

..... AN AMERICAN JOURNAL OF CIVIL DEFENSE

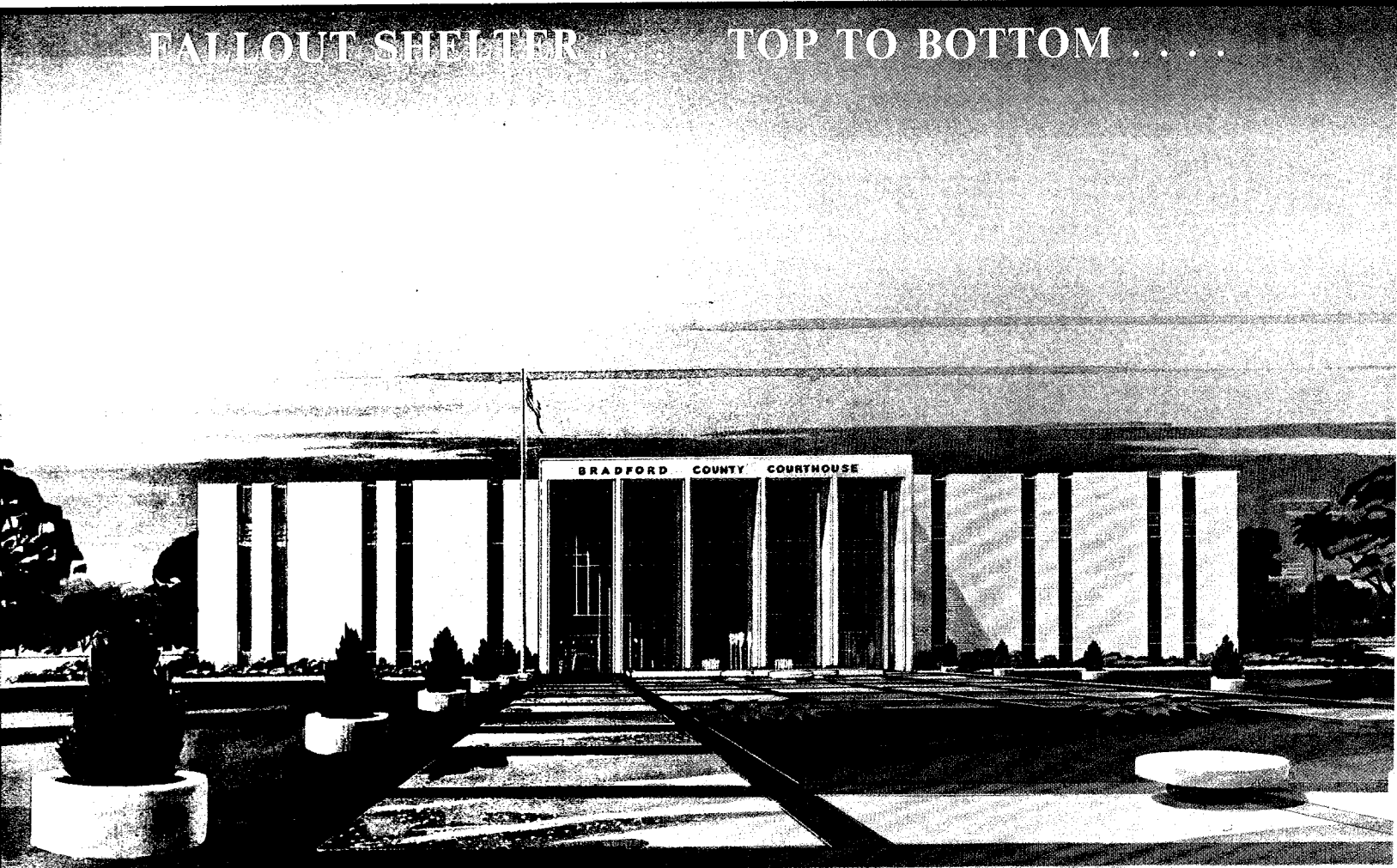
WIVE

VOL. 1 NO. 3

SEPTEMBER - OCTOBER 1968

FALLOUT SHELTER

TOP TO BOTTOM . . .



CIVIL DEFENSE FORUM

OAK RIDGE CIVIL DEFENSE SOCIETY

**ASSOCIATION FOR COMMUNITY-WIDE
PROTECTION FROM NUCLEAR ATTACK**

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**SURVIVAL IN CITIES —
THE TUCSON TUNNEL-GRID PLAN**
- by Morris W. Self

**PRESIDENTIAL NOMINEES
ANSWER SURVIVE QUERIES**

"The need for an effective Civil Defense is surely beyond dispute. . . No city, no family nor any honourable man or woman can repudiate this duty. . ."

- Sir Winston Churchill

SURVIVE

VOL. 1 NO. 3

SEPTEMBER - OCTOBER 1968

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Swiss Reaction To SURVIVE

Many encouraging letters have been received wishing SURVIVE success and supporting its objectives. Doctor Paul Huber, head of the *Physikalisches Institut* at the University of Basel, in Basel, Switzerland, has a unique point of view. He writes:

"I read the first issue of SURVIVE with interest. I was not aware of the fact that an effective organization for civil defense could run into so many problems in the United States. This is regrettable not only from the point of view of the citizen, who would be the one to suffer in case of a catastrophe (this is a Swiss euphemism for nuclear war), but also because the absence of defense measures would deny the government full freedom of action. Since the actions of the United States are of great influence for large areas of our world, they are of decisive significance and importance. It must remain impossible to influence them through external pressures."

Among SURVIVE Contributors

MORRIS W. SELF

Professor of Structural Engineering with a PhD degree from the University of Minnesota, Morris W. Self is a professional consultant in protective construction. He has conducted special engineering courses in anti-blast construction across the nation. His technical publications include reports for the Office of Naval Research, the Office of Civil Defense and the American Society of Civil Engineers. Participation in blast shelter design studies for OCD forms the basis for his article "Survival in Cities - Tucson's Tunnel-Grid Plan" which appears on page 1.

DON F. GUIER

About Don Guier there's an infectious aura of determination and confidence that promises new hope for a national awakening to civil defense problems. Appointed Director of the Oklahoma Civil Defense Agency in 1963 and Oklahoma Emergency Planning Director in 1964, Guier in 1966 was elected to serve as 1967-68 President of the National Association of State Civil Defense Directors. He is the only civil defense director ever to be appointed to the National Academy of Sciences Civil Defense Advisory Committee, in which capacity he now serves. Guier's column *SO BE IT!* (page 7), is a regular *Survive* feature.

SURVIVAL IN CITIES – THE TUCSON TUNNEL-GRID PLAN

by Morris W. Self

An incisive analysis of blast shelter prospects under urban targets by an engineer who helped to design Tucson's proposed defense against the threat of nuclear attack. The Tucson project, sponsored by the Office of Civil Defense and directed by Engineer Howard Harrenstien, pioneered the tunnel-grid concept of urban shelter. It stands today as the valued forerunner of the expanded tunnel-grid studies undertaken by the Civil Defense Research Project of the Oak Ridge National Laboratory.

The continued proliferation of nuclear weapons with respect to the size, numbers, world-wide distribution, and effective delivery increases the importance of establishing a strong system of civilian protection to complement our military defensive posture. Current and historic events do not permit us optimistically (or naïvely) to accept the well-worn hypotheses that a nuclear holocaust can be prevented by ostentatious display of military might on the one hand or patient political maneuvering on the other. We must continue and expand all efforts to prevent warfare, but these efforts in themselves can never justify a lack of preparedness for the eventuality of war. The widespread belief within our populations that a nuclear attack would produce infinite and complete destruction is contrary to the informed opinions of professionals studying the feasibility of protection.

The Office of Civil Defense, Department of Defense, has done much in promoting research to develop construction methods for protection against nuclear fallout radiation, thermal radiation and blast. Unfortunately, apathy within government and of the general public has greatly curtailed the effectiveness of these programs. Emphasis has been placed on protection against fallout radiation only, an effort to save as many people as possible under a very narrowly restricted program.

But fallout radiation is not necessarily the most lethal effect of nuclear explosions. In 1962, McGraw-Hill⁽¹⁾ published a report that considered the effects of a 10,000 megaton attack on only military targets within the United States. It was estimated that 15% of our population would succumb to blast and fire and another 57% would perish from fallout radiation. However, if both military and civilian targets are attacked, the deaths become 66% by blast and 23% by radiation; i. e. 11% of our population survives. In the first case, properly designed fallout shelters could assure a survival of about 80%. In the second case, fallout shelters would only provide about 30% survival, but blast shelters could increase this to about 85% sur-

vival. With the advent of multihead intercontinental ballistic missiles, saturation bombing becomes a real threat in nuclear war; and shelters for blast protection become even more important due to the fact that the small individual missiles would be more numerous, more dispersed, but less powerful.

Dual-purpose structures may be utilized wherein shelter takes a secondary role and does not significantly alter costs of functions related to the primary purposes of the structure.

Many underground tunnel systems are in use in the United States, and more are being planned to provide subways, utility tunnels, pedestrian passageways, parking areas, and truck delivery systems. Traffic congestion in cities and urban areas has become a critical problem and may only be solved by the construction of extensive underground transportation systems. If consideration were given to blast shelter in the initial planning stage of these projects, an enormous amount of inexpensive blast and fallout shelter could be provided.

The advantages of a tunnel system for shelter as compared to individual community or family shelters are many:

1. The buried conduit is widely recognized as an efficient structural element. Design and construction techniques have been extensively developed.
2. Utilities such as water, electrical power, telephone, and sewage systems could be readily placed within the tunnel system, easily accessible for maintenance and repair.
3. Direct contact and communication among inhabitants provide important physiological and psychological advantages. People would not be isolated in small groups. Families could be reunited.
4. The tunnel system and its entrances would be distributed according to population distribution. Shelter could be obtained quickly without creating abnormal concentrations of people.

⁽¹⁾ *Nuclear Attack and Industrial Survival*, McGraw-Hill Publishing Co., 1962, 16 pages.

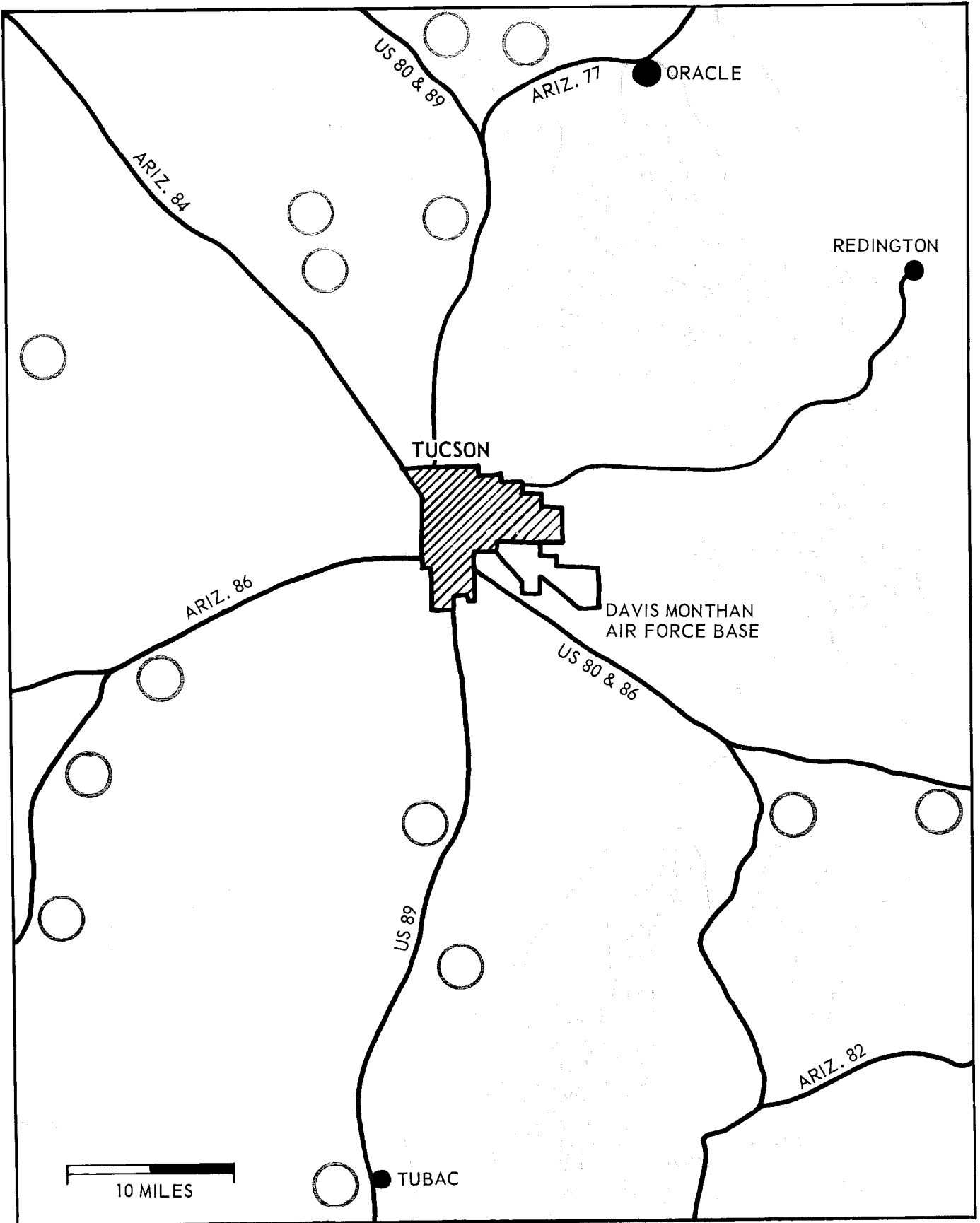
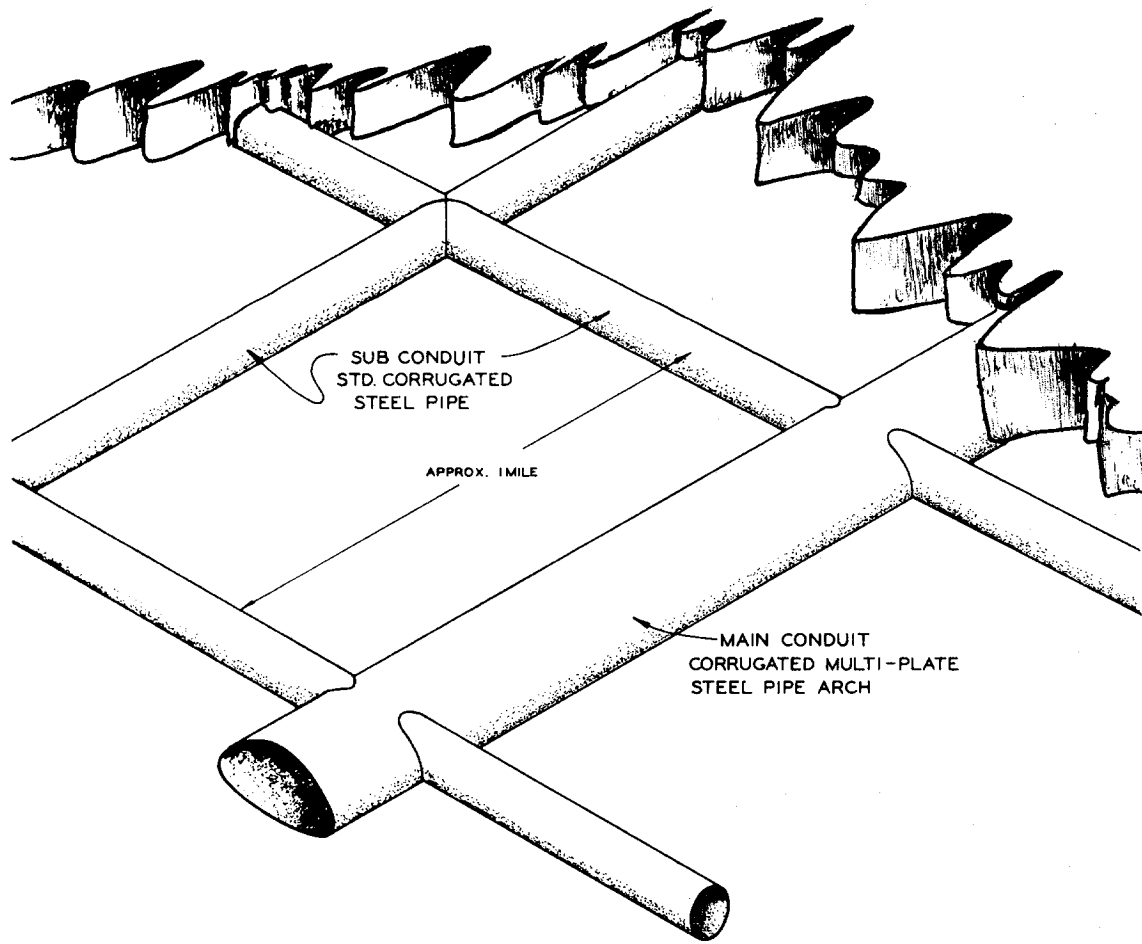
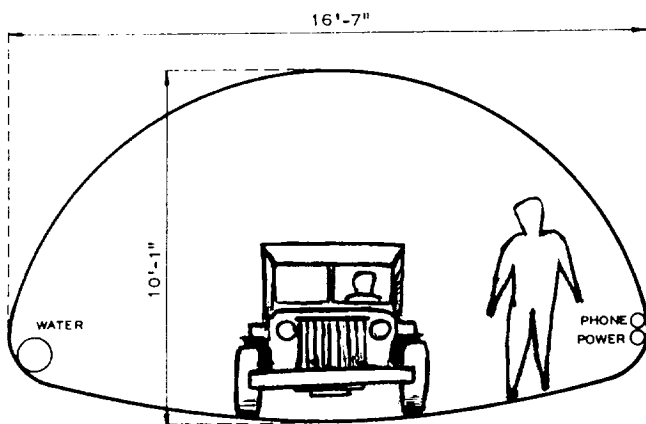


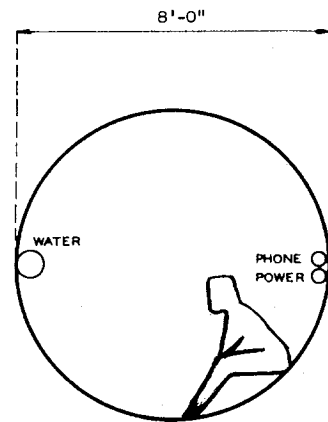
Figure 1 - Circles show 14 of the 18 missile sites in the vicinity of Tucson. Note air base in southeastern part of city.



SCHMATIC OF CONDUIT SYSTEM



SECTION - MAIN CONDUIT



SECTION - SUB CONDUIT

Figure 2 - Conceptual views of buried conduit system under Tucson metropolitan area. Limited traffic flow is feasible.

5. Early evacuation to regions of low level of contamination or to decontaminated areas would be possible.

These advantages combined with the important economic advantage inherent in the multipurpose system give tunnels an extremely high potential for providing maximum shelter effectiveness at minimum cost. In fact, if shelter considerations are incorporated into the over-all planning of the multipurpose system, the purely shelter aspects of the coordinated plan would contribute little to the over-all costs. Certainly this concept deserves careful and extensive study by city and community planners.

In 1962, the University of Arizona undertook a comprehensive study to develop and evaluate civil defense countermeasures for cities closely associated with military targets⁽²⁾. Chosen to direct the work was University of Arizona professor, Howard Harrenstien, now Associate Dean, University of Hawaii. This study considered a wide range of shelter types and systems, but only that portion of the study pertaining to tunnels will be dealt with here.

The defense of the people of Tucson against the heavy attack that may be anticipated presents a difficult problem. It is aggravated by the lack of existing natural or man-made potential shelter. The city is surrounded by 18 Titan missile sites, with an important Air Force base within two miles of the center of population. Urban facilities, such as underground transport and utility systems, storm sewers, home basements, etc. do not exist to any great extent.

The Tucson study was based on an expected 10-megaton surface burst at each of the eighteen missile sites and a 5-megaton surface burst on the Air Force base. For these weapons, the distribution of blast overpressure, ground motion, and radiation was predicted. That is, the stresses for which the tunnel structure was to be designed were evaluated.

Figure 1 shows the relative locations of 14 of the targets as well as the mountainous terrain around Tucson.

Shelter design procedures employed to build in sufficient structural strength to resist blast are not unlike those used for other structures in common use. More important is the functional design or layout of the tunnel system. The sizes and locations of the network of tunnels and entrances must be determined by studying population distribution and plans for evacuation. For the Tucson study, the population distribution was

⁽²⁾ *Local Civil Defense Systems, Final Report*, OCD-OS-62-232, Howard Harrenstien, et al., Engineering Research Laboratory, University of Arizona, Tucson, Arizona, 1964.

projected to 1973 with a predicted population of 466,400. The design objective was to create protected evacuation of the total urban population during and following a nuclear strike.

The proposed tunnel system consists mainly of a network of concrete or steel conduits buried under approximately five feet of earth. Two sizes are employed: about 45 miles of 16 ft. by 10 ft. pipe act as main conduit, and about 200 miles of 8 ft. pipe as secondary conduit. As shown in Figure 2, the main conduit permits limited vehicular traffic, and the secondary conduit permits pedestrian passage. Figure 3 shows the general plan of the conduit system, and the distribution of design blast overpressures. Entrances are provided at all schools, hospitals, and public buildings. The system provides the necessary underground passageways to outlying survival areas. All conduits are blast, fire, and radiation shelters as well as transportation and communication routes. Entrance design is depicted in Figure 4. The entry system also serves as a storage area and immediate control and command post. Ventilation and other mechanical equipment would be located in these areas.

A slight positive pressure is maintained throughout the system to keep out contaminated outside air. The possibility of blast overpressure being transmitted from breaks in the tunnel to other areas in the system

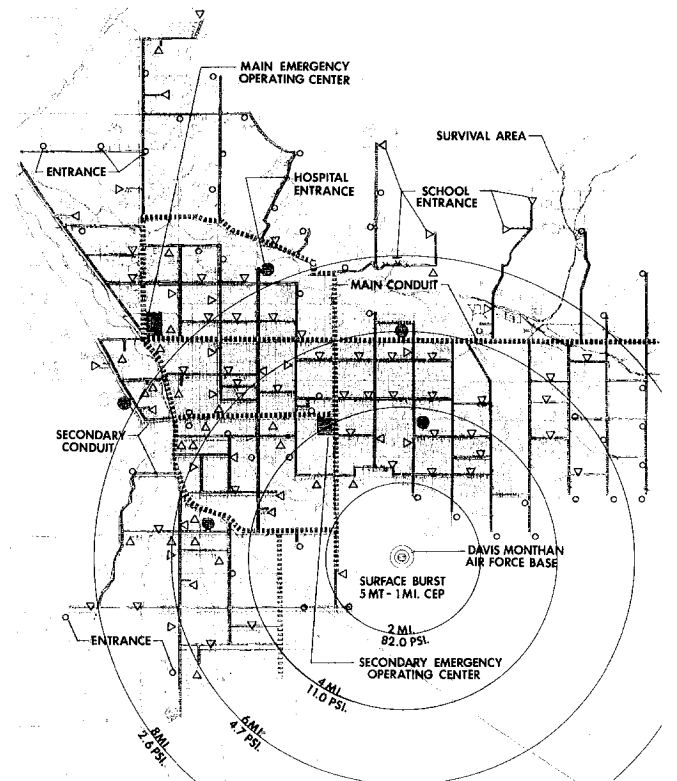


Figure 3 - Tucson, showing plan for conduit system, and pressure rings for a 5-megaton surface burst on Davis Monthan Air Force Base.

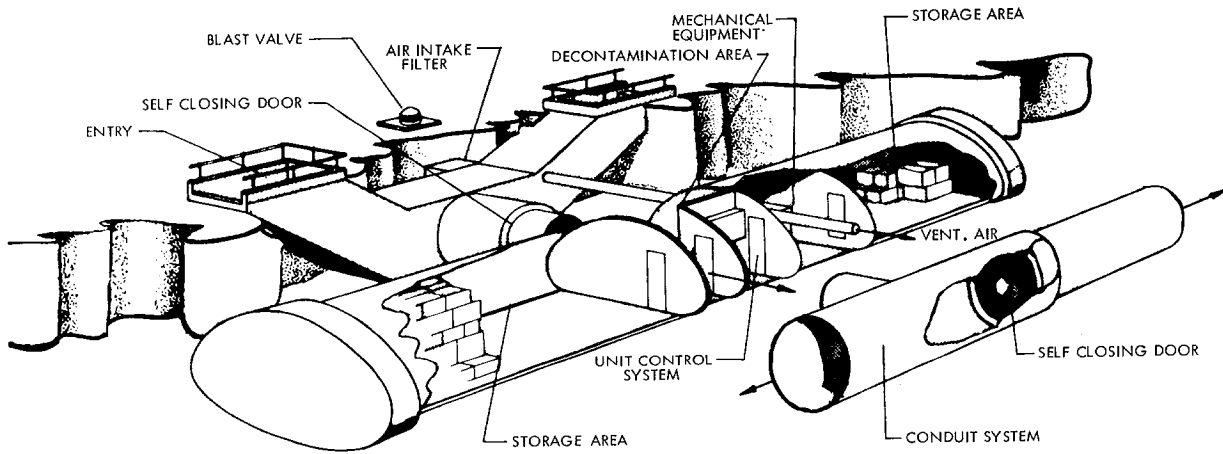


Figure 4 – Entrance and storage areas for Tucson’s tunnel-grid system. Research at the Oak Ridge National Laboratory has contributed to improvements in design.

is prevented by semi-automatic self-operating blast doors located at strategic points throughout the system.

Costs of the Tucson system as described are listed below. These costs are based upon actual construction bids on jobs in the Tucson area. Assuming construction on existing public property and the use of surplus equipment, the total price was estimated as follows:

Basic System Cost	\$ 94,465,224
15% Profit	14,169,783
10% Insurance and Overhead	9,446,522
5% Design Fees	<u>4,723,261</u>

Total \$122,804,790

This figure corresponds to a cost of approximately \$265 per 1973 resident. However, actual *shelter* costs would be much less because of the multiple use capabilities of the tunnel system. Although the system as

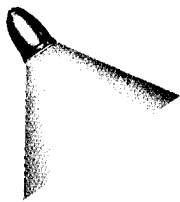
proposed for Tucson would only permit limited multiple use because of the small tunnels, a system of larger tunnels such as required for mass transportation would be even more advantageous with regard to costs attributed directly to shelter.

The Tucson Tunnel-Grid Plan “broke the ice” in providing a realistic solution for sheltering urban populations from the direct effects of nuclear weapons. Encouraging advances have been made in the four years which have followed the completion of the work in Tucson, especially under Civil Defense Research Project Director J. C. Bresee at the Oak Ridge National Laboratory.

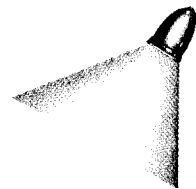
Civil defense programs can be readily tied in with other city planning projects, but first the city planners must be convinced that the threat to exposure of nuclear environment deserves consideration along with the threats of general pollution and massive traffic jams. ■

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C D SPOTLIGHT



IN FRANCE . . . ORSEC

With De Gaulle's nuclear *Force de Frappe*, France, unlike her neighbors, has shown a marked lack of concern about the effects of nuclear attack on French soil. Shelter planning has taken a back seat. Not so rescue operations - *Plan ORSEC*. This gets heavy priorities in organization, training and action.

Advanced rescue techniques developed by ORSEC (*Organisation des Secours* - Relief Organization) were dramatically demonstrated at the "International Fort-night on Disaster Rescue", a conference in Geneva, Switzerland, sponsored by the International Civil Defense Organization and attended by safety and civil defense representatives from 48 nations. Here Jean Douard, Chief of Operations for the French Office of Civil Protection, unwrapped two revolutionary devices for locating conscious victims trapped by disaster debris. The "Orbiphone" was described as an extremely sensitive electromagnetic receiver designed to search large areas for general locations of pinned-down survivors. The "capson", it was explained, took over when the general location was discovered to pinpoint the victim for a rescue attempt. The "capson" works with three acoustical receivers, each a directional indicator. Both systems depend upon the victim's ability to respond.

Surgeon General Raoul Favre, Director of the French Army Health Service Training School, underlined psychological factors in rescue operations. "The *survival* of man under duress," he said, "is limited by the very fact that he is more or less deprived of the will and the means of survival . . . The inadaptability of modern man, ignorant of the means of survival, sometimes even his refusal to use these means, are serious problems."

TRACY'S TORNADO

On June 13th a tornado hit Tracy, Minnesota. It left 9 dead, 66 injured and 4 million dollars in property damage. Tracy officials estimate that over 100 persons would have been killed had it not been for one fact: the Tracy civil defense siren blew for five minutes prior to the time the tornado struck. People were alerted. Most of them found shelter, although there was doubt as to the meaning of the siren.

Dr. Jack Von Bokern, President of the City Council, wrote to Minnesota's CD Director, Phillip A. Iverson:

"Civil Defense has an altogether new meaning in Tracy, Minnesota. It is hard to estimate how many of us owe our lives to the efforts of this organization.

"Our community is similar to any other community in the nation. We grudgingly go along with civil defense alerts, and as local government officials we do not always appropriate the necessary funds to maintain a good civil defense unit.

"...the Lyon County Civil Defense Director has been trying to get us to practice good civil defense procedures for years, and now, suddenly, we know why..."

ARCHITECT TALKS TURKEY . . .

Architect John McLeod, Co-chairman of the Department of Defense Advisory Committee on the Design and Construction of Public Fallout Shelters, makes the following statement in OCD publication MP-46, "Status of the Civil Defense Program" (April, 1968):

"I am convinced that some shielding can be achieved in modern building design at no sacrifice to appearance or function and without increasing the construction cost. For a modest cost increase a greater degree of fallout protection and a larger shelter capacity can be provided.

"The previous concepts of massive above-ground or underground shelters for adequate protection have been erased by knowledgeable architects and their consulting engineers who have solved the basic problem of integrating shelter early in the conceptual design of their projects without any adverse effects."

The Department of Defense Advisory Committee on the Design and Construction of Public Fallout Shelters was first established in 1962 at the suggestion of the President of the American Institute of Architects. In addition to a permanent member from this organization the committee is comprised of representatives from:

- The National Society of Professional Engineers
- The American Institute of Planners
- The Engineers Joint Council
- The American Society of Civil Engineers
- The Associated General Contractors
- The Consulting Engineers Council

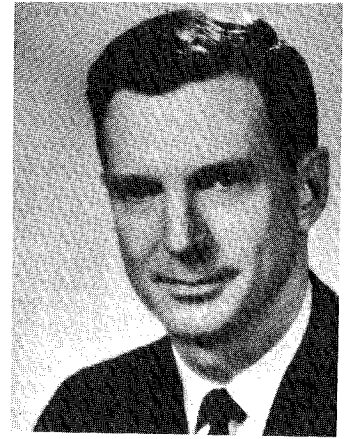
McLeod's official statement is a summary of the committee's work on the problem of providing radiation shielding in building designs without adversely affecting cost, appearance, or function - a process referred to as "slanting".

SURVIVE CONFERENCE SCHEDULED FOR NOVEMBER 23-24 IN FLORIDA

Gainesville, Florida has again been chosen as the site of what appears to be an annual *Survive* planning conference. The meeting will be held at the University of Florida on November 23rd and 24th (Saturday and Sunday). Members of the *Survive* Editorial Board, Editorial Consultants, staff members and *Survive* supporters will attend. The purpose of the conference is to review *Survive's* progress during its first year of publication, and to define policies and objectives for 1969.

SO BE IT!

by Don F. Guier



AN OPEN LETTER TO THE CANDIDATES:

The convention furor has subsided. Each of you is your Party's choice for the highest office in the land.

Those of us trained in this civil defense business – and there are several hundred thousand of us – and those in the public who have completed any one of a number of civil defense courses – and there are several million of them – have a few questions.

Mr. Nixon: We have heard you state that the nation faces “the greatest danger of world war of any time in our history”. . . that we must not be left behind by the Soviets in their *race* toward superiority in nuclear striking power and ballistic missile defense. . . that we must “restore the strength of America so that we shall always negotiate from strength and never from weakness.”

Very well. But neither your Party in its national platform nor you in your national addresses have mentioned civil defense or anything about “passive” or non-military protection for our people.

We submit, Mr. Nixon, that a posture of *assured survival** is necessary to face the threat of world war, to avoid an unfavorable strategic balance and to maintain credible strength. And survival can be assured through – and *only* through – effective *passive* in addition to *active* defenses.

As for you Mr. Humphrey: Your position on defense policy is not too clearly defined as we see it. Your Party's platform was silent on civil defense. But you say you have backed an “adequate” civil defense program and will continue to do so.

We submit, Mr. Humphrey, that our national civil defense program is grossly *inadequate* to protect our people against modern weapons and is receiving less Administration support each year. We know that the Soviets could today kill over half our people. Is this adequate protection?

And Mr. Wallace: Your pronouncements on foreign policy and national defense have not been many as you have concentrated on domestic problems. But you have agreed to “study” and “consider” strengthening civil defense by a blast shelter program and programs to provide better fallout shelters.

We submit, Mr. Wallace, that these and other civil defense measures, plus ballistic missile defenses, require attention if our people are to be secure from foreign as well as domestic violence.

And so we say to each of the candidates as they approach November. . . with appeals to the voters. . . with issues being debated. . . with events moving rapidly as they have recently in Czechoslovakia and Romania: Please don't forget the people!

Whatever positions you take on national preparedness or foreign policy, don't forget that *assured survival*, including civil defense, backstops and reinforces your policy.

It strengthens your position because it is, in itself, a strong deterrent to nuclear conflict and because *assured survival* offers the only means of salvation in the case of nuclear war by sneak attack, escalation, miscalculation or accident.

So we say, Mr. Candidate, don't forget the people!

When nuclear war can wipe out over half of these people unless an effective survival program is implemented, think of them, Mr. Candidate.

There are – among federal, state and local civil defense officials, Congressmen, scientists, former government officials, industry and labor leaders, retired military officers – experts who stand ready to brief you on what *assured survival* can mean to America, and how it can be achieved.

We urge you to visit with some of them.

**Assured survival* refers to national survival and means the survival of a very large majority of the nation's population.

BOOK REVIEW

Little Harbor

Little Harbor. A report on the 1967 review and updating of the 1963 *Project Harbor Study of Civil Defense*. National Academy of Sciences, National Academy of Engineering, National Research Council. (46 manuscript pages.)

In March 1967 the Atomic Energy Commission requested the National Academy of Sciences to review and update the *Project Harbor Study on Civil Defense*. The *Project Harbor Study* was a six-weeks civil defense conference held at Woods Hole, Massachusetts in the summer of 1963 and participated in by 63 scientists and engineers. 88 briefers, consultants and observers also took part in the conference. It was sponsored by the Office of Civil Defense. Probably the most ambitious study of its kind ever to be conducted, its proceedings and conclusions have since been analyzed and applied by civil defense authorities around the world.

Director of *Project Harbor* was Nobel Prize Winner Dr. Eugene P. Wigner. Dr. Wigner was also selected to head the reviewing and updating study. This took place at the Oak Ridge National Laboratory May 27 - June 3, 1967. The panel's report on the updating study has now been cleared for publication. What follow here are comments on and excerpts from the approved text.

Little Harbor is meaty and terse. It is based on *Project Harbor*, and a careful examination of the *Project Harbor Summary Report* is recommended as background reading. *Little Harbor* first notes important changes in the "Strategic Outlook" since 1963, principally the birth of ABM systems, a new and necessary emphasis on long-range recovery, and the dangerous underestimates of Chinese capabilities and intentions. It covers briefly "New Weapons and Weapons Effects". In a more detailed discussion of "Immediate Survival" *Little Harbor* touches with some persistence on civil defense program problems at the federal level. It says:

"Federal Responsibility for the common defense implies responsibility also for the protection of the lives of the civilian population, just as it implies responsibility for deterrence and offensive capability. Under conditions of modern warfare, civil defense cannot be divorced from other forms of defense. . .

"At present, the responsibility for the planning of civil defense and for the execution of these plans is widely divided. The amendment to the Federal Civil Defense Act makes civil defense a joint federal-state responsibility. As a result, the organizational structure of civil defense is quite complicated and has no well-established lines for

communications and decisions.

"Most of the planning is done by federal agencies, but much of the execution is in the hands of state and local officials. Since the federal government cannot order or force the state and city authorities to execute its civil defense plans, the actual level of preparedness shows large variations throughout the country. The control of the federal agencies can be exercised only by imposing conditions for the allocation of civil defense funds. Even when state and local officials wish to cooperate, the complex organizational setup often causes difficulties."

A revealing outline of shelter requirements and possibilities completes the discussion of "Immediate Survival." In a section entitled "Recovery" *Little Harbor* tackles the "complex" problems facing survivors beyond the pin-down phase which Dr. Wigner and his associates claim need much greater attention.

"Civil defense is not restricted to protecting the population from the effects of weapons. It must also assure that the ranks of the immediate survivors are not decimated because of failures to provide sustenance, to control disease, and to maintain order. Finally, it should provide the prerequisites of recovery. Although the meaning of recovery cannot be made entirely precise, it is clear that the dissolution of the United States as a political entity, indefinite continuance of standards of living close to subsistence levels, or the inability of the nation to cope with subsequent external threats, would each constitute a failure to recover.

"The emphasis given to the problems of long-term survival and ultimate recovery should depend on the level of the total civil defense program and the range of threats at which that program is directed. At very low levels of expenditure - such as the present federal level of about forty cents per person per year - the greater vulnerability of unprotected people relative to unprotected productive facilities warrants a high concentration on the survival of people. However, if all the population has good fallout protection, and the urban portion some blast protection, the amount and character of preparedness needed to complement this protection become quite sensitive to the level of attack on urban targets."

Later in its report the panel returns to the importance of leadership in any general "Acceptance of Civil Defense Programs." It observes:

"What is meant by acceptance is not so much a simple attitudinal matter, i.e., attitudes of liking, interest or even confidence, but rather:

SWEDISH INTERVIEW

1. A belief in the existence of certain conditions of threat;
2. An understanding of the consequences of possible responses;
3. An assignment of sufficient priority to those actions that implement the program for ameliorating the threat.

“Widespread belief in, and understanding of, situations in which many characteristics are changing and changing each other is difficult to secure. However, if belief and understanding are achieved among opinion leaders, more general belief and understanding are hastened. Furthermore, a shift in assigned priority of action is required initially only of decision makers, i.e., those who initiate, plan, decide, budget, and the like. This is a very small segment of the population, but the larger public, given the supporting belief in conditions and a faith that the decision makers have understood the consequences of responses, will correspondingly shift its priorities. Therefore, the likelihood and extent of acceptance are increased if one:*

1. Increases the credibility of the assessment of the threat;
2. Thoroughly clarifies the implications of the possible responses;
3. Restricts the pace of required change in currently accepted priorities;
4. Restricts the number of people whose direct participation is required;
5. Minimizes the resource commitments made necessary.

“A program to fit such a set of conditions is not easy and it will be relatively slow. But it should have a better image than a coerced rapid preparation for facing an attack. Given enough time, it should also be more effective.”

The study lists 10 “hindrances to acceptance” and 9 “contributions to acceptance”. In a final discussion called “The Threat” an incisive analysis of the cost of killing vs the cost of sheltering in nuclear attack situations is made. Here one of the review group, Rand Corporation economist Sidney G. Winter, is cited in a footnote as believing *“that a very substantial expansion of civil defense and other preparedness programs is consistent with a national strategy whose primary emphasis is on the deterrence of nuclear war, and that such an expansion would be undesirable if it were not so consistent.”*

Little Harbor will be welcomed warmly in foreign civil defense circles. Like *Project Harbor* it will be recognized as a document based on enlightened scientific research and will be utilized abroad. Will it in the United States? (WM) ■

* (Little Harbor footnote) Note that those who are decision makers are often among the opinion leaders, but there are many more opinion leaders than decision makers.

Late last year Dr. Walo von Greyerz, Chief Medical Officer of the Swedish Civil Defense Administration, made an official civil defense visit to the United States. In the March, 1968 issue of the Swedish Civil Defense magazine, *Civilt Försvar*, a special interview on his trip was published. Portions of this interview were as follows:

Q: Is it true that the civil defense effort varies greatly among the different states of the United States?

A: Yes, this was my impression. It may depend upon the fact that the Federal Civil Defense authorities are unable to force any state to follow its program. This is due to the administrative structure of the country. The federal civil defense authorities can only give advice or try to reach their goals by persuasion.

Q: How much money is spent on Civil Defense (in the United States)?

A: I have only information about what the Federal Government spends for civil defense purposes. The appropriations have continually decreased during the last six years. . . Many of the persons actively involved with civil defense problems expressed their dissatisfaction with this decrease in funding, in particular with reference to the steady inflation over the last few years.

Q: What are the arguments to explain the obvious neglect of providing shelters for shock and heat effects?

A: Several of the people I talked to held the opinion that big population centers such as New York City would not be subject to a direct hit with nuclear bombs because an enemy would not want to destroy the city. Instead it was highly probable that in case of an attack a bomb would be exploded off the coast so that a “favorable” wind would carry the fallout over the city. This point of view, which I met at several instances and places, is hard to understand, and I am unable to judge whether it was a result of wishful thinking or the product of a careful analysis. . .

Q: What considerations are given to the problems of evacuation?

A: The problems of evacuating the population from the major cities are given very little attention. The head of the New York Civil Defense viewed all plans of evacuation of New York City as entirely worthless. . .

(translation by Dr. Yngve Öhrn)

IN THE WAKE OF INTERLAKEN . . .

Following is a resumé of official summaries of committee deliberations at the Interlaken Symposium (Fachverband für Strahlenschutz) held at Interlaken, Switzerland, May 26-June 1, 1968. Although the resumé appears as one account, it is actually taken from conclusions reached by several committees composed of leading scientists representing the 21 participating nations.

The conferees considered the effect on the human body of radiation emitted by fallout particles. It was generally agreed that there is great need for additional information on this subject. Since the body repairs itself to some extent while absorbing a radiation dose, a given dose of longer duration is less damaging than one of shorter duration. It was pointed out that a better way is needed to express the damage resulting from a dose of a given duration. Some conferees pointed out that the currently used "ERD" method is not entirely satisfactory for communicating this information accurately. To shed more light on biological recovery, it was recommended that appropriately planned animal studies be conducted.

Civil defense decision makers need advice with respect to the exposures below which most people will not get sick. The maximum dosage from which most people will not die is also needed. This should be provided in terms of exposures over one-day, one-week, one-month, and one-year periods. Most conferees agreed on the 200-roentgen upper limit of short-term doses that will not cause illness severe enough to require medical care in the majority of people.

The establishment of exposure limits to be applied after the attack by decisions made before attack is inadvisable. Instead, the post-attack decision maker should be provided with simplified guidance on radiation effects that he can evaluate along with all the other problems that may confront him at that time.

In the rating of fallout shelters, it has been common practice to use the term "protection factor (PF)." The protection factor is designed to be the ratio of the dose rate in a completely unprotected location to that inside a specific shelter. It was pointed out that the usual methods of assigning this factor to a shelter are helpful for radiation protection planning but should not be used for operational purposes. Dose rate data based on radiation instrument readings on the spot are required for actual decisions. An operational decision maker should also be aware of the fact that people in the shelter shield each other. Thus the shielding may be optimized by proper placing of the shelter occu-

pants. This method of protecting farm animals has often been suggested.

Aside from whole body radiation from fallout particles on the ground and other surfaces, the second major danger from fallout radiation arises from the ingestion of radioactive elements in food raised on land contaminated with fallout particles. This is only possible if the elements can be dissolved in water. This solubility generally increases as the particle size decreases. Since small particles take longer to descend than larger ones, they are found farther down wind from the explosion. On the other hand, not all elements in fallout are soluble in water or stomach acids. The most important soluble elements are iodine-131, strontium-89, strontium-90, and cesium-137. Iodine finds its way to human thyroid glands, while strontium-89 and strontium-90 substitute for calcium in the bones. Cesium-137 is more generally distributed in human body tissue. With the possible exception of iodine-131 in infant thyroid glands, radiation from internal sources would rarely exceed that which would be expected to be absorbed from external radiation if proper precautions are taken. With a good shelter system, however, internal radiation hazards might become relatively more important.

It was emphasized that iodine-131, especially in children, is by far the most dangerous element. For this reason, means for countering this threat should be available. These would include administering inactive iodine and processing milk to reduce its iodine content. For the first few weeks after an attack, the entire radioactivity of milk can be attributed to iodine-131. Information should be in the hands of post-attack administrators to allow them to make intelligent decisions on the advisability of consumption of available foods such as milk.

Fallout hazards near the point of nuclear explosions (to a distance of several miles outward) are secondary to those from the immediate effects of blast and fire. Although the emphasis of the symposium was on radiological protection, it was noted that blast and fire protection had influenced the design of many European shelters, and that no suggestion of a reduction in the significance of these effects was intended.

It is essential to draw a distinction between the very small fallout particles that rise high into the stratosphere and are distributed over the entire earth's surface on the one hand, and local fallout that descends relatively near to the point of explosion on the other. It was agreed, however, that the distinction between the two cannot be precise. Local fallout producing sufficient radiation to require fallout shelters arrives within the first day after the explosions. These local fallout particles usually have a diameter of more than 20 microns (a micron is one-millionth of a meter), the average being much larger.

The arrival of local fallout particles larger than about 30 to 60 microns may be felt on the nose, forehead, lips, etc. of exposed persons. Particles of local fallout may be seen as they strike white objects and, after a short time, they appear as a layer of sand or soil particles on window sills, cars and other exposed objects. As a rough rule of thumb, a nuclear detonation on the earth's surface throws up about one megaton (one million tons) of soil per megaton of explosive yield. Fallout particles will be blown by the wind and washed by the rain from paved surfaces and roofs in a manner very similar to sand and dust particles.

Several procedures have been proposed in the past for calculating the distribution of local fallout particles from a nuclear explosion. These methods estimate how high in the atmosphere the particles of various sizes will be when they condense from the vaporized mixture of earth, bomb structure material, and fission products that compose the mushroom-shaped cloud produced by the explosion. They then follow the descent of these particles through various layers of atmosphere with varying wind velocities and directions. The major usefulness of these fallout distributions lies in the information obtained on the general nature of the problem and to assist in designing civil defense measures and exercises. If wind data at a number of altitudes are available, it is possible to use these procedures to reliably predict the general region where fallout will be found, even though accurate estimates for a given location are not possible. These local variations can be quite important, however, amounting to factors of ten over distances as small as 100 yards or so. This makes it necessary to have radiation measuring instruments available at a very large number of locations. It also requires the presence of a large number of trained personnel capable of making decisions based on local conditions. It will not be possible at the time of the emergency for adequate instructions to be issued from some central location to cover broad areas.

As we have seen above, the smallest particle diameter in local fallout is 20 microns. Since par-

ticles must be less than 5 microns to be retained through inhalation, no serious hazards from this source are to be expected, even for people who do not take shelter and do not use filtration devices. Even so, it is a wise precaution for personnel conducting decontamination (clean-up) operations in a dusty fallout environment to wear dust masks or to cover their noses and mouths with handkerchiefs or other suitable cloths. Past recommendations have indicated thorough personnel decontamination by showering and changing of clothes upon entrance to shelter areas. It was concluded that these problems of personnel decontamination have been highly overestimated in the past and that in most cases of civil defense concern, relatively simple procedures will suffice if any are needed. Furthermore it was noted that most conventional decontamination control instruments would be inoperable because of high background radiation.

Radioactivity in fallout comes from three sources: fission products from the splitting of uranium or plutonium atomic nuclei, radioactivity induced in the material of the bomb produced by neutrons, and radioactivity induced in the soil vaporized by the bomb's heat. In some cases, the element Neptunium-239 is an important contributor, and its effect may be equal to that of the fission products at a time about 4 days after detonation. However, because of its rapid decay its relative importance is soon negligible. Neptunium is produced from the uranium in the original bomb material.

It was emphasized that communications for the control of populations in a fallout environment are essential. Consideration should be given to the establishment of alternate means of communication in the event that primary radio or telephone communications are lost.

Emergency personnel serving either as an alternate to, or subsequent to, military obligations (as in Swiss practice and West Germany planning) may provide the most effective service to the public in a nuclear mass disaster.

Total civil defense systems include warning, shelters, plans and provisions for recovery, and emergency organizations to operate the system. It was the consensus that increased efforts in civil defense should involve increased attention to problems of recovery, such as the protection of vital resources (e.g. food and fuel). A partial shift in emphasis from survival to recovery at moderate levels of expenditures may be justified. (AAB) ■

(Futher Interlaken conference notes on other subjects, including observed radiation effects on thyroid glands in children, will be published in the November-December issue of *Survive*).

EDITORIAL . . .

The Race Toward Reasonableness . . .

"Under the shadow of the Bomb" is an article by former Secretary of Defense Robert Strange McNamara which appears in the September 3rd issue of LOOK. In his first paragraph McNamara states:

"... What we sometimes overlook is that every future age of man will be an atomic age, and if man is to have a future at all, it will have to be one overshadowed with the permanent possibility of thermonuclear holocaust."

McNamara goes on to present convincingly his concept that both Russia and the United States possess "assured destruction". He includes emphasis on the following points:

(1) That in the number of useable nuclear weapons "the United States currently possesses a superiority over the Soviet Union of at least three or four to one." (Questioned by some authorities.)

(2) That "we are not going to permit the Soviets to outdistance us. . ."

(3) That cost is not a factor in defense spending, that security is.

(4) That four scientific advisors to the last three presidents and three Directors of Research and Engineering to three Secretaries of Defense have "unanimously recommended against the deployment of an ABM system."

McNamara, however, also emphasizes the need for flexibility of our defenses. He points out that "even with our nuclear monopoly in the early post-war period, we were unable to deter the Soviet pressures against Berlin or their support of aggression in Korea". He could have added to this the forcible overthrow of democracy in Czechoslovakia, culminating in the murder of national hero Masaryk, the breaking of the Hungarian peace treaty, and other events.

The question then arises: Can we really be in a better position without true defense, with our population exposed to the threat of annihilation unless we submit? Does real flexibility not demand true ABM and civil defense as well?

The question which the Little Harbor Report, just released (see page 8), raises in this connection is: What could we do if the USSR evacuated its cities - it has made elaborate preparations for this - and then threatened us with a nuclear war unless we agreed to their demands? These demands could be the evacuation of Berlin, the withdrawal of the protection of the Philippine Islands or a number of other concessions.

The answer is simply that we could do nothing. The evacuation of the Russian cities would render our deterrence ineffective. Only if we could also protect our people could we resist these pressures. The lack of understanding of many members of our

defense establishment for the present ascendancy of true defense, for the need for ABM and Civil Defense, reminds one of the lack of understanding, just about 28 years ago, of the possibility of developing nuclear weapons.

McNamara has said: "Without a fallout shelter program, there is no basis whatsoever for deployment of an anti-ballistic missile system." The United States is today engaged in producing a limited ABM system.

It can be said that we have a fallout shelter program, but this is a weak program that has been growing weaker year by year through the failure of Congress to allocate the necessary funds. We have seen minimum protection factors reduced drastically so that more building areas could qualify as shelter. We have seen blast shelter in assumed blast areas ruled out, and we have seen evacuation from these danger areas ruled out. We have seen our shelter program drop from a second-class effort to a fourth-class farce.

In the face of this we see leading American scientists and other individuals of national prominence, including foreign sympathizers, express shock and alarm that the United States would allow its people to remain needlessly exposed to a fatality rate triple or quadruple that which real protection would give them.

McNamara, who has been the protagonist in this drama should be asked: Are these people wrong?

He should also be asked: Is Russia wrong in pursuing an active blast and fallout shelter program? Is Sweden foolish in following an even stronger program? Is Switzerland? Are other European countries?

Why does the American military protect its missiles with hardened sites? Why does the American military house its defense headquarters under a mountain of solid rock, on massive coil springs, behind huge steel blast doors? Why does a major part of American industry insist on pushing ahead with realistic survival planning, the American Telephone and Telegraph Company for instance, investing over \$800,000,000 in blast-protected cross-country communications? Why does the Federal Government pay for blast research year after year?

Why is this same policy not applied to the American public? Why does our government insist on replying with Civil Defense budget cuts?

Answers to these questions might make a contribution to Mr. McNamara's "race toward reasonableness" that would be meaningful in terms of the safety of the American family - and the survival of the American nation.

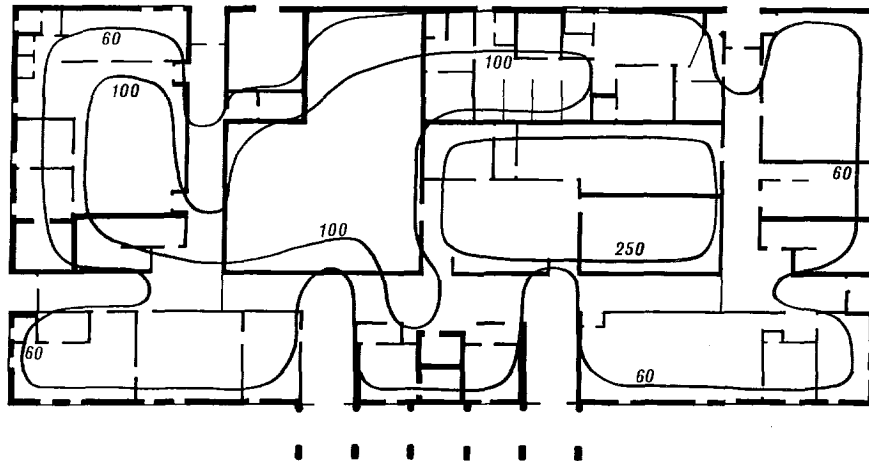
COURTHOUSE SHELTER

Bradford County, Florida (Starke, County Seat) is the home of *Survive*. This is no accident. It is not due to heady climate, landscape or lakescape. It is due to the realization by political leaders in Bradford County that civil defense must be a part of the American scene, their conviction that the survival program must serve the people, and the material evidence that they mean business.

The latest example of this concept is the Bradford County Courthouse. Ground was broken in July. It is due for completion in the summer of 1969. Architect Frank George was asked to design the building as fallout shelter. This was accomplished through consultation with M. H. Johnson, shelter analyst and architect on the staff of the Civil Defense

Bradford County is far enough from possible target areas to emphasize fallout shelter instead of the more expensive blast shelter. Following are distances from Starke to nearest possible targets:

- Gainesville, Florida 22 miles
- U. S. Naval Air Station 24 miles
Cecil Field, Florida
- U. S. Naval Air Station 32 miles
Jacksonville, Florida
- U. S. Naval Station 52 miles
Mayport, Florida



First floor schematic sketch showing protection factor contours. The entire second floor has a protection factor of 60 or over. Outside walls are 12-inch concrete block with brick facing. 1st. floor block are concrete-filled.

Technical Services Center at the University of Florida. Basic statistics are:

Total square footage	33,200
Cost	\$719,000.00
Cost per square foot	\$ 21.66
Useable square footage, PF 40 or above ..	26,800
Shelter capacity (number of people)	2,680
Extra cost for inclusion of shelter	\$ 1,000.00
Cost per person sheltered	\$.37

Bradford County has a population of 13,000. Shelter spaces now exist for 5,500 people. The new courthouse will boost this to over 8,000 shelter spaces. By 1971 Bradford County will have shelter spaces for its entire resident and transient population. This represents a progression from no available shelter spaces in 1964 to shelter for everyone within a period of seven years.

Statements of local officials:

Dave Shuford, Chairman, Board of County Commissioners: "Our public officials have become informed on nuclear attack problems. Our people expect their elected representatives to dig into vital issues and to take necessary steps in their interests. This is all we are doing. The protective features incorporated in the new courthouse are simply a part of this concept."

Carl Hurst, Mayor of Starke (County Seat): "The cost of a good public safety program investment is not really significant. The cost of a poor public safety program is outrageous. We consider civil defense the nucleus of our public safety program. Our shelters will serve in all types of disaster."

PRESIDENTIAL NOMINEES ANSWER

SURVIVE QUERIES

Letters to each major presidential aspirant went out in May from the editor of *Survive*. Each letter opened in this way:

“An issue of vital interest to the readers of *Survive* and its staff is the weight which you and other candidates in the current political campaign give to the question of national survival in the event of nuclear attack upon the United States. . .”

Questions on Civil Defense policies followed. Here are excerpts from the answers:

NIXON

“ . . . By the time the next President takes the oath of office, the Soviet Union will have drawn abreast of the United States in the number of land-based intercontinental ballistic missiles, a truly stunning reversal of its inferior strategic position vis-à-vis the U. S. at the time of the Cuban missile crisis in October, 1962.

“ . . . Not only has the Soviet Union come near matching America's nuclear striking power. It has forged ahead, under the impetus of new technology, in the field of ballistic missile defense. While the United States is still years away from deploying missile defenses, the Soviet Union has already installed such defenses around Moscow and, according to some reports, elsewhere in the country.

“The decision to go ahead on the Sentinel system is emphatically *not* the start of a new ‘arms race’ as some critics claim. It is a belated decision not to lose a race already in progress, a race in which the Soviets threaten to leave us behind. While men in Washington in the early 1960's drew comfort from America's overwhelming strategic superiority and talked of military technology reaching a ‘plateau’, strategic planners in Moscow bent every effort to exploit advancing technology and overthrow the unfavorable balance of nuclear power by the late 1960's. They have arrived at the point of prospective success — and America is entering a period of unprecedented peril. . . ”

WALLACE

“ . . . My position relative to a National Civil Defense program is essentially the same as taken by my administration within the State of Alabama. Specifically, I would support a National fallout

shelter program similar to HR 8200, as discussed in the Hébert Committee Report to Congress in 1963, provided my personal studies as President do not disclose a more economical approach. Adequate funds are not available at the local level for fallout shelter construction on a massive scale. However, there is no doubt in my mind that a fallout shelter program with some support from the Federal level can be developed to such an extent that every American will have adequate shielding from fallout radiation. A reevaluation of our foreign aid program could very well produce the funds necessary to insure the survival of our own people.

“ . . . I am not prepared at this point to give you my comments relative to a blast shelter program. However, you may be assured that this question would have my immediate study.

“ . . . I feel, as has been stated by the Joint Chiefs of Staff, that a strong Civil Defense program is inseparable from our National Defense program. We must plan not only for the destruction of an enemy, but for the survival of our people. I personally feel that planning and funding on the local level, will help in developing an adequate program. . . ”

HUMPHREY

Vice President Humphrey's statement is reproduced in its entirety:



THE VICE PRESIDENT
WASHINGTON

July 23, 1968

Dear Mr. Murphey:

I do not mean to quibble or to hedge. I will state, however, that I believe that we must give serious attention to the problem of civil defense. My record shows that I have backed an adequate program. I will continue to do so. I prefer not to get into details on this subject.

Sincerely,

Handwritten signature of Hubert H. Humphrey in black ink.
Hubert H. Humphrey

Mr. Walter H. Murphey
Editor, *Survive*
P. O. Box 910
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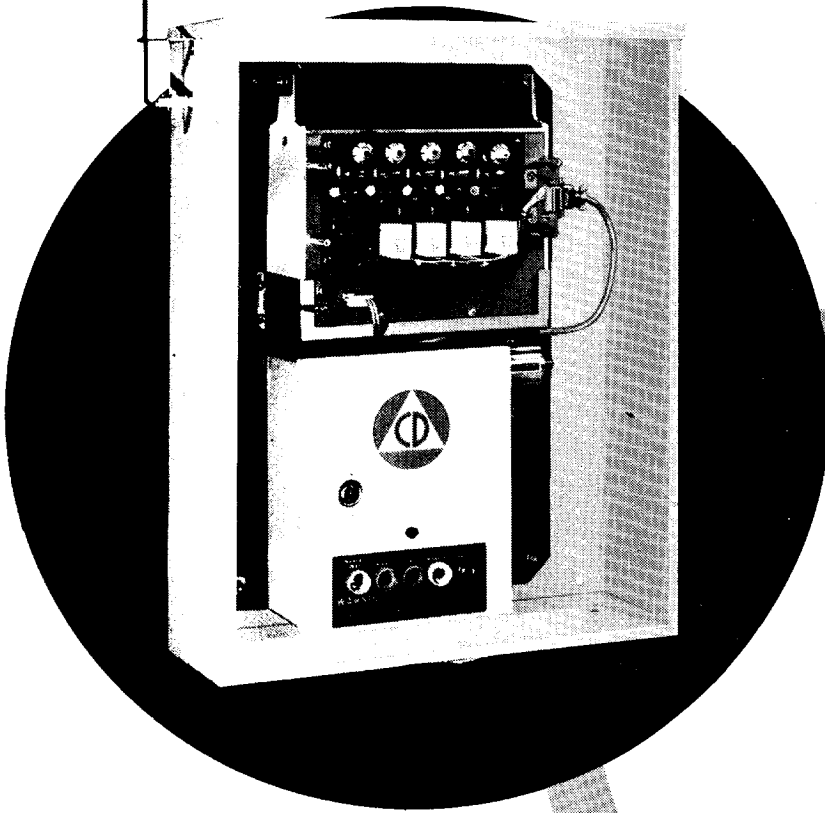
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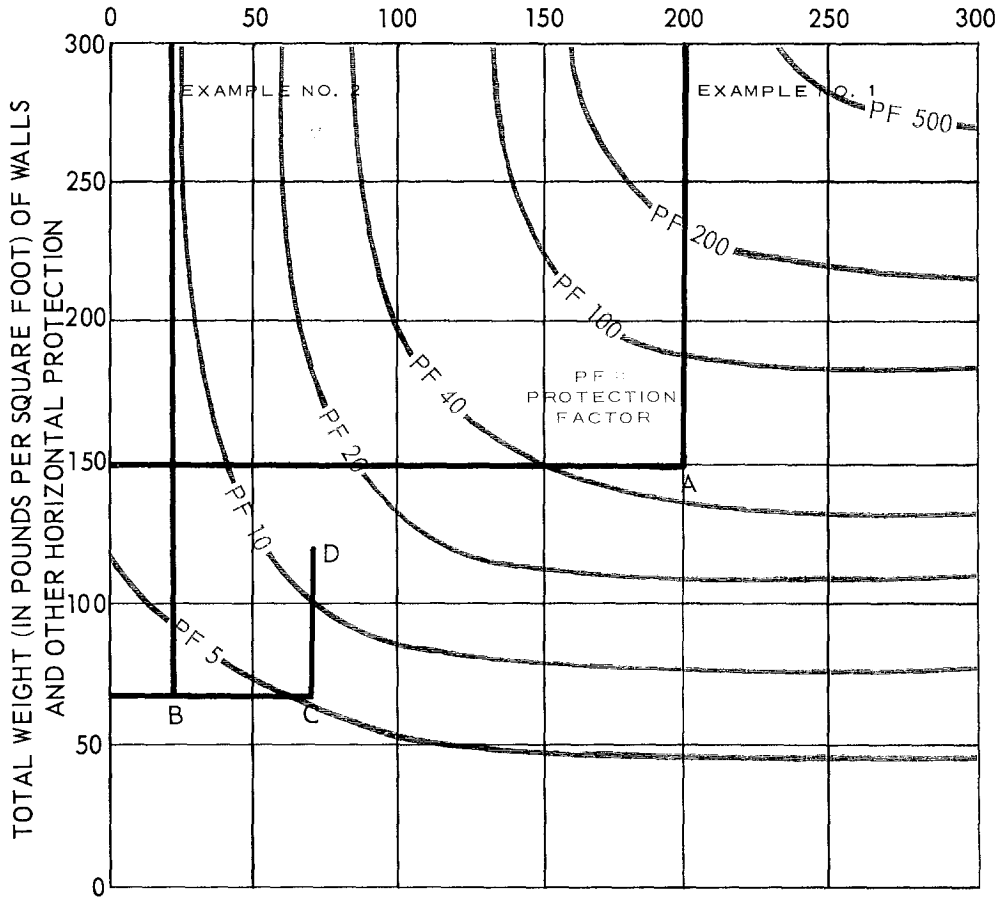


FEDERAL SIGNALS

Protection Factor Indicators For Fallout Shelters

(FOR SIMPLY DESIGNED SINGLE BUILDINGS, WHERE SILL HEIGHTS ARE THREE FEET OR MORE)

TOTAL WEIGHT (IN POUNDS PER SQUARE FOOT) OF ROOF AND OTHER OVERHEAD PROTECTIVE COVER



PREPARED BY L. B. BALDWIN

DEFINITION:

PROTECTION FACTOR - The outside fallout radiation reading divided by the radiation reading in a shelter will give shielding value of the shelter, or the protection factor. For instance, the protection factor of 50 found for Example No. 1 in the chart would mean that with an outside fallout radiation level of 1,000 roentgens per hour (r/hr) the radiation level inside would be 1,000/50 r/hr. With a normal decrease of the outside radiation level to say 25 r/hr the radiation level inside this particular shelter would be expected to be around .5 r/hr. Actual readings would vary somewhat from estimates.

TYPICAL WEIGHTS OF COMMON MATERIALS (for 1 square foot of area and 1 inch of thickness):

Wood sheathing	2½ lbs.
Wood	4 lbs.
Water	5½ lbs.
Concrete block (including air spaces)	6 lbs.
Brick	9 lbs.
Plaster	10 lbs.
Concrete (reinforced)	12 lbs.
Glass	15 lbs.

A wood floor, a frame wall, or a wood roof is likely to weigh in the neighborhood of 5 lbs. per square foot. An 8-inch concrete block in the neighborhood of 40-55 lbs. per square foot (weights vary with manufacturing processes). A brick veneer will add about 30 lbs. per square foot. A reinforced 4-inch concrete slab floor will weigh about 50 lbs. per square foot.

Qualified shelter analysts are still far between. A simple method to estimate shielding capabilities of buildings against fallout radiation (protection factors) is needed. The above chart is meant to do this, to give indications of protection factors for the non-technical evaluator. These indications, although generally "in the ball park" compared with engineering calculations, should be checked when practicable by qualified shelter analysts.

Estimates of average overhead and horizontal weights per square foot can be tricky, even for the experts. These should be conservative in order to be on the safe side. A table of typical weights appears at the right of the chart.

The use of the chart is illustrated by the following examples.

Example No. 1 (A structure similar to the Bradford County Courthouse - see cover and page 13): A masonry 2-story building with pre-stressed concrete 2nd floor and roof and 4-inch concrete slabs at each of these levels. For a shelter location on the 1st floor this would mean about 200 pounds per square foot of weight overhead. We therefore enter the chart at the 200 mark on the top scale and follow this line down to a level with the horizontal (or wall) protection at this location. With the shelter location near an external wall we find this horizontal mass to be about 150 pounds per square foot. We arrive at Point A on the chart, which indicates a protection factor of about 50. (An engineering analysis actually arrives at a protection factor of 60 for a similar location in the Bradford County Courthouse.)

Example No. 2: A two-story concrete block residence with brick veneer and framed flooring, attic and roof construction. Figuring 5 pounds per square foot for each overhead mass we come up with 15 pounds per square foot total overhead mass for a 1st floor shelter area. Following this line down from the top scale to an estimated horizontal mass of 75 pounds per square foot (block plus brick) we arrive at Point B, or an indicated protection factor of about 4. This is not good, but better than that of the usual frame house. This can be improved by careful addition of improvised shielding on the second floor above the shelter area and on the first floor around the shelter area. If, for instance, we could safely place about 25 pounds per square foot of materials on the second floor so as to shield the 1st floor shelter area from the fallout settled on the roof and another 25 pounds per square foot similarly on tables in the shelter area we then could move to Point C on the chart for an under-the-table protection factor of about 6. If, in addition to this, we succeeded in placing 50 pounds per square foot of materials around the 1st floor perimeter of the shelter area we could then move to Point D on the chart where we would find a protection factor of about 12. This is expedient fallout shelter, much better than none, but far inferior to that shown in Example No. 1. An under-the-table shelter may be uncomfortable, but so is a foxhole.

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END OF CD DILEMMA ASKED BY PITTMAN

In a forthright appeal to Senator Richard B. Russell, Stuart L. Pittman recently laid the case for a meaningful civil defense program squarely on the line: support it or drop it. Senator Russell is Chairman of the Senate Armed Forces Committee. Pittman of the Shaw, Pittman, Potts, Trowbridge & Madden law firm in Washington, and former Civil Defense Director under the Kennedy administration, was speaking for a small group of leading scientists and civil defense critics who had just held an impromptu meeting in a Washington hotel room. Wrote Pittman in part:

“ . . . In the hopes that the situation may be retrievable, we believe that the most important step to be taken at this time is for the Congress to authorize and direct the Secretary of Defense (or the President) to present to the Armed Services Committees, by a specified date early in the next Congress, a coherent plan and justification for a civil defense program around which state and local governments, industry and others can build with confidence that the Federal Government will carry through its part. This legislation should require a specific response including the following:

- (a) clear up the confusion on the relationship between shelter programming and anti-ballistic missile programming;
- (b) reaffirm or reject the past objective of fallout protection for the entire nation;
- (c) place the achievement of this objective, if reaffirmed, on a reasonable time schedule, including estimated annual Federal expenditures for program components;
- (d) present alternatives, if the current program is to be abandoned;
- (e) identify essential civil defense and emergency planning objectives other than the fallout shelter system, establishing completion schedules and estimated costs; and
- (f) identify civil defense programs which warrant research and planning effort but not deployment, again identifying completion schedules and estimated costs.

“It is respectfully suggested that the Federal Government’s participation in civil defense over the years has not been consistent and has not been fully responsible. The time has come for the Armed Services Committees of Congress to take the lead and clarify the issue of whether this country is moving toward a coherent civil defense effort. If it is not, the pretense and the considerable base already laid should be abandoned. Executive Branch witnesses at hearings before the Armed Services and Appropriation Committees have repeatedly put the monkey on the back of Congress on the civil defense question. We believe the initiative and responsibility lie with the Executive Branch, and that Congress should now make this clear.”

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