to four hours for the next four days and from the thirteenth day normal working, followed by rest in the shelter.

^^^

** SHIELDING

Strictly speaking, it is impossible to shield completely from all radiation but a sufficient thickness of shelter material will reduce the level of radiation to a negligible level. Below are some materials, and the thickness required to reduce radiation penetration by 50%.

Material	Meters	Feet
Iron and steel	0.21	.7
Concrete	0.66	2.2
Brick	0.60	2.0
Soil	1.00	3.3
Ice	2.00	6.6
Wood	2.60	8.8
Snow	6.00	20.3

****

DECONTAMINATION

If your body, or even your clothing, has been exposed to radiation, it must be decontaminated. Once in shelter scrape earth from the shelter bottom and rub it over the exposed parts of your body and your outer clothing. Brush it off and throw the soil outside. Wipe the skin with a clean cloth if possible. More effectively, if water is available, wash the body thoroughly with soap and water instead of soil.

MEDICAL CARE

ALL wounds must be covered to prevent alpha and beta particles entering through them. Burns, whether caused by beta particles and gamma rays or by firestorm heat, should be washed with clean water and covered. Urine may be used, if no uncontaminated water is available. The eyes should be covered to prevent further particles entering and a damp cloth placed over the mouth and nose to prevent further inhalation.

Radiation affects the blood and increases susceptibility to infection. Take all precautions -- even against colds and respiratory infections.

AFTERMATH

Unless stored in deep shelters, or with special protection, all foodstuffs are likely to have absorbed some measure of radioactivity. Be cautious of foods containing a high salt content, dairy products, such as milk and cheese, and sea foods. After tests it was found that food with salt and other additives had a higher concentration of radioactivity than food without them. The safest canned foods are soups, vegetables and fruits. Cured and processed meat are more readily contaminated than fresh. Bone absorbs the highest levels of radioactivity, then lean meat, with fat lowest.

WATER

Unless it is from a protected source, do not drink any water for at least 48 hours after detonation. Avoid water from lakes, pools, ponds and other static surface water. Filter all water and boil it before drinking.

The following sources are the least contaminated (in order of least risk):

1. Underground wells and springs
2. Water in underground pipes/containers
3. Snow taken from deep below the surface
4. Fast-flowing rivers

Dig a hole by a fast-flowing stream and allow water to filter down into it. Scrape off any scum that-forms on the surface and scoop up water. Filter it through layers of sand and pebbles (dig deep to obtain these) in a can with holes punched in the bottom, or through a

stocking. Boil in an uncontaminated vessel.
Decontaminate utensils by washing thoroughly in fast flowing or boiled water.

ANIMALS AS FOOD

Animals that live underground have less exposure to radiation than those that live on the surface: rabbits, badgers, voles and similar animals are the best bets but, when they venture out, they too will be contaminated. However, such food sources must be made use of. You will increase your own contamination -- but the alternative may be to starve.

To reduce contamination from meat do NOT directly handle carcases, wear gloves or use cloth to cover the hands while carefully skinning and washing. Avoid meat in direct contact with the bone. The skeleton retains 90% of radiation so leave at least 3mm (1\8 in) on the bone. Muscle and fat are the safest part of the meat. Discard ALL internal organs. Fish and aquatic animals will have a higher contamination than land animals from the same area. Birds will be particularly heavily contaminated and should not be eaten. However, eggs are safe to eat.

PLANTS AS FOOD

Root vegetables with edible tubers growing underground are safest – carrots, potatoes and turnips, for instance. Wash them well and peel before cooking.

Smooth-skinned fruits and vegetables are next safest. Plants with crinkly foliage are the hardest to decontaminate, because of their rough texture. They should be avoided.

LONG-TERM SURVIVAL

Predictions of the long-term results on the environment of major thermonuclear conflict differ widely. The possibility of a 'nuclear winter', with consequent effect on climate and plant life far beyond strike areas, would make even subsistence agriculture difficult. In the short-term however, and in the case of limited conflict, much of the advice in Home Front will be relevant.

Nuclear War Survival, Home Front
John " Lofty" Wiseman; The SAS Survival Handbook;
ISBN 0 00 26531407, (unabridged) pages 557 to 567

You do not have to be miles away from civilization to be caught in a survival situation. Natural disaster, civil disturbance or military action could cut you off from all the usual services and food supplies. Until they can be re-established, you would be left to manage on your own resources and skills.

With no power supplies, central heating, hot water, lighting, air-conditioning and refrigeration would all cease. Battery radios and television would for a time give some news of the rest of the world, if the situation is not global, but post, telephone and newspapers would no longer be available. As mains water supplies ceased to function, so taps would run dry and toilets would become unusable.

In the countryside there would be natural resources to draw upon. In large cities shops would soon be emptied of food -- sold or looted -- and plants in parks and gardens would be rapidly stripped, once any private stocks had been exhausted. The population would have to make forays out into the countryside to survive, or abandon the town, if not in a siege situation. Suburban dwellers have more vegetable plots and open spaces to provide foodstuffs. They would be less dependent upon shops. Those away from major centers are more likely to have their own food stocks, because they cannot shop at will.

Most families have some food in store. It should be rationed and supplemented with whatever can be found.

FOOD STORES

Storing food is a good habit to get into, especially if you live in an isolated place, which can become completely cut-off. If you have a year's food supply in store, and add to it as you use it, you will not only be able to survive the worst but will be able to live at last year's prices.

The stock does not have to be established in one go. Build it up gradually, taking advantage of special offers in supermarkets. Buy an extra tin or packet and put it by. Store your foods in a cool, dry, dark place and off the ground -- moisture and heat cause bacteria and molds. If stores are left on the floor insects and rodents will help themselves. Make sure that all containers are insect- and rodent-proof.

REMEMBER

Rotate cans, so that the contents do not settle, and separate. Label each can or packet with a color-fast waterproof pen, noting contents and date of storage. Use in sequence -- the oldest first. Store methodically and if a label falls off, you should still have a good idea of the contents.

Choice of foods will depend upon individual taste, but straightforward products (corned beef in preference to beef stew and dumplings) will keep better and can be used in a greater variety of ways. Wheat keeps better than flour -- it is less susceptible to moisture, light, insects and temperature change. Wheat found in the pyramids was found in good condition after thousands of years. However you must grind it to make flour, so invest in a small hand grinder.

KEEP IT SEALED

Screw-top sweet jars are ideal for storage and plastic containers with tight-fitting lids can also be used. Do not over fill them so that they distort and the lid does not fit correctly. Use adhesive tape to seal the lids. Reseal after using some but remember that once opened the contents will begin to deteriorate.

** RECOMMENDED FOODS / SHELF LIFE

Wheat- Indefinitely below 15 degrees Centigrade (65 degrees Fahrenheit) Milk powder- 2 years

Honey- Indefinitely

Egg powder- 2 years

Salt- Indefinitely if absolutely dry

Canned goods- 3-5 years (replace regularly)

Oats- Indefinitely

Cooking oil- 2 years (replace regularly)

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RATIONS

Complete rations are available with various menus either freeze-dried or dehydrated. They are lighter and less space-consuming than canned foods. Freeze-dried are best for both taste and texture and retain minerals which are lost in dehydration. Although both need water for reconstitution they can, in dire circumstances, be eaten as a dry munch.

VITAMINS

Multi-vitamin tablets are also a good investment. The body can store up to a month's supply of most vitamins, then health will suffer if they are not replaced. In stress situations they are more rapidly used up. The B family (and minerals, calcium and zinc) are first to go. Vitamin tablets do not have unlimited shelf-life -- check manufacturer's instructions.

OTHER FOODS

Dried fruit and nuts are nutritious and should also be included -- raisins, sultanas and currants all keep well. Nuts in their shells keep so long as they are dry. Packets of dried salted nuts such as peanuts, brazils and walnuts, are highly nutritious.

Potato powder is a great filler for hungry stomachs and can be prepared in several ways to make it palatable.

Brown rice has more nourishment than long-grain white rice which loses all its goodness when boiled.

STORE LOCATION

The cooler the storage area, the better the stores will keep a cellar is ideal but there may be a problem with dampness so keep all the stores off the ground and inspect them regularly. If there is a skylight in the cellar, cover it. The store is best kept dark. An attic is also convenient for storage -- the stores are not in the way of day-to-day activities. However, it may get very warm in summer and access may be difficult -- especially if a ladder is the only means of entry -- which may be awkward when trying to rotate bulky stores. The roof is also a vulnerable position in most kinds of disaster situations. In an area where hurricanes can be expected an attic is not a good choice. In territory liable to flooding a cellar would be equally at risk. Under stairs is another area that may offer some protection, though perhaps limited space. Advantage should be taken of wherever is most conveniently available to store not only food but also medical supplies, disinfectants, cleansing materials -- and water. If you divide your stores into more than one area, each with a variety of items, you should be well prepared.

ADD TO YOUR STORES:
Toothpaste and soap
Disinfectant and bleach
Washing powder
General medical supplies
Medicines: for dysentery, for stomach upsets, for allergies, general pain-killers,
Bandages and dressings

PRIORITIES

In a domestic situation there is likely to be shelter, unless it has been totally destroyed, or the area has become a danger zone and evacuation is imperative. Damage can be patched up to provide some protection from the elements and more permanent repairs undertaken as soon as possible.

Water supplies are always likely to be a problem -- for even during a flood drinking water is scarce. Fortunately there are likely to be some immediate reserves on the premises and, with warning of a crisis, these can be supplemented.

Fire for warmth is less of a problem, since there will be burnable materials in the house and surroundings. Infection may prove the greatest danger and strict hygiene and sanitary practices must be enforced.

WATER

Although a family of four can use a considerable amount of water each week, only a small percentage of this is for drinking -- a requirement of about 2 liters (4 pints) per day per person. If warned of a crisis, fill as many receptacles as possible, especially in a hot climate. A bath holds many gallons; increase its capacity by blocking the overflow. Use dustbins, buckets, pots -- even strong polythene bags if they are only half filled and securely tied off Store water in the dark. If light gets to it green algae will develop. Water is bulky and heavy. Do not store it in the attic or it may bring the ceiling down.

Even without advance warning there will be water in the storage tank, heating pipes, radiators, perhaps an aquarium, and the toilet cistern will hold another few gallons -- don't flush it. Outdoors you may have a swimming pool, water butts, or a pond -- even water from a car radiator can be utilized. Central heating water is usually treated with a de-oxygenizing agent and a car radiator probably contains anti-freeze, so water from these places is best kept for cleaning purposes. If it has to be used for drinking boil it, collect the steam in clean cloths and wring them out. Then re-boil. (Or, see Essentials.) Boiled water tastes flat and distilled water has even less taste. It is easy to restore some of its sparkle by putting oxygen back into it: simply pour the water back and forth from one vessel to another. A small piece of wood charcoal placed in the vessel while it boils also helps taste.

*** FILTERING AND STERILIZING

Filter and sterilize ALL water before using it for drinking. If circumstances make it impossible to boil water sterilize it with chemicals.

FILTERING: Allow water to stand in its container so that sediment settles at the bottom. Then siphon it into a filter made up of a nylon stocking (or other porous material) stuffed with layers of sand (bottom), charcoal and moss (top).

STERILIZING: Clear water: add 2 drops household bleach per liter (1 per pint) or 3 drops 2% tincture of iodine per liter (6 per pint) Cloudy water: double the quantities of bleach or iodine Large quantities: 1\2 teaspoonful bleach per liter (2 teaspoonsful per gallon)
****

COOKING IN WATER

Water in which food is to be cooked MUST be boiled for at least eight minutes, but water not boiled for as long can be used for heating cans of food provided it makes no contact with the foodstuff. Stand the can in water, pierce a small hole in the top to avoid the risk of explosion and plug it with a twist of cloth so that water cannot enter the can. Alternatively, boil the water, remove it from the heat and place the un-pierced can in the water. This takes longer for the can to heat through.

WATER CATCHMENT

0. Catch all available rainwater. Break off lower sections of down pipes and divert the flow into a container such as a dustbin. Even if rainwater is pure, guttering may contaminate it -so sterilize. 0. Supplement water receptacles with tarpaulins or plastic sheets supported on sticks. Rinse between showers to reduce tainting. 0. Dig a hole and line it with a plastic sheet or concrete for water storage. Cover it to prevent evaporation and debris falling in. 0.

If the local water table is high you may be able to dig down to water -- there may even be a well on your property which could be reopened.
0. Solar and vegetation stills (see Essentials) are other ways of obtaining water.

WATER CONSERVATION

Do not waste water washing clothes, other than underclothing. Never throw water away after use. Allow sediment to settle and it can be used again.

It is very important to wash the hands before preparing food, but the rest of the body can wait until it rains. The body produces natural oils and, as long as the pores are kept open, health will not be affected. You soon get used to the smell and social occasions are rare in a crisis situation. If showers are few and far between, use a damp cloth for a strip wash cloths left out on lawns or hushes over night may gather enough moisture for a wipe down without using up your water stores.

Injured persons must receive priority for bathing and all their dressings should be boiled regularly.

FIRE

The warmth and comfort of a fire are great morale boosters, but its most important use will be for boiling water and preserving food. These must take priority in the use of fuel.

Blocked fireplaces should be opened up again and chimneys checked for obstructions. If they are not clear there is considerable risk of setting fire to the chimneys themselves and thus to the house.

TO CLEAR A CHIMNEY

Tie a holly bush or a similar shrub to a long rope and from the rooftop lower the rope down the chimney (a stone tied on the end will ensure it drops). Now pull down the holly bush and it will clear the chimney.

IMPROVISED FIREPLACES

Where there are no fireplaces metal containers, metal dustbins lids and central heating radiators can all be used to light a fire on. In flats with concrete floors a fire could be lit directly on the floor. If you have a barbecue stand make good use of it. Never leave a fire indoors unattended. Even one in a proper grate should be allowed to die down for the night, if no one is going to stay up to watch it.

FUEL

Start with garden furniture, trees, shrubs, bean sticks, swings, ladders, tool handles. When these run out start on furnishings. Carpets, curtains and cushions will all burn. Cardboard, books and rolled up newspapers will also give off a surprising amount of heat. All kinds of vehicle fuel can also be burned as well as the conventional heating and lighting oils.

** WARNING

Many modern fabrics and furnishings, especially PVC and foam-block furniture, produce poisonous gases when burned. If burning these items make a fireplace in the garden or, if forced to burn them in a flat, make the fire near an open window. Cover the face with a damp cloth when you need to go near the fire to tend to it and things being heated on it.
****

FOOD

0. Check on all the food in the house and ration it immediately. 0. Use the perishable foods first. Fatty foods are the first to deteriorate and canned foods the last.
0. Remember that, once electric power fails, the refrigerator and freezer cease to function -- though they may take some time to defrost, if you open their doors as seldom and briefly as possible. 0. Boil milk and it will keep longer.
0. Boil eggs or coat them in a layer of fat -- if you have izinglass (a traditional method of preserving fresh eggs) simply immerse them in it.
0. Cook meat, wrap it in cloth and bury it in the earth. Cook pork first (which has the highest fat content), then lamb, then beef (which is the best meat to preserve).
0. Once meat has been cooked and allowed to cool, do NOT reheat it or you may risk food-poisoning.
0. You can only cook so much at a time, so leave the rest in the refrigerator or freezer while they are still cool places.

FOOD FROM THE GARDEN

The vegetables with four petals, including all the brassicas, from wallflowers to cabbages are edible. Hollyhocks, though not very tasty, are nutritious. Worms, slugs and snails are also edible. AVOID bulbs such as daffodils, tulips and aconites which are all poisonous.

FURTHER AFIELD

Explore parks and open spaces for other vegetation and for hunting and trapping wildlife. Birdlife in cities -- especially pigeons and starlings, will often fill the plate, especially if you bait snares and nets. (See Traps and snares in Food.)

CLOSER TO HOME

Beware of houseplants -- some of them are poisonous, especially the diefenbachia and philodendron -- though orchids are good to eat. If food is short there will be none to spare for pets and you CANNOT afford to be squeamish. If the aquarium water has to be drunk don't waste the fish. In fact they'll probably be the easiest to eat even if you don't need the water. The cat is next in the pot. Once dressed it will be hard to distinguish from rabbit. Gerbils, hamsters, rabbits, budgerigars and parrots can all be added to the diet and, unless the dog is an exceptionally good hunter, it should go too.

PRESERVING FOOD

For methods of smoking, salting and making pickles and chutneys see Food Preservation in Food.

When the fridge no longer functions remove the motor, cut a hole in the bottom, place it on some stones or bricks and with a fire beneath use it as a smoke-house.

SHELTER

The first priorities will be a sound roof over your head and a stable structure. Clear any debris and ensure that there is nothing which could still collapse or fall from above and cause injury. Use slates, tiles and bricks from other buildings to ensure that at least one building is sound.

IN COLD WEATHER

Conserve resources by living in one room, choosing a ground floor room with a southern aspect (if you live in the Northern Hemisphere). Block all drafts and avoid opening the door unnecessarily. If there is a fire burning, make sure that there is adequate ventilation to avoid asphyxiation or carbon monoxide poisoning. Wear warm clothing to help conserve fuel. The more people in the room, the higher the temperature. Rest and keep physical exertion to a minimum.

IN VERY WARM WEATHER

Use upstairs accommodation and spread out. Open windows on the downstairs windward side and open all windows on the lee side upstairs. Leave all the doors open and a cool breeze will blow through the house. Rest during the day and do any necessary work at night.

MOVING

If the house proves beyond repair, or other pressures force you to evacuate, take essential items -- food, blankets, tools, medical supplies, containers for water and materials suitable for shelter construction -- if they are not likely to be available. Use a pram or a shopping trolley as transportation. Either find an empty house or building, or prepare to set up camp elsewhere.

HYGIENE

Sanitation is very important during the aftermath of any disaster. Open sewers, contaminated water and the build up of rubbish all help to cause and spread disease. Germs carried by rats, fleas and other insects, rapidly multiply. All kinds of waste should be carefully disposed of and all the procedures described (see Hygiene in Camp craft) should be adapted to the doorstep situation.

EXCRETA

Urine is sterile but if large amounts accumulate they smell and attract flies. Use the 'desert rose' urinal, of the kind described in Camp craft. Keep the tube covered. If not used directly, pour all collected urine down the tube.

Build a latrine (again see Camp craft), far enough from the house not to be smelt but near enough to be handy for 'emergencies' -- there will be many such emergencies in a survival situation. A box with a hole cut in the base can be used as a thunder box. After use, if there is water available, wash yourself rather than using toilet paper. Wash the hands thoroughly afterwards.

Fit a lid to your thunder box, pile earth around the bottom and then you will contain the smells and keep out flies.

Move all muck with a shovel and avoid hand contact.

ANIMALS

Animals pick up diseases which can be transmitted to humans. If you handle animals, make sure you have no breaks in the skin -- or wear gloves. Infection can enter through the smallest of cuts. Cook all meat thoroughly.

KITCHEN WASTE

All biodegradable waste should be stacked in a corner of the garden and composted to enrich the soil. Compost heaps are also a great source of worms, which will add protein to your diet. However, there should not be much kitchen waste. Do NOT peel potatoes,-- much of their food value is in the skin. The outer leaves of cabbages which you once discarded, will be edible if you cut them up small.

Non-biodegradable waste -- cans and plastics that are not useful in some way -- should be burned, flattened and buried. This stops them attracting flies. In warm climates burn ALL waste. Put all the ashes in a pit.

** FOOD DISEASES

Salmonella and shigella are diseases transmitted through the oral- anal route, by contaminated hands.

Sores on hands can be a source of entry for staphylococcal food- poisoning with severe stomach pains, diarrhoea and dehydration. Clostridium botulinum, is a frequently fatal bacillus, which can be produced when canning at home if the temperatures are not high enough - it grows only when oxygen is excluded. There is no reliable way of determining whether food is contaminated so TAKE GREAT CARE if you do your own preserving. A related bacillus causes tetanus.

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COMMUNICABLE DISEASES

Living in close-knit groups after a disaster increases the risk of passing on disease. Good personal hygiene -- as good as possible -- can reduce the threat. Isolation of patients with colds or fever is advisable.

Seal dressings and discharges in a polythene bag and burn immediately. Dispose of all feces and urine in the field latrine -- and regularly boil the container used for their disposal.

PERSONAL HYGIENE

Wash with sand if there is no water available. Don't June 10, 2001bite your nails -- however stressful conditions may be -- or put the fingers to the mouth. Don't pick scabs or sores and keep them covered. Change underclothes regularly and wash them (but don't use drinking water to do so).

SOME USEFUL HERBAL PREPARATIONS

Strawberry roots contain a descaler to clean teeth.
Delphinium seeds can be crushed to treat head lice.
Birch bark can be distilled to produce a tar oil which soothes skin complaints.
Lavender makes a decoction to clean the skin.
See also Natural medicine.

Nuclear War Survival Skills Ch. 18: Trans-Pacific Fallout Updated and Expanded 1987 Edition
Cresson H. Kearny With Foreword by Dr. Edward Teller http://www.oism.org/nwss

Ch. 18: Trans-Pacific Fallout

POTENTIAL DANGERS TO AMERICANS

Many strategists believe that if a nuclear war is fought in the next few decades it probably will not involve nuclear explosions on any of our 50 states. Perhaps the first nuclear war casualties in the United States will be caused by fallout from an overseas nuclear war in which our country is not a belligerent. As the number of nations with nuclear weapons increases - especially in the Middle East - this generally unrecognized danger to Americans will worsen. Trans-Pacific war fallout, carried to an America at peace by the prevailing west -to -east winds that blow around the world, could be several hundred times more dangerous to Americans than fallout from the worst possible overseas nuclear power reactor accident, and many times more dangerous than fallout from a very improbable U.S. nuclear power reactor accident as lethal as the disastrous Chernobyl accident was to Russians.

Fig. 1 is a map showing fallout from a single above ground Chinese nuclear test explosion ("a few hundred kilotons") on December 28, 1966. [nw151.jpg]

Fig. 1. The Fifth Chinese Nuclear Test was Detonated on Dec. 28, 1966. It "involved thermonuclear material," and, according to the AEC press release, was a nuclear test in the atmosphere at their test site near Lop Nor." As indicated above, by the end of Dec. 31, 1966 the leading edge of its fallout cloud extended as far east as the dotted line shown running from Arizona to the Great Lakes.

ORNL DWG. 73-4611 [nw151.jpg]

It produced fallout that by January 1, 1967 resulted in the fallout cloud covering most of the United States. This one Chinese explosion produced about 15 million curies of iodine-131 - roughly the same amount as the total release of iodine- 131 into the atmosphere from the Chernobyl nuclear power plant disaster. (The Lawrence Livermore National Laboratory's preliminary estimate is that 10-50 million curies of iodine- 131 were released during the several days of the Chernobyl disaster; in contrast, its estimate of the iodine- 131 released during the Three Mile Island nuclear power plant accident, the worst commercial nuclear power plant accident in American history, is about 20 curies.)

Fig. 1 is from an Oak Ridge National Laboratory report, Trans-Pacific Fallout and Protective Countermeasures (ORNL-4900), written by the author of this book in 1970, but not published until 1973. No classified information was used in any version of this report, that summarized findings of the unclassified Trans-Pacific Fallout Seminar funded by the U.S. Atomic Energy Commission. This seminar was attended by experts who came from several research organizations and deliberated at Oak Ridge National Laboratory for two days in March of 1970.

Later in 1970 a final draft of this report was submitted to Washington for approval before publication. It was promptly classified. Publication without censorship was not permitted until after it was declassified in its entirety in 1973. None of the recommendations in this pioneering report were acted upon, but many of them are given in this chapter.

The findings and conclusions of the above mentioned 1970 Oak Ridge National Laboratory Trans-Pacific Fallout Seminar, summarized in the 1973 report, were confirmed by a later, more comprehensive study, Assessment and Control of the Transoceanic Fallout Threat, by H. Lee and W. E. Strope (1974; 117 pages), Report EGU 2981 of Stanford Research Institute.

Fallout from the approximately 300 kiloton Chinese test explosion shown in Fig. 1 caused milk from cows that fed on pastures near Oak Ridge, Tennessee and elsewhere to be contaminated with radioiodine, although not with enough to be hazardous to health. However, this milk contamination (up to 900 picocuries of radioactive iodine per liter) and the measured dose rates from the gamma rays emitted from fallout particles deposited in different parts of the United States indicate that trans-Pacific fallout from even an overseas nuclear war in which "only" two or three hundred megatons would be exploded could result in tens of thousands of unprepared Americans suffering thyroid injury. Unprepared Americans do not have potassium iodide, the very effective prophylactic medication to prevent thyroid injury from radioiodine, and few could get it during the several days that it would take trans-Pacific war fallout to reach the United States. Fortunately, removal of even a cancerous thyroid rarely is fatal to people blessed with modern medical facilities.

Only about 7,500 Americans (people living within a few miles of a nuclear power plant in Tennessee) have been given prophylactic potassium iodide to keep in their homes. No government organization has advised even Americans living near other nuclear facilities to buy and keep any kind of prophylactic medicine to protect their thyroids in case of a peacetime nuclear accident. As expected, official warnings and advice to the public continue not even to mention preparations that individual Americans could make to protect themselves and their families against thyroid injury either from trans-Pacific war fallout deposited on an America at peace, or as a result of war fallout if our country is subjected to a nuclear attack.

The worst danger to Americans from trans- Pacific fallout from a large nuclear war would be the whole-body gamma radiation doses that millions would receive from fallout particles deposited on the ground, on streets, on and in buildings. Protective countermeasures would include both sheltering some pregnant women and small children living in "hot spot" areas of abnormally high rain-out of fallout, and evacuating others. Unless such unavoidably time-consuming and expensive countermeasures were taken, several thousand additional Americans might die from cancer in the following 20 or 30 years. The largest total doses would be received by people who would live normal unsheltered lives for the first month or so after fallout deposition, while the dose rates would be highest.

Several thousand additional cancer deaths would be extremely difficult to detect, if caused by whole-body gamma radiation from fallout deposited nationwide, with these scattered deaths occurring over the 20 or 30 years following a Trans-Pacific war fallout disaster. For during these same decades about 15 million Americans normally would die from cancers indistinguishable from those caused by wholebody radiation from war fallout deposited on an America at peace. An authoritative risk estimate of getting cancer from low doses of radiation is given in Report No. 77 (March 15, 1984) of the National Council on Radiation Protection and Measurement, "Exposures from the Uranium Series with Emphasis on Radon and Its Daughters": "The low dose model for total excess cancer mortality is one hundred cases per million people exposed to one rem uniform whole body radiation. This would make the overall risk of cancer to the average individual in the population about one in ten thousand per rem, i.e., if ten thousand persons are exposed to a dose of one rem (one thousand mrem), one excess fatal cancer would be expected within the lifetime of the group."

Many radiation specialists have concluded from studies of the effects of extremely low doses that the above and similar conservative estimates of excess cancer deaths overestimate the number of fatalities likely to result from low radiation doses, such as would be received by millions of Americans from trans-Pacific war fallout.

TO PROTECT YOURSELF AGAINST TRANS-PACIFIC FALLOUT, START BY REALIZING THAT:

The dangers from trans-Pacific war fallout have been increased by the continuing trend toward deployment of more accurate, smaller, more numerous nuclear weapons, because:

* A large nuclear explosion (half a megaton, or more) injects most of its fallout particles and gases into the stratosphere, above the tops of clouds and above the altitudes at which quite prompt removal of contaminants from the atmosphere by scavenging takes place. Very small particles in the stratosphere do not reach the ground before they are blown at least several thousand miles. Most of these tiny particles remain airborne for weeks to years, are very widely dispersed, and are blown around the world several to many times before being deposited. By then the radioactivity of iodine-131 (that has a half life of only a little more than 8 days) is so greatly reduced that it is not nearly as dangerous as is radioactive iodine deposited much sooner with the fallout from smaller weapons of several hundred kilotons,

or less, explosive power.

* Nuclear explosions smaller than about half a megaton (500 kilotons) inject all or most of their fallout to lower altitudes - within the troposphere, below the stratosphere. Most of such fallout is deposited during the radioactive cloud's first world-circling trip, when even quite rapidly decaying radioiodine still is dangerously radioactive. This greater danger from smaller nuclear weapons has been proved by numerous measurements of fallout from many nuclear test explosions, both foreign and American.

The dangers from trans-Pacific fallout produced by peacetime nuclear accidents are not nearly as serious as many Americans have been led to believe. For example, the Chernobyl nuclear power reactor accident injected as much radioactive iodine into the atmosphere as would the explosions of several kiloton-range nuclear weapons totaling perhaps as much as half a megaton in explosive power. But not nearly as much of the radioactivity caused by this reactor accident reached the United States as would reach us from several nuclear explosions in the same area, capable of injecting an equal amount of radioactivity into the atmosphere, because:

* The cloud from the steam explosion that blew off the roof and otherwise damaged the Chernobyl reactor building, may have risen quite soon to 20,000 feet or more and was partially blown eastward clear across Asia and the Pacific Ocean. However, the top of the radioactive smoke cloud over the Chernobyl power plant, that burned for days, rose only about 3,000 feet above the ground. As a result, much of the airborne Chernobyl radiation stayed at relatively low altitudes where scavenging (removal) of smoke and fallout particles and gasses is most effective and rapid, due to aggregation on cloud droplets, rain-out, and dry deposition. In contrast, almost all of the fallout particles and radioactive gasses from a nuclear explosion are injected much higher, to altitudes where scavenging is less effective; there, the generally prevailing west-to-east winds promptly start transporting very small particles and radioactive gasses (that originate in the mid- latitudes of the northern hemisphere) around the world.

* Variable winds for days carried much of the Chernobyl radioactive material northward to Scandinavian countries, then westward and southward to other European countries. The resultant wide dispersal of this fallout allowed time for both scavenging and radioactive decay before a small fraction of these invisible radioactive clouds rose and also were blown eastward by the prevailing high-altitude winds. These west winds carried an extremely small fraction of the radioactive emissions from the burning Chernobyl plant clear across Asia and the Pacific to America.

The media habitually exaggerate dangers from nuclear accidents, and exploited the Chernobyl disaster. For example, when Dr. Robert Gale, the leading bone marrow transplant specialist who helped save a few Chernobyl victims, first returned from Russia, an Associated Press article quoted him as saying: "I think we can say there are at least 50,000 to 100,000 people who have had some dose of radiation which might be of long-term concern.

There will, unfortunately, be additional casualties. We hope the number will be small." The Rocky Mountain News headlined" 100,000 SOVIETS TO SUFFER FROM RADIATION, DOCTOR SAYS". Mary McGrory, the syndicated liberal columnist, also misinterpreted Dr. Gale's risk estimate and misinformed her readers by writing: "He [Dr. Gale] estimated that there could be 100,000 cases of radiation sickness . Such dramatic news items give the impression that 100,000 Russians - not just a small fraction of that number - are likely to suffer sickness or death from the Chernobyl radiation. So additional typical Americans, reading misinformation of this type and knowing very little about statistical evaluations of risks based on probabilities, have had their worst nuclear fears strengthened.

The public's exaggerated fears of extremely small amounts of radiation also are worsened by the media's use without explanations of very small units of radiation measurement, including the picocurie. (The picocurie is used to express the radioactive contamination of milk, water, etc., and is only one millionth of a millionth [1/1,000,000,000,000] of a curie.) One episode in which fears of radiation were thus worsened occurred shortly after the invisible fallout cloud from the Chernobyl disaster first reached the United States. Some listeners were frightened when a radio announcer merely stated that milk samples in northwest Oregon showed 118 picocuries per liter of radioactive iodine. Few Americans know that they will not be advised to stop using fresh milk unless its contamination is 15,000 picocuries or more per liter - as specified in the Food and Drug Administration's official, very cautious "Protective Action Guidance", published in the Federal Register of October 22, 1982.

The maximum measured radioactive contamination of milk in the United States by iodine-131 from the Chernobyl disaster was in milk produced by cows grazing on pasture in Washington: 560 picocuries per liter. The much greater potential danger from trans-Pacific war fallout is brought out by the fact that the approximately 300-kiloton Chinese test explosion of December 28, 1966 resulted in worse iodine- 131 contamination of milk produced by a cow grazing on pasture near Oak Ridge, Tennessee: 900 picocuries per liter. Even asmall overseas nuclear war with only 20 or so kiloton-range nuclear explosions could cause high enough contamination of milk to result in the Government's warning Americans to refrain from using fresh milk. Most Americans would heed this warning and would not drink or otherwise use fresh milk for weeks. In addition, a small overseas nuclear war possibly would cause a few American casualties years to decades later.

TWO SUMMARY CONCLUSIONS

1. Trans-Pacific war fallout deposited on an America at peace surely would be a disaster, but not an overwhelming one. The economic and psychological impact probably would be more damaging than the losses of health and life.

2. Prudent individuals should make preparations to enable them to use the low cost protective countermeasures described in this book, especially those in Chapter 13. Some of the most effective countermeasures, such as getting enough prophylactic potassium iodide to prevent thyroid damage even if war fallout dangers from explosions in the United States or overseas were to continue for a couple of months, cannot be accomplished after even an overseas nuclear war begins.

Nuclear War Survival Skills by Cresson Kearny

Ch. 2: Warnings and Communications

TYPES OF WARNINGS

Warnings are of two types, strategic and tactical.

Strategic warning is based on observed enemy actions that are believed to be preparations for an attack. For example, we would have strategic warning if powerful Russian armies were advancing into western Europe and Soviet leaders were threatening massive nuclear destruction if the resisting nations should begin to use tactical nuclear weapons. With strategic warning being given by news broadcasts and newspapers over a period of days, Americans in areas that are probably targeted would have time to evacuate. Given a day or more of warning, tens of millions of us could build or improve shelters and in other ways improve our chances of surviving the feared attack. By doing so, we also would help decrease the risk of attack. Tactical warning of a nuclear attack on the United States 'would be received by our highest officials a few minutes after missiles or other nuclear weapons had been launched against our country. Radar, satellites and other sophisticated means of detection would begin to feed information into our military warning systems almost at once. This raw information would have to be evaluated, and top- level decisions would have to be made. Then attack warnings would have to be transmitted down to communities all over America. Tactical warning (attack warning) of an out-of- the-blue, Pearl-Harbor-type attack would be less likely to be received by the average American than would an attack warning given after recognized strategic warning. However, the short time (only 15 to 40 minutes) that would elapse between missile launchings and the resultant first explosions on targets in the United States would make it difficult for even an excellent warning system to alert the majority of Americans in time for them to reach the best available nearby shelter.

Strengths and weaknesses of the present official warning system are summarized in the following two sections. Then the life-saving warnings that the first nuclear explosions would give, especially to informed people, are described.

WARNINGS GIVEN BY THE ATTACK ITSELF

The great majority of Americans would not be injured by the first explosions of a nuclear attack. In an all-out attack, the early explosions would give sufficient warning for most people to reach nearby shelter in time. Fifteen minutes or more before big intercontinental ballistic missiles (ICBMs) blasted our cities, missile sites, and other extensive areas, most citizens would see the sky lit up to an astounding brightness, would hear the thunderous sounds of distant explosions, or would note the sudden outage of electric power and most communications. These reliable attack warnings would result from the explosion of submarine-launched ballistic missiles (SLBMs). These are smaller than many ICBMs. The SLBM warheads would explode on Strategic Air Command bases and on many civilian airport runways that are long enough to be used by our big bombers. Some naval bases and high-priority military command and communication centers would also be targeted. The vast majority of Americans do not know how to use these warnings from explosions to help them save their lives. Neither are they informed about the probable strategies of an enemy nuclear attack.

One of the first objectives of a coordinated enemy attack would be to destroy our long-range bombers, because each surviving U.S. bomber would be one of our most deadly retaliatory weapons. Once bombers are airborne and well away from their runways, they arc difficult to destroy. To destroy our bombers before they could get away, the first SLBMs would be launched at the same time that ICBMs would be fired from their silos in Europe and Asia. U.S. surveillance systems would detect launchings and transmit warnings within a very few minutes. Since some enemy submarines would be only a few hundred miles from their targets, some SLBMs would explode on American targets about 15 or 20 minutes before the first ICBMs would hit.

Some SLBMs would strike civilian airport runways that are at least 7000 Ft long. This is the minimum length required by B-52s; there were 210 such runways in the U.S. in 1977. During a crisis, big bombers would be dispersed to many of these long runways, and enemy SLBMs would be likely to target and hit these runways in an effort to destroy the maximum number of bombers. Today most Soviet SLBMs have warheadsbetween 100 kilotons and one megaton.See Jane's Weapon Systems, 1987-88. Within 10 to 15 minutes of the beginning of an attack, runways 7000 feet or longer are likely to be hit by airbursts, to destroy U.S. aircraft and airport facilities. Later cratering explosions may be used to destroy surviving long runways, or at least to produce local fallout so heavy that they could not be used for several days for rearming and refueling our bombers. Therefore, homes within about 4 miles of a runway at least 7000 ft long are likely to be destroyed before residents receive warning or have time to reach blast shelters away from their homes. Homes six miles away could be lightly damaged by such a warhead, with the blast wave from a 1-megaton explosion arriving about 22 seconds after the warning light. Some windows would be broken 40 miles away. But the large majority of citizens would not be injured by these early SLBM attacks. These explosions would be life-saving "take cover warnings to most Americans, if they have been properly informed.

Sudden power and communications failures caused by the electromagnetic pulse (EM P) effects of nuclear explosions also could serve as attack warnings in extensive areas. An EMP is an intense burst of radio- frequency radiation generated by a nuclear explosion. The strong, quick-rising surges of electric current induced by EMP in power transmission lines and long antennas could burn out most unprotected electrical and electronic equipment. Also likely to be damaged or destroyed would be unprotected computers. The solid state electrical components of some aircraft and of some motors of modern autos, trucks, and tractors may be put out of commission. Metal bodies give some protection, whereas plastic bodies give little.

The usual means of protecting electrical equipment against surges of current produced by lightning are generally ineffective against EMP. The protective measures are known, but to date all too few civilian installations have been protected against EMP effects. Three or four nuclear weapons skillfully spaced and detonated at high altitudes over the United States would produce EMP effects that might knock out most public power, most radio and TV broadcasting stations lacking special protection against these effects, and most radios connected to long antennas. Nuclear explosions on or near the ground may produce damaging EMP effects over areas somewhat larger than those in which such equipment and buildings would be damaged by the blast effects.

HOW TO RESPOND TO UNEXPECTED ATTACK WARNINGS

Although a Pearl-Harbor-type of attack is unlikely, citizens should be prepared to respond effectively to unexpected warnings.

These warnings include:

Extremely bright lights -more light than has been seen before. The dazzling, bright lights of the first SLBM explosions on targets in many parts of the United States would be seen by most Americans. One should not look to determine the source of light and heat, because there is danger of the viewer's eyes being damaged by the heat and light from a large explosion at distances as far as a hundred miles away, in clear weather. Look down and away from the probable source, and quickly get behind anything that will shield you from most of the thermal pulse's burning heat and intense light. A thermal pulse delivers its heat and light for several seconds- for more than 11 seconds if it is from a 1 -megaton surface burst and for approximately 44 seconds if from a 20- megaton surface burst.

If you are at home when you see the amazingly bright light, run out of rooms with windows. Hurry to a windowless hallway or down into the basement. If you have a shelter close to your house, but separate from it, do not leave the best cover in your home to run outdoors to reach the shelter; wait until about two minutes after first seeing the light.

If outdoors when you see the bright light, get behind the best available cover.

It would be impossible to estimate the distance to an explosion from its light or appearance, so you should stay under cover for about two minutes. A blast wave initially travels much faster than the normal speed of sound (about 1 mile in 5 seconds). But by the time its overpressure has decreased to 1 pound per square inch (psi), a blast wave and its thunderous sound have slowed down and are moving only about 3% faster than the normal speed of sound.

If no blast or sound reaches you in two minutes, you would know that the explosion was over 25 miles away and you would not be hurt by blast effects, unless cut by shattered window glass. After two minutes you can safely leave the best cover in your home and get a radio. Turn the dial to the stations to which you normally listen and try to find information. Meanwhile, quickly make preparations to go to the best shelter you and your family can reach within IS minutes the probable time interval before the first ICBMs start to explode.

At no time after an attack begins should you look out of a window or stay near a window. Under certain atmospheric conditions, window's can be shattered by a multi-megaton explosion a hundred miles away. The sound of explosions. The thunderous booms of the initial SLBM explosions would be heard over almost all parts of the United States. Persons one hundred miles away from a nuclear explosion may receive their first warning by hearing it about 7-1/2 minutes later. Most would have time to reach nearby shelter before the ICBMs begin to explode.

Loss of electric power and communications. If the lights go out and you find that many radio and TV stations are suddenly off the air, continue to dial if you have a battery-powered radio, and try to find a station that is still broadcasting.

HOW TO RESPOND TO ATTACK WARNINGS DURING A WORSENING CRISIS If an attack takes place during a worsening crisis, the effectiveness of warnings would be greater. Even if our government did not order an evacuation of high-risk areas, millions of Americans would already have moved to safer areas if they had learned that the enemy's urban civilians were evacuating or that tactical nuclear weapons were being employed overseas. Many prudent citizens would sleep inside the best available shelter and stay in or near shelter most of their waking hours. Many people would have made or improved family car small-group shelters and would have supplied them with most essentials. The official warning systems would have been fully alerted and improved.

During such a tense crisis period, neighbors or people sheltered near each other should have someone listen to radio stations at all times of the day and night. If the situation worsened or an attack warning were broadcast, the listener could alert the others.

One disadvantage of waiting to build expedient shelters until there isa crisis is that many of the builders are likely to be outdoors improving their shelters when the first SLBMs are launched. The SLBM warheads may arrive so soon that the civilian warning systems cannot respond in time. To reduce the risk of being burned, persons working outdoors when expecting an attack should wear shirts, hats, and gloves. They should jump into a shelter or behind a nearby shielding object at the first warning, which may be the sudden cut-off of some radio broadcasts.

REMAINING INSIDE SHELTER

Curiosity and ignorance probably will cause many people to come out of shelters a few hours after an attack warning, if no blast or obvious fallout has endangered their area. This is dangerous, because several hours after almost all missiles have been launched the first enemy bombers may strike. Cities and other targets that have been spared because missiles malfunctioned or missed are likely to be destroyed by nuclear bombs dropped during the first several days after the first attack.

Most people should stay inside their shelters for at least two or three days, even if they are in a locality far from a probable target and even if fallout meter readings prove there is no dangerous fallout. Exceptions would include some of the people who would need to improve shelters or move to better shelters. Such persons could do so at relatively small risk during the interval between the ICBM explosions and the arrival of enemy bombers and; or the start of fallout deposition a few hours, later.

Fallout would cover most of the United States within 12 hours after a massive attack. People could rarely depend on information received from distant radio stations regarding changing fallout dangers and advising when and for how long they could go outside their shelters. Weather conditions such as wind speed would cause fallout dangers to vary with distance. If not forced by thirst or hunger to leave shelter, they should depend on their own fallout meter readings or on radiation measurements made by neighbors or local civil defense workers.

HOW TO MAKE A FALLOUT PILL.

http://www.ki4u.com/survive/doomsday.htm

You Will Survive Doomsday
By Bruce Beach
Copyright Information

 Our purpose in publishing this document is to ameliorate the effects of a nuclear holocaust for as many people as we can reach, and to locate as many people as we can who are willing and able to join our nuclear survival group.

MYTH #11: There is no such thing as a fallout pill.

There is a simple pill that would have prevented the difficulty. It is supplied in every nuclear emergency kit in Russia and available in Denmark and Sweden. Unfortunately it is not sold in North America. Fortunately, however, the pill is quite simple to make. Ahead of time, obtain a quantity of potassium iodide from your local drug store. Five dollars worth should be lots. When needed, take a regular glass and fill it a fourth or less full of water, and then slowly start pouring in the potassium iodide while thoroughly stirring the water. Don't worry about how much you pour in. You cannot pour in too much. After a while you will notice that the chemical no longer dissolves in the water. It just lies there on the bottom. This means that the water is saturated. You can now stop pouring in the chemical. More will not help or hurt.

Next take an eyedropper, or a soaked piece of paper if you do not have an eyedropper, and drop four drops onto a little piece of bread for an adult. Or two drops for a child. If you get several times that amount it is not going to harm you (although in much larger amounts it is a poison).

Now take some butter or margarine and make a little ball out of the bread and pop it down. Tastes awful. Ugh. Take once a day for 100 days after the last bomb falls. This is good stuff and you should have it around for reasons other than defense in case of a nuclear war. If you live anywhere within in a couple of hundred miles of a nuclear generating plant you might suddenly find yourself needing the stuff. The US department of Health rushed a supply of pills to Three Mile Island and they have a standard brochure all printed ready for distribution in case it or some similar site vents.

The department of defense also keeps a supply near the old Titan sites that are deteriorating and breaking down. [Author's update note: Once again those sites have been now decommissioned and no longer present a problem, but much greater concerns now arise from Terrorist Threat, and the U.S. Government is now stockpiling in many cities not only these pills but others for Bateriological and Chemical Threats]. Canadians have nothing. I'll take that back. They do have lots of nuclear plants and the distinct possibility of bombs exploding over their heads and on their soil.

The reason why the potassium iodide works is that the thyroid will absorb only so much iodine. After that, any iodine taken into the body is passed off by the kidneys. Since the body already has all the good stuff it wants it passes out the bad stuff. This is what we call thyroid blocking.

Do not try to use the tincture of iodine that you put onto cuts. Taken internally it will kill you. And you cannot eat enough iodized salt to do you any good. You would get salt poisoning long before you got sufficient iodine to do the job.

July 4th, 2002. I keep some books in the front of my truck, to read over in odd times. Looking in this one I found a good discussion about why we bought Iodine tablets, or take Modifilan tablets, that have iodine in them.

Nuclear War Survival Skills by Cresson Kearny

Ch. 13: Surviving Without Doctors

from book page 111 on --------

PREVENTION OF THYROID DAMAGE FROM RADIOACTIVE IODINES

There is no medicine that will effectively prevent nuclear radiations from damaging the human body cells that they strike. However, a salt of the elements potassium and iodine, taken orally even in very small quantities 1/2 hour to 1 day before radioactive iodines are swallowed or inhaled, prevents about 99% of the damage to the thyroid gland that otherwise would result. The thyroid gland readily absorbs both non-radioactive and radioactive iodine, and normally it retains much of this element in either or both forms. When ordinary,
non-radioactive iodine is made available in the blood for absorption by the thyroid gland

before any radioactive iodine is made available, the gland will absorb and retain so much that it becomes saturated with non-radioactive iodine. When saturated, the thyroid can absorb only about I% as much additional iodine, including radioactive forms that later may become available in the blood: then it is said to be blocked. (Excess iodine in the blood is rapidly eliminated by the action of the kidneys.)

An excess of ordinary iodine retained in the thyroid gland is harmless, but quite small amounts of radioactive iodine retained in the thyroid eventually will give such a large radiation dose to thyroid cells that abnormalities are likely to result. These would include loss of thyroid function, nodules in the thyroid, or thyroid cancer. Sixty-four Marshall Islanders on Rongelap Atoll were accidentally exposed to radioactive fallout produced by a large H-bomb test explosion on Bikini Atoll, about 100 miles away. Twenty-two of them developed thyroid abnormalities beginning nine years later.6 In the two days before they were taken out of the fallout area, these completely uninformed natives, living essentially outdoors, had received estimated whole- body gamma-ray doses of about 175 R from the fallout all around them. They absorbed most of the radioactive iodine retained by their thyroid glands as a result of eating and drinking fallout-contaminated food and water during their two days of exposure. (Because of unusual environmental conditions at the time of fallout deposition, some of the retained radioactive iodine may have come from the air they breathed.)

An extremely small and inexpensive daily dose of the preferred non-radioactive potassium salt, potassium iodide (KI), if taken 1/2 hour to 1 day before exposure to radioactive iodine, will reduce later absorption of radioactive iodine by the thyroid to only about 1% of what the absorption would be without this preventive measure. Extensive experimentation and study have led to the Federal Drug Administration's approval of 130-milligram (130- mg) tablets for this preventive (prophylactic) use only.36,37 A 130-mg dose provides the same daily amount of iodine as does each tablet that English authorities for years have placed in the hands of the police near nuclear power plants, for distribution to the surrounding population in the very unlikely event of a major nuclear accident. It is quite likely that a similar-sized dose is in the Russian "individual, standard first-aid packet." According to a comprehensive Soviet 1969 civil defense handbook,38 this first-aid packet contains "anti-radiation tablets and anti-vomiting tablets (potassium iodide and etaperain)."

Prophylactic use of potassium iodide in peacetime nuclear accidents.

When the Three Mile Island nuclear reactor accident was worsening and it appeared that the reactor's containment structure might rupture and release dangerous amounts of radioactive iodines and other radioactive material into the atmosphere, the Government rushed preparation of small bottles of a saturated solution of potassium iodide. The reactor's containment structure did not rupture.

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The 237,013 bottles of saturated KI solution that were delivered to Harrisburg, Pennsylvania-mostly too late to have been effective if the Three Mile Island accident had become an uncontained meltdown -were stored in secret in a warehouse, and were never used.

Since this famous 1979 accident, that injured no one, the Governors of the 50 states have been given the responsibility for protecting Americans against radioiodines by providing prophylactic potassium iodide. By May of 1986, only in Tennessee have Americans, other than some specialists, been given potassium iodide tablets; around one nuclear reactor some 7,500 residents have been given the officially approved KI tablets, to assure their having this protection if a nuclear accident occurs.

In April of 1982 the Bureau of Radiological Health and Bureau of Drugs, Food and Drug Administration, Department of Health and Human Services released "FINAL RECOMMENDATIONS, Potassium Iodide As A Thyroid- Blocking Agent In A Radiation Emergency: Recommendations On Use". These lengthy recommendations are summarized in the FDA's "mandated patient product insert". (See a complete copy in the following section.) This insert is packed with every bottle of non-prescription KI tablets sold. However, the lengthy FDA recommendations contain many facts not mentioned in this required insert, including the following: "Based on the FDA adverse reaction reports and an estimated 48 x 106 [48 million] 300-mg doses of potassium iodide administered each year [in the United States], the NCRP [National Council on Radiation Protection and Measurements] estimated an adverse reaction rate of from 1 in a million to 1 in 10 million doses." (Note that this extremely low adverse reaction rate is for doses over twice as large as the 130-mg prophylactic dose.)

FDA PATIENT INFORMATION USE OF 130-MG SCORED TABLETS OF POTASSIUM IODIDE FOR THYROID BLOCKING

(Potassium Iodide Tablets, U.S.P.)

(Pronounced poe-TASS-e-um EYE-oh-dyed)

(Abbreviated KI)

TAKE POTASSIUM IODIDE ONLY WHEN PUBLIC HEALTH OFFICIALS TELL YOU. IN A RADIATION EMERGENCY, RADIOACTIVE IODINE COULD BE RELEASED INTO THE AIR. POTASSIUM IODIDE (A FORM OF IODINE) CAN HELP PROTECT YOU.
IF YOU ARE TOLD TO TAKE THIS MEDICINE, TAKE IT ONE TIME EVERY 24 HOURS. DO NOT TAKE IT MORE OFTEN. MORE WILL NOT HELP YOU AND MAY INCREASE THE RISK OF SIDE EFFECTS. DO NOT TAKE THIS DRUG IF YOU KNOW YOU ARE ALLERGIC TO IODINE (SEE SIDE EFFECTS BELOW).

INDICATIONS

THYROID BLOCKING IN A RADIATION EMERGENCY ONLY

DIRECTIONS FOR USE

Use only as directed by State or local public health authorities in the event of a radiation emergency.

DOSE

ADULTS AND CHILDREN ONE YEAR OF AGE OR

OLDER: One (1) tablet once a day. Crush for small children.
BABIES UNDER ONE YEAR OF AGE: One-half (1/2) tablet once a day. Crush first.

DOSAGE: Take for 10 days unless directed otherwise by State or local public health authorities.

Store at controlled room temperature between 150 and 300C (59 degrees to 86 degrees F). Keep bottle tightly closed and protect from light.
WARNING

POTASSIUM IODIDE SHOULD NOT BE USED BY PEOPLE ALLERGIC TO IODIDE. Keep out of the reach of children. In case of overdose or allergic reaction, contact a physician or public health authority.

DESCRIPTION

Each Tablet contains 130 mg. of potassium iodide.

HOW POTASSIUM IODIDE WORKS

Certain forms of iodine help your thyroid gland work right. Most people get the iodine they need from foods like iodized salt or fish. The thyroid can "store" or hold only a certain amount of iodine.
In a radiation emergency, radioactive iodine may be released in the air. This material may be breathed or swallowed. It may enter the thyroid gland and damage it. The damage would probably not show itself for years. Children are most likely to have thyroid damage.
If you take potassium iodide, it will fill up your thyroid gland. This reduces the chance that harmful radioactive iodine will enter the thyroid gland.

WHO SHOULD NOT TAKE POTASSIUM IODIDE

The only people who should not take potassium iodide are people who know they are allergic to iodide. You may take potassium iodide even if you are taking medicines for a thyroid problem (for example, a thyroid hormone or anti-thyroid drug). Pregnant and nursing women and babies and children may also take this drug.

HOW AND WHEN TO TAKE POTASSIUM IODIDE

Potassium iodide should be taken as soon as possible after public health officials tell you. You should take one dose every 24 hours. More will not help you because the thyroid can "hold" only limited amounts of iodine. Larger doses will increase the risk of side effects. You will probably be told not to take the drug for more than 10 days.

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SIDE EFFECTS

Usually, side effects of potassium iodide happen when people take higher doses for a long time. You should be careful not to take more than the recommended dose or take it for longer than you are told. Side effects are unlikely because of the low dose and the short time you will be taking the drug.

Possible side effects include skin rashes, swelling of the salivary glands, and "iodism" (metallic taste, burning mouth and throat, sore teeth and gums, symptoms of a head cold, and sometimes stomach upset and diarrhea).

A few people have an allergic reaction with more serious symptoms. These could be fever and joint pains, or swelling of parts of the face and body and at times severe shortness of breath requiring immediate medical attention.

Taking iodide may rarely cause overactivity of the thyroid gland, underactivity of the thyroid gland, or enlargement of the thyroid gland (goiter).

WHAT TO DO IF SIDE EFFECTS OCCUR

If the side effects are severe or if you have an allergic reaction, stop taking potassium iodide. Then, if possible, call a doctor or public health authority for instructions.

HOW SUPPLIED

Tablets (Potassium Iodide Tablets, U.S.P.): bottles of [number of tablets in a bottle] tablets

( ). Each white, round, scored tablet contains 130 mg. potassium iodide.

Note that this official FDA required insert given above prudently stresses the name, the pronunciation, and the chemical formula (KI) of these Government-approved 130-mg potassium iodide tablets. Perhaps this emphasized information will keep some alarmed Americans (misinformed in a future crisis by the media that typically stated during the Chernobyl nuclear accident that "iodine tablets" were being given to people endangered by radioactive iodine from the burning reactor) from getting and taking iodine tablets, widely sold for water purification, or tincture of iodine.

Strangely, neither in official information available to the general public on the prophylactic use of KI nor in the above-mentioned FDA "Final Recommendations" is any mention made of the much greater need for KI in a nuclear war-even for Americans during an overseas nuclear war in which the United States would not be a belligerent.
Also note that this official insert contains no instructions for giving a crushed KI tablet to infants and small children. Nor is there any mention of the fact that the KI under the tablet's coating is a more painful-tasting drug than any that most people ever have taken. This

omitted information is given in the next to last section of this chapter.

Protection against radioactive iodine in fallout from a nuclear war fought outside the United States.

Most strategists believe that a nuclear war fought by nations other than the United States is a more likely catastrophe than a nuclear attack on America. Several of the Soviet and Chinese nuclear test explosions have resulted in very light fallout deposition and some contamination of milk by radioactive iodine in many of the 50 states. However, serious contamination of milk, fruits, and vegetables could result if war fallout from many overseas nuclear explosions were carried to an America at peace. These potential dangers and effective countermeasures are included in Chapter 18, Trans-Pacific Fallout.
If a nuclear war were to be fought in northern parts of Asia, or in Europe, or in the Middle East, a very small fraction of the fallout would come to earth on parts or all of the United States.40 This fallout would not result in an overwhelming catastrophe to Americans, although the long-term health hazards would be serious by peacetime standards and the economic losses would be great.40 The dangers from radioactive iodine in milk produced by cows that ate fallout contaminated feeds or drank fallout contaminated water would be minimized if Americans did not consume dairy products for several weeks after the arrival of war fallout. Safe milk and other baby foods would be the only essential foods that soon would be in very short supply. The parents of babies and young children who had stored potassium iodide would be especially thankful they had made this very inexpensive preparation, that can give 99% effective protection to the thyroid. All members of families with a supply of potassium iodide could safely eat a normal diet long before those without it could do so.

The most dangerous type of radioactive iodine decays rapidly. At the end of each 8 day period it gives off only half as much radiation as at the start of that period. So at the end of 80 days it emits only about 111000 as much radiation per hour as at the beginning of these 80 days. Because of this rapid decay, a 100-day supply of potassium iodide should be sufficient if a nuclear war, either overseas or within the United States, were to last no more than a week or two.
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The probability of most Americans being supplied with prophylactic potassium iodide during a major nuclear disaster appears low. Under present regulations the decision concerning whether to stockpile and dispense potassium iodide tablets rests solely with each state's governor.41

Need for thyroid protection after a nuclear attack on the United States.

After a nuclear attack, very few of the survivors would be able to obtain potassium iodide or to get advice about when to start taking it or stop taking it. In areas of heavy fallout, some survivors without potassium iodide would receive radiation doses large enough to destroy thyroid function before modern medical treatments would again become available. Even those injuries to the thyroid that result in its complete failure to function cause few deaths in normal times, but under post-attack conditions thyroid damage would be much more hazardous.

Ways to obtain potassium iodide for prophylactic use.

* By prescription.

With a prescription from a doctor, a U.S.P. saturated solution of potassium iodide can be bought at many pharmacies today. (In a crisis, the present local supplies would be entirely inadequate.) The saturated solution contains a very small amount of a compound that prevents it from deteriorating significantly for a few years. It is best stored in a dark glass bottle with a solid, non-metallic cap that screws on liquid-tight. A separate medicine dropper should be kept in the same place. An authoritative publication36 of the National Committee on Radiation Protection and Measurements states: "Supplies of potassium iodide can be stored in a variety of places, including homes,..."

In 1990 the price of a 2-ounce bottle of U.S.P. saturated solution of potassium iodide, which is sold by prescription only, ranges from about $7.00 to $11.00 in Colorado. A 2-ounce bottle contains about 500 drops. Four drops provide the daily dose of 130 mg for adults and for children older than one year. For babies less than one year old, the daily dose of a saturated solution is two drops (65 mg). Thus approximately 99% effective protection against the subsequent uptake of radioactive iodine by the thyroid can be gotten by taking saturated potassium iodide solution. If bought by prescription, today the recommended daily dose costs 6 to 9 cents.

* Without prescription.

In 1990 the leading company selling 130-mg potassium iodide tablets without prescription and by mail order in the United States is Inc., P.O. Box 861, Cooper Station, New York, N.Y. 10276. Two bottles, each containing fourteen 130-mg potassium iodide tablets, cost $10.00. Thus the cost per 24-hour dose is 36 cents. To the best of my knowledge, the company in the U.S. that in July of 1990 is selling 130-mg KI tablets without prescription at the lowest price is Preparedness Products, 3855 South 500 West, Bldg. G, Salt Lake City, Utah 84115. This company sells 14 tablets, in a brown, screw-cap glass bottle, for $3.50, postpaid, including shipping charges. For three or more bottles, the price is $2.50 per bottle.

After the disastrous Russian nuclear power reactor accident at Chernobyl in May of 1986, pharmacies in Sweden soon sold all of their 130- mg potassium iodide tablets and Poland limited its inadequate supplies of prophylactic iodide salts to the protection of children. In California, pharmacists reported abnormally large sales of iodine tablets, and also of tincture of iodine- apparently due to the buyers' having been misinformed by the media's reports that Europeans were taking "iodine" for protection.

Individuals can buy chemical reagent grade potassium iodide, that is purer than the pharmaceutical grade, from some chemical supply firms. No prescription or other authorization is necessary. In 1990 the least expensive source of which I am aware is

NASCO, 901 Jamesville Avenue, Fort Atkinson, Wisconsin 53538. The price for 100 grams (100,000 mg) in 1990 is $10.50, plus $2.00 to $4.00 for shipping costs. Thus the cost in 1990 for a 130-mg daily dose is less than 2 cents. NASCO sells 500 grams (500,000 mg-about one pound) for $35.50, plus $2.00 to $4.00 for shipping-making the cost per standard daily dose only one cent.

For years of storage, crystalline or granular potassium iodide is better than a saturated solution. Dry potassium iodide should be stored in a dark bottle with a gasketed, non-metallic cap that screws on tightly. Two-fluid-ounce bottles, filled with dry potassium iodide as described below, are good sizes for a family. Separate medicine droppers should be kept with stored bottles.

Thus at low cost you can buy and store enough potassium iodide for your family and large numbers of your friends and neighbors- as I did years ago.

Practical expedient ways to prepare and take daily prophylactic doses of a saturated solution of potassium iodide.

To prepare a saturated solution of potassium iodide, fill a bottle about 60% full of crystalline or granular potassium iodide. (A 2-fluid-ounce bottle, made of dark glass and having a solid, non-metallic, screwcap top, is a good size for a family.

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About 2 ounces of crystalline or granular potassium iodide is needed to fill a 2-fluid-ounce bottle about 60% full.) Next, pour safe, room-temperature water into the bottle until it is about 90% full. Then close the bottle tightly and shake it vigorously for at least 2 minutes. Some of the solid potassium iodide should remain permanently undissolved at the bottom of the bottle; this is proof that the solution is saturated.

Experiments with a variety of ordinary household medicine droppers determined that 1 drop of a saturated solution of potassium iodide contains from 28 to 36 mg of potassium iodide. The recommended expedient daily doses of a saturated solution (approximately 130 mg for adults and children older than one year, and 65 mg for babies younger than one year) are as follows:

* For adults and children older than one year, 4 drops of a saturated solution of potassium iodide each 24 hours.

* For babies younger than one year, 2 drops of a saturated solution of potassium iodide each 24 hours.

Potassium iodide has a painfully bad taste, so bad that a single crystal or 1 drop of the saturated solution in a small child's mouth would make him cry. (A small child would be screaming in pain before he could eat enough granular or crystalline KI to make him sick. Some KI tablets are coated and tasteless.) Since many persons will not take a bad tasting medication, especially if no short-term health hazards are likely to result from not taking it, the following two methods of taking a saturated solution are recommended:

* Put 4 drops of the solution into a glass of milk or other beverage, stir, and drink quickly. Then drink some of the beverage with nothing added. If only water is available, use it in the same manner.
* If bread is available, place 4 drops of the solution on a small piece of it; dampen and mold it into a firm ball the size of a large pea, about 3A inch in diameter. There is almost no taste if this "pill" is swallowed quickly with water. (If the pill is coated with margarine, there is no taste.)

As stated before, 4 drops of the saturated solution provide a dose approximately equal to 130 mg of potassium iodide.

Preparing potassium iodide tablets to give to infants and small children.

The official FDA instructions for using KI tablets state that one half of a 130-mg tablet, "first crushed", should be given every 24 hours to "babies under one year of age", and that a whole tablet should be crushed "for small children."

Putting even a small fraction of a crushed or pulverized potassium iodide tablet on one's tongue is a startling experience, with a burning sensation. A slightly burnt sensation continues for hours. Therefore, a mother is advised to make this experiment where her children cannot see her.

To eliminate the painfully bad taste of a crushed or pulverized KI tablet, first pulverize it thoroughly. Next stir it for a minute into at least 2 ounces of milk, orange juice, or cold drink, to make sure that the KI (a salt) is completely dissolved. Then the taste is not objectionable. If only water is available, stir the pulverized tablet into more than 2 ounces of water.

KI is a corrosive salt, more injurious than aspirin to tissue with which it is in direct contact. Some doctors advise taking KI tablets after meals, except when so doing would delay taking the initial dose during an emergency. All recognize that taking a dilute solution of KI is easier on the stomach than taking the same dose in tablet form. This may be a consequential consideration when taking KI for weeks during a prolonged nuclear war emergency.

WARNINGS

* Elemental (free) iodine is poisonous, except in the very small amounts in water disinfected with iodine tablets or a few drops of tincture of iodine. Furthermore, elemental iodine supplied by iodine tablets and released by tincture of iodine dropped into water is not effective as a blocking agent to prevent thyroid damage. If you do not have any potassium iodide, DO NOT TAKE IODINE TABLETS OR TINCTURE OF IODINE.

* DO NOT MAKE A FUTILE, HARMFUL ATTEMPT TO EAT ENOUGH IODIZED SALT TO RESULT IN THYROID BLOCKING. Iodized salt contains potassium iodide, but in such a low concentration that it is impossible to eat enough iodized salt to be helpful as a blocking

agent.

OTHER WAYS TO PREVENT THYROID DAMAGE

Besides the prophylactic use of potassium iodide, the following are ways to prevent or reduce thyroid damage under peacetime or wartime conditions:

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* Do not drink or otherwise use fresh milk produced by cows that have consumed feed or water consequentially contaminated with fall- out or other radioactive material resulting from a peacetime accident or from nuclear explosions in a war.

* As a general rule, do not eat fresh vegetables until advised it is safe to do so. If under wartime conditions no official advice is obtainable, avoid eating fresh leafy vegetables that were growing or exposed at the time of fallout deposition; thoroughly wash all vegetables and fruits.

* If a dangerously radioactive air mass is being blown toward your area and is relatively small (as from some possible nuclear power facility accidents), and if there is time, an ordered evacuation of your area may make it unnecessary even to take potassium iodide.
* For protection against inhaled radioactive iodine, the FDA Final Recommendations (which are mentioned in the preceding section) state that the following measures "should be considered": "..sheltering [merely staying indoors can significantly reduce inhaled doses], evacuation, respiratory protection, and/or the use of stable iodide."
Research has been carried out in an effort to develop a thyroid protection procedure based on the ordinary iodine solutions which are used as disinfectants. Since iodine solutions such as tincture of iodine and povidone-iodine are dangerous poisons if taken orally, these experiments have utilized absorption through the skin after topical application on bare skin.

All reported experimental topical applications on human skin have given less thyroid protection than does proper oral administration of potassium iodide. Moreover, undesirable side effects of skin application can be serious. For these reasons researchers to date have not recommended a procedure for the use of ordinary iodine solutions for thyroid protection.

Potassium iodide, when obtained in the crystalline reagent form and used as recommended above on pages 114 and 115, is safe, inexpensive, and easy to administer. Prudent individuals should obtain and keep ready for use an adequate supply of potassium iodide well in advance of a crisis.

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What you don't hear about Nuclear War.

Excerpted from: Nuclear War Survival Skills, Cresson H. Kearny ISBN 0-942487-01-X
Book pages 12-20; EMPHASIS MINE

-- An all-out nuclear war between Russia and the United States would be the worst catastrophe in history, a tragedy so huge it is difficult to comprehend. Even so, it would be far from the end of human life on earth.

THE DANGERS FROM NUCLEAR WEAPONS HAVE BEEN DISTORTED AND EXAGGERATED,
for varied reasons. These exaggerations have become demoralizing myths, believed by millions of Americans. ....
-- While working with hundreds of Americans building expedient shelters and life-support equipment, I have found that

MANY PEOPLE AT FIRST SEE NO SENSE IN TALKING ABOUT DETAILS OF SURVIVAL SKILLS.

THOSE WHO HOLD EXAGGERATED BELIEFS ABOUT THE DANGERS FROM NUCLEAR WEAPONS MUST FIRST BE CONVINCED THAT NUCLEAR WAR WOULD NOT INEVITABLY BE THE END OF THEM AND EVERYTHING WORTHWHILE.

Only after they have begun to question the truth of these myths do they become interested, under normal peacetime conditions, in acquiring nuclear war survival skills. ....

-- Fortunately for all living things, the danger from fallout radiation lessens with time. The radioactive decay, as this lessening is called, is rapid at first, then gets slower and slower. The dose rate (the amount of radiation received per hour) decreases accordingly. ....

-- Within two weeks after an attack the occupants of most shelters could safely stop using them, or could work outside the shelters for an increasing number of hours each day. ....

-- As long as Soviet leaders are rational they will continue to give first priority to knocking out our weapons and other military assets that can damage Russia and kill Russians.

TO EXPLODE ENOUGH NUCLEAR WEAPONS OF ANY SIZE TO COMPLETELY DESTROY AMERICAN CITIES WOULD BE AN IRRATIONAL WASTE OF WARHEADS. The Soviets can make much better use of most of the warheads that would be required to completely destroy American cities;

THE MAJORITY OF THOSE WARHEADS PROBABLY ALREADY ARE TARGETED TO KNOCK OUT OUR RETALIATORY MISSILES BY BEING SURFACE BURST OR NEAR-SURFACE BURST ON THEIR HARDENED SILOS, LOCATED FAR FROM MOST CITIES AND DENSELY POPULATED AREAS. ....

-- STATEMENTS THAT THE U.S. AND THE SOVIET UNION HAVE THE POWER TO KILL THE WORLD'S POPULATION SEVERAL TIMES OVER ARE BASED ON MISLEADING CALCULATIONS.

One such calculation is to multiply the deaths produced per kiloton exploded over Hiroshima or Nagasaki by an estimate of the number of kilotons in either side's arsenal. (A kiloton explosion is one that produces the same amount of energy as does 1000 tons of TNT.)
THE UNSTATED ASSUMPTION IS THAT SOMEHOW THE WORLD'S POPULATION COULD BE GATHERED INTO CIRCULAR CROWDS, EACH A FEW MILES IN DIAMETER WITH A POPULATION DENSITY EQUAL TO DOWNTOWN HIROSHIMA OR NAGASAKI, AND THEN A SMALL (HIROSHIMA-SIZED) WEAPON WOULD BE EXPLODED OVER THE CENTER OF EACH CROWD.

Other misleading calculations are based on exaggerations of the dangers from long-lasting radiation and other harmful effects of a nuclear war. ....

UNSURVIVABLE "NUCLEAR WINTER" IS A DISCREDITED THEORY

that, since its conception in 1982, has been used to frighten additional millions into believing that trying to survive a nuclear war is a waste of effort and resources, and that only by ridding the world of almost all nuclear weapons do we have a chance of surviving. Non-propagandizing scientists recently have calculated that the climatic and other environmental effects of even an all-out nuclear war would be much less severe than the catastrophic effects repeatedly publicized by popular astronomer Carl Sagan and his fellow activist scientists, and by all the involved Soviet scientists. Conclusions reached from these recent, realistic calculations are summarized in an article, "Nuclear Winter Reappraised", featured in the 1986 summer issue of Foreign Affairs, the prestigious quarterly of the Council on Foreign Relations. The authors, Starley L. Thompson and Stephen H. Schneider, are atmospheric scientists with the National Center for Atmospheric Research.

THEY SHOWED "THAT ON SCIENTIFIC GROUNDS THE GLOBAL APOCALYPTIC CONCLUSIONS OF THE INITIAL NUCLEAR WINTER HYPOTHESIS CAN NOW BE RELEGATED TO A VANISHING LOW LEVEL OF PROBABILITY."

Their models indicate that in July (when the greatest temperature reductions would result) the average temperature in the United States would be reduced for a few days from about 70 degrees Fahrenheit to approximately 50 degrees.

These facts and general statements line up with the leading I have from the LORD. Paul

Nuclear War, NO Experts On, (Reality Check)

(Though Canadian, his writing still applies to us. Need to get into contact with this guy. - Paul)

You Will Survive Doomsday; By Bruce Beach
http://www.ki4u.com/survive/doomsday.htm

MYTH #21: YOU WILL RECEIVE ADEQUATE WARNING FROM YOUR GOVERNMENT.

The government at first proposed the individual family shelter plan. Then it abandoned it. Next it proposed the community shelter plan. Then it abandoned it. Then it proposed the relocation plan. Then it abandoned it. Presently it has no plan. Don't you feel abandoned?

The government has millions to spend for destruction but not a penny for defense. The EMO (Emergency Measures Organization) has been completely shut down. The Ontario government was allocated three berths in the Radiological Defense Officers course (for the summer of 1982) given by the Canadian Emergency Measures College at the Emergency Planning Canada Federal Study Center in Arnprior, Ontario, but it didn't feel it could afford to send anyone even after our group offered to pay expenses for three people. We appealed all the way up to the Solicitor General's office.

Admittedly, I am authorized to teach the course but during the last course that I taught at one of the community colleges (free gratis) I could not even get any resource personnel to come from Camp Borden, who are responsible for administering the examinations. I feel abandoned. A radiological detection kit that I used to be able to get for sixty dollars, in the US, now costs in Canada, with import duties (they really want you to have one), federal and provincial taxes, exchange rate, custom's brokerage, and you name it, $450. Who cares?

The last Radiological Scientific Officers Course taught in Canada was in 1977. No future courses are planned. There are no communities with a nuclear defense plan. I think I can make that an unqualified statement.

Millions for destruction and not a penny for defense. Your family's destruction bill for this year is $1,300 per member of your family. Do you realize what $1,000 a year for the last ten years would have bought you in the way of nuclear survival defense? Instead, your government has bought you destruction. Your family's destruction. Oh, I am well aware of the argument that our pile of bombs has maintained peace in the world for the last ten years, and the belief that it will continue to maintain peace. Believe it if you want to. All the high government officials have their shelters. Why do they need them if you don't? [Author's update note: Curiously, even the government's shelters for civil authorities have now been closed]. If the government knew today that the Russians were going to attack next week, do you think they would tell you? If they did, what would you and the millions like you do? It would only create panic and get in their way. No, I do not think that you would be told. Do you feel abandoned?

MYTH #22: YOU WILL RECEIVE NO WARNING, AND THERE IS NO HOPE IF YOU DO.

The fact the government may not warn you, and is not giving you any assistance to defend yourself does not mean that you haven't been warned. There are many people who feel they can see the signs of the times. Anyway, if you have read this document, consider yourself warned. You may still have time to prepare. If an attack should occur you probably do not live in a primary target area and will have plenty of time to escape. If you have made preparation.

MYTH #23: ONE OF THE PRIMARY TARGETS WILL BE NUCLEAR POWER PLANTS.

Many persons come up with all sorts of rationalizations as to why they should not prepare for survival. One is that there is a sufficient number of weapons in the world, that if they were all used, they could destroy the whole of mankind. This is true.

However, it may be that all the weapons will not be used. Some may be destroyed by the other side. Some may misfire. Others may just fail to get launched. This is why each side has so many extra. Moreover, many persons make the mistake of assuming that it is all in man's hands and determined by man's will. Whatever. It may be that some limited amount of the potential for destruction will be used.

Another rationalization often heard is that the person feels they live in a target area such as in the vicinity of a nuclear generating plant. In actuality the Russians have little need to target the nuclear generating plants and probably can do more damage by not doing so. A bomb on the plant would just blow it to smithereens and the material in the plant might add little to the radioactive fallout. On the other hand, as a result of the EMP, if the plant is left on its own when it loses its computer control it will go into a meltdown and add substantial radioactive material to the atmosphere.

All of this is quite speculative, of course. There are no experts on nuclear war. There is no one living who has been through one. There is general agreement that it will be awfully terrible. It will probably take six or seven months just to bury the bodies. But, there will probably be someone around to do it.

NUCLEAR WAR, POST ATTACK RADIATION, " DO NOT LAY ON THE GROUND" RULE
You Will Survive Doomsday; By Bruce Beach
http://www.ki4u.com/survive/doomsday.htm

MYTH #06: There would be no dangerous radioactivity after a couple of weeks.

There is a wide range of misconceptions about what is safe and what is not. The matter is sufficiently complicated that a person should have professional advice. However, if there was no doctor going to be available to set a broken leg I presume you would go ahead and do the best you could. And if one had to build a bridge to get across a river and there was no structural engineer around, again I presume one would have a go at it.

Doctor's would like to have their x-ray machines available when setting a leg, and engineers would like to have their surveying equipment, specification guides, and computers or slide rules when they are building a bridge. So you can well imagine a radiological defense officer would like to have radiation detection equipment available when giving advice in a radiation defense situation.

However, if the advise, expertise, or equipment, is not available, one must go on. One rule of thumb is that if there is not enough fallout that you can see it, then there is not enough of it that it will kill you. Fallout is usually small grain dust or grit, often having a light color, but not always. It depends upon its source. The best place to spot it is on a smooth surface, like the hood of a car. The more dense fallout is, probably the greater the hazard, although there isn't necessarily a direct correlation. It may fall thick enough that quite a little heap of it may be brushed up from a surface that is one foot square. It is possible to build, from common materials found around the home, an expedient radiation detection meter. The details for such a meter are found in books listed in the bibliography.

Even if one has commercially available radiation detection equipment there is still some considerable skill required in its use. For example, almost all survey equipment is designed to be used by an adult of normal stature. This means that if the equipment is held in the hand of a walking adult it will tell how much radiation is being received 3 1/2 feet above the ground, and particularly by the adults vital organs which are above that level. A child's or an infant's vital organs will be below that level and will be exposed to much more hazardous levels than an adult's. For this reason, if one is passing through an area that is suspected to have any radiation at all, a child should be carried on an adult's shoulders.

There is another rule of thumb that for every seven fold increase in time radioactivity will decrease by ten fold. This is called the seven/ten rule. This is based upon standard decay. It is useful as an example, for training, and in building theoretical models, but in actual practice the decay rate is likely to be something quite different. It is determined by the isotopic composition of the matter under consideration.

There is another commonly held misconception among semi-trained individuals that low levels of radiation cannot be rapidly fatal. Someone, after several days in the confines of a cramped expedient shelter, might conclude that because their meters now indicate a very low level of radioactivity (or perhaps no radioactivity if it is a high-range instrument), that it would now be all right to go outside and sleep on the ground in the cool breezes beneath the bright summer stars.

The fallacy again arises from taking measurements at a level that assumes the vital organs are well above the radiation source. This is not the case when a person is stretched out on the ground for long hours of sleep. These long hours of low level radiation exposure to the vital organs will result in a fatality in just a few days. Likewise, perfectly healthy adults who take infants out of the cramped, unpleasant, expedient shelter to allow them to play during the day on a blanket spread out on the ground will be quite shocked to see those infants sicken and die in just a few days while they themselves remain healthy. The infant's vital organs again being close to the weak radiation source for a long period while the adults' vital organs are being protected by distance.

Nuclear War, Sovereignty of God Over
(And here I thought this guy might not be a Christian. Wrong again!   -Paul.)

You Will Survive Doomsday; By Bruce Beach
http://www.ki4u.com/survive/doomsday.htm

MYTH #20: THE BOMBS TODAY ARE SO LARGE AND THERE ARE SO MANY THEY WILL DESTROY THE WORLD.

There are those who feel that the holocaust will destroy everything. And well it might, for there are certainly more than enough nuclear weapons in the world to achieve that end. "Except those days be shortened, none will survive, not even the very elect." But, if it is the Divine Will, those days will be shortened. There are those of us who feel that the Divine Hand is evidenced in the dealings of the world, every moment unto every moment.

The Divine happenings often seem quite natural. If one were to say unto a mountain, "Be thou removed and cast into the sea." and it should occur, another would say an earthquake just happened to happen right then. If the forces of nature should transpire so that in the midst of the holocaust the planet should suddenly tip on its side and place His sign (the Southern Cross) suddenly blazing in the sky above the heads of the people in the northern hemisphere, there are those who would only recognize the natural causes.

Such an event would certainly play heck with the astral, satellite based, and inertial, guidance systems upon which the individual and MIRVed warhead delivery systems depend.

Events would not even have to be as miraculous as I have described in order to limit Word War III. There is serious concern on the part of the military that they will not even be able to fight the war because of such factors as the EMP. However, I have faith in the military. I am sure they will do an admirable job of trying to destroy the world.

None of us have an infallible insight into the future or its timetable. Whatever will be, will be. We can but wait upon events to prove our speculations to be right or wrong. While we are working and waiting some of us put our trust in God. Others put it in the Government.

 Our purpose in publishing this document is to ameliorate the effects of a nuclear holocaust for as many people as we can reach, and to locate as many people as we can who are willing and able to join our nuclear survival group.

Nuclear War, Startling Article on Radiation, (Hormesis)
July 4th, 2002. On the very last page, after the index, after his book's discussion of all things relating to Nuclear War, from how to prepare, to building a shelter, to food and

survival, the author includes this startling article on exposure to radiation. Note reference to terrorists using nuclear weapons.

Nuclear War Survival Skills, Cresson M. Kearny
1999 Addendum on Hormesis

None of the copies of Nuclear War Survival Skills, including this UPDATED AND EXPANDED 1987 EDITION and other editions published before March 1999, have even mentioned hormesis. The hormesis concept states that low and high doses of an agent may have opposite effects. Although a high dose is harmful, a low dose may actually be beneficial, perhaps by stimulating the body's normal defense and repair mechanisms.

When I wrote the first edition of this book, which was first published in 1979, I knew about hormesis and believed it to be a valid explanation of a very important survival process. But I did not even mention hormesis. For I believed that if at the time I did so, then the chances of any U.S. Government organization advocating and using my book would be reduced to almost zero. The idea of any radiation being healthful was unthinkable even to the most well educated people.

I still believe I made the right decision for the years before the 1990s, when the collapse of the Soviet Union greatly reduced the risk of a massive nuclear attack on the United States and increased the chances of much smaller attacks, especially by terrorists with few nuclear weapons.

The facts proving the validity of hormesis are now overwhelming. Physicist T.D. Luckey's pioneering book, Radiation Honnesis, has become a recognized classic. And the studies of Bernard Cohen, Ph.D., and other scientists have unexpectedly revealed that Americans living in homes having "dangerous" radiation from radon and its daughter products have better health and live longer than comparable persons exposed to lower radiation levels. See Professor Cohen's irrefutable paper, "Test of the Linear-No Threshold Theory of Radon Carcinogenesis for Inhaled Radon Decay Products," Health Physics, 68 (1995), pp 157-174.

Those Americans who learn the facts about hormesis will be less likely to panic if subjected to light fallout from the explosion in the United States of a few nuclear weapons, or to become fearful if they learn that they are receiving larger than average radiation doses from radon and its daughter products in their homes.

The Emergency Plans Book

MEMORANDUM FOR:

THE SECRETARIES OF THE MILITARY DEPARTMENTS
THE ASSISTANT SECRETARIES OF DEFENSE THE GENERAL COUNSEL
THE ASSISTANTS TO THE SECRETARY OF DEFENSE
THE DIRECTOR, GUIDED MISSILES
THE CHAIRMAN, JOINT CHIEFS OF STAFF
THE CHIEF, ARMED FORCES SPECIAL WEAPONS PROJECT AND
THE DIRECTOR, NATIONAL SECURITY AGENCY

FROM: J.W. CLEAR OFFICE OF EMERGENCY PLANNING ACTING DIRECTOR 23

APRIL 1958
SECRET

SUBJECT: Revision of Emergency Plans Book

It is intended that the Emergency Plan Book (EPB) of the Department of Defense will be brought up to date as of 1 June 1958.

Addressees are requested: (a) to review sections of the Plan Book which pertain to emergency plans and actions over which they have cognizance; and (b) to submit on or before 23 May 1958, either an indication that no plans are necessary, or changes which are to be included in the proposed revision of the EPB.

The situation assumptions, planning information, actions, operational assignments and organization, and appendices, in Mobilization Plan C, approved 1 June 1957 for planning policy and guidance, will be used for purposes of reviewing Department of Defense plans and actions for the situations resulting from enemy attack on U.S. Forces outside the CONUS.

Attached for use in reviewing DOD emergency plans and actions to be implemented in the event of a direct attack on CONUS, is a copy of "Capability Assumptions" (Part I-A, pp.I-2), the "Situation Assumptions-The Attack" (Part I-C, pp. 27-29), and the "Situation Assumptions-Post Attack Analysis" (Part I-C, pp. 30-43) of ODM Mobilization Plan D Minus. These sections were noted by the NSC, at its 11 July 1957 meeting, as being suitable for defense mobilization planning for a surprise attack on the CONUS. They constitute the latest and only approved guidance to the departments and agencies on the D-Minus type situations.

PLAN D-MINUS MAY 1, 1957

PART I. PLANNING INFORMATION

A. CAPABILITY ASSUMPTIONS

CAPABILITY ASSUMPTIONS are statements of assumed capabilities of the USSR, known effects of atomic weapons and assumed advanced warning capabilities of our own forces. CAPABILITY ASSUMPTIONS are not statements of intent nor of what the USSR will do. They are statements designed to give uniform interpretation to the knowledge of various agencies engaged in defense mobilization planning. All CAPABILITY ASSUMPTIONS, as well as all other assumptions in Part I-Planning Information, are consistent with intelligence sources. It is within the range and scope of the CAPABILITY ASSUMPTIONS that SITUATION ASSUMPTIONS and POLICY ASSUMPTIONS have been developed.

1. The USSR is capable of:
a. Producing atomic weapons of varying yields ranging from a few kilotons (thousands of tons) to megatons (millions of tons) of TNT equivalent, biological and chemical agents, and incendiary and high- explosive weapons.

b. Delivering these weapons anywhere within the United States and upon U.S.-deployed forces and Allies by piloted aircraft, submarine launched missiles or mines or clandestine means.

c. Fusing these weapons for air or surface burst or for delayed action.

d. Employing propaganda, psychological warfare, and sabotage.
e. Supporting a large-scale war effort.

2. Warning Capabilities:

a. Weapons launched from submarines may arrive without warning. Likewise, weapons emplaced by clandestine means may be detonated without warning.

b. An air defense warning of an initial mass attack by manned aircraft can be received on the Canadian border and the Atlantic, Pacific and Gulf coasts from a few minutes to three hours before the aircraft reach those boundaries. Intelligence as to the probable time attacking aircraft will take to reach specific areas can be available to civil defense through the Attack Warning System.

c. Interior areas can have one to three hours additional warning between the time an air defense warning is received and the time when they are under attack from manned aircraft.

d. Strategic warning cannot be assured.

PART I. PLANNING INFORMATION

B. MILITARY EFFECTS [was not released]

C, SITUATION ASSUMPTIONS

SITUATION ASSUMPTIONS are statements describing a national condition and a condition of the international political and military environment, the existence of which would require immediate and forceful action by the U.S. Government. They are not forecasts of future events but describe for planning purposes a condition that could occur.

The situation described herein has resulted from the exercise of some of the capabilities of the USSR described in Section A, CAPABILITY ASSUMPTIONS, and the effects of atomic weapons described in Section B, WEAPONS EFFECTS.

1. THE ATTACK

1. The USSR has made attacks with large numbers of atomic weapons on the United States and on some of its territories, bases overseas, and its Allies. The domestic air defense warning yellow for the first attack was disseminated two hours before USSR aircraft appeared over U.S. frontiers. At the same time as the air defense warning yellow was announced, submarine launched missiles arrived and weapons emplaced by

clandestine means were detonated. However, the major weight of attack has been delivered by manned aircraft.

2. Air Defense operations in North America and overseas have destroyed a substantial portion of the attacking aircraft but half of those destroyed had reached the bomb release lines and had released their weapons. U.S. and Allied military operations have resulted in casualties and damage to the enemy at least as great as those received. Notwithstanding severe losses of military and civilian personnel and materiel, air operations against the enemy are continuing and our land and naval forces are heavily engaged. Both sides are making use of atomic weapons for tactical air support and in the land battle.

3. The USSR is expected to use its remaining capability to launch additional strategic air attacks and has considerable air power for tactical and air defense operations. The USSR submarine fleet is active in both the Atlantic and Pacific and serious losses to U.S. and Allied-controlled ocean shipping are being incurred. Intensive propaganda is being directed against the U.S. and its Allies. Clandestine activities and sabotage are being conducted.

4. Both on the North American continent and overseas, the major weight of the attacks appears to have been directed on U.S. and Allied military installations including atomic weapons delivery capabilities and facilities producing atomic weapons, coastal naval bases, concentrations of ground forces, and ports and airfields servicing international transportation. In addition, the District of Columbia and many population and industrial centers have been attacked. Due to actions of Air Defense Forces and to aiming and other errors of the attacking forces, many weapons resulted in random surface bursts.
5. The weapons employed range from a few kilotons TNT equivalent to several megatons. All of the weapons in the megaton range burst on the surface. The great majority of the weapons in the kiloton range were air bursts. Blast and thermal radiation damage extends from 5 miles to as much as 15 miles from ground zeros. Severe fire storms have occurred in heavily built-up cities and many rural fires were started involving growing crops and forests. The surface bursts have resulted in widespread radioactive fallout of such intensity that over substantial parts of the United States the taking of shelter for considerable periods of time is the only means of survival. Prior to assurance of safety anywhere on the surface, without shelter, radiological defense monitoring is essential.

6. The general level of casualties throughout the United States is extremely serious. In many localities it is catastrophic. The following is an estimate as of D-Plus-7 of casualties which have occurred or will occur as a result of the attacks:

(Millions) Killed and Injured, Fatally Injured

Recovery Total Possible

Blast and Thermal	12.5	12.5	25
Nuclear Radiation	12.5	12.5	25
Totals	25.0	25.0	50

Without thorough radiological defense monitoring and the application of adequate protective measures many more radiation injuries will occur from the cumulative effects of exposure to residual radiation and the consumption of contaminated foodstuffs and water

PART I. PLANNING INFORMATION

C. SITUATION ASSUMPTIONS

2. POST-ATTACK ANALYSIS

1. GENERAL. With human casualties exceeding material losses, ultimate recuperative potential to meet the requirements of the surviving population is high, providing this population can be adequately motivated. In spite of the magnitude of the catastrophe that has struck the nation and the possibility of additional, but lighter attacks, more than 100 million people and tremendous material resources remain. Restoration of the economy and our society will be possible and necessary. The speed with which restoration is accomplished will depend on governmental leadership and direction, maintenance of the confidence, and initiative of the people and the wisdom of the organization for utilization of remaining resources.
2. The attack has caused an almost complete paralysis in the functioning of the economic system in all of its aspects. For many years the size and shape of the economy will reflect these effects. There is an immediate severe impact on organized governmental activities, a fragmentation of society into local groups, a deterioration of our social standards, a breakdown in our system of exchange, and complete disruption of normal production processes. The functioning of the post-attack economy may depend chiefly on the rapidity and efficiency with which local and regional action can be organized to carry out broad national policies disseminated as widely as possible before attack and reiterated or expanded by any means immediately after attack. This would naturally include the maximum utilization of our remaining resources, among other things.
3. Consideration of the post-attack situation must be directed to two separate and distinct phases, although at some point in time these overlap and tend to merge. The first period might be described as predominantly the survival period; the second is predominantly the reconstruction period.

4. During the survival period the economy is operating in a highly disorganized manner. The utilized labor force is engaged in large numbers in disposing of the dead, taking care of surviving injured, decontaminating and cleaning up bombed areas, returning public works and utilities to operation, and other activities related to the direct and immediate effects of the attacks. After taking account of the armed forces requirements, the emergency government workers, and essential services, there are few workers left to produce goods. During the first three to six months there will be more capacity for the production of goods than workers to operate the facilities. The production of goods of any kind will be either of an emergency nature- -essential survival items are of a haphazard nature in isolated, not directly affected areas.

5. Protection of the whole population from the physiological effects of radioactive fallout is the most significant aspect of this period. Days, weeks and months must elapse before great areas are safe for continued occupancy. Many areas are of such importance that decontamination measures must be taken without waiting for radioactive delay.

6. The care of the surviving injured presents a major problem, calling for the coordination of all resources which can be used in this field. The provision of the necessary food, clothing, and lodging also call for concentrated efforts on all governmental levels. The main problem with respect to food and clothing is one of distribution, arranging to get the available supplies to the areas of greatest needs. The main problem with respect to lodging is directing people to where lodging is available. Action during this survival period must be directed principally toward steps to ensure survival of the remaining population and support of necessary military operations.

7. After the more pressing of the survival needs of the damaged economy have been met, the reconstruction period will start. There will be an overlap here; the latter period will start before the former ends and it will be impossible to state precisely when one starts and the other stops. Basic actions necessary for re- establishment of the economy, particularly as to the undamaged parts, will have to be taken, announced, or stimulated at the earliest possible moment of the post-attack effort; although some longer-term actions in that connection may not become wholly relevant until the secondary stage.

8. The reconstruction phase calls for actions of a different type than those used in the survival phase. In the survival phase, the concern is for the immediate needs of the people; in the reconstruction phase, the emphasis is on programs for the future needs of the nation. In the light of the damage, the remaining resources, and the overall national demands, it must be decided what programs must be started. During this period there will still be severe strains on resources, such as manpower, facilities, materials, and services. Programs for the maximum utilization of remaining resources must be devised.

9. GOVERNMENT. Governmental control is seriously jeopardized and central federal direction is virtually non-existent. Many of the highest government officials are casualties although the presidential office is functioning. Washington was so severely damaged that no operations there are possible. Token complements of personnel at the relocation centers for those governmental agencies that had them are inadequate to carry out essential functions. Some additional personnel who evacuated during the warning period or waited out the radiation hazard in adequate shelter will be available to augment the relocation complements where fallout conditions permit. Because of heavy fallout, none of the personnel at a few of the relocation sites survived. At several additional relocation sites almost all personnel are sick and many are dying. The same situation applies to the Regional Mobilization Committee headquarters. Communication and transportation between the relocation and regional centers are inadequate. In many areas, including several of the largest cities, where surviving injured outnumber the surviving uninjured active adults, the social fabric has ceased to exist in the pre-attack pattern. Confusion is widespread in these areas and customary control and direction are non- existent. These extreme conditions are most prevalent in the vicinity of the heavily damaged and contaminated areas.

10. HEALTH. Health resources, including physicians, nurses, and other manpower, hospitals and other medical care facilities, and health supplies and equipment, are in a critical state. This results both from the high concentration of these resources in the attacked areas, and from the unprecedented requirements for the surviving resources. Even with the most stringent selection of patients to be treated, rationing of supplies from the outset, and maximum support of industrial restoration, remaining supplies will be adequate

only for minimal needs.

11. From a pre-attack total of 1.6 million hospital beds,
approximately 100,000 are available for use at D-7. Where medical care is possible, most patients are being treated under improvised arrangements on the ground, in tents, in any available buildings-- utilizing civil defense emergency hospitals and other available hospitals and medical equipment.

12. The patient load requirements have essentially exhausted immediately available health and sanitation supplies in the affected areas. Much of the supplies remaining are either inaccessible or unusable because of radiological contamination or because of the disruption of transportation. The production potential for health supplies and equipment is almost completely inoperable for an extended period. Most of the plants which remain are seriously damaged or inactivated due to radioactive contamination and lack of skilled personnel.

13. The medical care requirements are overwhelming. In addition to 25,000,000 dead or dying, there are 25,000,000 surviving casualties who require emergency medical care. Of this number, one-half (12,500,000) are suffering from blast and thermal injuries and have an immediate and evident need for treatment. Of the 25,000,000 radiation casualties, 12,500,000 have received lethal dosages and have died or will die regardless of treatment. Of the 12,500,000 remaining one- half will require hospitalization at some time during the period from D-2 weeks to D-12 weeks, with the peak, 5,000,000 being reached between D-5 weeks and D-7 weeks. Some of this requirement for hospitalization can be met by facilities becoming available which were earlier unusable due to contamination and shortages of transportation and other services.

14. Inadequate provision for laboratory diagnostic aids has hampered the more accurate determination of degrees of radiation injury. Unless such determinations are made, many lives may be lost because treatment is being given to hopeless cases.

15. Besides the casualties resulting from the effects of attack-- blast, thermal, and nuclear radiation-there are 120 million surviving of which there is a daily census of 9 million (on the basis of a threefold increase over normal peacetime experience) requiring some type of medical care because of displacement of people, disruption of normal medical and sanitation services, pollution of food and water supplies, environmental exposure, physical and emotional stress, malnutrition and overcrowding. Included in the 9 million above, the numbers afflicted with communicable diseases are considered to be increasing rapidly among both the adult and the pre-adult populations. These diseases include typhoid fever, influenza, smallpox, diphtheria, tetanus, and diarrheal and streptococcal diseases. There are some reports of outbreaks of yellow fever and other tropical diseases in the South and of plague, cholera, and typhus in coastal cities. Reserve stocks of vaccines are being rapidly depleted or are inaccessible due to fallout, blast damage, or other reasons. Epidemics of certain of these and of other communicable diseases are anticipated.

16. FOOD. Many survivors will need to remain under cover and acute shortages will develop except in the available shelters that have been equipped by individuals or groups with adequate food and supplies. When decay of radioactivity permits movement of people out of shelters in the contaminated areas, it is important that food supplies be available

without delay. Salvable food stocks in the contaminated areas will particularly meet immediate needs since requirements have been reduced by heavy loss of life. To make up local deficiencies, additional food must be shipped into some areas. Ability to do this depends on adequacy of transportation and communication since food supplies in the nation as a whole are expected to be adequate for all essential civilian and military needs in this immediate post-attack period. Day to day production of essential food commodities must be maintained and, where necessary, restored, since existing food stocks cannot for long make up for loss of current production.

17. HOUSING AND COMMUNITY FACILITIES. The housing situation is critical. Fire and blast have either completely destroyed or rendered unrepairable significant portions of the housing supply. The situation is further complicated by fallout which has made much of the remaining housing unusable for varying lengths of time. In only very isolated situations is the housing inventory adequate to rehouse survivors from attacked areas. Extensive repair and restoration work on the remaining standing stock and emergency shelters are desperately needed. Voluntary and enforced billeting measures and utilization of non-residential structures are being effected.

18. Community facilities have been extremely hard hit. Blast damage has not only completely eliminated major water and sewer networks, but has at the same time dangerously impaired the function of water and sewer facilities in peripheral areas otherwise unaffected by blast and fire damage. Stopgap arrangements for providing potable water from local sources are in effect, but waste disposal is a serious health menace.

19. MONETARY AND CREDIT SYSTEMS. The monetary and credit systems have collapsed in damaged areas and are under severe pressure in those areas overrun with refugees and in the areas where evacuees are concentrated. In transactions occurring in these areas the price structure is rising sharply as to some essentials while collapsing as to other goods and services. Bartering, unorganized confiscation, and looting are in evidence and threaten further the restoration of any orderly degree of economic activity. Because of the interrelationship of the monetary and banking systems, personal and business financial transactions in undamaged areas threaten to reach a standstill.

20. DOMESTIC COMMERCIAL COMMUNICATIONS. Minimum nationwide telephone and telegraph facilities remain available to provide for the exchange of urgent communications except with those areas actually bombed and destroyed, and with those areas in which communications facilities have been sabotaged. The loss of commercial power sources together with a serious personnel problem created by loss of specialized manpower through casualties, sickness and confusion, the fear of fallout, and lack of food and water, seriously limits employing the remaining communication facilities to their full capacity. Consequently, there are long delays in placing all but the most urgent telephone calls as well as in the delivery of telegraph messages.

21. INTERNATIONAL COMMERCIAL COMMUNICATION. International radiotelegraph, radiotelephone, and cable control terminals located in gateway cities on the East and West coasts have been destroyed. Damage from sabotage has occurred at cable landing locations on both the East and West coasts and the cutting of the ocean telephone cable has severely reduced the submarine cable capacity for handling telegraph and telephone traffic to Atlantic, Hawaiian, and Alaskan points. Limited radiotelegraph and radiotelephone capacity remains, however, but is unreliable due to electronic jamming,

damage to facilities at overseas locations, sabotage efforts, and radiological contamination effects upon surviving technical and operating personnel. Air mail is being employed where available and practicable to supplement the reduced capabilities of the overseas communications network.

22. TRANSPORTATION. Severe disruption to transportation service exists in all attacked and contaminated areas. Within these areas there has been heavy damage to terminal, warehousing, servicing, and related facilities. Motor vehicles in non-attacked areas free of contamination, including those not previously engaged in common carrier service, are being mustered for use in support of disaster areas. Rail transportation is affected more seriously by disruption of lines and yards in attacked areas than by loss of rolling stock. Large quantities of rail and highway motive power and equipment were not damaged, making it possible to continue minimum essential traffic within those areas not duly affected by contamination and to restore principal lines to service as rapidly as radioactive decay or decontamination measures permit opening uncontaminated lines which bypass the physically damaged areas. However, reserve stocks of operating supplies and fuel for all forms of domestic transportation are being depleted at a faster rate than they are being replenished.

23. In major port areas there has been heavy damage to piers, warehousing, shipbuilding and repair yards, and related facilities. Damage to shore side cargo handling facilities has necessitated the use of alternate out loading ports and sites along the coasts and the limitation of shipments to the current capacity of those locations. Damage to reserve fleets has been minor, but reactivation is impeded by losses of repair yards, tugs, and manpower. The worldwide distribution of merchant shipping at sea and in foreign ports has left the major part of the active fleet intact, but ship losses are nevertheless serious in light of immediate and heavy requirements for shipping to support and reinforce overseas military operations. Neither ships nor convoy protection in the vulnerable coastwise sea- lanes can be provided for other than direct military support, except in cases of extreme necessity in priority higher than that of the military. Merchant shipping, therefore, cannot be counted on to supplement or replace inland domestic surface transportation to any substantial extent.

24. Domestic airlift capacity has been decreased substantially due to damage and destruction of airfields, airstrips and aircraft, lack of communications, manpower, repair parts, fuel, and maintenance facilities. The remaining aircraft are largely devoted to high-priority routes and highest-priority traffic under the air priority system and other controls. Trans-ocean airlift capacity is decreased substantially due to destruction of aircraft, damage to bases, circuitous rerouting and inadequate ground facility capability.

25. ELECTRIC POWER. Due, for the most part, to heavy damage to distribution lines and substations in bombed cities, sufficient electric power is not immediately available in the majority of the fringe areas and reception centers for evacuees. Most acute need for power in such areas is for refrigeration, hospital operation, community water systems, heating, and mass feeding. Small portable generators can meet only a fraction of these needs. Aggregate generating capacity of electric utilities operable following the attack is sufficient for minimal national needs; therefore, the power shortage will be alleviated in most areas as soon as transmission and distribution lines can be repaired, new lines strung, interconnections effected and communications restored. Restoration of electric service will be slower than in cases of natural disaster. Anticipated delays are due to several factors, including difficulty in transporting utility repair crews and material from undamaged areas to augment those in areas of need and denial of immediate access into fallout areas to make

repairs and to obtain stocks of materials and equipment, new or salvable. Where primary sources of steam-generated electric power have been destroyed, the power-consuming facilities (industrial plants, stores, homes, etc.) have, in large measure, likewise been destroyed. In most cases, where hydroelectric-generating facilities have been damaged, there is enough generating capacity intact in the system and through interconnections with other systems, to meet essential needs of the areas served. In those areas, however, sharp curtailment of supply to undamaged industrial plants will be necessary for an extended period. Enough skilled manpower has survived to operate generating plants. Fuel stocks at thermal generating plants using coal, are adequate to keep plants operating for a minimum of 30 to 60 days even after allowance for possible use of a part of their stockpiles for other emergency purposes. Generating plants dependent solely on oil as a fuel can continue operating for a shorter period from stocks on hand, the time varying with the stock position of individual plants.

26. FUELS. Of all the fuels (including petroleum products, gas, and solid fuels), motor fuels including aviation are the most universally used throughout the nation, regardless of season. Therefore, even though movement of the mass of civilian passenger automobiles is strictly limited, the availability of motor fuels for uses essential to human survival and military operations is of widespread and urgent concern. Among such uses are the operations of trucks, diesel locomotives, water transport, aircraft, tractors and other farm equipment needed for food production, and a host of engines required for water supply, sanitary disposal systems, and hospitals.

27. Initial military operations are being fueled almost entirely from stocks in military storage. Stocks in motor fuels in undamaged areas to and through which evacuees moved are nearly exhausted, despite rationing efforts by some local authorities. In many of these areas and in contiguous support areas, radioactive fallout temporarily immobilizes all transport and farming operations, thus halting consumption in wheeled equipment and simultaneously preventing replenishment of stocks. When decay of fallout permits resumption of human activity, some consumers such as railroads, airlines, and to a lesser extent, certain farmers, can operate for a brief period using stocks on hand. Generally, however, there will be an immediate, heavy drain on bulk plant stocks of motor fuels including aviation. The rate at which such stocks can in turn be replenished will vary by areas, depending upon availability of surface transportation, the extent to which they are normally served by pipelines, and proximity to surviving, operable petroleum refineries.

28. In cold areas to and through which evacuees have moved, the situation with respect to cooking and heating fuels (kerosene, fuel oil, liquefied petroleum gas, coal, and gas) is somewhat similar to that of motor fuels. Sheltering and feeding of swollen populations in such areas are rapidly depleting cooking and heating fuels in homes and other buildings and, in communities served by natural gas, lowering pressure in distribution lines. Fallout prevents immediate replenishment of home stocks. When deliveries can be resumed, local distributors' stocks of fuel oil, "bottled" gas, and coal will soon be gone. Local industrial and some utility stockpiles of coal can be tapped if needed for heating of hospitals, homes, and shelters. Shifts from less available to more available fuels will be necessary. At the outset, wood where available is providing essential warmth, but this cannot long meet needs of masses of people. Again, provision of minimum essential supplies of cooking and heating fuels will depend largely upon restoration of transportation and communication.

29. The physical productive capacity of oil and gas wells and coal mines has been little

affected by the attack, but their operation in some areas is precluded temporarily by radioactive fallout making surface work hazardous to human survival. Even after decay of fallout permits men to work at these facilities, breaks in power service will temporarily prevent operation of certain of them as well as some pipeline pumping stations. A substantial percentage of aboveground fuel facilities in bombed areas--including petroleum refineries, pipeline terminals, tank farms for storage of crude oil and products, gas compressor stations, and coal-handling equipment at rail and port terminals--have been destroyed or extensively damaged. Destruction of docks, tanks, and refineries in coastal areas has drastically curtailed inter-coastal movement and importation of petroleum and petroleum products by tankers. Inland, the disruption of and damage to railroad, waterway, and highway transport at or near urban centers will continue to hamper distribution of both coal and petroleum products.

30. The non-military requirements for fuel in the post-attack period will be much smaller than pre-attack requirements, since millions of fuel consuming units--particularly residences, commercial buildings, electric power and generating plants, and factories--have disappeared in the bombing. With strict rationing of petroleum products and allocation of coal, the surviving fuel production capacity, including petroleum refinery capacity, is sufficient to meet properly time- phased military requirements and minimum essential civilian needs for both motor fuel and heating fuel and, also, progressively to supply reviving industries. Priority will be given to the supplying of fuel for human survival and military operations, including communications, transportation, electric power, and food production essential to both. Refinery yields will be adjusted to fit the pattern of needs for particular petroleum products depending on the season of the attack and military requirements. Nevertheless, due mainly to transportation difficulties, severe, localized shortages of one fuel or another from time to time during the next several months should be anticipated. This will call for endurance by affected communities, maximum conservation of motor fuels, perhaps a return to relatively primitive methods of cooking and heating, and ingenuity on the part of the fuel industries and government to alleviate shortages.

31. MANPOWER. In assessing the survival and emergency work to be done, total manpower requirements for civil defense purposes substantially exceed the available supply. Although manpower priorities have been established in individual local areas, the difficulties of communicating with higher levels of government have resulted in conflicting demands on certain support areas. Some civil defense services are experiencing support surpluses while others cannot function because needed support is lacking.

32. The provision of effective manpower support is jeopardized by the dislocation and disorganization of the general population. In many communities evacuation took place in anticipation of initial and follow-up attack. They are now attempting to return to their homes but the process is slow, and previously identified skills cannot be located until the evacuated population is reestablished in the home community. It will be some time before manpower in such areas can be organized to provide needed support to devastated areas and to restore essential services and production.

33. In many localities radioactive fallout, the imminence of fallout, and particularly the fear of this unseen hazard has temporarily immobilized a tremendous proportion of the manpower which would otherwise be immediately available. Denial of access to large areas

because of the fallout hazard has compounded the already major problems in transportation of labor to the point of need.

34. In many localities there is a surplus of manpower in certain skilled occupations which could be used if necessary equipment and supplies were available. In other localities, the best use of manpower resources requires the temporary separation of workers from their families until housing, transportation, feeding, and other conditions permit reuniting family groups wherever the workers are most needed. Difficulty has been encountered in trying to contain evacuated populations in relocation centers around cities which have been attacked so that they do not further endanger their lives by moving into fallout areas. Many thousands of people are trying to reach the homes of friends and relatives. As a consequence, the size of the labor force and the skill distribution within the relocated area changes continuously. The instability of this situation adversely affects the recruitment of specific skills within the area, and throws askew the labor assessments necessary to balance manpower demand with available supply with a minimum of population shift.

35. In relocation areas, utilization of available unskilled manpower for necessary emergency work is most inefficient for lack of enough trained civil defense technicians and of leaders and sub-leaders previously trained and organized.

36. Training programs offer little solution except for very short-term skill development.

37. PRODUCTION. As in all other areas of economic activity the effect of the attack on levels of production can best be described in time phases. There is an immediate and virtually complete paralysis of the production effort, even in non-damaged and slightly damaged areas. Following this "shock" phase, the gradual return of workers to their places of employment sets in motion a slow recovery cycle, manifesting itself first in scattered, undamaged, non-fallout areas. As the fallout decays and decontamination is started the areas of recovery expand, limited primarily by manpower shortages.

38. During the early post-attack period primary emphasis must be placed on the production of essential civilian goods and services and on military items urgently needed for combat and support. Two major factors determine achievable levels of production.

39. First, a major limitation on post-attack production will arise from the damage to the chain of production. The pre-attack production levels achieved in this country resulted from the functioning of a highly complex operation, in which many thousands of contributors to overall production were bound together through the interrelationships of production processes. Suppliers of raw materials, fabricators of metal shapes and forms, manufacturers of components and subassemblies, and final product producers, all contributed to the flow of production in such a manner that, by and large, items necessary for successive steps in the productive process were available when and where needed. It is impossible to measure the damage to this chain of production in all of its ramifications. It seems reasonable to assume, however, that the process has suffered severe damage, not immediately reparable. It will take months to determine the bottlenecks and dislocations, and many more months to overcome shortages and imbalances. The resumption of any sizeable production effort will, of course, be dependent on the extent to which necessary services--power, transportation, communications, etc. can be provided.

40. A second major limitation is the number and types of workers available for production purposes, particularly in the first six months. As the need for workers for emergency civil defense efforts lessens, more persons will become available for the production of goods and services. However, even after the first six months, manpower will still impose a restriction on the size of the production program, because of manpower losses and also because of the lowered efficiency of the available utilized labor force.

CHAPTER 2
Nuclear, Biological, and Chemical Weapons Effects

2-1. General
Nuclear weapons are the most destructive weapons available for use on the battlefield today. Biological agents are easy to disperse on the battlefield without immediate detection; however, their effects on exposed troops can change the course of the battle. As more nations enter the arena of developing biological and chemical weapons, their potential effects on our troops will increase. Biological and chemical weapons/agents may be employed by terrorists, or in any level of conflict (low-, mid-, or high-intensity). Consideration of both the physical and biological effects of these weapons is required for HSS operations.

2-2. Physical Effects of Nuclear Weapons
a. The principal physical effects of nuclear weapons are blast, thermal radiation (heat), and nuclear radiation. These effects are dependent upon the yield (or size) of the weapon expressed in kilotons (KT), physical design of the weapon (such as conventional and enhanced), and upon the method of employment. For a low altitude detonation of a moderate-sized (3 to 10 KT) weapon, the energy is distributed (Figure 2-1) as follows:

(1) Fifty percent as blast.

(2) Thirty-five percent as thermal radiation; made up of a wide spectrum of electromagnetic radiation, including infrared, visible, and ultraviolet light and some soft x-ray radiation.

(3) Fourteen percent as nuclear radiation, 4 percent as initial ionizing radiation composed of neutrons and gamma rays emitted within the first minute after detonation, and 10 percent as residual nuclear radiation (fallout).
(4) One percent as EMP.

b. Larger weapons are more destructive than smaller weapons, but the destructive effect is not linear. Table 2-1 presents a comparison of three aspects of nuclear weapons effects with yield.

c. The effects of blast, heat, and nuclear radiation are also determined by the altitude at which the weapon is detonated. Nuclear blasts are classified as air, surface, or subsurface bursts.

(1) An airburst is a detonation in air at an altitude below 30,000 meters, but high enough so that the fireball does not touch the surface of the earth. The altitude is varied to obtain the desired tactical effects. Initial radiation will be a significant hazard, but there is essentially no local fallout. The ground immediately below the airburst may have a small area of neutron-induced radioactivity. This may pose a hazard to troops passing through the area.

(2) A surface burst is a detonation in which the fireball actually touches the land or water surface. In this case, the area affected by blast, thermal radiation, and initial nuclear radiation will be smaller than for an airburst of comparable yield; however, in the region around ground zero, the destruction will be much greater and a crater is often produced. Additionally, a significant amount of fallout is created and can be a hazard downwind.

(3) A subsurface burst is an explosion in which the detonation is below the surface of land or water. Cratering usually results. If the burst does not penetrate the surface, the only hazard is from the ground or water shock. If the burst penetrates the surface, blast, thermal, and initial nuclear radiation will be present, though less than for a surface burst of comparable yield. Local fallout will be heavy over a small area.

2-3. Physiological Effects of Nuclear Weapons

The physiological effects of nuclear weapons result from: direct physical effects from the blast; the thermal radiation; the ionizing radiation (initial or residual); or a combination of these. For smaller weapons (less than 10 KT), ionizing radiation is the primary creator of casualties requiring medical care, while for larger weapons (greater than 10 KT), thermal radiation is the primary cause of injury.

a. The rapid compression and decompression of blast waves on the human body results in transmission of pressure waves through the tissues. Resulting damage is primarily at junctions between tissues of different densities (bone and muscle), or at the interface between tissue and airspace. Lung tissue and the gastrointestinal system (both contain air) are particularly susceptible to injury. The tissue disruptions can lead to severe hemorrhage or to air embolism; either can be rapidly fatal. Direct overpressure effects do not extend out as far from the point of detonation and are often masked by the drag force effects. A typical range of probability of lethality, with variation in overpressure for a 1 KT weapon, is shown in Table 2-2.

(1) The significance of the data is that the human body is relatively resistant to static overpressure compared to rigid structures such as buildings. For example, and unreinforced cinder block panel will shatter at 0.1 to 0.2 atmospheres.

(2) Overpressures lower than those in Table 2-2 can cause nonlethal injuries such as lung damage and eardrum rupture. Lung damage is a relatively serious injury, usually requiring hospitalization, even if not fatal; whereas eardrum rupture is a minor injury, often requiring no treatment at all.
(a) The threshold level of overpressure for an unreinforced, unreflected blast wave which can cause lung damage is about 1.0 atmosphere.
(b) The threshold level for eardrum rupture is around 0.2 atmospheres; the overpressure associated with a 50 percent probability of eardrum rupture is about 1.1 atmospheres.

(3) Casualties requiring medical treatment from direct blast effects are produced by overpressures between 1.0 and 3.5 atmospheres. However, other effects (such as indirect blast injuries and thermal injuries) are so predominate that patients with only direct blast injuries make up a small part of the patient work load.

b. The drag forces (indirect blast) of the blast winds are proportional to the velocities and duration of the winds. The winds are relatively short in duration, but can reach velocities of several hundred kilometers (km) per hour. Injury can result either from missiles impacting on the body, or from the physical displacement of the body against objects and structures.
(1) The distance from the point of detonation at which severe indirect injury occurs is greater than that for equally serious direct blast injuries. A high probability of serious indirect injury can occur when the peak overpressure is about 0.2 atmospheres. This range will increase with the increased size of the weapon; for a 1 KT weapon the range is 0.22 km, whereas for a 20 KT weapon, the range is 0.76 km. Injuries will occur and casualties will be generated at greater ranges, but not consistently.

(2) The drag forces of the blast winds produced by a nuclear detonation are so great that almost any form of vegetation or structure will be broken up or fragmented into missiles. Thus, multiple, varied missile injuries will be common, increasing their overall severity and significance. Table 2-3 lists ranges at which significant missile injuries can be expected.

(3) The velocity to which missiles are accelerated is the major factor in causing injury. The probability of a penetration injury increases with increasing velocity, particularly for small, sharp missiles such as glass fragments. Small, light objects are accelerated to speeds approaching the maximum (wind) velocity. Table 2-4 shows data for probability of penetration related to size and velocity of glass fragments.

(4) Heavy, blunt missiles may not penetrate, but can result in significant injury, particularly fractures. The threshold velocity for skull fractures from a 4.5 milligram (mg) missile is about 4.6 meters/second.
(5) The drag forces of the blast winds are strong enough to displace even large objects (such as vehicles), or to cause the collapse of large structures (such as buildings) resulting in serious crushing injuries. Man himself can become a missile. The resulting injuries sustained are called translational injuries. The velocity at which the body is displaced will determine the probability and the severity of injury. Assuming a displacement of 3.0 meters, the impact velocity associated with various degrees of injury is shown in Table 2-5. The velocities in Table 2-5 can be correlated against yield. The ranges at which such velocities would be found are given in Table 2-6.

2-4. Biological Effects of Thermal Radiation
The thermal radiation emitted by a nuclear detonation causes burns in two ways--by direct

absorption of the thermal energy through exposed surfaces (flash burns); or by the indirect action of fires in the environment (flame burns). Indirect flame burns can easily outnumber all other types of injury.

a. Thermal radiation travels outward from the fireball in a straight line; therefore, the amount of energy available to cause flash burns decreases rapidly with distance. Close to the fireball all objects will be incinerated. The range for 100 percent lethality will vary with yield, height of burst, weather, environment, and immediacy of treatment. The critical factors determining the degree of burn injury are the flux (calories per square centimeter [cal/cm2]) and the duration of the thermal pulse. The amount of thermal radiation needed to cause a flash second-degree burn on exposed skin will vary with the yield of the weapon and the nature of the pulse (Table 2-7).

NOTE

The battle-dress uniform, mission-oriented protective posture (MOPP) gear, or any other clothing will provide additional protection against flash burns. The airspaces between the clothing significantly impede heat transfer and may prevent or reduce the severity of burns, depending on the magnitude of the thermal flux.

b. Indirect (flame) burns result from exposure to fires caused by the thermal effects in the environment, particularly from ignition of clothing. The larger-yield weapons are more likely to cause fire storms over extensive areas. There are too many variables in the environment to predict either incidence or severity of casualties. Expect the burns to be far less uniform (in degree) and not limited to exposed surfaces. For example, the respiratory system may be exposed to the effects of hot gases produced by extensive fires. Respiratory system burns cause high morbidity and high mortality rates.

c. The initial thermal pulse can cause eye injuries in the forms of flash blindness and retinal scarring. Flash blindness is caused by the initial brilliant flash of light produced by the nuclear detonation. This flash swamps the retina, bleaching out the visual pigments and producing temporary blindness. During daylight hours, this temporary effect may last for about 2 minutes. At night, with the pupil dilated for dark adaptation, flash blindness will affect personnel at greater ranges and for greater durations. Partial recovery can be expected in 3 to 10 minutes, though it may require 15 to 35 minutes for full night adaptation recovery. Retinal scarring is the permanent damage from a retinal burn. It will occur only when the fireball is actually in the individual's field of view and should be a relatively uncommon injury. The location of the scar will determine the degree of interference with vision. Figure 2-2 presents the threshold distance for minimal eye injuries.

2-5. Physiological Effects of Ionizing Radiation

A nuclear burst results in four types of ionizing radiation: neutrons, gamma rays, beta, and alpha radiation. The initial burst is characterized by neutrons and gamma rays while the residual radiation is primarily alpha, beta, and gamma rays. The effect of radiation on a living organism varies greatly by the type of radiation the organism is exposed to. See Table 2-8 for characteristics of nuclear radiation.

a. Alpha particles are extremely massive charged particles (four times the mass of a neutron); they are a fallout hazard. Because of their size, alpha particles cannot travel far and are fully stopped by the dead layers of the skin or by the uniform. Alpha particles area negligible external hazard, but if inhaled or ingested, can cause significant internal damage.

b. Beta particles are very light, charged particles that are found primarily in fallout radiation. These particles can travel a short distance in tissue; if large quantities are involved, they can produce damage to the basal stratum of the skin. The lesion produced is similar to a thermal burn (called a beta burn).

c. Gamma rays, emitted during the nuclear detonation and in fallout, are uncharged radiation similar toi X rays. They are highly energetic and pass through matter easily. Because of its high penetrability, radiation can be distributed throughout the body, resulting in whole body exposure.

d. Neutrons, like gamma rays, are uncharged, are only emitted during the nuclear detonation, and are not a fallout hazard. However, neutrons have significant mass and interact with the nuclei of atoms, severely disrupting atomic structures. Compared to gamma rays, they can cause 20 times more damage to tissue.

e. When radiation interacts with atoms, energy is deposited resulting in ionization (electron excitation). This ionization may involve certain critical molecules or structures in a cell, producing its characteristic damage. Two modes of action in the cell are direct and indirect action. The radiation may directly hit a particularly sensitive atom or molecule in the cell. The damage from this is irreparable; the cell either dies or is caused to malfunction. The radiation can also damage a cell indirectly by interacting with water molecules in the body. The energy deposited in the water leads to the creation of toxic molecules; the damage is transferred to and affects sensitive molecules through this toxicity.

f. The two most radiosensitive organ systems in the body are the hematopoietic and the gastrointestinal systems. The relative sensitivity of an organ to direct radiation injury depends upon its component tissue sensitivities. Cellular effects of radiation, whether due to direct or indirect damage, are basically the same for the different kinds and doses of radiation. The simplest effect is cell death. With this effect, the cell is no longer present to reproduce and perform its primary function. Changes in cellular function can occur at lower radiation doses than those which cause cell death. Changes can include delays in phases of the mitotic cycle, disrupted cell growth, permeability changes, and changes in motility. In general, actively dividing cells are most sensitive to radiation. Additionally, radiosensitivity tends to vary inversely with the degree of differentiation of the cell.

g. Predicting radiation effects is difficult because often it is unknown which organ was exposed. Thus, most predictions are based on whole body irradiation. Partial body and specific organ irradiation can also occur; particularly from fallout particles or internal deposits. Depending upon the organ system, the irradiation can be severe. The severe radiation sickness resulting from external, whole body irradiation and its consequent organ effects, is a primary medical concern. The median lethal dose of radiation which will kill 50 percent of the exposed persons within a period of 60 days, without medical intervention (designated as LD50/60), is approximately 450 centigray (cGY).

h. Recovery of a particular cell system is possible if a sufficient fraction of a given stem cell population remains after radiation injury. Complete recovery may appear to occur; however, it is possible for late somatic effects to have a higher probability of occurring because of the radiation damage.

2-6. Effects of Biological Weapons
Biological warfare is the intentional use, by an enemy, of live agents or toxins to cause death and disease among personnel, animals, and plants, or to deteriorate materiel.

a. Live Agents.

(1) Live agents are living organisms like viruses, bacteria, and fungi. They can be delivered directly (artillery or aircraft spray), or through a vector such as a flea or tick. Modern technology has eliminated some unpredictable aspects of live agent use, making weaponization more likely.
(2) For some agents, only a few organisms are needed to cause infection, especially when inhaled. Live agents are small and light; they can be spread great distances by the wind and can float into unfiltered or nonairtight places.

(3) Live agents require time after they are ingested to multiply enough to overcome the body's defenses. This incubation period may vary from hours to days or weeks depending on the type of organism. Thus, to be effective, a live agent attack would need to be launched well in advance of a tactical assault.

(4) These agents also have life cycles in which to grow, reproduce, age, and die. While they live, these agents usually require protection and nutrition supplied by another living organism (the host) to survive and grow. Weathering (wind, rain, and sunlight) rapidly reduces their numbers. Some bacterial agents produce spores that can form protective coats and survive longer. However, the hazard from most live agents may only last for one day.
(5) Live agents are not detectable by any of the five physical senses; usually the first indication of a biological attack is the ill soldier. The diseases caused by live agents may be difficult to control because they are often easily spread from soldier to soldier, directly or indirectly.
(6) Because of their incubation period and life cycle, likely areas for live agent use are in the combat service support (CSS) area. But attacks in the forward areas cannot be ruled out.

b. Toxins.

(1) Toxins are by-products (poisons) produced by plants, animals, or microorganisms. It is the poisons that harm man, not the organisms which make the toxins. In the past, the only way to deliver toxins on a large scale was by using the organism. With today's technology

large quantities of many toxins can be produced; thus, they can be delivered without the accompanying organism.

(2) Toxins have several desirable traits. They are poisonous compounds that do not grow, reproduce, or die after they have been dispersed; they are more easily controlled than live organisms. Field monitors capable of providing prompt warning of a toxin attack are not available; therefore, soldiers must learn to quickly recognize signs of attack, such as observing unexplained symptoms of victims. Toxins produce effects similar to those caused by chemical agents; however, the victims will not respond to the first aid measures that work against chemical agents. Unlike live agents, toxins can penetrate the unbroken skin; when mixed with a skin penetrant such as dimethyl sulfoxide, their speed of penetration is increased. Because the effects on the body are direct, the symptoms of an attack may appear very rapidly. The potency of most toxins are such that very small doses will cause injuries and/or death. Thus, their use by an enemy may be an alternative to chemical agents because it allows the use of fewer resources to cover the same or a larger area. Slight exposure at the edges of an attack area may produce severe symptoms or death from exposure to toxins because of their extreme toxicity. Lethal or injury downwind hazard zones for toxins may be far greater than those of CW agents.

2-7. Behavior of Biological Weapons

Biological agents can be disseminated in a spectrum of physical states. They may be living microorganisms or spore forms of the organism. See Table 2-9 for stability of various biological agents. They may be spread by--

Arthropods.

Contact with infected animals.

Contamination of food and water.

Aerosol, liquid, or solid dispersion.

The only requirement is that they must be stable enough to survive transport and dissemination. The toxicity of biological agents is not the same for everyone; each individual does not react exactly the same way to the same amount of an agent. Some are more resistive than others because of race, sex, age, or other factors. The dose is the quantity of a biological agent received by the subject. The penetration of agents by various routes need not be accompanied by irritation or damage to the absorbent surface, but there are often unique signs and symptoms identifiable either with the inhalation, ingestion, or percutaneous route of entry.

a. Spray dispersion of biological agents often enter the body through the respiratory tract (inhalation injury). The agent may be absorbed by any part of the respiratory tract from the mucosa of the nose and mouth to the alveoli of the lungs.

b. Droplets of liquid and (less commonly) solids may be absorbed from the surface of the skin, digestive tract, and mucous membranes. Agents penetrating the skin may form temporary reservoirs under the skin.

c. Contaminated food and water can produce casualties when ingested.

2-8. Effects of Chemical Weapons

a. A chemical agent is a chemical which is used to kill, seriously injure, or incapacitate man because of its physiological effects. They can be disseminated by artillery, aircraft, rocket, or by nonconventional means used by terrorists. When first employed in combat during World War I, the chemical weapon (chlorine) was so effective that the attacking Germans were not prepared to exploit the success.

b. Chemical agents are very effective weapons against poorly trained and equipped forces; however, they are less effective against well-trained forces.

2-9. Behavior of Chemical Weapons
Chemical agents can be disseminated as a gas, vapor, or aerosol under ambient conditions. They have a range of odors varying from none to highly pungent characteristics. Their stability is dependent upon the environmental conditions in the area of employment. See Table 2-10 for persistency of various chemical agents.

a. The toxicity of a chemical agent is not the same for everyone; each individual does not react exactly the same way to the same amount of an agent. Some are more resistive than others because of physiological factors. The dose is the quantity of a chemical received by the individual for percutaneous or oral doses and as a time weighted concentration, milligrams-minute/m3, for inhalation. It is usually expressed as milligrams of agent per kilogram of subject body weight (mg/kg). The LD50 is the dose which kills 50 percent of the exposed population. The ID50 is the incapacitation dose for 50 percent of the exposed subjects. The penetration of agents by various routes need not be accompanied by irritation or delayed superficial damage to the absorbent surface, but there are often unique signs and symptoms identifiable by the route of entry.

(1) Gaseous, vapor, and aerosol chemical agents often enter the body through the respiratory tract (inhalation injury). The agent may be absorbed by any part of the respiratory tract from the mucosa of the nose and mouth to the alveoli of the lungs. Aerosol particles larger than 5 microns (μ) tend to be retained in the upper respiratory tract; particles in the 1 to 5 μ range are retained in the deep volume of the lungs; while those below 1 μ tend to be breathed in and out again, although a few are retained in the deep volume of the lungs.

(2) Vapors and droplets of liquids can be absorbed from the surface of the skin and mucous membranes. Toxic compounds which are harmful to the skin can produce their effects in liquid or solid state. Agents penetrating the skin may form temporary reservoirs under the skin; the vapors of some volatile liquids can penetrate the skin and cause intoxication. Additionally, wounds and abrasions may present areas which are more permeable than intact skin.

PROTECTING YOURSELF FROM EMP
by DUNCAN LONG

EMP. The letters spell burnt out computers and other electrical systems and perhaps even a return to the dark ages if it were to mark the beginning of a nuclear war. But it doesn't need to be that way. Once you understand EMP, you can take a few simple precautions to protect yourself and equipment from it. In fact, you can enjoy much of the "high tech" life style you've come accustomed to even after the use of a nuclear device has been used by ter- rorists--or there is an all-out WWIII.

EMP (Electro-Magnetic Pulse), also sometimes known as "NEMP" (Nuclear Electromagnetic Pulse), was kept secret from the public for a long time and was first discovered more or less by accident when US Military tests of nuclear weapons started knocking out phone banks and other equipment miles from ground zero.

EMP is no longer "top secret" but information about it is still a little sketchy and hard to come by. Adding to the problems is the fact that its effects are hard to predict; even electronics designers have to test their equipment in powerful EMP simulators before they can be sure it is really capable of with standing the effect.

EMP occurs with all nuclear explosions. With smaller explosions the effects are less pronounced. Nuclear bursts close to the ground are dampened by the earth so that EMP effects are more or less confined to the region of the blast and heat wave. But EMP becomes more pronounced and wide spread as the size and altitude of a nuclear blast is increased since the ground; of these two, altitude is the quickest way to produce greater EMP effects. As a nuclear device is exploded higher up, the earth soaks up fewer of the free electrons produced before they can travel some distance.

The most "enhanced" EMP effects would occur if a nuclear weapon were exploded in space, outside the Earth's atmosphere. In such a case, the gamma radiation released during the flash cycle of the weapon would react with the upper layer of the earth's atmosphere and strip electrons free from the air molecules, producing electromagnetic radiation similar to broad-band radio waves (10 kHz-100 MHz) in the process. These electrons would follow the earth's magnetic field and quickly circle toward the ground where they would be finally dampened. (To add to the confusion, we now have two more EMP terms: "Surface EMP" or "SEMP" which refers to ground bursts with limited-range effects and "High-altitude EMP" or "HEMP" which is the term used for a nuclear detonation creating large amounts of EMP.)

Tactically, a space-based nuclear attack has a lot going for it; the magnetic field of the earth tends to spread out EMP so much that just one 20-MT bomb exploded at an altitude of 200 miles could--in theory--blanket the continental US with the effects of EMP. It's believed that the electrical surge of the EMP from such an explosion would be strong enough to knock out much of the civilian electrical equipment over the whole country. Certainly this is a lot of "bang for the buck" and it would be foolish to think that a nuclear attack would be launched without taking advantage of the confusion a high-altitude explosion could create. Ditto with its use by terrorists should the technology to get such payloads into space become readily available to smaller countries and groups.

But there's no need for you to go back to the stone age if a nuclear war occurs. It is possible to avoid much of the EMP damage that could be done to electrical equipment--including the computer that brought this article to you-- with just a few simple precautions.

First of all, it's necessary to get rid of a few erroneous facts, however.

One mistaken idea is that EMP is like a powerful bolt of lightning. While the two are alike in their end results--burning out electrical equipment with intense electronic surges--EMP is actually more akin to a super-powerful radio wave. Thus, strategies based on using lightning arrestors or lightning-rod grounding techniques are destined to failure in protecting equipment from EMP.

Another false concept is that EMP "out of the blue" will fry your brain and/or body the way lightning strikes do. In the levels created by a nuclear weapon, it would not pose a health hazard to plants, animals, or man PROVIDED it isn't concentrated.

EMP can be concentrated.

That could happen if it were "pulled in" by a stretch of metal. If this happened, EMP would be dangerous to living things. It could become concen- trated by metal girders, large stretches of wiring (including telephone lines), long antennas, or similar set ups. So--if a nuclear war were in the offing-- you'd do well to avoid being very close to such concentrations. (A safe distance for nuclear-generated EMP would be at least 8 feet from such stretches of metal.)

This concentration of EMP by metal wiring is one reason that most e- lectrical equipment and telephones would be destroyed by the electrical surge. It isn't that the equipment itself is really all that sensitive, but that the surge would be so concentrated that nothing working on low levels of electric- ity would survive.

Protecting electrical equipment is simple if it can be unplugged from AC outlets, phone systems, or long antennas. But that assumes that you won't be using it when the EMP strikes. That isn't all that practical and--if a nuclear war were drawn out or an attack occurred in waves spread over hours or days-- you'd have to either risk damage to equipment or do without it until things had settled down for sure.

One simple solution is to use battery-operated equipment which has cords or antennas of only 30 inches or less in length. This short stretch of metal puts the device within the troughs of the nuclear-generated EMP wave and will keep the equipment from getting a damaging concentration of electrons. Provided the equipment isn't operated close to some other metal object (i.e., within 8 feet of a metal girder, telephone line, etc.), it should survive without any other precautions being taken with it.

If you don't want to buy a wealth of batteries for every appliance you own or use a radio set up with longer than 30-inch antenna, then you'll need to use equipment that is "hardened" against EMP.

The trick is that it must REALLY be hardened from the real thing, not just EMP-proof on paper. This isn't all that easy; the National Academy of Sciences recently stated that tailored hardening is "not only deceptively difficult, but also very poorly understood by the defense-electronics community." Even the US Military has equipment which might not survive a nuclear attack, even though it is designed to do just that.

That said, there are some methods which will help to protect circuits from EMP and give you an edge if you must operate ham radios or the like when a nuclear attack occurs. Design considerations include the use of tree formation circuits (rather than standard loop formations); the use of induction shielding around components; the use of self-contained battery packs; the use of loop antennas; and (with solid-state components) the use of Zener diodes. These design elements can eliminate the chance an EMP surge from power lines or long antennas damaging your equipment. Another useful strategy is to use grounding wires for each separate instrument which is coupled into a system so that EMP has more paths to take in grounding itself.

A new device which may soon be on the market holds promise in allowing electronic equipment to be EMP hardened. Called the "Ovonic threshold device", it has been created by Energy Conversion Devices of Troy, MI. The Ovonic threshold device is a solid-state switch capable of quickly opening a path to ground when a circuit receives a massive surge of EMP. Use of this or a similar device would assure survival of equipment during a massive surge of electricity.

Some electrical equipment is innately EMP-resistant. This includes large electric motors, vacuum tube equipment, electrical generators, trans- formers, relays, and the like. These might even survive a massive surge of EMP and would likely to survive if a few of the above precautions were taking in their design and deployment.

At the other end of the scale of EMP resistance are some really sensitive electrical parts. These include IC circuits, microwave transistors, and Field Effect Transistors (FET's). If you have electrical equipment with such com- ponents, it must be very well protected if it is to survive EMP.

One "survival system" for such sensitive equipment is the Faraday box.

A Faraday box is simply a metal box designed to divert and soak up the EMP. If the object placed in the box is insulated from the inside surface of the box, it will not be effected by the EMP traveling around the outside metal surface of the box. The Faraday box simple and cheap and often provides more protection to electrical components than "hardening" through circuit designs which can't be (or haven't been) adequately tested.

Many containers are suitable for make-shift Faraday boxes: cake boxes, ammunition containers, metal filing cabinets, etc., etc., can all be used. Despite what you may have read or heard, these boxes do NOT have to be air- tight due to the long wave length of EMP; boxes can be made of wire screen or other porous metal.

The only two requirements for protection with a Faraday box are: (1) the equipment inside the box does NOT touch the metal container (plastic, wadded paper, or cardboard can all be used to insulate it from the metal) and (2) the metal shield is continuous without any gaps between pieces or extra-large holes in it.

Grounding a Faraday box is NOT necessary and in some cases actually may be less than ideal. While EMP and lightning aren't the "same animal", a good example of how lack of grounding is a plus can be seen with some types of lightning strikes. Take, for example, a lightning strike on a flying air- plane. The strike doesn't fry the plane's occupants because the metal shell of the plane is a Faraday box of sorts. Even though the plane, high over the earth, isn't grounded it will sustain little damage.

In this case, much the same is true of small Faraday cages and EMP. Consequently, storage of equipment in Faraday boxes on wooden shelves or the like does NOT require that everything be grounded. (One note: theoretically non-grounded boxes might hold a slight charge of electricity; take some time and care before handling ungrounded boxes following a nuclear attack.)

The thickness of the metal shield around the Faraday box isn't of much concern, either. This makes it possible to build protection "on the cheap" by simply using the cardboard packing box that equipment comes in along with aluminum foil. Just wrap the box with the aluminum foil (other metal foil or metal screen will also work); tape the foil in place and you're done. Provided it is kept dry, the cardboard will insulate the gear inside it from the foil; placing the foil-wrapped box inside a larger cardboard box is also wise to be sure the foil isn't accidentally ripped anywhere. The result is an "instant" Faraday box with your equipment safely stored inside, ready for use following a nuclear war.

Copper or aluminum foil can help you insulate a whole room from EMP as well. Just paper the wall, ceiling and floor with metal foil. Ideally the floor is then covered with a false floor of wood or with heavy carpeting to insulate everything and everyone inside from the shield (and EMP). The only catch to this is that care must be taken NOT to allow electrical wiring connections to pierce the foil shield (i.e., no AC powered equipment or radio antennas can come into the room from outside). Care must also be taken that the door is covered with foil AND electrically connected to the shield with a wire and screws or some similar set up.

Many government civil defense shelters are now said to have gotten the Faraday box, "foil" treatment. These shelters are covered inside with metal foil and have metal screens which cover all air vents and are connected to the metal foil. Some of these shelters probably make use of new optical fiber systems--protected by plastic pipe--to "connect" communications gear inside the room to the "outside world" without creating a conduit for EMP energy to enter the shelter.

Another "myth" that seems to have grown up with information on EMP is that nearly all cars and trucks would be "knocked out" by EMP. This seems logical, but is one of those cases where "real world" experiments contradict theoretical answers and I'm afraid this is the case with cars and EMP. According to sources working at Oak Ridge National Laboratory, cars have proven to be resistant to EMP in actual tests using nuclear weapons as well as during more recent tests (with newer cars) with the US Military's EMP simulators.

One reason for the ability of a car to resist EMP lies in the fact that its metal body is "insulated" by its rubber tires from the ground. This creates a Faraday cage of sorts. (Drawing on the analogy of EMP being similar to lightning, it is interesting to note that cases of lightning striking and damaging cars is almost non-existent; this apparently carries over to EMP effects on vehicles as well.)

Although Faraday boxes are generally made so that what is inside doesn't touch the box's outer metal shield (and this is especially important for the do-it-yourselfer since it is easy to inadvertently ground the Faraday box--say by putting the box on metal shelving sitting on a concrete floor), in the case of the car the "grounded" wiring is grounded only to the battery. In practice, the entire system is not grounded in the traditional electrical wiring sense of actually making contact to the earth at some point in its circuitry. Rather the car is sitting on insulators made of rubber.

It is important to note that cars are NOT 100 percent EMP proof; some cars will most certainly be effected, especially those with fiberglass bodies or located near large stretches of metal. (I suspect, too, that recent cars with a high percentage of IC circuitry might also be more susceptible to EMP effects.)

The bottom line is that all vehicles probably won't be knocked out by EMP. But the prudent survivalist should make a few contingency plans "just in case" his car (and other electrical equipment) does not survive the effects of EMP. Discovering that you have one of the few cars knocked out would not be a good way to start the onset of terrorist attack or nuclear war.

Most susceptable to EMP damage would be cars with a lot of IC circuits or other "computers" to control essential changes in the engine. The very prudent may wish to buy spare electronic ignition parts and keep them a car truck (perhaps inside a Faraday box). But it seems probable that many vehicles WILL be working following the start of a nuclear war even if no precautions have been taken with them.

One area of concern are explosives connected to electrical discharge wiring or designed to be set off by other electric devices. These might be set off by an EMP surge. While most citizens don't have access to such equipment, claymore mines and other explosives would be very dangerous to be around at the start of a nuclear box if they weren't carefully stored away in a Faraday box. Ammunition, mines, grenades and the like in large quantities might be prone to damage or explosion by EMP, but in general aren't all that sensitive to EMP.

A major area of concern when it comes to EMP is nuclear reactors located in the US. Unfortunately, a little-known Federal dictum prohibits the NRC from requiring power plants to withstand the effects of a nuclear war. This means that, in the event of a nuclear war, many nuclear reactors' control systems might will be damaged by an EMP surge. In such a case, the core-cooling controls might become inoperable and a core melt down and breaching of the containment vessel by radioactive materials into the surrounding area might well result. (If you were needing a reason not to live down wind from a nuclear reactor, this is it.)

Provided you're not next door to a nuclear power plant, most of the ill effects of EMP can be over come. EMP, like nuclear blasts and fallout, can be survived if you have the know

how and take a few precautions before hand.
And that would be worth a lot, wouldn't it?

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The author of this article, Duncan Long, is well-known as the writer of many gun, self-sufficiency, and survival books. His firearms books are listed (along with other interesting books) in a free catalog available from Paladin Press, P. O. Box 1307, Boulder, CO 80306 (303) 443-7250. Long's NUCLEAR WAR SURVIVAL is available for $14 from Long Survival Publications, 115 Riverview Dr., Wamego, KS 66547. Long has also recently had a post-nuclear war sci-fi book, ANTI-GRAV UNLIMITED released from Avon Books (available from local book stores or from Avon Books, 105 Madison Ave., NY, NY 10016; for autographed copy, send $4 to: Long Survival Publications, address above).

http://members.cox.net/dlong41/guns/nuke.htm

Surviving a Terrorist Nuke
By Duncan Long

Whether it were the result of a terrorist attack using a "brief case" nuclear device or the first salvo of an all out nuclear war, what you did during the first few moments following a nuclear blast would mean the difference between life and death.

It's important to realize that such weapons will be relatively small. This reason for this is that when a bomb increases in size by a factor of ten, its destructiveness is only roughly doubled. Militaries employ large numbers of smaller nukes rather than just a few large ones; smaller bombs and warheads are more easily delivered and give more bang for the buck.

Terrorists would use small bombs for much the same reason. Small nukes would do a lot of damage while being easy to conceal and deliver. While the anti-nuclear activists of the 1980s liked to describe the devastation the largest possible nuclear bomb would cause, in reality much smaller bombs would be used in almost any attack you might face in the future.

You can survive quite close to "ground zero" if a small nuclear device explodes. The population in Nagasaki was unprepared for any sort of attack; but there were survivors who chanced to be in bomb shelters when the nuclear explosion occurred. Some of these people were just one third of a mile from ground zero when the bomb exploded. A good shelter can be the ticket to surviving a nuclear attack. Since the Nagasaki bomb was not all that different from those that might be encountered in a limited war or terrorist operation, you could survive a similar blast even if you're just a mile from ground zero.

Of course the farther you are from ground zero, the better off you'll be. For this reason, one good survival strategy is to be away from areas that are apt to attract attacks. Washington, DC, New York City, or other big cities may be glamorous, but if the street crime isn't enough to turn you away the nuclear threat probably should be. Ditto for those living close to large harbors, military complexes, or other possible targets. Moving away from such areas will probably keep you safe from nuclear attack for the rest of your life.

Regardless of the size or source of a nuclear explosion, the energy released will be in a several forms including visible light (at its peak, four times as bright as the sun), thermal (heat) rays, and ionizing radiation in the form of gamma rays, neutrons, Alpha particles, and Beta particles (with fallout arriving some time later if it has been created by the explosion).

The release of energy during the explosion super heats the air around it until it is hotter than the face of the sun. This air expands violently making a blast wave that races from ground zero (the center of the explosion) at up to 4,000 miles per hour (fortunately this speed drops off quickly as the distance from ground zero increases). The air ahead of the blast wave is compressed; it bends light and appears slightly luminous and will appear as a sheet of glass moving out from the center of the explosion. The blast sounds -as an unknown observer once said "like the gates of Hell clanging shut."

As the blast wave storms away from ground zero, the fireball that created it rises so quickly that it creates a vacuum under it. The vacuum pulls air back toward ground zero so that the blast wave is followed by a counter wave sucked back toward the area of the explosion to fill the vacuum. Both the blast wave and the counter suction wave are destructive.

All in all, you won't have trouble knowing a nuclear explosion has occurred especially since its fireball will be four times as bright as the sun. Now what steps will be most apt to save you?

First: Do not ever, ever look toward a nuclear flash. The intense light will burn into your retina to create blind spots. This damage will make spots similar to those you see when you look at a bright light; only these won't go away they'll last the rest of your life.

If you don't look directly at the flash, the intense light reflected from light colored surfaces may still dazzle your eyes. If you're driving or doing anything that absolutely requires that you see, stop immediately; this will keep you from having to "drive by braille" when the bright light goes away and you're left in "snow blindness" for a short time. Although such blindness will only be temporary, tooling down the road at 55 MPH or running a buzz saw while you're "in the dark" isn't too good of a survival strategy.

To avoid complete "snow blindness" when it is necessary to see to find your way to a safe place, you should close one eye. This will allow you to get off a road or into shelter so that one eye can "see" with the eye you closed after the fireball is gone. If at all possible, however, you should cover both eyes at the first sign of the flash to avoid any chance of damage to them.

There are two immediate dangers you'll have to face after the initial flash of a near by nuclear weapon. The first is the pulse of radiation following the light and the second is the blast wave traveling behind it.

You won't have much time to look for safety. Only a few seconds. Fortunately, of the whole spectrum of radiation given off by nuclear explosion, the visible light is given off first, thereby giving you a slight lag time before the more dangerous thermal, gamma, and neutron radiation reach peak levels and start moving out from the blast.

This short grace period gives you time to "duck and cover" as they called it during the 1950's. Such quick action can be very effective in minimizing both radiation exposure as well as keeping you from getting burns from the thermal pulse. Far from being something ineffective (as some peace activists have suggested), the duck and cover strategy can be a real life saver.

What should be ducked behind?

It should be something heavy so that a blast wave can't move it around and so that it can shield you from flying debris. But even if almost nothing is available, just hitting the dirt and covering your exposed skin with clothing can still help to minimize skin burns and puncture injuries.

How long should you stay down?

You should not jump right back up after the flash subsides since a blast wave may be thundering toward you. If you're dangerously close to the blast, the wave may reach you in just 2 to 15 seconds; if the blast wave is going to be dangerous, it should have passed through your area after two minutes. So, after your duck and cover maneuver, you "one thousand one, one thousand two, one-thousand three..." it until you've counted off two minutes. If there are multiple explosions, then you start counting again with each new flash (which will be visible even with your eyes closed unless you're in a windowless room).

Here's the drill: Bright flash? Dive for cover. Your response needs to be automatic. Yelling, "Hit the deck" to those around you may save them as well since we've all seen enough war movies to know what the order means and many people react reflexively to this command, especially if there's a bright flash. You may save several lives by yelling this.

Stay down for two minutes. If the blast wave is going to be dangerous, it will pass through your area within this time. (Of course if there are multiple explosions, you'll have to wait until two minutes after the last flash.)

The blast wave will create several real dangers. Indoors, glass is the worst worry even some distance from the blast. Closer to ground zero, other flying debris like plaster or chunks of wood become equally dangerous and the blast itself can send YOU flying if you don't have the sense to get down. Consequently, you should dive for cover behind something that will offer protection both from the thermal radiation as well as blast-hurled missiles.

If you're out in the open when a flash alerts you to a nuclear attack, all isn't lost. Diving into a ditch or other depression is the best strategy, but even if these aren't available, covering your head and lying with your feet pointed toward the blast can improve your chances considerably; such a position will help to keep you from being blown about and your shoes give good protection to your feet (which can withstand more abuse than your head to start out with).

After the "two minute wait" for the blast wave to pass by, you should get up and head for permanent cover. And that brings us to the most long lived effect of many nuclear weapons: radioactive fallout.

The "fallout" from a dirty bomb won't technically be radioactive fallout. Instead it will be the scattered remains of the original radioactive materials used to make the bomb. The good news is that there won't be much of it compared to a real nuclear weapon; the bad news is that it will have a half live very much longer than that of a conventional nuclear bomb. Instead of being dangerous for weeks, the radioactivity from a dirty weapon will be of concern for years and most likely centuries without proper cleanup of the area.

A dirty bomb will be easy to spot. The blast wave, if any, will be very limited and will extend only hundreds of yards from the explosion. There'll be very limited damage like that produced by a car bomb--but with radioactivity in the dust and rubble.

You might have to do the detection of radioactive particles on your own; following the World Trade Tower bombing, there was no sign of any officials using radiation meters. Had a dirty bomb been used, it's likely that the contamination would have been spread over a huge area, tracked to area hospitals, fire stations, and police stations with the activities of rescue crews and victims before anyone detected its presence.

The lesson to be learned here is that if you know or suspect that a dirty bomb has been used, there may not be any official confirmation of the fact for hours or even days. For this reason you would ideally have some radiation detection equipment of your own, to do the job the officials may fail to do. Lacking that, you need to be very, very cautious if an explosion seems suspicious.

If you suspect or learn that a dirty bomb has been employed, then leaving the area would be the first option to consider. But remember that becoming a refugee puts you at the mercy of strangers. Have a "bugout" bag of supplies and necessities ready to go (a wise precaution for a lot of other catastrophes as well).

When word gets out that there are dangerous levels of nuclear materials in an area, there will be a panic with large numbers of frantic people clogging city streets. In such a case, you're better off sitting tight until the congestion is cleared or goes into gridlock.

If a real nuclear weapon has been detonated near the ground, there will soon be fallout raining into your area. In such a case you're probably better off hunkering down and waiting until the levels of radiation outside have dropped to safer levels. This is especially true if you have a large stock of supplies and perhaps even a fallout shelter (even if it's only improvised in a corner of your basement); in such a case you'd be better off ignoring official orders to evacuate and going it alone. Such a tactic has the added benefit of permitting you to protect your home from looters who may try to take advantage of the confusion.

What is fallout? Radioactive fallout is created when the suction wave of the blast carries matter upward with the vacuum created by the nuclear fireball as it rises. If the explosion is close to the ground, the matter sucked from the surface of the earth moves into the fireball and is incinerated by the intense heat. (This dust is the "stem" that gives ground bursts their mushroom shape.)

As the debris is pulled up into the nuclear explosion, it's exposed to the radiation produced by the chain reaction; this exposure induces radioactivity in the debris. As this molten, now radioactive debris continues upward, it cools off and solidifies into small particles which gradually fall back to earth. These particles are radioactive fallout.

Fallout travels upward a long way; it takes quite a while for it to fall back down. Even close to ground zero, it will take at least 15 minutes for large sand to pea sized pieces of fallout to return to the earth. Smaller pieces, falling farther downwind from ground zero, will take longer with the very smallest of particles remaining airborne for days, weeks, months, or even years as they are blown farther and farther by high altitude winds.
This lag time that it takes for the fallout to arrive on the ground is a big plus which many are unaware of. Because of the time needed before fallout can reach the ground, areas down range which will eventually receive dangerous levels of fallout will remain free of radioactive particles for up to several hours following a nuclear blast. This gives you time to make last minute preparations or even travel to a safer location if you're caught away from home during the attack or even pick up the children from school if they are close by. You'll have at least 15 20 minutes and more likely an hour or more.

Because large particles of fallout will arrive before the smaller ones, you'll not have trouble spotting fallout unless you're so far down wind that only small particles will be arriving many hours or even days later. Large fallout will arrive in a variety of forms and color (due to its make up and depending on the material that was at ground zero). White, gray, or even black ash or popcorn like particles could be encountered.

Regardless of its form, it will be falling from the air and will appear unlike any natural phenomena. You'll be able to recognize it for what it is. When the fallout starts to arrive, you must get out of it as soon as possible (and ideally -would be out of the open well before fallout started to arrive).

If you are forced to be in the open, keep radioactive fallout off your skin and clothing by brushing it off. Cover your head and use a wet handkerchief over your face to keep from inhaling the dust if you don't have any other sort of dust mask available. Remember: any time spent in the fallout will greatly lower your chances for surviving. Get into a shelter of some sort as soon as you can.

During the critical time before fallout arrives, it's important that you don't get side tracked since you don't know how much time you really have. Do first things first. Let tasks slide that aren't essential. Remember, too, that communications will be disrupted, buildings may be destroyed, many people will be panicked and/or injured.

Be prepared to look out only for yourself and your family; trying to "save" everyone will only result in everyone's loss. While this seems harsh, those who haven't taken a few minutes to learn about how to survive a nuclear attack are going to be so ill prepared that they'll soon perish in any area where lethal amounts of fallout to come into the area they're in unless they are extraordinarily lucky. If you really care about these people, you should try to tell them how to survive NOW, well before a nuclear attack; last minute teaching won't take place when the bombs have exploded and the fallout is ready to rain down. Once the attack has taken place, save yourself and your family and let those who have gambled with their future by not preparing to survive pay the piper.

During such a time of panic and confusion, you'll need to be careful you don't get sucked into unwise decisions or suggestions from others who don't have any real idea of what is going on. This will include many "authorities" who are completely ignorant of what a nuclear attack would be like. School officials, your boss, policemen, national guard troops, etc., may all be giving orders and instructions which if followed could result in your death or the death of your loved ones. Ignore the chaos and go about your business of surviving as quickly as possible.

If you're away from home and can't get back to your family shelter, don't seek shelter someplace which will gradually become packed with people. This includes all US "public fallout shelters" which, as most readers know, are currently only signs on public buildings (the exception to this rule are shelters created for Congress which have been and continue to be fully stocked). To put it bluntly, public shelters are potential death traps.

If you travel a lot, or work some distance from your home, then a bugout bag of essentials would greatly improve your chances as well. This bag could be kept in a closet or locker at your place of work or in the trunk of your car. It could get you through the arrival of the fallout and then you could travel back to your home on foot to join your family weeks later.

If you prepare ahead of time, you can minimize potential thermal pulse and blast damage to your home. One important point is to choose a home with a light colored roof and exterior paint (both are especially important on wood frame houses); light colors reflect both light and heat making your home more fire resistant to the thermal pulse of a nuclear weapon. Avoid a weathered wood exterior on your home and don't paint it a dark color. Brick or stone facings are first choice both for the added shielding they give from radiation as well as their resistance to thermal damage.

Terracing around your home can also add a lot of shielding to a basement -- creating a potential make-do shelter in the process. Such work can be very attractive and can even improve the value of your home if you sell it.

Some trees, shrubs, and grass are more fire resistant than others and should be considered for planting around your house. Evergreens tend to be more flammable than deciduous trees and are best avoided in areas very close to targets (where a thermal pulse could set the trees on fire).

Your lawn shouldn't turn brown in the fall (Bermuda grass is especially bad about this). And be sure to keep dead bushes, piles of leaves, etc., well away from your house so that they can't start a fire following a thermal pulse. For the same reason, don't stack firewood next your home and keep the garage free of stacks of old newspapers and cardboard boxes.

Since a nuclear blast can turn windows into jagged daggers, it's wise to take some steps to minimize this danger. One way to help keep chunks of glass in the window is to place an "X" of tape across each pane of glass. Cloth tape is best for this, but multiple layers of scotch tape, clear packing tape, or contact "paper" (which is actually plastic) over glass panes will also improve things if you're worried about how your windows look to the neighbors. Best bet is to replace glass in bedrooms or other areas where you may not be able to react quickly to an oncoming blast with plastic. Most hardware stores stock clear plastic that can be used in windows.

White reflects light; that means white drapes, curtains, or shades are more ideal than darker colored window coverings when it comes to reflecting a nuclear thermal pulse. These light colors will reflect much of the light and thermal pulse back out your windows and might even save you from having a fire indoors.

After the nuclear blasts have occurred, you should take a few steps to protect you home from further damage while you're in your shelter. If your area may have freezing weather while you're holed up, it's a good idea to drain the water out of your home's pipes to keep them from rupturing and damaging the inside of your house.

Patching up any light damage done to your house by a nuclear blast is also a good idea if it can be done quickly before fallout enters your area. Windows and doors can be sealed with large strips of plastic or duct tape to minimize the entrance of fallout dust. Shutters or large sheets of plywood might be used to close up windows which might be easily used for entrance by looters who don't have the good sense to get out of the fallout once it starts to arrive. Doors and windows can even be nailed shut but be sure you leave several ways for you to escape from your home quickly should there be a house fire or similar disaster.

The aftermath of a nuclear attack would be no picnic. But, with some advanced preparations and common sense tactics like "duck and cover", you could survive and live to help rebuild your neighborhood and perhaps even help create a new nation.
