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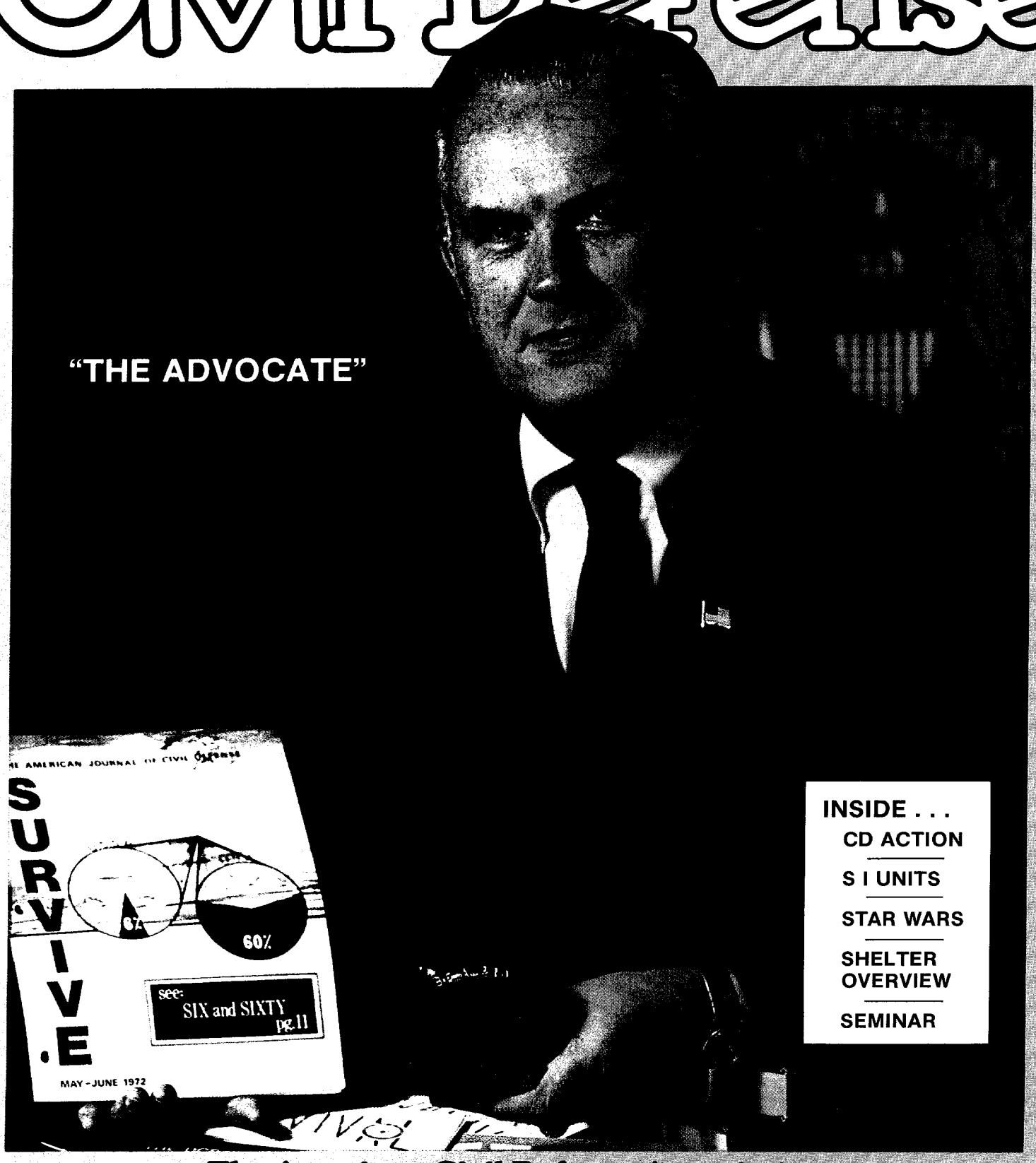

INSIDE . . .

The American Civil Defense Association

TRADEMARK — THE AMERICAN CIVIL DEFENSE ASSOCIATION

The American Civil Defense Association

Journal of Civil Defense

Presenting the Views of Industry, Technology, Emergency Government and Concerned Citizenry

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COVER PICTURE

John Bex is Chief of the Executive Programs Division at the Emergency Management Institute in Emmitsburg, Maryland. Through thick and thin for over 15 years he has advocated and actively campaigned for a "defense that defends." In his article on pages 6 and 7 ("Needed Now: Action for Civil Defense") he strongly urges that Congress examine the evidence and make a decision in the best interests of the American people.

DISPLAY ADVERTISERS

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The *Journal of Civil Defense* presents authentic information relating to civil defense—to the survival of free government, the United States and peace in the nuclear age. Its aim is public education in this field and service as a forum.

Authors are encouraged to submit manuscripts for consideration by the editorial committee for publication (the *Journal,* as a non-profit organization, pays no fees). Articles, preferably illustrated, should be 500 to 1,200 words in length, slanted to the non-technical reader, and oriented toward the civil defense field. Views expressed in contributions to the *Journal* are those of the authors and do not necessarily reflect *Journal* policy. Material may be reproduced if context is preserved, credit given, and copy sent to the *Journal of Civil Defense.*

"The need for an effective Civil Defense is surely beyond dispute . . . No City, no family nor any honorable man or woman can repudiate this duty . . ."
— Sir Winston Churchill

CAPITAL COMMENTARY — Jerry Strope

You have their word on it

On June 2nd, Julius W. Becton, Jr., director of the Federal Emergency Management Agency, hosted a briefing at FEMA headquarters for representatives of a broad range of private associations including, for example, the Reserve Officers Association, the National Governors Association, and the National Association of Counties. I attended on behalf of both TACDA and the American Strategic Defense Association. This column is both report and commentary.

. . . TODAY CIVIL DEFENSE IS "IN DEEP TROUBLE."

The subject of the meeting was civil defense. In introduction, Director Becton stated that, among FEMA's various missions, civil defense was "our bottom line." He also acknowledged that today civil defense is "in deep trouble" and needs all the help it can get. The new ingredients to be discussed were the recent National Security Decision Directive signed by President Reagan on February 4th and a new nuclear attack planning base named NAPB-90. The impact of NSDD-259 was discussed by Joseph Moreland, head of the newly established Office of Civil Defense at FEMA, and NAPB-90 was summarized by its project officer, Ronald Treichel.

Moreland was refreshingly candid about the meaning of NSDD-259, which was reproduced in its entirety in the June issue of this Journal. Yes, the directive reasserted that the policy of the United States is to have a civil defense capability as an element of its national security posture. But what kind of capability? The "operative" language is "The program will emphasize development of a civil defense infrastructure capable of rapid expansion in a national security emergency." In other words, having been rebuffed by the Congress for funding to produce an effective civil defense "in being," the Reagan Administration has now formally renounced this former objective.

Forget about defense against a surprise attack or a sudden confrontation. The new civil defense capability will be to "surge in an international crisis." For how long? Who knows, but a goodly number of months would be required even if the "infrastructure" to do so were developed. Plans will be laid and, if taken seriously, will profoundly change the character of the future FEMA budgets for civil defense. This can be seen already in the 1988 budget submission, with its emphasis on "crisis management" (emergency operating centers), a hardware item that is not susceptible to surging. Look for renewed emphasis on training trainers rather than operators and similar evidence of concern for the surge infrastructure.

The second set piece in the briefing was NAPB-90. The connection with NSDD-259 is contained in the latter's itemization of responsibilities: "The Federal Government will focus on guidance to the public and to State and local governments to improve preparedness for national security emergencies . . . Governments at all levels should make information available to citizens on threats, including nuclear attack . . ." As pointed out at the briefing, State and local governments are quite capable of judging threats from natural and technological disaster agents but the Federal Government is uniquely qualified in the arena of nuclear attack threat. The civil defense agency has published guidance on the attack threat since the "target areas" of the 1950's. The most recent version, known as TR-82, was formulated over a decade ago. Since Soviet weapon systems have changed drastically in the interim to emphasize more numerous warheads of lower explosive yield, FEMA apparently has given high priority to in-house development of a replacement for TR-82. The replacement, NAPB-90, has been published as an interim document pending, among other things, consultations with State agencies. That's fortunate because the interim version is larded with errors, both large and small, that will need correction irrespective of comments from the States.

FORGET ABOUT DEFENSE AGAINST A SURPRISE ATTACK . . .

But the real problem with NAPB-90 is not the bundle of errors but the implications for its use as a planning basis. Unlike TR-82, which targeted big weapons as both air and surface bursts simultaneously, NAPB-90 is based on how the Soviets say that they would fight a nuclear war. Thus, most of the weapons are air-burst, sharply reducing the extent of the fallout threat. In addition to military and military-industrial targets, the NAPB-90 charts are littered with hundreds of bursts on isolated electrical power and chemical plants. But the one resource not targeted is the one FEMA is charged with defending — people. The Soviets do not target population, considering that immoral, says the briefer. You have their word on it!

The anti-defense lobbies will have a field day with that one, you can rest assured, especially since the proportion of the U.S. population at risk of direct weapons effects has been reduced. But one can wonder at the merit of the proposition for planning purposes even if it may be closer to the mark than, say, TR-82. After all, most city people have been convinced in this age of MAD deterrence that they are the hostages who will be shot at. And, public opinion polls suggest that many, if not most, will be attempting to get out of town at about the time that FEMA gets around to getting permission to surge civil defense.

Maverick retired (USAF) Colonel John E. Bex — Hoosier-bred rugged individualist — makes no bones about the requirement for mandatory United States civil defense.

An outspoken advocate of professionalism in the civil defense field the sometimes caustic Bex has spotlighted survival problems in articles in the nation's newspapers and leading patriotic publications. At one time Bex was Regional Director at the Defense Civil Preparedness Agency's Region II headquarters in Olney, Maryland.

In this, Bex's latest of a long string of Journal articles dating back fifteen years, Bex called for an active Congressional Civil Defense "action" committee — a committee that could, in addition to probing civil defense facts and fallacies, provide — as the Hébert Committee did in 1963 — members of the committee and other members of Congress dramatic evidence that civil defense, with or without SDI, is a vital requirement for American perseverance in the Nuclear Age.

NEEDED NOW:

ACTION for Civil Defense

— John E. Bex

A great amount of news coverage is being devoted to civil defense these days during what can be called a sort of "discussion period." While much of the material has been supportive, some of it reflects a strong opposition to any sort of civil defense capability for the people of these United States. In fact, in some quarters, contempt of civil defense appears to have developed into a "cottage industry."

For the concerned opposition I'd like to share these thoughts:

In anticipation that a nuclear exchange could occur out of anger or by accident we have these options:

(1) Do nothing;

(2) Plan to seek nearby shelter;

(3) Plan to evacuate to a distant, more secure area should time permit.

During the 1950s and 1960s it was felt that we would have only a few hours advance notice. Now it is felt that we may have a longer period — up to several days or a couple of weeks. Knowledgeable authorities have stated that the kill area of the total USSR missile arsenal, if it all impacted upon U.S. soil, would cover no more than 4 to 5 percent of our land area. It is reasonable, then, to assume that if one had the time and determination one could find secure shelter from fallout in the remoter areas of our country where chances of survival would be good.

What is it that makes the small opposition to civil defense so vocal? Civil defense has always been the element of national security most intimately related to the citizenry. Civil defense provides a system for reducing vulnerability of people and communities to damage, injury and loss of life and property in the event of disaster. Elected and appointed officials at the state and local levels of government depend on their civil defense organization for support in carrying out their disaster-related responsibilities. A good part of the reason for an accompanying "down-with-civil defense" syndrome is a lack of understanding in civil defense reflected in allegations such as:

(1) The American public is not sold on civil defense;

(2) Civil defense cannot work;

(3) Civil defense measures make war more thinkable and are provocative;

(4) Civil defense is gigantically expensive.

The allegations reflect a lack of knowledge of the facts, contribute to misinformation and serve to foster erroneous conclusions. Let's look at these points one by one:

(1) The American public is not sold on civil defense?

A large body of available public attitude information shows a consistent level of public support for every kind of civil defense program — fallout shelter, blast shelter and evacuation. Few public programs command such a broad base of passive support. Survey

Lack of Resolution

Apathy at state and local levels reflects the lack of federal resolution and purpose of a national scale. The defense of the country and the protection of the people are elements of the common defense as provided for under the Constitution and are primarily a federal responsibility. The general public reacts to a national situation in the way in which their leaders react. Apathy and indifference at the federal level cascades and permeates all political levels making the prospect of providing adequately for the common defense an insurmountable task.

Cuts in the federal budget for Civil Defense are echoed in the budgets of state and local governments. The result is widespread atrophy.

— John E. Bex

data since the 1960s show that 87 percent of the population surveyed is in favor of fallout shelter, that 50 percent felt that the people should go along with any fallout program the government proposed, and that more than two-thirds of Americans would not be opposed to "strategic evacuation."

According to this research, the public regards civil defense as a government responsibility. People associate civil defense with national defense and trust the government in this area. They believe that what needs to be done *is* being done. They believe more is being done than is actually being done and that even this is *not enough.*

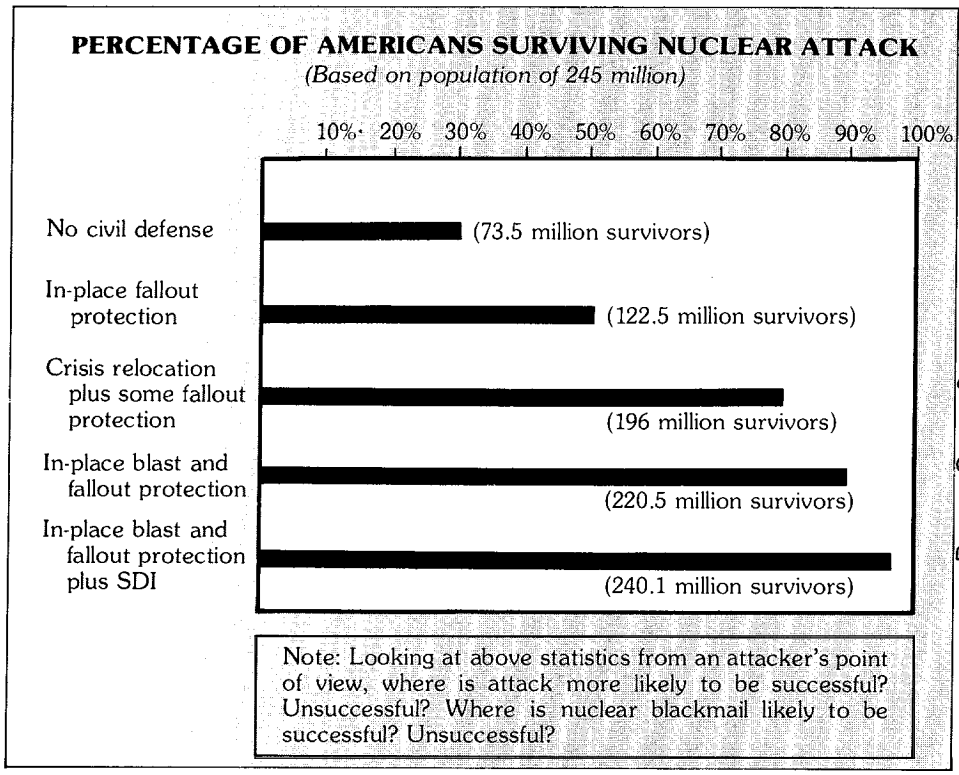
(2) Civil defense cannot work?

More than six out of every ten Americans estimate that their chances for survival in the event of nuclear attack are bad. People who live in highly industrialized urban areas estimate that their chances are even worse than that. But studies indicate that effective civil defense can definitely reduce the vulnerability of the U.S. population. For example, if there were no civil defense about 30 percent of the population would survive. With in-place fallout protection about 50 percent would survive. With crisis relocation (evacuation) plus some fallout protection about 80 percent would survive. With in-place blast and fallout protection about 90 percent would survive. And couple this with SDI ("Star Wars") and 98 percent would survive.

The greatest prize in life is to work hard at a mission worth doing. Civil defense is that kind of mission. Since Steuart Pittman there has been no national director who took civil defense seriously until now. I am elated that Julius Becton apparently is going to try to enforce the law. What more can you ask of a national director?

— John E. Bex

As former Soviet Civil Defense Chief Marshal V.I. Chuykov said over fifteen years ago: "Although the weapons we have examined are called mass weapons, with the knowledge and skillful use of modern defense measures they will not affect the masses, but only those who neglect the study, mastery and use of these measures."



(3) Civil defense measures make war more thinkable and are provocative?

Survey data do not show that preparedness measures make war seem to be more acceptable, more probable. The Soviets have been spending over four billion dollars per year on civil defense measures. They do not seem to have worried about it being "provocative" to the United States. Survey data show that about two-thirds of those asked feel that such measures "make no difference" one way or another in this regard.

(4) Civil defense is gigantically expensive?

Building underground shelters that would protect our population from fire and blast truly would be expensive. Our Congress has so far ruled out this option.

Certainly one of our biggest concerns is the fact that the Russian people are being conditioned to the thought that you can fight a nuclear war and survive. Inasmuch as no effort yet has been made by us to bring a national in-place shelter concept into being, crisis relocation planning (evacuation of likely target area) appears to be a viable inexpensive option. This is a common-sense choice of prudent people that has been misconstrued due to inadequate communication — not only to the media, but to the public at large. To be sure, the "don't-want-to-listen-or-understand" anti-civil defense groups have further distorted the issue.

Civil defense warning systems over the years have saved thousands of lives and have in doing this paid for their investment many times over. They have been used in warning roles for tornadoes, fire, earthquake, hurricanes and other natural disasters. Evacuations have also paid off in lives saved. As have other civil defense measures. Civil defense training, education and public information are most important — and inexpensive too.

As the "Star Wars" concept is better understood and developed, the need for a well-coordinated civil defense program will become clear. If only five percent of enemy-fired missiles should get through our space-based defenses then civil defense would mean the saving of millions of lives.

Civil defense makes good sense, and the world knows it. But in the United States it needs a rugged shakedown. It needs an overhaul and major surgery. No one knows that better than the present FEMA leadership. Congressional action is long overdue.

With public safety at stake in a massive way the subject merits public debate. That would help generate congressional action. □

Marcel M. Barbier has earned two Ph.D. degrees — one in electrical engineering from Zurich, Switzerland (1950) and one in physics from Paris, France (1954). He was radiation safety officer at the European Organization for Nuclear Research in Geneva, Switzerland from 1954 to 1973. Since that time he has been a consultant on radiation hazards in the United States. In 1980 he founded his own shelter design and construction company — Marcel M. Barbier, Inc. (See his classified ad in "Marketplace," page 30.)*

Soviet Civil Defense Action at Chernobyl

— Marcel M. Barbier

Now that sufficient information on the Chernobyl nuclear accident has been gathered, it is possible and interesting to examine the part played by the Soviet Civil Defense Organization in mitigating the consequences of the accident.

We begin by a chronology of the events. It will show all that had to be done in this particular nuclear catastrophe. From this it will then be possible to draw conclusions and lessons for our own civil defense.

Saturday, April 26, 1986, 1:24 A.M. — Two explosions shatter the Chernobyl Reactor 4 building, sending up tons of radioactive materials, reactor debris and ignited graphite into the atmosphere. Some of this falls down and sets neighboring buildings on fire. Emission of heat, gases, radioactivity continue throughout the night.

1:30 A.M. — The Pripyat and Chernobyl Fire Departments rush to the scene.

2:30 A.M. — The Generator Hall roof fire, nearest to the reactor, is brought under control thanks to the incredible courage of the firemen.

5:00 A.M. — Most other fires are under control. 35 firemen and plant technicians are rushed to hospitals. 8 of them, having received doses of the order of 1600 rads (16 grays), die within a few days.

7:30 A.M. — Civil Defense Directors and Military Commanders arrive at the plant and establish their headquarters and the base for all the rescue operation in an existing large civil defense bunker located 600 meters (2,000 feet) from the damaged reactor.

11:00 A.M. — The nuclear experts team has already left Moscow by air. All telecommunication links with the administration and military nationwide have been established.

3:00 P.M. — Helicopter photos, video recordings and dose measurements become available. Aircraft and surface teams survey a 30-kilometer radius around the reactor for radioactivity. A number of men from the helicopter crews die in the following days from exposure to radiation.

Helicopter decontamination in progress near Chernobyl reactor site.

Sunday, April 27th — First helicopter drops made of boron compound, lead, concrete, clay to put out fire of burning reactor (continued through June with total of 1,000 flights).

1:30 P.M. — 57,500 persons moved out in 3 hours from Pripyat and Chernobyl under supervision of 5,000 doctors, nurses and civil defense personnel.

Monday, April 28th, 9:00 A.M. — First measurement of radioactivity outside the Soviet Union, in Sweden. Recordings of Swedish monitoring stations (unmanned on weekends) show that the fall-out arrived at 2:00 P.M. on Sunday. Additional 77,500 persons plus farm animals are moved out of the 30-km radius around the reactor. Evacuee emergency supplies, rations and animal feed are delivered to all population and animals.

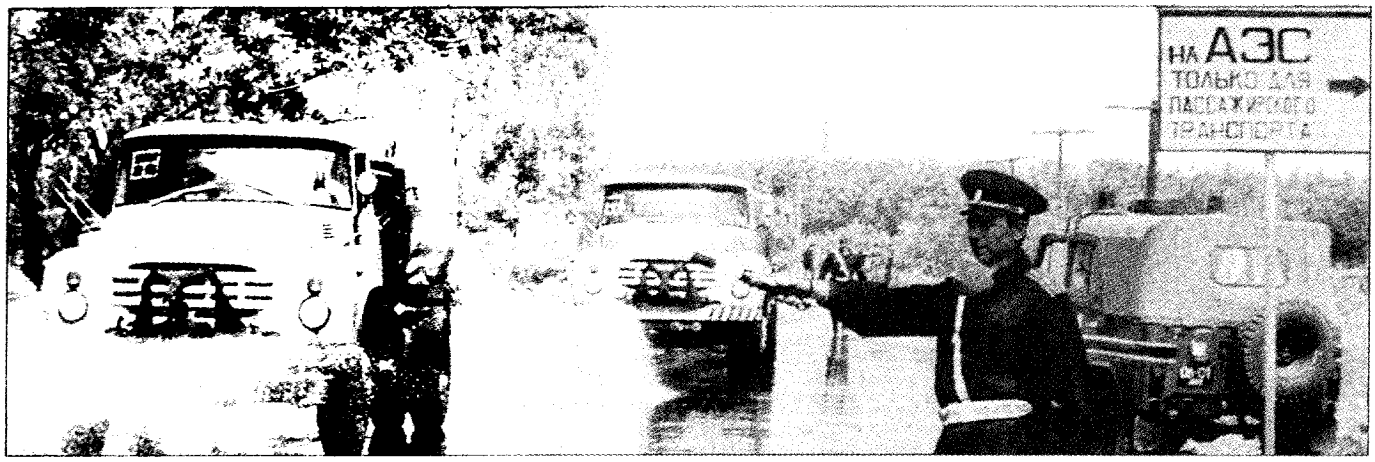
250,000 children are moved out of the city of Kiev, under supervision of 2,500 Kiev civil defense personnel mobilized for monitoring and surveillance of the evacuation.

60,000 infants and mothers are evacuated from the areas of Gomel, Shitomir, Tchernigoi, Minsk.

May 1st-2nd — A 300-second inspection of underground cavity below reactor takes place. Outflow valves of water pools below reactor are opened by a volunteer team of divers. 200 fire engines pump out the water from the pools underneath the reactor.

Clearing of debris around reactor building is done by radio-controlled excavators and bulldozers. Helicopters drop "sticky" decontaminants

*Address: P.O. Box 2905, Reston, VA 22090 (Tel: 703-860-1275).



Road scene near Chernobyl reactor site after accident.

to fix surface radioactivity.

May 3rd through 7th — Nitrogen gas is circulated through the basement and cooled through a cooling plant outside.

May 11th through 18th — 400 engineers and miners dig a 7-foot wide, 460-foot long tunnel at a depth of 20 feet under the reactor building.

May 18th - June 30th — Construction of an additional one-meter thick concrete foundation under the whole reactor building with its own nitrogen-fed heat exchanger to remove the heat from the reactor core.

June - July — Removal of top soil and pancakes of radioactive decontaminants is done by special machinery with operator cabs shielded from radiation with steel and lead sheets.

July - August — Roof of turbine hall is repaired. Foundations of outside wall of reactor building are extended to carry additional wall of concrete. Concrete is poured over irretrievable machinery to confine radioactive debris. Massive dykes and walls are erected around reactor site to prevent washing out of surface radioactivity by water into nearby lake and streams.

August - October — Completion of reactor entombment takes place. Hundreds of deep wells are bored to assure uncontaminated water supply.

This chronology leaves one in awe. Given the fact that the accident was caused by mismanagement of the reactor, the response to the emergency, in contrast, was truly remarkable. One cannot but admire the courage, resolve, and technical competence of the various teams and organizations which participated in the rescue and salvage operation. Also their ability to plan and execute innovative and difficult feats of engineering under hazardous conditions has to be highly commended.

It is now possible to derive some conclusions from the Chernobyl experience with respect to our own civil defense needs:

In general, with the gigantic scale of the rescue and salvage operation and the very limited time in which to act, there is need for a large civil defense force of trained personnel nationwide, ready for action instantly.

Manning of radiation monitoring stations should be round-the-clock, 7 days a week.

Lack of operational radiation dose rate meters results in deaths, especially for teams which are the first on the scene (firefighters, helicopter crews).

Underground civil defense shelters are a necessity for every rescue operation, as they provide protection from blast, fall-out and fire and serve as emergency operation centers and bases for personnel and equipment. Such shelters should be built at all locations of potential hazard and threat.

Reliable telecommunication links from the rescue post and headquarters nearest to the disaster have to be established immediately.

Vehicles shielded with lead and steel plates and equipped with NBC (nuclear, biological, chemical) air filtering systems are required for transportation of rescue personnel and equipment to site of accident.

Radio-controlled excavators and bulldozers in the highest radiation areas in the immediate vicinity of the accident are necessary for mitigating the causes producing the hazard.

Manned excavators with cabs clad with lead or steel are needed for clearing rubble, opening roads and cleaning-up radioactivity in the high radiation areas.

Protective clothing and respirators with adequate filters or independent air supply have to be available on a large scale.

Personnel to check very large contaminated areas and determine or open safe routes for evacuation, has to be available in large numbers in a very short time for an evacuation to be successful.

Medical and civil defense personnel has to be mobilized in large numbers to oversee evacuation and give health care to evacuees at a network of preinstalled disaster refuges, field clinics, and disaster hospitals.

Plans for providing transport, emergency rations, clothing, bedding, tents, medical supplies, animal feed have to be ready.

Even in areas distant from the disaster, teams must be available to check the atmosphere, soil, water supply and edible items for radioactivity, promulgate safety rules and distribute iodide tablets if appropriate.

Do we have all of the above? It is time people raise their voices to request each and every part of it.

Are we willing to do something about establishing a civil defense organization really capable of coping with nuclear accidents, terrorism and war? □

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Like it or not — and most of us do not — the "International System of Units" is being used increasingly throughout the world. Those units used for radiation measurements in this "SI" system differ from those with which we have grown comfortable. Here Dr. Kathy Gant, a physicist at Oak Ridge National Laboratory, tackles the job of clarifying types of radiation measurements and explaining the SI unit that should be used for each. Although the United States lags behind most of the world in adopting these units, we need to become familiar with them in order to understand and cooperate with our colleagues who are using them.

This article is a response to requests by those who have read reports of radioactivity (e.g. those from areas affected by the Chernobyl incident) given in SI units. It may take for most of us a bit of concentration.

Kathy S. Gant

SI Units

— A Coherent System for Radiation Measurements*

— Kathy S. Gant

Physical units — the way we choose to express measurements of physical quantities — can be an emotional topic. We have developed a sense of measurements in our familiar system of reference (a foot or a quart, for example), and we are sometimes reluctant to change that frame of reference.

On the other hand, the use of different units of measure by different people makes commerce and communication unnecessarily difficult. Scientists, who collected environmental data from many countries following the Chernobyl accident, found themselves confronted with data containing a variety of units, from picocuries per liter to counts per egg. Inconsistencies in units and errors in conversion complicated the environmental analyses.

Just "going metric" is not the answer. Although the radiation units used in the United States have always been metric, they differ from those in the International System of Units (SI), increasingly used throughout the world.

Table 1. SI and conventional radiation measurement units

Physical Quantity	SI Unit	Conventional Unit	Relationship
Activity	becquerel (Bq) (s^{-1})	curie (Ci)	1 Ci = 3.7 X 10^{10} Bq = 37 GBq
Exposure (x rays and gamma rays only)	coulomb/kilogram (C/kg) (no special name)	roentgen (R)	1 R = 2.58 X 10^{-4}C/kg = 258 uC/kg
Absorbed dose	gray (Gy) (J/kg)	rad	1 rad = 0.01 Gy = 10 mGy
Dose equivalent	sievert (Sv) (J/kg)	rem	1 rem = 0.01 Sv = 10 mSv

THE SI SYSTEM OF UNITS

In 1954, the General Conference on Weights and Measures (CGPM), an international group, adopted a rationalized and coherent system of units for worldwide use. At the group's 1960 conference, this system was formally named the International System of Units or in French, Le Système International d'Unités, from which we get the initials SI.

SI has seven base units, the meter (length), the kilogram (mass), the second (time), the ampere (current), the kelvin (temperature), the candela (luminous intensity), and the mole (amount of a substance). The radian and steradian are considered supplementary units for measurements of plane and solid angles, respectively.

In SI, there is only one unit for each physical quantity, and units for other quantities are derived from these. Sometimes, as in the case of the radiation units, these derived quantities have been given special names. The SI units are coherent, that is, relationships between SI units contain only the number one; there are no conversion factors. For example, the derived SI unit for force is the newton. Just as force is the product of mass and acceleration, the newton is the product of the units for mass and acceleration (kg and m/s^2, respectively). The

Table 2. Quality factors (Q) for different kinds of radiation.[a]

Type of radiation	Q
X rays, gamma rays, and electrons	1
Thermal neutrons	2-3
Fast neutrons and protons	10
Alpha particles	20

[a]Alan Martin and Samuel A. Harbison, *An Introduction to Radiation Protection*, Chapman and Hall, New York, 1982, p. 30.

*Based on work performed at the Oak Ridge National Laboratory, operated for the U.S. Department of Energy under Contract No. DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc. The views expressed are those of the author and do not necessarily represent those of the Department of Energy.

Table 3. SI Prefixes					
Factor	Prefix	Symbol	Factor	Prefix	Symbol
10^{18}	exa	E	10^{-3}	milli	m
10^{15}	peta	P	10^{-6}	micro	μ
10^{12}	tera	T	10^{-9}	nano	n
10^{9}	giga	G	10^{-12}	pico	p
10^{6}	mega	M	10^{-15}	femto	f
10^{3}	kilo	k	10^{-18}	atto	a

newton is then defined solely by multiplying and dividing the base units ($kg \cdot m/s^2$).

SI UNITS FOR RADIATION PROTECTION

The differences in the traditional radiation units — curies, roentgens, rads, and rems — are often not understood. The units and terminology developed along with the field of radiation science. Rad and rem sound very similar. The confusion about radiation measurements is frequently complicated by professionals who are not careful with their use of the terminology. This article will examine the SI radiation units, indicate their relationships to the other units, and try to clarify the quantities they describe. This material is summarized in Table 1.

Activity

The activity of a radioactive source refers to its rate of radioactive transformation or decay. The original choice of a curie (Ci) for the unit of activity was based on the activity of radon in equilibrium with one gram of radium. This value was later standardized at 3.7×10^{10} per second.

The SI unit for activity is the becquerel (Bq), defined as one per second* or $Bq = s^{-1}$. (Although other quantities, such as frequency, could be described in becquerels, the unit is, by convention, reserved for radioactivity.) Then $1 Ci = 3.7 \times 10^{10} Bq$.

Exposure

The first widely used radiation unit was the roentgen (R), introduced in 1928. The roentgen is a measure of exposure, the amount of ionization that gamma rays or x rays produce in air. (Ionization is the removal of an electron from an atom.) Ionization can be readily measured, so the exposure is a good indication of the intensity of some radioactive fields. Although the roentgen is still used (the standard U.S. civil defense instruments read in roentgens or roentgens per hour), it has limitations as a unit. It applies only to x rays or gamma rays and their effect on air. However, we are usually more concerned about the effect of radiation on tissue or other materials.

In the SI system, the unit for exposure is the coulomb per kilogram (C/kg). No special name has been given to this unit. To convert measurements in roentgens to SI units, use $1 R = 2.58 \times 10^{-4} C/kg$. (Note that the coulomb is not an SI base unit; it is defined as an ampere-second.)

Absorbed Dose

The radiation absorbed dose or rad describes the energy that is deposited by radiation in any material. The rad is defined as 100 ergs (energy) absorbed per gram of material (0.01 J/kg). A 1 R exposure would result in an absorbed dose of 0.87 rad in air or about 0.96 rad in tissue for gamma rays or x rays over the commonly encountered range of energies. The historical reason for the choice of 100 ergs was that under conditions of charged particle equilibrium, about 100 erg/g (within about 10%) resulted from the exposure of a small volume of tissue to 1 R. (The similarity of the numerical value for roentgens and absorbed dose in tissue led many people in the past to use the terms interchangeably in situations where great accuracy was not required. It is, however, incorrect to refer to a "dose of 10 R.") Unlike exposure, absorbed dose is a valid concept for any type of ionizing radiation.

The SI unit for absorbed dose is the gray (Gy), defined as an energy deposition of one joule per kilogram (J/kg) of material. The gray is then 100 times larger than the rad (100 rad = 1 Gy).

Dose Equivalent

Although the same amount of energy per unit mass may be deposited in tissue by different kinds of radiation, the biological effectiveness of that dose may differ. One rad of alpha radiation can do about 20 times as much damage in a biological system as one rad of gamma radiation. To adjust for this difference, the absorbed dose in rads was multiplied by a "quality factor" (Table 2). This product was the dose equivalent in rem. The dose equivalent allows one to sum up the effects of absorbed doses from different kinds of radiation.

In the SI system of units, the unit for dose equivalent (H) is the sievert (Sv). It is defined as the product of the absorbed dose (D) in grays, the quality factor (Q), and a further modifying factor (N) that considers other aspects such as dose rate ($H = D \cdot Q \cdot N$). At the present, this modifying factor has been given a value of one. Hence, 1 Sv = 100 rem. When the quality factor also has a value of one, the absorbed dose in Gy is numerically equivalent to the dose equivalent in Sv.

WORKING WITH SI UNITS

Practice and use will help us learn to "think" in SI units. Calculations

Table 4. Comparison of doses in both old units and SI units.		
Description	Old Units	SI Units
Whole body dose that would cause[a]		
100% exposed population to die within 2 weeks	1000 rem	10 Sv
50% exposed population to die within 2 months	350-450 rem	3.5-4.5 Sv
Mild nausea in part of the exposed population	50 rem	500 mSv
Annual whole body dose limit for nuclear industry workers	5 rem	50 mSv
Average annual per capita dose due to[b]		
Natural background	103 mrem	1.03 mSv
Medical procedures	91 mrem	910 μSv
Nuclear weapons testing	4-5 mrem	40-50 μSv
Nuclear power	<1 mrem	<10 μSv
Consumer products	0.05-1.5 mrem	500 nSv-15 μSv

[a]K. S. Gant and M. V. Adler, "The Effects of Low Levels of Radiation", *The Journal of Civil Defense*, 17(4), 1984, p. 13.
[b]B. Sheien and M. S. Terpilak, eds., *The Health Physics and Radiological Health Handbook*, Nucleon Lectern Associates, Olney, Maryland, 1984, p. 8.

*This means one disintegration per second.

are easier in SI units, because conversion factors are not required within the system of units.

Because the range of activities, absorbed doses, and dose equivalents is very large, prefixes are used with the SI units to describe multiples and submultiples. These SI prefixes are shown in Table 3. The use of prefixes allows one to deal with convenient numerical values (75 MBq instead of 75,000,000 or 7.5 X 10^7 Bq), by substituting a prefix for an exponent.

It is important to know which units are being used in order to keep the numerical values in perspective. The numerical values for activity in becquerels are much larger than the equivalent value expressed in curies, because the becquerel is a small unit. For example, assume that 1.0 mCi of iodine-131 is administered for a medical thyroid-imaging procedure. To convert this activity to becquerels, first express it in curies and then multiply by the conversion factor.

$$1.0\ \text{mCi} = (1.0 \times 10^{-3}\ \text{Ci}) \times (3.7 \times 10^{10}\ \text{Bq/Ci}) = 3.7 \times 10^{7}\ \text{Bq} = 37\ \text{MBq}.$$

Numerical values for absorbed doses and dose equivalents in grays and sieverts are one hundred times smaller in SI units than those in rads and rems. For example, a typical dose received from cosmic radiation on a transcontinental jet trip is 2.5 mrem. In SI units this would be

$$2.5\ \text{mrem} = (2.5 \times 10^{-3}\ \text{rem}) \times (10^{-2}\ \text{Sv/rem}) = 2.5 \times 10^{-5}\ \text{Sv} = 25\ \mu\text{Sv}.$$

Additional examples of dose conversions are found in Table 4. The numerical resemblance between roentgens and rads for x rays and gammas does not hold for comparable quantities with SI units, emphasizing the essential difference between exposure and absorbed dose.

ADVANTAGES AND DISADVANTAGES OF USING SI UNITS

It is an advantage to have a single set of coherent, rational, and decimal units used in all countries and in all branches of science. The SI system is simple to learn and use. National language dependency is eliminated; SI units need no translation.

The radiation protection field is rapidly adopting SI units. Although curie, rad, and rem are still frequently used, they are often used along with the SI units. Many scientific journals require the SI units be given and tolerate the others in parentheses. SI units have already replaced all other units in many parts of the world.

Instruments and equipment are built for a world market. Nuclear instruments made in the United States have historically had a relatively large percentage of sales outside the country. Until the SI system is universally accepted, manufacturers who serve international markets will have to build two versions of a radiation detection instrument or design instruments with dual readouts.

There is some concern that the transition to SI units will cause errors in both nuclear medicine and the nuclear industry. It is not clear whether dealing with unfamiliar units might cause problems or whether it might prompt more careful calculation. In Sweden, the nuclear medicine and radiation therapy field switched to SI units in January 1979 without adverse effects. As a consequence of the change, the x-ray therapy equipment is now calibrated in terms of absorbed dose, which has resulted in greater accuracy in administering the prescribed dose.

The adoption of SI units may require retraining of people, changing some reference materials, adapting computer codes, and modifying older instruments. Most of the regulations under which the U.S. nuclear industry operates are still written using the old units. Conversion of regulatory limits will probably involve more than just an arithmetic adjustment; new standards will be expressed in terms of rounded values in SI units.

Regulations involving the international transportation of radioactive material are already being implemented in SI units. In an effort to keep the Transport Index in the same magnitude, it is being redefined in μSv/10 h, instead of mrem/h. Activities will be given in becquerels, but labeling that includes both sets of units may be required during a transition period.

IMPLICATIONS FOR CIVIL DEFENSE AND EMERGENCY PREPAREDNESS

The emergency preparedness and radiological defense fields could be particularly affected by the switch to SI units. There are a large number of civil defense instruments throughout the country which read in the old units. Civil defense and emergency response organizations involve a large number of people who are not radiation protection professionals and may not receive frequent training.

FEMA does not consider gradual conversion to SI units as a viable alternative. In the event of a large nuclear accident or nuclear attack, decisions on public safety would be made using the existing stockpile of instruments and the previously trained personnel. They feel the importance of accurate communication of radiological information during a national emergency should not be complicated by the problem of coping with two systems of units. FEMA estimates the cost to convert the existing instruments, retrain personnel, and update written guidance would be $75-90 million.

The responsibilities of radiological defense personnel, however, are often no longer confined to planning for nuclear attack. Many also have responsibilities for responding to peacetime radiological emergencies, such as transportation accidents and incidents at fixed nuclear facilities. They may have to deal with shipping papers giving activity in becquerels or cooperate in large accidents with other responders who are using newer instruments and SI units. They cannot wait until such time as FEMA receives a large enough appropriation to convert the entire radiological defense system to become familiar with SI units.

The impact of the change to SI units can be lessened by planning now for the changeover. Both sets of units could be used in the current radiological training courses and refresher courses. Both instructional materials and operational guidance, such as Protective Action Guidelines, should include the new units.

Obtaining civil defense instruments that read in SI units is a larger problem. The most desirable choice in the transition period would be new instruments which read in either system of units. Realistically, however, there is not likely to be significant replacement of the older instruments for some time. Perhaps in the near future, the scales on the instruments could be changed or

scale overlays developed for the new units. When it is not practical to change the scale, a conversion chart might be attached to the instrument.

SI units will eventually be the standard for radiation measurements. Sooner or later we will all be working in becquerels, grays, and sieverts. The end result will be a simpler way of dealing with radiation measurements. Perhaps that simplicity will even make it easier to discuss radiation with the general public. □

CD AT CHERNOBYL: HELP OR ?

Marcel Barbier (see article, page 8) and Bruce Sibley (see review of his Chernobyl report, page 25) both indicate that Soviet Civil Defense was on the job at the Chernobyl disaster and effective to a fair degree under tremendous difficulties.

Other reports give a picture of confusion and failure to respond as expected. William J. Eaton of the *Los Angeles Times,* for instance, reports from Moscow that a civil defense exercise at Balakovo (a nuclear power plant site about 600 miles southeast of Moscow) attempted to correct the civil defense errors of the Chernobyl incident, found new ones to commit.

He quotes Yuri Burov, a Soviet reporter, as saying: "City officials were pathetic in their inability to do anything constructive."

Could be. But it should be remembered that the Soviets in condemning the American SDI plans are mum about their own SDI development. And past indications have been that the Soviets don't want it known by the West that their civil defense is good, well-funded and universal. To cite Soviet civil defense successes would be to encourage the West to do something about its own ailing program.

That would be terrible. □

LETTERS

Anchorage, AK

[Excerpt of letter from Bruce I. Staser to *Anchorage Daily News.*]

The history of technology tells us that Star Wars, once begun, will gradually be perfected. . . .

And what are the alternatives? Depending upon a dictatorship to keep its word? Verification of a disarmament agreement? Who really believes that a closed society would permit the thousands of inspectors that verification would require . . . ? And there is no substitute for on-the-ground inspections. So, I ask the opponents of Star Wars, once again, what are the alternatives?

Ephrata, WA

Dear Mr. Badley
[TACDA President]:

Thank you for your letter to the Seattle *Post Intelligencer* published March 24, 1987 regarding the poor attitude state officials in Oregon and Washington had toward a planned nuclear attack exercise. Your letter corrected and informed without ridicule — excellent!

I will be in Washington State for some years to come and I would like to work toward improving nuclear preparedness in this state.

Please provide me with information about your organization and advise me as to how I may be able to work with you here.

Gary M. Garnant

The "big guns" of the world of homeland defense line up in Mobile this November to expose and analyze the greatest danger the United States has ever faced: national survival in the face of the nuclear threat. The 1987 DDP/TACDA seminar November 6-9 at the Mobile Hilton will present top strategic scholars and planners in a provocative program that will feature speaker-audience exchanges and a challenge to government to come to grips with its No. 1 problem. The "Civil Defense Summit," as the seminar has come to be called, is a symposium where America's future is on the line. It is an appeal for preparedness and peace. It is a market for practical solutions and routes to them. It is a forum to explore ways for democratic civilization to endure in an age of unprecedented danger. It is a meeting not to miss.

THE CIVIL DEFENSE SUMMIT

1987 DDP/TACDA SEMINAR MOBILE, ALABAMA (NOVEMBER 6-9)

High Frontier Conference Precedes Seminar
American Public Works Association Gives Support

When Doctors for Disaster Preparedness (DDP) and The American Civil Defense Association (TACDA) meet this year in Mobile, Alabama for their annual seminar they will enjoy the active support of the Alabama-Mississippi civil defense professionals.

And High Frontier, which is now campaigning for early deployment of SDI, will hold a conference immediately preceding that of DDP and TACDA — at the same Mobile Hilton and during the day on November 6th.

Support will also come from the American Public Works Association, and its "Council on Emergency Management."

Pressed for an explanation of the seminar's theme — "Wake Up America" — TACDA president Charles L. Badley had this to say:

> If we are to be realistic, we have to face the disagreeable fact that war is no longer something that is "somewhere else" — far from our shores. With ICBMs and SLBMs and an array of other modern warfare techniques our women and children and our elderly are much more at risk than the GI in his front-line foxhole.
>
> We don't like to think about that. We turn away from it. We are in a kind of "Sleep Today - Weep Tomorrow" mode.
>
> DDP and TACDA contend that Americans deserve better, and that's the background for our 1987 theme: "Wake Up America."
>
> What is better is practical and attainable, and all we have to do is to make up our minds that survival is worthwhile. If we do that our chances for peace skyrocket.
>
> There's everything to gain and nothing to lose in a proposition like that. All we need to do is to turn our attention to it.

The 1987 seminar looks to be by far the most important in its 10-year history. It's a logical climax to those in Washington DC, Los Angeles, Dallas, Kansas City and elsewhere.

A reduced seminar fee ($148 to October 31st, then $165) and bargain rates at a refurbished Hilton ($40 single, double, triple or quadruple) add to the temptation. Mobile, "Garden City of the South," offers the visitor incomparable historic and scenic tours. Literally millions of chrysanthemums, for instance, at Bellingrath Gardens (they bloom in November).

Don't miss Mobile! □

HIGH FRONTIER SEMINAR NOVEMBER 6 — MOBILE HILTON

HIGH FRONTIER, the Washington-based organization which has since 1981 campaigned courageously and relentlessly for a non-nuclear strategic defense initiative, will conduct its seminar immediately prior to that of DDP/TACDA.

The HIGH FRONTIER seminar will be held at the Mobile Hilton during the day on November 6th.

DDP/TACDA seminar participants are invited to take advantage of HIGH FRONTIER's presence and attend its sessions.

Following this seminar (and the evening meal) DDP/TACDA invites all to its "Welcome Reception" at 7 PM.

Please note the HIGH FRONTIER annoucement on page 28 — and the DDP/TACDA seminar agenda outline on page 15.

DDP/TACDA AGENDA OUTLINE

Friday, November 6

7PM	— Welcome Reception — Exhibit Area, Mezzanine floor

Saturday, November 7

8:15AM-12:00N	— Seminar Morning Program
12:00N-1:30PM	— Luncheon Program
1:30-5:00PM	— Seminar Afternoon Program
7:00-8:00PM	— Reception (Exhibit Area)
8:00PM	— Banquet

Sunday, November 8

8:15AM-12:00N	— Seminar Morning Program
12:00N-1:30PM	— Luncheon Program
1:30-5:00PM	— Seminar Afternoon Program
5:00-10:00PM	— Mobile Hospitality Tour
7:30-10:00PM	— Shelter Workshop

Monday, November 9

8:15-11:30AM	— TACDA Business Meeting


Alley


Becton


Graham


Greene


Kearny


Teller


Wigner


Wiley

Note: For those DDP/TACDA seminar participants who wish to come early and/or stay late to take advantage of scenic and historic sightseeing (or for whatever other reasons) the cooperative Mobile Hilton offers to extend its bargain $40 single-double-triple-quadruple rate to cover the extra stay.

MOBILE SEMINAR MINI-BIOS (SCHEDULED SPEAKERS)

Eric E. Alley — Chief of British Civil Defense and prime mover in the new British civil defense initiative (formerly with ICDO, Geneva, Switzerland).

Julius W. Becton, Jr. (Gen.) — FEMA Director, strong civil defense proponent, in particular the provision of credible population protection measures.

Conrad V. Chester, Ph.D. — Chief of Emergency Planning Group, Oak Ridge National Laboratory (leading authority, national defense technology).

Donald Cheu, M.D. — National authority on airport disaster response, chairman, Calif. Disaster Medical Care Committee, Office of Emergency Services.

Daniel O. Graham (Gen.) — Former Director of the Defense Intelligence Agency; currently director of High Frontier; presidential advisor.

Nancy D. Greene — Strategic analyst; editor of intelligence newsletter HUMINT; motion picture actress (husband: Lorne Greene).

Wade Guice — Emergency Director of Gulfport, Mississippi, town that bore the brunt of 20th Century's most destructive American hurricane.

Cresson H. Kearny — author of *Nuclear War Survival Skills* (new edition now available); formerly with Oak Ridge National Laboratory.

Max Klinghoffer, M.D. — Medical response authority; author, *Triage Emergency Care Handbook;* combat surgeon; Chief, O'Hare medical rescue team 17 years.

Ken Lucas, M.D., Engineer — oncologist; Swiss background; proponent of strong preparedness against nuclear attack and terrorism.

Lambert C. Mims — General Counselor (and past-president), American Public Works Association; guest lecturer at National Emergency Training Center, writer.

Arthur Outlaw — Current mayor of Mobile; Director of Morrison, Incorporated (Morrison cafeteria chain headquartered in Mobile); youth counselor.

Arthur Robinson, Ph.D. — Chemist; writer; civil defense publisher; co-author developer;

Edward Teller, Ph.D. — H-bomb architect; x-ray laser developer; presidential advisor; author; Sr. Fellow, Hoover Institution on War, Revolution and Peace.

Eugene P. Wigner, Ph.D. — Nobel laureate; member of Fermi team that produced first nuclear reaction; edited *Who Speaks for Civil Defense?;* writer; author.

Charles Wiley — War correspondent (8 wars); prisoner in Communist jails; writer; outspoken orator; recently returned from Afghanistan.

Gregg Zimmerman — Shelter research specialist with Emergency Management Group, Oak Ridge National Laboratory; designer, fallout and blast shelter.

REGISTRATION — DDP/TACDA 1987 Seminar, Nov. 6-9, 1987
Registration — $148* (After Oct. 31: $165)
*Includes: 3 luncheons, 1 banquet, 2 receptions & coffee breaks)

TO: TACDA/DDP Annual Seminar
P.O. Box 1057
Starke, FL 32091
(Phone: 904/964-5397)

☐ Enclosed $ _____
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☐ I'll pay at registration desk

Name(s) _____

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City _____ State _____ Zip _____

Phone (_____) _____

ROOM RESERVATION FORM

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No deposit required. Give credit card information if arriving after 6 PM.

Arrival date/time _____ No. of days _____

Name _____

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City _____ State _____ Zip _____

Phone ( ) _____

— DDP/TACDA SEMINAR PARTICIPANT —

Dr. Jane M. Orient, Vice-President of Doctors for Disaster Preparedness (DDP), writer for leading medical journals and publisher of DDP's Arizona newsletter, is known for her uncanny talent for exposing technological blundering wherever it pops up. Here she trains sights on scientists who in an effort to discredit SDI are peddling spurious information.

Requiem for Strategic Defense ("Star Wars") is Premature

— Jane M. Orient, M.D.

Opponents of American homeland defense applauded a recent report by the American Physical Society (APS) with headlines like this: "Scientific Truth: Physicists' Report Shoots Down SDI Feasibility."

The truth of the matter is that the report did nothing of the kind. In addition, it is laced with technical errors that should acutely embarrass its eminent and prestigious authors when it is published as a serious scientific work.

Since no one is proposing near-term deployment of exotic weapons like lasers and neutral particle beams, the report is attacking a straw man. Advocates of rapid deployment want heat-seeking missiles called "Space Based Kinetic Kill Vehicles." These are based on a mature technology, now utilized in routine air defense (for example, the Sidewinder missile). The American Physical Society report ignores the only type of missile defense actually being considered by the Department of Defense.

It also ignores the reason for the sense of urgency that drives SDI proponents: the real possibility that the Soviet Union might have a first strike capability, *and* a nationwide defense against retaliation, by the mid-1990s. According to the 1985 National Intelligence Estimate 11-3-885, the Soviet Union has warm assembly lines that could be used for turning out antiballistic missile (ABM) components in massive numbers (*The Wall Street Journal,* July 16, 1985).

The authors of the report assert that we won't know about the feasibility of advanced directed-energy weapons for at least 10 years. Government scientists actually working on these technologies say it will only take from five to seven years. Either could be right, and both could be wrong. The government scientists naturally read the report with avid interest. They sought to learn something. And they discovered some astonishing errors, as detailed in a study by Gregory Canavan, a physicist of 25 years experience who has served as a high-level scientific advisor to the Air Force. Some of these errors are summarized in *National Review,* May 22.

The report asserts that 100 nuclear reactors would have to be placed in orbit to provide "housekeeping" power for 100 satellites. Why? The physicists assumed that between 100,000 and 700,000 watts

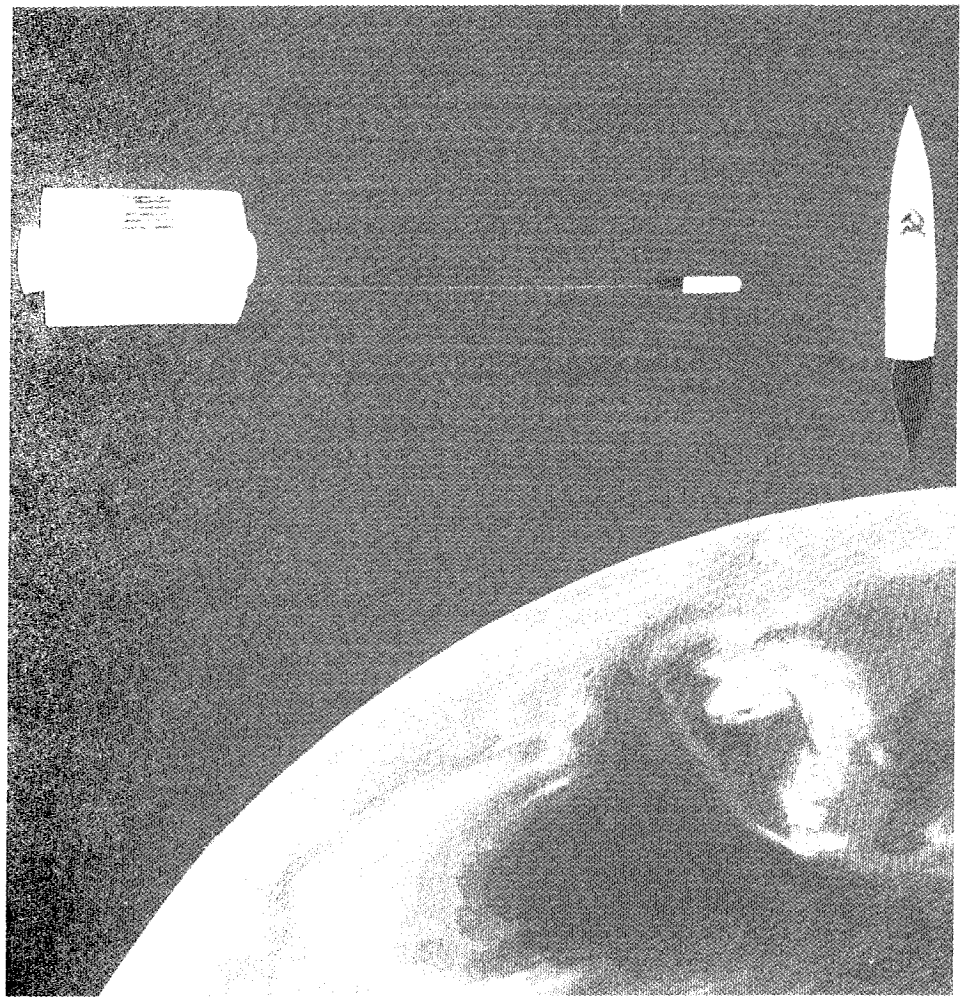
> Almost two decades of adherence to unsound theories and bad strategy has led the United States and its Free World allies to a crisis in our security. Ten years ago the United States was so militarily strong that an attack on our homeland was considered nearly inconceivable, not only by ourselves but by friend and foe alike. We were simply too strong to be attacked or intimidated. This is no longer the case.
>
> Today, Americans feel threatened by the possibility of nuclear attack, some so keenly that they grasp at such desperate measures as "nuclear freeze" in the vain hope that mere expression of those fears will remove the threat. Our allies no longer feel confident that American strategic power is sufficient to permit them to withstand the blandishments and threats emanating from the Kremlin. And, Soviets themselves grow even bolder in flexing the sinews of their vast armies, fleets, and nuclear attack forces — secure in the knowledge that American nakedness to attack by their massive array of long-range missiles ensures American timidity.
>
> Daily, this basic situation grows worse. It must be corrected as quickly and effectively as American ingenuity and productive capacity will allow. Otherwise, the adverse trends in Free World security will become irrevocable; liberty will either flicker out slowly as we yield gradually, or die in a blinding flash of nuclear war.
>
> — from *The Case for Space Defense,* by Gen. Daniel L. Graham.

of electricity would be required for such functions as temperature maintenance and operating radio equipment. But the actual power requirement is well known: a few thousand watts, a hundred times less than the report said. This amount is readily supplied by solar cells and storage batteries.

The physicists also state that one billion watts of power would be needed to run a neutral-particle-beam weapon. But that weapon is being designed to produce one-hundred-million-volt particles with a current of one-tenth of an ampere. From Physics I, watts = volts x amperes, giving 10,000,000 watts for the power of the beam. Since three watts must be put in for each watt that comes out, the power requirement is 30,000,000 watts, 30 times less than the physicists calculated.

The American Physical Society report says that the chemical lasers have only been tested at a power somewhat about 200,000 watts, and that another "one or two orders of magnitude" (a factor of 10 to 100) are needed. But a multimillion watt laser was demonstrated by SDI more than a year ago, and the Soviets have had such lasers for several years. (The Soviets claim they are for "medical research," but one wonders what sort of medical application involves blowing a hole a foot in diameter in a human body.) According to the Strategic Defense Initiative Organization, some technologies have shown one or two orders-of-magnitude increase in performance over the time during which the report was being prepared.

Dr. Frederick Seitz, a former President of the National Academy of Sciences (also former President of the American Physical Society) observed that the American Physical Society Report was "not worthy of serious consideration in this vital debate." And he added: "I know of no other way to describe a nominally serious study, replete with equations, which nonetheless contains numerous errors, inconsistencies, and unrealistic assumptions on matters of great importance in the technological assessment of missile defenses."



Considering countermeasures that the Soviets might adopt, the report acknowledges that shielding an SS-18 missile against lasers would diminish its payload to "less than half." But nearly *all* the payload (the bombs) would have to be sacrificed. The authors underestimated the mass of the shielding by assuming it to be proportional to the mass of the missile rather than to its surface area.

While countermeasures by Soviet rockets are incorrectly portrayed as easy and cheap, SDI opponents frequently allude to the vulnerability of defensive satellites. Yet satellites can defend themselves by a variety of measures, including maneuverability, shooting-back, shielding, and decoys.

Based on the flawed American Physical Society report, John Tirman (of the Winston Foundation for World Peace) advised in a *Los Angeles Times* editorial: "the nation should start making plans for SDI's burial."

If SDI is buried, it will be primarily for political reasons, not technologic ones. And a wrong decision could be followed by the burial of the United States as a free nation.

If SDI is buried, it will be primarily for political reasons, not technologic ones. And a wrong decision could be followed by the burial of the United States as a free nation.

Physicists of long memory may recall an early accompaniment of Hitler's rise to power. The prestigious German journals of physics started publishing shoddy work. □

Dr. Orient will be a panelist on the Doctors for Disaster Preparedness panel at the DDP/TACDA Seminar in Mobile, Alabama (November 6-9, 1987).

As leader of the Emergency Planning Research Group at Oak Ridge National Laboratory Dr. Conrad V. Chester has been working out the knotty problems of nuclear war survival for over 20 years. Chester's expertise focuses on design and testing of blast shelter, effects of nuclear weapons on nuclear reactors and protective measures against biological weapons. It includes other special studies in the nucleonics field. Dr. Chester is motivated by the conviction that a strong defense makes war less likely.

Shelter Overview 1987

— **Conrad V. Chester**

Major excerpts from a hitherto unpublished document prepared by Dr. Chester for The American Civil Defense Association.

Shelter is a vital part of any civil defense program. Present inventories of nuclear weapons in most of the world arsenals are capable of generating radioactive fallout over huge areas. In the case of the United States, a fraction of the existing Soviet arsenal is capable of covering almost all of the area of the United States with lethal levels of radioactive fallout. Without fallout shelter, people in these areas would die.

In addition, strategic target areas would be subject to blast effects from weapons. People who do not evacuate these areas would require blast shelter in order to survive.

FOREIGN CIVIL DEFENSE PROGRAMS

Several foreign countries have very effective and elaborate civil defense programs including extensive blast shelter to protect their people. Of these, Switzerland is the best known. In a steady program of investment which now approaches $30/person/year, it has over the past twenty years built excellent shelter for over 80% of its population. The Swiss government requires blast shelter in all new building construction and pays for the additional cost of the shelter.

The Soviet Union also has a very large and vigorous civil defense program which is based on a combination of very hard, well-developed, shelters for their leadership and much of their critical workforce, some unknown amount of shelter for their civilian population, and plans to evacuate unsheltered population in a nuclear crisis or confrontation.

SDI?

The question should be asked: Where does civil defense fit into the Strategic Defense Initiative (SDI) picture?

SDI is an opportunity to protect populations against nuclear missiles and to discourage nuclear attack itself. Its research and deployment must be pursued relentlessly.

Its deployment would not lessen the need for civil defense. Civil defense would provide invaluable help in taking care of SDI "leakage." If we use the often-cited 10% leakage figure for SDI, then an effective civil defense (50 psi shelter) would add more than 50 million Americans to the total of lives saved.

Why No U.S. Shelter?

There are a variety of contributing reasons that the United States has no effective in-place means to protect its citizens against nuclear war.

For the past twenty-five years a majority of the defense community has supported a U.S. strategic policy of Mutual Assured Destruction (MAD) which maintains peace by threatening total annihilation of of any possible attacker of the United States by a retaliatory nuclear strike. It was a natural evolutionary product of the nuclear superiority the United States enjoyed in the 1950's and early 60's. Shelters were seen as unnecessary and even harmful to a strategic doctrine of MAD.

The other reason why the United States has no shelter is cost. A blast shelter program to protect the bulk of the population of the United States in high risk areas would cost on the order of $100 billion which is significant even compared to strategic weapon systems.

There seems to be a developing consensus among many strategic writers and thinkers that MAD is unsatisfactory for the indefinite future. The acquisition of additional tens of thousands of warheads by the United States and the Soviet Union is no longer perceived as

adding to the safety of either side or to the stability of international relations.

FALLOUT SHELTER

Groundburst nuclear weapons can cover very large areas with lethal levels of fallout radiation. The areas covered depend on wind patterns at the time of the attack and firm predictions of fallout in any given area cannot be made even if the precise attack pattern is known. In any national civil defense program, fallout shelter is needed in every location by every citizen.

PROTECTION FACTOR

The degree of protection offered by a fallout shelter is often expressed as "protection factor" (PF) or "fallout protection factor" (FPF). This factor is the ratio of the dose a person would get outside the shelter in an open area compared to that he would get inside the shelter over the same period of time. Spaces designated as fallout shelters usually have a protection factor of at least 40. Spaces with protection factors of 200-1000 would prevent injury or illness from fallout almost anywhere in the country.

FALLOUT PROTECTION PRINCIPLES

Gamma radiation from fallout is absorbed by any kind of mass, such as earth, water, concrete, lead, iron or wood. A layer of any mass weighing approximately 100 lbs./sq. ft. placed between fallout and a shelter space will reduce the radiation from that fallout entering the space by a factor of 10. If the layer of protective mass is doubled to 200 lbs./sq. ft. the radiation coming through it will be reduced by a factor of 100. If the layer is increased to 300 lbs./sq. ft. the radiation penetrating the layer is reduced by a factor of 1000. For fallout radiation these factors are not affected very much by the composition of the material.

EXAMPLES OF FALLOUT SHELTER

The term "best available" is often used to describe existing structures which provide some protection against fallout. There are many such structures both natural and man-made which can offer substantial amounts of radiation protection with little or no modification.

Caves, Mines and Tunnels

Underground caves, mines, and tunnels extending more than a few hundred feet underground offer almost complete protection against fallout radiation. However, if more than a few people are to be sheltered in such structures, some form of forced air ventilation is required.

A very promising future source of fallout shelter is underground mines for the production of concrete aggregate dug in the neighborhood of large cities. Under Kansas City and its surroundings there are many such mines which have been excavated in such a way as to deliberately produce useable underground space. The rock is strong and well adapted to supporting large, open areas. It is quite possible that this quarrying technique could be extended to other metropolitan areas.

Underground Parking Garages, Shopping Malls and Tunnels

These man-made underground structures usually provide very good protection against radiation from surface fallout. Unfortunately, many of them are located in target areas and would be subjected to the additional hazard of blast for which they are not designed.

Basements

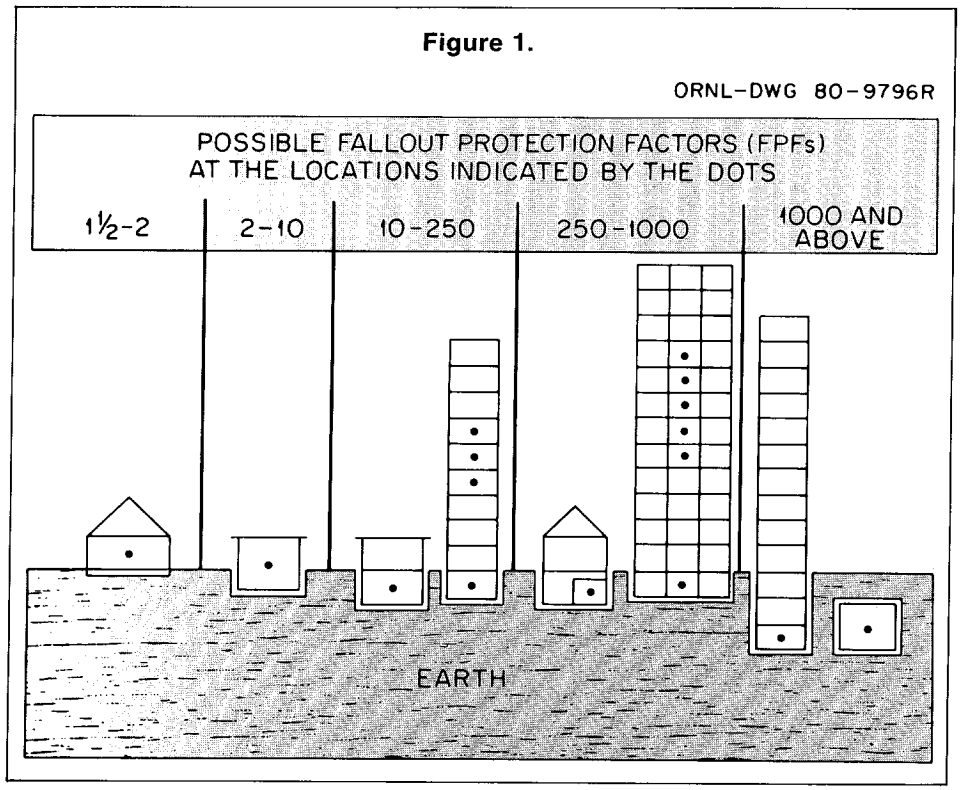
Basements in masonry buildings can provide fallout protection factors well in excess of 40, if the building has more than one or two stories. In many modern buildings, there may be 2 or 3 levels of basement. The lower levels provide very high protection factors. Fig. 1 is an illustration of the protection available in unimproved buildings.

Residential basements in single-family houses provide much lower protection factors; 10-20 with perhaps higher in corners. Significant protection can be obtained in residential basements by improvising additional shielding around a small space in the corner.

When considering using basements for shelter, the possibility of combustible furnishings on the upper floors being ignited by the thermal pulse from distant weapons should be kept in mind. Lightweight fabrics can be ignited by large-yield weapons at distances up to 20 miles.

FEMA publications provide descriptions on markedly improving the protection factors of basements (safely).

Figure 1.



Expedient Fallout Shelter

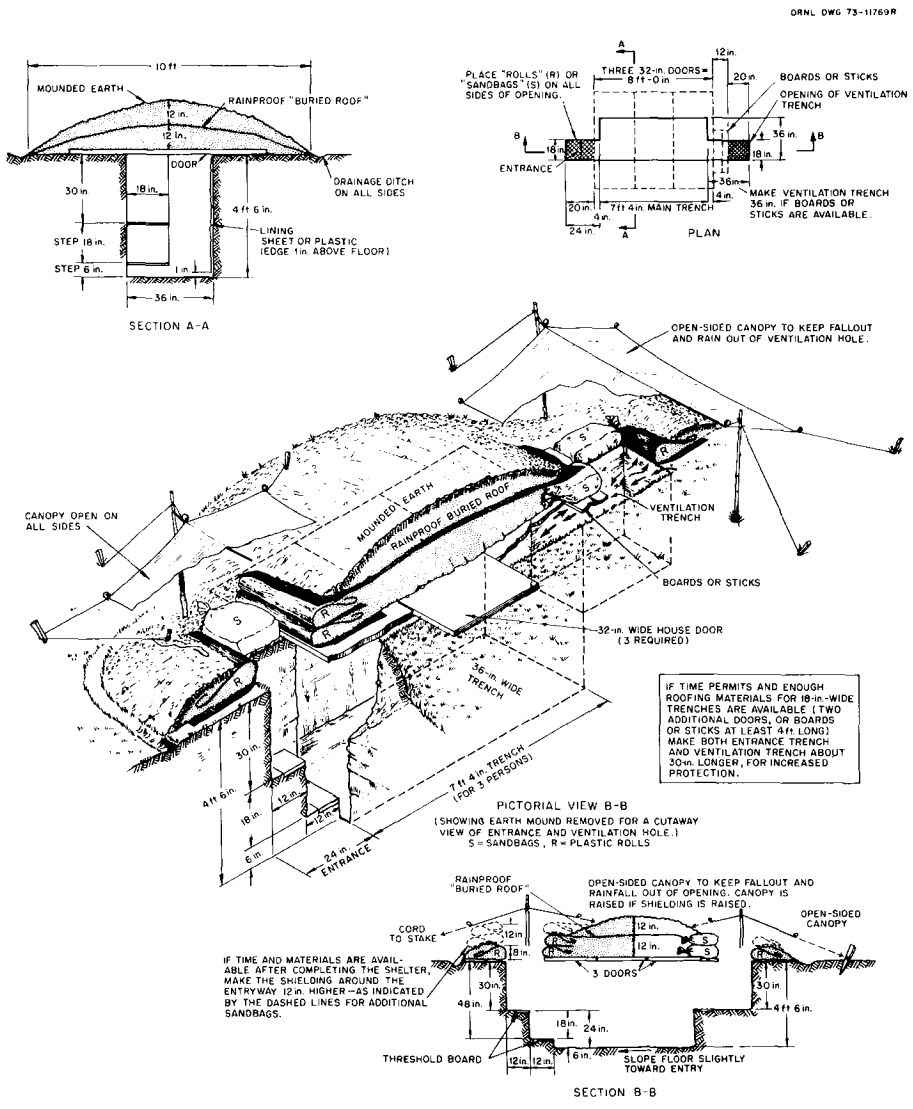
Expedient shelter is any shelter constructed out of materials at hand in an emergency. While this classification can include improvised upgrading schemes referred to above, the term commonly refers to covered trenches and earthworks such as described in the book *Nuclear War Survival Skills* by Cresson Kearny.

The simplest expedient shelter might be a foxhole with a tent or other rain cover pitched over it. A person sitting in the bottom of a 5-ft. deep foxhole would have a protection factor of 40 if he left the fallout on top of the rain cover over the foxhole. If the fallout were shaken off the rain cover, the protection factor while seated in the bottom of the foxhole would be 200. Similar protection factors can be obtained by digging foxholes or slit trenches in the crawl space underneath houses without basements or by tunnelling under the floor slabs of slab-on-grade houses. With this approach, very significant fallout protection can be obtained in an hour or two by moving a minimum amount of earth. However, foxholes are not very comfortable to spend two weeks in, and a foxhole underneath a house would be a very bad place to be if the house was ignited by a thermal pulse.

The very best protection that can be obtained after a crisis starts is from one of the covered trench designs of expedient shelters found in *Nuclear War Survival Skills.* The simplest versions of these are no more than a 4-ft-deep 3-ft-wide ditch dug in the earth and covered with closet doors, wood poles, 2 x 4's and sheetmetal, or any other material that can be put over the trench and then covered with a foot or two of earth (Fig. 2). Openings at either end make ventilation easy to accomplish. The earth cover provides complete protection against thermal pulse. If fallout is kept out of the entrances, the trench will provide a protection factor of at least 200.

Unshored covered trenches can collapse if exposed to low levels of airblast, but provide much better protection than frame houses.

Figure 2.



Prepared Shelter

In the event of a nuclear confrontation it would obviously be desirable from the standpoint of the country, the local civil defense director, and the individual, if there was close-by shelter space and the spaces were equipped with the necessary ventilation, water , food, sanitation, and light. President Kennedy advocated the construction of family fallout shelter in the summer of the 1960's during the Berlin crisis. Apparently, many people built private shelter in this time period. Very shortly afterward, the doctrine of Mutual Assured Destruction was adopted by the United States and very few additional people built fallout shelters.

Today, there is a revival of interest in civil defense. If a family were to build a fallout shelter, it would make economic sense to have it serve some additional and useful purpose such as a tornado shelter, root cellar, photographic dark room, or storage area.

"Slanted" Construction

It is possible to design commercial masonry buildings outside target areas in such a way that they provide large amounts of high-grade fallout shelter space at little if any additional cost of construction. This can be done by the grading around the building, and the selection of concrete construction, arrangement of windows, building layout, and number of stories.

In recent years, a new type of building construction called earth-sheltered construction has become popular. The impetus for this type of construction has been energy con-

servation. However, the means of achieving it — bringing earth up on two or three sides of the building and often on the roof — provides a structure with inherently good fallout protection. Earth-sheltering can be considered a type of slanting. It can be done at little additional cost in commercial masonry structures. However, earth-sheltered residences cost more than a residence of the same floor area built above ground of conventional frame construction.

In many areas of the midwest, earth-sheltered school construction is becoming popular as protection against tornadoes. Energy savings, in both heating in the winter and air-conditioning in the summer are an added inducement. This is a trend which should be vigorously supported by civil defense directors.

BLAST SHELTER

APPLICATION

With the present Soviet arsenal and the array of strategic targets in the United States, up to several percent of the area of the continental United States might be exposed to blast overpressures in an all-out nuclear war.

Present U.S. policy is to encourage the population to move out if a serious confrontation develops between the U.S. and the Soviet Union. However, if the crisis develops more quickly than evacuation can be conducted, blast shelter could save tens of millions of lives. Even with evacuation, some people will have reasons for staying in the risk area. Stay-behinds may include police and firemen and workers in critical industries. These people must be supplied with blast shelter if they are to be expected to remain.

Homeowners at the outer edges of the risk areas, particularly in the suburbs, may be reluctant to evacuate and leave their homes and possessions unguarded. A home blast shelter would make evacuation of the lower threat areas unnecessary.

PRINCIPLES OF PROTECTION

Protection against airblast is obtained by constructing a strong container in the form of a room which can be occupied by the shelter population. The room must be designed to be strong enough that it will not collapse under the design load — a straightforward exercise for a mechanical or structural engineer. The room must also have an entranceway closed by a door strong enough to resist the design overpressures, including any reflected or amplified overpressure and the negative phase as well. The door must also be capable of transmitting the blast load on it ultimately to the soil and be adequately supported around its edge so it is not torn loose and thrown into the interior of the shelter.

The shelter room must also have ventilation air intakes capable of admitting an adequate amount of air for the occupants with an acceptable pressure drop. The air intakes must be capable of surviving the environment where they come out of the ground; blast, windloading and any anticipated flying debris. The ventilation intakes must have some method of limiting the blast overpressure admitted to the shelter as well as completely excluding any airborne missiles that get into the air intake. The pressure limiting devices can be a quick closing blast valve, a flow retarding sand filter, or for low overpressures, a sufficiently long air intake duct with some turns in it.

SHELTER HABITABILITY

Survival

Surviving in shelter requires more than just protection against weapon effects. People will die within minutes without oxygen, hours without cooling, days without water, and weeks without food. It makes little sense to design a shelter without designing for these other threats to continued survival.

Ventilation

Ventilation is the most immediate need for shelter occupants. A flow rate of 3 cubic ft/min. (85 liters/min.) is recommended to replace oxygen and remove carbon dioxide for each occupant. This flow rate will suffice in many circumstances where shelters are small, occupants are few, and the weather is not too warm. Up to ten times higher rates are required for large, crowded shelters in hot, humid weather.

Water

Most humans will die in about four days if deprived of water. If the temperature and humidity are not too high, most healthy adults can survive on a quart of water per day for two weeks in reasonably good condition. In order to allow for some heat stress and a little water for sanitation, one gallon/person/day should be allowed for in shelter designs.

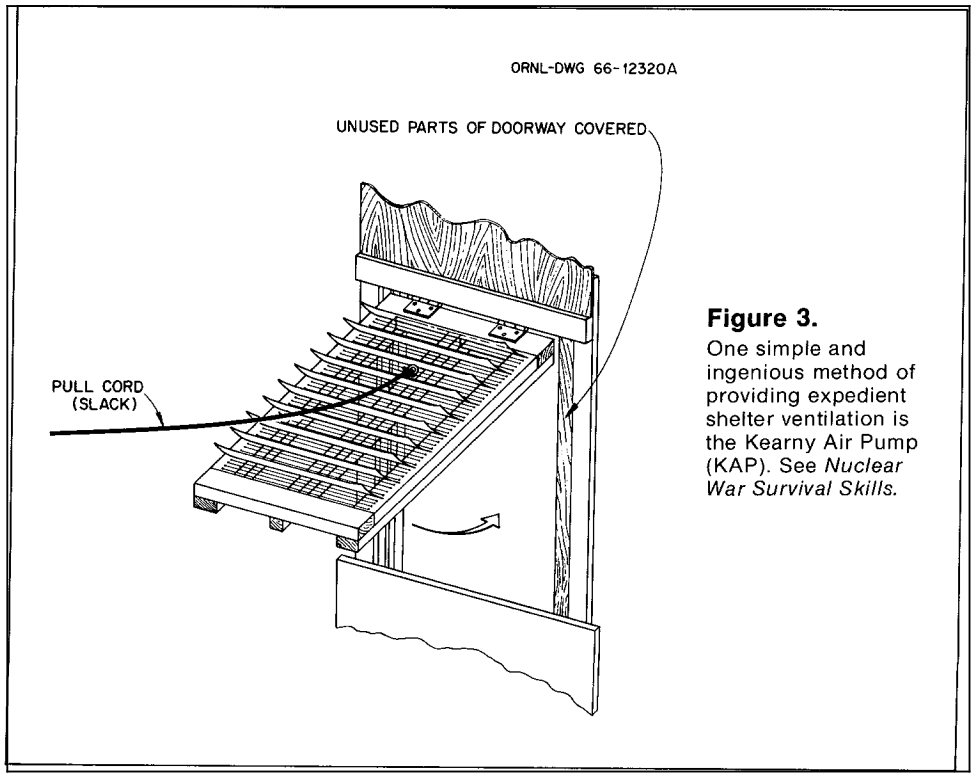


Figure 3.
One simple and ingenious method of providing expedient shelter ventilation is the Kearny Air Pump (KAP). See *Nuclear War Survival Skills.*

Food

The majority of healthy adult Americans could survive a two-week shelter stay with no food without ill effects. A continuing supply of food is critical for infants, small children, and pregnant or nursing mothers.

The critical survival problem with food (and water) may be a long-term supply. In large areas in the northeast a highly successful evacuation and fallout sheltering program could result in large numbers of survivors of a nuclear attack and a food supply of only a few weeks in some areas. Plans for restoring food shipments to these areas from food surplus areas are an indispensible part of plans to save the population.

Sanitation

In all American wars prior to World War II, more soldiers died from infectious diseases than from enemy weapons. World War II saw the large-scale introduction of sulfa drugs and later antibiotics which dramatically reduced deaths from infection.

It is quite possible that antibiotics would not be available for sometime after a nuclear attack. The widespread destruction of housing anticipated in a large war and the need for people to live in fallout shelter for a few weeks could result in large amounts of the population living in conditions resembling military field conditions prior to World War II. The general unavailability of antibiotics and medical care, electricity for public water supplies, and chemicals for water purification, in concert with effects or the radiation dose received by the population have led some analysts to predict additional population losses of 30% among the survivors of the attack. The vital necessity of public health measures, especially sanitation, is readily apparent.

Light

Underground shelters can be totally dark especially at night. The complete absence of light can cause vertigo in some occupants and can make essential tasks of feeding and sanitation very difficult.

Humans can survive the complete absence of light for very long times (e.g. blind people), and function reasonably well once accommodated to it. However, there are a variety of techniques for providing emergency light at very low cost ranging from powering flashlight bulbs off automobile storage batteries to the construction of improvised oil lamps and the use of aluminum foil reflectors in entrances of shelters.

Bedding and Winter Clothing

Hypothermia is a potential threat to small groups of people in shelters in cold climates in the wintertime. It is not a danger to people crowded into larger shelters. For people in small shelters blankets or warm clothing can be vital.

Communications

Communications, if only a.m. portable radios, are very important to a shelter population to tell them when they can safely emerge and begin recovery operations. Survivors will require information on renewed food supplies and where their labor can be most productively used to insure their continued survival.

CONCLUSION

A great deal is now known about designing and constructing shelters to protect people against the effects of nuclear weapons. Design manuals exist that enable any competent structural engineer to design an effective permanent shelter. It may not be the most economical shelter from the standpoint of labor and materials (due in many cases to the neglect of earth arching) but it will be effective.

One problem that has not been solved is that of getting useful amounts of shelter built. The political (and economic) climate in the United States in 1987 is not conducive to taking expensive measures to protect the American people against the effects of nuclear war.

It may be, however, that the situation is changing. □

SOVIET NUCLEAR POWER AFTER CHERNOBYL

[From the "Daily Report — Soviet Union" of the Foreign Broadcast Information Service]

Excerpt from a Werner Pirker Moscow dispatch for the Vienna VOLKSSTIMME, in German:

> The Soviet Union never considered a withdrawal from nuclear energy after the Chernobyl tragedy, not even a gradual withdrawal, said [Y. N.] Filimentsev [USSR Ministry of Nuclear Power Generation]. The accident can only result in an increase in safety. This was also made clear to the delegation of the Greens Party of the FRG, who paid a visit to the Ministry of Nuclear Power Generation. The accident happened because the most elementary human logic had not been followed.

Excerpt from a Moscow TASS broadcast in English:

> The contribution of nuclear-power engineering will steadily grow. By the year 1990 the output of electricity at this country's nuclear power stations will have doubled as compared with 1985. Eleven nuclear power stations are currently under construction in the USSR and their number will increase, a TASS correspondent was told by Andranik Petrosyants, chairman of the USSR State Committee for the Utilization of Nuclear Energy.

FEMA UPS CD ACCENT AT EMI

As a logical extension of FEMA Director Julius Becton's renewed emphasis on civil defense, courses at the Emergency Management Institute (EMI) at Emmitsburg, Maryland are getting in-depth revisions to bring them in line with the new policy.

The first major broadside in this effort is to be a new resident course to be called "Civil Defense Systems, Programs and Policies." The 32-hour (minimum) resident course is scheduled for January 4-8, 1988. The class will be subdivided into seven major subheads:

I. What is Civil Defense?
II. History of Civil Defense — 1950 to Present
III. The Hazards
IV. The Effects of Nuclear War
V. Civil Defense Systems, Programs, and Policies
VI. Interfacing With "The Public" on Civil Defense Issues
VII. Foreign Civil Defense Programs

The January pilot course will be aimed at regional staff personnel. A second pilot will target state staffs (June 20-24), and a third scheduled for September 12-16 will bring in local staffs.

No prerequisites are required.

Among the instructors will be FEMA State and Local Programs and Support (SLPS) Directorate Chief Joseph Moreland, who will cover "What is Civil Defense" and Dr. Wayne Blanchard, who will present "History of Civil Defense — 1950 to Present." Blanchard is also the designated FEMA "engineer" charged with the implementation of Becton plans for EMI.

The second initiative is to be a series of teleconferences patterned after the successful TV conferences that have been so popular in the past several years. The course outline is not yet firm, but it is contemplated that FEMA Director Julius Becton himself and SLPS Chief Joe Moreland will be prominently involved. The first of these conferences is planned for May 1988, the second for November 1988 and the third for April 1989.

EMI project officer for the civil defense upswing is veteran defense proponent John Bex, Chief of EMI's Executive Programs Division under the auspices of which the new courses will be programmed. "The third initiative," says Bex, "will be a civil defense seminar that is expected to serve as the capstone for the Professional Development Series (PDS) at the operational levels. Local emergency management/civil defense people who have completed PDS in the field would participate. Current plans are for the first seminar class to be held in May of 1988. Plans are to schedule four or five of these seminar presentations each year. We'll have more information as all these plans develop."

Setting the stage for the civil defense comeback at EMI is EMI Director Robert Petersen whose active support of hard-core homeland defense dates back to long before he was Civil Defense Staff College Director in Battle Creek, Michigan in the early 1970s.

Needless to say, TACDA and the Journal will be eager to disseminate news of a civil defense program that aims directly at their objectives of preparedness, survival and peace.

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READER'S DIGEST REACTS TO CONGRESSIONAL GIVEAWAYS

A matter of education: if you are wondering why Congress can't afford to protect the homeland read "Update — How Congress Creates a Deficit" beginning on page 39 of the July 1987 *Reader's Digest.*

Of the "ten most wasteful programs" exposed by *Reader's Digest* a year ago, only one was cut. The other nine "rip-offs" promoted by special interest groups and cooperating members of Congress include keeping 22 military bases open that the Pentagon wants closed, school lunch subsidies for children of mid- to upper-income families, and urban development that fattens the fat.

The article quotes Senator Bill Armstrong of Colorado as saying: "The verdict on Congress is: no guts." Senator Gordon Humphrey of New Hampshire is also critical. And Senator William Proxmire of Wisconsin indicates that for every taxpayer who testifies in favor of reducing the giveaways there are one thousand lobbyists from special interest groups who testify in favor of plundering the public.

The job of Congress it would seem, is not to plunder the public but to protect it.

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1986: LOWEST TORNADO DEATH TOLL IN HISTORY

Richard A. "Dick" Wood, DMIC, now at the National Weather Service Forecast Office in Albuquerque, NM continues to do an enviable job of reporting U.S. natural disaster deaths.

In his latest report Wood reveals that 1986 tornado deaths totalled only 15 — which beats the previous 1981 low of 24.

All deaths occurred in the months February through August. Mobile homes continued to lead fatality locations with 47% of the deaths accounted for there.

The "Disaster Preparedness Report" is published by the National Weather Service, 8060 13th St. (Room 1326), Silver Spring, MD 20910. Other than tornado deaths, it covers deaths by flood, heat, winter storms, lightning and hurricanes. It also presents— in addition to its thoroughly researched fatality statistics — 19 pages of information of particular value to those working in the disaster control field.

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WAY TO WAGE PEACE: *DEFENSE!*

Parade magazine for June 21st features joint articles by a Russian and an American titled "Can We Wage Peace?" Missing in the observations is the fact that active and passive homeland defenses by *both* the USSR and the USA (not by the USSR alone, as is the case today) will effectively protect each side with technologies not capable of offensive action.

Soviet objections to US homeland defenses are not a part of sincere peace efforts.

REVIEWS

NUCLEAR WAR SURVIVAL SKILLS — Lifesaving Nuclear Facts and Self-Help Instructions — Updated and Expanded 1987 Edition, by Cresson H. Kearny. Published by Oregon Institute of Science and Medicine, 2251 Dick George Road, Cave Junction, OR 97523. Single copy $9.50, 2 copies $16, 5 copies $35, 15 copies $75, postage paid. Author's original version published 1979 by Oak Ridge National Laboratory (ORNL).

— Reviewed by Don Hanks.

The original version of Cresson Kearny's *Nuclear War Survival Skills* was published by the Oak Ridge National Laboratory in 1979. It was republished with minor changes (some helpful, some possibly harmful) by several publishing companies. Although over 400,000 copies were sold from 1979 to now, the author has shared no royalties, nor will he prosper from the considerable market for his revised and updated 283-page version just published (1987) by the Oregon Institute of Science and Medicine.

That unprofitable situation occurred, alas, because Kearny wrote the original on company time so to speak. His books won't make him rich but they have made him famous, at least in nations where civil preparedness goals persist. So this review is more about the remarkable Kearny than about his best sellers.

Nobel Laureate Eugene Wigner wrote the biographical note. His protégé Kearny was one of the first scientists recruited to study nuclear war survival problems at ORNL.

Kearny's concern with nuclear warfare dates from his college years at Princeton where he graduated with top honors in 1937. He was a Rhodes Scholar and earned two degrees in geology at Oxford.

During the Munich crisis he was a courier helping anti-Nazis escape from Czechoslovakia. A year before Pearl Harbor he went on active duty as an infantry reserve lieutenant assigned to the Panama Mobile Force. There he helped develop equipment and rations specialized for jungle use. For that work he was promoted to major and was awarded the Legion of Merit. He served later as a demolitionist and in 1944 he joined the famed Office of Strategic Services.

Worried about America's continuing lack of civil defense, Kearny spent two years with Herman Kahn's Hudson Institute which was the most influential of the civil defense "think tanks" in the early 1960s.

ORNL became Kearny's base beginning in 1964 except for two years in Vietnam — long enough to receive the Army's Decoration for Distinguished Civilian Service in 1972. He is now "retired."

He is a genuine expert on civil defense here and in other countries including the USSR, China, Sweden, Switzerland, England and Israel. He initiated and edited translations of Soviet and Chinese civil defense manuals. He also designed and tested expedient shelters and other survival needs, including underground shelters built of commonly available materials by inexperienced civilians — a sort of ultimate demonstration.

Kearny's *Nuclear War Survival Skills* as revised, is considered the first book of its kind, all or most of it actually field tested. The book's main emphasis is on survival preparedness that can be completed in the last few days of a worsening crisis.

A few significant updatings improve the original version. The 1987 edition reflects changes in nuclear weapons and strategies. Improvements in self-help equipment and new instructions are cited.

An addition to the first chapter demolishes the recent myths of unsurvivable "nuclear winter" and blinding ultra-violet sunlight.

A new chapter supplies much more information about small and cheaper shelters than is described in official hand-outs. Shelter builders are advised to consider Russia's smaller, more accurate, and more numerous warheads when developing construction or evacuation plans.

Another new chapter tells how to reduce radiation from nuclear weapons exploded beyond American borders.

Improved instructions are given for making and using a KFM (Kearny Fallout Meter) which Kearny invented in 1977. The cost of materials won't exceed $17.

Simple instructions for making directional fans have been added to the "Ventilation and Cooling of Shelters" chapter.

A new appendix tells how to make a Plywood Double-Action Piston Pump, inspired by a wooden air pump the author saw in China in 1982.

The latest edition contains scores of other new facts.

Edward Teller in his foreword says the updated book is an overdue step in educating Americans. "It does not suggest survival is easy. But (the book) can save lives and it will stimulate thought and action crucial in our two main purposes: to preserve freedom and to avoid war."

The updated book costs $9.50 (postage paid) which is a better price than for the 1979 book. Quantity discounts are substantial, for example, $5 each for 15.

Among Kearny's other published works are *Blast Tests of Expedient Shelters in the DICE THROW Event* (1978), *Expedient Shelter Construction and Occupancy Experiments* (1976), *Construction of Hasty Winter Shelters* (1972), *Chinese Civil Defense* (1975), *Maintaining Nutritional Adequacy During a Prolonged Food Crisis* (1979), *The KFM, a Homemade Yet Accurate and Dependable Fallout Meter* (1978), and *Trans-Pacific Fallout and Protective Countermeasures* (1973).

THE NIGHT AFTER . . . Climatic and Biological Consequences of a Nuclear War. MIR Publishers, 1985, Printed in USSR at the VTI Press, Moscow. Compiled by Boris Gontarev. 165 pages. Available from: Victor Kamkin Bookstore, Inc., 12224 Parklawn Drive, Rockville, MD 20852. $5.75.

— Reviewed by Don Hanks.

Russia's scientists are a contradictory lot. Their country's leaders have spent millions to provide

effective blast and fallout shelter for urban citizens and many others. Yet every contributor to this book declares time and again that no nation, and not many individuals, can survive a nuclear war.

Russian writing of this sort has to be read as propaganda. The politicized scientists who wrote *The Night After . . . Climatic and Biological Consequences of a Nuclear War* are members of the USSR Academy of Sciences. They want their American counterparts to believe the Russian goals are peaceable. They would have everyone convinced, if they could, that every improvement in American defense can and must be neutralized by Russian counteractions.

Thus the Russian scientists who wrote this book promote Russian preparedness yet condemn American preparations, such as they are, which they say causes further Russian expansion to keep up with the Americans.

Virtually every thought in the Russian book reflects this peculiar contortion. Seeing the book for what it is — a propagandistic argument for the Russian rationales — can give us a better perception of their thinking.

It also helps a little toward understanding why the Russians assail the Star Wars concept as a waste of American money. The Russian counteractions are plain and simple to the Russians: they will build more offensive missiles faster than the Americans can build their destroyers.

Extensive references running into the hundreds are cited at the end of each chapter. Few Americans are among them. Among the best known are Edward Teller, Kathy Grant, and C.V. Chester (all proponents of shelter systems).

The titles of several chapters are revealing. Examples:

- Changes in the atmosphere due to a nuclear war.
- Climactic consequences. . . .
- Medical consequences. . . .
- Ecological disaster: Impact on the Third World.
- A real threat to the existence of mankind.
- Will our planet become a radioactive desert?

Not unexpectedly, none of the Russian assertions is favorable or friendly to the United States.

THE LAST NUCLEAR EXPLOSION — Forty Years of Struggle Against Nuclear Tests (a historical survey). General Editor: Valentin Falin. Published by Novosti Press Agency Publishing House, Moscow 1986. 110 pages plus appendix (175 pages). Available from: Victor Kamkin Bookstore, Inc., 12224 Parklawn Drive, Rockville, MD 20852. $5.00

— Reviewed by Don Hanks.

This is a short (110-page) history, from the Russian point of view, of Russia's 40-year effort to disarm all nuclear weapons before the end of the century. And despite the subtitle, banning tests is but one of the steps toward ending nuclear explosions.

So the book is really a bit of soft anti-SDI propaganda involving some typically convoluted Russian sarcasm.

Example: "Washington's false arguments pursue a single objective — to prove that the perfection of nuclear weapons is ostensibly essential in order to render these weapons harmless" and that is "the proclaimed official aim of the Strategic Defense Initiative."

Also "the laser weapons (which will be a component of the SDI system) to incinerate the enemy's towns and cities will be less complicated than using it to protect the USA against missiles." And therein is the reason for Russia's unrelenting propaganda against the SDI program.

Several pages are given to Russian support of Carl Sagan's "nuclear winter" predictions that dust and soot, raised by nuclear explosions, would darken and freeze most of the earth and render it unfit for humans during the next million years. "No one," say the Russians, "will survive."

"And that is why everyone concerned about the future of civilization demands that yesterday's test explosions become *The Last Nuclear Explosion.*"

The book gives us nothing really new and is not worth much of your time unless you want to analyze nearly 200 excerpts from documents which support the Russian position on the test ban issue.

The *Journal of Practical Civil Defence,* Special Report 187001: "Chernobyl, The Pandora Syndrome," by C. Bruce Sibley, 11 Newport Crescent, Waddington, Lincolnshire LN5 9LZ, England, Ph. 522, 720585, April 1987, U.S. $38.00 (for this report and others within one year).

— Reviewed by Marcel M. Barbier.

The English *Journal of Practical Civil Defence,* published by C. Bruce Sibley, is back. It will now appear as a series of special reports and the above mentioned is the first one. It signals our friend Sibley's return to good health.

The report reads like a detective story, so great are the gifts of the author for dramatic expression and clarity. The psychological reasons for the implacable sequence of events having lead to the reactor explosion are for the first time fully decribed. Sibley takes us into the control room where we follow step by step the preparation of the tragedy. After the explosions a masterful chronology of all rescue operations is presented in great detail. The reader is informed of all the different fronts of the rescue effort and how they were carried out, often with incredible gallantry. Every relevant information of scientific value is given in numbers.

The consquences of the accident on the general population are reviewed and the evacuation of large segments of the population living in various areas of the Soviet Union is described. Contamination observed and measures taken in Eastern and Western Europe are indicated.

This remarkable essay on the Chernobyl disaster is so full of technical data that a large number of conclusions in the fields of nuclear reactor construction, operation, mitigation of nuclear accidents, and organization of civil defense rescue efforts can be arrived at immediately through

logical thinking. It is both seed and food for thought for the civil defense-interested person who wants to figure out for himself or herself what reality really looks like in a large-scale nuclear emergency. (Shelter-designer builder Marcel M. Barbier, is president of Marcel M. Barbier, Inc., 3003 Rayjohn Lane, Herndon, VA 22071.)

PRACTICAL PREPAREDNESS — VIDEO, Color, ½-in. VHS. 64 min. $29.95. Available from TACDA, P.O. Box 1057, Starke, FL 32091.

— Reviewed by Robert Baffin.

For the civil defense buff who is genuinely interested in the art of contending successfully with emergency situations and/or shelter living *Practical Preparedness* is a gold mine that deals in solutions. Water, food, lighting, heating, sanitation — you name it. Practical ways to deal with each problem are presented.

Produced on a truly professional level, the film features personable survivalists John and Judy Wadsworth and is suitable for viewing by individuals, mixed groups and families.

Wadsworth, in fact, markets compact survival kits from his Salt Lake City base.

The film's price of $29.95 is a special — down from the original price of $69.95.

After viewing the film, TACDA jumped at the Wadsworth offer to let it act as distributor. If you see it you'll know why.

WHEN THE WIND BLOWS (British anti-nuclear war film)

— Reviewed by Richard E. Sincere, Jr.

(LONDON) — Moviegoers in London's West End queued up to see the animated version of Raymond Briggs' 1982 anti-nuclear-war book, *When the Wind Blows.* Directed by veteran animator Jimmy T. Murakami and with music by rock stars David Bowie, Roger Waters, and Genesis, the movie is sure to catch the attention of young people and film buffs alike. And it has a built-in audience among members of the Campaign for Nuclear Disarmament, the Greenham Common protesters, and the growing European Green Party movement.

An opening night party for the film was thrown at the Eisenhower Center, an old World War II command bunker now used for secure storage of business records. One of the partygoers noted that during the last war, this location 120 feet below street level (and, indeed, with subway trains rumbling 20 feet overhead) couldn't have been safer; yet in the next war the bunker and anyone inside it would be instantly vaporized.

What nonsense! Such a statement could come only from a person who knows nothing about the effects of nuclear weapons. It is no wonder that this gentleman and others who are backing *When the Wind Blows* think their movie presents an anti-nuclear-weapons message. I would suggest that the opposite is true — *When the Wind Blows,* like the 1983 ABC-TV feature *The Day After,* is a powerful visual argument for maintaining strong nuclear deterrance and for enhancing efforts in strategic defense and civil defense.

At its most basic, the film's message is that nuclear war must be prevented. Who can argue with that? By focusing on two senior citizens, the film reminds us that nuclear war belongs not just to generals or statesmen, but will have dire effects on ordinary people like you and me. We knew that in August 1945 — nothing new here.

Unwittingly, perhaps, the film's producers draw attention to the absence of effective civil defense protection. Jim and Hilda Bloggs, the two characters, try their best to survive the nuclear attack and its aftermath. They rely, unfortunately, on wholly inadequate information in a government-issued civil defense booklet. With fuller instructions presented long before the pending disaster and with more explicit descriptions of the effects of nuclear weapons — not only in the booklet but on TV, radio, and in newspapers during the crisis that leads to war (in the movie) — Jim and Hilda may not have had to die slowly and painfully from radiation sickness.

If *When the Wind Blows* teaches anything, it teaches us that we should learn the basics about nuclear weapons, and especially about the deadly effects of radiation. Ignorance is dangerous; a little knowledge can be lifesaving.

Ethical codes from the Hippocratic Oath to the Sermon on the Mount mandate that we take care of the suffering. Failure to provide an effective civil defense program is a moral failure. As President John F. Kennedy put it, "To recognize the possibilities of nuclear war in the missile age, without our citizens knowing what they should do or where they should go if the bombs fall, would be a failure of responsibility."

The Jims and Hildas of this world depend on us to take up the burden of responsibility. Our city councils, state legislature, governors, senators, representatives, and the White House must acknowledge this:

First, we must try our best to ensure that nuclear war never occurs. Second, we must ensure that should deterrence fail, citizens are protected against the hazards of war. Both jobs have to be done *now* — when the wind blows will be too late.

Richard Sincere, a contributing editor of the *Journal of Civil Defense,* is currently pursuing post-graduate studies at the London School of Economics and Political Science.

NUCLEAR ATTACK PLANNING BASE-1990 (NAPB-90). Published by FEMA, 1987. 8½" x 11" format, paperback, 583 pages. Limited distribution — not for public release.

— Reviewed by Kevin Kilpatrick

NAPB-90 is a comprehensive FEMA study of nuclear attack targeting on the United States *circa* 1990. It focuses on targets of military value (presumably consistent with Soviet doctrine), and it analyzes the effects on population — direct, fire and fallout.

The bulky volume is meant for the professional planner (at all

echelons) concerned with fatality patterns of attack - and mitigation measures. The cover notes "Not for Public Release." FEMA reports that this simply means that NAPB-90 is intended for use by a specialized audience of planners and is not a general circulation document. NAPB-90 is unclassified, and both the public and the news media are free to read and report on copies distributed to planners.

The report admits limitations and avoids proclaiming itself as authoritative. In fact, it solicits data corrections from users in the field. However, the statistics contained in the work do stimulate a good bit of thinking.

For instance, out of a 1985 population of 241.65 millions NAPB-90 puts 129.74 millions at risk in areas where a 2psi or greater overpressure is contemplated. For an overpressure of 0.5 psi and greater the figure is 175.11 millions. Fallout from "high" fallout risk areas to "low" fallout risk areas (where it can still be lethal) would affect 228.863 millions — 86.2% of the total population.

All this and much more is broken down by region, by state and by county. State maps (counties are shown) indicate locations of presumed nuclear bursts and extent of effects. The same is done for fallout patterns and their intensities.

NAPB-90, as its title indicates, is a "planning base." It replaces TR-82, a 1975 study that has become obsolete. It gives tables which indicate the value of shelter. It could be — should be — used as a planning document in providing emergency operating centers for key government and military personnel.

It probably will be.

It should also be used to provide shelter for the public and to stimulate interest in do-it-yourself shelter.

It probably won't be.

In any case the FEMA Office of Civil Defense team produced NAPB-90 under the direction of Ronald F. Treichel deserves hearty congratulations. For those professionals who follow the FEMA lead in seriously addressing nuclear attack problems it is an invaluable guide.

THE NUCLEAR SHELTERIST, by Walton W. McCarthy. Published by Todd & Honeywell, Inc., Ten Cuttermill Road, Great Neck, N.Y. 11021. 1986, 354 pages, $22.50.

— Reviewed by Conrad V. Chester

This is yet another book on civil defense to appear in the last few years by people who have become acutely concerned about the threat from nuclear weapons. As one would infer from the title, this book advocates protection against nuclear weapons.

The author is a recent entrant to the field having spent the last two years becoming educated in nuclear weapons effects and shelters. According to the book jacket, he holds a B.S. from Montana State University and is a member of The American Society for Quality Control, American Society for Metals, and Society for Plastics Engineers. One would infer that his education had considerable technical content.

. . . AN INVESTMENT OF 480 BILLION DOLLARS.

The book is a monumental effort containing a prodigious amount of information in 304 pages of text and another 50 pages in appendices and references.

Unfortunately, the book contains many conceptual errors. In his evaluation of manually-closed blast valves he does not realize that the sound of an explosion arrives at a shelter at the same time as a shock wave.

The author's recommended solution to the civil defense problem in the United States is for each family to have a welded steel tank shelter buried in its yard. This is certainly an effective shelter but as he acknowledges will cost approximately $2,000 per space. Only a small fraction of U.S. families are likely to come up with the $8,000-$12,000 dollars for a shelter. Ignoring for a moment the fact that only two-thirds of the population lives in detached one- and two- family dwellings and hence would have yards, an expenditure of $2000 per space implies an investment of 480 billion dollars. Spread over 20 years, this would be 8% of the Department of Defense budget per year.

The author recognizes some of the problems with shelter that need to be addressed. Adequate water and food supply, sewage, adequate sleeping facilities, and adequate habitability in general are strongly advocated. The most unfortunate facet of this book, aside from the technical errors, is the authors advocacy of a "shoot thy neighbor" solution to the problem of the unsheltered population in a crisis. He roundly condemns expedient shelter as being of inadequate habitability. He has failed to make the connection between expedient shelter and what the unsheltered population can do in an emergency rather than trying to force its way into a miniscule number of pre-crisis shelters. Reproducing copies of shelter plans from *Nuclear War Survival Skills* and organizing one's neighborhood or community to construct these or at least disseminate the information on them would be a far more cost-effective method of assuring the security of one's own shelter.

The author is greatly concerned by chemical weapons as well as biological weapons. Concern about biological weapons is justified. Chemical weapons which are more expensive to defeat are unlikely to be used in intercontinental missile payloads when nuclear or biological weapons are available.

In the sum, this book contains a great deal of information the majority of which is useful. Unfortunately, some experimentally unverified "off the top of the head" information is scattered through it and the novice will have difficulty distinguishing which is which. □

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*Based on work performed at Oak Ridge National Laboratory operated for the U.S. Department of Energy under Contract No. DE-AC05-840R21400 with Martin Marietta Energy Systems, Inc.

Lt. General Daniel O. Graham (USA-Ret)
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NOTE FROM THE ASDA FLIER:*

The American Strategic Defense Association (ASDA) is an organization of concerned United States citizens who are dedicated to building a better basis for peace in the nuclear age. To further this aim, we in ASDA diseminate information on strategic defense, arms control, and disarmament and on the facts about the possible effects of a strategic nuclear attack. We exchange information on the various means of national survival and recovery.

Members of ASDA are convinced that strategic defense can substantially decrease the likelihood of reductions in offensive arms and delivery systems. In addition, we hold and can demonstrate that, if nuclear war should come, a well-developed strategic defense can markedly decrease death and destruction and increase the ability of the nation to survive and recover.

*ASDA, P.O. Box 3639, Arlington, VA 22203.

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In an address to Arizonans for National Security Dr. Edward Teller had this to say:

My main point today is to tell you the little I know about Soviet defenses. They have worked on defenses diligently and, I think, rightly. The Soviets have every right to defend themselves.

But, they have no right to tell us not to defend ourselves, and some of our friends in the United States have even less right to side with Gorbachev when he disagrees with our president.

. . . We have an excellent chance to preserve the peace, but only if we do not allow our defenses of the world not conquered yet by the Soviets to fail.

Teller is scheduled to be banquet speaker at the DDP/TACDA seminar on November 7th in Mobile. (See pages 14-15.)

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UPCOMING

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Aug 16-19	**IAFC 87: GATEWAY TO THE FUTURE,** Int'l. Assn. of Fire Chiefs Conference & Educational Expo, Cervantes Convention Center, St. Louis, MO. Contact: IAFC, 1329 18th ST, NW, Washington, DC 20036 (202/833-3420).
Aug 21	**KENTUCKIANNA HAZARDOUS MATERIALS CONFERENCE/SCHOOL,** Business & Industry Conference (see Aug. 22 below).
Aug 22-23	**KENTUCKIANA HAZARDOUS MATERIALS CONFERENCE/SCHOOL,** Emergency Responder School, Burhan's Hall, Founder's Union Bldg, Univ. of LA, Shelby Campus, 8900 Shelbyville Rd., Louisville, KY 40222. Reg. fee $35. Contact: Charlie Frazee, Ky DES-Area 6 Coord., POB 17437, Louisville, KY 40217 (502/636-0439).
Sep 7-11	**THE SIXTH PACIFIC BASIN NUCLEAR CONFERENCE,** Beijing, China, American Nuclear Society and the Chinese Nuclear Society will co-sponsor this seminar titled "Outlook of Nuclear Technology Development in the 1990's". Contact: D.J. Jolliffe, ANS, 555 N. Kensington Ave, LaGrange Park, IL 60525 (312/352-6611).
Sep 11-13	**NY STATE VOLUNTEER AMBULANCE & FIRST AID ASSN. 32nd ANNUAL EDUCATIONAL CONFERENCE & TRADE SHOW,** Pines Resort Hotel, So. Fallsburg, NY. Contact: NYSVA&FAA, PO Box 347, Brooklyn, NY 11229-0347 (718/646-8410).
Sept 12-13	**OPERATION CHALLENGER,** Tippecanoe River State Park, IN, workshops and activities covering survival. Live Free members $5, public $10. Contact: Live Free Region 7, PO Box 1743, Harvey, IL 60426.
Sep 15-18	**POPULATION EXPOSURES From The NUCLEAR FUEL CYCLE,** Garden Plaza Hotel, Oak Ridge, TN. Sponsored by the Oak Ridge National Laboratory. Contact: Dr. R.O. Chester, Health & Safety Res. Div., ORNL, PO Box X, Oak Ridge, TN 37831 (615/576-2100).
Sep 16-17	**AMERICAN COLLEGE OF NUCLEAR PHYSICIANS PET/SPECT:** Instrumentation, Radiopharmaceuticals, Neurology, and Physiologic Measurement at the Shoreham Hotel, Washington, DC. Latest advances in Nuclear Medicine. Contact: Barbra Hickey, ACNP, Suite 700, 1101 Conn. Ave, NW, Washington, DC 20036 (202/857-1135).
Oct 3-8	**NATIONAL COORDINATING COUNCIL ON EMERGENCY MGMT. CONFERENCE,** Little Rock, AR. Contact: Kay Harmon, 3615 N. Grandview Dr, Peoria, IL 61614 (309/688-8661).
Oct 16-18	**OPERATION DISCOVERY,** Northeast Texas Area, Seminar on civil defense, crime control, emergency medicine, etc. Open to public. Contact: James Boorman, 6768 Ridgetop, N. Richland Hills, TX 76180 (815/488-6568).
Oct 21-23	**INDIANA CIVIL DEFENSE COUNCIL ANNUAL FALL CONFERENCE,** Howard Johnson East, So. Bend, IN. Contact: Joe Klarke, 1033 Faurote Ave., Decatur, IN 46733 (219/724-4950).
Oct 23-26	**A WORLD VIEW OF TRAUMATIC STRESS:** Similarities & Variations, 3rd Annual meeting of the Society for Traumatic Stress Studies. The Baltimore Marriot Inner Harbor, Baltimore, MD. Contact: TSTSS, PO Box 2106, Dayton, OH 45401-2106 (513/278-1905).
Oct 26-28	**TEXAS GULF COAST EMERGENCY MANAGEMENT ASSOCIATION ANNUAL CONFERENCE,** Houston, TX. Contact: Denny Holt, Texas Gulf Coast EMA, 300 W. Walker St, League City, TX 77573 (713/332-3431).
Nov 2-5	**1987 SCIENTIFIC ASSEMBLY,** sponsored by the American College of Emergency Physicians. George S. Moscone Center, San Francisco, CA. Contact: ACEP, PO Box 619911, Dallas, TX 75261-9911 (214/659-0911).
Nov 6-9	**DOCTORS FOR DISASTER PREPAREDNESS/THE AMERICAN CIVIL DEFENSE ASSOCIATION ANNUAL SEMINAR/CONFERENCE,** The Mobile Hilton, Mobile, AL. Contact: DDP/TACDA, PO Box 1057, Starke, FL 32091 (904/964-5397).

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LATELINE ....

GOOD NEWS: HIGH FRONTIER

INTEREST IN SHELTER IS ON THE UPSWING. Journal mail proves it. For those wanting information on shelter types and shelter construction we refer them (1) to shelter articles that have appeared in the Journal -- these are becoming more frequent -- one appears in this issue, and one appeared in the June issue; (2) to classified ads under "Marketplace" -- and these are becoming more numerous; (3) to reviews of books on shelter construction appearing in the Journal -- example: reviews in this issue; (4) to the list of shelter blueprints available from The American Civil Defense Association -- see advertisement on page 29; (5) to FEMA's shelter plans -- now a part of the new FEMA "self-help" accent; (6) to the special coverage given shelter at the annual DDP/TACDA seminar -- this year November 6-9 in Mobile, Alabama; and (7) to the industry and ingenuity of interested parties -- much can be done by individuals to wind up with a shelter that meets family needs through kitchen-table planning for design and equipment. An appreciation of shelter dividends is also coming back into vogue -- these include storm protection, fireproof construction, simplified climate control, a more healthful environment, cheaper insurance (if, indeed, one needs any at all), and maintenance costs cut to the bone. The adventure of shelter building also removes us from hazards of matchstick housing.

TACDA's FUND-RAISING DRIVE has brought in so far more than $4,000 from 85 generous contributors. As helpful as this support is, unfortunately it falls short of the $25,000 goal, and the effort continues with renewed dedication. Professional fund-raising expertise is obviously lacking, but contributors can be assured that 100% of what they donate goes to TACDA -- not 50%, 40%, 30% or even less (professional fund raisers must themselves meet expenses and show profits). The TACDA staff contributes in many ways. Air travel expenses for a mid-July Washington trip, for instance, came to $0. There are now two major pledges of $1,000 each for August 1st. There are hopes for more -- even foundation and industrial help. And TACDA keeps working an 8-day week (or is it 10?).

AIDS: THE MEDIA ARE BECOMING MORE AND MORE ALARMED. And well they should. The question pops up repeatedly: "What does civil defense have to do with AIDS?" True, TACDA is primarily concerned with national security and homeland defense. But the focus is also often trained on other disasters. With an estimated two million Americans (or more?) infected -- over one in ten in some major cities -- AIDS looms as a major pandemic. With blood transfusions multiplied in a disaster it can pose a threat worse than the disaster itself. An AIDS article was published in the April Journal. Another will appear in the October issue. The November seminar will feature an AIDS symposium by a physician, a paramedic-oriented nurse and a prominent journalist.

GOOD NEWS IS THAT HIGH FRONTIER HAS SCHEDULED A SEMINAR BACK-TO-BACK WITH DDP/TACDA in Mobile. The High Frontier agenda is scheduled during the day on November 6th with the DDP/TACDA "Welcome Reception" following at 7PM the same evening. DDP and TACDA members, and others attending the DDP/TACDA seminar, are invited to take advantage of this opportunity to get an in-depth briefing on SDI. In turn, High Frontier seminar participants are cordially invited to consider attending the DDP/TACDA seminar which follows.

TIME FOR LETTERS TO CONGRESS

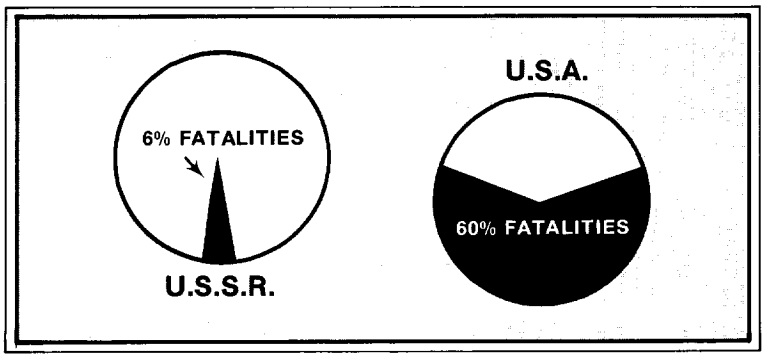
If John Bex's logic (see Bex article "Needed Now: Action . . .") strikes you as hitting the homeland defense problem on the head — it does that and much more — you may want to write a Member of Congress or two or more — maybe enclosing copies of the Bex article — in an effort to cite the facts of the incredible "Hostage America" posture we find ourselves trapped in today. If so, the addresses are:

For senators —
Senate Office Building
Washington, DC 20510

For representatives —
House Office Building
Washington, DC 20515

In addition to being sensitive to the opinions of constituents, Members of Congress are also alert to weighing carefully questions of national security. Your viewpoints contribute to their understanding of these issues.

EDITORIAL . . .



SIX and SIXTY

The dramatic cover of the May-June 1972 issue of the *Journal of Civil Defense* (at that time called *Survive*) shocked readers. Could it be that in a World War III the U.S. would lose 60% of its population and the USSR 6%? And these figures we call "conservative"? Why? What would this mean in terms of United States survival? What could be done to remedy the inglorious picture?

In the cover picture of this current August 1987 issue John E. Bex, holding a copy of the 1972 issue, reminds us of what has been done: *Nothing.*

At the same time Bex also reminds us, in his nuclear attack survival chart on page 7, of what *can* be done. The loss of 60% of our population (or *70%* as Bex claims) can be cut by well-known remedial measures to 20% or 10% or even 2%!

The question is not whether we can do it or not. We can! The question is whether or not national leadership (Congress that is) is interested in turning its attention to national survival.

This is why Bex calls for congressional action in this issue's lead article.

The objective would be to overcome congressional (and public) indifference to national survival and to stimulate action to overcome indifference and to provide the country and its people with a means for survival.

Perhaps a friendly warning is in order: All that happened once before — almost! In 1963 Louisiana Congressman F. Edward Hébert chaired a House of Representatives subcommittee that checked out a proposed shelter bill. The subcommittee members were opposed to civil defense, and a long staff study bolstered their convictions that civil defense was useless, even dangerous. But as expert testimony was heard this attitude changed. The committee report reads in part:

> As these witnesses presented their testimony, a slow but easily perceptible change was evident in the attitude of the committee members. Opposition to the program melted and then hardened into an attitude of firm belief in and support of the fallout shelter program. . . .

The point is that with exposure to the facts reasonable people discard their emotional prejudices and embrace realistic measures to contend with ominous threats without being overwhelmed by them. Passed on to a Senate committee, however, the bill died without the evaluation given to it by the Hébert House subcommittee.

Other congressional reviews have been made. A 1983 "oversight" by the House of Representatives Military Installations and Facilities Subcommittee painted a hopeless picture, and its chairman Ronald V. Dellums reflected the negative view of the members.

Any new "action" review (called for by Mr. Bex in his article) should check, among other items, the 1963 Hébert subcommittee report and should paste prominently upon its wall a copy of the Bex survival chart.

With this kind of approach the chances for achieving in the United States the kind of population protection that now exists in the Soviet Union might be vastly improved — and the doomsayers' caterwauling muffled.□

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