THE AMERICAN JOURNAL OF CIVIL DEFENSE

SURVIVE

"I believe that defensive systems, which prevent attack, are not the cause of the arms race, but constitute a factor preventing the death of people. Some argue like this: What is cheaper, to have offensive weapons which can destroy towns and whole states or to have defensive weapons which can prevent this destruction? At present the theory is current somewhere that the system which is cheaper should be developed. Such so-called theoreticians argue as to the cost of killing a man – $500,000 or $100,000. Maybe an anti-missile system is more expensive than an offensive system, but it is designed not to kill people but to preserve human lives."

–Alexei N. Kosygin, Premier, USSR

THE CIVIL DEFENSE FORUM – THE OAK RIDGE CIVIL DEFENSE SOCIETY – THE PROFESSIONAL SOCIETY FOR NUCLEAR DEFENSE – THE ASSOCIATION FOR COMMUNITY-WIDE PROTECTION FROM NUCLEAR ATTACK

JANUARY–FEBRUARY 1972 VOL. 5 – NO. 1

SURVIVE

VOL. 5, NO. 1 JANUARY-FEBRUARY 1972

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"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

CD Calendar

January 9-10	North Carolina Civil Defense Association – Sanford, North Carolina
February 22-29	Sixth World Civil Defense Conference, International Civil Defense Organization – Geneva, Switzerland
March 27-29	Midyear Conference, United States Civil Defense Council – Sheraton Park, Washington, D. C.
April 9-12	Conference, California CD & DA – Long Beach, California
May 5-7	Conference, Nebraska Civil Defense Directors Association – Ogalalla, Neb.
June 2-8	Exposition: L'Homme, l'Air et l'Eau – Paris, France
June 11-14	Annual Conference, National Association of State Civil Defense Directors –San Antonio. Texas
June 18-21	Conference, Region Six USCDC – Abilene, Kansas

(Officials of State, regional, national and international CD Associations are invited to submit dates and places of meetings. Please submit early.)

The largest underground power development in the world is now under construction in Northeast Canada at Churchill Falls, Labrador. Scheduled for completion in 1976 at a cost of nearly one billion dollars, the Churchill Falls facility is expected to produce 34½ billion kilowatt hours – more than 20% of the electricity now generated for all of Canada.

The project's powerhouse, tunneled out of solid rock, is 972 feet long, 81 feet wide, and reaches heights of 154 feet.

EDITORIAL . . .

American Roulette

In a heavy mixed-target nuclear exchange between the "superpowers" population losses would be about as follows:

United States 65%*
Soviet Union 6%*

A first reaction to these contrasting estimates is apt to be one of disbelief. But evidence bears them out. Means of protecting populations include fallout shelter, blast shelter, evacuation, and ABM (antiballistic missile) techniques. All of these means have been cultivated by the USSR, all of them neglected by the United States.

ABM in particular has been misunderstood in the United States. It has been rationalized as part of an attack arsenal. It is not. It is a weapon of defense. Its value is only in *destroying* offensive weapons, in *protecting* targets – and people. As USSR Premier Alexei Kosygin says "it is designed not to kill people but to preserve human lives" (see cover).

In 1969 America's "ABM Debate" shook the halls of Congress and saw emotions repeatedly rise and boil. Eminent scientists Jerome B. Wiesner, George W. Rathjens, Jr., Steven Weinberg and Ralph E. Lapp led the anti-ABM troops with gusto and flourish, impressed many lawmakers and influenced ABM thinking throughout the nation. Unfortunately, their rhetoric was not always matched by their logic. They were often deeply in error. (See "When Science Tangles with Politics" by Robert L. Bartley, page 2 this issue.)

The question of survival, observed anti-ABM scientists in defense of their position, was overdone and not particularly important.

If survival can be accepted as unimportant, the casualty estimates

United States 65%
Soviet Union 6%

perhaps can also be accepted as unimportant.

However, we prefer to think that survival of Americans *is* important. The 1969 plea of Evar Peterson (then president of the U. S. Civil Defense Council) rings of the kind of honest analysis we like. He said:

> "It seems we are willing to protect everything but the citizen who pays the bill. Your honorable body is giving consideration to the protection of our missile sites with an ABM system. It is most appropriate to consider such a matter, but of what value is it to protect the missile sites if our citizens are not given a chance to also survive?"

We think too that Congress might now reconsider the merits and demerits of the 1969 ABM testimony.

*Evidence consists of Office of Civil Defense research and studies by Carsten M. Haaland, Arthur A. Broyles and others to support the USA figure. The USSR figure is arrived at by weighing the analyses made by Eugene P. Wigner, Joanne Gailar, Leon Goure, and the editor-author of the Soviet civil defense manual N. I. Akinov. (Also see the July-August 1969 issue of *Survive* for ABM viewpoints.)

SURVIVE

THE AMERICAN JOURNAL OF CIVIL DEFENSE

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Survive presents authentic information relating to civil defense–to the survival of free government, the United States, and its people 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 advisory board for publication. Articles (preferably illustrated) should be 1,000 to 1,500 words in length, slanted to the non-technical reader, and oriented toward the civil defense field. Views expressed in contributions to *Survive* are those of the authors and do not necessarily reflect *Survive* policy.

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When Science Tangles With Politics

— by Robert L. Bartley

To a layman earnestly following the long and heated debates over the anti-ballistic missile, one of the most depressing difficulties has been the sharply conflicting testimony of scientific experts, not only over conclusions but over relatively simple things the methods of science ought to be able to resolve.

So it is of no small interest that a scientific society has released a 21-month study of precisely this problem as it concerned one definable aspect of the 1969 Safeguard debate. It's interesting, too, to notice the inevitability with which this report has been swept up into scientific-personal-political controversy. You start to watch the dispute with the question in mind, What can science contribute to public policy? Before your eyes, the question starts to become, Could it be that all aspects of public policy are "merely political" and that science, as science, can contribute nothing at all?

The 135-page report is by an ad hoc committee on professional standards of the Operations Research Society of America, the principal organization of cost-effectiveness analysts. It studied the conflicting answers by different scientists to a complicated but presumably manageable question: Assume that by the mid-1970s the Soviet Union deploys around 500 of its SS-9 intercontinental missiles, with multiple warheads of certain powers and accuracies, and that it fires these missiles to destroy the American Minuteman missile force. If Safeguard is not built to defend Minuteman, how many Minutemen would survive to be used in retaliation?

No one knows whether this hypothetical question in fact describes the situation that will exist in 1975; each of the many assumptions could be wrong. Even if the assumptions prove true, the question is by no means the only issue in the ABM debate. Others include whether Safeguard would succeed in defending Minuteman and indeed, given our submarines, whether Minuteman is needed at all. But the survival issue is one question science ought to be able to answer. At least, as the ORSA report notes, different scientists ought to be able to trace their different answers to different assumptions, and the debate can then center on the assumptions.

This did not prove possible in 1969. Albert J. Wohlstetter, a prestigious Pentagon consultant from the University of Chicago, calcualted that 5% of the Minutemen would survive, probably not enough retaliatory power to be a credible deterrent. George W. Rathjens Jr., an MIT professor and former high disarmament official, calcualted 25%. In an extended exchange of testimony and several increasingly acrimonious letters to The New York Times, they failed to reach agreement on the reasons for this difference. Meanwhile, Ralph E. Lapp, an analyst frequently published in The New York Times Magazine, contended that 75% of Minutemen would survive.

Mr. Wohlstetter Vindicated

The long and the short of the ORSA report is that Mr. Wohlstetter was right. He not only provided accurate calculations based on realistic assumptions, but he correctly identified Mr. Rathjens' mistakes and Mr. Lapp's absurdities. The committee did fault some presentation of some pro-ABM spokesmen, but its chief thrust is to criticize the opposition scientists, including someone no less prestigious than Jerome B. Wiesner, currently president of the Massachusetts Institute of Technology. On the survival issue, it says, the opponents' analyses were "often inappropriate, misleading or factually in error."

The problem is, though, in what context do you evaluate the report? There is a personal context. Mr. Wohlstetter suggested the study, arguing that one purpose of ORSA is to develop professional standards. Mr. Rathjens, Mr. Wiesner and the other ABM opponents, who are not members of ORSA, refused to cooperate. To make matters worse, one member of the ad hoc committee had previously been involved in a personal and professional dispute with Mr. Rathjens.

The ad hoc committee was unanimous in its report, though it included both supporters of the ABM and those who opposed it because of other issues. Five members of ORSA's 13-member governing board opposed release and publication of the report, however, on grounds that the society should not involve itself in personal disputes.

There is also most definitely a political context, a point powerfully made in a 30-page reply that Mr. Rathjens, Mr. Wiesner and their colleague Steven Weinberg released to inquiring members of the press. They accuse the report of dwelling on the survival issue "to a disproportionate degree," of "avoiding some of the major issues which were embarrassing to the administration."

They do not regard the survival issue as particularly important in the overall debate; indeed, Mr. Rathjens has always conceded that the Soviets could build a force large enough to destroy Minuteman if they were determined to do so. The bulk of their reply points out issues they regard as more central, noting for example that the Soviets are

(Reprinted with permission of The Wall Street Journal)

still not far along toward the missile accuracies necessary to destroy Minuteman.

While by no means conceding all of the report's criticisms on the survival issue itself, they do say, "We do not claim infallibility. We made mistakes, but we believe not serious ones: Such errors as we made were a reflection of the fact that, with limited time and resources, we devoted our efforts to the issues of fundamental concern." They regard the ORSA report, and Mr. Wohlstetter's instigation of it, as an attempt to discredit the whole anti-ABM case by focusing on a peripheral issue.

Perhaps this political context is the only one in which the episode can be judged, though what comes through in talking to Mr. Wohlstetter is not political commitment to the ABM but enormous professional pride feeling itself under challenge. Alton Frye, who opposed the ABM as a Senate aide and still holds the respect of both sides of the dispute, told a symposium on the report and the ABM debate, "The important thing to know is that the participation of scientists is governed by the rules of politics."

Two Questions

The late Leo Szilard is often quoted on the difference between science and politics: When a scientist makes a statement, the question is, is it true? When a politician makes a statement, the question is, why did he say that? If they have done nothing else, the Safeguard debate and ORSA report show that these questions become almost impossibly mixed when scientists are involved in political debate.

Even so, is there not a valid question whether in this maelstrom of politics and personality there remains some place for science? Ought not someone ask, is it true? When other contexts rear their heads, can the scientific context be totally ignored? Is there not a valid interest – above an interest of scientists – that when something is offered as science it in fact meets the tests of science, that whatever small part of the question can be settled by science at least is settled competently?

These are the questions the authors of the ORSA report wanted to address, and indeed the noted sociologist Edward Shils calls the report "a landmark" in an issue that dates to "the use of astrology and geomancy for the guidance of princes." Mr. Shils, like Mr. Wohlstetter from the University of Chicago, asks what use those who reflect on problems ought to make of their prestige, "What they can contribute when their scientific knowledge runs out," and "whether the scientists should restrain themselves."

The thrust of the ORSA report is that a place for science in public policy can be preserved only if scientists show a good deal more restraint than most of them, particularly the ABM opponents, showed in that debate. To take the simplest thing, the report's guidelines suggest that when scientists testify in Congress they provide detailed written explanations of their calculations, in advance, for scrutiny by committee staffs and opposing experts.

Using Classified Information

It offers equally simple guidelines on classified information: It should be used where appropriate and properly filed to make it accessible to those who might check it. In the ABM debate, detailed statements were not common, and even when the reply to the report is considered, it seems that anti-ABM calculations were based on estimates tediously extrapolated from non-classified sources when both sides had access to more accurate classified information.

More broadly, the ORSA report seeks to distinguish how the adversary process presents traps for scientific analysts to avoid. "The Senator who may want to kill a program on the ground it is fiscally irresponsible may argue against it on ethical grounds if this is the best way to win his point, even though he himself may not have any particular ethical reservations."

Scientists, it suggests, should restrain themselves from such opportunistic argument, though many did not in the ABM debate. Some scientists even argued that an alternative to Safeguard could be found in a "launch on warning" policy – firing the entire Minuteman deterrent on the basis of mere radar warnings that seem to show incoming missiles – though it's difficult to see how any responsible analyst could actually favor such a policy.

Finally, the ORSA report suggests that scientists "avoid ad hominem attacks, either veiled or overt." The record of the ABM debate is a record of one long ad hominem attack on any outside expert who happened to back the Pentagon position. There is the constant suggestion that he is a tool of the "military-industrial complex," that his opinion is nothing more than designed to win more government contracts, that he has sold out. Meanwhile anti-ABM experts are assumed to be pure and devoid of any self-centered motive, though men on both sides of any public debate seek things such as public recognition, advancement in certain circles, vindication of policies they backed when previously in government or simply power over the events in question.

In the MIT scientists' initial letter refusing to cooperate in the ORSA study, there is the sentence: "The role of outside consultants, such as Mr. Wohlstetter, was definitely secondary, but the extent to which they received support from the Department of Defense, and the use of Air Force aircraft to transport them to public debates, should also be examined."

The insinuation about Mr. Wohlstetter and the Air Force planes happens to be false; but what if it were true? Would that change his mathematics? Such a charge has nothing to

(Continued on page 13)

COMMENTARY

In reference to Dr. Leonard B. Greentree's comments on stockpiling of drugs [see COMMENTARY in September-October 1971 issue] I would like to correct his mistaken views. With the stark horror to be expected in nuclear war doctors as well as other public service personnel would be so overwhelmed that their capability for taking care of sick and injured would disappear completely. There would be nothing but panic. Anyway, how would the injured make it to the hospitals or other treatment areas even if they could get aid there? Most everyone within the target areas would be killed anyway. Surviving doctors and nurses – if any – would be totally immersed in trying to contact and help their own families. There is no use investing millions in medicaments that are not going to be used. Dr. Greentree's idea is certainly humane, but it is entirely impractical.

(Name withheld by request)

(Note: We have been cautioned that the publication of the book excerpt below might be inadvisable because of its gruesome nature. Our opinion is that Survive *readers want pertinent facts whether they are agreeable or not. Our policy is not to dodge them. –Ed.)*

Answer: Casualty patterns of larger nuclear weapons except for size are not expected to be radically different from that of the Hiroshima weapon of 1945. This latter produced a reaction among medical personnel somewhat different from that feared by the above writer and indicates that planning along the lines suggested by Dr. Greentree would be of value. One popular source is the book *Hiroshima**, and we quote from it:

> *". . .Of a hundred and fifty doctors in the city, sixty-five were already dead and most of the rest were wounded. Of 1,780 nurses, 1,654 were dead or too badly hurt to work. In the biggest hospital, that of the Red Cross, only six doctors out of thirty were able to function, and only ten nurses out of more than two hundred. The sole uninjured doctor on the Red Cross Hospital staff was Dr Sasaki. After the explosion, he hurried to a storeroom to fetch bandages. This room, like everything he had seen as he ran through the hospital, was chaotic – bottles of medicine thrown off shelves and broken, salves spattered on the walls, instruments strewn everywhere. He grabbed up some bandages and an unbroken bottle of mercurochrome, hurried back to the chief surgeon, and bandaged his cuts. Then he went out into the corridor and began patching up the wounded patients and the doctors and nurses there. He blundered so without his glasses that he took a pair off the face of a wounded nurse, and although they only approximately compensated for the errors of his vision, they were better than nothing. (He was to depend on them for more than a month.)
>
> "Dr. Sasaki worked without method, taking those who were nearest him first, and he noticed soon that the corridor seemed to be getting more and more crowded. Mixed in with the abrasions and lacerations which most people in the hospital had suffered, he began to find dreadful burns. He realized then that casualties were pouring in from outdoors. There were so many that he began to pass up the lightly wounded; he decided that all he could hope to do was to stop people from bleeding to death. Before long, patients lay and crouched on the floors of the wards and the laboratories and all the other rooms, and in the corridors and on the stairs, and in the front hall, and under the portecochere, and on the stone front steps, and in the driveway and courtyard, and for blocks each way in the streets outside. Wounded people supported maimed people; disfigured families leaned together. Many people were vomiting. A tremendous number of school girls – some of those who had been taken from their classrooms to work outdoors, clearing fire lanes, crept into the hospital. In a city of two hundred and forty-five thousand, nearly a hundred thousand people had been killed or doomed at one blow; a hundred thousand more were hurt. At least ten thousand of the wounded made their way to the best hospital in town, which was altogether unequal to such a trampling, since it had only six hundred beds, and they had all been occupied. The people in the suffocating crowd inside the hospital wept and cried, for Dr. Sasaki to hear, '*Sensei!* Doctor!.' and the less seriously wounded came and pulled at his sleeve and begged him to go to the aid of the worse wounded. Tugged here and there in his stockinged feet, bewildered by the numbers, staggered by so much raw flesh, Dr. Sasaki lost all sense of profession and stopped

working as a skilled surgeon and a sympathetic man; he became an automaton, mechanically wiping, daubing, winding, wiping, daubing, winding.

"By nightfall, ten thousand victims of the explosion had invaded the Red Cross Hospital, and Dr. Sasaki, worn out, was moving aimlessly and dully up and down the stinking corridors with wads of bandages and bottles of mercurochrome, still wearing the glasses he had taken from the wounded nurse, binding up the worst cuts as he came to them. Other doctors were putting compresses of saline solution on the worst burns. That was all they could do. After dark, they worked by the light of the city's fires and by candles the ten remaining nurses held for them. Dr. Sasaki had not looked outside the hospital all day; the scene inside was so terrible and so compelling that it had not occurred to him to ask any questions about what had happened beyond the windows and doors. Ceilings and partitions had fallen; plaster, dust, blood, and vomit were everywhere. Patients were dying by the hundreds, but there was nobody to carry away the corpses. Some of the hospital staff distributed biscuits and rice balls, but the charnel-house smell was so strong that few were hungry. By three o'clock the next morning, after nineteen straight hours of his gruesome work, Dr. Sasaki was incapable of dressing another wound. He and some other survivors of the hospital staff got straw mats and went outdoors – thousands of patients and hundreds of dead were in the yard and on the driveway – and hurried around behind the hospital and lay down in hiding to snatch some sleep. But within an hour wounded people had found them; a complaining circle formed around them: 'Doctors! Help us! How can you sleep?' Dr. Sasaki got up again and went back to work."

*From HIROSHIMA, by John Hersey. Copyright 1946 by John Hersey. Originally appeared in *The New Yorker.* Reprinted by permission of Alfred A. Knopf. Inc.

Your "Day of Lethargy" comment brings back a lot of memories, for I was stationed at Wheeler Field on December 7. I disagree with one of your basic assumptions, however, regarding an "alert of the military in Hawaii to suspicious circumstances during the weeks which preceded the attack."

We were on alert – all out, full battle stations alert – for the week preceding the attack. It was called off at noon, Saturday, December 6.

It was not simply a question of being caught unprepared, it was a question of completely dropping our defenses. In view of your comment regarding the fact we had broken their code, which has been amply corroborated, it would seem this was done deliberately.

Henry C. Woodrum – Redding, California

Civil Defense Abroad

Israel, along with the shaping up of its armed forces, has created a civil defense organization geared to function at peak efficiency. Armed forces reservists between the ages of 45 and 55 and women up to age 35 must serve in Israelian civil defense – called HAGA. In crisis situations this duty to serve can be extended for males to 62 years and for females to 50 years of age. Members of HAGA are annually called up for 14 days training. This includes coordinated exercises. In addition, they may be called to duty for periods required to accomplish special tasks.

HAGA reservists serve within a public commission commanded by the civil defense chief, who has the rank of colonel. Local commanders and commissions are responsible in the various districts and towns.

Reservists within their districts belong to several special units, such as medical groups, evacuation troops, and collection outfits for picking up wounded after air attacks. Like the armed forces, civil defense units can be completely activated within hours.

Among other duties the members of HAGA are responsible for the routine inspection of air-raid bunkers in factories, schools and residences. This is done to guarantee that all are kept fully equipped and that technical equipment is fully operational.

In Israel civil defense is also responsible for contending with terrorist activities, and members of HAGA have police functions defined by a 1969 law. If necessary they have the right to arrest and frisk suspicious persons. They are further detailed to keep public areas and institutions under surveillance to prevent the positioning of bomb materials.

(Translation from West Germany *Zivilverteidigung,* September 1971 by Dr. Werner M. Lauter.)

Robert T. Olsen's letter in the November-December issue of *Survive* indicates more confidence in "honest discussion" as a means of civil defense than many of us can muster.

The idea that words may constitute an effective defense system is more common among wordsmiths than one might imagine. It is, however, irreconcilable with the facts. For example, the historian, Jacques Novicow calculated about 1860 that, since 1500 B.C., about 8,000 treaties of peace have been negotiated each of which was supposed to remain in force as long as the contracting nations endured. What actually occurred was that the treaties were honored for two years on the average. Beilenson's recent (1969) book, *The Treaty Trap,* is, perhaps, even less encouraging.

I suspect that most of us feel safer behind concrete than we do behind parchment however elegant the words thereon.

Bruce A. Rogers – Tempe, Arizona

SPOTLIGHT

CANADA OUTLINES NUCLEAR ATTACK "RISK AREAS"

With the completion of a new shelter survey update Canadians are given an idea of what they can expect in their respective communities in the event of nuclear attack. Canada's Emergency Measures Organization has divided the Canadian population into four "risk areas" depending on the geographical relationships to likely targets. These are:

Risk Area Category	Expected Weapons Effects	Population Involved
Direct	Blast, thermal, radiation (target areas)	9,592,000
High Risk	Radiation: over 5,400 roentgens (14 days)	4,518,000
Medium Risk	Radiation: 820–5,400 roentgens	2,327,000
Low Risk	Radiation: less than 820 roentgens	4,774,000

For Canada's 21,000,000 inhabitants there are 21,000,000 shelter spaces with a protection factor (PF) of 50 or more. However, more than 15 million of these spaces are located within target areas, leaving about 6 million PF 50 spaces for the 11½ million people "surviving direct effects." In the "high risk" category PF 50 would in some cases not be adequate.

On the plus side, about 70% of the PF 50 spaces are really PF 100 or more. Also, shelters of less than PF 50 will have a life saving potential in "medium risk" and "low risk" areas. Shelters down to a PF of 10 have been surveyed, and although these would be presumably of little value near target areas they would save lives in much of the "medium risk" areas and in all of the "low risk" areas. Counting these shelters, total spaces for Canada uncovered by the survey come to over 53 million.

(Note the similarity of John A. Samuel's approach in his article "Fallout: How Far? How Fast? How Much?" on page 8 of this issue.)

Excerpt from the *Washington Report* ("Lemming Strategy"), November 5, 1971:

As for those Senators whose recent avocation has been to undermine U.S. defenses, they now have it on the authority of the Committee on Professional Standards of the Operations Research Society of America that much of the so-called expert testimony on the cost-effectiveness of certain weapons upon which they relied so heavily was "often inappropriate, misleading or factually in error."...

The Senate is basically at fault that Americans are behaving like lemmings on their rush to drown themselves in the sea. And low profile leadership will not suffice to break the trend toward national suicide, whether in the Senate or elsewhere. The time is overdue when the President must resolutely silence the anti-defense clique with the overpowering arguments which are at his disposal.

Hawaii's Civil Defense Extension Program posted a student enrollment rate of 142.2 per 100,000 population for the first nine months of 1971. This compares with a national rate of 14.4 and gives Hawaii first place in the nation.

1971 SURVIVE PREPAREDNESS AWARDS

Eight regional awards, one to a local civil defense organization in each of the eight civil defense regions... One national award.

Entries and nominations may come from any county, city, state, and regional civil defense directors or from any other authoritative source. Organizations are encouraged to submit their own nominations...

Entries for the calendar year 1971 must reach SURVIVE not later than January 20, 1972. Selections will be announced in the March-April 1972 issue of SURVIVE and will be presented at appropriate occasions as soon after announcement as practical...

SURVIVE PREPAREDNESS AWARD ENTRY/NOMINATION FORM

(Suggested only; any format acceptable) Date:_____

Organization _____

Address_____ City_____

State_____ Zip Code _____

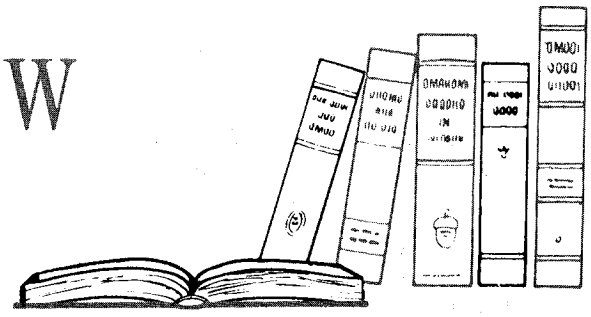
This entry/nomination is submitted for the following general reason(s) (please limit to 100 words or less): _____

Specific information in support of nomination is appended hereto as attachments as follows (examples of specific information categories are shelter, organization for disaster, staff operations, training, warning, local government support, rescue capabilities, functional planning, etc.—attachments may include pictures, charts, clippings, letters, etc.—they sould be as brief as full coverage will allow):

A. C. E.
B. D. etc.

Please give name, organization and address of party making nomination, if different from nominee. Thank You.

REVIEW



The Effects of Fallout Shelter Legislation In Arizona, prepared for the Office of Civil Defense by the State of Arizona Division of Emergency Services, under the direction of Carl N. Smith, Director. 118 pages. (Distribution limited to national and regional headquarters of the Office of Civil Defense and State Civil Defense agancies.)

Carl Smith doesn't take "no" for an answer. Not easily anyway.

In 1965 he became Director of Civil Defense and Emergency Planning for the State of Arizona.

In 1966 he introduced Arizona's first shelter bill to the Arizona Legislature. It died.

In 1967 he introduced another state shelter bill. Same fate.

In 1968 he made a third attempt. His bill passed the House but was voted down by the Senate.

In 1969 he tried once more. This time he succeeded with landslide votes for the bill in both chambers.

Now Carl Smith has an Arizona "progress report" to make. Not exactly the kind he would like to make. But it is an honest one and one which proves that dedication, drive, and two-fisted tenacity are still qualities that pay off in results. And it has all the earmarks of an interim report. Carl Smith is still plugging.

It should be stated too that, with all its admitted faults, the mandatory Arizona shelter legislation is apparently the most effective to date. During the period January 1, 1970 through May 31, 1971 122 public building projects came under the purview of the new shelter law. Of these, due to waivers for one reason or another, 44 will actually be built with shelter and are expected to produce 46,891 spaces. It is estimated – conservatively – that public buildings will provide 287,000 spaces by 1985. Although this is only 35% of the anticipated population increase it is certainly a substantial start.

Opposition by architects has put additional obstacles in Smith's rough road. Some have viewed the shelter legislation as an infringement "upon the architect's freedom of expression" and an outcome of "the highly immoral ambitions of warmongers."

On June 7, 1969, two months after passage of the shelter bill, the Arizona Society of Architects adopted this resolution:

> "The Arizona Society of Architects' Board of Directors goes on record as being strongly opposed to the fallout shelter law because of the potential greatly increased cost of the design and construction of many public buildings; and [has] serious doubts of the value and philosophy of the program whether ever needed for fallout protection or not. The law also sets an undesirable precedent of public determination of design and environmental values."

In the report by the Southern Arizona Chapter of the American Institute of Architects an attempt is made to discredit Smith's efforts that reads more like a wierdly negative appeal for a better civil defense program. It substantiates the fact that shelter can be designed into quality construction *without* extra cost–usually without intent. It also implies clearly that blast protection is needed for Arizona cities. It recommends repeal of the shelter law. Smith points out, however, that relatively few architects have been responsible for the opposition and that difficulties along this line are now being ironed out.

The report frankly lists other adverse factors, including the luke-warm approach of federal agencies in considering shelter for their construction projects.

Two vitally important points emerge from the study:

(1) Arizona has made a breakthrough with mandatory shelter legislation that has produced shelter in 44 Arizona public construction projects in the past two years; and

(2) Arizona recognizes the breakthrough as a *beginning only.*

Says Smith:

"The primary conclusion that can be derived from this study is the fact that the law *is* effective in producing significant amounts of shelter space in new public building construction. Most of the shelter that has been and will be created by the shelter law will be in areas where a definite need for shelter exists and, therefore, it is a valuable tool in the continuing effort to alleviate the shelter deficits within the state."

Carl Smith has changed lip-service shelter legislation into a shelter law with teeth in it. The teeth need a good bit of adjusting, but we think they'll get it.

At least in Arizona. ■

American doctors, according to the *Journal of the American Medical Association,* have almost doubled medical diagnostic radiation since 1964. Evidence shows that this increase accounts for 3,000 to 30,000 deaths annually. The average "annual genetically significant dose from medical sources" is "10,000-fold greater" than radiation exposure of persons living near atomic power reactors.

The usual answer to the question "What kind of a fallout radiation dose can my (non-target area) community expect in the event of nuclear attack?" is evasive. One is apt to be advised of the complexity of variables, the impossibility of predicting exactly where nuclear weapons will fall, and the futility of searching for helpful information. Professor Samuel brushes this negativism aside. Here he puts together a set of reasonably severe assumptions and gives reasonable estimates of the maximum fallout doses communities may expect depending on their distances from targets.

How Far? How Fast? How Much?

- by John A. Samuel

The current policy of the Office of Civil Defense requires that standard public fallout shelters provide a minimum radiation protection factor of 40 (PF 40). This policy is supported by Department of Defense studies of the effects on the United States of a large variety of hypothetical nuclear attacks. These studies show that, with such protection, more than 90 percent of the people who survive the direct effects of the attack and who would otherwise die from the effects of fallout radiation, could survive.

A protection factor (PF) is a measure of how much a structure protects occupants against fallout radiation. In a shelter with PF 40 the occupants would be exposed to 1/40th the radiation to which they would be exposed if unprotected in the same location. The PF does not measure the *amount* of radiation to which they would be exposed, since this would depend on the radiation levels outside. It also does not indicate how much radiation a person could receive and still survive.

There is very little information available on the effects on humans of large acute doses of radiation. The length of time involved for an acute dose is not specified although it is often taken as 24 hours. For purposes of this discussion, however, it is taken as four days or 96 hours since it is usually assumed that recovery from radiation damage begins about four days after exposure.

It is generally assumed that the average person could receive an acute, whole body dose of up to 100 roentgens without disabling sickness. There would be changes in the blood, but the individual would probably be able to carry on his usual activities.

Whole body radiation doses between 100 and 200 roentgens could result in a certain amount of sickness, but would rarely be fatal. The illness may be little more than discomfort and fatigue, but there could be some nausea and vomiting. Persons so exposed should recover in several weeks.

For doses over 200 roentgens the probability of survival decreases with increasing exposure. It is generally assumed that 50 percent of the population exposed to an acute dose of 450 roentgens would die. The remainder would be ill and might require several months to recover. At exposures over 600 roentgens it may be assumed that there would be few, if any, survivors.

The effect of nuclear radiation on the human body depends not only on the total dose but also on the rate at which it is received and the extent of the body exposed. The above exposure levels refer to acute, whole body doses. The same total doses extending over a longer period of time would not produce such severe effects.

The question now arises as to what is meant by the term "survival." If it means that nobody will get sick and everyone can carry on normal activities the maximum allowable dose would be taken as about 100 roentgens in four days. If some sickness but no deaths are to be allowed the limit would be about 200 roentgens in four days. It is also possible to set the limit at about 300 roentgens, for example, and assume that there would be some deaths but that more people would live than would die.

Professor John A. Samuel

On this basis the studies of hypothetical attacks indicate, for people with PF 40, 93 percent would receive less than 200 roentgens and 98 percent would receive less than 450 roentgens, obviously some would die. Thus it is calculated that PF 40 shelters would save the lives of 97 percent of those who survived the initial effects of the nuclear weapons.

The Office of Civil Defense has the responsibility of establishing minimum criteria which apply to the entire United States. These criteria must strike a reasonable balance between practicality and idealism. PF 100 shelters would save the lives of about two percent more people than PF 40 shelters, but the cost of providing PF 100 is considerably greater than the cost for PF 40. Thus the PF 40 minimum requirement is more reasonable on a cost-effectiveness basis. Actually, of course, there are many, many shelters with PFs much greater than 40. In fact it is estimated that the median is about PF 150 for shelters available in existing buildings; that is, as many shelter spaces have a PF of greater than 150 as have a PF of less than 150.

The statistical probability studies serve reasonably well to establish nationwide criteria. However, the statistics do not apply to one specific shelter or one specific locality. Here it cannot be assumed that 97 percent of the people in PF 40 shelters will not die. If the radiation level outside is too high all the people in a specific area may die if they have only PF 40 shelters.

Thus a civil defense director for a given political subdivision may be more concerned with what level of protection is required in "his community" than what is determined to be a reasonable criterion on a national basis. Before he can make this determination he must have some basis for establishing an expected radiation level at his location. If this can be done it becomes relatively simple to determine what minimum protection factor will be necessary to assure survival.

There are many factors involved in determining what level of radiation may occur at a given locality, most of which cannot be predicted prior to an actual attack. These include such obvious factors as the point of detonation, height of burst, and the fission yield of the weapon. They also include the direction and velocity of winds at all levels up to about 80,000 feet, the size, location, and severity of any rainstorms or snowstorms which would tend to wash fallout out of the air, the presence of downdrafts or updrafts in the atmosphere which would affect the distribution of fallout and the possibility of multiple bursts which would produce overlapping fallout patterns.

It is possible, however, to assume a given set of conditions and make an estimate of the radiation levels to be expected under these conditions. Figure 1 [next page] shows the total dose of fallout gamma radiation for a given set of assumed conditions. These conditions are a surface burst of a weapon with a fission yield of one megaton, and an average effective wind speed of 15 mph. The deposited amount of fallout material and associated radiation intensity are based on a mathematical model developed at the U.S. Naval Radiological Defense Laboratory. Radiation levels are calculated for the downwind centerline of the fallout pattern.

Examination of Figure 1 indicates that the maximum four-day dose for an unprotected person would occur at about 30 miles downwind and would be about 6,000 roentgens. If a person were in a shelter with a protection factor of 40 at this time and location his total dose would be about 150 roentgens. He might become slightly ill but almost certainly would survive.

At distances greater than 30 miles downwind the total dose to be expected would be less than the 6,000 roentgens, and persons in PF 40 shelters would be expected to survive. In fact at about 115 miles downwind the total dose in four days is less than 200 roentgens and most persons could survive even without shelter.

Thus it may be assumed that PF 40 shelters would be adequate to assure survival of the fallout from a single one megaton weapon. But what if it should be a larger weapon?

Figure 2 shows a plot of expected total radiation doses on the downwind centerline of the fallout pattern from a five megaton fission yield surface burst.

For the five megaton weapon the maximum four day dose occurs about 45 miles downwind and is about 12,500 roentgens. Persons in PF 40 shelters would receive a dose of

over 300 roentgens in four days and some deaths would be expected. Those who did not die would be sick and require several months to recover.

At about 60 miles downwind the total unprotected dose would be about 8,000 roentgens in four days, and persons in PF 40 shelters would be exposed to about 200 roentgens. Most of them should survive. Thus it might be assumed that PF 40 shelters would be adequate at distances greater than 60 miles from a five megaton fission yield burst, under the conditions assumed.

It should be noted that Figures 1 and 2 are based on one megaton and five megatons of fission yield. Nuclear weapons in the megaton range may be expected to be fusion type devices. The products of the fusion reaction are not radioactive. Such weapons, however, have a fission "trigger" to initiate the fusion reaction, and this does produce radioactive debris. Thus only part of the yield of a megaton weapon would be fission yield. In order to have five megatons of fission yield the total yield would probably be ten megatons or more.

Figures 1 and 2 were plotted for an average effective wind of 15 mph. A question naturally arises as to what the effect would be if the wind speed were something different. If the effective wind were less than 15 mph the fallout particles would not be carried as far from the point of detonation before reaching the ground. The effect would be to concentrate the fallout in a smaller area and it would be expected that radiation doses would be greater in this area. Areas at a greater distance would receive less fallout and consequently less radiation exposure.

On the other hand, if wind speeds were greater than 15 mph the fallout would travel farther before reaching the ground and be more widely dispersed. Close in areas would probably have radiation exposures less than indicated in the figures while more distant areas would have greater exposures and the fallout effects would extend to greater distances. For example, an area 75 miles downwind would receive fallout about five hours after detonation if the effective wind is 15 mph. In this time radioactive decay would have reduced the radioactivity by about 85 1/2 percent. If, however, the wind speed were 30 mph the fallout would arrive in about 2 1/2 hours and would have decayed by only about 66 2/3 percent. Also, the particles deposited would be larger, carrying with them a higher initial level of radioactivity.

The data in Tables 1 and 2 have been approximated from the curves in Figures 1 and 2 to show the effectiveness of shelters with various protection factors. Although PF 40 is required for licensing as a public fallout shelter it is interesting to note that shelters with a protection factor as low as 10 can have a very significant life-saving potential. At a point 75 miles from a one megaton burst, for example, the four day dose would be about 850 roentgens. Persons without shelter would almost surely die. A shelter with only PF 10 would reduce this dose to about 85 roentgens which most people would survive with no noticeable effects. Even

FIGURE 1 – 1 MEGATON FISSION YIELD

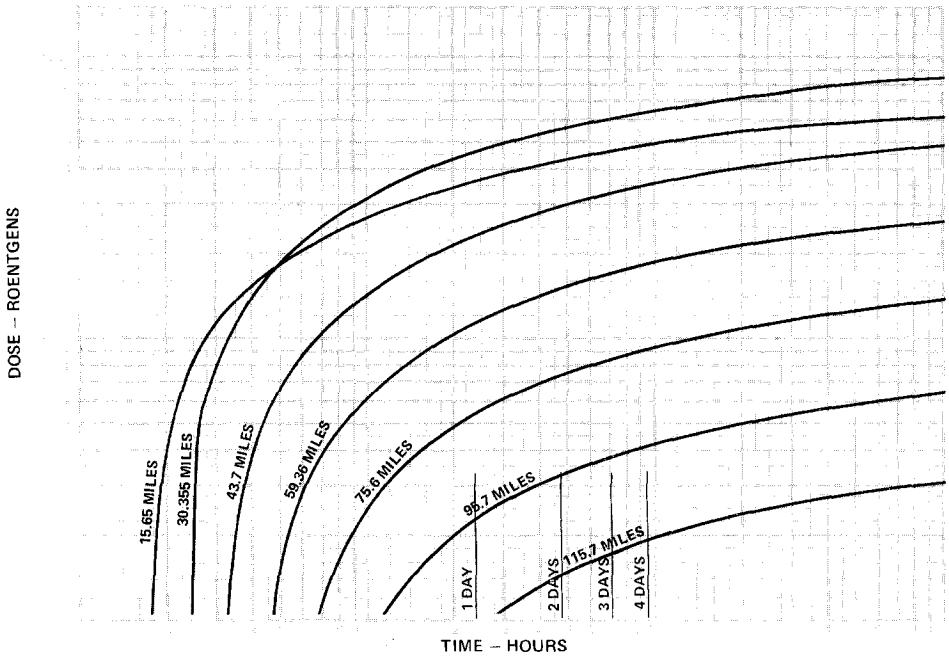


TABLE 1 – DOWNWIND FALLOUT RADIATION DOSE
1 MT FISSION YIELD SURFACE BURST
15 MPH EFFECTIVE WIND

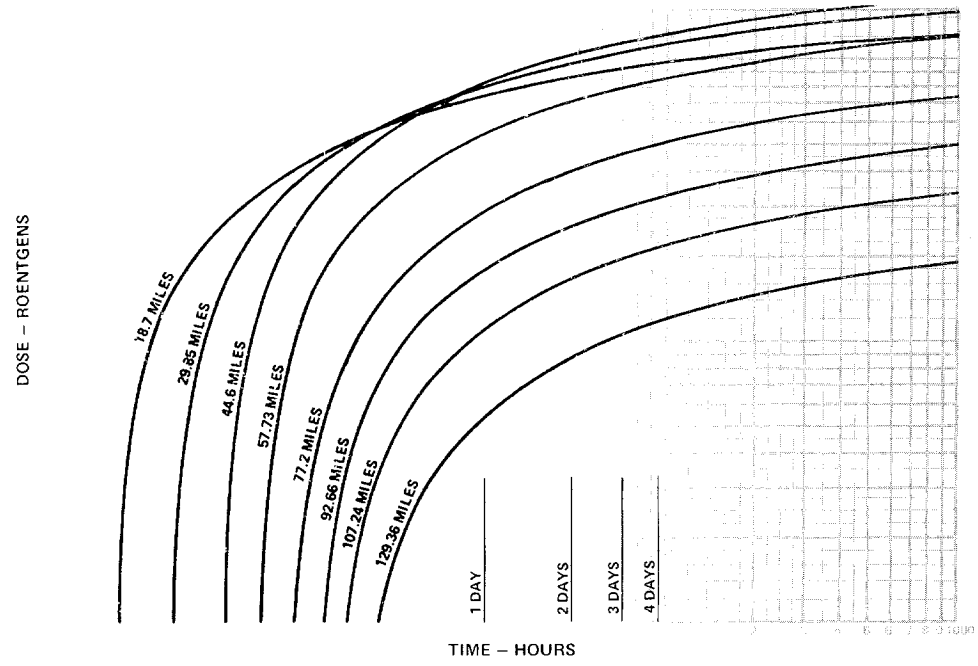
Distance from Ground Zero (Miles)	4 DAY DOSE – ROENTGENS					
	No Shelter	PF 10	PF 20	PF 40	PF 100	PF 150
15	4500	450	225	112½	45	30
30	5800	580	290	145	58	38¾
45	3400	340	170	85	34	22¾
60	2750	275	137½	68¾	27½	18¼
75	850	85	42½	21¼	8½	5¾
90	500	50	25	12½	5	3¼
105	225	22½	11¼	5½	2¼	1½
115	200	20	10	5	2	1¼
130	125	12½	6¼	3¼	1¼	¾

at 15 miles from a one megaton burst about half the people in PF 10 shelters might survive, although they would probably be sick and take a long time to recover.

This is not intended to advocate the use of PF 10 shelters. They should certainly be used if nothing better is available but every effort should be made to provide shelters which offer greater protection. The emphasis here has been on what is necessary for survival but certainly it would be desirable to offer the people of the United States something better than bare survival. Those who emerge from shelters after a nuclear attack will face the staggering task of rebuilding the country. They cannot be expected to do this if thousands or millions are still incapacitated or debilitated from radiation sickness.

This discussion, and civil defense policy, is based on survival of the immediate effects of radiation. No consideration has been given to the possible long-term or genetic effects. There has been much discussion and conjecture about these effects but little reliable information is available. However, it seems reasonable to proceed on the assumption that the long-term effects of radiation exposure could be significant and, therefore, such exposure should be reduced to a minimum.

FIGURE 2 – 5 MEGATON FISSION YIELD



The data for Figures 1 and 2 are calculated from a mathematical model for certain assumed conditions. It is unreasonable to expect conditions at the time of an actual nuclear detonation to conform to the assumptions made. Fallout patterns from weapons tests certainly have not occured exactly as predicted by mathematical calculation. Therefore it could be expected that conditions at any given point relative to a nuclear detonation might be either better or worse than indicated in Fig. ures 1 and 2, but it would be unlikely that they would be exactly as indicated. However, the figures give some indication of the general range of what might be expected and may be useful as general guidelines for planning purposes.

TABLE 2 – DOWNWIND FALLOUT RADIATION DOSE
5 MT FISSION YIELD SURFACE BURST
15 MPH EFFECTIVE WIND

Distance from Ground Zero (Miles)	4 DAY DOSE – ROENTGENS					
	No Shelter	PF 10	PF 20	PF 40	PF 100	PF 150
18	10600	1060	530	265	106	70¾
30	11000	1100	550	275	110	73¼
45	12000	1200	600	300	120	80
60	8000	800	400	200	80	53¼
75	5500	550	275	137½	55	36¾
90	3500	350	175	87½	35	23¼
105	2400	240	120	60	24	16
130	1200	120	60	30	12	8
145	750	75	37½	18¾	7½	5
175	350	35	17½	8¾	3½	2¼

The calculations tend to indicate that the PF 40 criterion may be quite reasonable under present conditions of civil defense financial support and where survival of the immediate effects of fallout radiation is the basic consideration. However, the calculations also indicate that people in PF 40 shelters could be exposed to radiation doses which are much too great in terms of maintaining physical capability to cope with the post-shelter problems and in terms of long-term and genetic effects.

It may be concluded that it would be highly desirable to design and construct shelter facilities which would provide the highest degree of radiation protection consistent with available construction funds.

This is, of course, exactly the intent and objective of the present shelter development program. The problem in attaining that objective is the lack of construction funds to build shelters with a sufficiently high level of protection in areas where they are needed. ■

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When Science Tangles With Politics

(Continued from page 3.)

do with the scientific question, it is true? It has everything to do, and in a rather ugly way, with the political question, why did he say it?

There is of course no law saying that a scientist can't be as political as the next man. But there is a question how long the prestige of science can be maintained if scientists see their role in public policy as little or no different from the politicians. If scientists do not scrupulously guard a certain minimum of detachment and self-restraint, what do they have to offer that the next man does not? If all questions are political, why not leave them all to the politicians? ■

FROM THE CONGRESSIONAL RECORD FOR NOVEMBER 17, 1971:

Hon. Bob Wilson of California. . . Mr. Speaker, I read with particular interest an article in the November-December 1971 issue of *Survive,* entitled "Civil Defense and Deterrence" by Richard C. Rasmussen. Mr. Rasmussen reviews the present maze of conflicting opinions relative to the building and maintenance of a strong civil defense program. The ability of this or any nation to build a strong and viable nonmilitary defense against attack is a crucial deterrent against aggression. In this uneasy world, we must maintain not only our watchfulness, but our military and civilian defense preparedness as well. I commend Mr. Rasmussen's comments to my colleagues' careful attention. . .

(The Rasmussen article appears in its entirety as a part of Congressman Wilson's remarks.)

Q & A CORNER

Q In answer to a question you said 65% to 75% of our people would die in a heavy nuclear attack with our present state of preparedness. What about Russia? What percentage of their population would die under the same kind of attack?

A Accoding to the recent Soviet civil defense manual: 5% to 8%.

Q At a recent meeting of our officials, one of them questioned the validity of our shelter program. He indicated that the population was saved from fallout radiation at Hiroshima by jumping in the river rather than taking shelter in buildings. Is there any truth to this?

A No. It has the ring of many myths that honest people are led to embrace because they would like to avoid grappling with the facts of good civil defense. The Hiroshima weapon produced no significant fallout because it was an air burst. So there were no fallout casualties. There were, however, casualties from "initial radiation" – radiation direct from the burst itself and not from fallout. Many victims did use the river, but not for the reason cited by your official.

Q What facts is the National Fallout Shelter program based on?

A On the fact that nuclear weapons bursts at or near ground level produce widespread fallout and a contamination of the environment by radiation – also on the fact that many facilities (buildings, caves, etc.) possess enough mass to afford significant protection from the radiation given off by the fallout. For a deeper look into this question see pages 8 to 11 of this issue.

Q Why is evacuation frowned on by OCD? Don't other countries use it? Please explain.

A Evacuation has been discouraged mainly because it requires considerably more time than we would have in a last-minute warning of missile attack and because it usually leads *away* from shelter. However, a number of American communities have begun to have second thoughts on this policy for very good reasons (the inadequacy of urban *fallout* shelter in a *blast* environment, the creation of population targets through the massing of people in central shelters, available time of dispersal during crisis developments, etc.). *Counter*-evacuation was discussed by Eugene P. Wigner at the annual Oak Ridge Civil Defense Project meeting last April. And OCD announced in July that it was "re-examining the concept of evacuation of cities during a period of intense international crisis." As for other countries, some plan on using evacuation, some do not. Carsten M. Haaland (Oak Ridge National Laboratory) points out that while a totalitarian government can probably accomplish evacuation at will, in a free country it would have pretty tight limitations. The technique of "crying wolf" could make evacuation a complete nuisance to Americans in short order. Combine this with the thought that the country which plans a first strike can also plan its evacuation in advance. It was to counter the advantage of such an advance evacuation that the concept of counter-evacuation was put forward. If we look upon our urban populations as hostages – as some appear to be willing to do – the solution is simple: we do nothing. If we are not willing to accept this hostage concept we have a real problem that needs a real airing.

NEXT IN SURVIVE:

Congressman Floyd Spence (S. C.), member of the House Armed Services Committee and chairman of the Special Committee on Defense Priorities writes on "Soviet Arms Build-Up and the Policy of 'Assured Destruction'."

***Survive* focuses on the early Florida presidential primary with a timely probe of candidates' home defense postures.**

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