

F. A. S. NEWSLETTER

Volume 14, No. 10

December 1961

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HEW REPORTS ON I 131

On Nov. 24, the Department of Health, Education, and Welfare issued a statement that radioactive iodine 131 levels in air, water, milk and other foods were not high enough anywhere in the country to justify general use of non-radioactive compounds to block the uptake of radioactive iodine by the thyroid gland.

The statement was issued in the form of an interim report to State and Territorial health departments and to National medical organizations, pending completion of special studies of various counter measures which might be taken if fallout levels were to reach a point where individual or public action to reduce exposure would need to be considered.

Iodine 131, like non-radioactive iodine, tends to be taken up by the thyroid. In very large amounts it could interfere with normal functioning, or cause cancer in that organ.

The interim report points out that considerable attention has been given the suggestion that physicians should prescribe non-radioactive iodine to block thyroid uptake of iodine 131 particularly by infants, children and pregnant women.

The report emphasized that nationwide daily surveillance reports to the Public Health Service enable State, county and city Governments to be alerted in ample time if radioactivity levels should be reached which would warrant institution of protective measures.

The use of non-radioactive iodine compounds as one of several counter measures was suggested at a recent meeting of State and territorial health officers with the Public Health Service. The suggestion has been submitted to the National Advisory Committee on Radiation, Public Health Service, for evaluation.

The interim recommendation against the general use of iodine compounds as a counter measure pending completion of current studies, is based on the advice of a number of medical and scientific authorities. They were consulted by the Public Health Service, Children's Bureau and the Food and Drug Administration as an interim step.

FIRST PEACEFUL ATOMIC EXPLOSION SET OFF

The United States has detonated the first nuclear bomb designed to explore the peaceful potentials of atomic explosives. The nuclear explosion, known as Project Gnome, involved the detonation on December 10 of a 5-kiloton nuclear device in the Salado formation of New Mexico about 25 miles southeast of Carlsbad. The device was exploded about 1200 feet underground at the end of a hooked and self-sealing tunnel. The explosion unexpectedly released a small light cloud of radioactive steam into the air but hours later the AEC said no radioactivity was detected in any communities near the test site. The bomb rocked an observation site 4½ miles away and the shock waves were heard on seismic instruments in Washington, D. C. Officials and newsmen from 10 foreign nations (no Iron Curtain countries) were among the crowd of observers who watched the first experiment to harness an atomic explosion for peaceful uses. (W. Post, 12/11). Preliminary estimates indicated that the experiment had been reasonably effective in obtaining the desired scientific information.

Project Gnome was the first in the Plowshare Program initiated under the Eisenhower Administration in 1957. According to the AEC, the experiment had these four objectives:

"1. Explore the feasibility of converting the energy from the nuclear explosive into heat for the production of electric energy.

"2. Investigate the practicability of recovering useful radioisotopes for scientific and industrial applications.

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STATEMENT BY THE FEDERATION OF AMERICAN SCIENTISTS ON CIVIL DEFENSE SHELTERS

[The primary business of the FAS Council, at its meeting in Chicago at Thanksgiving was discussion of FAS position, if any, on Civil Defense Fallout Shelters. The statement which emerged from that meeting, and which was approved by the Council, is set forth in full below.]

Oversimplifications in the public press recently have tended to produce the misleading impression that the individual can by his own efforts insure his survival in the event of any nuclear war. This impression is as wrong as the perhaps equally widespread view that there is nothing that anyone can do to improve his chances of survival if war comes.

The Federation of American Scientists considers the shelter issue unusually difficult as it involves measures and estimates that are without precedent, making predictions highly uncertain. Shelter planning involves many technical considerations not easily conveyed to the public, many of which depend in some degree on information that is unavailable—either because the information has not been released, or because it is not known in the United States, or because it depends on decisions not yet made, or because the effects involved are in fact imponderable. The fact that civil defense planning bears intimately on the individual citizen's everyday life, to a degree not true of other security measures, has engendered higher emotional content in the discussion.

The truth about fallout shelter programs is both simple and complex. It is clear that a properly designed fallout shelter program can save at least some people and, in home situations, most people. It is also clear that few, if any, people can become "safe" by building a fallout shelter.

Beyond these simple truths, both of which must be recognized in any responsible discussion of a fallout shelter program, the truth becomes more complex and more difficult to determine.

For example, claims of over 90% survival would be reasonable for one particular kind of possible enemy attack; namely, an attack at present Soviet force levels which concentrated only on our counter-attack bases. In this event, there would be little direct threat to most of our population, and fallout shelters could be effective in those downwind population centers where lethal concentrations of radioactive fallout would occur. On the other hand, an attack pattern which included the bombing of our centers of industrial strength and of population might well take the lives of half our total population. Fallout shelters would provide little or no protection to those in the area of blast and firestorm damage—an area hundreds of square miles in the case of a 20-megaton bomb. In this case, fallout shelters might still save the lives of some tens of millions of people in the surrounding areas of heavy fallout. However, the problems of survival of these people after they emerged from their shelters and of reconstructing a social order would be enormous. It is not possible to predict what attack pattern would be selected initially by the Soviet Union in the event of nuclear war nor what pattern might develop as the war progressed.

Furthermore, it is particularly complex and difficult to determine the truth about what might be called the political impact of a fallout shelter program—upon ourselves and our Government, upon Russia, upon our allies, and upon neutrals. These political effects can be of critical importance because they may change the chances that there will be a nuclear war; and it is clear that a substantial reduction in the likelihood of nuclear war would increase the Nation's safety far more than would a fallout shelter program.

While well-reasoned statements on civil defense possibilities have been made by the President and by some other high

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ATMOSPHERIC A-TESTING NOT IN THE NATIONAL INTEREST

(An Editorial, reprinted with permission, from the Saturday Review, Nov. 18, 1961)

The United States has accused—and rightly so—the Soviet Union of reckless belligerence in its resumption of atmospheric nuclear testing. However, we Americans are in the throes of what might be termed “counter-belligerence.” Fearful that by this series of tests the Soviets have caught up with or surpassed us, many people insist that our national security demands that we undertake a similar program of atmospheric testing of weapons of all sizes.

I would find it easier to accept this argument if I could really believe that the Soviets have significantly matched or excelled our nuclear weapons technology. I am not convinced of this. Nor do I know of any expert testimony or other public evidence indicating they have done so. I am willing to be convinced, if somebody whose judgment I respect can tell me, within the limits of classification, just what it is they have accomplished and what we must do to regain our lead. I have not been told this; I don't think any part of the United States public has been told this; I doubt very much whether many people in the United States government could provide the answer. All we are told is that “for our own security” we may have to resume atmospheric testing.

Yet, according to President Kennedy himself, we have a more than adequate stock of nuclear weapons. Certainly it is more than adequate from the standpoint of what the weapons were originally intended for; namely, either massive retaliation against an aggressor or limited battlefield use. It may be we have not perfected the warheads, and particularly the rocketry, that might go into very sophisticated missiles or anti-missile missiles, but certainly we have enough nuclear weapons to do whatever job military people normally think needs to be done. As for the means of delivering these bombs, our leaders in Washington tell us that the technology of delivery by polaris missiles, airplaine-carried missiles, and ICBMs is in much better shape than we ever dreamed it was going to be as recently as a year ago.

Why then must we resume testing? Merely because the Soviets have resumed testing? Do we really know that they have surpassed us in technology, and if they have, does this simply mean that they can kill a few more people than we can with a single bomb? Are we seeking to continue the upward spiral of the arms race without end, forgetting about disarmament or any other alternatives which might lead to a more peaceful world? We have said over and over again, and we meant it, that we don't want to resume testing; that what we want to do is to stop testing under effective international inspection and controls. If this is our real goal, is it best served by hysterically matching Soviet callousness?

Although a good many Americans are inclined (and with some justification) to scorn “world opinion,” and although this opinion is certainly not as homogeneous and powerful as some claim it to be, it nevertheless does exist. The administration and the American people should ask themselves: Do we deliberately wish to flout opinion all over the world in order to gain an advantage which is nebulous to say the least? Do we feel that it is worthwhile to emulate Soviet brutality in order to be able to tell Congress, the American people, and the rest of the world, that now we can kill people ten times over rather than nine times over?

This in my opinion is absolutely below the sense of common dignity which the United States Government and its citizens should have. I have by experience become accustomed to defending the United States position, but I would have a difficult time defending this position.

We have charged, with justification, that the Soviet resumption of atmospheric testing has brought terror to the world. We must recognize that if the United States also begins atmospheric testing, it will bring despair to the world. Within our own country, and throughout all nations, men will be forced to conclude that, in reality, primitive military and political considerations are our true guides, regardless of our protests that a more lofty ideology inspires us to champion the cause of reason and peace. In the face of the consequent despair, the Peace Corps, the Alliance for Progress, and our many other proclaimed ambitions for a rich and fruitful frontier for all men will be considered as shams.

If we resume atmospheric testing, we will have good reason to wonder if and when we will again have the opportunity to guide and inspire others—or even to inspire ourselves.

—James J. Wadsworth.

IAEA DIRECTOR COLE REPORTS ON INTERNATIONAL ATOM AGENCY

The annual report of the International Atomic Energy Agency was summarized, November 23, before the U.N. General Assembly by Stirling Cole, Director General of the IAEA, whose term of office expires at the end of the year. In presenting the annual report, Mr. Cole said the agency's efforts to further the East-West exchange of scientific information had been of “very real use” to other nations in applying nuclear energy toward peaceful ends. He predicted that the “age of nuclear power” would become a “reality” by 1970. During 1961, money for research contracts increased to \$600,000, compared with \$400,000 in 1960, according to the report.

Shortly after Mr. Cole delivered his report, the U.S. was attacked in the General Assembly by Mme. Zoya V. Mironova, delegate from the Soviet Union, who accused the U.S. of “subordinating” the IAEA to serve American “political and military interests.” The accusations followed the pattern of those made by the chief Soviet delegate to the International Agency's general conference in Vienna the previous month (see Newsletter, Vol. 14, No. 8). At that time the Soviet Union had vigorously protested the election of a Swedish scientist, Dr. Sigvard Eklund, as Director General of the IAEA, succeeding Mr. Cole. Mme. Mironova revived the arguments against Dr. Eklund's election and also charged that the U.S. had “imposed” a strict system of controls over the use of atomic materials given to under-developed countries. She contended that such controls operated to the advantage of “certain circles” in the U.S.

A rebuttal to the Soviet accusations at the U.N. session was made by several of the Western nations, led by Sir Patrick Dean of Britain (N.Y. Times, 11/24).

CIVIL DEFENSE NOTES

- The Federal Trade Commission on December 8 issued a 15 point guide to protect consumers against useless fallout shelters, misleading shelter ads and scare tactics by shelter salesmen. The commission renewed a warning that it would take action against shelter advertisers within its jurisdiction that failed to follow the guide. Use of the term “blast shelter” was specifically banned by the guide. (W. Post, 12/9).

- On December 1, the Defense Department launched its 93-million dollar nation-wide shelter survey (see Newsletter, 14-7, “New Civil Defense Program”). Preliminary surveys have been conducted in Washington, Baltimore, Houston and White Plains, N.Y. Stuart Pittman, Assistant Secretary of Defense for Civil Defense, reiterated that the survey was aimed at finding usable shelter space in existing structures. (W. Post, 12/2).

- The Federal Government plans to add fallout shelters to all Federal buildings in Washington that have been built in the last 10 years. Meanwhile the American Chemical Society is building a shelter in its new building that will accommodate 700 persons for 2 weeks. (W. Post, 11/30).

- Lester Machta, U.S. Weather Bureau specialist on fallout has revised official estimates of the time of the descent of fallout from the recent USSR tests. According to Dr. Machta, half of the radioactive debris will remain trapped in the stratosphere and will not come down until the Spring of 1963. (W. Post, 12/5).

- Walter Lippmann places the blame for the current shelter “flap” squarely upon the speech made by President Kennedy on July 25. Lippmann says in his recent column entitled “Fallout Shelters” that the President in his special message of May 24 “expounded the concept of Civil Defense coolly, clearly and exactly.” (See Newsletter, 14-6, “Federal Civil Defense Program to be Expanded”). Kennedy saw that a serious shelter policy would have to be “a long range program.” But on July 25, after having met with Khrushchev in Vienna, his words implied that “the shelter program could be carried out as an emergency measure against a 6 month ultimatum.”

Mr. Lippmann continues, “it is the treatment of the policy on shelters as an emergency measure which has caused all the trouble.” He concludes that we should promote a long-range shelter program to protect ourselves against “irrational calculations by irrational men,” and in a final word he points out that it is the business of diplomacy to protect the nation against such irrational calculations. (W. Post, 11/14).

STATEMENT BY FAS
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Administration officials, we believe that our national leadership should now assume a special responsibility for making detailed information readily available to the public so that people will know the chances for and against survival if we get into a nuclear war and how much a fallout shelter program might realistically contribute to improving the likelihood of survival.

It is evident that the destruction of life and of the mechanisms for maintaining our society in its familiar pattern would be vast in any kind of major nuclear war. Consequently, it is recognized by our Government that its efforts toward security must be directed at the prevention of such a war. A large part of the effort must be devoted to our military strength so that it will be apparent to a possible enemy that his security also depends on the avoidance of war. Another part of the effort must lie in the area of negotiation and mutual conciliation to keep tensions from growing out of control. We call attention to the danger that a shelter program that is "oversold" may develop public attitudes which would hamper our Government in this latter important function, and might generate a public conviction that nuclear war is just another one of the ordinary risks of life in the 1960s. This may, in turn, encourage an attitude of undue inflexibility in foreign policy.

In addition to our interest in identifying and clarifying the facts and policy considerations germane to a shelter program, the Federation of American Scientists believes that the Administration should direct the present concern over the possibility of nuclear war, as manifested in the public's interest in shelters, toward developing support for political measures designed to lead toward a more basic solution of the problem of security. Indeed, it is our belief that a frank appraisal of what shelters will and will not do in the event they might have to be used, will provide the Government with a reservoir of public support for more positive approaches to reducing world tensions. Such positive approaches which merit high-level consideration might include, for example, agreement to submit all international disputes to binding arbitration, the beginning of political integration among at least those Western countries of common values, renunciation of first use of nuclear weapons, establishment of a United Nations peace-keeping force on a permanent basis, additional efforts to curb any further spread of nuclear weapons, and greatly enhanced operations of the new Arms Control and Disarmament Agency, among many other policy initiatives, either as alternatives or in combination.

EXPLANATORY TEXT

Shelter policy involves a number of components that interact with, and frequently counteract, one another and that require a political judgment in deciding which considerations should be governing. Thus, a judgment on a national shelter program cannot be made on purely scientific grounds. Yet we believe that a conscientious review of the major considerations involved in such planning, and their principal technical components, is of considerable potential usefulness, and is one which the Federation of American Scientists is appropriately qualified to undertake.

The memorandum that follows is intended to provide such a review, directed primarily toward fallout shelter programs of relatively modest scope. A modest shelter program is one which will not prevent the Soviets from inflicting very large scale civilian fatalities if they choose an attack pattern designed to achieve that objective. On the other hand, a modest shelter program is one which will provide some protection against fallout for those who are outside of the area of immediate destruction. The memorandum deals with the considerations that have to do with three main aspects of security planning: protection of the population against attack at current Soviet force levels, and possibilities of reducing potential civilian casualties; the effects of possible changes in the strategic force levels of the Soviets and others; and the effects of the program on the likelihood of war. Each aspect will be considered in turn.

1. **Protection of population against attack at current Soviet force levels.** The degree of protection which a modest fallout shelter program would provide depends importantly on the scale of the enemy's attack, and on the tactics he employs. At any given time, the Soviet Union has a virtually fixed maximum number of bombs it could realistically hope to deliver on the United States in the event of war. This num-

ber can change with time, but cannot change drastically overnight. Whether or not the Administration has precise estimates of current Soviet capabilities is not publicly clear, but several public sources indicate that present Soviet delivery capabilities are probably in the range of a few thousand megatons of yield, with roughly half the total yield derived from fission energy, which would produce the bulk of the fallout. Just how much these maximum capabilities might be reduced through the action of our air defense forces, and by United States attacks on Soviet strategic forces in the opening phase of the war, is highly uncertain; the reduction could range from slight to substantial, depending on how the war started.

Even a modest national fallout program would be likely to result in some reduction in United States casualties from an attack of this approximate scale. The extent of reduction, however, depends considerably on the tactics used by the enemy. Simple fallout shelters would be of maximum utility if most or all of the enemy weapons were directed at our own strategic forces such as bomber and missile bases, rather than at cities or industrial centers. In this case, modest shelters could save many tens of millions of lives, and total casualties might be held to approximately ten million persons.

Even so, this would constitute an unprecedented catastrophe for the United States. However, if the enemy attack were directed chiefly or entirely at population or industrial centers, fallout shelters would provide little protection against blast and firestorm effects, and the casualties could approximate half the populace. Fallout shelters could still save a few tens of millions of people who might otherwise be killed, but these survivors would face many more difficulties in recuperation than in the former case.

Many strategists maintain that it would be foolish in circumstances of relatively limited stocks of weapons and delivery systems for an enemy to expend weapons on population or industrial centers simply for the sake of killing people, because he might better expend the weapons attacking our strategic forces, and thereby reduce his own destruction. Others argue that an enemy will sacrifice at least some strategic gain to attack at least some population or industrial centers, either for blackmail purposes, for influencing resolve to continue the war, out of sheer tradition, or for some other reason. It is clear that reliable information concerning present Soviet war plans—whether they would chiefly attack cities or strategic forces—probably does not exist in the Administration, and certainly has not been made public. Moreover, what—if any—change in those plans would occur once a war had started is difficult or impossible to predict. Even more uncertain is the question of whether such Soviet war plans would themselves be influenced by a United States shelter program; it is sometimes argued that such a program would cause the Soviets to increase the scale of attack on population and industrial centers, and thus draw more of their weapons away from our own strategic forces. In view of the fact that the strategic forces could then retaliate more effectively, this argument does not seem forceful.

2. **Possible changes in strategic forces.** The foregoing discussion concerned possible wars involving Soviet forces at more or less their present levels. It is possible that Soviet forces may increase, or strategic nuclear forces of other nations may develop, to levels that could nullify the protection afforded by a modest fallout shelter program. Such an increase may not occur; it is worth pointing out that the first-strike delivery capability of United States forces has probably been declining slightly in the recent past, and many military strategists believe that a deterrent force of a few hundred reliably deliverable weapons of a few megatons each constitutes an adequate deterrent force, whether or not the potential enemy has civil defense. But the possibility should be considered.

The radiation protection provided by a modest program of fallout shelters ranges from factors of 5 or 10 or 20, in largely unmodified basements of existing buildings, to factors of 100 or 1,000 or more for specially constructed basement or backyard shelters. Therefore, the increase in enemy strategic forces required to nullify the shelter program would be something like a factor of 10, so far as fallout effects alone are concerned. However, other effects could be more important, and the increase required could be as little as a factor or two or as much as a factor of 10 or more, depending upon enemy tactics both before and after the increase.

Changes of this scale could not be effected overnight. However, it seems possible that the Soviets could, with a suffi-

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STATEMENT BY FAS
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ciently intense effort, double their existing forces in something like one year, or multiply them by 10 in two or three years. Such an effort would require a very large diversion of resources, comparable to mobilization on the scale of World War II. Without such diversion, a more reasonable time scale for a 10-fold increase would be 5 to 10 years.

It is possible that the shelter program itself might be partly or wholly responsible for such an increase in opposing strategic forces, if the opponent were interested in causing a large number of fatalities. If so, the shelters could still have had a temporary value, in terms of a possible contribution toward deterring nuclear war and in terms of technical effectiveness in case nuclear war occurred. On the other hand, if shelters contribute to an accelerated buildup of strategic forces, their possible temporary value must be balanced against the increased destructiveness if war should occur.

To summarize the considerations under items 1. and 2., we can say the following: In the near future, a modest fallout shelter system offers substantial reduction of civilian damage in an attack against our strategic forces only. It offers appreciably less reduction in an attack pattern that includes bombing of our population and industrial centers. In the longer range, a modest shelter system offers even less assurance of a major reduction in casualties and damage, if opposing strategic forces increase deliverable yield substantially.

3. **Effects on likelihood of war.** It is possible, at least as a matter of principle, that the existence of a shelter program might itself influence the likelihood of general war. This question has been the subject of intense discussion, and is one of the major imponderables. Nonetheless, we should discuss the main considerations of this problem, which are quasi-technical in a broad sense of the term.

(a) It is perfectly clear that the political leaders of the United States would never initiate a general nuclear war except under extreme provocation or by mistake. However, the question of what constitutes sufficiently extreme provocation is likely to depend on just how catastrophic the war might be. Therefore, any shelter program that could substantially mitigate the consequences of a war is likely to lower the provocation threshold, which might of itself make war more likely. To be set against this, however, are two other factors: first, no foreseeable shelter program will make nuclear war appear as something to be undertaken lightly, so the threshold would not be lowered very much; second, potential enemies would be aware that the threshold had been lowered and would presumably tend to be more careful not to engage in actions that could seem extremely provocative (such as, e.g., attacking Berlin or West Germany).

(b) In the event that we received equivocal evidence that an attack on the United States was under way or about to get under way, our own military officials would be strongly motivated to attack the strategic forces of the opponent immediately, in order to blunt the attack as much as possible. One of the possible sources of accidental war is that such evidence might be incorrect. To the extent that the populace is protected against an enemy attack, one of the motives for initiating a blunting attack on the basis of equivocal evidence would be reduced; it would then be potentially less catastrophic to wait and make sure. Therefore, this aspect of population shelters might tend to make certain types of accidental war less likely. However, shelter programs are probably much less important in diminishing the likelihood of accidental war than is the protection of our strategic forces.

(c) An effect that is less certain than the preceding, but possibly no less important, is the psychological effect on the populace resulting from an organized program of fallout shelters. It is possible that such a program might develop public attitudes and pressures that would narrow the range of policy alternatives available to the Government, in ways that could make the ultimate occurrence of war more likely. The possible extent and character of this effect is a subject of controversy among students of these matters. However, the possibility is a source of concern to many.

(d) There is another psychological effect which must be mentioned, and which has generated perhaps the greatest amount of emotion; that is the effect of a shelter program on the personal behaviour and attitudes of people, even in the absence of nuclear war. A well-organized fallout shelter program, coupled with a balanced flow of information about the efficacy of shelters, may strengthen the ability of the

public to recognize realistically the dangers of nuclear war, which may occur despite all we can do to prevent it. Such realistic facing of the danger could have the effect of strengthening public support for drastic political action aimed at preventing nuclear war. Against this possible beneficial effect must be weighed the deleterious effects which could occur. Although difficult to measure or predict, these include the possibilities of weakening of the society by preparations for personal survival with little regard for others, and of the diversion of effort from long range concerns in an atmosphere of fear and fatalism.

(e) A final possible effect on the likelihood of war is the provocative effect of a shelter program as it may be interpreted by the Soviets. Although President Kennedy has stated that the major purpose of a shelter program would be as insurance in case of "an irrational attack, a miscalculation, an accidental war which cannot be either foreseen or deterred," it has been argued that the Soviet Union might consider that a major purpose was to strengthen our own position in case we decided to initiate nuclear war. Such a conclusion by the Soviet Union, the argument goes, could increase the overall degree of tension and make more likely both a major war and an initial attack by Russia.

We believe in fact that the provocative effect of a modest fallout shelter program will not be appreciable, for the reason that clearly such shelters would not prevent very large scale fatalities in case of a deliberate attack on population and industrial centers; certainly such a program should be far less provocative than a massive civil defense program designed to protect the populace even against deliberate retaliatory attacks.

4. **Conclusions.** The Federation of American Scientists does not now recommend the adoption or rejection of a specific shelter program; we believe it more appropriate simply to set forth the above summary of major quasi-technical considerations that relate to civil defense programs, primarily to modest fallout shelters. (A very expensive program of blast shelters and other measures would pose a new range of problems that we have not discussed.) Still less do we presume to advise individuals on the personal preparations they should make.

However, we do wish to emphasize again two major points: First: Although a modest fallout shelter program offers substantial protection for the near future and for some kinds of attack, it offers appreciably less protection under other kinds of attack that might occur in the immediate future, and still less protection against possible strategic forces that might evolve later. Second: The present time seems especially opportune for furthering political measures that would tend to improve security. This point is separate from the question of any decision concerning shelters. Though such political measures do not involve engineering or science, we wish to state that as individuals most of us believe that the best hope of long-term world security resides in basic political rearrangements, rather than in continually increasing military expenditures. The Administration should use the present period of national concern to consider further such political measures as agreement to submit all international disputes to binding arbitration, the beginning of political integration among at least those Western countries of common values, renunciation of first use of nuclear weapons, establishment of a United Nations peace-keeping force on a permanent basis, additional efforts to curb any further spread of nuclear weapons, and greatly enhanced operations of the new Arms Control and Disarmament Agency, among many other policy initiatives, either as alternatives or in combination. It might also be possible, and would seem highly worthwhile, to agree with the Soviet Union to refrain from pursuing intensive and expensive civil defense programs, and inspection of such an agreement would be relatively simple.

JANUARY COUNCIL MEETING

The FAS Council will meet in New York City January 24-27, in conjunction with the meetings of the American Physical Society. Details of time and place will be mailed shortly to all Council members. All members of the Federation are invited to attend Council meetings and to suggest items appropriate for Council discussion. Material which a member wishes circulated to the Council should be submitted in 60 copies to the National Office at 1700 K Street, N.W., Washington 6, D. C.

REVIEW: SCIENCE AND THE NEW NATIONS

Science and the New Nations,

edited by Ruth Gruber, Basic Books, 1961

One year ago, the Weizmann Institute sponsored an international conference on the role of science in the advancement of the new nations. Scientists and political representatives from forty countries convened at this meeting. Excerpts of their talks and a sampling of the discussion have just been published under the above title.

There is little in this compilation that will sound a new or unfamiliar note. We have heard on all sides about the challenge and problems of the undeveloped (or as they are now euphemistically called, "developing") nations. Their need for vast leaps in education, for immense amounts of capital, and for stable governments to administer their ambitious programs are all well known. The difficulty in realizing their goals, or in even making a significant step forward, has been summarized repeatedly in the statistical terms of inadequate per capita growth, which is a reflection of low productivity on the one hand and a rapid increase in population on the other.

ECONOMIC PROBLEMS

The generation of capital to finance their development is one of the first requirements of the new nations. To achieve, for example, a 2% per capita annual growth in income requires (because of population growth) about a 4% overall yearly increase, which can occur only if about 25% of the national output is withheld from personal consumption. It is of interest that Japan, between 1880 and 1935, proceeded along these lines, with a 10-fold increase in real national income which was accomplished by a 15-20% level of savings (foreign investment in Japan being very limited over this period). Professor Lewis, in his discussion of this problem notes: "Capitalists are distinguished from other dominant classes by their passion for saving and for productive investment. Earlier dominant classes had different ambitions. Priestly classes saved, but they invested their wealth more usually in monuments and churches. Landowners saved, but in their heyday they used their savings to buy more land rather than to invest in improving the land. The capitalist was the first dominant type to turn saving and productive investment into a religion of life." For rapid economic development the restriction of personal consumption is not going to be enough; hence the need for large infusions of capital from the outside. There is great emphasis on the "large", to put into motion the "self-perpetuating forces of economic expansion and growth. A trickle of capital would only remain a Sisyphean effort, always overtaken and defeated by the growth of population and declining standards of living."

POPULATION GROWTH

The population explosion is duly noted: a net increase in the world population of 100,000 per 24 hours, which is expected to result in a total of 6 billion by the end of the century, compared to 1 billion at the beginning. The Japanese have taken this problem in hand with a government-sponsored birth control program that has greatly increased the numbers of families practicing contraception with an attendant sharp decline in birth rate. However, there are countries such as Iran that do not favor birth control despite their rapidly increasing population.

The need for the proper kind of government was stated most eloquently by Sr. Garcia of Buenos Aires. "The type

of South American man we have to form must be trained so as to be able to vanquish the enemies of our progress: the desert, the lack of material means, and primitive and brutal nature of our continent". This "new frontier" statement was made in 1852, but the goal has not been realized because of the special interests of Church and landowners that continued to dominate government.

EDUCATION AND TECHNOLOGY

There does not appear to be unanimity on the immediate educational needs of the new nations. For example, Professor Lewis believes that "we have made a fetish of universal literacy and universal primary education". The result is to give rural children ambition to move into towns looking for white collar jobs that don't exist, whereas the money could have been used to show illiterate farmers new seeds and new techniques.

Many technological and scientific problems were touched upon during the conference. The material is familiar to F.A.S. readers, but several points might be mentioned. Current estimates are that the energy from coal, oil, and hydroelectricity will not be sufficient by the end of this century. In England, nuclear power will be competitive with conventional sources by 1970. For most of the new nations, in which conventional fuel shortages are unlikely to arise for many years, it is thought preferable to avoid current "burner" reactors and to await development of "breeder" reactors which are more economical with respect to fissionable material. Use of solar energy still evokes interest. There are some 30,000 solar hot water heaters in Japan. A research "solar pond" in Israel has nearly reached the boiling point at the bottom, by virtue of sunshine, and salt layering at the bottom of the pond to increase water density and minimize convection. In some areas, water supply is a more urgent problem than energy supply. Israel will soon reach the limit of presently available water resources, so that desalination will probably be needed. Successful 5-year tests on cloud seeding were reported from Australia. On the medical front, large areas of Africa are still faced with the danger of the tsetse fly, the transmitter of trypanosomiasis. This disease not only affects humans, but also prevents the breeding of domestic animals for protein food. It is considered the most important health problem of the continent.

Out of this conference there emerged new friendships, an appreciation of the diversity of challenges facing the developing nations, and opportunities for future regional co-operative efforts in economic and technological ventures.

E. LEONARD

LOADING OF N. S. SAVANNAH REACTOR COMPLETED

A core of uranium-bearing fuel elements containing enough latent energy to power the N. S. Savannah, the world's first nuclear cargo-passenger vessel, for 3½ years without refueling was assembled inside the ship's reactor on Nov. 29. The task of loading the core's 32 fuel elements into place in the Savannah's 69 thermal megawatt pressurized water reactor took place aboard the vessel at the yard of the ship's builder, the New York Shipbuilding Corporation, in Camden, New Jersey.

Construction of the Savannah was authorized by Congress as a joint project of the Atomic Energy Commission and the Maritime Administration to demonstrate the feasibility of nuclear energy for merchant ships. The Commission has authorized fuel loading and low-power tests of the reactor and initial sea trials of the Savannah. The reactor is to achieve criticality at Camden where it will be brought, after zero and low-power testing, to 10 per cent of rated power. Full power will be reached after the ship has been moved by auxiliary power to Yorktown, Va. Initial sea trials will be held from that base. Upon successful completion of the initial sea trials, the Savannah will be delivered to the Government.

Considerations of safety have received careful attention throughout the period of construction of both the ship and its reactor and will continue during the test period. Reports on reactor operations up to 10 per cent of power and of inspections of these operations will be filed with and will be reviewed by the AEC's regulatory staff. The staff will

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FAS NEWSLETTER

Published monthly except during July and August by the Federation of American Scientists, 1700 K Street, Northwest, Washington 6, D. C. Subscription price: \$2.00 per year.

Chairman.....John S. Toll

The FAS Newsletter is prepared in Washington by FAS members. The staff for this issue were: Editor—Gary Felsenfeld; Writers—E. Anderson, R. Glasser, F. K. Millar, N. Seeman, E. Shelton and assistance from B. Stiller.

The FAS, founded in 1946, is a national organization of scientists and engineers concerned with the impact of science on national and world affairs.

TEST BAN

An abortive attempt was made this month to resume test ban negotiations in Geneva. Resumption was formally requested by the U.S. and Britain on September 14, following completion of debate on the nuclear test issue in the United Nations General Assembly; the talks had been recessed on September 9 until after the completion of this debate (W. Post, N. Y. Times, 11/4). On November 21, the Soviet Union stated its willingness to renew negotiation "if the U. S. and Britain felt the talks would serve to bring closer together the points of view of the different sides" (N. Y. Times, 11/22), and representatives returned to Geneva to reopen the talks on November 28. On the eve of the resumption of the conference, the U.S.S.R. asked France to join the negotiations, and publicly proposed a new test ban plan which would call upon the Soviet Union, the United States, the United Kingdom, and France to 1) end nuclear tests in the atmosphere, outer space, and under water, such testing to be monitored by national systems of detection, and 2) declare a moratorium on underground tests pending agreement on a control system for such tests as part of international control over general and complete disarmament (W. Post, N. Y. Times, 11/28). In the reopening at Geneva, U. S. delegate Arthur Dean immediately rejected any system without international inspection as "absolutely unsatisfactory and unacceptable." The Soviet negotiator Semyon Tsarapkin stated that "in the present state of world tension" international inspectors "would serve only for espionage purposes" (N. Y. Times, 11/30) and that the impossibility of an international control system was simply "realistic" (N. Y. Times, W. Post, 11/29). Tsarapkin said that he was prepared to negotiate no further on the test ban treaty draft submitted by the West last April and that repudiation of the previous agreements had to be accepted as a "fact of international life" (N. Y. Times, 11/29). Dean said there was "nothing whatsoever negotiable" in the new Soviet proposal. On November 30 the British and U. S. chief delegates decided to leave the talks in the hands of their deputies and return to "report to the U. N. General Assembly Russia's flat refusal to discuss a controlled test ban" (W. Post, 12/1).

On November 5, the Voice of America mobilized against Soviet jamming 52 transmitters broadcasting simultaneously over as many as 80 frequencies. The concentrated effort was an attempt to get to the Soviet people a description of the extensive series of nuclear tests by the U.S.S.R.; the broadcast gave facts about the blasts and about radioactive fallout. The message was beamed in eight languages and asked, "Have you been told?" The special broadcast was publicized in advance in the hope of alerting listeners and although extra jammers were apparently added from other Communist countries, the jamming was reported effective only on certain frequencies and in certain areas and was weak and ineffectual on others. Tentative evaluation was that reception was enough to have made the undertaking worthwhile (N. Y. Times, 11/6).

FAS NEWSLETTER

Federation of American Scientists
1700 K Street, N.W.
Washington 6, D. C.

Vol. 14, No. 10

December 1961

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file its findings on the reports in the public record on the Savannah before the reactor is allowed to operate in excess of 10 per cent of power. Following the sea trials, results of the Savannah test program through that point will be filed with and reviewed by the regulatory staff and by the AEC's Advisory Committee on Reactor Safeguards before being submitted to the Commission for review.

After the nuclear safety of the ship has been reconfirmed, the Savannah will enter the next phase of its program—that of extended sea trials over an 18-month period during which the vessel will carry passengers and cargo at prevailing rates, but not on regular schedule, and will visit major U. S. and foreign ports (AEC release, 11/29).

FIRST PEACEFUL ATOMIC EXPLOSION SET OFF

(Continued from page 1)

"3. Expand the data on characteristics of underground nuclear detonations to a new medium (salt), which has marked differences from the tuff (a volcanic rock) at the Nevada test site in which previous detonations [Non-peaceful—Ed.] have been conducted.

"4. Make neutron cross-section measurements that will contribute generally to scientific knowledge and to the reactor development program."

AEC estimates Project Gnome cost at \$5.5 million.

Doubts have been expressed, particularly by the Committee for Nuclear Information (CNI), St. Louis, Mo., regarding the usefulness of the Plowshare Program. A CNI analysis, last year, of AEC data has shown, for example, that the cost of electric power produced by underground explosions would actually be greater than that of conventionally-produced electricity, in contrast to more optimistic AEC forecasts. Difficulties in re-using the site of an explosion as well as the need to protect power generators from radioactive contamination would contribute to the increased cost, according to the CNI analysis. Earth shock from the 10 and 100 megaton explosions suggested as sources of power would be an additional undesirable feature. The CNI report indicated that the Project Gnome explosion could perhaps provide some answers as to the feasibility of the proposed power scheme. ("Nuclear Information", Vol. II, No. 9, July, 1960).

The United States Atomic Energy Commission has published an 18-page bibliography, "Peaceful Uses of Nuclear Explosions", (TID-3522, 5th Rev.), which is available from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., for \$0.50.

The publication lists 151 references, and their availability, regarding potential peaceful uses of nuclear explosives of the type that are being considered under the Commission's "Plowshare" program. (AEC release, 11/16).

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F. A. S. NEWSLETTER

STATEMENT BY THE FEDERATION OF AMERICAN SCIENTISTS ON CIVIL DEFENSE SHELTERS

[The primary business of the FAS Council, at its meeting in Chicago at Thanksgiving was discussion of FAS position, if any, on Civil Defense Fallout Shelters. The statement which emerged from that meeting, and which was approved by the Council, is set forth in full below.]

Oversimplifications in the public press recently have tended to produce the misleading impression that the individual can by his own efforts insure his survival in the event of any nuclear war. This impression is as wrong as the perhaps equally widespread view that there is nothing that anyone can do to improve his chances of survival if war comes.

The Federation of American Scientists considers the shelter issue unusually difficult as it involves measures and estimates that are without precedent, making predictions highly uncertain. Shelter planning involves many technical considerations not easily conveyed to the public, many of which depend in some degree on information that is unavailable—either because the information has not been released, or because it is not known in the United States, or because it depends on decisions not yet made, or because the effects involved are in fact imponderable. The fact that civil defense planning bears intimately on the individual citizen's everyday life, to a degree not true of other security measures, has engendered higher emotional content in the discussion.

The truth about fallout shelter programs is both simple and complex. It is clear that a properly designed fallout shelter program can save at least some people and, in home situations, most people. It is also clear that few, if any, people can become "safe" by building a fallout shelter.

Beyond these simple truths, both of which must be recognized in any responsible discussion of a fallout shelter program, the truth becomes more complex and more difficult to determine.

For example, claims of over 90% survival would be reasonable for one particular kind of possible enemy attack; namely, an attack at present Soviet force levels which concentrated only on our counter-attack bases. In this event, there would be little direct threat to most of our population, and fallout shelters could be effective in those downwind population centers where lethal concentrations of radioactive fallout would occur. On the other hand, an attack pattern which included the bombing of our centers of industrial strength and of population might well take the lives of half our total population. Fallout shelters would provide little or no protection to those in the area of blast and firestorm damage—an area hundreds of square miles in the case of a 20-megaton bomb. In this case, fallout shelters might still save the lives of some tens of millions of people in the surrounding areas of heavy fallout. However, the problems of survival of these people after they emerged from their shelters and of reconstructing a social order would be enormous. It is not possible to predict what attack pattern would be selected initially by the Soviet Union in the event of nuclear war nor what pattern might develop as the war progressed.

Furthermore, it is particularly complex and difficult to determine the truth about what might be called the political impact of a fallout shelter program—upon ourselves and our Government, upon Russia, upon our allies, and upon neutrals. These political effects can be of critical importance because they may change the chances that there will be a nuclear war; and it is clear that a substantial reduction in the likelihood of nuclear war would increase the Nation's safety far more than would a fallout shelter program.

While well-reasoned statements on civil defense possibilities have been made by the President and by some other high

Administration officials, we believe that our national leadership should now assume a special responsibility for making detailed information readily available to the public so that people will know the chances for and against survival if we get into a nuclear war and how much a fallout shelter program might realistically contribute to improving the likelihood of survival.

It is evident that the destruction of life and of the mechanisms for maintaining our society in its familiar pattern would be vast in any kind of major nuclear war. Consequently, it is recognized by our Government that its efforts toward security must be directed at the prevention of such a war. A large part of the effort must be devoted to our military strength so that it will be apparent to a possible enemy that his security also depends on the avoidance of war. Another part of the effort must lie in the area of negotiation and mutual conciliation to keep tensions from growing out of control. We call attention to the danger that a shelter program that is "oversold" may develop public attitudes which would hamper our Government in this latter important function, and might generate a public conviction that nuclear war is just another one of the ordinary risks of life in the 1960s. This may, in turn, encourage an attitude of undue inflexibility in foreign policy.

In addition to our interest in identifying and clarifying the facts and policy considerations germane to a shelter program, the Federation of American Scientists believes that the Administration should direct the present concern over the possibility of nuclear war, as manifested in the public's interest in shelters, toward developing support for political measures designed to lead toward a more basic solution of the problem of security. Indeed, it is our belief that a frank appraisal of what shelters will and will not do in the event they might have to be used, will provide the Government with a reservoir of public support for more positive approaches to reducing world tensions. Such positive approaches which merit high-level consideration might include, for example, agreement to submit all international disputes to binding arbitration, the beginning of political integration among at least those Western countries of common values, renunciation of first use of nuclear weapons, establishment of a United Nations peace-keeping force on a permanent basis, additional efforts to curb any further spread of nuclear weapons, and greatly enhanced operations of the new Arms Control and Disarmament Agency, among many other policy initiatives, either as alternatives or in combination.

EXPLANATORY TEXT

Shelter policy involves a number of components that interact with, and frequently counteract, one another and that require a political judgment in deciding which considerations should be governing. Thus, a judgment on a national shelter program cannot be made on purely scientific grounds. Yet we believe that a conscientious review of the major considerations involved in such planning, and their principal technical components, is of considerable potential usefulness, and is one which the Federation of American Scientists is appropriately qualified to undertake.

The memorandum that follows is intended to provide such a review, directed primarily toward fallout shelter programs of relatively modest scope. A modest shelter program is one which will not prevent the Soviets from inflicting very large scale civilian fatalities if they choose an attack pattern designed to achieve that objective. On the other hand, a modest shelter program is one which will provide some protection against fallout for those who are outside of the area of immediate destruction. The memorandum deals with the considerations that have to do with three main aspects of security planning: protection of the population against attack at current Soviet force levels, and possibilities of reducing potential civilian casualties; the effects of possible changes in the strategic force levels of the Soviets and others; and the effects of the program on the likelihood of war. Each aspect will be considered in turn.

1. **Protection of population against attack at current Soviet force levels.** The degree of protection which a modest fallout shelter program would provide depends importantly on the scale of the enemy's attack, and on the tactics he employs. At any given time, the Soviet Union has a virtually fixed maximum number of bombs it could realistically hope to deliver on the United States in the event of war. This number can change with time, but cannot change drastically overnight. Whether or not the Administration has precise estimates of current Soviet capabilities is not publicly clear, but several public sources indicate that present Soviet delivery capabilities are probably in the range of a few thousand megatons of yield, with roughly half the total yield derived from fission energy, which would produce the bulk of the fallout. Just how much these maximum capabilities might be reduced through the action of our air defense forces, and by United States attacks on Soviet strategic forces in the opening phase of the war, is highly uncertain; the reduction could range from slight to substantial, depending on how the war started.

Even a modest national fallout program would be likely to result in some reduction in United States casualties from an attack of this approximate scale. The extent of reduction, however, depends considerably on the tactics used by the enemy. Simple fallout shelters would be of maximum utility if most or all of the enemy weapons were directed at our own strategic forces such as bomber and missile bases, rather than at cities or industrial centers. In this case, modest shelters could save many tens of millions of lives, and total casualties might be held to approximately ten million persons.

Even so, this would constitute an unprecedented catastrophe for the United States. However, if the enemy attack were directed chiefly or entirely at population or industrial centers, fallout shelters would provide little protection against blast and firestorm effects, and the casualties could approximate half the populace. Fallout shelters could still save a few tens of millions of people who might otherwise be killed, but these survivors would face many more difficulties in recuperation than in the former case.

Many strategists maintain that it would be foolish in circumstances of relatively limited stocks of weapons and delivery systems for an enemy to expend weapons on population or industrial centers simply for the sake of killing people, because he might better expend the weapons attacking our strategic forces, and thereby reduce his own destruction. Others argue that an enemy will sacrifice at least some strategic gain to attack at least some population or industrial centers, either for blackmail purposes, for influencing resolve to continue the war, out of sheer tradition, or for some other reason. It is clear that reliable information concerning present Soviet war plans—whether they would chiefly attack cities or strategic forces—probably does not exist in the Administration, and certainly has not been made public. Moreover, what—if any—change in those plans would occur once a war had started is difficult or impossible to predict. Even more uncertain is the question of whether such Soviet war plans would themselves be influenced by a United States shelter program; it is sometimes argued that such a program would cause the Soviets to increase the scale of attack on population and industrial centers, and thus draw more of their weapons away from our own strategic forces. In view of the fact that the strategic forces could then retaliate more effectively, this argument does not seem forceful.

2. **Possible changes in strategic forces.** The foregoing discussion concerned possible wars involving Soviet forces at more or less their present levels. It is possible that Soviet forces may increase, or strategic nuclear forces of other nations may develop, to levels that could nullify the protection afforded by a modest fallout shelter program. Such an increase may not occur; it is worth pointing out that the first-strike delivery capability of United States forces has probably been declining slightly in the recent past, and many military strategists believe that a deterrent force of a few hundred reliably deliverable weapons of a few megatons each constitutes an adequate deterrent force, whether or not the potential enemy has civil defense. But the possibility should be considered.

The radiation protection provided by a modest program of fallout shelters ranges from factors of 5 or 10 or 20, in largely unmodified basements of existing buildings, to factors of 100 or 1,000 or more for specially constructed basement or backyard shelters. Therefore, the increase in enemy strategic forces required to nullify the shelter program would be something like a factor of 10, so far as fallout effects alone are concerned. However, other effects could be more important, and the increase required could be as little as a factor or two or as much as a factor of 10 or more, depending upon enemy tactics both before and after the increase.

Changes of this scale could not be effected overnight. However, it seems possible that the Soviets could, with a suffi-

ciently intense effort, double their existing forces in something like one year, or multiply them by 10 in two or three years. Such an effort would require a very large diversion of resources, comparable to mobilization on the scale of World War II. Without such diversion, a more reasonable time scale for a 10-fold increase would be 5 to 10 years.

It is possible that the shelter program itself might be partly or wholly responsible for such an increase in opposing strategic forces, if the opponent were interested in causing a large number of fatalities. If so, the shelters could still have had a temporary value, in terms of a possible contribution toward deterring nuclear war and in terms of technical effectiveness in case nuclear war occurred. On the other hand, if shelters contribute to an accelerated buildup of strategic forces, their possible temporary value must be balanced against the increased destructiveness if war should occur.

To summarize the considerations under items 1. and 2., we can say the following: In the near future, a modest fallout shelter system offers substantial reduction of civilian damage in an attack against our strategic forces only. It offers appreciably less reduction in an attack pattern that includes bombing of our population and industrial centers. In the longer range, a modest shelter system offers even less assurance of a major reduction in casualties and damage, if opposing strategic forces increase deliverable yield substantially.

3. **Effects on likelihood of war.** It is possible, at least as a matter of principle, that the existence of a shelter program might itself influence the likelihood of general war. This question has been the subject of intense discussion, and is one of the major imponderables. Nonetheless, we should discuss the main considerations of this problem, which are quasi-technical in a broad sense of the term.

(a) It is perfectly clear that the political leaders of the United States would never initiate a general nuclear war except under extreme provocation or by mistake. However, the question of what constitutes sufficiently extreme provocation is likely to depend on just how catastrophic the war might be. Therefore, any shelter program that could substantially mitigate the consequences of a war is likely to lower the provocation threshold, which might of itself make war more likely. To be set against this, however, are two other factors: first, no foreseeable shelter program will make nuclear war appear as something to be undertaken lightly, so the threshold would not be lowered very much; second, potential enemies would be aware that the threshold had been lowered and would presumably tend to be more careful not to engage in actions that could seem extremely provocative (such as, e.g., attacking Berlin or West Germany).

(b) In the event that we received equivocal evidence that an attack on the United States was under way or about to get under way, our own military officials would be strongly motivated to attack the strategic forces of the opponent immediately, in order to blunt the attack as much as possible. One of the possible sources of accidental war is that such evidence might be incorrect. To the extent that the populace is protected against an enemy attack, one of the motives for initiating a blunting attack on the basis of equivocal evidence would be reduced; it would then be potentially less catastrophic to wait and make sure. Therefore, this aspect of population shelters might tend to make certain types of accidental war less likely. However, shelter programs are probably much less important in diminishing the likelihood of accidental war than is the protection of our strategic forces.

(c) An effect that is less certain than the preceding, but possibly no less important, is the psychological effect on the populace resulting from an organized program of fallout shelters. It is possible that such a program might develop public attitudes and pressures that would narrow the range of policy alternatives available to the Government, in ways that could make the ultimate occurrence of war more likely. The possible extent and character of this effect is a subject of controversy among students of these matters. However, the possibility is a source of concern to many.

(d) There is another psychological effect which must be mentioned, and which has generated perhaps the greatest amount of emotion: that is the effect of a shelter program on the personal behaviour and attitudes of people, even in the absence of nuclear war. A well-organized fallout shelter program, coupled with a balanced flow of information about the efficacy of shelters, may strengthen the ability of the public to recognize realistically the dangers of nuclear war, which may occur despite all we can do to prevent it. Such realistic facing of the danger could have the effect of strengthening public support for drastic political action aimed at preventing nuclear war. Against this possible beneficial effect must be weighed the deleterious effects which could occur. Although difficult to measure or predict, these include the possibilities of weakening of the society by preparations for personal survival with little regard for others, and of the diversion of effort from long range concerns in an atmosphere of fear and fatalism.

(e) A final possible effect on the likelihood of war is the provocative effect of a shelter program as it may be interpreted by the Soviets. Although President Kennedy has stated that the major purpose of a shelter program would be as insurance in case of "an irrational attack, a miscalculation, an accidental war which cannot be either foreseen or deterred," it has been argued that the Soviet Union might consider that a major purpose was to strengthen our own position in case we decided to initiate nuclear war. Such a conclusion by the Soviet Union, the argument goes, could increase the overall degree of tension and make more likely both a major war and an initial attack by Russia.

We believe in fact that the provocative effect of a modest fallout shelter program will not be appreciable, for the reason that clearly such shelters would not prevent very large scale fatalities in case of a deliberate attack on population and industrial centers; certainly such a program should be far less provocative than a massive civil defense program designed to protect the populace even against deliberate retaliatory attacks.

4. **Conclusions.** The Federation of American Scientists does not now recommend the adoption or rejection of a specific shelter program; we believe it more appropriate simply to set forth the above summary of major quasi-technical considerations that relate to civil defense programs, primarily to modest fallout shelters. (A very expensive program of blast shelters and other measures would pose a new range of problems that we have not discussed.) Still less do we presume to advise individuals on the personal preparations they should make.

However, we do wish to emphasize again two major points: First: Although a modest fallout shelter program offers substantial protection for the near future and for some kinds of attack, it offers appreciably less protection under other kinds of attack that might occur in the immediate future, and still less protection against possible strategic forces that might evolve later. Second: The present time seems especially opportune for furthering political measures that would tend to improve security. This point is separate from the question of any decision concerning shelters. Though such political measures do not involve engineering or science, we wish to state that as individuals most of us believe that the best hope of long-term world security resides in basic political rearrangements, rather than in continually increasing military expenditures. The Administration should use the present period of national concern to consider further such political measures as agreement to submit all international disputes to binding arbitration, the beginning of political integration among at least those Western countries of common values, renunciation of first use of nuclear weapons, establishment of a United Nations peace-keeping force on a permanent basis, additional efforts to curb any further spread of nuclear weapons, and greatly enhanced operations of the new Arms Control and Disarmament Agency, among many other policy initiatives, either as alternatives or in combination. It might also be possible, and would seem highly worthwhile, to agree with the Soviet Union to refrain from pursuing intensive and expensive civil defense programs, and inspection of such an agreement would be relatively simple.

FAS COUNCIL STATEMENT ON TEST BAN

The following statement, approved at the New York meeting, was released to the press on Jan. 31, 1962:

The United States is now considering whether to resume testing of nuclear weapons in the atmosphere. The Federation of American Scientists considers this to be a decision of major importance.

It is well to recall that a somewhat similar situation to that existing now occurred in 1958. Following a concentrated series of nuclear weapons tests the U.S.S.R. announced that it would cease testing if other nations would also cease testing and work out a treaty to prohibit testing in the future. The United States somewhat reluctantly agreed to discuss a treaty but continued to conduct tests at a high rate until mid-fall. Although the U.S.S.R. held a few more tests late that year, a test ban treaty would have left the United States with an appreciable advantage in weapons technology. Now both nations are more nearly on a par. Should the U.S. try to "get ahead" again, for a little while, or is this a good time to stop so long as the Soviets will follow our example?

This is a problem for the public to ponder as well as our leaders in Government. Most, if not all, of the facts on which a judgment should be based are not secret and are intelligible to laymen as well as to scientific and military experts. The social and political repercussions are quite as important as, and perhaps even more important, the technical and military factors.

How do we stand militarily vis-a-vis the U.S.S.R.? "Although substantial progress had been made and much useful information obtained by the Soviet Union, there is no reason to believe that the balance of nuclear power has been changed to favor the Soviet Union." (U.S. Atomic Energy Commission, December 9, 1961.)

What might be gained by testing? Advocates of testing will cite modernization of weapons systems, development of weapons more discriminating in their effects, study of possible effects of atmospheric explosions on military communications systems, study of anti-missile systems and even search for new "breakthroughs." It is important to realize that in the present advanced state of nuclear weapons no step comparable in terms of weapon yield to the thermonuclear breakthrough is foreseeable. In fact, an increase by orders of magnitude in the amount of energy released from matter is excluded by one of the most thoroughly established laws of physics. The U.S. and the U.S.S.R. already have sufficient weapons to destroy each other and further "improvements" in nuclear weapons will not alter this situation significantly.

What are the non-military factors which should be considered? We list four that deserve consideration:

1. The Soviet Union has announced that it will resume atmospheric testing if we do, thus perpetuating this conspicuous aspect of the arms race. If we refrain from testing, we deprive the Soviets of this excuse. Of greater significance, such an act of self-restraint on our part may help to convince the Soviet leaders that the U.S. is in earnest about slowing the arms race and sincere in its dedication to disarmament.

2. We scientists are also concerned about the effect resumption of testing may have on our own public attitudes. For resumption of tests now cannot help but foster the impression that our security can in the long run be maintained solely by military strength. For 16 years the FAS has maintained that security must ultimately be found in political arrangements to obtain stable peace.

3. Atmospheric tests produce global fallout. The best scientific judgment is that testing affects only a very small fraction of the world's population. But it almost certainly cuts short the lives of some people in this and ensuing generations, most of whom have no voice in the decision to test.

4. A decision to resume atmospheric testing would turn world public opinion against us. But an announcement to refrain from testing would make a very favorable impression on the non-nuclear powers, and would strengthen international efforts to obtain a more stable world.

Clearly, the decision—whether or not to resume testing—must not be based solely on military considerations, but must be designed to further our long range goals and to promote national security viewed in the broadest sense. After considering these issues, and in particular because of the effect resumption of atmospheric tests will have on disarmament negotiations, the FAS Council concludes that it would be most unwise to resume such testing at this time. If the Government, after weighing these factors, decides that atmospheric tests are necessary, then we feel it owes an explanation of both the technical and political reasons for such a decision to the citizens of this country and to the nations of the world.