Chapter 3
Warnings and Communications

IMPORTANCE OF ADEQUATE WARNING

When Hiroshima and Nagasaki were blasted by the first nuclear weapons ever to be used in war, very few of the tens of thousands of Japanese killed or injured were inside their numerous air raid shelters. The single-plane attacks caught them by surprise. People are not saved by having shelters nearby unless they receive warning in time to reach their shelters—and unless they heed that warning.

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 20 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.

OFFICIAL WARNING SYSTEM

The U.S. official warning system is designed to give civilians timely warning by means of siren signals and radio and television announcements. The National Warning System (NAWAS) is a wire-line network which is to provide attack information to official warning points nationwide. When the information is received at warning points by the officials who are responsible, they will sound local sirens and initiate radio and TV emergency broadcasts—if power has not failed. Officials at NAWAS warning points include many local civil defense directors. NAWAS receives information from our

constantly improving military warning and communications systems.

SIREN WARNINGS

The Attack Warning Signal is a wavering, wailing sound on the sirens lasting three to five minutes, or a series of short blasts on whistles or horns. After a brief pause, it is repeated. This signal means only one thing: take protective action—go promptly to the best available shelter. Do not try to telephone for information; get information from a radio broadcast after you reach shelter. It is Federal policy that the Attack Warning Signal will not be sounded unless an enemy attack on the United States has been detected. However, since local authorities may not follow this policy, the reader is advised to check the plans in his community before a crisis arises.

The following limitations of attack warnings given by sirens and broadcasting stations should be recognized:

- Only a relatively small fraction of urban Americans could hear the sirens in the present city systems, especially if most urban citizens had evacuated during a crisis.

- Except in a crisis threatening the outbreak of nuclear war at any moment, most people who would hear the attack warning signal either would not recognize it or would not believe it was a warning of actual attack.

- A coordinated enemy attack may include the detonation of a few submarine-launched ballistic missiles (SLBMs) at high altitudes over the United States within two or three minutes of the launching of hundreds of SLBMs and intercontinental ballistic missiles (ICBMs). Such high-altitude bursts would produce electromagnetic pulse (EMP) effects primarily intended to knock out or disrupt U.S. military communications. These EMP effects also could knock out the public power necessary to sound sirens and could put most unprotected broadcasting stations off the air.

Radio warnings and emergency communications to the general public will be broadcast by the Emergency Broadcast System (EBS). This system uses AM broadcasting stations as the primary means to reach the public; selected FM and TV stations are included for backup. All stations during a crisis plan to use their normal broadcast frequencies.

EBS stations that are not put off the air by EMP or other effects of early explosions will attempt to confirm the siren warnings of a nuclear attack. They will try to give information to listeners in the extensive areas where sirens and whistles cannot be heard. However, EMP effects on telephones may limit the information available to the stations. The functioning EBS stations should be able to warn listeners to seek the best available nearby shelter in time for most of these listeners to reach such shelter before ICBMs begin to explode. Limitations of the Emergency Broadcasting System in 1979 include the fact that very few civilian radio stations are protected against EMP effects. Many of the protected stations would be knocked out by blast; most do not afford their operating personnel fallout protection that is adequate for continuing broadcasts for long in areas subjected to heavy fallout.

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 are 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.

Unlike the more numerous, small, multiple warheads of most U.S. SLBMs, most Soviet SLBMs produce a megaton-range explosion. Within the first 10 minutes after the beginning of an attack, many runways 7000 feet or longer are likely to be cratered by a 1-megaton surface burst. 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 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 (EMP) 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.

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 15 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, windows can be shattered by a multimegaton 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 $7\frac{1}{2}$ 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 or 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 is a 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. In such dangerous areas, people in shelters 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 KEEP RADIOS OPERATING

Having a radio to receive emergency broadcasts would be a great advantage. The stations that would still be on the air after an attack would probably be too distant from most survivors to give them reliable information concerning local, constantly changing fallout dangers. However, both morale and the prospects of long-range survival would be improved in shelters with a radio bringing word of the large-area fallout situation, food-relief measures, practical survival skills, and what the government and other organizations were doing to help. Radio contact with the outside world probably can be maintained after an attack if you remember to:

- Bring all of your family's battery-powered, portable radios with you to shelter, along with all fresh batteries on hand.
- Protect AM radios by using only their built-in short loop antennas. The built-in antennas of small portable radios are too short for EMP to induce damaging surges of current in them.
- Keep antennas of FM, CB, and amateur radios as short as practical, preferably less than 10 inches. When threatened by EMP, a danger that may continue for weeks after the initial attack because of repeated, high-altitude explosions, do not add a wire antenna or connect a short radio antenna to a pipe. Remember that a surge of current resulting from EMP especially can damage diodes and transistors, thus ending a radio's usefulness or reducing its range of reception.
- Keep all unshielded radios at least six feet away from any long piece of metal, such as pipes, metal ducts, or wires found in many basements and other shelters. Long metal conductors can pick up and carry large EMP surges, causing induced current to surge in nearby radios and damage them.
- Shield each radio against EMP when not in use by completely surrounding it with conducting metal if it is kept within six feet of a long conductor through which powerful currents produced by EMP might surge. A radio may be shielded against EMP by placing it inside a metal cake box or metal storage can, or by completely surrounding it with aluminum foil or metallic window screen.
- Disconnect the antenna cable of your car radio at the receiver—or at least ground the antenna when not in use by connecting it with a wire to the car frame. Use tape or clothespins to assure good metal-to-metal contact. The metal of an outside mirror is a convenient grounding-point. Park your car as near to your shelter as practical, so that after fallout has decayed sufficiently you may be able to use the car radio to get distant stations that are still broadcasting.
- Prevent possible damage to a radio from extreme dampness (which may result from long occupancy of some belowground shelters) by keeping it sealed in a clear plastic bag large enough so the radio can be operated while inside. An additional precaution is to keep a plastic-covered radio in an air-tight container with some anhydrite made from wallboard gypsum, as described in Appendix C.
- Conserve batteries, because after an attack you may not be able to get replacements for months. Listen only periodically, to the stations you find give the most useful information. The batteries of transistor radios will last up to twice as long if the radios are played at reduced volume.