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CIVIL DEFENSE ACTIVITIES OF THE ATOMIC ENERGY COMMISSION

Report by Director of the Division of Biology and Medicine

THE PROBLEM

To clarify responsibilities of the AEC in the field of civil defense and to make assignments therefor.

Background and Discussion

2. The statutory basis for AEC activities in civil defense lies in the following provisions of the Atomic Energy Act:

- a. Sec. 1(a) states as a declaration of policy that the development and utilization of atomic energy shall be "subject at all times to the paramount objective of assuring the common defense and security."
- b. Sections 3(a), 4(c)(2), 5(a)(4), 5(c)(2), 7(c) and 12(a)(2) express, in part, a policy of guarding against the hazards of atomic energy. These provisions could be of hazards in research, production of material. NV0026119
- c. Sections 1(b)(2) and 10(a)(2) en dissemination of information in processes of scientific progress.


CLASSIFICATION	DECLASSIFY	EXEMPT
1. UNCLASSIFIED	2. CONFIDENTIAL	3. SECRET
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3. Recent developments in other Federal agencies connected with civil defense are briefly summarized as follows:

- a. By Directive of March 27, 1948 Secretary of Defense Forrestal created an Office of Civil Defense Planning within the National Military Establishment "to provide for the development of

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detailed plans for, and the establishment of, an integrated national program of civil defense; to secure proper coordination and direction of all civil defense matters affecting the NME; and to provide an effective means of liaison between the NME and other governmental and private agencies on questions of civil defense." Mr. Russell J. Hopley was appointed OCDFP Director, being responsible directly to the Secretary of Defense.

- b. A comprehensive report, "Civil Defense for National Security," was submitted by the Director of OCDFP to the Secretary of Defense on October 1, 1948. This report commonly referred to as the "Hopley Report," strongly recommended the establishment of a permanent Office of Civil Defense in the NME to be responsible for both the planning and operational aspects of civil defense in accordance with the detailed scheme outlined in the Report. This included direction and coordination at the Federal level of the work of state and local civil defense organizations. The recommendations of the Hopley Report were never instituted although the OCDFP continued to function in its planning capacity until recently.
- c. By Presidential directive of March 3, 1949 the National Security Resources Board was instructed "to assume * * * * * leadership in civil defense planning and to develop a program which will be adequate for the Nation's needs." The Presidential memo stated "Under present conditions the essential need of the

[REDACTED]

Federal Government in the area of civil defense is peacetime planning rather than operation of a full-scale civil defense program. Therefore I see no need to establish at this time a permanent organization, such as a proposed Office of Civil Defense. Rather, I see a definite necessity to continue planning for civil defense and an immediate need to fix in a responsible agency definite leadership for such planning. Since peacetime civil defense planning is related to, and a part of, over-all mobilization planning of the Nation in peacetime, I have concluded that the NSRB, which is charged with advising me concerning the coordination of such over-all mobilization planning, is the appropriate agency which should also exercise leadership in civil defense planning."

- d. In accordance with a directive from the Acting Chairman, NSRB, dated March 29, 1949, "A Report on Civil Defense Planning" was prepared by the Office of Mobilization Procedures and Organization, NSRB. This report, hereafter referred to as the "Gill Report" summarized the current situation as of May 1949 with respect to Federal government civil defense thinking and activities. AEC among other concerned agencies was asked to contribute a statement as to its civil defense situation. This statement is attached hereto as Appendix "A". The Gill Report envisages the broad field of civil defense as comprised of the following separable functions:

- (1) Civilian participation in active defense
- (2) Wartime disaster relief

- [REDACTED]
- (3) Peacetime disaster relief
 - (4) Internal security
 - (5) Volunteer war activities

The Report recommends that "primary responsibility" for the first two functions only be made at this time to the appropriate agencies—the NME in the case of (1) above and the General Services Administration*in the case of (2). The AEC is included as one of several "participating agencies" associated with the GSA in its primary responsibility for wartime disaster relief.

- e. The "participating agencies" were asked to submit to NSRB directly, comments on these proposals. The reply of AEC is contained in a letter from Chairman Lilienthal to Mr. Steelman, Acting Chairman, NSRB, dated 7-7-49^{***} stating in part:

"We note the proposed assignment to the GSA of primary planning responsibility in the immediate future for wartime disaster relief and the listing of the AEC as a participating agency in this planning program. The Commission will, of course, be glad to assist the GSA in the fulfilment of its responsibilities. . . . The Commission feels that it can make an important contribution by making available to the GSA technical information on which planning for disaster relief against radiological warfare must necessarily be based. . We anticipate that the Commission's role in civil defense planning will be in large measure one of supplying information to other agencies with primary responsibility for civil defense planning."

- f. By terms of Presidential Reorganization Plan No. 4 of 1949, the NSRB was transferred, effective 8-20-49, from the Department of National Defense to the Executive Office of the President.

- 4. The Atomic Energy Commission to date has done the following:

*Formerly the Federal Works Agency

** Copy on file in Secretary [REDACTED]

- [REDACTED]
- a. Reviewed the hazards that might exist in its own installations in event of an atomic disaster or attack and considered the best ways of meeting them. Special studies have been made of OakRidge, Hanford, and the Washington office, as presenting problems of fairly typical nature.
 - b. Studied and determined upon and is assembling sample quantities of types of radiation detection instruments for use in event of an emergency.
 - c. Initiated organization of groups of emergency monitoring personnel in Atomic Energy Commission major installations, prepared to make radiation hazard surveys of any area attacked.
 - d. Collected (and is continuing to collect) all available data on the effects of atomic explosions on man, animals, plants, and physical structures. Knowledge gained from September, 1945 up to now from Hiroshima and Nagasaki is of great value, as are the Bikini and Eniwetok data. The forthcoming Eniwetok tests are being planned to fill in gaps in that knowledge and to orient it in terms of modern types of bombs.
 - e. Carried on (and is continuously emphasizing) research in the effect of radiation on living matter and its constituents. This is being done both in Atomic Energy Commission, university, hospital, and other research laboratories. This work is essential to any attempts toward protection or treatment.
 - f. Cooperated with the NME in providing data for and reviewing the Hopley Report.

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- g. Considered with the NME the problems of radiological warfare.
- h. Cooperated with the NME in the preparation of a Weapons Effect handbook containing basic data essential for civil defense planning.
- i. Engaged in a fellowship program which includes the medical and biological sciences as they relate to atomic energy and health physics. The objective is to add to the pool of trained personnel for the Country's atomic energy enterprise. Such trained personnel may well prove useful also in radiological defense measures and in training others for such purposes.
- j. Sponsored, in cooperation with the Armed Forces, special training courses in the medical aspects of atomic energy for selected military, naval, airforce, and PHS officers at Oak Ridge, Los Alamos and four AEC regional training centers.
- k. Contracted with the University of Michigan Survey Research Center for a survey of the state of knowledge and attitudes toward radiation hazards. (AEC 157 series).
- l. Participated on the Interdepartmental Working Committee of the NSRB on underground structures and protective construction.
- m. Through participation on another classified Committee, is assuring that civil defense problems are considered in any future test of explosives.
- n. Participated on Interdivisional Committee on Educational Implications of Atomic Energy. (Established by FSA, Office of Education).

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5. After a full discussion of civil defense problems the Advisory Committee for Biology and Medicine at the 12th meeting held on October 8-9, 1948 unanimously endorsed the recommendation of the Division of Biology and Medicine "That in view of the danger to human life, and in fact to all life, the AEC should feel responsible and take an active role in imparting general knowledge and data to the public." The Advisory Committee for Biology and Medicine further recommended at the 14th meeting on February 12, 1949 as follows:

"The people of the United States naturally look to the Atomic Energy Commission for precise information regarding atomic energy, urgent requests for such information are being made, and it should therefore be understood that one of the important obligations of the Commission is to disseminate the information.

"The Advisory Committee for Biology and Medicine recommends that the Atomic Energy Commission select and appoint a staff member to give his entire attention to collecting the necessary information and to studying the relations and activities of the Atomic Energy Commission in relation to agencies concerned with defense of the civilian population and the training of appropriate personnel to handle disaster due to atomic warfare.

"The identity, programs and personnel of groups concerned with Civilian Defense should be determined and listed. The type and range of information that the Atomic Energy Commission can release to such organizations should be determined and formulated, and in so far as is not clearly inconsistent with national interest, the Atomic Energy Commission should disseminate facts regarding the extent and limitations of atomic energy, this dissemination having as its purpose allaying extravagant fears and creating a consciousness of real dangers. We believe that a well and truly-informed public is the best guarantee of effective organization and maintenance of disaster relief. We would, therefore, recommend that the above-mentioned staff member pursue a long term study of the relationships with civilian defense agencies, in order to improve them and stimulate their organization as well and as soon as possible."

Conclusions

6. The urgency of AEC participation in the civil defense program, to the fullest extent consistent with its assigned role, is indicated by the recent Presidential announcement of a Russian atomic explosion

Russian atomic
positive civil
and delegated



~~obligation is increased materially.~~

7. The AEC has sufficient statutory authority upon which to base ~~its~~ ^{the} civil defense program. In addition, ~~there is the designation of~~ ^{the AEC has been} ~~the AEC~~ ^{designated} by the NSRB as a participating agency in the program of wartime disaster relief, overall responsibility for which is assigned to the GSA. It might be mentioned that the organizational shift of the NSRB to the Executive Office of the President serves to strengthen the position of the NSRB as a direct agent of the President and hence lends additional weight to these assignments.

8. It would seem advisable that AEC efforts ~~in its~~ ^{in its} ~~for~~ ^{appropriate} civil defense activities be made known to the public. ~~announcement~~ ^{announcement} there have been ~~the lack of concrete~~ ^{the lack of concrete} ~~ing.~~ ^{ing.} Thus, even dis- regarding the primary consideration of the public welfare, it is imperative in the interests of continued favorable public relations for the AEC, to announce publicly the AEC contribution to civil defense.

Recommendations

9. It is therefore recommended that the Commission:

a. Reaffirm that the AEC has a responsibility to provide scientific, ~~the~~ ^{the} ~~problem of~~ ^{problem of} ~~data relating to~~ ^{data relating to} the effects of atomic weapons, for civil defense planning;

b. Note that the Division of ~~Atomic Energy~~ ^{Atomic Energy} has responsibility for coordination of the civil defense activities of



[REDACTED]

the Commission and for liaison of these activities with the NSRB, the NSC, the GSA, and other interested agencies.

c. Note that the divisions of the Commission are responsible for the preparation of information and for technical consultation in the following categories. The Division with primary responsibility is noted:

- | | |
|---|---|
| (1) Blast effects on structures and utilities | Division of Engineering
Div. of Biology & Medicine |
| (2) Shielding and shelters | Same as (1) |
| (3) Blast effects on personnel | Div. of Biology & Medicine |
| (4) Burns | Div. of Biology & Medicine |
| (5) Ionizing radiation injuries | Div. of Biology & Medicine |
| (6) Radioactive decontamination | Div. of Biology & Medicine
Division of Engineering |
| (7) Medical care for casualties and refugees | Div. of Biology & Medicine |
| (8) Radiological safety detection and measurement | Division of Production
Div. of Biology & Medicine |
| (9) Educational and information programs | Div. of Pub. & Tech. Inf.
Div. of Biology and Medicine |

d. Note that the following unclassified studies and manual will be undertaken, and after Commission approval will be disseminated in conjunction with NSRB:

- (1) A paper for doctors on treatment of persons exposed to radiation.
- (2) A paper for the engineering profession and construction industry, "Atomic Bomb vs. Buildings."

[REDACTED]

- (3) A paper for city planners *concerning* Atomic Energy Aspects of Dispersal, etc.
- (4) A manual for operation and maintenance of monitoring instruments, with standards of tolerance.
- (5) A paper on decontamination.

- e. Approve for transmittal the statement "The City of Washington and an Atomic Bomb Attack" ~~attached~~ (Appendix "C"; previously circulated as AEC 186/1), by means of letters to the Acting Chairman, NSRB, and to the Executive Secretary, NSC, such as that in Appendix "B";
- f. Note that recommendations will subsequently be made as to appropriate means for informing the public of AEC civil defense activities;
- g. Notes that the Joint Committee and the MLC will be informed of the action approved in this paper.

LIST OF INCLOSURES

	APPENDIX "A"
	STATEMENT OF AEC ACTIVITIES IN THE FIELD OF CIVIL DEFENSE
	APPENDIX "B"
	DRAFT LETTER TO NSRB AND NSC
	APPENDIX "C"
	THE CITY OF WASHINGTON AND AN ATOMIC BOMB ATTACK

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STATEMENT OF A.E.C. ACTIVITIES IN THE FIELD OF CIVIL DEFENSE

The Atomic Energy Act designates a number of functions to the AEC which are pertinent to a program of planning for and activities in civil defense. First, the AEC is required to establish a program for the control of scientific and technical information relating to atomic energy in such a manner as to assure the common defense and security. Second, the AEC is directed to arrange for the conduct of research and development activities relating to the utilization of fissionable and radioactive materials for medical, biological, health or military purposes and for the protection of health during research and production activities. Third, the AEC is authorized to establish such standards and instructions as may be indicated to protect health and to minimize danger from explosions.

In view of these and other provisions of the Act, the Commission feels that it may properly assume a responsibility for the dissemination of atomic energy information to appropriate agencies within the government or to the public. The AEC recognizes its unique position in regard to the accumulation of information in the field of atomic energy and is anxious to cooperate in furnishing information to any agency designated with responsibility for planning and action in regard to civil defense.

The AEC has information on a number of pertinent problems and there is a considerable volume of research and development in the facilities of the AEC and its contractors which is pertinent to civil defense. The AEC also supports through direct contracts related research in a number of colleges, universities and hospitals. Thus, the AEC could be looked to for information

APPENDIX "A"

in the following fields under atomic weapons.

1. Blast effects on structures
2. Blast effects on utilities
3. Blast effects on personnel
4. Burns
5. Ionizing radiation injury
6. Shielding and shelters
7. Medical care for casualties and refugees
8. Psychological problems
9. Radiological safety - including instrumentation for the detection and measurement of atomic energy
10. Training of personnel

In regard to the problem of training, the Commission has already established several programs which include the training of physicians, biologists and biophysicists in the broad field of atomic energy and the training of technicians to detect and measure radioactivity. Within these groups it is anticipated that there will develop the future teachers in these fields.

The AEC is conscious of the necessity for planning to meet any eventuality in the case of disaster at a Commission installation. Accordingly, we are organizing at our major installations disaster teams skilled in the use of detection instruments who would be available in the event of an accident within Commission facilities. It is apparent that these could contribute to any program of civil defense.

Since a majority of the activities of the AEC in this regard fall within the responsibility of the Division of Biology and Medicine, the members of this Division will represent the Commission in the field of Civil Defense Planning.

APPENDIX "A"

APPENDIX "B"


DRAFT LETTER FROM CHAIRMAN, AEC TO EXECUTIVE SECRETARY,
NATIONAL SECURITY COUNCIL *and ACTING CHAIRMAN, NSRB*

1. In recent months, this Commission's staff has estimated the character and extent of damage that might be done by atomic attack to major installations of the atomic energy program. One of the surveys has covered the headquarters installation in Washington. In this case, however, the survey group for obvious reasons considered the city as a whole, rather than the AEC building.

2. The recent atomic explosion in Russia brings closer the time when decisions must be made on major issues of civilian defense, including the matter of dispersal out from congested urban areas of facilities such as those of Government in Washington. The staff members who made the survey for the Commission recommend strongly that dispersal be considered here, and elsewhere. Their report also comments on problems of providing warning of attack, shelters, fire-fighting after an attack, medical care, etc.

3. The Commission is providing this brief summary report to the National Security Resources Board which bears the primary responsibility for civil defense planning, as we have provided and will provide other information pertinent to civil defense that comes from our research and operations.

4. We also bring the paper to the attention of the National Security Council in the belief that the Council may well wish to consider now the important national policy question of dispersal of facilities from urban centers.


APPENDIX "B"

DRAFT LETTER FROM CHAIRMAN, AEC TO CHAIRMAN, NATIONAL SECURITY
RESOURCES BOARD

1. There is attached a report entitled "The City of Washington and an Atomic Bomb Attack." This report is based on the available unclassified reports on the effects of an atomic bomb and the experience in this regard of the members of the Commission staff.

2. We recognize the important questions that this report raises and we feel that they require careful consideration. The Commission and its Staff stand ready to discuss the scientific and technical implications at greater length with whatever group is asked to consider this report.

THE CITY OF WASHINGTON AND AN ATOMIC BOMB ATTACK

The effects of the explosion of an atomic bomb in a metropolitan area and the problems in civil defense that ensue differ in both quality and quantity from those of high explosive bombing.

The experience of the bombed cities of England and Germany may be utilized for lessons in fighting fires, rescue of trapped personnel, and large-scale care for the wounded and homeless. Knowledge of the problems which are peculiar to an atomic bomb attack, on the contrary, must come from a study of what occurred at Hiroshima and Nagasaki where the bombs were fused to detonate high in the air. The Japanese estimated that the heights of burst were 550 to 600 meters, that is, approximately 1800 to 1970 feet. While there is no assurance that an enemy might not detonate his bomb in water adjacent to a city, on the surface of the ground, or underground--each of which would bring its own unique problems--it is more likely that he would resort to an air burst because the latter would devastate a larger area on the surface of the ground. That is, a bomb equal in power to the Nagasaki bomb, if detonated in air over an American or European city, would crush or otherwise render useless the residences, as an example, over an area of 6 to 8 square miles. It presents not only a radiation hazard, but an explosive hazard beyond any block-busters and a fire hazard beyond any incendiaries.

From such a burst there would be four effects near the surface of the ground: (1) blast, that is, a wave traveling with approximately the velocity of sound would engulf objects in a high pressure, (2) wind of considerable velocity would follow the blast as the highly heated air near the point of detonation expanded, (3) heat traveling with the velocity of light, would

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strike exposed objects and kindle fires and (4) radiation would penetrate the bodies of exposed personnel. Two additional effects should be mentioned. First, from the detonation of the bomb there would result highly radioactive fission products which would rise with the cloud from the bomb to be scattered harmlessly at great distances by the air. Second, near ground zero--the point on the ground directly beneath the point of burst--the radiation would cause objects to become radioactive but at a level which, to judge by Japanese experience, would be harmless to those who entered the area on rescue missions immediately after the incident.

If an atomic bomb is exploded quite close to the ground, as at Alamogordo there will be a small area of residual radioactivity. If a bomb is exploded in water, such as Test Baker at Bikini, there will be considerable amounts of residual radioactivity, depending upon wind, currents, tides and the size of the body of water.

The blast and wind, which may be considered together, would crush or render unusable the ordinary load-bearing brick wall dwellings for a distance of 7000 or 8000 feet from ground zero, would severely damage steel mill-type buildings for a distance of 4000 to 5000 feet, and would cause substantial structure damage in multi-story steel or reinforced concrete buildings up to distances of 2500 feet.

Accordingly, in an instant the usually dependable telephone, telegraph, electric service, and transportation (both public and private) would cease to exist in the damaged area. Also, because of the numerous broken pipes in houses, water pressure would fall to near nothing.

In addition to the direct fires which would follow the flash heat, there would be many more which would start from broken gas and electric lines and in

[REDACTED]

particular, from combustible material coming into contact with cooking and process fires. Firefighting equipment inside the damaged area would probably be crushed by the collapse of the firehouses and with water pressure gone the many fires would speedily merge to destroy the greater part of the crushed area.

While this is happening, what would be the fate of the people? In Japan, the number of casualties was enormous because the attacking planes were not heeded and people were caught in the open or with inadequate cover. Consequently, great numbers were badly burned by the flash, many so severely that they died within a short time, or were exposed to such a level of radiation that they died. As radiation passes through the body in any considerable amount a number of tissues which are necessary for normal health are damaged. At Hiroshima and Nagasaki everyone within one-half mile not protected by earth, steel or concrete died and the incidence of radiation injury was very high up to approximately one and a quarter miles from ground zero.

With adequate warning which was heeded and adequate shelters which were occupied the casualties could be greatly reduced. Furthermore, doctors with ample medical supplies, hospital facilities, and blood banks would save many of those who were injured by blast or burns.

No one can do the enemy's thinking for him and decide what he would select as his aiming point in Washington. In addition to some purely military establishments like the Naval Gun Factory, there are three obvious targets: (1) The Pentagon, (2) the area near the Capitol which includes the Senate and House Office Buildings and the Union Station, and (3), assuming 5000 feet as the diameter of the circle in which there would be severe damage, the area in which is located the White House, Treasury Department, Executive Office, State



Department, Interior Department, Navy Department, Pan American Union, Federal Power Commission, Court of Claims, Brookings Institution, National Advisory Committee for Aeronautics, Inter-American Defense Board, American Council on Education, Carnegie Endowment for International Peace, Red Cross, Federal Works Agency, Veterans Administration, Federal Reserve, Reconstruction Finance Corporation, and Atomic Energy Commission. Aiming accuracy being something less than perfect, it is clear that other sites on the rim of the area would also be endangered.

The 5000-foot diameter circle has been assumed somewhat arbitrarily. It is known from the experience in Japan that at distances of 2500 feet from ground zero substantial modern tall buildings would suffer such damage that 10 to 15 per cent of their main columns and beams would require replacement, much of their outer wall shell would be stripped off, and they would lose their partitions and their windows. As the distances to ground zero became less the damage would become progressively greater.

Because it represents modern construction and because the data are available, the Atomic Energy Commission Building is selected as an object for study. Would it protect its population in an attack? From its plans it is found that the building has the following above its floors:

<u>Cover Above</u>	<u>Inches of Concrete</u>
Attic Floor	2-1/2
3rd Floor	9-1/2
2nd Floor	17-1/2
1st Floor	25-1/2
Basement	33-1/2

The maximum thickness mentioned, that is, 32 to 34 inches, may protect against the radiation hazard from a bomb detonating overhead at a height of



[REDACTED]

1800 feet. No one can predict the strength of an enemy's bomb. Furthermore, windows, partitions and possibly walls would become missiles. There would be approximately 80% casualties and added to this an unknown number of radiation deaths. Naturally, less substantial buildings and their inhabitants would suffer much greater damage. The inevitable conclusion is that the building should be abandoned in the event of an impending attack, or well before.

These predictions for the AEC building are generally applicable to Government buildings in Washington.

Metropolitan business districts, in which there are great concentrations of population during working hours, are additional vulnerable areas. Shelters for these populations may be provided in basements and in the interior of lower stories of large buildings if the work is undertaken in time.

It must be regarded as probable that fire will spread from the outside to buildings which have been opened by blast and that, in the absence of firefighting, their contents will be destroyed. In consequence, valuable records or microfilm copies should be removed to storage vaults.

Those agencies in the circle of probable severe damage with the Atomic Energy Commission, which for any reason should not be moved, as well as the Capitol and the Office Buildings, and the Pentagon, should initiate immediately individual studies to establish nearby safe shelters. However, adequate warnings must be assumed for any shelter to be effective. Hence, dispersal is far preferable.

The hard fact is that a shelter system, while saving the lives of the persons who take shelter, does not guarantee the resumption of vital functions. For example, in the event of an attack upon the Atomic Energy Commission building the building would be completely destroyed and

[REDACTED]

following the attack those who emerged from the shelter would be quite helpless to carry on the far-flung operations of the atomic energy program.

The alternative to the shelter system and an alternative which not only saves the lives of key personnel but also permits at the same time a continuance of the vital governmental operating functions is--dispersal. It is the only safe alternative. The problems which it presents, physical, financial and psychological, are obviously tremendous and beyond the scope of this paper and the authority of this agency.

Long-range community planning to place projected hospital, fire stations and other essential emergency services in properly dispersed fashion should be encouraged. Routes available for emergency evacuation should be planned. These may well provide effective fire lanes through areas now highly vulnerable.

The attractiveness of the target vanishes with dispersal of some or all mentioned agencies. of the above/ Scattered in the outskirts of the Washington area with distances of perhaps two miles between targets, the agencies would have a fair measure of security because no single one of them would be likely to warrant the expenditure of a bomb. Also, and equally important, persons who live adjacent to the original area would be less in jeopardy because the enemy would seek his target elsewhere.

To avoid extreme confusion, such a program of dispersal should be undertaken now. To wait until the move must be made in haste will put an intolerable load on transportation, utilities, and construction forces. All areas in the United States are not equally vulnerable to attack. Many large communities would be in no danger, provided an enemy were to confine his attention to

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targets with a conceivable military value. Competent authority, perhaps the National Military Establishment, should designate such threatened targets and plans should be prepared for evacuating the adjacent areas when an attack seems imminent. Safe shelters must be provided for workers who must remain.

From the experience at Hiroshima and Nagasaki it is clear that if an attack comes to an unwarned population the most that can be expected of them will be that the uninjured will rescue those who are trapped or injured before they are reached by fire. Because of the confusion and destruction which will follow a bomb burst, general relief must come from the outside. Washington, if attacked, would look for help—that is, for workers, supplies, and equipment—from its outlying undamaged ring and its suburban areas and from cities as distant as Baltimore, Philadelphia and Richmond. Relief must be organized with this in view. Supplies, supplementary firefighting equipment and new hospitals must be kept outside vulnerable areas. Plans must be made now for housing, clothing and feeding those persons who are forced to evacuate threatened areas or who survive in attacked areas.

Safety will in large measure depend upon adequate warning of an attack, warning which it must be assumed will come from the radar system of the National Military Establishment. Such warning, when combined with shelters for those who must stay in threatened areas, will minimize, or even eliminate, casualties. Less effective measures may result in panic, suffering, and 80,000 deaths as at Hiroshima.