Disaster Study Number 12

Symposium on

HUMAN PROBLEMS IN

The Utilization of Fallout Shelters

11 and 12 February 1960

Editors

GEORGE W. BAKER and JOHN H. ROHRER

With the Assistance of

MARK J NEARMAN

Disaster Research Group

National Academy of Sciences—

National Research Council

Publication 800

DISASTER RESEARCH GROUP

The Disaster Research Group is an activity of the Division of Anthropology and Psychology, National Academy of Sciences — National Research Council. It succeeds and carries on many of the functions of the Committee on Disaster Studies, which met under the auspices of the Division of Anthropology and Psychology from 1952 to 1957.

The Disaster Research Group conducts research, sponsors conferences and publications, and advises with officials on problems of human behavior in disaster and civil defense. It continues publication of the Disaster Study Series initiated by the Committee on Disaster Studies.

At present its activities are supported by a grant from the National Institute of Mental Health of the Department of Health, Education, and Welfare, a contract with the Office of Civil and Defense Mobilization, and a grant from the Ford Foundation.

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National Research Council,
Disaster Research Group
Division of Anthropology and Psychology

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Held at the National Academy of Sciences
Washington, D. C.
11 and 12 February 1960

Editors

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Publication 800
National Academy of Sciences — National Research Council
Washington, D. C.
1960

This symposium was conducted under Contract No. CD-SR-58-70 with the Office of Civil and Defense Mobilization. The contract is monitored by the Office's Social Sciences Division.

Library of Congress
Catalog Card Number 60-60074

Available from
Printing and Publishing Office
National Academy of Sciences — National Research Council
Washington, D. C.

Price $3.00

PREFACE

The use of thermonuclear power as a weapon of war represents one of the greatest challenges to survival that has ever confronted society. To date, there is little reason to hope that society's regulatory agencies can completely control the use of this new development. Until such control is achieved, the preservation of society may require that we content ourselves with such interim innovations as fallout shelters.

Changes in culture occasioned by the introduction of innovations have sometimes posed extremely complex and challenging problems for planners and administrators. The difficulty, as students of society have known for many years, stems partly from the fact that material and non-material components of a culture are necessarily interrelated and their relationships are conditioned by a complex of basic values. More importantly, the student knows that a satisfactory integration of the new material component does not proceed automatically. Nor does the most lucid and authoritative presentation of all pertinent facts necessarily ensure a prompt or satisfactory adoption of a new element. Changes in basic material culture may require the most sophisticated planning considerations.

Since the announcement of a National Policy on Shelters on 7 May 1958, a number of things have become fairly clear about Civil Defense. The subject has been ably and publicly discussed by such national figures as Governor Nelson Rockefeller, and it has been examined in such published works as "Spectrum of Conflict 1960-1970," Stanford Research Institute Journal, (1959, 3), and George A. Steiner, "Civilian Problems in Surviving Attack," Business Horizons, (1960, 3, 52-61).

From such contributions there has emerged an awareness that presentation of the facts of the radiation hazard and the recommendation of a means for insuring some protection (building a fallout shelter) from the hazard have not resulted in widespread adoption of the remedy. Admittedly this failure poses vast problems for the administrators who are responsible for implementing the shelter policy, as well as the scientists who devote some of their time to a consideration of civil defense.

In December 1959, the Disaster Research Group of the National Academy of Sciences-National Research Council and the Social Sciences Division of the Office of Civil and Defense Mobilization recognized the need to focus some concerted scientific and administrative attention on (a) the requirements for getting shelters built in our contemporary society and (b) the identification and analysis of the wide range of human problems that would be encountered in a general adoption and use of fallout shelters. This was followed by a decision to invite representatives from these specialities to a meeting devoted to a general consideration of the subject. In orienting the invited participants, it was pointed out that the fallout shelter concept involved planning considerations for three periods: pre-occupancy, occupancy, and post-occupancy.

In developing the program for the symposium, the speed with which it was convened necessarily argued for a primary consideration of scientific papers that would be based on completed and ongoing research projects. Fortunately, as the contents of this document indicates, a number of these were available within the programs of the Disaster Research Group and the Office of Civil and Defense Mobilization.

The interested reader can find a more detailed consideration of the subjects presented herein by A. D. Biderman, D. C. Miller, E. J. Murray, J. H. Rohrer, and J. A. Vernon in working papers that they wrote for the Disaster Research Group. These were reproduced in Appendices for an Analysis of Several Surveys Relative to Problems of Shelter Habitability, (Washington, D. C.: NAS-NRC, Disaster Research Group, 1960). Also, D. N. Michael's paper was based on a larger report, Procedures for Managing Large Fallout Shelters, (Stanford, Conn.: Dunlap & Associates, Inc., 1959).

By scheduling the meeting immediately after the Academy-Research Council's 8-10 February 1960 Conference on Environmental Engineering in Protective Shelters, it was possible to secure contributions by two authorities who are most knowledgeable on the shelter programs of Sweden and Germany. The availability of a number of scholars who have contributed to the development of disaster research also greatly facilitated the speed with which the symposium program was developed. Space and working considerations dictated that the total number of participants be kept under sixty. Clearly, many additional scientists and administrators would have been invited to participate in the symposium if it had not been necessary to observe these criteria.

George W. Baker
14 July 1960

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ORIENTATION

Chairman, George W. Baker

Introduction to the Symposium

The Social Science Research Implications
of the National Fallout Shelter Program

INTRODUCTION TO THE SYMPOSIUM

Gerald R. Gallagher
Office of Civil and Defense Mobilization

I want to welcome you on behalf of the Office of Civil and Defense Mobilization. We are pleased and grateful to see so many distinguished people present for this Symposium on Human Problems in the Utilization of Fallout Shelters. I take it as an indication of the importance of the subject that you have seen fit to take time out of your crowded schedules to be here. A number of you were present at the Symposium on Environmental Engineering in Protective Shelters during the first three days of this week. That was an excellent and highly significant meeting and I fully expect that this symposium will be equally successful.

As background for your discussions, I think a brief review of the present National Policy on Shelters would be helpful. The policy was announced on May 7, 1958, by Governor Hoegh by direction from the President. It states that, in the event of nuclear attack on this country, fallout shelters offer the best single nonmilitary defense measure for the protection of the greatest number of our people. It is stated further that the Administration's national civil defense policy, which presently includes planning for the movement of people from target areas if time permits, will now also include the use of shelters to provide protection from radioactive fallout. To implement this established policy, it was determined that the Administration would undertake these specific actions:

(a) The Administration will bring to every American all of the facts as to the possible effects of nuclear attack and inform him of the steps that he and his State and local governments can take to minimize such effects.

(b) The Administration will initiate a survey of existing structures on a sampling basis, in order to assemble definite information on the capabilities of existing structures to provide fallout shelter, particularly in larger cities.

(c) The Administration will accelerate research in order to show how fallout shelters may be incorporated in existing, as well as in new, buildings.

(d) The Administration will construct a limited number of prototype shelters of various kinds, suitable to different geographical and climatic areas.

(e) The Administration will provide leadership and example by incorporating fallout shelters in appropriate new Federal buildings hereafter designed for civilian use.

The Administration has undertaken all of these actions and, in addition, is taking steps to incorporate fallout shelters in existing Federal buildings.

It is noted in the policy statement that Federal example is an indispensable element to stimulate State and local governments and private investment for fallout shelters. Community use of shelters in Federal buildings is contemplated.

The policy then is one of strong endorsement of the requirements for fallout shelters and assignment of responsibility for the construction of shelters to the individual, be it the individual home owner, the individual industry, or the individual government. The policy stated flatly that there will be no massive, Federally-financed shelter construction program.

I think it would also be of interest to this audience to review some of the background that led to the present shelter policy. As you are well aware, shelter is by no means a new consideration in civil defense. In World War II, shelters were a basic element of defense for civilians against air attack. Since the Federal Civil Defense Administration's establishment in 1951, shelters have been considered a major element in the agency's planning of defense for the civilian population against nuclear weapons.

You may well be confused by my reference to the Federal Civil Defense Administration here and other references to the Office of Civil and Defense Mobilization. The Federal Civil Defense Administration was a predecessor agency to the present Office of Civil and Defense Mobilization. The Office of Defense Mobilization and the Federal Civil Defense Administration were combined into the Office of Civil and Defense Mobilization in July 1958.

It is true that the shelter we planned for in 1951 was essentially blast shelter, although it provided protection against direct

radiation effects as well as thermal effects. The blast protection required was of a relatively low order because in those days it was considered that the small nuclear weapons of that time would be exploded at a so-called optimum height of burst that would assure a maximum distribution of effect from blast, though the blast pressures even at ground zero would be of comparatively low magnitude. It was not until 1954, following the Castle Test Series in the Pacific, that appreciation began to grow for the extent of the fallout hazard that could result from the explosion of large weapons in contact with the ground. At that time, fallout shelters as such, began to come into the picture, although continuing attention was given to the problem of protection against blast, direct radiation, and thermal effects.

As the megaton weapons became an actuality, there was a period in 1954 and 1955 when many people felt that shelter as a protection against these weapons was completely impractical. Emphasis at this time was placed on protection by evacuation (by movement of people away from probable targets). It should be emphasized that civil defense planners were aware that with the development of the intercontinental missile the time available for evacuation would be very minimal, although it must be conceded that missile development moved somewhat faster than anticipated, so that by 1956 it was clear that shelter must be considered again as a major tactic in the protection of the civilian population. It was assumed that entry time for shelter in the target areas would be no more than 20 minutes to a half-hour, which was based on a hopeful estimate of warning time that could be developed against missiles. For fallout shelters away from target areas it was assumed there would be substantially more time before the fallout came down and presented a lethal hazard.

In December 1956, as a means of bringing about policy development in the Government in respect to shelter, the Federal Civil Defense Administration made a proposal for a national shelter program that would combine blast shelters of median quality and fallout shelters in areas away from targets where the probability of blast damage was low. It should be emphasized that at no time in the planning of civil defense measures has it been considered that absolute protection could be provided at all times to all of the population. Practical measures would fall somewhat short of that objective because of the extreme situations with which we are contending.

Following the FCDA proposal, the subject of shelter in all of its aspects was given the most intensive study throughout the Federal Government. Connected with any proposal for shelter were

the obvious considerations of the effect on international relations and questions of feasibility and practicality from the standpoint of cost and the employment of resources. The study given to the problem during 1957 at the highest levels of Government resulted in what we consider a quite rational conclusion in the light of all the facts, i.e., the policy enunciated by Governor Hoegh in May 1958, which I previously described.

The earlier proposals by FCDA looked at optimum qualities of protection in programs to be undertaken on a comprehensive national basis and supported by public funds. Our designs purposely offered a high level of potential protection. With the adoption of the policy that places responsibility for the construction of shelters on the individual, it was necessary to change our approach in shelter design and concentrate on designs of lowest possible cost. This shift in policy reflects compromises in the level of protection assumed and emphasizes simple construction detail so that the shelter could, in large measure, be constructed by the average householder on a do-it-yourself basis.

I should note here that as our research proceeded we found that the lower levels of protection on which present designs are based provide a very great life-saving potential for the country, and in fact, it has been demonstrated that there exists a very substantial resource in the way of fallout protection in existing buildings. Certainly we can go a long way in meeting the requirements for fallout protection by the improvement of space that now exists.

Our concentration on low cost measures, which were calculated to be attractive to the individual home owner, industry, or government, has made it all the more imperative that the human problems in the utilization of such shelter be closely examined. Austerity is our watchword in shelter. In my opinion, it must be in the forefront of consideration of shelter habitability problems in this symposium.

I think that definite progress is being made in selling the need for fallout shelters to the American people. You have undoubtedly noted increasing emphasis on the subject in your newspapers. Two recent events merit mention because of their significance. On January 25, a conference on fallout protection was held in the White House with the Special Committee on Civil Defense of the Governors' Conference. The Chairman of that Committee is Governor Rockefeller. The same Committee introduced a resolution, which was adopted at the annual Governors' Conference in Puerto Rico last August, accepting the need for fallout shelters and indicating responsibility on the part of State Governors to promote

shelter construction. Governor Rockefeller has pursued this activity in the State of New York and he has a task force working at this time on a report that will be available in the relatively near future proposing a specific program for the State of New York.

I repeat that we are very appreciative of your presence here and I am certain that the discussions in this symposium will be of great significance in the furtherance of the shelter program.

THE SOCIAL SCIENCE RESEARCH IMPLICATIONS OF THE NATIONAL FALLOUT SHELTER PROGRAM

Ralph L. Garrett
Office of Civil and Defense Mobilization

Before examining the social science research implications of the fallout shelter program as we see them, I should like first to review briefly the context within which the Social Sciences Division of the Office of Civil and Defense Mobilization (OCDM) operates. I think it useful to set the stage by referring to the relationship of the OCDM mission to other Federal Agencies and the kinds of research for which OCDM is responsible.

The OCDM, located in the Executive Office of the President, is responsible for directing and coordinating the national civil defense effort. Within the Federal structure, the heads of Departments and Agencies, coordinated by the Director of OCDM, plan and conduct such civil defense and defense mobilization activities as are inherent in their normal responsibilities or as may have been assigned by the OCDM.

The National Plan for Civil Defense and Defense Mobilization provides that State and local governments will build civil and defense mobilization functions into their existing governments. Major responsibility is maintained by the Chief Executive of the State and local governments with the aid of trained civil defense personnel. The Executive directs the performance of these emergency functions within constituted governmental structure, augmenting the staff where needed.

Within this general responsibility, the OCDM maintains a research and development program. It has the responsibility of coordinating the research activities of the Federal Government relating to civil defense and defense mobilization activities as stated in the National Plan. It also carries out the Federal function of assisting State and local governments in their research.

Research is defined here as the investigation of or experimentation in matters affecting and affected by government, industrial, or individual actions for the protection of life and property

and for the mobilization and management of resources and production. This responsibility requires coordinating the total Federal research effort as well as assisting and coordinating the efforts of State and local governments, industries, and other non-governmental organizations in research relative to their civil and defense mobilization responsibilities.

OCDM uses the competence of all appropriate Federal agencies in the conduct of its research programs. While some difficulty has been encountered in securing funds, the agencies are making progress. As these programs develop, OCDM will have a major responsibility for coordinating and planning the total effort. Broad emergency assignments have been made to such agencies as Department of Agriculture; Department of Commerce; Federal Aviation Agency; Department of Health, Education, and Welfare; Housing and Home Finance Agency; Department of Interior; Department of Labor; and the Post Office Department. Research that does not fall within the programs and capabilities of government agencies is contracted for elsewhere.

The OCDM research program includes investigation into weapons effects; social and psychological effects; passive defense; operating systems for identifying, computing, and transmitting operational data; resource data accumulation and analysis; and equipment design and utilization. Included are studies of effects of nuclear, biological, and chemical weapons on humans, animals, and plants; studies of the effects of attack and other war situations upon government, social, and economic organizations and systems; the psychological reactions of people to disaster; and requirements essential to meet government, economic, and human needs.

Emphasis is placed on (a) the preparation of government, economic, and social controls to assure prompt and effective defense mobilization, equitable distribution of foods and services, and the return to a stable economic system; (b) measures to strengthen, preserve, and utilize the democratic processes in problems relating to reconstruction and rehabilitation; (c) preparation of the civilian population to withstand the impact of an attack and participate effectively in the recovery program; and (d) development of plans to expedite recovery to post-attack normalcy and nongovernmental controls in daily life.

In conducting its research programs, the Social Sciences Research Division of OCDM, which has been in operation about two years, uses all the social science disciplines with the exception of Economics. In developing the social science phase of the Shelter Program, the services of major research consultants have

been used. For example, the Disaster Research Group of the National Academy of Sciences-National Research Council (NAS-NRC) provides consultation and research services. Early in 1958, at the request of the OCDM, the Disaster Research Group (DRG) convened a consultant panel to consider the problems of shelter habitability and to advise OCDM on priority research in this field. Valuable advice has been provided by this Consultant Panel on Shelter Habitability, and the research in this area, which OCDM now has underway, was largely conceived by this Panel and has resulted in more definitive research programs than would otherwise have been possible.

To meet another specific need, OCDM created the Interdepartmental Ad Hoc Advisory Group on Research and Development for Food for Shelters. This committee has provided valuable advice on the requirements for research on foods for shelters. Two of the projects recommended have been undertaken: one by the Georgia Experiment Station of the University of Georgia and one by the Department of Agriculture. The possibility of funding additional food research under Public Law 480 is being explored by OCDM and the Department of Agriculture. In addition, a number of food research projects have been developed for implementation by universities and other research groups at the community level of the Prototype Shelter Program.

To provide social science guidance for the development of shelter designs, OCDM initiated a literature review of problems relating to the human occupancy of shelters, a systems analysis of problems of shelter habitability and management, and several shelter occupancy studies. This research was designed to identify special requirements for shelter occupancy, organizational structure, and human tolerances to shelter living.

During this period OCDM research, of necessity, could not be directed to the total spectrum of human factors involved in the shelter program. It had to be largely directed to the problems of shelter occupancy and the impact that the study of these problems might have on shelter design and occupancy criteria. However, it now becomes important to re-evaluate this program with the Panel and to obtain its advice on priority efforts during the coming year.

In reviewing current emphases, it is convenient to consider shelter problems as arising in four more or less distinct periods of time: (a) shelter-training, (b) shelter-taking at time of warning, (c) shelter occupancy, and (d) post-shelter living.

During the shelter-training period, the morale and attitudes of the population are greatly affected by developments of the cold war. It is within this environment that OCDM is promoting a "do-it-yourself" shelter building program, a program which depends heavily upon favorable public attitudes. In this connection the DRG was asked to assist OCDM in developing suggested research projects on knowledge and attitudes for use in the Prototype Shelter Program and a subcontractor has been engaged to provide advice and assistance in this area. The Prototype Shelter Research Program also includes plans for research on problems of shelter-taking and shelter occupancy.

Research on post-shelter living has received little attention. Research planning in this area must be expanded to include basic problems of post-attack environmental conditions to determine how human adjustments can best be facilitated by pre-attack planning. Perhaps through consideration of these problems in the research community a program can be developed that would define in a general manner the way in which these adjustments can be made. Once defined, standards or criteria could be established that would test the feasibility of carrying out various priority efforts during this period.

OCDM and the NAS-NRC are reviewing DRG functions with a view to developing a structure and methods whereby DRG can participate more broadly in the development of a social sciences research program that deals with the human problems of nonmilitary defense. This new structure will make it possible for the DRG to provide the scientific research, advice, and counsel needed for planning a total research effort.

In 1952, at the request of the Surgeons General of the Army, the Navy, and the Air Force, the NAS-NRC set up within its Division of Anthropology and Psychology a Committee on Disaster Studies (CDS). At that date, little research had been conducted on human behavior under disaster conditions. The Federal Civil Defense Administration (FCDA) did not have an integrated research and development program during this period. Subsequently, FCDA requested the assistance of the NAS-NRC in the conduct of an active research program. The NAS-NRC placed this task with the CDS. Later, the Committee became the Disaster Research Group. Considerable work has been accomplished by the DRG and their findings are a valuable consideration to the OCDM program. The studies in the area of human behavior in disaster have assisted in the development of a new field of research in the social sciences. These efforts have resulted in knowledge that has assisted greatly in the improvement of nonmilitary defense planning. In reorienting its function, nothing will detract from the contribution that has been

made by this program; in fact, the DRG is currently reviewing the findings of the various studies with a view to developing summaries or abstracts. These should have maximum immediate use to the planners. It is planned that the reoriented interests of DRG should encompass all human problems of nonmilitary defense.

The OCDM and NAS-NRC planning includes drawing together a committee of scientists who will have continuing concern with some of these human problems. The NAS-NRC is making a valuable contribution to the planning of such a program by facilitating greater involvement of the scientific community in problems relating to nonmilitary defense. The scientific problem-solving capability of our Nation is needed to help develop programs in this part of our overall defense program.

The National Shelter Policy provides for building prototype shelters throughout the country. The purpose of this program is to gain experience in the construction of facilities that incorporate protection from fallout as an integral part of shelter design and to refine knowledge of the requirements and behavior of a typical cross-section of the population who would be occupying limited shelter space for realistic periods of time. The Congress made available $2,500,000 for Fiscal Year 1960, which is being programmed at this time. This is a two-year program and an additional $3,000,000 has been requested for 1961. The shelters built under this program, in addition to providing construction experience, offer a very valuable opportunity for research and public viewing.

OCDM is preparing research guidance for State and local governments and other research groups that will conduct limited research and demonstrations in connection with these prototype shelters. During 1960. construction of approximately 152 prototype shelters is planned. These include 100 family shelters; 38 community shelters of the 50-man capacity; 4 community shelters of the 100-man capacity; 3 school shelters; 2 hospital shelters; and one each of the following types: dome shelter, understreet shelter, garage shelter, shelter in a museum or a similar construction, and a shelter under a highway fill.

These shelters, located for the most part in heavily populated areas, are financed by Federal funds. Under a contract with OCDM local communities propose to undertake certain shelter demonstration and research projects at their own expense. The contract also provides an option for the Federal Government to use the shelters for two 20-day periods for conducting research of its own in the shelters over the next two years. To date, some 55 proposals for prototype shelter projects have been received.

Proposals indicate that 20 major universities and 10 other research groups have agreed to conduct some kind of social science research in connection with the shelters. The remainder have either not specified who will undertake the local studies or have indicated only a rather general interest in research.

The planning and construction phase of the prototype shelter program is now under way and it is anticipated that research can be started on some projects in the summer of 1960. The contracting arrangement requires local groups to present proposals for approval before undertaking the research. In January 1960, OCDM issued preliminary guidelines stating research objectives and giving initial guidance in such areas as shelter design, shelter demonstration, shelter training and drills, public attitudes, and habitability studies. These initial guidelines are being supplemented by annexes suggesting specific research projects that will aid in meeting general research objectives. The projects are designed to be challenging to major universities, but they also include projects that might be accomplished by the local civil defense organizations with minimum research supervision.

Since prototype shelters will be located in heavily populated areas they will be readily accessible to many colleges and universities and will provide a unique opportunity for social science research. In addition to the locally financed and sponsored research, certain Federally financed projects are to be conducted in these shelters and it is expected that they will be used for most of the habitability research during the next two years.

The National Shelter Plan tells how sample surveys of existing structures can be made to collect information on the capability of such structures to provide fallout shelter protection. Such studies have been conducted in Tulsa, Oklahoma; Montgomery, Alabama; Milwaukee, Wisconsin; and Contra Costa, California. These studies, together with radiation shielding studies, demonstrate that there is a surprisingly large shelter potential in existing large buildings.

Based upon these findings, a pilot project has been undertaken that attempts to prescribe in one document an integrated community action program covering (a) community surveys of the shelter potential of existing buildings; (b) selection of the prospective fallout shelter buildings on the basis of the radiation fallout protection criteria; (c) the selection of buildings on the basis of their habitability criteria; (d) programs for achieving maximum protection for the maximum number of people; (e) definition of action priorities; and (f) shelter departure.

The fallout protection afforded in large existing buildings constitutes a major shelter resource. Since considerable shelter potential already exists in present structures, new shelters will be designed to close the gaps between shelter available in these buildings and the population shelter requirements. Social science research can assist in defining preferred action programs in both these areas which will achieve the greatest shelter protection for the least effort and cost.

The shelter program presents a wide range of human factors that are amenable to research. As indicated earlier, they include the human problems that would be encountered in four distinct periods of time. Adaptive responses and actions of people in shelters in an emergency will be greatly conditioned by preparatory shelter training which is considered an important readiness measure.

In civil and defense mobilization planning constant attention must be given to finding means of motivating many different audiences to undertake various emergency readiness measures. Audiences include government officials who need (a) to develop continuity of government plans, (b) to establish lines of succession to public office, (c) to provide for the safekeeping of essential records, (d) to establish centers and alternate sites for operation of government, and (e) to provide for the protection and maximum utilization of government personnel and resources.

Research relating to public information, training, and education is needed to find the best methods of informing the public, professional, institutional, and other groups about nonmilitary defense and involving them in the program.

Considerable research has been completed on the feasibility of movement and reception in connection with the development of national civil defense plans. These plans now include most of the country. With the increased speed of weapons greater reliance must extend to shelter for saving human life. However, this does not replace the value of controlled movement as a major means of protection.

If evacuation is essential, it is important to achieve a proper public response to warning. Research can contribute to the development of the most effective method of warning the population. Studies have been undertaken by OCDM as to the feasibility of various warning devices. A new device developed recently can be plugged into the power outlet and activated centrally over the existing power system. Special warning devices for radios and

television are undergoing development, but an acceptable mechanism is not available at present. Some combination of the indoor and outdoor warning devices that utilizes both sirens and an indoor warning device seems to be the best type of warning system.

The response to warning must be considered as an integral part of the warning system, and public education and training is required to achieve a proper response. Public education programs relating to response to warning signals have been conducted over some period of time. There is some evidence that people tend to respond to their own personal evaluation of the hazard rather than to the warning signal. We must find ways and means of teaching the population to recognize, accept, and respond to a warning signal.

OCDM will continue to study warning devices with a view toward achieving a widespread, rapid warning capability. The social sciences can make valuable contributions by providing data that will aid in developing the kinds of public education programs that will achieve the proper response to the signals.

We are involved in a world-wide conflict with an alien hostile ideology. The scope of this conflict involves peaceful competition, economic warfare, psychological and political tensions, rioting, border incidents, guerrilla actions, and the prospects of limited war, general war, or even mutual annihilation. Against this general background of international tension we must build effective nonmilitary defense action programs. The general morale of the American people, their willingness to support and cooperate in such programs will greatly influence the outcome of the conflict. In building this program, the social sciences have a unique opportunity to make a large contribution through the development of research in many areas in support of plans and programs designed to achieve high nonmilitary defense posture.

FIRST SESSION

Chairman, John K. Hemphill

Background Research: Survey of Some Related Experiences

Shelter Programs and Related Research Activity
in Three European Countries

Discussion of Papers

BACKGROUND RESEARCH: SURVEY OF SOME RELATED EXPERIENCES

Implications for Fallout Shelter Living from Studies of Submarine Habitability and Adjustment to Polar Isolation

The Relevance of Studies of Internment for the Problems of Shelter Habitability

Some Implications for Shelter Living Based on a Study of Isolated Radar Bases

Generalizations from Sensory Deprivation to Fallout Shelters

Adjustment to Environmental Stress in Fallout Shelters

English World War II Bombshelter Experiences and Their Application to U. S. Civil Defense Shelter Problems

IMPLICATIONS FOR FALLOUT SHELTER LIVING FROM STUDIES OF SUBMARINE HABITABILITY AND ADJUSTMENT TO POLAR ISOLATION

John H. Rohrer
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In reviews of the literature both on the effects of polar isolation and on submarine habitability and their possible implications for living in fallout shelters, I reported only those studies dealing with social and psychological aspects of these two types of isolation that I felt pertinent to "fallout shelter living." These reports then are essentially ones of editorial judgment and speculation regarding relationships holding under the two conditions. They are not extensive reviews of all the existing literature on human adjustment in either situation. I did, however, read all of that literature.

There are two major dimensions that affect adjustment to polar isolation (Rohrer, 1958). One is the size of the total population of the camp in which the men are located; the second is the duration of stay that the men will make in polar isolation. The size of the large station, numbering approximately 100 men, is essentially the same as found in submarines. This size requires less of an adjustment by the men, inasmuch as several different cliques may form. Face-to-face relationships that develop in the small stations present a more tenuous problem of adjustment.

Also, there is one big difference between the adjustment problems in the Arctic and those in the Antarctic. In all of the Arctic stations studied, it has always been possible for the men to get out at any time throughout the year (Debons, 1950; Essen, n.d.; Nusser, 1948; Rohles, 1953). This is not true of the men in the Antarctic (Rohrer, 1958), and this commitment to, and acceptance of, the fact that they are going to be completely isolated for one year in the Antarctic reduces the opportunity for conflict over whether to "stay or leave" with which some men in the Arctic stations are confronted.

Typically, one can identify four distinct phases of adjustment to polar isolation (Rohrer, 1958). The first one, marked by con-

siderably heightened anxiety, occurs when the men get on the ice. This anxiety may last for as long as six weeks.

The second phase of adjustment occurs during the winter months (the months of darkness) when there is a decrease in the work role with a corresponding increase in the amount of depression that all personnel in the stations feel.

The third phase of adjustment occurs after the sun returns. This is usually in August. The problems of depression and sleeplessness become less intense and the men can get work done that they were unable to do during the dark period.

The fourth phase occurs from two to four weeks before the men are taken off the ice. During this phase there is much anticipatory behavior: the men anticipate the behaviors they will engage in when they get off the ice with a resulting decrease in the effectiveness of the performance of their work and housekeeping chores.

Two of the four phases of adjustment to polar isolation are most directly applicable to the problems of adjusting to living in a fallout shelter. These are the initial and final phases. In all probability, the initial phase in fallout shelter living will be characterized by high anxiety. Certainly this is true if the public is properly informed concerning the danger of nuclear fallout. Increases in the amount of anxiety felt during the early part of shelter occupancy will be due to at least five rather different factors:

(a) not knowing what to expect in shelter living;

(b) fear of radioactive contamination through contact with other people in the shelter;

(c) fear of presence of contagious diseases;

(d) phobic fears in response to the small space and the threat of suffocation;

(e) anxieties over family, business, etc.

Following are speculations concerning some of the results of the initial heightened anxiety to be expected in shelters:

1. Persons who are strongly predisposed to the development of psychiatric symptoms will probably exhibit those symptoms. Such persons will create management problems.

2. For some, the increased anxiety will result in increased aggression, and the aggression more than likely will be displaced from the primary source of anxiety (Rohrer, 1958). For example, a person who has developed a considerable loading of anxiety over his family's welfare might displace his anxiety-motivated aggression toward both the formal and informal leadership in the shelter.

3. If there are perceivable evidences of need for aid and assistance to be given to other shelterees (as occurs in natural disasters), then the increased anxiety motivation may be channelized into altruistic behavior that might greatly facilitate the development of the shelter's social organization.

Alternatively, the increased anxiety may result in lessening the probability that effective informal leadership will emerge, at least in the early phases of shelter occupancy. This would follow as a result of the increased general anxiety of the membership of the shelter, which may cause persons to be more preoccupied with handling their own anxieties rather than to think in terms of social organization.

4. The effects of anxiety, coupled with the impersonality characteristic of a large collection of people, suggest that there must be some nuclear formal organization in existence right from the beginning of shelter life.

5. Increased anxiety will result in increased occurrence of headaches and sleeplessness in a good many of the shelter inhabitants. Quite probably, this increase in psychosomatic problems and sleeplessness will be rationalized to the conditions of shelter living. For example, sleeplessness may be attributed to lack of space or high noise in a shelter rather than to its basic cause, namely, that of an individual's own anxiety.

It becomes necessary, then, to consider ways of minimizing the development of initial anxiety resulting from entering a fallout shelter. One way that is effective in reducing initial anxiety, as evidenced by both polar studies and studies carried out on actual disasters, is to engage people in activity that is functionally oriented and meaningful to them (Kinsey, 1959; Marks & Fritz, 1954; Rohrer, 1958). Examples of the work role in polar isolation are directly applicable. Quite probably the greater acceptability of the Salvation Army as contrasted with Red Cross workers, as reported in studies of natural disasters (Marks & Fritz, 1954), is related to the fact that the Salvation Army provides activities for the group that are meaningful, whereas the Red Cross tends to be more bureaucratic in its handling of disaster situations.

One way that this meaningful activity could be provided is to use a suggestion made by John Hemphill of providing "do-it-yourself kits" made up of raw materials and letting the shelterees build the living arrangements that they want in the shelter. This would provide them, for example, permissible individualistic ways of creating conditions of felt privacy and objects that they might need, such as benches and tables; but more importantly, it would provide activity that would serve greatly to reduce the anxiety that they felt under conditions of shelter living. A matter for consideration here, too, is that of economy. It would be far more economical to take raw materials and store them in a shelter, since they could be replaced before they had deteriorated and the initial costs could be regained. Also, there is the fact that the initial cost would not be as great as buying finished benches and beds.

It is essential that two-way communication devices be placed in each shelter. One of the few things that people who have lived in polar isolation universally agree upon is the importance of the short-wave radio in maintaining morale and a feeling of belonging to a larger society (Rohrer, 1958). It seems to me, particularly in view of the fact that the two-week period one would be living in a shelter would be characterized by the initial phase of high anxiety found in polar isolation, that it would be impossible to maintain shelter living without such communication.

The motivations of most people living in fallout shelters would differ considerably from those of people spending a year in polar isolation, although there are some generalizations applicable from the motivations of the so-called "summering-over" people in polar isolation. It is probable that, under shelter isolation conditions, most of the deprivations will revolve around those superficial to physical survival; e.g., deprivations felt over missing a TV show, not having hot meals, not having sufficient privacy or a space that one can call one's own, or complaints growing out of racial or religious prejudices. Again, activity by almost all members of the shelter plus good intra-shelter communication will tend to minimize these felt deprivations.

There will probably be a lot of conflict and ambivalent feelings experienced by a considerable number of people living in shelters over whether to remain in the shelter for the required period. To use Neal Miller's model on conflict behavior (Miller, 1944), the conflict can be characterized as double approach-avoidance conflict. That is, there will be tendencies for the individual to approach the outside world and, at the same time, tendencies to avoid going into the outside world. This conflict can be alleviated to a considerable degree by maximizing the perception

of the outside threat. This is the problem of making real, in as many sense modalities as possible, the danger of the invisible radioactive fallout. The threat of the outside environment under conditions of polar isolation is very real and easily perceived. It serves as a powerful deterrent from wandering away from camp. The threat under conditions of shelter living must be made as real as possible in order to convey effectively information concerning the reality of the danger. Conflict can further be resolved by minimizing the reasons for not wanting to stay in the shelter. This is one vital reason for two-way communication between the shelter and other outside shelters. Not only does two-way communication give reassurance by providing information on what is going on in the outside world, it also provides reassurance that outside help is available if the shelter is in desperate need. For example, a shelter might have twenty seriously ill people but no physician or medical care personnel. If one could reassure the group in that shelter that there is some way of getting assistance to them, it would have a positive effect in making the people want to stay in the shelter. Likewise, the realization that the occupants in the shelter were in communication with the outside world would tend to maintain the usual habits of social living; e.g., maintaining their compliant attitudes towards authority.

The final phase of polar isolation and the preparation to leave a fallout shelter probably have much in common. Insofar as the shelter is concerned, upon receiving word that the people may soon be able to leave the shelter, there will probably tend to be a disintegration of informal social bonds that have developed. There will be a decrease in the performance, or an ignoring, of the usual housekeeping responsibilities, e.g., disposal of garbage and waste material or disposal of the dead. The concern and consideration for maintaining shelter living will tend to lessen with a corresponding increase in one's own personal preoccupations, which may result in a net increase in the expression of hostility and the occurrence of expressions of irritability.

It seems to me that considerable attention in the planning of policies and procedures for shelter management should be given to this factor of the group's reaction to shelter evacuation. In all probability, the notification that the shelter can be evacuated should be given as closely as possible to the time of actual evacuation. Moreover, it would appear that considerable thought should be given to ways of minimizing rumors that might develop in any shelter concerning possible date of evacuation, time of evacuation, etc.; for the rumor would serve the purpose of arousing anticipations that would lead to a disintegration of the informal social organization, a greater preoccupation with personalistic concerns, and the raising of hostility and aggression.

It is difficult to extrapolate the findings on submarine habitability to fallout shelter habitability. Factors that make for this difficulty are as follows:

(a) There is a highly structured formal organization aboard submarines that is not likely to exist in shelters.

(b) There is a highly trained crew that has volunteered for the service and, hence, has made a commitment to accept conditions not likely to be found acceptable to the general public.

(c) Submariners have assurance while they are on cruise that their families are safe in an intact society.

(d) There exist built-in skills, on the part of crew members, for meeting any emergency or crisis that might arise; this is not likely to be true for the occupants of a fallout shelter.

(e) The submarine crew is a very select homogeneous group: all males within a restricted age range. One can expect in a fallout shelter heterogeneous age and sex groupings, which will create additional problems both in management and in social interaction.

Nevertheless, there are some generalizations from the submarine literature that do have implications for fallout shelter habitability:

1. On their first dive the members or crew of a submarine experience increased initial anxiety, which may last for only a few hours or may extend up to as long as 60 hours. It will be recalled in the polar isolation studies that the same condition of initially heightened anxiety existed upon entering isolation. The fact that this condition was found under two different conditions of isolation amongst highly selected young men with high motivation for entering into isolation points to one rather hard fact concerning fallout shelter habitability: the most critical period in terms of managing, minimizing panic, and maintaining control of the shelter population is going to be during the first 24 to 48 hours of occupancy. The recommendations made in the memorandum comparing polar isolation to fallout shelter habitability on this critical time period can each be emphasized and repeated. That is, in this current planning period, ways must be worked out to build in institutionalized ways for reducing this initial anxiety, for the degree of success or failure of shelter occupancy is going to be determined largely by this factor.

2. The space-man ratio to be found aboard submarines has little if any meaning when applied to fallout shelter situations (Vagel, 1953). Conditions of selection, training, motivation, and personal commitment are the conditioning factors for the submariner. It is likely that the civilian population will not have similar commitments and that it would not accept or tolerate the square-foot-space-man ratios to be found aboard submarines.

3. Aboard submarines during World War II, it was found that the radio man's position was regarded as having the most prestige by the enlisted men. It was felt by the officers that this was true because he had the most direct communication channels with the outside world. Other crew members sought him out because of his greater knowledge of "what was happening." The implication of this generalization for shelter habitability is that methods of communicating with the outside world must exist within the shelter proper because of the great importance of this factor of communication to people living in isolation.

4. During World War II, one of the major habitability problems aboard submarines was controlling temperature and humidity (Kinsey, 1953). Given the combination of high humidity and high temperature, there was a considerable increase in upper respiratory infections, a rise in skin irritations, and heightened fatigue on the part of crew members. The implication of this observation is pretty straightforward, insofar as shelter habitability is concerned. Considerable engineering thought should be given to ways of controlling humidity and temperature factors for these reasons: the heterogeneous groups likely to exist in the shelter (e.g., infants who have high susceptibility to upper respiratory infection as well as to skin irritation); the social implications of these conditions (i.e., in terms of maintaining morale and minimizing rumors relating to virus infections); and the unavailability of sufficient medical and medical ancillary personnel in the shelter situation to handle an epidemic of respiratory infections.

5. Submarines, despite the considerable thought and skill that has gone into the building of their ventilating systems, still have ventilating problems (Kinsey, n.d.) which include increased carbon dioxide concentrations and increased aerosol concentrations, the latter apparently created by smoking. These two atmosphere contaminants produce upper respiratory disturbances, eye irritations, headaches, and a reduction in concentration; and these symptoms appear when the carbon dioxide concentration in the atmosphere is fairly low. That is, the symptoms appear when there is, from a straight engineering-physiological point of consideration, an atmosphere that is within the "safe tolerance" range.

The implication for shelter planning again is rather straightforward. In the engineering of the shelter ventilation system one must consider not only the control of carbon dioxide concentration in the shelter atmosphere but also ways of minimizing the concentration of the aerosols. Only recently have the people concerned with submarine habitability isolated the aerosols as an important atmospheric problem.

6. Aboard submarines, the crew's preoccupation with food and its preparation makes this the most important single factor in maintaining the crew's morale. The implication for fallout shelter situation here is pretty straightforward and likely to be overminimized in the planning of food stockpiling. The basic problem of providing fallout shelters for the citizenry of this country is to get them into the shelter and keep them there until the danger of the fallout has been minimized. Consideration must be given not only to the caloric content of the food, but also the problems of palatability, food aversions, etc., if the people are to be kept in shelters. The work done by Kurt Lewin and his associates during World War II (Lewin, 1951), in which they studied ways of getting the civilian population to accept substitutes for food normally eaten, etc., is directly applicable here and should be considered in the planning for food stockpiling and food preparation during the shelter occupancy. It is the same old story of being able to lead a horse to water, but being unable to make him drink. If the shelter population finds the food unpalatable, it is likely to leave the shelter while the external atmosphere is still dangerous.

7. Submariners, when in isolation (i.e., when on cruise), tend to sleep far more than do other Navy personnel assigned to different services, or civilians. There is probably a variety of reasons for this, which include boredom, possible fatigue, and probably the effects of inhibiting hostility of the crew members. The implication for fallout shelters is that perhaps this "excessive sleeping" factor may increase the need for bunking or sleeping facilities in shelters.

8. The literature on submarines indicates the great importance of having institutionalized ways for using leisure time; e.g., recorded music, movies, card games (Kinsey 1959; Vagel 1953). The implication of this finding, which was also found in conditions of polar isolation, for shelter habitability is fairly important. Provision must be made in the shelter situation for ways in which the inhabitants can use the leisure time that they will have over the approximately two-week period of occupancy. Provision in the shelter for ways of using leisure time is a researchable problem. Moreover, it is a problem that should be researched rather than left to some arbitrary decision made by an OCDM staff member.

9. The submarine literature on World War II dealing with conditions where there was heightened anxiety among the crew members--such as existed under attack conditions—places considerable emphasis on being able to "do something with your hands" in order to control anxiety. The implication from this observation for the shelter situation is that provision should be made to keep as many of the occupants of the shelter as possible busy doing something. This reinforces the implication from the polar isolation studies that it would be highly desirable to provide "do-it-yourself kits" in the shelter for construction of bunks, benches, etc. Not only would it be economically more feasible in terms of shelter furnishing to do this, but it would have the additional advantage of reducing and controlling the anxiety that would likely be felt in a shelter under actual nuclear fallout conditions. Finally, it would help to alleviate the problem of "leisure time" noted in the previous paragraph.

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THE RELEVANCE OF STUDIES OF INTERNMENT FOR THE PROBLEMS OF SHELTER HABITABILITY

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This report attempts to relate information regarding internment of military, civilian, and political war prisoners to the problems of fallout shelter living. Though almost any general question about behavior would be applicable to both situations, discussion will be focussed on four areas: (a) subjective and objective deprivation, (b) role of expectations in adjustment, (c) socio-economic organization and social differentiation, and (d) the relationship of internee values and group organization to the larger society.

Shelter living, per se, should constitute no problem of consequence for those who will have to spend a few days with family or a few friends in even a modestly provisioned shelter. The present discussion, consequently, is addressed primarily to the problems confronting the large and heterogeneous group that must stay for, say, ten days or more in an inadequately supplied shelter.

Subjective and Objective Deprivation

Humans Considered as Storage Commodities

Some writings convey the impression that people constitute a highly perishable and fragile commodity; others that they can be tightly stored and negligently packed for reasonable periods of time without permanent damage or deterioration. This apparent conflict can be reconciled by reference to the following considerations:

1. The tolerance limits of many critical environmental variables are far broader than most persons in our society imagine. The usual tendency of captors and captives is to pay more attention to providing sufficient food and water than to safeguarding against the factors that appear to be most likely to take a toll: heat and cold, infectious disease, and inadequate ventilation.

2. Conditions not directly related to physiological survival can cause humans to interact in such a way as vastly to increase or decrease the chances of their healthy survival in a confined situation.

3. The restorative powers of the human organism are great and swift, and individuals return rapidly from marked conditions of degeneration to something like a normal state. Restoration of internees, however, has proved dependent in some respects on a properly nurturant atmosphere after release.

Physiological Deprivation

Physiological effects of the privations of captivity, as recorded by physicians and physiologists, is beyond the scope of this review. Boder (1949) has attempted to catalog common deprivations in internment situations, and Hinkle (1960) and Wolff (1959) have summarized some of their behavioral effects. The literature, however, proves of greater value for its information on the psychological and social aspects of behavior under conditions where some gross estimate of the degree of food deprivation is possible than for its evaluations of the degrees of physiological impairment associated with precisely-defined degrees of nutritional deficiency.

Even in an extreme situation, the survival and health needs as determined by internees do not always correspond with those most physiologically important. Human sensory apparatus registers disproportionately great distress for some deprivations, and little or none for others. People's intelligence and training lead them to exaggerate some threats and to minimize others, and cultural definitions make certain things essential or urgently desired that are not essential to physiological survival, e.g., the frequently reported trading of rations for tobacco by starving prisoners. This example illustrates the principle that minimum criteria of adequacy must cover not only what is required for physiological survival but also what is necessary to keep the pressure of needs from forcing the individual into activities imperiling his survival.

Thus, pain and distress signals are highly developed for the perils of the ordinary animal environment and are undeveloped for those that occur relatively rarely in nature. To illustrate, strangulation evokes one of the strongest distress reactions, but there is little or no painful reaction to a dangerously depleted supply of oxygen in the air. Thirst and, to a considerably lesser extent, hunger can be tyrannical needs. Prisoners on many occasions have eaten or drunk from infected sources and perished, whereas they might not have suffered more than briefly had they remained

hungry or thirsty (U. S. Congress, 1956). On the other hand, anorexia is among the most frequently reported symptoms in deprivational captivity, due to the hunger not being tyrannical enough to overcome cultural habituation regarding what is appetizing.

The survival of a group, however, is dependent precisely on the fact that the press of biological needs is restrained by social and cultural proscriptions (Bluhm, 1948). Extortion, theft, betrayal, murder, and cannibalism have occurred where social and cultural controls have been sufficiently weakened (Boder, 1954).

Conflict

Where deprivation exists, complicated problems of sacrifice and balance arise between the biological and the socio-cultural systems. Upsets of non-vital elements in either system can have effects on vital elements within its own or the other's system as well as on the relationships between the systems. To illustrate, it may become necessary under adverse circumstances to sacrifice certain ordinary cultural proprieties that may not be isolated cultural forms but part of a system that degenerates in their absence (Adler, 1958). This explains the argument (U. S. Department of Defense, 1955) that adherence to the honorifics of military courtesy and deference is required for the maintenance of vital organization in the POW camp.

This conflict between social standards and biological needs in the extreme situations has, it is believed, an important bearing on the problems of social organization in shelters. A particularly common expression relating to this conflict is "the loss of the will to live."

The "loss of the will to live" may be considered as merely a more extreme form of the apathetic withdrawal characteristic of most prisoners in deprivational situation as well as in many other situations in which the "necessities of life" are amply supplied (Vischer, 1919). In the majority of cases, the onset of extreme apathy is reported as occurring after a longer period of incarceration than the expected maximum time persons will be required to remain in shelters, although it is sometimes reported as occurring earlier as part of the reaction to "the shock of capture." The causes of the apathetic reaction are given both as a lowering of vitality accompanying chronic starvation and a response to insoluble conflicts, such as between cultural and biological needs.

It does appear true that a need for a precipitate adjustment to insufficient diet and shelter claims a higher toll than a relatively

gradual one. There have been repeated observations (Cochrane, 1945; Kennedy, 1945; Markowski, 1945) that individuals who appear to be "better physical specimens" are sometimes the first to succumb to rigorous deprivation. The youngest and the largest appear among the first to display "fatal withdrawal," presumably because a given ration goes further to meet the needs of the smaller or fully matured individual, and the one whose growth processes have ceased (U. S. Congress, n.d.). True equity in rationing would take into consideration the different metabolic demands associated with differences in age and size (Vaughan, 1949). Special characteristics of the current and prospective American population should be considered in ration planning, i.e., the population bulge in the lower age ranges and the increase in average stature.

Incidence of Mental Disorder

The general observation has been that a seriously incapacitating mental disease rarely occurs during captivity other than extremely apathetic withdrawal. Most studies of former victims report almost no psychoses and few severe neuroses. Several discussions (e.g., Jones & Tanner, 1948; Katz, 1950; Lanzetta, 1955; Martius, 1946) have suggested that the incidence of neuropsychiatric disorders is much higher immediately preceding release, and still higher after repatriation, than it is during deprivation. There is some basis (Kirman, 1946; Kral, 1951; Tas, 1951) for inferring that serious neuropsychiatric disorders are less common among at least some populations during stressful captivity than before it. Of 60,000 Europeans released from Japanese prison camps, only 56 cases were hospitalized for mental disorder (Kirman, 1946). Of 100,000 British prisoners of war in World War II, only 811 were regarded as serious mental patients upon their release (Jones & Tanner, 1948).

The most obvious implication for shelter habitability is the possible threat from depressive reactions and disinvolvements. While, in most cases, these have developed after a longer period of privation than that envisioned for sheltering, their onset was likely to be immediate when the privational experience followed the total destruction of the captive's sources of basic meaning and purpose; e.g., when he regarded himself as totally and irrevocably isolated from his world. These considerations suggest a greater utility for "frills" in shelter design that promote activity, involvement, and a positively-toned mood.

Psychological Reactions to Organic Symptoms

Some of the common organic symptoms in privational situations are of interest here because of the social and psychological reactions to them.

Illustrative is the high incidence of unsightly dermatitis associated with hunger and other privational conditions. These have frequently been mistaken by fellow prisoners as manifestations of contagious disease, with resultant anxiety and divisiveness. Dysentery and polyuria are other sources of extremely serious group friction when crowding is added to other deprivations. An additional factor is that some radical symptoms reflect relatively benign disorders. Amenorrhea has at times approached universal incidence among women internees. In many cases, menstruation is reported as ceasing immediately upon internment.

Behavioral symptoms associated with organic or other effects of deprivation include short temper, infantilism, projection, failing memory for recent events, and shortened attention span. Fellow-prisoners, rather than the captor, are reported to be the usual targets of hostile feelings (Nardini, 1952; Wolf & Ripley, 1947). All of these conditions strain social relationships and make positive social interaction more difficult to sustain.

It is almost a truism that the degree of subjective deprivation experienced is not always correlated with objective measures of the degree of seriousness of the deprivation encountered.

Socio-Economic Background Factors

The socio-economic background of the prisoner has been suggested by some observers as a factor affecting adaptation and survival. Youth and advanced age have sometimes been reported (Anderson, Boysen, Esensten, Lam, & Shadish, 1954; Bergman, 1958; Nardini, 1952) as factors associated with decreasing adjustment and survival chances in extreme internment situations. Women are sometimes reported (Ural, 1951; Vaughan, 1949) to be better adapters than men.

There are conflicting views on survival and adaptability differences of persons from different social strata and with differing levels of intelligence. Some reports suggest that persons of lower class origin adjust better, others that there is no difference, and yet others that higher class origin increases survival chances. Clearly, the relationship is not a simple one. In some situations (e.g., Nardini, 1952) it is quite clear that there was high correlation

between rank and survival chances among Air Force prisoners of the Communists in Korea (U. S. Congress, n.d.). A decided factor in survival is the value placed on the individual by his fellows and by his captor.

It has been suggested that the more intelligent person is handicapped in his camp adjustment by his greater sensitivity to cultural conflicts, even though the intelligent person with psychopathic tendencies seems to make an excellent adjustment in many situations (Cohen, 1953; Herling 1951; Katz, 1950; Kogon, 1950). On the other hand, it seems that intelligence is required for coping with many of the captivity problems and that at least some intelligent persons have been able to persevere through their capacity to take a detached, intellectual view of their predicament (Bettelheim, 1943; Bluhm, 1948; Cohen, 1953).

Inactivity and the Barren Environment

It is also an old saw that inactivity, boredom, and monotony increase distress and discomfort. This generalization has greater relevance to the person who is well-fed and possesses a surplus of energy beyond that required to sustain existence than it does to the starved, exhausted, or debilitated person. One hypothesis advanced for the common observation is that purposeful activity, unlike inactivity, involves the functioning of inhibitory mechanisms that restrict the awareness of dysfunctional percepts and sensations.

The individual's initial experience with isolation and barren environments involves considerably heightened feelings of, or reactions to, pain and distress, heightened anxiety, and bizarre thinking. Most individuals, however, perform two major sorts of adjustments so that almost all report a gradual but marked adaptation. One of these adaptations involves learning that many ways may be found to utilize the resources in what initially appears to be the empty space between four bare walls.

A second source of adaptation that the isolate usually develops is the increased ability for disciplined mental activity independent of external stimulation and testing. In a similar class are the mental exercises of which the isolated person frequently grows fond; e.g., building imaginary houses board by board, and perfecting skill at mental arithmetic (cf., Bone, 1957; Burney, 1952; Small, 1900; Weissberg, 1951). Control of "day-dreaming" activity is of vast importance for adjustment.

Among recreational activities, the one most frequently and highly endorsed, at least by those victims who have written about their experiences, is reading. For the long-term prisoner, the content of the book is of less importance than the act of reading in itself (Biderman, Herman, & Howard, 1958).

Social Isolation and Communication Needs

Isolation from reliable information about the "outside" is acutely deprivational for many, especially for those who have been unable to communicate with "their people." Of all sources of psychological distress, those associated with fears of abandonment are among the most extreme (Nardini, 1952).

It can be inferred that the basic communication needs of a shelter will involve some means for indicating to the outside the presence of victims within the shelter and for receiving acknowledgment from some outside source. Some prisoners have commented that the ability to signal the presence of urgent distress would also be extremely comforting to inmates, even if there was nothing "the outside" could do about it.

Beyond these elemental considerations, the content of communication is of rapidly decreasing significance for the prisoner. News of the war, if it has meaning for his immediate situation or prospects, is generally desperately sought, although authentic items may have great difficulty in competing with attractive rumors.

Sexual Deprivation

Sexual deprivation per se is rarely reported as a major source of distress by victims of internment, except by those in the most favored situations. It has been asserted (Cohen, 1953) that sex urges disappear with the reduced vitality associated with hunger and debilitation. However, psychological repression probably accounts for more of the loss of sex desire than does debilitation (Bluhm, 1948; Niremberski, 1946). Others (Cohen, 1953; Friedman, 1949) have suggested regression, rather than repression, as the explanatory mechanism.

The Role of Expectations in Adjustment

The nature of the expectations of the victim is frequently mentioned as a factor determining the effectiveness of adjustment to a highly deprivational situation. The most common generalization holds that the closer to reality the individual's expectation is,

the more probable is his survival. Anecdotes offered by the literature (e.g., Anderson et al., 1954; Cohen, 1953; Katz, 1950; Segal, 1954) indicate that over-optimistic expectations lead to "shock," over-reaction, and insufficient preparation and adaptation, while over-pessimistic expectations produce fatal resignation.

Expectations Regarding Length of Stay

Expectations regarding the length of stay are particularly relevant to the shelter case. This question was examined (Tas, 1951) in three separate groups of Air Force prisoners who were held in conditions of group isolation for considerable periods of time. The general impressions from the groups were that overt and conscious "optimism" and "pessimism" are verbal defenses that are differentially congenial to different types of personality. An hypothesis suggested was that the type of outlook taken was good or bad depending on the emotional significance such overt symbolic activity had for the individual.

The most automatic and prevalent reaction among captives was a somewhat "shallow optimism" (Wolf & Ripley, 1947). This appears related to people's notions about whether to be "optimistic" or "pessimistic" and may be pertinent to a larger, relatively unstudied body of folklore regarding psychological self-manipulation. The prisoner literature affords countless illustrations, ranging from Bettelheim's sophisticated attempt (1943) to exploit the natural dissociative reactions to extreme situations in order to facilitate his own psychological adjustment at one pole, to magical and semi-magical forms of thinking at the other.

Indefinite Expectations and Commitments

As a general rule, the individual must assume an identity consistent with the radical adaptations the most extreme captivity situations demand. The situation must be perceived as an indefinitely continuing phenomenon in order to produce a degree of commitment to it that will make for such self-change. While the prisoner-of-war literature sheds considerable light on consequences for behavior during periods captives define as of "short indefiniteness" (one that may end at any moment), as opposed to "long indefiniteness" (one that may last indefinitely), little of general importance has been learned about what determines which attitude is taken. The question is generally equated in the literature (Newman, 1944) with morale, or optimism and pessimism.

In analyzing intensive interviews with repatriates, it was found difficult to rate unambiguously on a scale of "optimism" and

"pessimism" the expectations of individuals at the time of capture. This difficulty stems, in part, from the fact that the prisoner's attention was most frequently concentrated on moment-by-moment challenges and demands, rather than on the longer run speculations (Bloemsma, 1953; Vischer, 1919). It is probably true that the expectations in advance of the catastrophe play a significant role in the adjustment to its early stages.

Expectations and the "Disposition to Act"

One possible lesson from the military experience is that training and information can create a general disposition to act in a crisis. For example (U. S. Congress, n.d.), the major contribution of evasion and escape training lies in developing an attitude in the airman that effective action is possible in situations that otherwise would appear hopelessly overwhelming. Clearly, the importance of this disposition to act is already well recognized in civil defense thinking.

As a parallel, the dissemination of instructional civil defense material may be serving a more important purpose than immediate learning. It may be fostering a disposition to regard the situation of thermonuclear attack as one in which positive action is appropriate, even though little of the public learns its specific content.

The "Fate Worse than Death" Anxiety

Prisoner-of-war and concentration camp experiences also can be examined for the light they shed on the "fate worse than death" concept. The attitude that surviving a thermonuclear attack would be a "life not worth living" is a widespread barrier to the acceptance of civil defense measures.

Several former prisoners of war have made statements like "I would have killed myself rather than to go through that sort of thing again." Nonetheless, they indeed did "go through that sort of thing" again, and again, without attempting suicide. According to most sources, suicides are exceedingly rare among prisoners of war except during the initial period of captivity. Again, the implication is that prior intellectualization and verbalizations are not good indicators of actual behavior in the crisis.

Socio-Economic Organization and Social Differentiation

The Temporary Camp as a Model

Internment societies vary tremendously in their beginning, as in their later characteristics. The closest parallel to shelter situations would be the moderate-sized group being held at a temporary camp or collection point, where the captor did not exert active influence on the affairs of the group. Units captured more or less intact would provide a parallel to the neighborhood shelter; a camp including POW's captured in a number of different engagements and largely unknown to one another would approximate the urban-center shelter.

The shelter would be like the collection point in that it would be a temporary way-station toward a dimly-known, indefinite future: a purgatory. The lot of the prisoner has sometimes been much improved, sometimes much worsened, after his arrival at a permanent camp. Almost invariably, however, the consuming interest of the prisoner has been to get to wherever he was going to be held permanently, even when there was good reason to believe conditions would be worse there (cf., Jacobson, 1949; Scholmer, 1955, on "desire to get it over with"). Some prisoners feel that even if it will not be better, at least it will be different (Cohen, 1953). These observations would be consistent with the expectation that irrational pressures may develop to leave shelters and to deny the radiation peril, if the shelter environment becomes oppressive. Other qualifications pertain to the irrational and unarticulated fear of freedom that some prisoners develop, and the emotional attachment of the solitary prisoner to his cell (Small, 1900).

Those attempting to organize shelter life may encounter what has been referred to earlier as a lack of commitment to the immediate situation. This contrasts with the frequent characterization of the "feverish activity" behavior of prisoners on arrival at what they believe to be a permanent camp, which, in turn, slowly gives way to the apathy, monotony, and despair that are usually attributed to the prisoner-of-war camp routine.

"Shock of Capture"

There is widespread comment in the literature concerning the "shock reaction" characteristic of newly-captured prisoners. Observers among the captor tend to describe the newly-captured as automatically compliant. POW officers, however, have frequently said they found it impossible to control their men (Segal,

1954). This apparent conflict may lie in the degree of perceived relevance of the commands that captors, as opposed to captured officers, have to give in the initial situation.

Prisoners who are not wounded or exhausted by battle generally do not describe themselves as initially in a "state of shock." Rather, they indicate more often that they were surprised at the matter-of-factness of their attitude in the initial situation. A more descriptive term than "shock" appears necessary to describe the emotional and behavioral reactions of the initial moments of crises.

If conditions are good in the initial holding point, there is considerable activity toward establishing linkages with the past: locating friends and finding out about their fate. With immediate stress of any degree, however, close ties of several hours earlier can be forgotten completely. This is also true when the individual gets caught up in some urgent group activity (Bloemsma, 1953; Kogon, 1950). Thus, some bomber crewmen have reported (U. S. Congress, n.d.) that they never stopped to wonder what had happened to their crew mates until several hours, or even days, after their capture.

"Ecological" Conflict

At the very first, the need for organization and authority is felt, but somehow, organization itself fails to materialize. The usual early camp is a collection of warring primary groups, which, even within themselves, are not existing in complete harmony. The initial problems of social organization are not so much social, in the Weberian sense, as they are ecological. In the earliest stages, the social problems that arise involve typically the collisions and conflicts of the activities of individuals because of the scarcities of the environment; particularly the scarcity of space (Scholmer, 1955; Vaughan, 1947-1948). The earliest organization in many groups involves the division of space. Sometimes the outcome of this process is of vital significance for individuals and the group as a whole. Measures of the differential value of space, other than size, are needed in shelter planning and allocations.

Factors that differentiate space in a critical manner may not be discernible at the outset. Thus, space against a wall is generally extremely desirable for occupancy on a number of counts: it reduces the number of neighbors by half, it can be leaned against, it can serve as an anchor for pegs and screens, it is apt to be out of the stream of traffic. The unavailability of community space appears sometimes to be a factor retarding the development of

larger group activity. Pressures on space, particularly during initial periods, have been aggravated by the physical state of prisoners—contagious disease, incontinence, and flatulence have sometimes been the rule rather than the exception. Tas (1951), for example, describes the difficulties of treating enuresis, which was common among the children in a concentration camp where family units were held together under crowded conditions. Demands by neighboring families that parents take stern action accentuated the anxieties producing the complaint, and thus aggravated it.

Social Conflict and Intra-Group Aggression

The development of social organization in the group reduces the frequency and seriousness of the purely ecological kind of conflict, but only at the risk of more structured conflicts taking place. As norms, sentimental definitions, and sub-group identifications develop, social conflicts arise (Johnson, 1941; Vaughan, 1947-1948).

Prisoners of war are notorious for the amount of overt hostility they feel toward one another (Wolf & Ripley, 1947). Whether this projection would be greater or less in shelters where the captor personnel are not available as targets of hostility is difficult to say, but those closest at hand would seem regularly to be the most convenient targets.

Prison camp societies gradually develop codes and forms of interaction that diverge from those of the "outside" to compensate for the increased possibilities of social friction. These include lesser demands for interactional involvement, greater permissiveness in expression of inter-personal hostility, greater acceptability of thinly-veiled hostile expressions as "jokes," a greater tolerance of deviant behavior. These adaptations, however, run counter to the heightened need of groups under stress for manifestations of high group integration (cf., Lanzetta, 1955), and create additional need for symbols of in-group solidarity and common identity.

While "deculturation" (Boder, 1954) producing real asocial behavior may account for some of the low regard internees frequently have for their fellows, other factors doubtlessly contribute. One is that the heightened need for the display of group integration associated with stress occurs under conditions where integration is difficult to achieve and more difficult to display (Lanzetta, 1955).

Social Differentiation by Modes of Adaptation to Stress

The fundamental distinction made by observers of different modes of adaptation by different personalities involves active, aggressive, and adaptive behavior on the one hand, and passive, withdrawing, and maladaptive behavior on the other. There is the additional distinction between behavior directed toward the social environment and behavior directed toward the harsh physical environment.

The proportion of prisoners falling in the various categories has varied with circumstances. Other factors include physical condition upon capture; rank and other characteristics that determine how the individual is regarded initially by his fellow prisoners; whether he is with friends who play supportive roles, or is a stranger in the community; and the existence of some identity that provides for entree into a primary group apart from his personality characteristics. Bloch (1946-1947) has observed, however, that even the usual bases of social identity and grouping may fail to operate if they are not linked to obvious survival interests in the extreme situation.

The Withdrawal Reaction

Of all types of prisoner-of-war adjustment, social and environment withdrawal has been the center of interest. "Loss of the will to live" or "fatal withdrawal" leading to death is very often interpreted in terms of psychogenic factors as the major determinant of who succumbs (Katz, 1950). One form of evidence (Goss, 1869; U. S. Congress, 1956) for the psychogenic factors in the syndrome are the psychological "cures" both physicians and laymen among prisoners report as effective: insults, slaps, authoritatively shouted commands resulting in "snapping them out of it." There is, of course, particularly great danger of false confirmation occurring where there are such strong moral judgments involved in both initial diagnosis and the "cure," as seems to be the case here.

The widely publicized contention that most of the deaths of American POWs were due to a psychologically caused "give-up-itis" seems without foundation. Avitaminosis, simple malnutrition, and the dehydration associated with the virulent forms of dysentery then epidemic in Korea (Hardy, Mason, & Martin, 1952) seem to have played much greater roles (Anderson et al., 1954; Wolff, 1959). A shelter program need not be founded on the premise that Americans have become "soft," or that they are "softer" than other nationalities.

Initiative and Organization in Crises

On the basis of both Korean and World War II history, the comment has been made (Kinkead, 1959) that urban individuals in general, and Americans in particular, frequently died unnecessarily in captivity because of their failure to take the initiative necessary for their own and their fellows' survival, and because of their unwillingness to subject themselves to the group discipline on which survival in such circumstances is dependent. The alleged prevalence of "give-up-itis" among Americans in Korea has been attributed to just these failings.

To an extent, there is some contradiction in the interpretations of these phenomena. On the one hand, there is the complaint that Americans are too dependent on authority and do nothing without being told; on the other hand, they are too independent of authority and reject direction in time of crisis (e.g., Kinkead, 1959). Both are supported by numerous authenticated cases of behavior of prisoners in Korea.

The loss of the individual's ability and initiative for coping with the physical environment, which is associated with the elaboration of the division of labor in society, has long been a subject of comment. The effect is even greater with respect to the crisis situation—the more vital the matter, the more reason in modern society for "entrusting it to experts" (Eissler, 1955). While there is little evidence that this attitude is uniquely American, such an attitude has constituted a real handicap to adaption to crises.

There is probably little that can be done as part of a shelter program to change this attitude, although there are measures for compensating for it. One possibility is indicated by the fact that though the inexperienced front-line aidman's medical knowledge and technique was frequently barely superior to that of many ordinary infantrymen, he nonetheless generally functioned as if it were superior. The importance of making a task "somebody's job," even when there is no opportunity for training him to do the job better than an ordinary citizen could is reemphasized by many captivity experiences. Rotation of "details" has disadvantages even in the case of "dirty work," which individuals may resent being "stuck with" permanently.

While much of the disorganization of military order in prisoner-of-war camps is attributable to deliberate interventions of the captor, there was a tendency among Americans toward the adoption of an equalitarian and "democratic" mode even apart from this. The frequent collapse of the hierarchical authority system

among American military persons in captivity indicates that such a form of organization might have even less viability among civilian shelterees, unless some objective other than individual survival and individual well-being becomes defined as the objective of the group.

The equalitarian ethic arose in situations that were marginal or slightly above. Where there was comparative plenty or acutely sub-subsistence conditions, an authoritarian elite tended to develop. Under the first conditions, its development was due to a reinstitution of precapture rankings; under the second, an elite arose based on control of scarce goods and other sources of naked power.

Barbed-Wire Society

From impressions of the prisoner literature, it is ventured that the most important class of adjustment for minimizing the deprivations of isolation from the larger society has been the recreation of a microcosmic society behind barbed wire. Depending largely on the degree to which such activity is encouraged, tolerated, or actively thwarted by the captor—much less, upon the physical opportunities provided by the environment—prisoner groups gradually evolve an articulated social system, embodying, through time, more and more counterparts to the functions and institutions of normal society (Sentner, 1949). Of all factors in individual adjustment to captivity, the extent to which a prisoner's daily existence becomes oriented toward this immediate prison society and away from the outside, the more healthy his adjustment appears.

A common contention of survivors of severe internment situations is in apparent contradiction to this principle. Nardini (1952, p. 244), for example, believes it was essential for survival in a Japanese prisoner camp to "conceive of oneself as something better than the environment implied." This, he states, depended on focusing forward and backward on the self-identities of a more favorable past and future.

A plausible reason for the contradiction between this view and that held by others such as Kral (1951), that past and future identities must be subordinated except in controlled fantasy life, is that the former were held by physicians, who were among the few individuals in the camp who could practice their profession and thereby preserve high continuity with previous identities. To the extent that the nobler self-identities, e.g., one's profession, nationality, political allegiances, and family status, can be a basis of a functional identity in the camp society, it can have the ego-supporting functions Nardini (1952), Bondy (1943), and others found it had.

For the mass of persons, such possibilities for continuity of status did not exist. The noted attorney, the well-to-do businessman, as well as the factory worker, had to create ego-supporting roles in the present situation if they were to develop the attitudes on which survival depended. Frequently, a skill or an identity from previous life helped greatly. A qualitative difference, however, exists here from the kind of continuity manifested by the professional for whom professional identity is a more total thing. It would be important, however, to structure shelter organization to maximize opportunities for this continuity of role identity for as many persons as possible.

Pathologies of Over-Immersal in the Immediate Situations

From a broader social point of view, there are potential pathologies to a complete immersal of prisoner life in the immediate. A major difficulty is that such groups frequently evolve patterns of group adjustment to the immediate situation that conflict with moral or other values of the larger society. Retrospective judgments by former prisoners themselves, and by others, may condemn aspects of such an adjustment.

Integration of National Values in Camp Society

Considerable accommodation of the immediate prison system to the larger social values is possible. This occurs where the central "social institution" of the prison society has a goal that is derived from or is identical with a value of the larger society. The classic examples of such values in prisoner-of-war history are group survival, escape, and resistance. In various situations, one or another, or some combination of these values, has formed the central basis around which the entire prisoner social organization has developed. Group survival is the natural core of organization in marginal subsistence situations where it appears to the members of the group that all can survive, but only if there is effective group activity toward this end.

Where acute scarcity does exist so that all cannot survive, shelter leaders must have a commitment to purposes for which they are willing to sacrifice others, and preferably, a purpose to which others are willing to be sacrificed. Survival is effective as an integrating group value only in situations that are defined as super-marginal, or truly marginal. In acutely sub-marginal situations, survival, as a value by itself, permits few discriminations among the population, since every one regards himself and others as possessing fairly equal rights to life. Escape and political resistance have provided organizational bases in such situations.

Since the prisoner-of-war population is generally all male and within a fairly narrow age range, the "women and children first" ethic is not relevant. This ethic, however, may serve for such distinctions in shelter situations. Organization may develop around the "higher" altruistic purpose of insuring the survival of the young. The internment literature (Eissler, 1955; Vaughan, 1949) indicates that one cannot rely on this ethic being applied spontaneously.

The central value bases of prisoner organization are relevant to the shelter problem in indicating the need for "heroic" purposes. The special difficulties facing the engendering of such purposes for the shelter situation is indicated by the importance of a relevant cultural tradition in the acceptance and pursuit of such values in prisoner groups (Sentner, 1949).

It is believed that shelter planning should envision organization, or at least leadership, as oriented to some value other than simply the survival of the shelterees as a group. Preferably, this should be an "heroic" purpose. Defense against invasion and the reconsolidation of the larger community and the nation might serve as such values. The primary mission of the shelter leadership would be regarded as the attainment of such objectives, rather than the survival of the shelter group. From this standpoint, some name other than shelters would be applied to the places in which the population is supposed to go in response to the alarm. Names like "bases," "posts," or "civil combat stations" suggest themselves.

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SOME IMPLICATIONS FOR SHELTER LIVING BASED ON A STUDY OF ISOLATED RADAR BASES

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The purpose of this paper is to review and analyze research on human behavior and morale in isolated radar bases in the United States and in Japan and to apply its findings to the probable shelter conditions after nuclear attack. The research was carried out in the United States Air Defense Command on radar sites in the United States and Japan during 1951-1953. The central purpose of the research was to examine the impact of isolation on morale and human relations problems. The research design incorporated sites with varying degrees of isolation. While many sites were markedly isolated, none could be considered as extremely isolated as occurs on many northern or island sites. Men were required to live within the barbed wire enclosure 24 hours a day for many days. Passes were abundant but limited transportation often prevented movement out of the site for many weeks. The fact that many found nothing interesting to do when they left the radar base also dissuaded them from leaving.

A radar base is manned by a squadron varying from 50 to 200 men. In our sample, the men averaged 24 years of age, with a range from 18 to 45. The typical airman was a high school graduate; the typical officer was college educated. About 70 per cent of the men lived in dormitories on the base. Of these 70 per cent, three-fifths were single men and two-fifths were married men whose wives were not with them. The remaining 30 per cent of the sample were men who lived with their wives off the site wherever they could get housing. Sometimes this meant married personnel lived as much as 80 miles away. The length of service on a site might run to four years; the average airman in the sample had spent about 18 months on a given site. Isolation in Japan was more cultural than geographic.

In all Air Defense Command Sites, both in the United States and Japan, the radar sites had many common characteristics:

(a) standard facilities for eating, sleeping, and working,

(b) limited opportunities for recreation, especially for athletic activities and physical exercise,

(c) protracted periods of work involving limited bodily movement,

(d) limited geographical space for outdoor movement and limited shelter space for indoor movement.

The question as to how congruent these conditions may be with shelter habitability problems in a nuclear war depends on specifying possible shelter conditions. Four shelter conditions might prevail that have a high degree of similarity with radar bases:

(a) provision for shelter in a prepared evacuation compound many miles from a city to which the inhabitants may not return for a long period; a leadership structure appointed and sufficient supplies of food and fuel;

(b) provision for shelter in an underground factory or office setting where there is enforced isolation of daily life; a leadership structure appointed and sufficient supplies of food and fuel;

(c) provision for shelter in a large public shelter with 200 people or more inside a city that has not been hit but is susceptible to radioactive fallout; and

(d) small groups dispersed in various improvised shelters foraging off the land for food and other necessities.

The findings that are discussed in this paper are focused upon radar situations believed to be relevant to these four possible shelter-type conditions.

Shelter Characteristics and Behavior

1. The Air Site research indicates that leisure problems will emerge as the most crucial (Medalia, n.d.; Miller & Staff, No. 14, n.d.). Apathy and lassitude will increase unless there is a vigorous work and recreational program.

2. The more isolated the shelter, the greater will be the extent of personal problems (Garrity, n.d.; Medalia, n.d.).

3. The larger the shelter, beyond a minimal occupancy of 50, the greater will be the extent of personal problems, and the lower the morale of the occupants (Davis, Gross, & Miller, n.d.).

4. A cultural environment that is impoverished by normal standards of living breeds boredom, and the desire to escape this environment is very great. Inclement weather, which limits out-of-door activity, is especially detrimental to mental outlook. People adapt by trying to leave the enclosures frequently; failing this, they utilize sleep patterns as an antidote. Bodies grow fatter, and apathy increases (Miller & Staff, No. 15, n.d.).

Personal Characteristics and Behavior

1. Failure to establish desired sex and affectional relationships shows up in an increase of restlessness, which is exhibited by a greater participation in drinking and fighting, and by a desire to escape the enclosure (Miller & Staff, No. 15, n.d.).

2. The better educated persons will experience less deprivation than persons with poorer education (Medalia, n.d.).

3. Children provide a whole set of problems that aggravate parents' morale. Children need special kinds of recreational facilities to allow for their more energetic bodies; they need special measures of protection against cold, sickness, and accident. These demands place heavy burdens on parents whose concern extends to their offspring (Bushnell, n.d.).

4. Heterogeneous racial or ethnic members impose strains on group adjustment. A racial discrimination, or "pecking order," must be understood to take into account expected patterns of segregation and discriminatory behaviors. The allocation of limited food or water might be especially amenable to discriminatory practices (Gross & Collins, n.d.).

5. Persons who have developed habits and attitudes conducive to limited range of leisure participation are somewhat better adapted to the life of an isolated environment. Persons of rural background are better adjusted to isolation than those of urban background. The operative principle states: "Relative deprivation is greater for those who have built habits and values around a wide range of spectator pursuits, usually of a commercial character" (McCann, 1956).

6. Older people adjust better to the life of an isolated environment than younger people (Garrity, n.d.).

Leadership and Group Behavior

1. The needs for recreational facilities will be most commonly requested, if shelter, food, and clothing are adequate (Miller & Staff, No. 15, n.d.).

2. Individuals who threaten bodily injury to others, or who are extremely disruptive of group relations, will have to be incarcerated (Davis, Gross, & Miller, n.d.).

3. Leaders who are human relations-minded can stimulate a higher level of morale in a group. Leaders who are operation-centered tend to reduce group morale (Medalia & Miller, 1955; Miller & Medalia, 1955).

4. The simplest but most widely used recreational facility will be a library, or its substitute, especially in inclement weather. Other facilities of value are ping-pong tables, baseball equipment, and films (Davis, Gross, & Miller, n.d.).

Conclusions

Planning Considerations for Shelter Communities

The disruption of normal community life will be accompanied by various complaints and feelings of relative deprivation. As many material and leisure needs are removed, deprivation will be experienced. The planner of the improvised evacuated community will face some questions of policy. Five possible community types are presented (Air Site Project Staff, 1955; Bushnell, n.d.; Willis, 1953): (a) limited purpose community, (b) symbiotic community, (c) marginal community, (d) small, complete community, and (e) regimented community.

It is likely that the regimented community under authoritarian leadership is best adapted to the belief in the "big bang" theory of nuclear war. If a full-scale attack on all major cities is carried out, survival may be considered a matter of safeguarding as many persons as possible from deadly radiation dangers for a possible two-week period.

If a long, protracted period of living in an area for evacuees should be the case, then the other community concepts may be important to consider. Among these, the limited purpose community is perhaps most appropriate. Economic costs are minimized and emphasis is placed on the immediate necessities required for

survival. Nothing is provided, except what is necessary for biological and work needs. This concept has characterized the radar site. Experience shows such communities can function, although a price must be paid in mental and emotional stress with an attendant loss in efficiency. Human life for a more protracted period may best be preserved by establishing small, complete communities utilizing, perhaps, large caves and underground buildings. Such communities should be completely stocked with food. Workshop, church, library, and recreational facilities should be provided.

The symbiotic and marginal communities represent various concepts of utilizing the resources of small, existing communities nearby (Air Site Project Staff, 1955).

Leisure Needs

1. The general consensus of leaders in isolated sites was that leisure needs engendered most of the personal problems and, indeed, most of the administrative problems. Radar site personnel identified their need for recreational pursuits as their major want (Miller & Staff, No. 15, n.d.). These men relied most heavily on reading, sleeping, and talking as leisure activities. Some drank, and some gambled. Ping-pong and pool were the principal recreational games in the winter, but baseball was most popular when outside play was possible. Needless to say, none of these pursuits compared with the attraction of female companionship when such companionship was available. An overview of all recreational activity shows that it can be roughly classified into four types: creative, divertive, disintegrative, and illegal (Miller & Staff, No. 15, n.d.). Of these varieties, divertive forms were most frequently utilized.

2. The greatest challenge facing people in protracted isolation is the organization of creative or, at least, wholesome recreation. Ordinarily, creative learning experience must be planned. In a fallout shelter, the hobbies and trained capacities of each person should be utilized. A core group of books for children and adults should be a basic requirement of any pre-equipped shelter. Games should be available. Supplies like paper and pencils are equally adaptable to play and to learning. Language, literature, and science study should be possible in many shelter groups if there are people with teaching skill.

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GENERALIZATIONS FROM SENSORY DEPRIVATION TO FALLOUT SHELTERS

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Sensory deprivation (S. D.) is a term that has come to mean many things, but by and large, it refers to various conditions of human confinement and isolation. Sensory deprivation involves, in all cases, the confining of an individual to a small room under conditions of reduced sensory stimulation. To this extent, S. D. and life in a Radiation Fallout Shelter (RFS) may be similar. But beyond this point any close similarity between RFS and S. D. may be tenuous at best.

Sensory deprivation usually involves confinement of a single individual, whereas RFS will probably almost always involve at least several people, although solitary isolation in a fallout shelter is conceivable.

Sensory deprivation usually involves a drastic reduction in either the amount or the variability of sensory stimulation. In some S. D. studies (Vernon & Hoffman, 1956; Vernon & McGill, 1957; Vernon & McGill, 1958), the individual was confined to a dark, light-proof, sound-proof room resulting in a drastic reduction in the amount of sensory stimulation reaching the subject. In other studies (Bexton, Heron, & Scott, 1954; Heron, 1957; Heron, Doane, & Scott, 1956), the subject was exposed to a constant masking noise and/or an unvarying illumination and in these cases sensory stimulation was present but its variability drastically reduced. In RFS, there is little reason to expect either of those conditions to hold. In shelter life, there will probably be plenty of sensory stimulation as well as variability in the stimulation. The shelterees, however, will probably feel cut off from "outside" stimulation coming from the rest of the world.

In S. D. studies, the subjects are greatly restricted and restrained in movement, except when eating or using the toilet. Most S. D. studies involve a great deal of inactivity. Life in an RFS will not provide for the maximum of activity, but most assuredly shelterees will move about a great deal. In fact, they will probably take routine calisthenics.

The longest period of confinement used in S. D. work to date has been six days, and by far the vast majority of confinements has been for considerably less time. The period of confinement most likely to be encountered in RFS is difficult to determine since it depends on so many conditions, but the best safe estimate we have at present is 14 days. Even if this period is cut in half it still results in a confinement that is considerably longer than most S. D. work. The discrepancy may not be as large as it seems, for in most cases the S. D. confinement would appear to be a much more concentrated confinement. That is, it may be much more difficult to spend three days in total darkness than to spend a week in a typical RFS. And it may be infinitely more trying to experience solitary confinement as compared to confinement with others.

Sensory deprivation studies have minimized some of the stress of confinement by providing a subject with an "emergency alarm" to effect his release any time things become too "rough" for him. Obviously such a feature cannot obtain in RFSs. In addition, the necessity for life in RFSs will be infinitely more stressful than in any S. D. studies. Sensory deprivation has in no way simulated, nor could it, the life-or-death stress of shelter existence. Thus the motivation for sustained S. D. is, of necessity, much less than that for RFS.

In some S. D. studies, though not all, the confined subject has had advanced knowledge of the proposed length of confinement. It is conceivable that shelterees will not have the advantage of such knowledge. It is conceivable not only that shelterees will not know when they may exit from their shelter but that they may actually exit only to find it necessary to return to the shelter. The indeterminacy of the duration of confinement will render a more difficult adjustment to confinement.

Despite the differences between S. D. and shelter life, there are nevertheless certain comparisons that can be made. There are certain data coming from the S. D. studies that offer help for, and allow predictions about, life in fallout shelters.

Time Orientation: A Sensory Deprivation Study

Before listing the findings resulting from S. D. studies, it would be desirable to understand how most studies are conducted. To be sure, each investigator employs a special way of proceeding, so the present illustration should be considered as a theme upon which many variations have been rendered.

Very early in our S. D. studies, we noted an unusual amount of interest on the part of our subjects in time orientation. When they were placed in S.D., they did not know how long they were to be kept there except that it would never be over six days. We found that upon release from confinement they often volunteered a guess as to how long their stay in S. D. had been. This reaction was prompted in part by the fact that they were paid $20 per day of confinement and thus they were naturally curious to know how much money they had earned. I suspect, however, that it was more than just interest in money that caused them to reflect upon elapsed time. In any event, this rather prevalent interest in time orientation started us to think on the matter. Specifically, we came to ask: does man have a time sense?

We arranged a button in the confinement cubicle. The subject was instructed to push the button for five seconds whenever he felt that an hour had elapsed. In this manner he was to denote the passage of each hour. When he awoke after sleeping he was to guess how long he had slept and indicate that period by an appropriate number of pushes on the button. Thus if he pushed the button, say four times, we would know that he had just awakened from sleep and further that he estimated he had slept for four hours.

Note that our subjects had no way of telling time. They received no visual or sound clues to aid them in their estimations. They were faced with the problem of a more or less absolutely pure estimation of elapsed time. A survey of the literature revealed no other studies of this nature. A similar study was conducted by MacLeod and Ruff (1935) at Cornell University. They confined humans to a sound-proof room and asked for estimates of time. Their study, however, was confounded by the presence of lights, books to read, tasks to perform, and such things, which would give the subjects a pretty fair indication of elapsed time.

William James (1890) provided some speculation about man's estimate of time. He claimed that a day full of excitement passes "ere we know it." On the other hand, a day full of waiting will seem a small eternity. In fact, he claimed, we grow attentive to the passage of time whenever there is a relative emptiness of content. James is saying that the way in which man reckons time is not dependent so much on the actual lapse of time as on the content of that lapse. To demonstrate how long empty time can seem, merely close your eyes and wait for someone to tell you when one minute has elapsed. Here, as in the experiment, we are obviously talking about present time.

From James and from everyday observation we came to predict that estimates of time lapse in S. D. would be grossly overestimated. Empty time seems long and there can scarcely be any time more empty than that in S. D., thus we predicted that our subjects would probably come to mistake, say, a half an hour for a full hour or some such similar mistake. Our prediction could not have been more incorrect.

As the data show (Fig. 1), all of our subjects underestimated elapsed time. Some of them underestimated to such an extent that at the end of four days of S. D. they had accumulated a loss of 36 hours. In other words, they had lost one and one-half days out of four. Incidentally, all subjects were confined for four days, but they were not so informed prior to confinement. Instead they were told that they would be confined for any length of time up to six days.

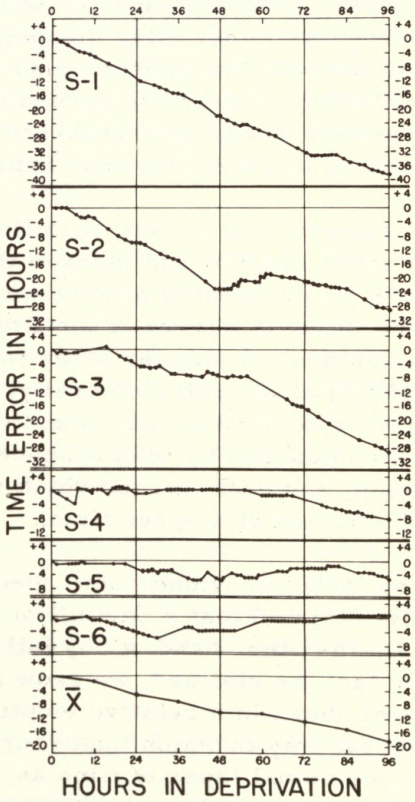

Figure 1

Not all subjects were as bad as indicated above. Some only accumulated a loss of 8 to 12 hours over the four-day period. But the general conclusion still stands; all subjects underestimated the elapse of time.

Ernst Mach (1914) seems to have offered an answer for our findings. He quotes the work of Dr. R. Wlassak who, in 1903 published the book Primitive Music. Wlassak claimed that time values are always diminished when connected with vivid emotional coloring. Now obviously Wlassak is referring to the appreciation of timing in music, but it seems reasonable that his prediction may hold for S. D. subjects since such confinement is highly colored with emotionality. For example, many subjects find they cannot endure S. D. and require early release from it. Thus, perhaps our people underestimated time lapse in S. D. because of the emotional coloring that accompanies S. D.

One week after release from confinement each subject was brought back to the laboratory for routine check-ups. In every case, the subject volunteered the comment that the period of confinement had shrunk to almost nothing. It was as though the four days had ceased to exist. This finding is very much in line with James's theory of time. In retrospect, James claimed, we feel that empty time passed quickly, whereas filled time seemed to have occupied a very long interval.

One further piece of data about man's temporal orientation came out of the S. D. study. It will be recalled that each man was instructed to push the button for five seconds to denote the passage of one hour. By measuring how long he actually pushed the button we were able to get at his ability to estimate short intervals of time. From this calculation we found a perfect positive correlation, which made sense. The individual who lost the most time over the four days had the shortest average estimate of five seconds, and so on, until the man who underestimated least made the best estimates of the five-second interval. Thus these subjects appeared consistent in their ability, or inability, to estimate time whether it was for long or short intervals.

In conclusion, it was determined that man can do a very reliable job of estimating time despite the reduction in sensory cues. He is not very accurate, he tends to underestimate elapsed time, but he is very consistent, so much so in fact that we could have predicted his total loss for four days on the basis of one day's data.

This then is a typical S. D. study. Now let us turn briefly to some summary statements about generalizations from S. D. work to shelter conditions.

Generalizations from Sensory Deprivation

1. Shelter confinement will be more easily tolerated than S. D. confinement due to the presence of illumination and the presence of other persons.

2. Shelter confinement will not be nearly so restricted as S. D. confinement and hence easier to endure.

3. Shelterees probably can expect to loose weight; almost all S. D. subjects did.

4. Some shelterees, but not all, can expect to emerge from shelter into a yellow-tinted world, especially if shelter illumination has been low. Many, but not all, S. D. subjects comment on a yellow tint upon emerging from S. D. confinement. The condition is very temporary, which is indicative of no damage to the visual mechanisms.

5. If illumination in the shelter is very low, the shelterees can expect to experience some visual hallucinations. If illumination is absent altogether, the hallucinations will not occur. These phenomena are temporary and do not indicate any sort of mental or physical deterioration. One should not become alarmed over the realization that he is experiencing an hallucination.

6. Auditory hallucinations may occur under shelter conditions, especially if a relative quiet prevails that is interrupted by non-structured sounds.

7. The threshold of pain was found to be lowered by S. D. That is to say, S. D. caused one to become more sensitive to pain. The same effect may occur in shelter.

8. Some S. D. subjects report an inability to maintain thought during confinement. This probably will not occur in shelter since the shelterees could talk to each other, and so on.

9. In S. D., it was found that for simple tasks learning ability improved. Something of this sort will be of no consequence to shelterees since they will not be concerned primarily with learning tasks.

10. Shelterees can expect a deterioration of almost all kinds of motor performances. Fortunately the losses are not great, they would not be incapacitating, and they are temporary. Shortly after release from confinement, S. D. subjects regained the accustomed motor ability and skill.

11. Almost all S. D. subjects found an inordinate amount of time devoted to sleep. Sleep simply provided an excellent escape from a boring situation. Unfortunately, however, they tended to sleep too much at the beginning so that they could not sleep later on. Shelterees would do well to use sleep as an escape mechanism, but they should discipline themselves so that it would be available to them throughout their confinement.

12. Almost all S. D. subjects reported that S. D. was stressful and certainly shelterees can expect the same result. Some S. D. subjects were unable to endure such confinement and demanded an early release. Roughly between one-fourth and one-third of our subjects fit that category. It is of interest, however, that none of the people used in the time orientation study pushed the alarm switch. This would suggest that confinement can be made more bearable if some task is introduced to help pass time.

13. Subjects in S. D. often have dreams relating to wishes of release and shelterees can expect much the same thing. The only precaution to be observed here is not to allow the dream to plant some obsessive idea that would be incompatible to continued confinement.

14. The analysis of the air in the S. D. chamber revealed that CO_2 can climb to a surprisingly high level without effecting the subject. Apparently, under the conditions of greatly reduced activity one can endure easily up to five per cent concentration of carbon dioxide, at least for several days.

15. All S. D. subjects report a strong need for bathing, but they do not detect any odor. Apparently they adapt to the odor and never come to notice it. Shelterees can expect the same effect, which will undoubtedly be fortunate.

The main value of these generalizations is that knowledge of them may prevent the shelterees from being caught off-guard by some unexpected development. Advanced knowledge of this sort may help them adjust to many of the conditions and effects of shelter life.

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ADJUSTMENT TO ENVIRONMENTAL STRESS IN FALLOUT SHELTERS

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If it should become necessary for people to take refuge in nuclear fallout shelters, a number of psychological adjustment problems might arise. Among other things, individuals might have to endure various physiological deprivations and adverse environmental conditions during the two-week occupancy that would probably be required for safety. These factors might include a lack of food and water, poor air circulation, or overcrowding. The psychological effects of these conditions might be of significance in planning for shelter construction, stocking, and organization. Many of these effects have been studied in experimental and field situations.

The present plan of the Office of Civil and Defense Mobilization is to stock shelters with enough food to provide 2,000 calories per day per person. In general, this is an adequate diet for most people, especially in view of the lack of activity likely in a fallout shelter. The psychological effects would be minimal. However, if the period of occupancy be extended beyond the two-week period or if more people than planned for enter the shelter, rationing would be necessary and caloric intake might be severely reduced. Actually, normal people would most likely survive a total lack of food for two weeks, and after the first three or four days they would not feel hungry. But, as studies at the University of Minnesota (Brozek, 1955) have shown, muscular coordination and manual performance deteriorate. The men in the study felt tired and weak, and had difficulty in concentrating. They experienced nausea after work, tended to be sleepy, and had a dryness in the throat. A personality test showed that the men were anxious, depressed, and preoccupied with bodily concerns. They were also irritable. Partial food deprivation shows similar effects even with diets of 1,000 calories per day. Prolonged semi-starvation may result in poor social and emotional adjustment, including neurotic and even psychotic symptoms and a deterioration in moral standards (Keys, Brozek, Henschel, Mickelson, & Taylor, 1950). In the shelter situation, in the case of prolonged occupation or overcrowding, the chief effects would probably be decreased efficiency, depression, and irritability.

Various vitamin deficiencies produce somewhat similar psychological effects (Goldsmith, 1956; Wilder, 1952), but these would probably not show up during the shelter period except in special cases. These special cases deserve some mention since they may present management problems. Pregnant and lactating women, very young children, the aged, and some of the physically ill have special nutritional problems including increased vitamin needs. An emergency vitamin supply might prevent some problems in these special populations in the event of a food shortage (Wohl & Goodhart, 1955).

The quality of the food supply would have some bearing on the general morale of the group. For example, having some hot food seems to have a beneficial effect (Wohl & Goodhart, 1955). Acceptance of various kinds of emergency rations is related to personality. Immature and maladjusted individuals may reject emergency rations (Torrance & Mason, 1957), but this can be influenced by group pressures (Foster, Pratt, & Schwartz, 1955).

Water is one of the essential requirements for human life. Without water, a group of people in a fallout shelter could not survive for two weeks. Death occurs about four or five days after total water deprivation, depending on other factors such as environmental temperature. Some water is contained in food so that with food the period might be extended for a few days (Marriott, 1950). The current plan is to provide one-half gallon per person per day. Overcrowding or prolonged occupancy would reduce this. Water deprivation produces not only the powerful sensation of thirst but also physical weakness, difficulty in concentration, irritability, and, eventually, confusion and hallucinations. At extremes, people will suck their own blood and drink their own urine (Wolf, 1956). Studies have shown that, at moderate temperatures, men are able to do well on one-half gallon per day but that reducing this to one-fourth gallon made it difficult to maintain physiological water balance (Monagle, Grande, Buskirk, Brozek, Taylor, & Keys, 1956). Water needs went up if the temperature increased markedly. Salt is required for water balance but will probably not be a problem, unless there is an abnormal loss of fluid due to sweating, vomiting, or diarrhea followed by an ingestion of large amounts of water (Mariott, 1950). The loss of fluid might occur, but the large water intake seems unlikely in a shelter. Infants are particularly susceptible to water loss. In general, water requirements are so crucial, not only to psychological adjustment, but to survival as well, that emergency supplies should be provided in a shelter. Emergency supplies of salt might also be advisable but are not as urgent.

The temperature in the shelter would also influence behavior. Present specifications call for an effective temperature of 85° Fahrenheit. Few really serious problems would be likely at this temperature level, but drastic increases or decreases might be disturbing. Extremely cold temperatures do not seem likely in crowded, enclosed, underground shelters. Conceivably, this could be a problem in a northern state in the middle of winter. Even then, the wind factor, which is of great importance in cooling the body, would be minimized. Nevertheless, low temperatures do have effects. Manual dexterity begins to deteriorate below 60° Fahrenheit and becomes almost impossible below 40° Fahrenheit (Dusek, 1957). Emotional tension, irritability, and depression occur, particularly in some individuals (Blair, Urbush, & Reed, 1947). On the other hand, heat and humidity would probably be of greater significance in a shelter situation, particularly under crowded conditions. Above 90° Fahrenheit, temperature impairs work efficiency, concentration, and emotional reactivity (Chiles, 1958; Mackworth, 1946; Reed, 1942). High temperatures particularly disturb hard physical labor, producing nausea, dizziness, and pain. Sedentary people are especially disturbed (Buskirk, Iampietro, & Bass, 1958; Fregly & Iampietro, 1958). The temperature at which performance is affected depends on the humidity (Eichna, Ashe, Benn, & Shelley, 1945). This interaction is important in shelters, which will probably be humid as well as hot. The psychological symptoms of depression and fatigue are significant for shelter planning. It should be noted that much of the effect of high temperatures is due to the loss of water through sweating. The water can be replaced by drinking. This underscores the importance of an adequate water supply.

The next factor is the air supply of the shelter. The effects of a decreased oxygen supply have been studied in decompression chambers and at high altitudes. Visual acuity is especially impaired (McFarland, 1952). Other functions that have been shown to be disturbed include handwriting, reaction time, code translation, and recent memory. Judgment becomes unreliable and a man's insight into his own condition and deterioration is minimal. In this respect, oxygen lack is similar to alcoholic intoxication. As oxygen deprivation continues, people show irritability, lassitude, and anger or go to the other extreme of exhilaration, euphoria, and boisterousness. Delusions and hallucinations sometimes occur. Lack of oxygen may produce organic brain damage leading to decrements in intelligence that may last a lifetime (Morgan & Stellar, 1950; Windle, 1952). People who are subjected to other stresses, such as anxiety, disease, and hunger, tend to be more susceptible to the effects of oxygen deprivation (McFarland & Barach, 1937). Of particular significance to shelter planning is the fact that lack of oxygen does not produce a craving analogous to hunger or thirst

(Miller & Dollard, 1941). Thus, a person may be affected by a decrease in oxygen without being aware of a difficulty. Carbon dioxide, in large amounts, may also have somewhat similar psychological effects. Carbon monoxide, a deadly poison, is given off in engine exhaust fumes and tobacco smoke. Even at low concentrations, this gas multiplies the effects of lowered oxygen in the air (McFarland, 1952). Smoking and engines should be avoided in shelters. Body odors and stagnant air have detrimental effects on performance and adjustment as well as interactions with temperatures (New York State Commission, 1923). In general, from the point of view of both short and long term psychological results, efforts should be made to insure an adequate air supply.

Another kind of stress that might be of significance in a fallout shelter is that due to environmental stimulation. A shelter might be a noisy place. Noise does not affect most performance and intellectual tasks (Stevens, 1946). But it may affect concentration, and it does produce irritability, fatigue, and aggression (Broadbent, 1958). Low illumination can increase muscular tension and may have other psychological effects. So, too, glaring light sources increase muscular tension (Tinker, 1949). Some of these factors might be minimized in shelter construction. Sensory deprivation has many interesting psychological effects, including performance decrement and hallucinations (Bexton, Heron, & Scott, 1954). However, a crowded shelter would probably provide enough internal stimulation to make up for loss of external sources.

The effects of confinement and crowding in a small space have been studied experimentally in connection with possible space travel. The OCDM plan is to provide 5 to 12 square feet per person, but this may be reduced to as little as 2 square feet in an emergency. In one study (Gaite, Hanna, Bowe, & Greco, 1958), young men were kept in a small chamber providing 15 square feet of floor space per person. During a seven-day period, there was a decrement in tasks relying on concentration and vigilance. Morale dropped. The men experienced sleep loss because of short bunks (62 inches) and distraction. The almost continual operation of a food-heating unit contributed greatly to the humidity and temperature, making the levels objectionable. As a consequence, the taste and smell of food became nauseating. Some individuals find confinement extremely difficult; they may even have hidden tendencies towards claustrophobia. Other individuals may be disturbed by the lack of privacy. Some sort of private toilet facility should be provided.

If space conditions are such that people are limited to 2 square feet, the problems will be multiplied enormously. The

situation will be similar to rush hour subway trains. People will become extremely fatigued and sleep-deprived. A two-week period of this would be almost unbearable. If conditions get this bad, it would probably be best to provide tiers of horizontal bunks so that fatigue and sleep loss are minimized.

Fatigue and sleep loss during a two-week period of shelter occupancy are probably unavoidable to some degree due to crowding, noise, and other factors. These conditions produce disturbances in performance especially in those tasks involving concentration and vigilance (Chapanis, Garner, & Morgan, 1949). The effects of sleep deprivation have been studied at the Walter Reed Army Institute of Research (Williams, Lubin, & Goodnow, 1959). Men became listless, apathetic, and sometimes irritable (Murray, 1959; Murray, Schein, Erikson, Hill, & Cohen, 1959; Murray, Williams, & Lubin, 1958). The subjects described many subjective experiences including visual disturbances, disorientations, and hallucinatory-like episodes (Morris & Williams, 1959). Other studies (Tyler, 1947) have reported overt aggression and psychotic-like states. These effects disappear with proper rest.

In the preceding paragraphs, a number of individual physiological deprivations and adverse environmental conditions were considered separately. However, many of these variables may interact and produce an overall stress of great magnitude. For example, extreme crowding might increase the temperature and humidity. This would lead to sweating and, consequently, thirst, weakness, and irritability. The heat plus hunger might lead to nausea and this might produce vomiting in pregnant women and ill persons. This would add to the general level of tension. The tension, noise, and crowding would lead to fatigue and sleep loss and possibly peculiar subjective experiences. Special populations, including the very young and the very old, the physically and mentally ill, would further complicate the picture. In addition, anxiety about eventual survival and the fate of loved ones would interact with the environmental stresses.

A key factor in all of the effects discussed in this paper is frustration (Dollard, Doob, Miller, & Sears, 1939). Each physiological deprivation and adverse environmental condition constitutes a psychological frustration and altogether they constitute an extremely frustrating situation. Individual reactions to frustration are many and varied, but a few of the major ones should be pointed out to help in planning for shelter organization. One of the earliest and most prominent reactions to frustration is aggression. Aggression is sometimes successful in removing the source of frustration. In a shelter situation, this would not be possible and the

unresolved aggression might take forms destructive to interpersonal relationships. Recall that one of the most common symptoms of the deprivations and conditions mentioned above was irritability and aggression. A second reaction to frustration is depression. This probably occurs at a later stage. Despair, helplessness, and melancholia might appear. This was also a common symptom in the studies summarized. A third important reaction to frustration is regression (Barker, Dembo, & Levin, 1941). People may become infantile, unreasonable, demanding, and spiteful. Self-centered, rather than cooperative, behavior may occur. Many pathological symptoms and character traits may show up as demonstrated in many of the studies. Finally, a common reaction to frustration is withdrawal. If people were driven to escape the frustrating shelter situation, their lives would be endangered. All of these reactions to frustration should be anticipated and planned for.

Most of the common reactions to frustration, as well as other problems emerging from the environmental stresses covered in this report, can be dealt with through proper social leadership and group organization. One possibility is to train shelter leaders. These leaders would have an understanding of the nature of the environmental stresses and the reactions to them. Ways of minimizing the stresses might be worked out in particular shelters. In addition, these leaders could be taught some of the elementary techniques of group leadership including setting up channels of communication, delegating responsibility, running democratic group discussions, and keeping up morale. Of course, in an actual situation a leader might not be present. A natural leader would probably emerge and it might be useful to have a manual covering many problems of shelter living available for him.

One of the chief problems facing a shelter leader and the group would be keeping people in the shelter in the face of all of the frustration mentioned. One can think of the individual as being in a conflict (Miller, 1944). He has strong motivations for leaving the shelter, but these are balanced by his fear of external radioactivity. As the frustrations build up, he is more and more motivated to leave. As time goes by, the radiation hazard seems less and less important. In order to keep him in the shelter, one must reduce his motivation to leave by dealing with the frustrations to the extent to which this is possible. Beyond that, the only way to keep him in the shelter is to reinforce his avoidance of the external environment. This can probably be best accomplished by giving correct and realistic information. Extremely emotional appeals may be rejected, ridiculed, and denied. Broadcasts by well-known authorities would probably be powerful deterrents to leaving the safety of the shelter.

This last brings us to a point which has been emphasized to the writer by N. H. Mackworth in a personal letter. This is the extreme psychological importance of communication with other shelters and with the areas not in the radiation zone by radio or other media. This could be used for exchanging information and comparing experiences. Details about the radiation hazards could be broadcast and reinforced by persons of authority and prestige. Information about separated family members could be obtained, adding greatly to morale and decreasing one motivation for leaving the shelter.

A word about the research in the area of environmental stress as it relates to shelter planning. Most of the experimental studies have been done with healthy, young men in college or the armed services. Many of the results may underestimate the influence of these variables as they apply to special populations such as children, women, the aged, and the ill. Another shortcoming of the studies is that they have emphasized effects on physiological and task performance, rather than resulting emotional and social effects. Finally, most of the studies have examined one variable only, while the interaction effects are probably also important. Therefore, a need exists for more research along these lines. This research should be done in laboratories simulating shelter conditions as much as possible, should involve special populations and interactions between variables, and, finally, should emphasize emotional and social processes.

To summarize: Living in an atomic fallout shelter for two weeks may involve many physiological deprivations and adverse environmental conditions. Many of these stresses have significant effects on behavior. These include decreased efficiency in performance, difficulties in concentration, irritability, depression, and personality disturbances. Special groups such as children, pregnant women, and the ill would be particularly affected. A common element in the various environmental stresses is frustration. Common reactions to frustration include aggression, depression, regression, and withdrawal. Many of these problems can be handled by adequate social leadership and organization. Shelter leaders should be trained and a manual prepared. A critical problem would be keeping people in the shelter in the face of the frustration. One way of handling this and other problems is through radio contact with the outside world. Further research is recommended.

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ENGLISH WORLD WAR II BOMBSHELTER EXPERIENCES AND THEIR APPLICATION TO U. S. CIVIL DEFENSE SHELTER PROBLEMS

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English World War II bombshelter experience has been briefly examined in order to identify hypotheses relevant to U. S. Civil Defense shelter planning. No attempt has been made to summarize such bombshelter experiences.

To this end, Index Medicus and Psychological Abstracts for the years 1939-1945 were consulted. Perhaps the most useful sources in the literature were sections in The Civilian Health and Medical Services, edited by A. S. MacNalty, (London: H. M. Stationery Office, 1953). In addition to consulting published sources, the writer met with certain personnel of the Ministry of Health who had had some experience in this area. A more extensive review of available material would probably have been desirable. However, time was inadequate for getting more than a picture of the range of information available, and the results obtained suggested that any additional investment of time and money would not yield sufficiently worthwhile returns, at least not with regard to the psychological and social factors involved in shelter living.

Certain basic difficulties in interpreting the available information became evident:

1. Present concerns are very different from those in World War II. A current need is to determine the critical limits beyond which problems of morale, mental health, and social conflict will arise. However, at the time when the English authorities made their observations, they were concerned with preventing the occurrence of just such critical situations; they tried to anticipate these major problems of health and morale by taking various planning steps. Since they succeeded in staying within the critical limits, it is difficult to know now whether the problems would have developed.

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*Miss Rayner read this paper for Dr. Guskin who was resident in Britain.

2. Problems of physical health and injury were of much more concern at that time than psychological and social causes and effects, and so the observational focus was again different.

3. Since the observations that would be of most interest now were not recorded in detail at the time, the problem becomes one of interviewing people more than fifteen years later about details that were not the most significant events in their lives even then.

The data, in terms of an over-view of World War II shelter experiences, indicate that morale was high and mental disturbance infrequent. Authorities became quickly concerned with discomforts and health risks, so that the most extreme conditions either never materialized or were quickly reduced in magnitude. The wartime situation created in nonshelter living so many tolerated deprivations that shelter living was not seen as so different in that respect. Since military people were undergoing much greater risks, personal discomfort would hardly have been acceptable as a significant source of complaint. People tended to be oriented towards the broader problems of war. Finally, there were socially and psychologically rewarding aspects of civilian wartime living, and shelter living in particular, where the same people returned night after night to share the same sleeping quarters.

British Experience and U. S. Civil Defense Plans

The Conditions under Which People Seek Cover, or Take Risks

Civilian casualties in air raids would have been reduced markedly if all people had taken proper shelter in response to the alerts. However, even during the heaviest attacks, more than half the population of London did not give itself adequate shelter protection. The probability of a person getting injured or killed in any one alert was very low; thus, after an initial tendency for people generally to take shelter, experiences with air raids led many people to take risks. The first alert, shortly after war was declared, was very effective because of the anticipation that war would mean bombing and that bombing would mean massive destruction.

This reaction implies that CD personnel should not worry about the apparent apathy of people at the moment, but should be more concerned with what people anticipate in the event of war and the occurrence of an alert or some other signal. Incidentally, the English do not hold full practice drills with practice signals. The sirens are reserved for the real thing. Only the CD personnel practice reactions to the attack situation. Thus, so far as the general public is concerned, sirens are not confused with other things.

Under repeated bombing threats, anxiety decreases if people have some way of protecting themselves even if they do not use it. People cannot spend their entire time in shelters in anticipation of an unpredictable event. They take the risks, forgetting about the threat hanging over their heads. Things that make the threat visible are avoided as sources of anxiety. If shelters are used, they are the ones that reduce the anxiety most, not necessarily those that authorities propound to be the safest; e.g., underground shelters may, as in England, be felt to be safer than aboveground shelters regardless of their true safety value. Getting into the car and driving away from the city may seem safer than going into the basement, though it might be disastrous. It would be an interesting bit of research to ask people to imagine what they would do first and where would be the safest place if they heard the signal after the threat was declared.

Concerns of People in Authority Positions

There were some indications that people in authority positions expected the mass of people to retreat to shelters when war started, making themselves unavailable for necessary wartime industries. In actuality, however, being able to work in the war effort was highly valued and desired. During the war, civilians took greater risks than desired, and bombing influenced work attendance only when time had to be spent in making arrangements after the worker's home was destroyed or his family members were injured or killed. It should be remembered, of course, that most of the bombings were at night. There seems to be a similar concern in the U. S. that the development of a shelter program may lead to passivity of its citizens. People will undoubtedly need and want to be active in a period of threat, whether or not they have shelters.

Another occurrence of interest was the pre-war tendency of responsible officials to make extreme estimates of attack and destruction, and not make any plans adequate for other alternatives. At present, planning in the U. S. seems to focus on certain massive attack patterns, e.g., all 200 major targets simultaneously attacked. Actually, other possibilities are as reasonable, e.g., a single bomb in each of three major urban areas. The two assumptions, that attack will come at the most disruptive time and that it will be a single devastating one without a prolonged threat, both ignore problems that should be anticipated if these assumptions are invalid.

On the other hand, the expectation that responsible people must make all the relevant decisions and preparations before the crisis is unreasonable; all the possibilities cannot be anticipated. Planning an organizational structure for dealing with problems that

arise will, in many cases, be more important than a pre-existent solution.

Leadership

A great deal of responsibility for the high morale of civilians during World War II has been accorded the air raid wardens. Among the things emphasized as important factors in the acceptance of their leadership were that they were from the people, not the military, not the police; that their word was law (i.e., they were firm and they were respected); that they were local leaders (i.e., the people they had control over were their neighbors); that they had recognizable uniforms or symbols that set them apart from others; and that they knew their duties and carried them out well.

The Influence of Group Structure on the Shelter Situations

Since the attacks came at night, the shelters were soon used as dormitories. They amounted to communal shelters because the people who used them lived in the area. People returned to the same shelter night after night, sharing it with the same neighbors and becoming even closer to each other than their initial common background had made them. This kind of grouping has been claimed to have had a biologically advantageous effect of minimizing illness; with fewer outsiders around, resistance to local bacterial strains was built up. The grouping also gave a kind of social immunity to emotional disturbance.

Similarities and Differences

Some of the most important differences between the two kinds of situations can be examined as differences in time considerations: warning time, time spent continuously in shelters, the length of time during which threat continues, and the predictability of these times.

The dominant pattern of shelter-taking in England was that people moved into shelters almost every evening, slept there until morning, and then went about their normal routines. As a definite expectation was developed that attacks would come at night, anxiety and loss of sleep were readily avoided by this procedure. In comparison, the nuclear attack situation seems unlikely to be a predictable series of events, and the aftereffects of any attack would be of such length that people would not be able to leave for days or, possibly, weeks. The predictability of nuclear attack would probably be low with the warning period relatively short, perhaps only 15

minutes. Such a warning period, however, would be no shorter than that experienced by the English during World War II. When there were daytime raids, the warning that an air attack was imminent was only about 15 minutes, since the destination of the attack could not be predicted much before that, and it would have been very wasteful to have everyone run for shelter everytime any planes headed for England. Similarly, during the night attacks, those who did not choose to sleep in shelters had little time to take shelter. The result was that for many of those who did not sleep in shelters, duck-and-cover was the rule. During the latter part of the war, rocket bombing occurred during the day. The time for warning and the predictability of the attacks were so low that there was no time for anything but "ducking" into the nearest cover. The period of time over which these attacks occurred was much shorter, and no discernible pattern of further reactions seems to have developed.

Problems relating to the physical conditions of the British shelters may parallel those of a fallout shelter. These conditions are summarized in this quote (MacNalty; 1953, 1, pp. 193-195):

> With the continuous night raids upon London, shelters not originally intended or designed for sleeping began to be used every night as dormitories. There was a rush to the underground tube railway stations, which rapidly led to severe overcrowding. People felt safer when they no longer heard the sounds of gunfire or exploding bombs; they therefore avoided the surface shelter and sought protection underground or under such places as railway arches, many of which, though traditional shelters of the last war, had never been scheduled as shelters, and afforded protection much below standard.
>
> A serious public health problem thus appeared, and the Minister of Home Security and the Minister of Health appointed a committee...to inquire into health conditions in air raid shelters...
>
> The fundamental problems were overcrowding, defective ventilation, insufficient closet accommodation, dampness and lack of cleanliness. Many of the shelters were below the level of the sewers and pail closets were essential. Dampness, due to faulty roofing, condensation, and flooding by storm or by fire-hose water, led to increased overcrowding in those shelters or parts of shelters which remained dry.

The seating capacity of public shelters provided for occasional use, had been assessed at six square feet per person, or three and one-half square feet if artificial ventilation provided an adequate turnover of air. This assessment...did not foresee their use as dormitories, and yet so dense was the crowding in some shelters that even this space was not available...

The first attempt to control overcrowding was to fix a minimum of 50 cubic feet per person in shelters used as dormitories, though it was recognized that since it was humanly impossible to deny admission to anyone during air raids it was equally impossible to enforce any standard. The provision of bunks in which shelterers could sleep went far to reduce overcrowding and later, when more approved shelters were provided, a ticket system restricted the dormitory population of a shelter to the number of its bunks... Fortunately, shelterers were never forced to spend the hours of daylight as well as the night in shelters, and as an adequate vitamin content was always maintained in the people's diet, no immediate ill-effects from sunlessness were observed...

Except in the tube stations, lighting was often inadequate, while in very few shelters was there effective lighting during the evening which could be dimmed during the night. Heating arrangements were seldom provided as they interfered with adequate ventilation of the shelters.

The absence of a piped water supply and consequently of washing facilities in many large shelters, and an unexpected mosquito nuisance in several of the underground tube stations were other difficulties to overcome...

Gradually medical aid posts were opened and staffed. Bunks were provided and shelters coded to indicate clearly their capacity both as dormitories and as casual shelters. Sanitation, water supply, ventilation and lighting, canteens and amenities were installed and the management of the shelters was made part of the warden service of local authorities.

The poor physical conditions, which alarmed public health authorities, failed to lead, however, to serious epidemics. The reasons for the absence of serious outbreaks are explained by the health authorities (MacNalty, 1953, 1, 213):

> (In one large sample studied) less than 10 per cent were under 15 years and most were of middle-age, with a heavy predominance of females. The shelter populations were first assembled at the end of a fine summer, they tended to come from the same locality and the same social group, and so to be concentrations of pre-existing groups. There was no large-scale massing of strangers, the population was relatively immobilized and haphazard massing in places of amusement was lessened. The mortality figures for the country as a whole were low. The weather, though cold, was dry and unusually free from fog. The shelter population, in short, was tough and resistant, and the nation's diet carefully planned with adequate rations of protective foods. Morale was high, and unexpected patience, good temper and even heroism prevailed. The psychological ill-effects of bombing were compensated by the benefits of a new social experience; there seemed to be no increase in neurosis. Of the 3,500 new cases treated in the medical aid posts, only 30 were obviously of psychological origin, though some 150 other complaints may have had a psychological element.

Summary

1. Anticipation of the effects of war and bombing may be a better predictor of shelter-taking behavior than the apparent apathy towards the possibility of war and bombing.

2. Anxiety in response to bomb threats was reduced by repetition of attacks of a less destructive nature than anticipated, and by the availability of protection even though it was not used.

3. The high morale and low incidence of mental disturbance in shelters has been attributed, to a great extent, to the leadership of wardens and the satisfactions of communal living.

4. The relatively stoical attitudes of the British people during the war tended to minimize negative responses to deprivation.

5. The inadequacies in the physical properties of shelters were quickly recognized and attended to. Many of these inadequacies were attributable to a longer stay required in shelters than had been anticipated.

6. Authorities ought to consider a variety of alternative assumptions about destruction. Perhaps more importantly, they should develop an organization for dealing with unanticipated problems as they arise.

7. Findings are limited since the British authorities during World War II were naturally much more concerned with anticipating and alleviating physical and medical problems that developed in shelters than with determining the critical limits at which dangerous social and psychological situations might develop.

SHELTER PROGRAMS AND RELATED RESEARCH ACTIVITY IN THREE EUROPEAN COUNTRIES

The Shelter Program and Shelter Occupancy Experiments in Sweden

A Shelter Occupancy Experiment near Bonn, Germany

Soviet Civil Defense

THE SHELTER PROGRAM AND SHELTER OCCUPANCY EXPERIMENTS IN SWEDEN

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The Swedish Shelter Program is a compromise between complete protection from every form of warfare and the kind of protection that is readily available. Generally speaking, the program consists of

(a) a plan for evacuation of the most densely populated sections of the country according to their importance as target areas and

(b) a system of sheltering that will give various degrees of protection from atomic, biological, and chemical (ABC) warfare.

Organization of Swedish Civil Defense Research

The technical and economic aspects of civil defense research planning are controlled by the Royal Swedish Civil Defense Department, which is under the Ministry for Home Affairs. The actual research is generally carried on by the Research Institute of National Defense and the Royal Swedish Fortification Administration, both under the Ministry of Defense.

Today the necessity of a total defense is generally agreed upon by all responsible Swedish leaders, and civil defense is viewed as equal with military defense.

The Plan for Evacuation

The plan calls for evacuating the population from the most densely inhabited target areas when the threat of war becomes imminent. Except for Stockholm, no area will be left with more than 15,000 in it.

The evacuation is planned to take place in two phases. The first will be almost automatically put into operation at the mere threat of war. Women, children, the aged, and the infirm (about 50 per cent of the total population) will be moved out of the big cities to rural areas. The feasibility of this evacuation is possible because Sweden is a vast country (173,000 square miles) with a population of seven millions, many of whom have two residences—a city dwelling and a small, country summerhouse.

The second and final phase of evacuation is intended for the working personnel of the industries within the bigger cities (10,000 or more). The industrial workers and most of the other people left from the first evacuation will be temporarily moved to the peripheral areas. This group consisting of about 40 per cent of the normal population will have possibilities to remain continuously in standard shelters with enough space and supplies for at least one week. Therefore, complete evacuation will mean that only about 10 per cent will still live within the most vulnerable parts of the largest cities where the first-class shelters are situated.

The Shelter System

Shelter protection is considered in terms of ABC warfare; i.e., a certain amount of protection will be provided against nuclear, bacteriological, and chemical weapons, including the effects of blast, radiation, heat, toxic particles, and gases. Consideration is also given to protection against conventional weapons. Three types of shelters have been or are being constructed or planned.

First-class Civilian Shelters

The first-class shelters are located in the evacuation area. They are either built in rock or made of concrete. They are constructed to withstand pressures of 147 pounds per square inch (psi) or more. They are located in areas where big fires may develop and, where necessary, are fully equipped to remain completely closed off from the outside until the fire has had time to burn down—an estimated time of less than ten hours. They also have devices for ventilation and temperature control under extremely crowded conditions (5.4 square feet per person) for a limited time in case of emergency, as well as gas and aerosol filters. This technical equipment is also used as much as possible during peacetime.

These shelters are constructed in cities with more than 50,000 inhabitants. They are intended for use by workers who must remain

in the city to keep the necessary war industries running, certain civil defense units, police, and utility personnel.

Since at least 50 per cent of the normal population will have been evacuated before these shelters are used, the available space in them will be enough to serve as quarters for the remaining people. They will provide an average of 10.8 square feet per person, or 16.2 square feet per person for half the people lying down and 5.4 square feet per person for the half sitting up.

The cost of both rock and concrete shelters is about $386-580 (U. S.) per person, or per 10.8 square feet. About 30 per cent of this amount will be paid through peacetime use of the shelters for garages, training halls, swimming pools, cinemas, storage of supplies, etc. Of the remaining 70 per cent, about two-thirds will be paid by the State and one-third by the local governments.

Standard Shelters

These shelters are being built into the new buildings that are being constructed in preplanned suburban areas. They consist of the normal concrete house basement with certain reinforcements applied to walls and ceilings. The concrete ceiling, for instance, is given a higher load capacity by means of tube columns that the tenants can install quickly. These shelters will withstand pressures of 7.4 to 14.7 psi, depending on the area in which they are built.

The standard shelters are equipped with technical devices to permit prolonged living at an occupancy density of 10.8 square feet per person. After 10-12 hours, ventilation will be necessary, at least during the hot season. Ventilation can be maintained during air cleaning by means of sand filters or activated carbon and aerosol filters built into new houses or only activated carbon and aerosol filters in pre-existing houses. The air will be sucked into the basement via the house, which will tend to filter out a certain amount of radioactive fallout. No cooling equipment is installed.

The standard shelters are constructed in towns of at least 10,000 inhabitants. For towns with fewer inhabitants, no shelters have been constructed at all. At present the total number of places equipped with standard shelters is about 1.5 millions.

The cost for these shelters is about $29 (U. S.) per 10.8 square feet beyond the ordinary costs for the basement. This amount is paid by the tenants, as the costs are included in the rent.

Shelters for Radiation Protection

In Sweden, there is a plan for taking stock of basements in rural area dwellings to investigate the possibilities for reinforcing and completing them so that they will offer a certain amount of radiation protection (Factor 1/100 - 1/1000). There has been much discussion going on as to the possibility of preparing suitable protection in this way. Recommendations for construction materials shall be made by the government. The rest of the procedures, though legislated (from July 1, 1960), will be left to the house owners. Concerning the cost, there are no definite figures as yet, but $5.80-7.70 (U.S.) per person has been suggested for buildings that have already been constructed.

Gas Protection

In addition to collective gas protection filters in the first-class and the standard shelters, the whole population can possibly be provided with gas masks. For small children, special gas-protected areas will be arranged within the shelters.

Shelter Occupancy Experiments

To begin with, I want to point out that the following comments are based on strictly personal opinions developed during peacetime technical work with air conditioning experiments in closed spaces, like shelters and submarines. I would certainly not want anyone to generalize from these comments, especially with respect to the behavior of humans in a real war situation. I think that there is hardly any possibility of making accurate forecasts, based on peacetime experiments, of the behavior of certain individuals in a real situation. The only thing you know is that people's behavior will be different from what it was—some will behave better, some worse. According to my personal experiences, most will behave better.

Equipment

Anyhow, some suggestions for the design of group shelter equipment might be made with respect to its influence on human behavior. For instance, constructions that might cause or contribute to accidents in the case of panic ought to be avoided. Also, steps should be avoided and entrance and exit openings placed in such a way that filling and emptying of the shelter can proceed smoothly and quickly. But such precautions would apply to any building where there is crowding, e.g., theatres and cinemas.

A problem more special for shelters is the choice of air cleaning equipment. Equipment that is simple to operate should be preferred over more complicated kinds, even if the cost may be a little higher. Written instructions on how to operate the equipment should be short and clear. The possibility of maintaining devices in a high degree of readiness without using them over very long periods also needs to be thoroughly considered.

In addition to these points, the ventilation equipment should be constructed to maintain under normal operation atmospheric conditions that in themselves will not bring on a panic. This means, for instance, that the CO_2 concentration should be kept at a level where the compensatory body reactions (i.e., increased respiration volume) are unnoticed even by the more sensitive members of the population, i.e., people with heart diseases. Ventilation and air cleaning equipment should also be designed for handling the highest possible density of occupancy.

Crowding

Something might be said about the special problems in group shelters that are produced by crowding.

In all shelter experiments that I have attended, the complaints of people were primarily over crowding and the inability to move about, and only secondarily about atmospheric conditions (heat, etc.). The limited space available for each individual certainly makes strong self-discipline necessary, especially if the situation is to be kept under control for long periods. To help maintain order, a shelter manager is necessary. He should give information at regular intervals on the situation inside and, if possible, outside the shelter. This is done to prevent many rumors, inquiries, and feelings of anxiety and isolation, though the facts that are given may only be small notes about the time, temperature, weather conditions, etc.

Isolation and Privacy

Much has been said during this symposium about the negative psychological effects of isolation on groups of people during extended periods, but there is one thing I want to point out: each individual's longing for privacy. It has been observed in crews living close together but isolated from the rest of the community, as on battleships during long cruises. In the quarters of a destroyer, this longing might sometimes even create a ventilation problem. This happens when curtains are made from clothes and sheets of paper or plastic and put up around bunks to cut out the light and the sight of other people, thus increasing personal privacy.

Psychological Consequences of Prolonged Living in Shelters

Finally, I will make some remarks on the psychological consequences that the possible necessity of prolonged staying in shelters for periods up to 15 days might have for civilians under a nuclear attack with radioactive fallout.

There is a Swedish saying that is often passed on from the training officer to his soldiers: You can stand three times more than you believe you can, five times more than your wife believes you can, and eight to ten times more than your mother believes you can. In other words, I fear that many people are inclined to underestimate the capability of the human race to adjust to severe conditions. If you have in your shelter the most necessary means for survival (i.e., air, water, salt, some food, the necessary hygienic arrangements) and if you know that you have a pretty high probability of being rescued after a certain period, the idea of having to stay 15 days and nights in a shelter will seem endurable.

Some means of communication by radio-telephone or even by TV seems to be valuable in keeping contact with the outside. Also, some sort of radiation dosimeter might be useful for informing you about the possibilities of making short expeditions outside the shelter.

The important thing, in any case, will not be what you face inside the shelter, but what you have to face outside it when you finally come out.

The Importance of Training

The main thing is having the means for survival available and giving civilians the training necessary to make them more familiar with the shelter situation. I want to stress that the training is most important, since it is the only way known to diminish the effects of sudden fright. Anyhow, everybody must at some time during his existence realize and accept the fact that life is dangerous. You might even die from it.

A SHELTER OCCUPANCY EXPERIMENT NEAR BONN, GERMANY

Hermann Leutz
Ministry of Federal Housing, Germany

The experiment, conducted by the German Board of Civil Defense in collaboration with the Ministry of Defense, was designed primarily to test the effects of occupancy on various shelter construction materials. The facility used in the experiment was a 50-man shelter of a type recommended by the Ministry of Housing. It was located at the Hardthöhe, near Bonn. The participants were 30 army volunteers, dressed for combat and carrying combat packs and arms, and 10 civilians.

The specific questions under study were

(a) determination of the effects of the experiment on the physical conditions of the participants and of the suitability of the water and the foods for living in a shelter,

(b) determination of the condition of the air within the shelter under different kinds of ventilation,

(c) measurement of the increase in temperature and the warming up of the surrounding parts of the building through the body heat of the occupants,

(d) testing of the furnishings and of a new way of dividing the rooms,

(e) measuring sound intensity, testing the effectiveness of the communications system, and testing emergency lighting.

The experiment was purposely designed to test the limits of the given conditions; i.e., to determine if it was possible through continuous surveillance of the participants by army medical men to conduct an experiment under extremely unfavorable conditions. This was especially true with regard to living with protective

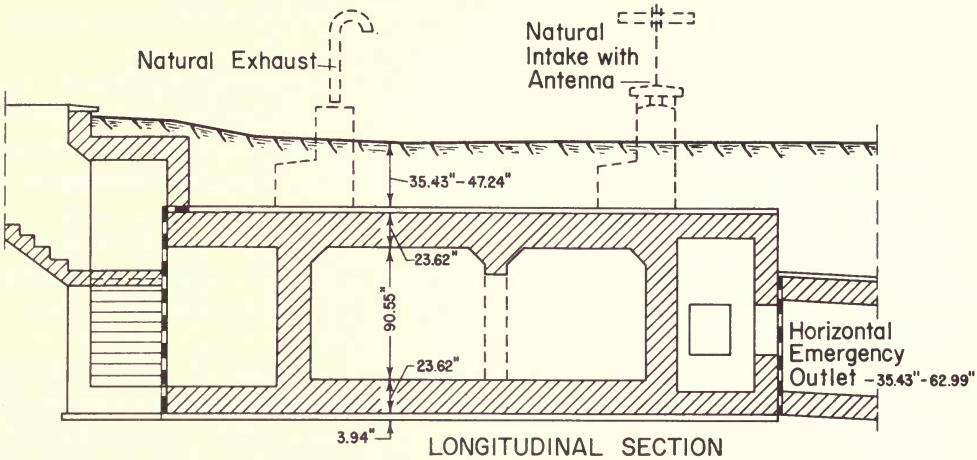
ventilation for the full test period of seven days. Compared to previous experiments in the United States, this seems to be carrying things quite far. However, since it is not impossible that unfavorable circumstances might make it necessary to live for several days under this kind of ventilation, this condition was assumed. It was recognized, however, that a concentration of war gas resulting from a single attack would doubtlessly not persist more than a few days, and residual radiation, after deposit of the particles, would allow a change to normal ventilation after 49 hours.

The shelter (Fig. 1) was designed to accommodate 50 civilians at a ratio of 1 to 2, i.e., one-third on berths and two-thirds on seats. Due to the nature of the experiment, however, the shelter was divided into two rooms and occupied by only 40 persons at a ratio of 1 to 1. The front room was chosen for a 20-man sitting room and the back one for a 20-man sleeping room. The sleeping room also supplied sufficient room for a 14-day supply of drinking water, and the sitting room held a 7-day supply of military rations for the army participants, as well as the rations for the civilians.

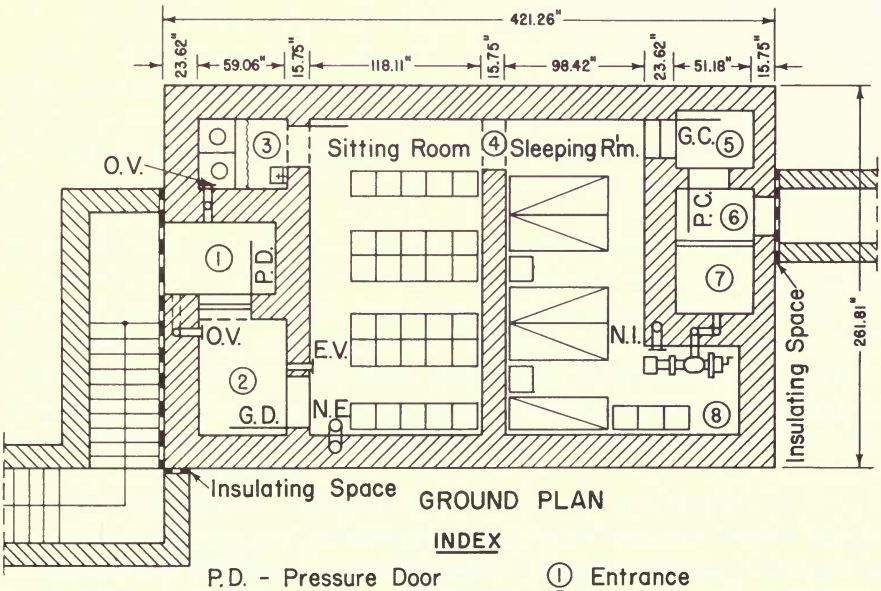
The shelter equipment was made of steel. The berths were covered with plastic materials that had to meet the following requirements: washable, elastic, porous to air, corrosion resistant, and easily disinfected. The seats were made of the same plastic materials, as well as various types of plywood. Several styles of furniture construction had been chosen for testing. The measurements for the berths were 70.86 inches by 23.62 inches. They were stacked in tiers of three, the distance between tiers being 25.59 inches with the lowest tier 13.78 inches above the floor. For the seats, 17.71 inches by 17.71 inches, with 17.71 inches for the seat height, 32.28 inches for backrests, 48.81 inches for head rests, and 65.74 inches for space for packs. The mattresses on the berths were also tested, as were new emergency toilets utilizing disposable plastic bags. These bags were also used as garbage containers.

In order to derive acceptable scientific data, the duration of the experiment was set at 168 hours. During this time, human endurance was not exceeded, though experimental circumstances were more unfavorable than had been expected. Temperatures had been persistently high during the year and had warmed up the ground and the shelter walls considerably. This summer heat was still effective at the time of the experiment, due to the difference between ground and outside air temperatures.

An air volume of 37.5 liters per minute per participant was provided through the main coarse-sand filter during the trial shelter occupation. This volume is felt to offer sufficient protection against chemical effects and nuclear radiation for about 48 hours.



LONGITUDINAL SECTION



GROUND PLAN

INDEX

P.D. - Pressure Door	① Entrance
G.D. - Gas Door	② Gas Sluice
G.C. - Gas Clappervalve	③ Toilet
P.C. - Pressure "	④ Shelter Room
E.V. - Exhaust Valve	⑤ Sluice
O.V. - Overpressure Valve	⑥ Anteroom
N.E. - Natural Exhaust	⑦ Coarse sand main filter
N.I. - Natural Intake	⑧ Ventilator

Figure 1

For this amount of time, due to the heat and water vapor given off by the participants, the temperature and humidity of the air in the shelter rises to values that lie close to the limits of human endurance. Up to this limit, the heat and circulation regulators in the human body can be expected to compensate for the additional stress.

The limit of human tolerance was reached after 96 hours. Then careful and prompt increasing of the ventilator's efficiency sufficiently relieved the stress on these regulatory capacities to permit the test to continue for the whole 168 hours without danger to the participants.

During the experiment, a 48-hour electricity failure was simulated; the electricity was shut off and slow-burning candles used.

Preliminary Conclusions and Interpretations

1. During the continuous occupation of the shelter with protective ventilation operating, no impairment of health occurred. The transition from work metabolism to rest metabolism took place almost without any disorder. The physical conditions of all participants remained satisfactory throughout the experiment. An average loss of weight of a little less than 4-1/2 pounds per participant was observed. Individual cases of constipation with mild headaches were relieved by medication.

The medical knowledge gained from this experiment will be described in a later memorandum. However, at this time we will observe that all participants showed a high degree of understanding and open-mindedness with regard to the necessity of the experiment. Further, we suggest that when such experimental subjects leave a very warm and humid shelter, special medical precautions must be followed in order to prevent any impairment of health.

2. Throughout the experiment, protective ventilation was used in the room except for a half-hour during which normal air was pumped in to measure the sound intensity. At the beginning, the amount of air supplied was 53.0 cubic feet per minute. This resulted in a temperature between 82° and 84° Fahrenheit and a relative humidity of slightly more than 80 per cent. After about 130 hours, the air volume was increased to 84.8 cubic feet per minute to determine to what extent temperature and humidity could thereby be influenced. The temperature was brought down to about 80.6° Fahrenheit and the relative humidity to 79 per cent. The temperature, as well as the humidity, of the air was relatively high. In comparing these room temperatures with those in a mine (ranging

from 82° Fahrenheit and 82 per cent humidity up to 107.6° Fahrenheit and 90 per cent humidity), we find that, though such temperatures are normal for certain occupations, they are probably tolerated only after one becomes accustomed to them.

3. As a result of the high initial temperatures of the walls and the room air, condensation appeared at an early point. Unpainted walls and ceilings and the absence of protective covering on walls near the seats and berths might have perhaps delayed this. It is also desirable not to insulate the floor with a water-repellant so that as much moisture as possible can be absorbed. Likewise, the parts of the walls that are covered with luminous paint should not be too large.

4. The performance of the whole ventilation system met all expectations. A new method of mounting the ventilator on a vibration damper showed excellent results. It was possible to reduce vibration noise substantially so that there was no disturbance caused by the running of the machine. There is no cause to propose any changes in the ventilation system for civilian use.

5. The changes in planning made in April 1959 by the Ministry of Housing in its directives on shock-proof shelter construction were found to serve their purpose during the experiment. No improvement was found necessary as to the spatial arrangement of seats and berths. The division of the shelter into the two rooms proved advantageous by keeping the disturbances to sleeping at a minimum.

6. The experiment shows that steel construction offers considerable advantages over wood construction. It was possible, for instance, to build an additional berth onto the three-tier berth just by screwing one on top during the experiment. In this case, the distance between berths corresponded to those provided in a shelter only 6.56 feet high.

7. Drinking water brought in the shelter in various types of canisters and bottles proved suitable. However, the water in tightly closed cans of 11.6 ounces and 2.2 pounds was found most functional. No differences in taste were found, as all canisters contained fresh water. The distribution of mineral water (Fachinger) resulted in some objections: it affected the taste of coffee and tea and decreased the solubility of "instant" beverages. In several instances the glass bottles with carbonated water broke. They were used, however, only as a substitute when containers able to withstand the carbonation pressure were temporarily unavailable. It is still questionable, however, to what extent canned water can be

provided as part of civilian shelter equipment. The special shelter food was found suitable. The distribution of separately packaged daily rations proved advantageous.

8. The electricity necessary for the lighting and the ventilato operation was set at 500 watts. Since operation proved satisfactory, it would therefore be possible to connect an emergency electric outfit to this wattage, if necessary.

During the simulated electricity failure, the emergency lighting by candles proved sufficient, and an increase in CO_2 content was not detected by the rough evaluation that was made.

9. The use of the emergency toilets in a darkened room caused no difficulties, as dim blue lights were installed and slow-burning candles used when the electricity was shut off. The strips of luminous paint served well as guides. The process of removing the feces in the plastic bags was undoubtedly practical, though objections were raised over the transparency of the bags.

10. Communication between the shelter, the laboratories, and the local communications net was easily maintained.

SOVIET CIVIL DEFENSE

Leon Gouré
The RAND Corporation

The Soviet Union is no longer as enigmatic and mysterious as it appeared to Sir Winston Churchill, but there are many activities that Moscow still prefers to keep secret. The implementation of the civil defense program is one of these activities, but fortunately, because of the need to train and instruct large numbers of Soviet citizens, considerable publicity is given to Soviet Civil Defense theory, training, organization, and operational concepts. The following brief description of the Soviet Civil Defense program is based on the many publications issued in connection with the program.

Background

Because the Soviet leaders have always believed war to be at least a strong possibility, they have been interested in civil defense since the early 1920's and have at various times embarked on extensive civil defense training and construction programs. For example, between 1935 and 1959 six mass civil defense training programs were instituted. During World War II, when training was compulsory, 137,000,000 persons are said to have passed a 28-hour civil defense course (U. S. House of Representatives, 1959). During the Second World War, the Soviet population participated on a large scale in civil defense and also had considerable shelter experience.

The importance of civil defense as a factor contributing to Soviet war-readiness has been stressed by the top marshals of the Soviet Union and has been discussed by the Ministers of Defense at Party Congresses (Pravda, March 20, 1957; Soviet Patriot, February 13, 1958; Voennye Znaniia, No. 1, 1957; Voennye Znaniia, No. 2, 1957).

Basic Soviet Civil Defense Theory

1. Soviet manuals state that civil defense must protect the population against all types of weapons: conventional, chemical, bacteriological, and nuclear. The threat of the so-called ABC weapons, which are termed "means of mass destruction," has been especially stressed since 1954 (U. S. House of Representatives, 1959).

2. Civil defense must provide important industrial, administrative, and other vital installations with the ability to continue their operations "under condition of attack from the air" (Miroshnikov & Zapolskii, 1958). [This concept may be changed as a result of Khrushchev's "new look" in Soviet military strategy (Pravda, January 15, 1960).]

3. The civil defense system must be based on the mass participation of a trained population and must be able to deal quickly with the damage and casualties resulting from an attack (Miroshnikov & Zapolskii, 1958).

Organization

Soviet Civil Defense organization works through the national, territorial, and local administrations and the economic institutes. The small full-time professional staff, which was headed until recently by a First Deputy Minister of Internal Affairs (MVD), develops operational and organizational systems, and conducts research. Full-time staffs at the Republic, Territory, regional, district, and city levels direct the work of formations and groups organized on the bases of existing services and volunteer teams. The formation of civil defense units according to a prescribed table of organization is compulsory for all Republics, provinces, counties, cities, districts, factories, collective and state farms, large institutions, and large public buildings and apartment houses (Miroshnikov & Zapolskii, 1958). In a Soviet city, there are eleven different civil defense services (medical, shelter, decontamination, etc.) which are headed by the mayor and a civil defense staff (U. S. House of Representatives, 1959). This organization is duplicated on the district level and in large industrial installations (U. S. House of Representatives, 1959). On the lowest level, in apartment houses and farms, there are the so-called volunteer Self-Defense Groups, each containing eight specialized teams (for medical, shelter, fire fighting, and other duties). A group of about 48 persons is organized for every 500 residents or more (U. S. House of Representatives, 1959). The units in urban centers are to be

supplemented by special rural formations and military or militarized units that come to the assistance of the cities following an attack (U. S. House of Representatives, 1959).

According to a West German writer, Khrushchev is said to have claimed that 22,000,000 persons, or 10 per cent of the entire population, now serve in civil defense formations (Schellhammer, 1959). This may be a goal rather than an actuality.

Training

The Soviet authorities have been insisting on the importance of training the entire Soviet population in civil defense so as to reduce casualties, soften the shock caused by an attack, and mobilize the adult population to perform civil defense tasks in case of need (Bibergal & Margulis, 1958; Soviet Patriot, February 11-14, 1958). Since 1955, three compulsory training programs for all persons over 16 years of age have been instituted. In 1955, there was a 10-hour program; in 1956-1958, a 22-hour program; and in 1959, a 14-hour program that stressed practical civil defense work (U. S. House of Representatives, 1959). Upon the completion of the latter in 1960, a new 18-hour program is to go into effect to stress practical work in post-attack operations (Soviet Patriot, October 21, 1959; Soviet Patriot, November 1959), and to be completed during 1961. The training programs familiarize the population with the nature of modern weapons and their effects, teach them to use individual means of protection and how to behave in shelters, and instruct them in first aid, fire fighting, decontamination, and, in rural areas, veterinary assistance to farm animals (U. S. House of Representatives, 1959).

All training is conducted in small groups after work at places of employment or in apartment houses and farms (U. S. House of Representatives, 1959). According to Soviet press reports (Soviet Patriot, July 1, 1959; Soviet Patriot, September 16, 1959; Soviet Patriot, November 30, 1959; U. S. House of Representatives, 1959), the training has been uneven, lagging especially in rural areas, and at times has been only perfunctory, but constant efforts are made to improve its quality and to check on its effectiveness.

Means of Protection

Khrushchev (Pravda, January 15, 1960) has claimed that the Soviet Union, because of its size and its greater dispersal of

population and industry, is less vulnerable to attack than Western countries. Soviet city planners have recommended measures to reduce population density in large cities, and civil defense requirements are to be incorporated in the development of new urban districts or centers. Among other means to protect the population are (a) individual measures, (b) collective measures, and (c) evacuation.

Individual Measures

Soviet Civil Defense theory and training emphasize the use of gas masks and protective clothing against the effects of chemical-biological-radiological (CBR) agents, when an attack finds people in the open, in inadequate shelters, or obliged to leave the shelters before it is safe to do so. While no gas masks have been issued to the general public, the latter is receiving training in their use. People have to test gas masks in gas chambers, and in some cases are compelled to wear these masks on exercise hikes or during working hours (Voennye Znaniia, No. 8, 1959). At present, gas masks and protective clothing are being issued only to civil defense formations, the general public will receive them, as well as individual chemical warfare decontamination kits, only when the Soviet Government receives what it considers strategic warning of a possible attack (Gvozdev & Iakovkin, 1958; Miroshnikov & Zapolskii, 1958).

Collective Measures

While the Soviet population made use of a variety of shelters during the Second World War, a few of these are suitable for present conditions. According to Soviet Civil Defense literature (Supron & Zverev, 1959), the requirements of a modern Soviet shelter are

(a) that it have a fire-resistant roof and be capable of withstanding the thermal radiation of a nuclear explosion;

(b) that the roof be below the surface of the earth and provide sufficient protection against radiation from the explosion and the subsequent fallout (Soviet standards on permissible radiation levels set 50 roentgens as the limit of permissible immediate dose, while 100 roentgens is an outside permissible cumulative dose over a relatively short period of time);

(c) that the roof be capable of withstanding the collapse of the building above, the attenuated blast wave of a nuclear explosion, and direct hits by small- or medium-caliber high explosive and incendiary bombs;

(d) that it have at least one emergency exit with a tunnel located so as not to be buried under debris; and

(e) that permanent shelters in likely target areas be capable of hermetic sealing against seepage of CBR agents and of the blast wave, and be equipped to allow relatively long-term occupancy.

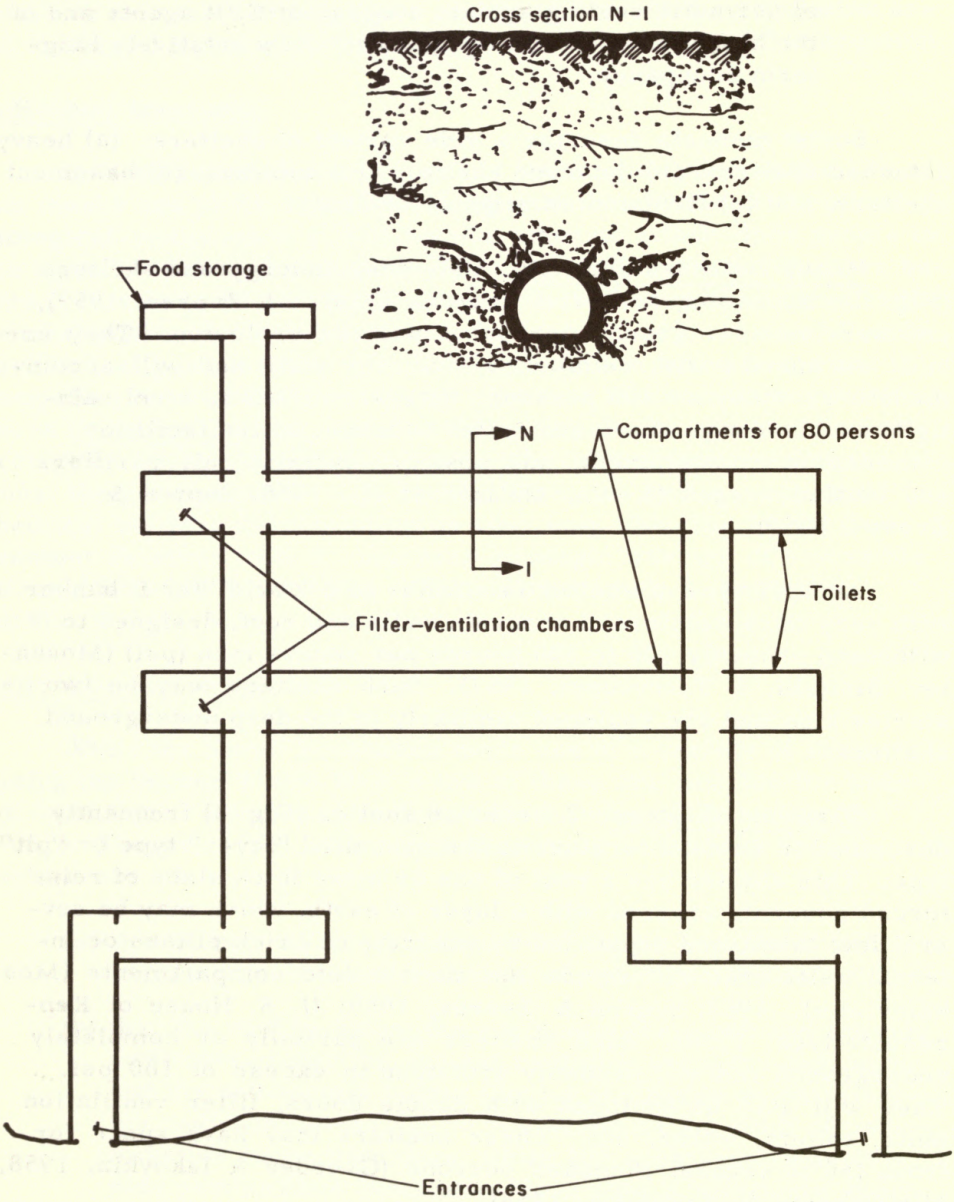
Soviet manuals describe a wide variety of shelters: (a) heavy detached shelters, (b) detached shelters, (c) subways, (d) basement shelters, and (e) field and emergency shelters.

Heavy Detached Shelters. Only deep underground shelters (Fig. 1), according to Soviet sources (Supron & Zverev, 1959), can survive near ground zero of a nuclear explosion. They are built as tunnels with reinforced concrete walls and will accommodate as many as 150 persons, filter-ventilators, steel, air-tight double doors, food and water storage, toilet facilities, communication equipment, and possibly chemical air purifiers and bottled oxygen (Levin, Malinin et al., 1958; Supron & Zverev, 1959).

Another type of shelter is similar to a World War II bunker with very thick reinforced concrete walls and roof, designed to withstand probably 200 to 300 pounds per square inch (psi) (Moskalev, Sinitsin, & Tetrychnyi, 1957). Such shelters may be two stories high and are equipped similarly to the deep underground shelters.

Detached Shelters. A detached shelter (Fig. 2) frequently described in Soviet literature is the so-called "layer" type or "pit" type. This shelter has a roof of one or more thick slabs of reinforced concrete covered with a layer of earth, which may be several feet thick, and supported by concrete or brick pillars or internal walls that will divide the shelter into compartments (Moskalev et al., 1957; Supron & Zverev, 1959; U. S. House of Representatives, 1959). Such shelters are partially or completely underground and will probably withstand in excess of 100 psi. They will also be equipped with double doors, filter ventilation units, toilets, water, etc. These shelters may have space for from 150 to several thousand persons (Gvozdev & Iakovkin, 1958; Miroshnikov & Zapolskii, 1958).

Subways. Some Soviet leaders, notably Kozlov, as well as Soviet Civil Defense manuals (Lebedeva, 1958; Los Angeles Times, July 26, 1959; New Orleans Times-Picayune, August 13, 1959; Uchebno-metodicheskoe..., 1959), indicate that the Soviet



Deep shelter

Figure 1. Deep Shelter

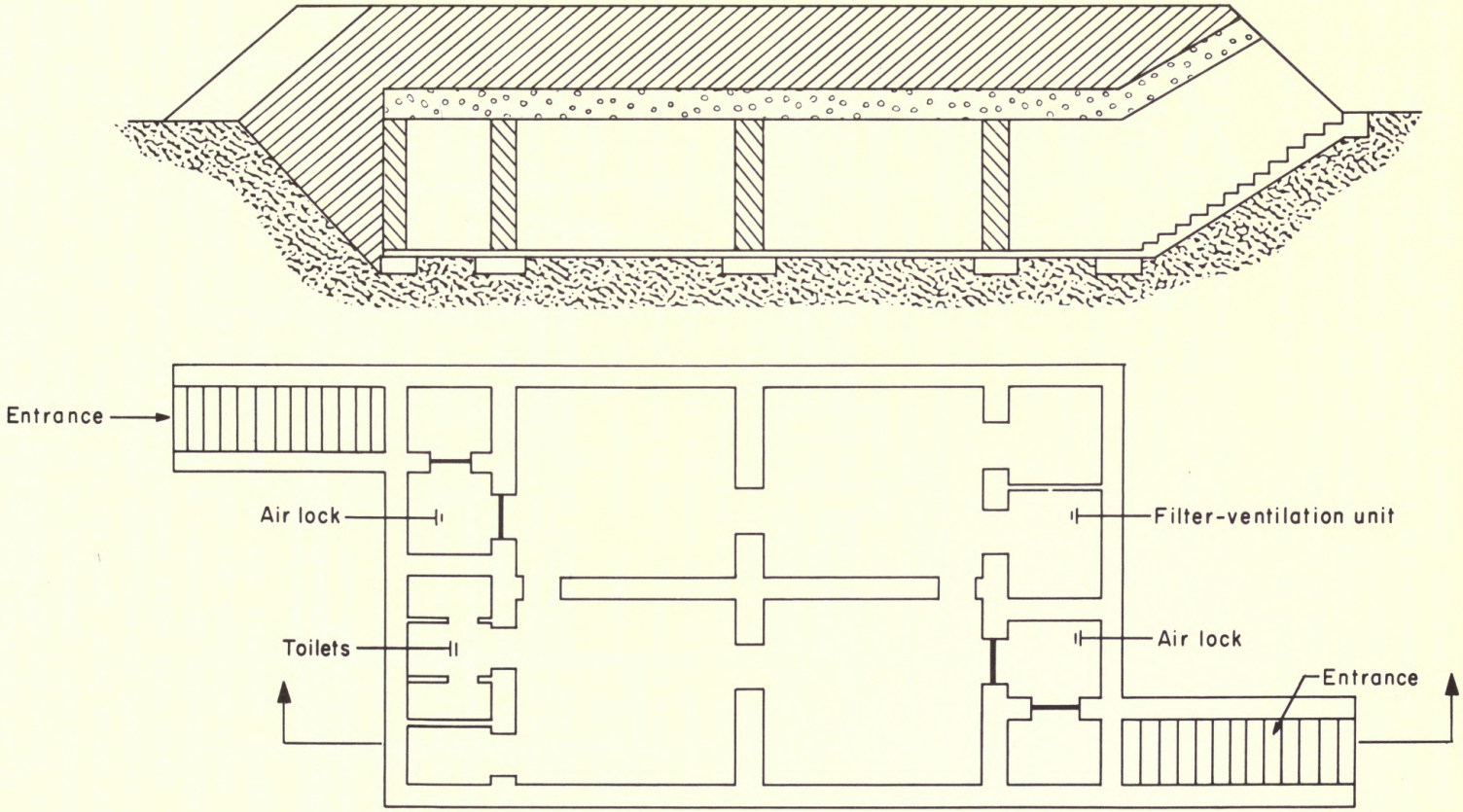


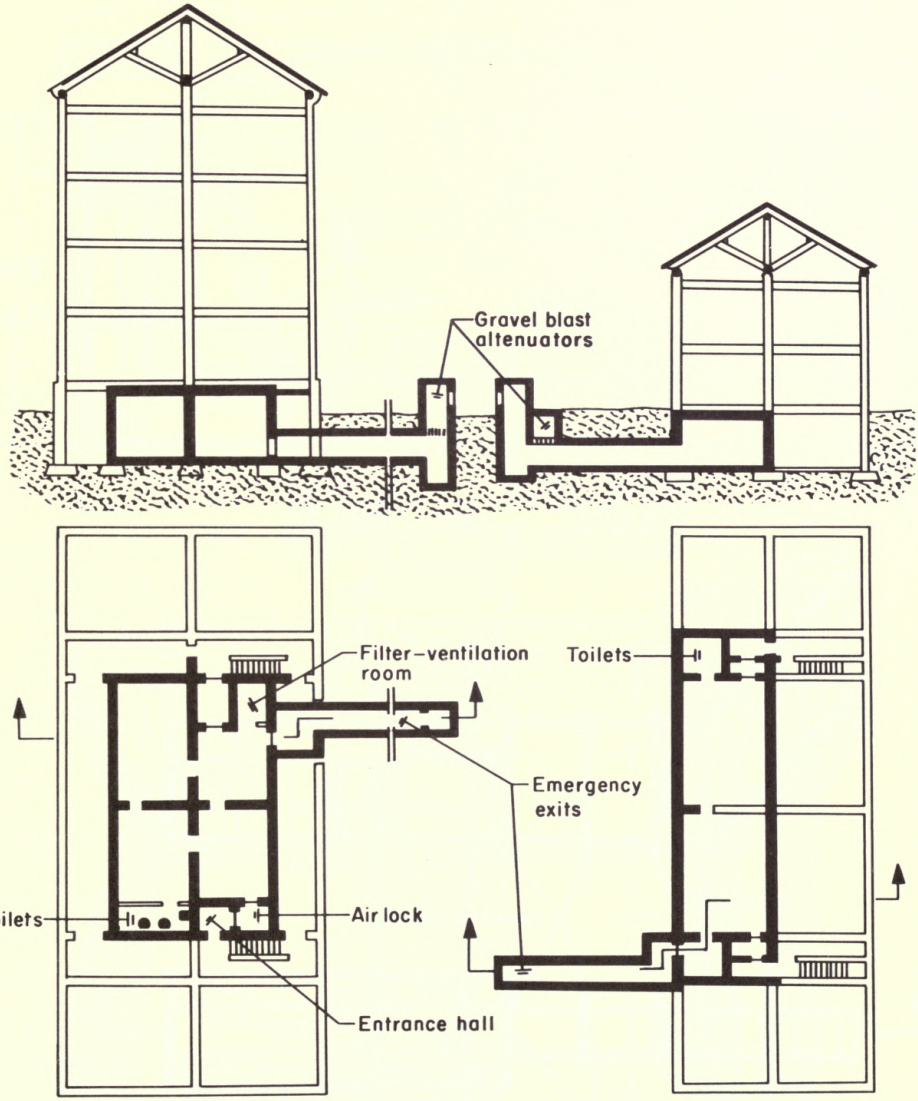
Figure 2. Detached Shelter

Union intends to use the subways as shelters. There are subways in operation in Moscow and Leningrad, and this year the Kiev subway will begin operations. These subway systems are fairly deep and the Moscow one could shelter on the lower platforms and in the tunnels from one to two million persons or 20 to 40 per cent of the city's inhabitants (U. S. House of Representatives, 1959).

Basement Shelters. The Soviet basement shelter (Fig. 3) is a special area of the basement of an apartment house or public building built to meet the basic Soviet specifications for an air raid shelter. It has a roof of reinforced concrete supported by steel or reinforced concrete beams capable of withstanding the collapse of the building above, and it is fireproof (Levin et al., 1958; Miroshnikov & Zapolskii, 1958; Supron & Zverev, 1959; U. S. House of Representatives, 1959). It is completely underground and capable of being hermetically sealed. Its basic equipment will include airtight double metal doors of the bulkhead type, a filter-ventilation unit, one or more emergency tunnels, toilets, water, heating, telephones, storage batteries, and possibly bottled oxygen (Gvozdev & Iakovkin, 1958; Miroshnikov & Zapolskii, 1958; Uchebno-metodicheskoe..., 1959). Depending on the building, it may occupy the entire basement or only part of it. It is divided by interior walls into compartments. The recommended capacity of such a shelter is 100 to 150 persons. It may be designed for over 10 psi and up to 100 psi. According to Soviet manuals, it is expected to survive the blast "at some distance" from ground zero (U. S. House of Representatives, 1959).

Field and Emergency Shelters. These shelters (Figs. 4 & 5) are mostly of the fallout type and are usually less permanent. They are to be built by the population when the Soviet government announces a "threatening situation" alert, i.e., that there is strategic warning of an enemy attack (U. S. House of Representatives, 1959). They consist of various types of earth-covered trenches, dugouts or galleries, and tunnels in mountain sides, and they have walls made of precast concrete, wood, metal sheeting, and other handy materials (Miroshnikov & Zapolskii, 1958; Supron & Zverev, 1959).

These shelters are to be built in both cities and rural areas, but especially the latter, and are designed to hold from 25 to 60 persons (Gvozdev & Iakovkin, 1958; Supron & Zverev, 1959). They may have heating and a simple ventilation system, but no running water. They may or may not have metal doors. For the most part, they do not appear to be designed for long-term occupancy. Shelters of this type can be built in one day or less, provided the necessary material is available (Kerillov, 1956). If the shelters cannot be hermetically sealed, the people



Basement shelter

Figure 3. Basement Shelter

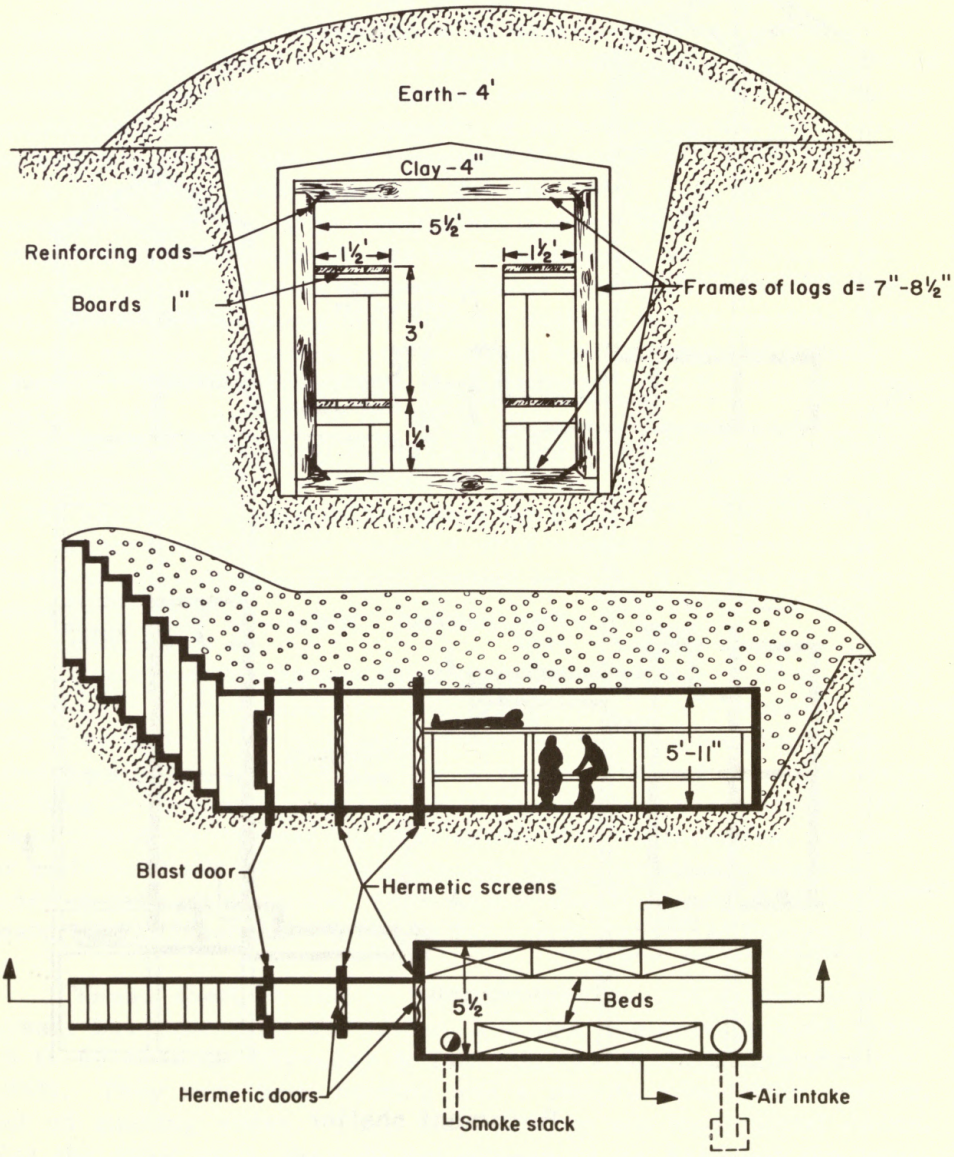


Figure 4. Dugout Shelter

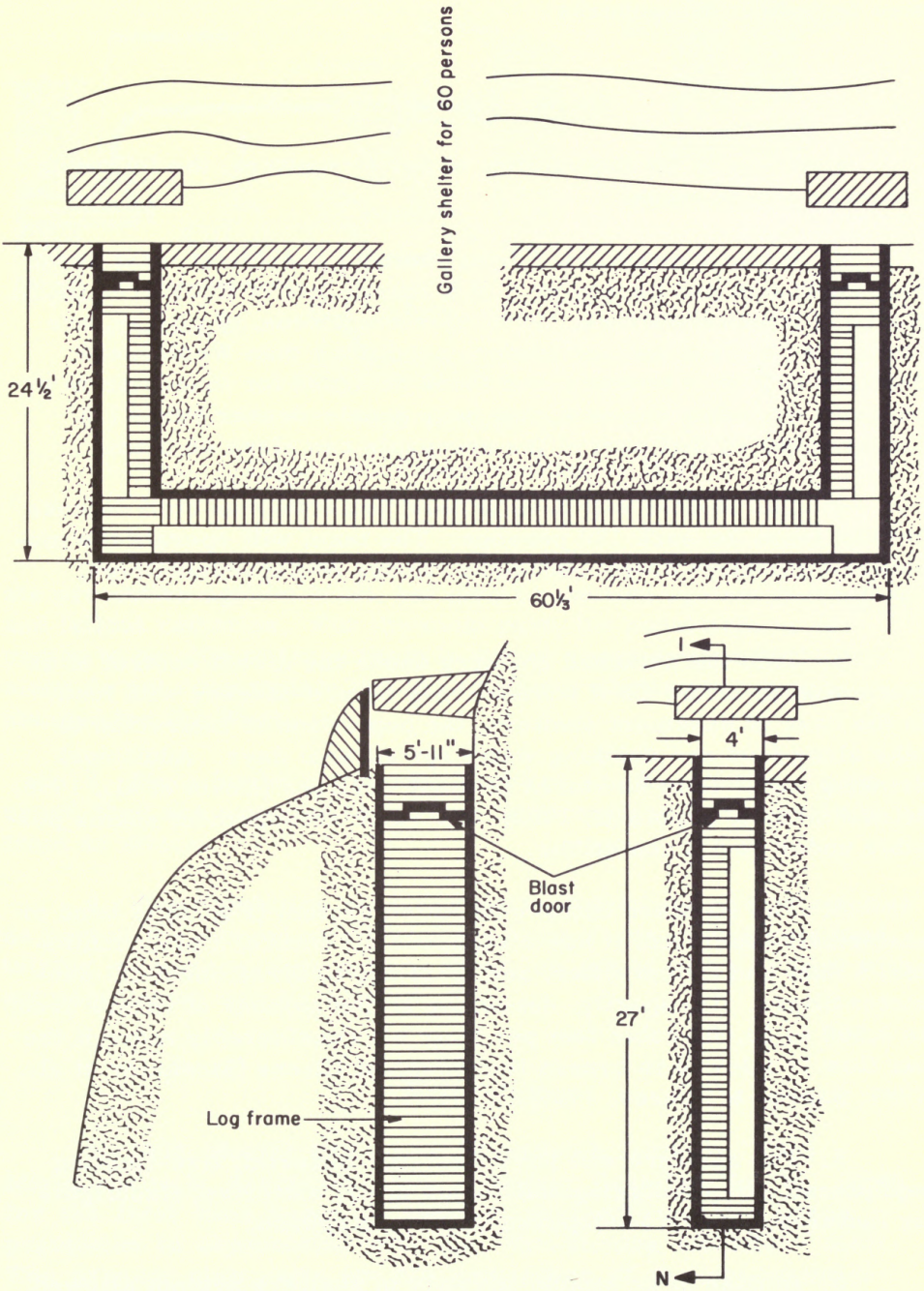


Figure 5. Gallery Shelter

using them are instructed to wear their gas masks during an attack. One-family shelters paid for by the families concerned may also be built in the suburbs.

Shelter Habitability

Concerning the habitability of Soviet shelters, the following remarks can be made.

1. In most instances, Soviet shelters provide at least about 56.5 cubic feet per person or 5 to 8 square feet of floor area (U. S. House of Representatives, 1959). Soviet citizens, of course, are more used to crowded and austere conditions than Westerners. Shelters will have benches, and those designed for longer-term occupancy, including dugouts, may have double-decker bunks (18 inches wide) so that part of the occupants can sleep on them.

2. The shelter will have at least one five-man civil defense shelter team for each 150 persons. The team will operate the machinery, maintain order, etc. (U. S. House of Representatives, 1959).

3. Only the detached shelters under the direct control of an institution or of the Civil Defense may be pre-stocked with food. In the case of basement shelters, the population is instructed to take along food and drinking water for several days. Additional drinking water is to be stored in these shelters (Levin et al., 1958; Miroshnikov & Zapolskii, 1958). No other arrangement seems possible under Soviet conditions.

4. The standard filter-ventilation system (Fig. 6) is hand or electrically operated; it has a hardened air intake, a blast inhibitor, a dust and fallout filter, and from one to three chemical cannister filters. Its capacity, depending on the number of filters used, is 3,500 to 10,600 cubic feet per hour but considerably more if the air flow is allowed to bypass the chemical filters (Moskalev et al., 1957; Supron & Zverev, 1959).

5. The shelters will have first-aid material, fire-fighting equipment, simple digging and repair tools, batteries, flashlights or lanterns, a radio loudspeaker, and a telephone.

6. In case of an attack, persons in shelters are not allowed to leave until they have received instructions from the chief of the civil defense shelter team (Miroshnikov & Zapolskii, 1958).

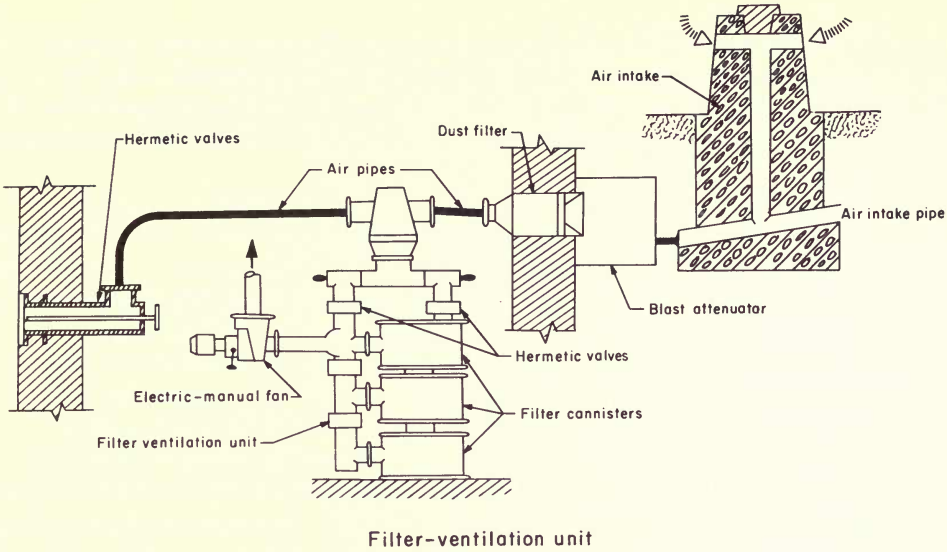


Figure 6. Filter-ventilation Unit

7. The Soviet shelters are designed to give little to moderate protection against blast, but good protection against thermal and fallout radiation. For the most part, the population is expected to be able to leave them in two to seven days, and the Russians do not contemplate the 14- to 90-day shelter occupancy planned for the West.

8. Since Soviet permanent shelters are fireproof and gas-proof, they are expected to survive large surface fires resulting from an attack.

9. The population receives instructions in shelter discipline as part of the compulsory training program: no smoking or loud talking, no unnecessary moving about, no use of water or food without permission will be allowed, etc.

Evacuation

In 1958, Soviet literature (Gvozdev & Iakovkin, 1958; Miroshnikov & Zapolskii, 1958; Voennye Znaniia, No. 11, 1958) for the first time began to mention evacuation of the urban population in conjunction with the "threatening situation" alert. The present plan calls for the evacuation of the nonessential city population to rural areas. Also to be evacuated to suburban areas are various civil defense formations (Supron & Zverev, 1959). It is likely that key elite elements in industry, the party,

and the administration will also be evacuated to shelters outside the cities. Nevertheless, the authorities at present still appear to plan to leave a part of the "productive" element of the population in the cities.

Pre-Attack Measures

In addition to the measures already described, which are to be taken in a "threatening situation" alert, Soviet Civil Defense plans to undertake, in cooperation with the entire population, extensive prophylactic measures in the areas of fire, epidemic prevention, the safeguarding of supplies and water, blackout, and a variety of other measures designed to reduce the vulnerability of the cities and of the country as a whole to attacks (Miroshnikov & Zapolskii, 1958).

Post-Attack Operations

The present Soviet Civil Defense plan (Miroshnikov & Zapolskii, 1958; Supron & Zverev, 1959) calls for large-scale rescue and evacuation operations in the disaster zone immediately after the attack in order to give prompt aid to the casualties and limit the damage. The disaster area is to be reconnoitered by teams equipped with radiological and chemical detection equipment of which the Soviets have a considerable variety (Levin et al., 1958; Supron & Zverev, 1959). Following this, first-aid, fire-fighting, rescue, and decontamination teams move in. Manpower will be provided by surviving civil defense formations, special rural and military formations, and civil defense units from other cities, as well as mobilized citizens who happen to be at hand (Miroshnikov, 1959; Miroshnikov & Zapolskii, 1958). Only regular Civil Defense units will have radiological equipment, but self-defense groups will have chemical detection kits. Rescued persons will be evacuated to uncontaminated areas where mobile or stationary decontamination and medical units will take care of them. Food and other essential supplies are to be provided by special civil defense services. Casualties are to be repeatedly sorted out and evacuated by stages to permanent or temporary hospitals where they will receive the required medical help (Supron & Zverev, 1959). In the meantime, large-scale fire-fighting, decontamination, and repair work will continue in the disaster area.

It is evident that the system will be effective only in the zone of partial destruction. In the zone closer to ground zero, the

intensity of the destruction, the high rate of radiation, and the probable firestorm will prevent the timely rescue of persons not adequately sheltered. Those in surviving shelters are apparently expected to be able to wait until the rescuers reach them.

In rural areas, the people are instructed to protect their water supply, stocks of fodder and grain, and other foodstuffs from chemical or bacteriological contamination and to disperse and protect the cattle (Miroshnikov, 1959).

Conclusion

There is little information from open Soviet sources on the question of shelter availability. Some indication of Soviet activity in shelter construction appears in Soviet press discussions (Soviet Patriot, June 11, 1958; Soviet Patriot, May 20, 1959; Soviet Patriot, July 1, 1959; Soviet Patriot, July 8, 1959) of civil defense exercises, which occasionally mention the existence of shelters. The training manuals are most emphatic on the necessity to shelter the population from attack. Judging by the effort made to train the population and various civil defense groups and by the apparent size of the investment in civil defense equipment and shelter, it seems reasonable to conclude that the Soviet Union has been for a number of years, and is now, engaged in an extensive civil defense program. This is not a crash program and its character appears to undergo changes as Soviet Civil Defense is adjusted to new weapon effects.

Concerning the impact of the Soviet Civil Defense program on the population, it may be said that it has neither greatly reassured nor greatly alarmed the Soviet citizenry (Soviet Patriot, July 8, 1959; Soviet Patriot, September 27, 1959; Voennye Znaniia, No. 6, 1958; Voennye Znaniia, No. 1, 1959). Since the program has been in effect for a number of years, it does not appear to the Russian people to be connected with any specific crisis, and besides, they had considerable experience with such programs before the Second World War. Soviet conditions and methods of operation also have led the population to accept compulsory training courses and so-called "voluntary compulsory" participation in various schemes instituted by the Soviet authorities. The Soviet citizen knows from experience that he must rely to a considerable degree on self or mutual help in crisis conditions. Consequently, the civil defense program is taken, by and large, as a matter of course and as one more obligation imposed by the authorities on the population. While some Soviet citizens are enthusiastic and others defeatist, the majority are relatively apathetic (Soviet Patriot, June 11, 1958; Soviet Patriot, May 20, 1959; Soviet Patriot, July 1, 1959; Soviet Patriot,

July 8, 1959). In a time of crisis, however, it is likely that they would obey orders and respond to their training, for they know that the Soviet authorities are prepared to enforce obedience and to punish ruthlessly any unauthorized or panic-inspired behavior.

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DISCUSSION OF PAPERS

NORMAN A. HILMAR
Walter Reed Army Institute of Research

As a sociologist I have been very interested in the papers presented today, some of which I had the privilege of reading before coming here. One of the questions that concerns me most is how we can restore to survivors some sense of social or community organization after it has been psychologically and, perhaps to a great extent, physically destroyed by enemy attack. I think this is one constructive task that could be worked on in fallout shelters, especially reasonably large shelters. I am assuming that large shelters will be occupied by whoever is at hand. They may be homogeneous groups of individuals who know one another but they may very well be strangers. Shelter occupants will be concerned about their futures and overwhelmingly anxious about their families and friends, especially about those from whom they are separated.

I am a little pessimistic about designated shelter leaders being able to get to their assigned posts. They could be sick, on leave, or injured at the time when this hopefully never-occurring event might in fact occur. Under these circumstances it is going to be rather risky to plan on a functional and satisfactory group structure built around a predesignated leader. And that is the problem to which I would like to address myself briefly, capitalizing on some of the things that have already been presented very well during the day.

First of all, there seems likely to be a real and very dangerous tendency for the people in each shelter to feel lost, isolated, and abandoned, and to believe that society in the larger sense is simply gone. Apathy, fear, and aimless disoriented behavior is perhaps one fairly frequent reaction pattern that might arise in such a situation. Self-seeking, predatory behavior would be another dangerously disfunctional possibility.

I propose that it might be possible deliberately to design and build the basis of effective social organization into the shelter system. First of all, I would suggest that fairly large shelters be subdivided into living units by fixed partitions, these living units to accommodate perhaps ten or twelve persons. Several large areas

in the shelter should be reserved for large group meetings, work sessions, recreation, etc., if this is possible. I am not worried about leisure time becoming a major problem. It may be a problem, but it seems more likely that we may lose our leisure time along with a lot of the other amenities of life at this point.

It is vitally important to establish these fixed living units. Whoever comes into the shelter enters a rather hectic, amorphous social situation. If you have 75 to 100 people, many of whom do not know each other, milling around in a hole in the ground for a couple of weeks or so, you have far too large a group to be any sort of a primary group in Charles Horton Cooley's sense. By forcing people to move into small quarters, ten or twelve occupants to a living unit, they can group according to families, if there are families present, or friendship, or common interest or whatever. Then you have a face-to-face group that at least has the possibility of becoming a meaningful primary group to replace that which was badly disrupted at the time people were forced to take cover.

It is very important for mental hygiene that this be accomplished. The emotional support we get from these primary groups is often underestimated or overlooked as a basis for social influence and control. I think this is where meaningful, acceptable control can assert itself. By setting up these small living units, you can permit a modicum of self-determination and thus foster feelings of personal responsibility in a situation where the individual can see that his own actions now count. The individual thus becomes one of a face-to-face group of some twelve people, the names and identities of whom he knows, rather than one of a hundred strangers milling around in the underground. Occupants of each living unit can perhaps arrange screens and furniture and other available material to suit their individual needs, to provide for as much privacy as feasible (a very important point raised by Miss Åsa Brånd-Persson), and to provide some psychological anchorings in proprietary feelings about a bunk or a chunk of earth. "This is where I live. I may not have a home some place else; but now I have a home here and it is this square meter of space!"

Each living unit can function as a quasi-political district, if you will, to select or elect representatives to some sort of shelter government who will participate in decision-making and also feed back information to the other members of the living unit. I think this is very important. If someone stands up in a white helmet and says, "I am in charge here," he will not be in charge at all, unless he is accepted. Simply waiting for spontaneously emerging leadership can be a slow, painful process. However, if we can, by architectural arrangements, break people up into meaningful social units,

we have made giant strides toward the differentiation and ultimate reorganization of society. I hope this will permit shelter occupants a vestige of democratic control over their lives even in this very horrendous situation. Furthermore, I think this arrangement will tend to legitimize responsible authority. Whoever is chosen as a living-unit leader will be responsible to his particular small group; the members of the small group will then know and believe that they have some representation and voice in controlling what happens to their interests within the shelter and in the larger society, which will be reestablishing itself during this period.

Constructive work must certainly be provided for the period in the shelter. Hand-powered air pumps and generators should be considered for shelters, not just to keep people busy, but to provide useful work shifts and meaningful interdependence among the shelter occupants. This gives the shelter occupants something of a day-and-night sequence or at least a work-and-rest sequence, which is again like the life schedule they knew before the attack drove them to cover.

All sorts of emotionally stabilizing, functional activities could be thought of. Certainly teaching children should go on in the shelter in order to help restore to both children and adults some sort of similarity to life as it once was. A number of other essential activities should be capitalized on to make individuals in the shelter clearly responsible for relevant corresponding work roles. By saying, "You are to monitor the telephone," or "You are to prepare the food," etc., the group assigns to individual shelterees specific jobs which in themselves provide some socio-psychological anchorings in a world that has suddenly become very, very strange and quite frightening.

So much for the immediate group-living arrangements. The shelter, I suggest, must be so constructed that it incorporates an underground closed-circuit system such as sound-powered telephone connecting it to at least two other nearby shelters for mutual support and assistance. These companion shelters can be designated on a chart or map with brief instructions: "This phone will permit you to talk to Shelter 'A,' which is 500 yards north, or Shelter 'B,' which is 500 yards east, and these are the only people with whom you are linked in this lateral communication network."

This system would provide built-in wire for supportive or cathartic communication between the lowest echelon shelters. Leaders of adjacent shelters can then talk back and forth about mutual problems and solutions. They can say, "We are in trouble," and learn from others that "We are, too." They can exchange names

of shelter occupants and so begin the long search for news of friends and relatives. Leaders can get some reassurance, some ideas for solving common problems, and even, perhaps, material aid from one another. Only if such lateral communication is available is there any possibility of keeping clear the vertical channels of phone or radio communication to the next higher echelon, which must be reserved for essential traffic devoted to reorganization and survival of the society in the larger sense. By this lateral communication arrangement we can hopefully avoid everybody appealing to the higher echelons, saying, "Help us! We are in trouble! We are alone! We must talk to someone outside our shelter! Where are our families? Did they survive?"

If the vertical channels of communication are relieved of the bulk of these requests for reassurance and emotional support, they can be used effectively to compile lists of survivors, gather data on the radiation levels surrounding the shelter, and pass down information and instructions as to leaving the shelter and rebuilding the physical and social structure of the nation.

In summary, I should like to express my conviction that it is possible to build into our shelter program factors that will speed effective recovery by our society with the least possible incidence of personal disorganization among survivors. By systematically arranging our communication systems and our living arrangements within the shelters, we can establish the framework of an ad hoc society which may have to function for a long time after people come out of the shelters. The small living unit within the shelter can be viewed as a new primary group; the shelter itself, as a somewhat differentiated community of small primary groups; the "Buddy shelters," as neighboring communities; and the higher echelon will begin to represent, then, the larger society. This, I believe, would be a meaningful and effective social structure with which Americans are already culturally familiar, such familiarity in itself being a strong argument in favor of a successful outcome to the recovery effort.

IRVING L. JANIS
Yale University

A number of speakers have discussed a variety of communication problems that arise in connection with any adequate shelter program. For instance, Mr. Edward Murray and Mr. John Rohrer both emphasized the importance of communication during the confinement period and alluded to some of the potential functions of communications during the period before confinement. I would like to speak about one particular type of communication problem that has not been discussed in detail yet. The problem I have in mind is that of psychological preparation, which requires special types of communications designed to help people cope with danger and deprivation if they are subsequently exposed to actual stress situations.

In this connection, there are two separate types of stress situations that should be taken into account. The first is the situation of shelter confinement, with the multiplicity of deprivations and anxieties that would accompany any crisis necessitating the use of radiation shelter. The second is a type of situation that might prove to be far more difficult for people to bear: the post-confinement disaster situation that would arise if people were to emerge into a world largely destroyed, discovering that they were among the few who survived a devastating nuclear attack.

Much research, it seems to me, is needed on what might be called "emotional inoculation" techniques. I have used that term because I think it highlights a good analogy from the field of medicine. By an "emotional inoculation" technique, I mean some form of preparatory communication, given well in advance of exposure to stress, that elicits a psychological "working through" process such that the person is better able to withstand the stress when it subsequently occurs. We have many indications from studies of illness and surgery, from a few observational reports on peacetime disasters, and from numerous investigations of military combat, that suggest that stress tolerance might be significantly increased by appropriate communications given beforehand. My remarks are based on surveys of the psychological and psychiatric literature bearing on reactions to wartime and peacetime disasters as well as on my own research on stress behavior, covered in Air War and Emotional Stress (McGraw-Hill, 1951), Psychological Stress (Wiley, 1958), and "Emotional Inoculation," which appeared in Volume 5 of Psychoanalysis and the Social Sciences, edited by W. Muensterberger and S. Axelrad, (International Universities Press, 1958).

First of all, we have reason to expect that the type of communications required for purposes of emotional inoculation are quite different from the typical information releases and reassuring statements issued to the public in times of impending crisis by our military and civilian leaders. A number of very special kinds of communication contents and modes of presentation are likely to be needed in order to stimulate the psychological "working through" process. To pursue the medical analogy a bit further, it looks very much as though an effective psychological inoculation, like a medical one, requires that a person go through a minor form of the disease itself in order to build up defenses that are equivalent to antibodies. More specifically, the person must go through in anticipatory form some of the same anxieties and other emotional disturbances that characterize the emotional reactions evoked by the actual stress situation itself. These anticipatory reactions would include not only realistic worries about objective sources of danger, but also a foretaste of some of the more irrational fears and vague anxieties that are stimulated by the ambiguous threats encountered in any large-scale disaster.

Another type of emotional reaction that probably needs to be anticipated and worked through in advance consists of the ambivalent feelings that develop toward authority figures. Leadership, of course, is a prime source of reassurance in any danger situation. But in prolonged disaster situations, the problem of ambivalence is likely to become a serious one because, if suffering and discomfort continue over a period of weeks or months, many people begin to develop a sense of aggrievement. The authorities begin to be blamed, rightly or wrongly, for "allowing us to go through this for so long and not helping us or protecting us better." Hostile resentment toward local and national authorities can give rise to very serious personal conflict, which further depletes the inner resources of disaster victims.

You have also heard a number of speakers refer to the depressive, apathetic types of reactions that develop among people who survive the destruction of their community. The more severe and prolonged the post-disaster deprivations, the higher the probability that the survivors will develop affective reactions characterized by feelings of hopelessness about their future and by a morbid sense of having been abandoned by the powers that be.

All of these various affective reactions probably need to be stimulated, to some extent, in advance in order for each person to develop highly specific defenses for controlling his emotional reactions under subsequent disaster conditions. This means that certain types of preparatory devices are needed that will arouse these

feelings and guide them in a constructive direction, enabling the person vividly to imagine himself as a survivor in the future danger situation. Perhaps subsequent research will show that the only way to accomplish this is by a training procedure in which people are exposed to a simulated danger situation that is very close to the one in which they are likely to have to function later on. Or perhaps, some special forms of preparatory communications can be developed that will prove to be effective in inducing the appropriate degrees of emotional inoculation. The main point I wish to make is that this problem will require a great deal of systematic research.

A number of speakers at this conference have emphasized the importance of group relationships in enabling a person to cope with threatening events. The predisposition to group formation, along the lines that Captain Hilmar was just referring to, is also likely to be stimulated by inducing people to anticipate correctly the kinds of stresses they will be undergoing. This type of effect should also be systematically investigated. We need to find out a great deal more about how group formation can be stimulated and under what conditions a heightening of affiliative tendencies increases or decreases a person's stress tolerance.

Mr. Biderman has raised the question of whether people should be given optimistic or pessimistic expectations about the future in connection with large-scale disaster. My own research on related issues leads me to pose the problem in a somewhat different way. It looks as though two different types of communications are needed in the proper dosage. One type, as I have already indicated, may be needed to stimulate disturbing affects but without stimulating anxiety so much that it becomes overwhelming. A second type involves reassuring types of statements that facilitate reality-oriented defense. Both types are probably needed in order to break down the usual denial tendencies—to replace blanket reassurances, which are rather useless when the chips are down, with more differentiated defenses that will prove to be effective if a danger situation actually materializes.

Some of my research findings suggest that it may also be necessary to take account of individual differences in reactions to preparatory communications. For example, we are able to distinguish one group of persons that chronically over-reacts to any threat and this group can be broken down further into two sub-types: (a) those whose overreactions are symptomatic of a chronic personality disturbance, for whom nothing short of intensive psychotherapy can be expected to modify their disorganized behavior, and (b) those whose overreactions are based on misconceptions about the danger or on

very special vulnerabilities to just one particular kind of threat, but who can be influenced by appropriate educational devices.

Then, at the other end of the continuum are the underreactors, who characteristically respond to warnings about potential danger by denying that it could ever happen to them. Some of these people, and I suspect only a very small percentage, are chronic deniers; others are likely to be much more flexible so that, if given the appropriate information concerning the threat by authoritative sources, they will drop their denial defenses in favor of a more adaptive type of defense.

The problem, then, is to discover which types of preparatory communications, if any, will succeed in building up effective psychological defenses in various types of personalities. Different types of communications may be needed for different types of personalities.

Now I want to conclude by pointing out that what I have been talking about is essentially a proposal for a certain type of essential research that, it seems to me, requires a series of phases. The first phase is already well represented by the papers that have been presented today and by some of the additional studies that have been summarized in the working papers assembled for this conference. The initial phase to which I am referring consists of documenting the sources of psychological stress and the types of emotional reactions to be expected in the various extreme situations with which we are concerned.

The second phase involves attempting to develop preparatory communications that have at least a fair chance of being effective in preparing people for these stresses. This will require a great deal of ingenuity to invent suitable communications. Their evaluations would, of course, require applying the usual methods of communication research: exposing people to experimental communications and using interviews or questionnaires to find out to what extent their attitudes, expectations, and affects have been modified. But then comes the third phase, a crucial phase that should not be overlooked, i.e., the final experimental testing in a criterion situation of whatever psychological preparation techniques evolve from the first two phases of research.

A number of today's speakers have emphasized the fact that when you are in the presence of a complex set of deprivations and dangers, the interaction of all the various sources of stress operating together may give rise to quite a different set of reactions than what we would find if any single one of these deprivations or

dangers was operating alone. To predict reactions to actual disasters, it is probably necessary to investigate situations where people go through stress experiences without having a "panic button" that they can push to get out of the situation. For example, if we want to learn about the ultimate effectiveness of any form of psychological preparation for a nuclear attack, it is necessary to simulate as closely as possible the actual shelter confinement situation, and then to simulate the post-confinement situation. That takes a good deal of ingenuity, but I think it can be done. I have participated in some planning conferences, conducted last year at the American Institute for Research, in Pittsburgh, and from the discussion we had at that time, I feel it is quite feasible to duplicate most of the essential psychological features of a wartime shelter confinement situation in an experimental shelter. This may provide a useful criterion situation to obtain systematic data on psychological preparation and on a number of related problems that have been discussed today, so far as the period of confinement is concerned. But whether a feasible criterion situation can be set up to test reactions to a post-confinement disaster situation remains an open question. It seems to me that it is a worthwhile research enterprise to try to do so, in view of the potential value of developing effective techniques of psychological preparation, especially for key leadership personnel, whose post-disaster behavior may play a crucial role in limiting the magnitude of a disaster.

OSCAR SUTERMEISTER
Bethesda, Maryland

In your program I am identified as a city planner, not a psychologist nor an anthropologist. I presume I was invited to join the panel because of earlier air intelligence work in the fields of target analysis, the planning of air attacks on cities, and urban defense.

The broad framework of instructions set forth to me by Mr. Baker was to comment on the day's papers in terms of preattack and postattack utility of fallout shelters as well as their habitability during attack. The principal reaction I have developed to the papers and today's discussion is that shelters must be capable of fulfilling their primary function of saving lives during the attack phase before it becomes pertinent to consider their preattack and postattack value.

Referring back to Mr. Biderman's paper and the point made by Mr. Janis, that the authorities should seek to instill realistic expectations in shelter occupants, it is that point to which my comment pertains. Our current national shelter policy is one of placing responsibility on the individual for preparing a fallout shelter. The normal individual would do this at his home. However, if he is going to spend from $100 to, say, $500 to develop a fallout shelter, I believe he is likely to want some specific background information as to the threat, and it is my feeling that he will accumulate a little more background than simply a fear of fallout.

From my contacts with Civil Defense minded people in the Washington area, I would conclude that the person who is willing today to put out his own cash for a fallout shelter is very likely to know that in a metropolitan target area there is even greater mortal danger from blast, fire, and heat than from fallout. I would further conclude that there is, and will continue to be, a reluctance to go into fallout shelter construction if the individual feels that realistic consideration is not being given simultaneously to these other threats.

Therefore, I have a feeling that it would be helpful if a greater effort could be made to give fuller information on civil defense planning assumptions to the individual. Mr. Saunders showed us a slide which gave the planning assumptions for Operation Sentinel. I don't know the date of that operation. But the figures mentioned, 250 weapons with a total yield of 2500 megatons or an average yield of 10 megatons per weapon, placed on 144 targets, mean that 106 weapons would be a second weapon or additional weapons on a single target.

If, for example, we assume a 10-megaton weapon size (I am using very rough figures here), we might anticipate a psi (pounds per square inch) of about 3 for a distance 12 miles out from ground zero. Thus there might be a 24-mile diameter circle in which a relatively light fallout shelter, of the type now being recommended by OCDM as "an inexpensive type," would collapse under this average weapon. In a city where two of these weapons were used, there would be a wider area of such collapse of fallout shelters. If the occupants of shelters are not prepared for this probability, there will have been created a very serious example of failure to give shelter occupants realistic expectations.

What could be done in a constructive way about this? Would it be possible, for example, (a) to urge homeowners to think in terms of the nearest likely target close to their own homes and the distance in miles of their homes from such a target, (b) to

encourage them to select in their own minds the approximate size of weapon against which they were willing to spend their own money for protection, (c) to help them acquire a fuller understanding of probable psi at their homes from the assumed weapons, and (d) to let them decide on that basis how much blast protection beyond fallout protection they were willing to buy? Of course, everyone is always taking his own chances on aiming error, so he may get more or less protection than he counts on.

This is the key point that has come to the fore in my mind in trying to tie together my discipline with your sociological and anthropological disciplines.

In conclusion, I have the feeling that our national shelter policy right now is primarily a national shelter policy for non-target areas, and that for the target areas themselves, we really have an incomplete policy as of the moment.

ALLEN BARTON
Columbia University

The first thing that has come to my mind is based on the free-enterprise assumptions that we seem to be working under. In the period of getting into shelters, assuming there is a warning period, a tremendously different situation may arise depending on whether there is already reasonably total coverage (i.e., shelters enough for everybody) or only partial coverage. There is an old folk song that says, "if life was something money could buy, the rich would live and the poor would die." I think that is the basis on which we are operating, and it might cause considerable social conflict.

We have done some research at Columbia on the factors that make people take Salk shots. It is by now pretty well established that, while in every group of people there are some people who are not very rational, the poorer and less-educated you are, the less likely you are to get Salk shots: David Sills and Raphael Gill reported on this in their article, "Young Adults' Use of the Salk Vaccine," in Social Problems, (1958, 6). It presumably will be the same with a system of privately owned shelters.

Once people are in the shelters, the question of organization arises, and I think there may be some research that would be helpful in this respect. Captain Hilmar mentioned the possibility of organizing the occupants of a large shelter into groups of ten or twelve who would choose a leader or a representative and then sort out the occupants' jobs according to skills. F. L. Strodtbeck has quite elaborate data from the study of jury behavior in Chicago which he, R. M. James, and C. Hawkins present in "Social Status in Jury Deliberations," in American Sociological Review, (1957, 22). It covers what happens if you shut twelve people in a room and give them a strange and unfamiliar task and instruct them to choose a leader. He presents data on who gets chosen as jury foreman and on whether he is any good once he is chosen. I would expect that a lot of social stereotyping will happen in this situation. In the jury case it is usually somebody of professional or executive background, who has silver-gray hair and sits at the end of the table. This is a crude formulation of a rather refined set of findings. Do not take it too seriously.

In connection with how the jury handles sometimes complicated and confusing situations (e.g., cases where it is asked to decide how an accident happened, how a house got on fire, or whether it was due to some fault in the electrical system), you have the phenomenon of various people bringing in technical expertise. The jurors in Chicago are picked off the voting lists at random, and they constitute the sort of random group you might get in a shelter. It will often turn out that there is someone with technical expertise and he is made the authority on electrical wiring or whatever the case might be.

In connection with the problem of shelter organization and what has been done so far, presumably there has not been any very specific image of the physical design of the shelter that would in turn define the work roles and some of the details of their activity pattern. It would probably be quite useful to make certain assumptions about what kind of electric system, what kind of communication system, what kind of food and food preparation, ventilation, waste disposal, etc., there would be. And from these we should try to figure out a little bit in advance what kind of instructions you might give a randomly associated group on how to sort themselves out among these tasks.

In connection with the post-disaster emergence, it is rather unusual that people have two weeks to sit and think about the disaster before they have to come out and face the consequences of it. As someone pointed out, if it were possible to establish some combination of reasonable and decent communication from the

government to let people know how conditions were in different areas—what they would face when they got out--and also put in various kinds of handbooks or orientation group reading material, then these might be utilized during some of the period to get people somewhat prepared for the nature of the task they would have when they got out.

There is a fascinating book by Richard Meier, formerly of the University of Chicago, called Science and Economic Development, (Wiley: 1956), in which he had many proposals for what to do about underdeveloped areas. One of the most interesting was the idea that if you have more or less starving peasants moving into a great Oriental metropolis whom you want to house in an organized and planned way, then the best thing would be to bring them in by groups. They would be turned over to a supervisor located at a little railroad station, who would show them how to make wooden molds for making concrete blocks. The group would then be shipped a lot of sacks of cement and sand by rail, and they would then proceed to build themselves a little village while living temporarily in the railroad station.

There is probably some ingenious notion of this kind that might be applied to the general housing shortage in a post-bomb situation requiring some effective social organization. Mr. George Baker, in collaboration with N. J. Demerath, has written an article for Journal of Social Issues, (1951, 7), that analyzes the social organization of house building. It lists twelve different roles, all of which are involved in rather complicated and inefficient systems for getting anything done. I doubt that this system would function very effectively.

The last thing I have to say really relates more to what Mr. Janis said than to any of the previous papers. That is, if you are going to get into the question of the advance preparation of people for a civilian defense situation, you have to be aware of the fact that attitudes are interconnected. If you start socializing people toward the realities and necessities of any disaster situation, it could have many other consequences for their political and economnomic attitudes and behavior. These would have to be carefully taken into account before one got involved with a large-scale program. In the second place, the effort would meet resistances that are tied to their existing integrated political and ideological structures.

It might turn out to be virtually impossible to get them to take such a program seriously if at the same time other branches of the government and the mass media generally were preaching

other gospels, the gospel of selling automobiles and selling houses in the suburbs, or the gospel of voting to reduce the national budget. The politics of preparing people for civilian defense is probably not exactly in our scope at the moment, but it seems to me that it is extraordinarily complicated and requires the use of some political science as well as psychology.

SECOND SESSION

Chairman, John K. Hemphill

Some Current Research and Implications

Discussion of Papers

SOME CURRENT RESEARCH AND IMPLICATIONS

Some Implications from Disaster Research
for a National Shelter Program

Laboratory Research on the Habitability
of Public Fallout Shelters

The Implications of Food Acceptability
for Shelter Occupancy

Some Results of a Study of Procedures
for Managing Large Fallout Shelters

Some Comments on Public Opinion
and National Shelter Policy

Public Reaction to the Unscheduled Sounding
of Air-Raid Sirens in a Metropolis:
A First Glance at the Data

SOME IMPLICATIONS FROM DISASTER RESEARCH FOR A NATIONAL SHELTER PROGRAM

Charles E. Fritz
The J. Hillis Miller Health Center
University of Florida

There are obviously many different kinds and levels of implications that can be drawn from disaster research studies for a national shelter program. The particular implications that are drawn will largely depend on the kinds of questions that you direct to this body of findings. I assume that my assignment can best be handled by giving you a kind of representative sample of implications that I would draw from these materials. Many of the central ideas developed are the product of previous collaboration with Harry B. Williams, former Technical Director of the Disaster Research Group, although he is not responsible for the particular implications that I have drawn.

The implications that I will present range the gamut from pre-attack planning to post-attack operations, and from broad planning assumptions to specific operational suggestions. More specifically, I shall direct my comments to the following three questions:

(a) How can a realistic national shelter program be instituted in peacetime?

(b) How do you get people to respond quickly and effectively to a warning of attack?

(c) What are some of the major guidelines that should be taken into account in the planning, design, and operation of shelters?

Each of these questions, it should be noted, is oriented around the more general question: What are the salient human responses and needs that should be taken into account in a realistic program of preparedness for nuclear attack?

The implications that I will present in this brief time period will necessarily suffer from inadequate documentation and elaboration. The lack of time prevents me from giving the evidential base from which I have drawn the implications and also prevents me from elaborating on them in detail. (For a general review of disaster research findings, see Fritz & Williams, 1957.) The primary source of these inferences will be the 140 or so field studies of disaster that have been made in the past 10 years (Fritz, 1959); but I shall also give cognizance to the World War II bombing studies, the studies of civil defense exercises, the national sample surveys on public responses to civil defense, and numerous social histories of disaster.

For purposes of clarity, I shall state these implications in as stark and simple a manner as possible. I am not at this point concerned with the minute scientific hedgings that oftentimes obscure the salient thought. I am well aware of the fact that many of the statements that I will make require additional qualifiers, but if I stop to add all of these at the present time, we will probably lose any heuristic and challenging value that the statements may contain. I am also aware of the fact that many of the statements are open to argumentation, and most of them are framed with precisely that intent. Insofar as such arguments lead us back to a reconsideration of gaps in our knowledge that need to be filled, or to planning assumptions that need to be reassessed, they are highly desirable.

In stating these implications, I am not concerned about practical matters of implementation. The model that I am aiming for is one that incorporates an ideal recognition of the human and social factors involved in preparation for disaster and in the handling of the problems of actual disaster. The methods of implementing these implications and the compromises with the hard facts of social life that this implementation might entail are subjects that have to be considered in a different context.

Some Assumptions

I take it for granted that we can immediately agree to lay to rest all the ghosts that haunt the attic of popular thinking about human behavior in disaster. If people throughout history had actually engaged in all the mass panics, stampedes, looting, pillaging, mutual exploitation, and other nasty forms of behavior commonly attributed to disaster-struck societies, we would not be here today to talk about disaster because organized human societies would have long ago ceased to exist. If disaster studies have taught us nothing else, they have taught us that man is a highly adaptive social animal

when he is directly confronted with clear challenges to his continued existence. He has survived every conceivable form of danger and horror in the past and, short of total annihilation, he will continue to do so in the future.

Recognition of the fact that human beings will survive and that they will go on to organize new forms of life to cope with the changed conditions, of course, does not really hit the central problem that we are concerned with in wartime disaster preparedness programs: how to maintain or quickly reinstitute an organized society capable of meeting the basic needs of its members, protecting itself against external force, maintaining initiative and influence in international affairs, and preserving its basic values.

If we assume that these are the central goals of preparation, it should be obvious that we are talking about a major planned and directed effort aimed at societal survival, not simply the physical survival of people and resources. The achievement of these goals greatly transcends mere physical and biological survival and the laissez-faire assumption that we will permit people to make their own preparations and solve their own problems in the aftermath of disaster. When these goals are established, we are talking about the basic functions of a social system and how we can maintain that system or put it back together again. We are concerned not only with matters of biological survival (subsistence, shelter, and health) but with the problem of order (authority patterns, division of labor, cultural norms, social roles, etc.), with meaning (values, shared definitions of reality, communication mechanisms), and with motivation. If we continue to think of society as simply a collection of individuals utilizing resources, we will have lost our only hope of attacking the problem of preparation in any socially realistic way.

In the subsequent observations, I will assume that the maintenance or quick reinstitution of a coherent national society along these lines constitutes the major aim of a national preparedness program, including a national shelter program. Correspondingly, most of my observations will be directed to the implications of disaster research findings for the national decision-making structure.

How Can a Realistic National Shelter Program Be Instituted in Peacetime?

Proposition 1. The development of a national shelter program must start with the recognition by national leadership that adequate disaster preparation resides in system planning and

management, not in an attempt to secure individually-motivated self-protective action.

Disaster and accident preparedness programs based primarily on individual motivations for self-protection and requiring individual or small-group initiative have always failed because they ignore a basic fact of human life: the universal human tendency to err on the side of "normalcy," i.e., to assume that everything is all right until events clearly prove otherwise. As a consequence of this tendency, recognition of danger and preparation for danger are usually postponed until it is too late to prepare well-organized precautionary and protective measures. Behavior in the subsequent disaster then becomes a series of ad hoc or improvised adjustments that may eventually result in the reconstitution of the system, but at the cost of great delay and inefficiency of effort.

Programs designed to prepare people for uncertain future threat must compete in the market place of immediate and pressing human concerns--the day-to-day problems of earning a livelihood, protecting oneself and one's loved ones from the daily dangers to life and health, and securing recognition, response, and status in relations with members of one's personal community. This competition is inherently unfavorable to communications that are oriented to the future rather than the present, especially when the future conditions referred to are unpleasant or painful to contemplate, when there are no present societal rewards for the personal costs and sacrifices involved in making preparations, when there is no way of realistically testing whether the preparedness measures are effective, when there seems to be additional time before one has to make a decision, and when there is no apparent way to come to grips with the problem in terms of present resources or manageable units of activity.

Both the studies of natural disaster and the public opinion surveys on civil defense readiness have consistently shown that less than 10 per cent of the population will build shelters or take other realistic preparatory measures for future disasters when the program of preparation rests on individual initiative. Follow-up studies of accident-prevention programs have produced similar results. For example, it is now generally conceded that the publicity campaign designed to convince people that they should purchase seat belts for their autos is a total failure. After four years of public propaganda on this subject, fewer than one per cent of American drivers use seat belts (Consumer Reports, 1960).

The unit of planning and management in a nuclear attack is the nation as a whole—not individuals, not communities, not states,

not regions, but the total social system. This means that the total national requirements and needs must always be kept in the forefront of attention in planning protective, ameliorative, and rehabilitative organizations and activities. Although the traditional distinctions between national, state, and local governments obviously have to be recognized in the preparatory period, we must also recognize that these distinctions will vanish in a flash if a nuclear attack occurs. The federal government must be prepared to deal directly with the myriad human needs posed by the attack.

Proposition 2. The basis for system planning rests on a careful assessment of post-attack requirements, not on present organizational capabilities.

We can no longer assume that the traditional structure of American government—with its complex and overlapping division of labor and function, checks and balances, geographic distinctions, and high degree of voluntaristic participation by the citizenry—is capable of handling the needs posed by a severe attack on the nation. Rather, we must start with a careful and critical examination of post-attack needs and the organizational requirements that they presuppose for efficient and effective pre-attack preparation. These requirements then should be compared with existing capabilities in order to determine what changes, if any, are needed for realistic preparation.

This planning must clearly recognize the major disjunction between the organizational needs of a preparatory period and those of an attack period. During a preparatory phase, organizational policies must give full cognizance to the different sources of political power and influence present in an intact society and how these may be utilized in giving sanction to and securing conformity with a preparatory program. This type of operation differs radically from that of the post-attack period, when the normal social bench marks disappear or become radically altered. The rapidity of change and the fluid character of social conditions in a post-attack emergency phase places a heavy premium on the elimination of bureaucratic structures and ideologies that are incompatible with speed and flexibility of operation. To me, at least, this disjunction presupposes the development or utilization of a highly organized federal defense force especially trained for civilian disaster operations. This force must be able to engage in direct reconnaissance and speedy information-gathering and evaluation. It must also have the capacity for rapidity of decision-making, as well as have the sanction and capability for direct, mobile, flexible action in meeting imperative survival needs throughout the nation.

Proposition 3. As in other aspects of system preparedness, the system leadership must take complete responsibility for the initiation and implementation of the shelter program.

The development of an adequate shelter program can be accomplished only if the leadership and respected authorities in the system provide strong and consistent sanction and support for the program. This includes not only the clear definition of the nature of the threat and the required steps needed to secure the requisite degree of protection, but, more importantly, active and concrete steps to insure that the necessary protective facilities, equipment, organization, and training are provided.

The public holds the national leadership responsible for developing adequate civil protective measures. It does not make neat or fine distinctions between military and non-military defense. It assumes that the national authorities have the responsibility for assessing the danger and undertaking the necessary countermeasures, and it tends to judge the seriousness of the danger and the need for protective action not by what the leadership says but by what the leadership does with regard to preparation. Public cooperation and initiative is much more probable after the leadership has initiated a realistic program of preparation.

Proposition 4. The essential method by which societies secure adequate preparation for uncertain future disaster is to use or shift the reward structure of the society so that disaster preparedness becomes a socially sanctioned and rewarding form of behavior under normal conditions of social functioning, rather than an individual sacrifice that interferes with the on-going values in the society.

This redefinition of the situation and shift in the reward structure can only occur as a result of action by the system leadership that demonstrates that appropriate preparatory behavior will be recompensed by current rewards.

This general principle has a very specific implication for a national shelter program: every effort should be made to incorporate multiple peacetime uses into shelter construction, so that the shelter is not viewed simply as a place of refuge in the event of attack but as a place that has value in current life. The few people who have built shelters in the past (e.g., those in rural tornado areas) have usually done so with this multiple function in mind. The tornado cellar was primarily a place to keep the beer cold and to store perishables, only secondarily a place of possible refuge in a tornado. The association of the structure with reward and the familiarity

with its design that comes through continued use also serves to eliminate the strangeness and potential fear-provoking element of shelter-taking and shelter life.

How Do You Get People to Respond Quickly and Effectively to a Warning of Attack?

Proposition 1. Warning can be effective only when there is a system of organization designed to implement appropriate responses to a warning message.

An effective warning system requires total organizational implementation, from initial education and training in the recognition of the signal and in the appropriate action to take in response to the signal to final follow-up to insure that people are responding correctly to the warning. A system of warning is likely to be ineffective or inefficient if it depends on individual motivation and response to danger signals.

The characteristics of an effective warning system have been rather clearly established by disaster research: it accurately and rapidly transmits a clear, unique, unambiguous danger message that is instantly accepted as a sign for invoking prerehearsed, protective actions appropriate to the situation and to the nature of the danger.

Disaster studies have consistently shown that if there is ambiguity in the warning message, if the message can be identified with a "normal" or "test" situation, if local conditions or authorities refute the evidence of danger, people's response to warning will be delayed by further information-seeking or cue-confirming behavior and other inappropriate responses.

Proposition 2. A warning signal of attack should never be associated or identified with a test situation or with other kinds of emergency signals.

The signal must be so clear-cut and unambiguous that it is always, unequivocally, identified as "the real thing." Frequent repetition of the warning signal in a practice situation is like calling "wolf" over and over again when no wolf is present; when a real wolf appears, no one will believe you. Ideally, we want to call "wolf" only when actual danger is present. For this reason, I seriously doubt whether the present siren system of warning can be salvaged as an effective attack warning signal. At the very least, it will require strong reinforcement with other distinctive, informative signals.

It is also doubtful whether the decision about transmitting the warning signal should be left to local or regional authorities. In the ICBM era, with its fifteen-minute or half-hour warning time, it seems to me that we had better start thinking in terms of simultaneous national transmission of the warning message to the entire population. The fact that a few million people may unnecessarily take shelter is a small price to pay when the target or fallout areas cannot be accurately predicted. Local authorities simply will not and cannot have the necessary time or information to make a rational decision about whether or not to issue a warning.

Proposition 3. If the choice is between no warning at all and a warning time that is likely to be insufficient for people to complete the recommended or practiced protective acts, the best choice may be no warning at all.

At least one study (Marks & Fritz, 1954) has demonstrated that people who have insufficient warning to complete longer-range protective acts suffer greater proportions of casualties and have more severe emotional reactions during the impact of a disaster than those who have no warning at all or those who have considerable warning. People with no warning are more likely to use the protective opportunities immediately at hand, rather than expose themselves to greater danger by undertaking long-range or time-consuming protective acts.

This, of course, is an extremely difficult choice to make. It assumes a perfection in knowledge about the elapsed time between warning and attack, the likely targets, and the length of time required to take protective action, which may not in fact exist. It should be remembered, however, that, in a nuclear attack, the detonation of bombs will provide millions of people at some distance from the target areas sufficient time to take shelter, provided that they can identify the signs of attack and have the protective structures reasonably near at hand. In more remote areas, people may even have sufficient time hastily to erect shelters or to reinforce existing structures against the radiation hazard before fallout reaches them.

What Are Some of the Major Guidelines That Should Be Taken into Account in the Planning, Design, and Operation of Shelters?

Proposition 1. The building of individual family shelters should be discouraged and emphasis should be placed primarily on neighborhood, communal, and large-group shelters—the particular type of shelter being determined by the setting and group characteristics of the area.

In my judgment, the concept of the individual family shelter should be eliminated completely, except in those isolated areas where large group shelters are not feasible. There are many reasons that can be given to support this recommendation, and each tends to reinforce the other:

(a) Widespread feelings of isolation, abandonment, and consequent demoralization are much more likely to develop when there are millions of small, scattered shelter units.

(b) People obtain stronger feelings of security and support in large groups.

(c) The larger the group, the greater the spread of skills needed for shelter management and survival in the post-attack environment; hence the less the need for special training of shelter personnel.

(d) The larger the unit of management the easier the problems of shelter planning and administration and the less the cost per person.

(e) The smaller the number of shelters, the easier the task of communication between and among shelters and the greater the possibility of achieving order in the post-shelter attack on emergency relief and rehabilitation problems.

(f) The very act of planning, building, and equipping neighborhood and community shelters emphasizes the need for mutually cooperative behavior and combats the tendency for individuation of behavior—a tendency that poses the greatest control and administrative problems in a post-disaster period.

Proposition 2. Whenever possible, shelters should be located and built to encapsulate combinations of existing social groups whose membership and skills supplement and complement each other, e.g., groups having physical prowess or technical knowledge and those having social skills; groups with dependent membership and those with active, able-bodied, and productive functions. The aim in each case would be to replicate as closely as possible a total, self-sufficient community.

The use of existing groups as the unit of shelter planning offers obvious advantages: the requirements of these groups can be anticipated in advance; pre-existing organizational forms can be

used for securing conformity with warning and shelter-taking, and for securing orderly management during the period of shelter and post-shelter life. The emphasis on combination is designed to cover one of the most critical problems of shelter planning--the probability that many adventitious social groupings will not contain people who have the necessary organizational and survival skills. Special attention obviously needs to be given to the daytime population structure of residential areas populated with a high proportion of women with small, dependent children; to elementary school groups; and to hospitals, mental institutions, and other groups containing a large proportion of dependent or incapacitated members. The aim in each of these situations would be to combine these groups with other organized groups that can supplement the necessary physical and social skills, e.g., school and factory; business establishments and residential areas.

Proposition 3. Every effort should be made to avoid the pure "mass shelter," i.e., the adventitious and fortuitous grouping of anonymous individuals.

Even in highly mobile areas of large cities, it is not necessary to think solely in terms of the mass shelter concept. Large department stores, business and professional offices, public transportation and maintenance crews, and many other existing groups can be used to provide the essential nuclei of shelter occupancy and organization. There will always be a certain proportion of the population that will be adventitious shelterees, of course, but these people can be integrated around a relatively stable core of people whose presence and pre-existing organization can be predicted with considerable certainty.

It is obvious to me that the sooner we forget the mass-shelter concept and begin thinking in terms of utilizing existing organizational structures as the unit of planning and management, the more realistic we will be in developing a national shelter program. It should be noted that the concept of utilizing pre-existing organizational structures introduces a degree of order and stability into shelter planning that can never be achieved if we continually think in terms of a fluctuating, floating mass of anonymous individuals who have to be organized de novo in every shelter.

This does not mean, of course, that every necessary shelter skill will be represented in pre-existing groups. In large urban shelters, at least, it probably will be necessary to have a small corps of key personnel who are highly trained in shelter maintenance and other skills needed to supplement the skills of the existing groups designated to inhabit the shelter. It does suggest,

however, that some careful research be done to determine the skills present in existing groups before launching into an all-out recruitment and training program. In this connection, it should also be noted that the usual occupational inventories greatly underestimate the range of skills present in groups or organizations. Any future research on this subject should take into account the latent as well as the manifest skills--the skills acquired by previous experience, hobbies, special interests, and other social roles. These latent skills often provide the critical difference in determining whether or not a group can survive under adverse conditions, so their representation in estimates of manpower and training requirements is imperative.

Proposition 4. Flexibility of physical design should be the keynote of all shelter construction.

Highly rigid, pre-determined, and unchangeable design patterns should be avoided at all costs. The shelterees should literally be able to remake and restructure their shelter environment in accordance with the different needs and characteristics of the shelter occupants and in relation to the different needs occurring at different time periods of occupancy (Disaster Research Group, 1958).

The need for flexibility becomes obvious when we think of the shelter as serving multiple functions both in peacetime and in wartime (not only as a place of refuge for, say, two weeks but also as a habitat that may have to be occupied for months or years following an attack) and when we add the likelihood of unforseen needs resulting from the particular characteristics of the shelter occupants or from special circumstances. Moreover, the ability to carve out, change, and restructure their environment gives people an opportunity to engage in socially meaningful tasks and provides a sense of satisfaction that goes far beyond the simple use of space for survival purposes.

Proposition 5. Every effort should be made to develop instruments and communication techniques that will vividly dramatize and concretize the danger of radiation to people in shelters in order to prevent their premature exposure.

People will stay in shelters as long as it is obvious that departure from the shelter will greatly endanger life. In natural disasters, this is often facilitated by the observation of obvious danger in the immediate surroundings (flood waters, snow drifts, etc.), but, particularly in those areas remote from the zones of destruction, the nuclear attack situation will be different. Substitute

measures for making the danger of radiation appear real and present are needed.

Proposition 6. The period of shelter stay should be viewed as a period of active and productive preparation for the post-shelter environment, not as a period of listless "waiting-it-out."

It is both psychologically and practically unrealistic to view the period of shelter stay as one of soothing "hearts and flowers" music, leisurely recreation, and the conspicuous consumption of the pre-stocked fruits of a beneficent society. People in shelters will be anxiously oriented toward the future, and the more realistic and meaningful the fit between the shelter activity and the future needs of the society, the greater the likelihood will be of channeling this anxiety into socially useful form.

Insofar as possible, shelters should be combined with productive facilities (factories and workshops), so that the period of shelter stay can be used in the active manufacture or production of goods needed in the post-attack period. Every shelter should be stocked with at least minimal producer goods (hand tools in great variety) and the raw materials needed for the production of useful survival items.

The period of shelter stay should also be used as a period of reorientation and training for the hard realities of post-shelter life. This training should emphasize both the physical skills needed for post-shelter survival and the psychological perspectives that will minimize the trauma of post-shelter perceptions.

Proposition 7. All shelters should be tied together with an invulnerable system of two-way communication, so that every shelter can both send and receive messages.

The use of this network should give cognizance to the social psychological needs for information among the shelterees as well as the operational needs required for in-shelter and post-shelter survival. The general informational needs of shelterees can be predicted with considerable certainty:

(a) They will want to know what has happened to the Nation as a whole, to their communities, and to their homes.

(b) They will want to know how the national leadership feels about the war situation and what the leaders expect of them.

(c) They will want and need information on the whereabouts and condition of missing loved ones.

(d) They will be concerned with how long they will have to remain in the shelter, and whether or not outside aid will be available to solve emergency problems of shelter life.

(e) They will want and need orientation about the future: what life will be like when they emerge, what the future prospects for themselves and their children and other loved ones will be.

Disaster research findings suggest a number of general guidelines for handling public information and communication during and following the period of shelter stay. These are briefly outlined below.

Proposition 8. During the post-attack emergency period, communications to the public should reflect a clear expectation that, despite devastating damage and terrible suffering, the Nation has the will and the capacity to survive, resist, recover, and win.

The national leadership structure should never reflect demoralization of leadership or sentiments of apathy and defeatism for two reasons:

(a) The expectations reflected by national leadership are, in themselves, critical in determining whether or not the survivors reorient themselves to problems of national survival and display the unity and fortitude needed to overcome immediate survival problems and contribute to the war effort. The statements of national leadership have, in a basic sense, the character of a self-fulfilling prophesy: they can either promote the mobilization of human energy by giving it direction and purpose or they can dissipate this energy by encouraging sentiments of hopelessness and lack of goal direction.

(b) The establishment of goals that transcend the self and local interests, in itself, is a positive factor in promoting recovery, since it enables the survivors to orient themselves to objective realities outside themselves rather than to become preoccupied with the minutiae of internal problems and matters of self-interest.

Proposition 9. National communications should continually emphasize and reinforce the theme of commonality of suffering and unity in the struggle to survive, resist, recover, and win.

The feelings of commonality of suffering and strong social solidarity are virtually universal products of widespread disaster, but their generation is initially dependent on information that the disaster is, in fact, widely shared, and their continuation is based on the belief that sacrifice is being equalized and that all survivors are responding to the limits of their capacity in the effort to achieve societal goals. Survivors therefore need to be informed as quickly as possible that the attack has been an attack on the Nation as a whole and that the suffering and punishment they are undergoing is widely shared. The recognition of this fact not only facilitates national identification and eliminates feelings of invidious distinction but also prevents the initial build-up of unrealistic expectations about the quantity and availability of outside aid. It, therefore, focuses attention on the need for local areas to mobilize and cope with the problems in their own domain as best they can until such time as external aid may be available. (This type of communication, of course, must be framed in such a manner that people in local or isolated areas will interpret the absence of outside aid as a temporary fact of life to which they must make a realistic adjustment, rather than as a sign that they have become abandoned by the leadership and other parts of the society.)

Proposition 10. Whenever possible, informational ambiguity and uncertainty among the survivors should be reduced by providing specific information, even though the information may be personally painful and temporarily disorganizing to them.

Much of the loss of energy in a disaster-struck population derives from the efforts of the survivors to fill information vacuums or reduce the ambiguities about what has happened outside their local arena of observation. The anxiety generated by not knowing what has happened to the Nation as a whole and to one's loved ones in particular is likely to become a major impediment to the redirection of human energy into constructive tasks. In the aftermath of a nuclear attack, we can assume that the anxious search for information about kin and intimates will provide a major source of disorganization unless this problem is handled quickly by a highly efficient and coordinated survivor and casualty information service. When the choice is between continuing the ambiguity or resolving it by informing the population of the actual effects of the attack, the latter choice will usually be better in freeing energy for essential recovery tasks.

Proposition 11. The quick reuniting of families and significant reference groups should be a major goal of national policy.

Families and other primary reference groups provide the essential nuclei for regenerating more complex forms of social life. The more quickly these nuclei are reunited, the more quickly energy will be freed for larger societal tasks. It should be noted that this reunion can be greatly facilitated during the period of shelter stay by developing a coordinated clearinghouse of information on the membership of each shelter. Plans and procedures for reunion should receive high priority during and immediately following the period of shelter stay.

Proposition 12. All communications and organizational actions should ignore previous distinctions in wealth, power, and prestige, and treat the survivors equally or in accordance with standards based on disaster-induced loss and sacrifice.

Communications and actions that suggest that pre-disaster criteria are being used in the dispensation of relief aid or other treatment to the survivors have a high probability of fostering dissension and conflict.

Proposition 13. National leadership should emphasize and reinforce the tendency to judge losses in terms of how others have suffered in the attack.

A new, relative standard for judging the extent of suffering and deprivation emerges following disaster and this standard inevitably minimizes loss and deprivation when compared with normal standards. The fact that almost everyone can see others who are "worse off" helps people minimize what would ordinarily be an overwhelming sense of punishment and privation. This new, relative standard for judging loss is a positive factor in the recuperation of the population and can be reinforced by publicly recognizing people who have undergone terrible personal suffering but have continued to make positive contributions to national goals.

Proposition 14. All communications with the public during the emergency period should use "disaster language," i.e., the direct, personal, and sentimental language that develops among disaster victims.

This language is shorn of the usual formalistic modes of address; it recognizes no distinctions in social status, prestige, and authority; and it is characterized by a strong emphasis on the expression of primary group sentiments—expressions of sympathy, love, fear, shame, despair, hope, etc. In short, it represents a form of communication focused on the basic concerns of human life uninhibited by the usual constraints against the direct expression of thoughts and feelings.

Survivors need to feel that the leaders not only know about but deeply appreciate the suffering and pain that they are undergoing in their struggle to survive and recover; and one of the major means by which they judge this is in the extent to which the leaders "talk their language." Announcements of governmental action or statements of policy that smack of bureaucratic jargon and formalistic circumlocution, or otherwise appear to "cover up" or "smooth over" the hard realities of life, are likely to arouse feelings of resentment and embitterment.

Communications to the public should recognize the hard, bitter facts of present life within a broad framework of courage and hope for a future, better life. Disaster survivors develop a "live for today" philosophy that helps them overcome past and future worries and concentrate on immediate, pressing problems; but there is always hope that life will be better in the future, and this hope must be kept alive by projecting positive societal goals and by providing the substantive base for insuring that there is progress in achieving these goals.

Proposition 15. The national leadership must have the capability of speedily dispatching highly organized relief, control, and recovery forces to the areas of most critical need.

No amount of information or communication can equal the favorable impact made by the rapid arrival of organized outside relief and recovery forces that quickly dispense critically needed aid to the disaster victims. The "psychology of the deed" is infinitely more effective in achieving identification and support from local populations than the "psychology of the word." Speed of arrival and dispensation of aid is a central means for heightening the morale of survivors and for demonstrating that the national leadership and government is concerned about their welfare.

Close coordination between organized relief efforts and communications relating to the delivery of aid to local areas is highly essential. Communications to local areas should never build up false or unrealistic expectations about the timing and quantity of aid that can be given by outside government or private agencies. If aid is promised, the time of arrival and quantity of aid should be clearly specified and the actual delivery of the aid should accompany or closely follow any announcement that aid will be rendered.

Conclusions

If we really wish to be prepared to "survive, resist, recover, and win" a potential nuclear war, if we seriously believe that American society and its basic values should be preserved, then we inevitably commit ourselves to a program of civil preparedness that involves a recognition of the social realities of normal life and the ways in which this life changes under the impact of disaster. Disaster research conducted during the past ten years can provide us with some useful reference points for developing a socially realistic program of preparation, and I have attempted to indicate some of these bench marks or guidelines within the framework of planning for a national shelter program.

If there is any one central theme that emerges from this discussion, it is that we must approach the problem of a national shelter program with a high degree of creative system planning and social realism. We must stop thinking of American society as if it were simply a collection of individuals or families who, like the Minutemen of Revolutionary days, are individually responsible for the defense of the homeland. The realistic unit of administration and management in a nuclear attack is the Nation as a whole, and every facet of our preparation for such an attack should reflect a basic recognition of this reality. In utilizing the system planning approach, we must also recognize that American society consists of a myriad of interlocking groups and organizations whose interrelationships provide order, meaning, and continuity to our normal social life. The more frequently we can use these existing groups as the unit for shelter-taking, for shelter stay, and for the attack on post-shelter recovery and reconstruction problems, the more likely we are to achieve the goal of maintaining or quickly reinstituting a viable, organized society in the post-attack period.

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LABORATORY RESEARCH ON THE HABITABILITY OF PUBLIC FALLOUT SHELTERS

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This paper outlines an experimental project still in the development phase. Its purpose is the discussion of considerations that affect laboratory research on the habitability of public fallout shelters.

In general, it is divided into four parts:

(a) the definition of key terms,

(b) a description of an experimental study that is now being conducted,

(c) a discussion of some of the more trivial problems of behavioral science research on public shelters,

(d) a discussion of some alternative attitudes that behavioral scientists might adopt toward fallout shelter research.

Definition of Terms

Laboratory means any shelter, whether real or simulated, that is inhabited by subjects and used specifically for research purposes. The laboratory includes both peripheral and in-shelter measurement and recording facilities. As used here, the term implies nothing about the precision of control or measurement. It is used only to differentiate research involving confinement of subjects in shelters from research based entirely on logical analysis, studies of uninhabited shelters, or observations of "real-life" situations.

Research is used here in a very broad sense to include all attempts to derive reliable knowledge that can be subjected to the commonly-accepted criteria of science. Use of all the preferred

methods of science is not necessarily implied, although the use of such methods, insofar as they are feasible, is assumed.

Habitability, as it is used here, includes all of those factors that influence the comfort, safety, general well-being, or behavior of persons during or following a period of shelter confinement. It also includes factors that influence the decision to enter or leave a shelter. Limiting this discussion to research on human subjects, habitability does not include the effects of actual radiation since this is not a suitable subject for laboratory research.

Public fallout shelter is used here to denote any structure that is intended for use against radioactive fallout, is capable of supporting life for a period of two or more days of continuous habitation, and is not part of a private home. The fallout shelter may or may not also provide an appreciable degree of protection from blast, heat, bacteria, and chemicals.

A Habitability Study

Now, having agreed on the subject, let us describe briefly a study that is laboratory research on the habitability of public fallout shelters. This study is being conducted for the Office of Civil and Defense Mobilization by the American Institute for Research.

The Naval Radiological Defense Laboratory Study

As somewhat of an offshoot to the major study, which is being conducted in the main office in Pittsburgh, Pennsylvania, two representatives of the Institute's Western Office observed the 14-day habitability test conducted by the Naval Radiological Defense Laboratory (NRDL) and sponsored by the Office of Civil and Defense Mobilization. This test involved an experimental 100-man fallout shelter and used prisoners for most of the subjects. The American Institute for Research was responsible for the psychological aspects of the study. This portion of the study was primarily to determine how well the shelter facilities accommodated group living and how well inhabitants adjusted to shelter life.

Observations were made by a closed-circuit TV system and by microphone pickups in the shelter. A questionnaire was administered by the shelter commander, twice during the confinement period and once immediately before completion of the test.

Results of the study have not been fully analyzed and reported yet. However, there are five clear conclusions that can be drawn from preliminary analyses completed thus far:

(a) The shelter inhabitants came through the experience in remarkably good physical and mental condition. Ninety-six out of 98 respondents indicated that they would have volunteered for the test if they had known what it would be like. Eighty-six out of 96 respondents indicated that they would volunteer for a similar study again.

(b) The shelter organization and leadership had an important effect on shelter habitability. All of 98 respondents felt that dividing the group into sections enhanced habitability. All but one of 98 respondents indicated that they felt regular section leader meetings were effective. There was some indication, however, that reassignment of personnel to different groups from time to time would have added some much-needed variety. It was also suggested that some section leaders could have played a much more dynamic role.

(c) Restricted use of water was the most difficult hardship reported by the shelterees, even though there was no restriction on the amount of drinking water. Only waterless methods of face and hand washing were permitted.

(d) The second most difficult shelter-living condition was crowded conditions and the lack of space. This seemed to be more through lack of privacy and private storage facilities than actual crowding, however.

(e) The third most serious difficulty concerned seating facilities. Insufficient seating space (about half of the subjects could be seated at one time) and lack of backrests for available seating were both criticized.

The Pittsburgh Study

The study of psychological aspects of the NRDL test was somewhat incidental to the main purpose, which was to evaluate a prototype fallout shelter that had been developed by NRDL. On the other hand, the primary purpose of the work being conducted in Pittsburgh is to study the psychological and sociological aspects of shelter habitability.

These psychological and sociological aspects are being studied in three related ways. First, an attempt is being made to identify the effect of typical physical shelter conditions on the behavior of individuals and groups. Second, the manipulation of some of the psychological and social variables of shelter confinement should

identify their effect on behavior. Third, an attempt is being made to develop a kind of rough trade-off between psychological and social preparedness for shelter confinement versus amount of available space.

The Shelter. Before going any deeper into the design of the experiment, it will be helpful to develop a little context for further discussion by looking briefly at the facilities that will be used. Figure 1 is a rough floor plan of the experimental setup. The basic design is of a room within a room, with the inner room used as a synthetic or simulated shelter and the outer one used for experimental observations.

With this design, there is the capability for three different size shelters by shifting a movable wall to the three different positions indicated by dotted lines in the drawing.

Observation is made through a series of small one-way mirrors in each of the walls; closed-circuit TV; and six cardiod microphones, which can be used for stereo pickup in any combination of pairs. It might be noted that stereo is being used, because the preliminary tests indicate that stereo has a dramatic effect on ability to locate a source of sound and to pick out individual conversations from background chatter. As a matter of fact, the audio spectrum is being limited to just a little more than telephone range to improve the signal-to-noise ratio.

Recording will be by Polaroid, movie, and standard 35mm. still cameras; audio tape; and (a new concept in psychological research!) handwritten notes and checklists.

Figure 2 is a drawing of the intermediate size shelter with bunks in one of several possible configurations. This should give some notion of the amount of space that will be available in the shelter. This size shelter allows about 10 square feet per inhabitant since the plan is to include 30 persons in the shelter. Three-tier bunks will be used.

Subjects. Volunteer subjects are being recruited from a variety of sources, including the A. I. R. staff for pilot work; persons who contact us on the basis of newspaper articles and a little brochure describing the study; and persons from businesses, clubs, churches, and schools that are being contacted. Applicants will be screened for medical and psychiatric problems that might be dangerous. Individuals will be assigned to different experimental groups in a more or less random fashion, although time of availability will have to be a deciding factor in many cases. Both sexes

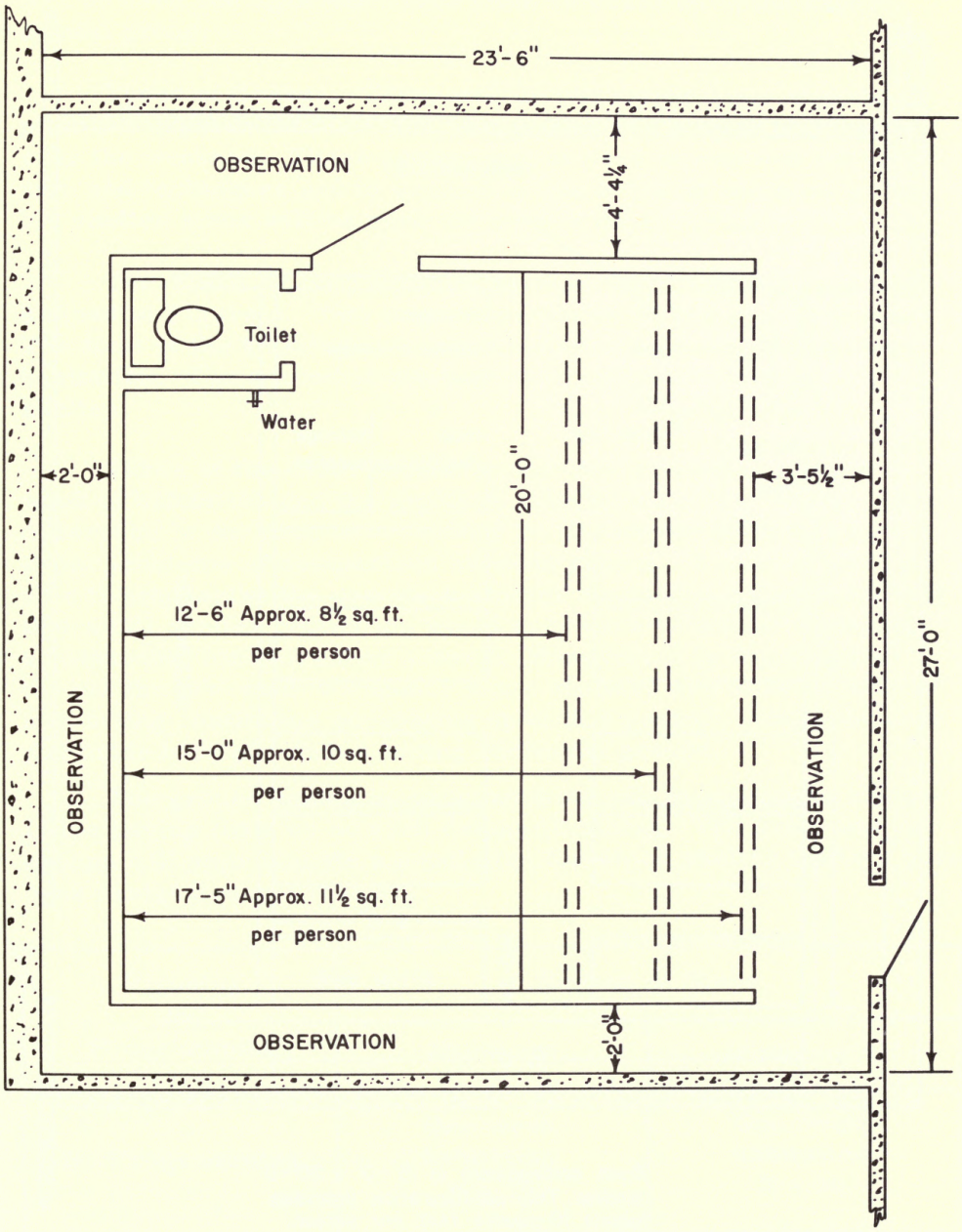
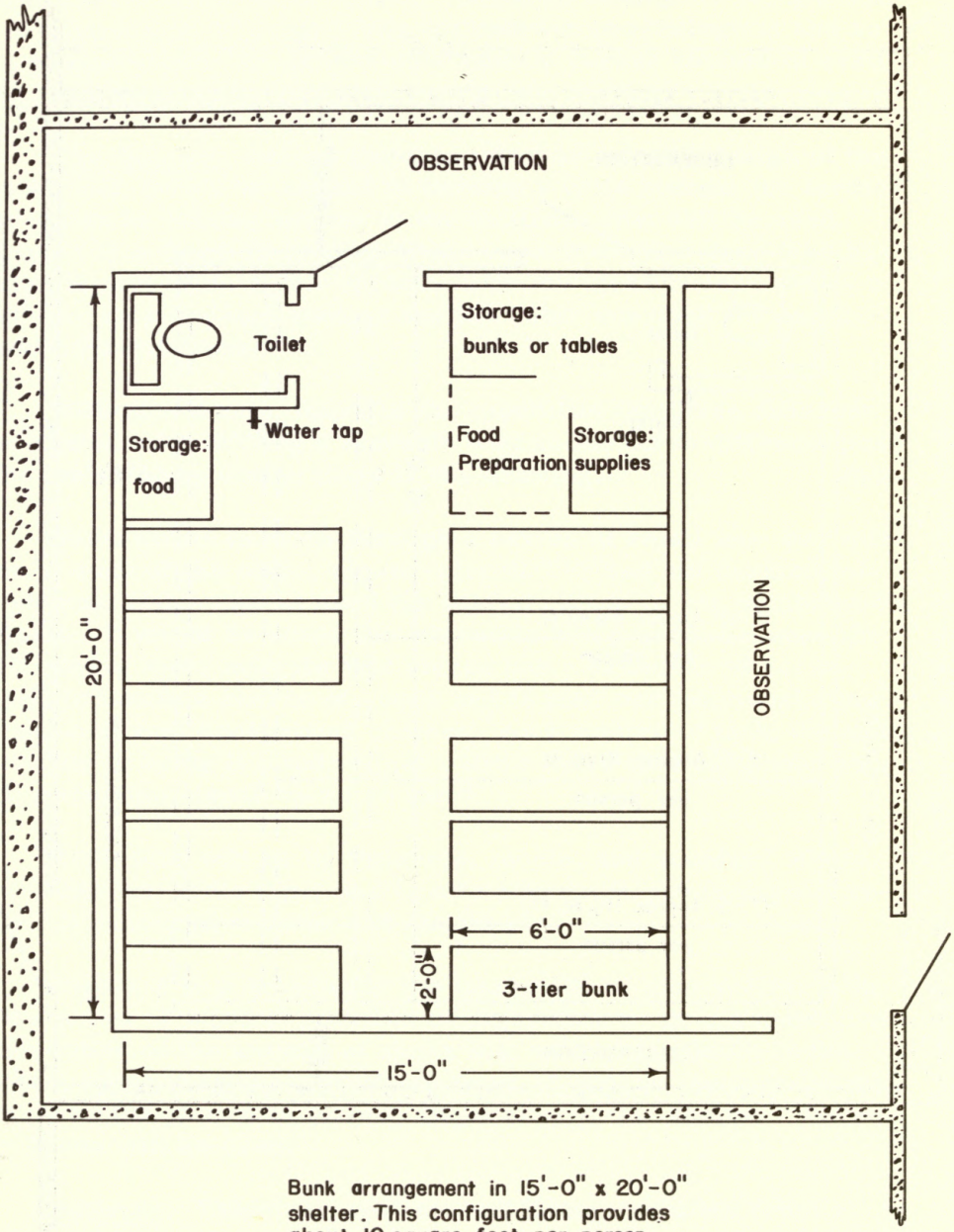

23'-6"
OBSERVATION
4'-4¼"
Toilet
Water
2'-0"
20'-0"
3'-5½"
12'-6" Approx. 8½ sq. ft.
per person
15'-0" Approx. 10 sq. ft.
per person
17'-5" Approx. 11½ sq. ft.
per person
OBSERVATION
OBSERVATION
OBSERVATION
2'-0"
27'-0"

Figure 1.



Bunk arrangement in 15'-0" x 20'-0" shelter. This configuration provides about 10 square feet per person.

Figure 2.

will be used and ages will range from 10 years up in the experimental group.

Types of Groups. There will be two major types of groups: pilot and experimental. Four pilot groups will stay in the shelter over the weekend. These groups will be used to improve the design and techniques and to determine which two of the three possible shelter sizes will be used for further experimental work.

There will be four experimental groups. These groups are defined in Figure 3. Two major dimensions define these groups. The first is the training and organization of subjects for shelter habitation. The second is the amount of space available in the shelter.

Three of the experimental groups are scheduled for one week of habitation and the fourth is scheduled for two weeks. This difference in duration of occupancy is, of course, going to cause some problems of comparison between groups. It seemed reasonable to emphasize the one-week studies because it appears unlikely that a full shelter population would ever have to inhabit a shelter continuously for more than a week. However, it is important to try out the two-week occupancy since shelters are to be capable of supporting continuous occupation up to this period. Available time and funds have precluded adding additional groups.

The groups having no programming will approximate a population having little or no civil defense training. The programmed groups will approximate a population for which shelter leaders have been designated and trained.

Planning and Programming	Amount of Space	
	Minimum	Minimum +
No Programming	One week habitation N = 30	One week habitation N = 30
Habitability Programming	One week habitation N = 30	Two weeks habitation N = 30

Figure 3. Experimental groups.

Measures. All experimental subjects will be given a series of pretests, observed extensively during shelter occupation, and then given another series of tests following shelter occupation. Consideration is being given to having subjects keep diaries in the shelter and to following them up for some time after their shelter occupancy.

Different experimental groups will be compared on all types of measures. Correlations among the different types of measures for a given group will also be obtained. Trends of in-shelter measures as a function of duration of occupation will be studied.

Some Problems in Behavioral Science Shelter Research

The number of specific limitations and problems in the study, which has just been briefly described, is very large. Rather than dwell on the limitations of this one study, it seems reasonable to mention four general problems that are inherent in behavioral science shelter research at the present time.

Group Comparisons. The first problem is involved in the comparison of different shelter groups. Normally, when making group comparisons on the basis of inferential statistics, we can draw N - 1 degrees of freedom from each group, because each individual's score is experimentally independent of other members' score of the group. For in-shelter behavior this is not the case, since one person's behavior is almost certain to affect the behavior of others. Consequently, "pure" degrees of freedom can be drawn only from the number of groups, not from the number of subjects. With the number of subjects required to simulate a public shelter situation, this can pose a substantial problem.

Number of Subjects and Duration of Trials. The second problem is, as a matter of fact, the number of subjects required for public shelter research and the length of time required continuously from each subject. Even to run one group for a week requires a substantial investment in subject recruitment.

Representativeness of the Sample. A third problem is obtaining a representative sample. Even where a sincere effort is made to get subjects from the general public, the experimenter must depend on volunteers. These volunteers may be representative of the general population in age, sex, socio-economic status, and other variables. That they are representative of the general population on civil defense attitudes seems subject to a reasonable doubt.

It is unlikely, for example, that a person who feels shelter research is immoral because it causes international tension will ever participate in shelter research. Yet, there is serious question that the shelter behavior of this kind of person can be predicted very adequately from observation of volunteers.

Simulation. The fourth, and final, problem is the ability to stimulate an attack condition realistically. The problems of physical simulation are trivial compared to the problems of psychological simulation. Consider the ethical restraints to making a person believe that he may have been or may be exposed to an overdose of radiation, that his family and closest friend may have been killed, that the total fabric of his society is in jeopardy. Yet, these elements are required for realistic psychological simulation.

A Point of View

Given the problems of behavioral science research on shelters, what should the behavioral scientists' attitude be toward this type of research? Although this question can not be answered specifically here, some of the alternatives can be explored briefly.

Ivory Tower. First, there is the ivory tower attitude of which behavioral scientists have so often been accused: if research is not pure, it should not be touched. This may, after all, be the only sensible attitude, for shelter research is not going to be very "pure" science for a good while to come. From the standpoint of one's personal security, a "hands off" attitude may be the only solution. No area seems as replete with charges of wasting taxpayers' money as civil defense. If behavioral scientists step into this arena, they will get their share of lumps.

Interesting Sidelights. A second attitude might be one of participating without really caring about the applicability of the research to civil defense. Rather, the time is spent working on incidental group dynamics problems of theoretical interest. In this way, the behavioral scientist can make a contribution without becoming emotionally involved in a potentially traumatic situation.

Follow the Politicians. A third attitude might be one of waiting and watching. Let the politician quit making civil defense a political football. Let the public show some real intent to do something about civil defense. Then the behavioral scientists will see what can be done to help.

A Symbol of Determination and Hope. Each of these attitudes has its inviting aspects. There is, however, an additional point of view that might be worthy of consideration. It sometimes seems that the advent of atomic and thermonuclear weapons has changed the composite personality of America. Very suddenly, the American personality went from overconfidence and often unwarranted optimism to depression and deep pessimism. "What's the use?" "What can we do about it?" "If it happens, it happens."

It seems that the American public, by and large, has become convinced that it is finished as a society if there is a nuclear war. No efforts have convinced John Q. Public that he is not doomed. "If it comes, it comes." There is nothing he can do but hope nobody starts anything.

In this matrix of fatalism and mass doom, the mass appeal of civil defense has been almost nil. The nuclear blast is so overwhelming, and radioactive fallout so insidiously intangible.

The fallout shelter is the first tangible evidence that something can be done. As such tangible evidence, it can become a potent weapon against the fatalism and gloom that has pervaded so much of our collective thinking. I have never seen so much spontaneous general interest in a behavioral science research project as there is in the study I described briefly to you.

It is foreign to the composite American personality to be fatalistic and a "gloomy Gus." The potential for determined action and hope is there. Perhaps the fallout shelter is the rallying point and habitability research a mechanism for generating the kind of popular interest and support that has so long been lacking.

If shelter research captures the public imagination as much as it might, we may have a whole new social phenomenon to study: America facing the future with serious concern, but with determination and hope.

THE IMPLICATIONS OF FOOD ACCEPTABILITY FOR SHELTER OCCUPANCY

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It is generally agreed that healthy persons can fast for two weeks of shelter existence without undue suffering or adverse physiological effects as long as water is available. The most austere of rations--a few candy bars or handfuls of parched corn--could alleviate the worst hunger pangs and maintain an isolated community with a minimum of casualties expressly due to inadequate nutrition.

On the other hand, it seems apparent, if shelters are to be manageable and beneficial to the entire population, that an adequate and palatable food supply is essential. It is on such a presumption that we approach the problem of developing shelter rations. The objective of the ration program is to provide palatable food in sufficient quantity to sustain the body and spirit of shelter occupants so they will be prepared to face a most difficult reconstruction of their society after they emerge.

It is almost certain that if food is available to shelter occupants, much of the activity in the shelter will tend to orient itself to the preparation, serving, and eating of food.

Problems presented, as one seeks to establish a shelter ration, are concerned principally with (a) stability, (b) palatability, (c) ease of serving, and (d) cost of food products. Solutions to ration problems are dependent on the situation and conditions of each shelter. Therefore, no formula will provide a standard shelter ration for every situation.

These problem areas are directly interrelated, and indirectly related to virtually every other problem of shelter design and habitability; for example: (a) if costs were not limited, almost any menu could be available, (b) many palatable, low-cost foods, such as bread and fresh vegetables, are not stable enough for shelter rations, (c) unprocessed cereals, such as rice, are palatable, inexpensive, and very stable, but would require more cooking than is desirable in shelters. Some products of limited stability might be

used in shelters in Minnesota with average ground temperature below 50° Fahrenheit, but they would involve very costly replacement in some parts of Florida with temperatures above 70° Fahrenheit. The objectives must be weighed against one another and an eventual judgment cast that compromises them all to some extent.

The Office of Civil and Defense Mobilization Interdepartmental Ad Hoc Advisory Group on Research and Development for Food for Shelters has been active since October 1958 and has made some preliminary decisions concerning the selection of shelter provisions. Food for shelters should (a) be reasonably palatable to a large proportion of the population, (b) provide about 2,000 calories per day per occupant for a two-week period, (c) be convenient to serve, (d) be minimal in cost, (e) require minimum space for storage, (f) be supplemented by a minimum adequate supply of water provided for in the design of the shelter, (g) require limited cooking facilities because of fuel requirements and the disposal of heat and vapor, (h) contribute as little as possible to the waste disposal problem in the form of containers and utensils.

It will be noted that these preliminary decisions are not specifications for the ration, but are only relative limitations in the selections of foods. Even the figure of 2,000 calories per day is arbitrary and may be infringed.

Before pursuing specifications of shelter rations, two general shelter situations may be delineated: (a) those where a scheduled rotation of food supplies from temporary storage in the shelter to normal food outlets will avoid appreciable quality deterioration of the foodstuffs, and (b) those where foods will be stored to the end of their usefulness and then be replaced by fresh supplies.

The most likely shelters for rotated supplies are those where the shelter management can be integrated with restaurant or commissary operations. In such cases, a suitable inventory of the food supplies can be rotated through the shelter area. Such situations exist in office buildings and factories that maintain catering service for employees and in regimented institutions such as hospitals, schools, jails, and military posts. In such cases, the cost of shelter rations will include extra investment because of enlarged inventory and extra handling, and the food selection will be dependent on its ultimate use.

The rotational plan may be the best way to keep total costs low for individual family shelters, while allowing a wide latitude for individual selection of foods.

The programming, educating, and disciplining for the rotation of food supplies loom as difficult problems that may weaken the usefulness of the concept. Such may be particularly difficult in the small, independent shelters.

For the other general shelter situation it may not be feasible or economical to rotate supplies; they must be held in the shelter until they are no longer palatable, and then replaced. It is not expected that the deteriorated supplies will have significant value and the cost of the ration becomes very dependent on how long the food remains palatable or how soon it must be replaced.

Rigorous cost analyses to compare these concepts of shelter provisioning have not been made, and it is unlikely that they can be made in general terms. Which situation will prevail must become the decision of the management of specific shelters. It seems likely that both types of shelter situations will exist. Therefore, investigation of problems of food selection and service for both should be made.

Problems of rotated food supplies are under consideration by the Food and Materials Requirements Division of the Commodity Stabilization Service of the U. S. Department of Agriculture. A prototype shelter stockpile is being developed for the U. S. Government Printing Office building in Washington, D. C. Other plans along these lines are also being developed. The Passive Defense Division, U. S. Navy Bureau of Yards and Docks, is giving some consideration to the concept of rotated stockpiles of commissary supplies for personnel shelters on naval bases. The OCDM Advisory Bulletin, "Individual and Family Survival Requirements" (1959), provides suggestions on shelter food supplies for small shelters.

Because of the work under way on rotated food supplies by the agencies mentioned above, remarks hereafter will be limited to problems of long-term storage of shelter food supplies.

Stability of Food

It is not enough that palatable and inexpensive foods be put into shelters when construction is completed. Selections must be made so that the foods will be palatable when they are consumed and so that the cost of stockpile surveillance and replacement, when added to initial cost, will be the minimum per year for the protection afforded.

In normal marketing channels, foods rarely escape consumption within two years of packing. Many of the foods we consider to be non-perishable, including most canned and dehydrated products, are indeed perishable when stored beyond the usual sale and consumption cycle. Many products require special inventory management because they will not retain quality long enough for general marketing practice.

A common form of deterioration is the internal corrosion of tin cans. Such corrosion is at a slow rate, but in a year or two at 70° Fahrenheit, enough hydrogen may result from the reaction to swell cans. Eventually cans will perforate from the corrosive action or rupture from the gas evolved. The rate of internal corrosion is dependent on the contents and the structure and material of the can itself.

In recent decades, technical developments of can manufacturing have done much to reduce the corrosion of cans, by the use of cold rolled steel, electroplating, and protective enamels (McKirahan, Connell, & Hotchner, 1959). These technical advances do not mean that canned foods are more stable than they used to be. The improvements have been used principally to provide the stability necessary for domestic markets (about a two-year maximum) and to keep container costs low in the face of rising material costs. Thus, the tendency has been to use the improved plating methods to reduce the tin requirement rather than increase the can life beyond the needs of the market.

In general, canned foods packed for domestic markets are not considered suitable for long-term storage as shelter rations, nor are they so intended.

Of course, a number of exceptions exist and a fairly good shelter ration could be selected from these. Canned meats, fish, peas, corn, pork and beans, baked beans, and some others are not highly corrosive. At moderate shelter temperatures, these items might be expected to last three to five years (American Can Co., 1945; North Atlantic Council, n.d.). On the other hand, most fruits, spinach, asparagus, green beans, and many others would not be expected to last as long as two years at 70° Fahrenheit.

Foods packed in hermetically sealed glass containers are several times more stable than those packed in tin. The lids are the weak point. However, lids are generally made of heavier plate than tin cans and are used with a protective coat of enamel. Furthermore, if jars are stored in an upright position, the contents do not contact the lid and corrosion is minimized.

While the technology exists to pack many food items in glass, relatively few foods are so packed commercially. The cost of glass packing is higher than tin and the containers weigh more, which adds to shipping costs. Because the enhanced durability has little significance in domestic trade, the cost factors militate against glass packing. Exceptions include very corrosive foods and foods that may be contaminated by metals. Also, some specialty items having high visual appeal (e.g., fruit juices, fruits for salad, apple sauce, and spiced peaches) are generally available in glass containers.

Dried foods present no problem of internal corrosion of metal cans. However, most dried foods are packed in flexible materials for the normal markets. Paper, plastics, metal foils, and laminations of all three are in common use. Even the best of these are occasionally subject to pinholing or to poor seals, which destroy the integrity of the package. Furthermore, none of the flexible packaging materials can be considered rodent and insect proof (Laudani, 1959; Michelbacher, 1959). If they are used for long-term storage, extra precautions must be taken to provide adequate protection of the food packed in them.

It is seen that the stability of food often revolves around the relationship of food to its package. In shelter situations and elsewhere, package deterioration may result from external forces and be unrelated to the content. Tin cans and metal lids to glass packages may fail due to temperature-humidity conditions in shelters during the indeterminate stand-by period. This is a factor of prime importance in the selection of food stockpiles and in the over-all design and management of shelters. Sweat damage must be prevented to achieve long-term stability of stockpiles.

Whenever air enters the shelter under conditions where dew point exceeds the shelter temperature, water will condense on walls, ceilings, equipment, and supplies. Over a long time and with repeated experiences of this type, supplies will be destroyed. We estimate, from atmospheric dew point and ground temperature data from the Weather Bureau and the Geological Survey, that in much of the eastern part of the United States atmospheric dew point at ten feet above ground will exceed ground temperature more than 80 per cent of the time during summer. For food stockpiles to remain usable for long periods, the containers must be protected. This can be accomplished by dehumidifying the shelters during the standby period or placing the stocks in protected rooms or master containers.

With ideal packaging, the food will still deteriorate. Dehydrated foods are subject to non-enzymatic browning and oxidative deterioration that affect their palatability; pigments, nutrients, and other components slowly react in canned foods and the products of corrosion are dissolved so that eventually the foods become objectionable.

Methods exist to enhance the stability of many products. Examples are the enzyme inactivation and controlled moisture content of dehydrated vegetables. Dehydrated potatoes can be very stable at 70° Fahrenheit or lower temperatures if packed in an inert atmosphere at a moisture content between 5 and 6 per cent. At higher moisture content, browning will occur with time. Lower moisture content will increase the tendency toward oxidative deterioration (Burton, 1945; Burton, 1949). Dehydrated tomato juice must be at moisture levels below about one per cent in order that browning be prevented. The oxidative deterioration of tomatoes affects flavor and color, and can be effectively controlled by inert package atmosphere (Wong, Dietrich, Harris, & Lindquist, 1956).

Much of the information available on stability of foods has been obtained relative to commercial requirements and does not directly apply to long-term storage; and much of it that has been published is contradictory. A large body of information on food stability has been developed in connection with military requirements (Woodroof, 1958). Military rations are generally packed in more durable packages than those used for domestic markets; and many of the products studied have been developed to meet highly specific military objectives, which are not necessarily applicable to shelter rations.

Furthermore, for both military and market studies the criteria of palatability may well be higher than essential for emergency food supplies in shelters. Thus, a minor quality change in a product may make it noncompetitive against newly packed items on the next shelf in the grocery store; the slightest haze of rust may make a can unattractive to a customer; and the morale requirements of reserve troops in the battle zone may demand the ultimate in flavor of rations. On the other hand, since shelter inhabitants know their existence under stress conditions will be of short duration, they may accept the beginnings of package failure and some reasonable degree of flavor and color deterioration of certain food items.

Until better information is available, shelter rations must be developed by extrapolations of existing data. The maintenance of palatability of food supplies cannot be accurately predicted.

Therefore, the food supplies must be under continuous surveillance during the stand-by period. Shelf life of all items must be anticipated as accurately as possible, and a program developed to withdraw and examine samples so as to know when each item must be replaced. Because of this, economy of material and effort will preclude the packaging of items of differing stability in the same container. Thus, the combination ration packs so useful for isolated individuals and small groups in military situations appear not to be useful in shelter rations. The problems of stockpile surveillance will be an important reason for simplicity in the ration selection.

Palatability

Palatability is a relative term. Individuality of preference is a human trait and the shelter ration cannot be expected to be palatable in all components to all occupants. A reasonable objective is to select foods that are relatively palatable to most people and unbearable to few. This objective will be most nearly achieved if the food is generally bland in flavor, allows some choice as to condiments on an individual basis, and can be easily varied so as not to be developed as a monotonous menu day after day.

Food selection for shelters should retain a high degree of local choice so as best to provide for regional and religious food traditions.

Ease of Serving

The design of shelters must provide for some type of food service. Food service, food selection, and shelter design are so interrelated that decisions pertaining to one must involve consideration of all three.

Several general patterns for food service should be considered and tested for feasibility in over-all shelter habitability investigations. The extremes of food service range from a centralized kitchen service with regimented preparation and serving of food and cleanup by a selected staff, to a general distribution of rations to individuals with individual responsibility for preparation, ad lib. consumption, and cleanup throughout their shelter existence. Many possibilities exist between these extremes.

Many of the emergency and survival rations developed by the Defense Department are intended for use by individuals or small groups isolated from kitchens. There are particular advantages of

such rations including compactness, palatability, convenience in use, and nutritional adequacy. Such advantages do not necessarily pertain to food service requirements in shelters.

Individual food service could impose difficult management problems in shelters. Food consumption would be lacking in control; waste, hoarding, gambling, and other undesirable practices could easily develop that would tend to create problems. However, the issuance of food to individuals or to small groups might provide more people with something useful to do or at least give them a contrast to their general inactivity. It would tend to localize any food poisoning outbreak caused from infection by food handlers. It would also relieve shelter management of direct commissary activities.

As a basic requirement, cooking of foods in crowded shelters does not appear reasonable because of the problems of heat and steam. However, the availability of hot foods and beverages are known to enhance general palatability of rations. It is not unreasonable to provide facilities for heating foods or boiling water in connection with food service. Precooked, dehydrated foods and soluble beverages can be served hot after reconstitution in boiling water. No further heating or cooking is needed for many products.

Of course, food selection should be predicated on the possibility that equipment or fuel supply may fail. Therefore, the ration should be selected on the basis that most or all of the foods must have a reasonable degree of palatability in the event that heating facilities are not available.

The food service should be developed with consideration of the possibility of food poisoning. Food preparation and service should be decentralized as much as it is consistent with efficient management and minimum equipment costs in order to help confine any attack. Disposable plates and flatware are desirable. Utensils for re-use should be sterilized by heat or germicidal solutions after each use.

Dishwashing and heat sterilizing equipment would (a) be wasteful of water supplies and fuel, (b) create heat and vapor to be disposed of by the ventilating system, and (c) add to the water waste disposal problem. It does not seem likely that shelters will have such refinements in connection with food service.

Cost

If the cost of a shelter program were too great, there would be no program. Cost must be considered in all decisions made in the problem areas discussed above. But, if shelter rations are too austere, they may fail in their objective of sustaining the body and spirit of the occupants so that they may emerge from shelter in the best possible condition to cope with an unpredictable environment.

Food costs for shelters include (a) initial outlays for food, related equipment, and shelter space; (b) supervision of the stored material to prevent its deterioration and to survey its quality at appropriate intervals; and (c) replacement of individual items at the termination of palatability. Estimates of these costs are needed to develop useful comparisons of ration and food service alternatives.

General Considerations

A number of related problems have not been mentioned but should be considered in the development of a food supply for shelters.

The age, sex, and physical condition of the shelter population, if known, would affect the selection of food. Because these factors cannot be known with accuracy, the ration must be developed so as to be flexible to extremes of circumstance. It is probable that infant and invalid feeding should be a responsibility related to the medical rather than the food service. However, rations should be so selected that some components would be suitable food for very small children and sick and aged persons.

It has been stated that shelter rations will supply a rated number of persons for a two-week occupancy. However, it is to be expected that many shelters will be overcrowded and in many instances food supplies will have to be extended over longer periods of time. At the initiation of occupancy, a decision should be sought based on an inventory of food stocks, the number of people present, and the estimated time that the group will remain in the shelter. The food issuance may be adjusted to accommodate more people or feed them for a longer time, or both. To this end, rations should be selected and packaged to allow variation in the feeding program without too much difficulty. It is to be hoped that the severity of an emergency that would lead to cutting rations would motivate the occupants to accept the more rigorous circumstances of shelter life.

For as short a period as two weeks, survival is not expected to be dependent on adequate balance of nutrients or caloric intake. Because of problems related to morale of occupants and ease of their management, it has been decided to provide 2,000 calories of palatable food per day per occupant on the basis of rated shelter capacity. It is hard to visualize a ration of 2,000 calories per day of foods that are normally acceptable to United States citizens that would not provide essential nutrients to sustain good physical condition for as short a period as two weeks. For these reasons, nutrient balance is considered of low order of importance in the selection of rations. One nutritional factor of possible importance concerns optimum protein content relative to water restriction. If water supply appears critical in a shelter situation, not more than 7 or 8 per cent of the caloric intake should be supplied by protein food (Quartermaster Food and Container Institute, n.d.).

Rations

Definitive development of a shelter ration is not yet possible due to lack of adequate information. Several concepts of the food supply and service should be considered as possibilities. Some of these can be developed into prototype food stockpiles and serve in preliminary tests of shelter habitability. They can also serve as focal points for evaluation and analysis of the interrelated factors listed above.

For the most immediate development of shelter provisions a "grocery store ration" is now possible. Such would include as many items in glass as possible and only the more stable canned products. Dehydrated items could be selected but many would depend on some cooking or heating facilities. Items would be selected to provide variety and to meet the personal preferences of the local shelter food committees. The canned meat and the meat and vegetable specialties would tend to be rather expensive; and the popular, bland, starch foods such as bread, potatoes, and rice would be in canned or dehydrated form, and quite different from the fresh. By use of extra protective packaging, some cookies and crackers might be included, and these could be carriers for jams, jellies, peanut butter, and processed cheese. Non-fat dried milk, soluble coffee, soluble tea, and sugar should be included.

Any shelter stockpile so developed should be sampled and evaluated on a yearly basis, and perhaps oftener after the first year or year and a half, to determine which items must be replaced. If temperatures of the shelter average lower than 70° Fahrenheit, surveillance could be less frequent.

If the shelter tends to be damp, the food supplies should be protected by repacking with desiccants in five-gallon cans or 55-gallon steel drums.

A more advanced ration concept would include some of the grocery store items, but the less stable products would be replaced by items of special procurement. Glass containers, heavier tinplate, metal packages for dry stores, etc., would increase initial cost of food supplies but provide a much higher level of stability that would allow less expensive surveillance and less frequent replacement. By special packs it would be possible to increase variety in the ration as well.

A final concept of the shelter ration is through the development of new food products uniquely suited to the problems of shelter supply and shelter use. Such foods must have some advantages over existing commercial products in the areas of cost, stability, palatability, or ease of serving.

From a supplier's viewpoint, a formidable obstacle to overcome in developing the unique shelter ration is its status on the commercial market. If such foods have no value in normal domestic trade channels, the shelter program alone must bear the cost of product development and amortization of any highly specialized plant and equipment that may be necessary.

Thus, in a specific shelter food product, one must seek economy through inexpensive and abundant raw material; moderate processing and packaging costs; unusual stability; and particular adaptability to shelter food programming.

To meet these requirements, a multi-purpose compressed cereal bar is envisioned. Such a product could be bulk packaged; would be convenient to serve as a cracker; could be used as a carrier for jam, cheese, and peanut butter; could be served with milk as a cold cereal or with hot milk as a hot cereal; and could be mixed with hot soup, gravy, or sauce as the main dish for dinner or supper. By these many uses, the one product might supply as much as half of the shelter food store, thus simplifying procurement and surveillance problems. It would have to be compact, stable, and reasonably palatable for all of these uses. It should have a simple formulation to reduce cost of ingredients. It should be firm enough to withstand bulk packaging without undue breakage but also be easy to crumble and masticate. It could even have some recoverable value as stock feed when it was no longer acceptable for food use.

Summary

The principal problem areas in the selection of food for fallout shelters have been defined as stability, palatability, ease of serving, and cost. Other considerations were mentioned and some of the interrelationships of the factors discussed. Three general concepts of the shelter ration were given as examples: (a) the grocery store ration of foods readily available out of normal commercial supplies; (b) the modified grocery store ration that would require special procurement of items to obtain greater product and package stability, but at an extra initial cost; and (c) the development of new products of specific qualities, valuable for shelter stockpiles.

It may be concluded that not enough information is on hand to make rigorous cost analyses to determine the best ration for any particular shelter situation. Especially needed are better data on expected shelf life of products and their packages, and knowledge of specific methods for prolonging shelf life of products.

Extensive product developments are needed before the third concept can be tested. However, in the long run, this may be the least expensive, most stable and palatable ration, and the one easiest to use under widely varying shelter circumstances. Obviously, the third concept cannot be applied to immediate shelter programming, although it should be possible to obtain some advance opinion of its impact on menu planning, food service, and palatability in current tests of shelter habitability. For example, a multipurpose food could be tested by use of several existing products, each of which would simulate one of its various functions in the menu. Other foods yet to be developed could be simulated in tests by foods of more limited stability, lower bulk density, and higher cost than would be desirable for ultimate shelter rations.

In the meantime, current shelter programs should be developed utilizing the first or second concept. In such cases, careful evaluation of the shelter circumstances should be made after structures are in operation to provide information to improve food stockpiling programs for the future.

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SOME RESULTS OF A STUDY OF PROCEDURES FOR MANAGING LARGE FALLOUT SHELTERS

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This is a fragmentary summary of the findings from a systems analysis by Dunlap and Associates, Inc., intended to develop management procedures for large fallout shelters. By a large fallout shelter is meant a shelter containing somewhere between 500 and 5000 people; for convenience, the study examined a shelter sized for 1000 people. By systems analysis is meant a detailed and sequential determination of what needed to be done; how it could be done; and what consequences followed for the operation of a particular subsystem of needs and for other interacting subsystems. Finally, knowing what needed to be done and how it could be done for each subsystem, compatibly with the other subsystems, it was possible to attend to who should do it and how it should be organized. In doing the above, some reasonable management procedures could be described.

The first part of the study was of an "idealized" management shelter. That is, the shelter was designed to meet ideal management conditions. The second part was concerned with managing already available shelter areas. The procedures were to some extent different in this latter case; however, the general lines of reasoning and general arguments presented herein were the bases for the management plans for the available shelters and for the modifications necessary when deviating from the idealized management situation. What follows, then, is intended only to give some feeling for the sort of shelter derived—something about its physical characteristics and about some important conclusions regarding such subsystems as sleeping, eating, and medical needs.

In view of the emphasis on management in this study, the reader may wonder at the amount of attention given to the interior design of the shelter and the equipments used in the shelter. In our perspective, these designs are integral to the management

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procedures suggested; the designs are expressions of management. Through these designs, we have avoided certain problems for management, or at least ameliorated them. In other cases, these designs are intended to enhance management's capabilities for conducting the procedures selected. Thus, the various pieces of "hardware" that are suggested should be understood not as gratuitous by-products of this study but rather as integral facets of the management system.

This study has deliberately avoided the psychological tolerance levels imposed by the living conditions. The study also avoided, whenever possible, the psychological issue of the specific direction of people's behavior by means of arranging management's activities and the physical structure of the shelter so as to cope with a number of behavioral alternatives. In particular, the philosophy was adopted that behavior derives from pre-conditions and can only eventuate in those forms that are, in fact, possible in the given physical environment. Thus, by anticipating the pre-conditions for various forms of behavior and by limiting the opportunities for alternative expressions of that behavior, the study tried to get around the more controversial psychological questions.

However, it is not asserted that the dimensions suggested for the shelter are, in fact, psychologically adequate. It is asserted that they are adequate for providing a manageable environment that supplies eating, sleeping, and physical movement capabilities, and the capacity for management to cope with these and related matters. It may very well be that either experiments or personal preference may indicate bigger bunks, wider aisles, etc. What is provided is a baseline of minimum manageable physical and procedural conditions, which interested parties are free to expand as future circumstances suggest.

General Recommendations

1. The study recommends that the shelter be designed to hold the maximum manageable number of people, i.e., without "extra" space for an overflow population. By manageable is meant being capable of conducting in a routine fashion the basic requisites for good physiological survival. Very importantly, this definition includes being capable of circulating messages, people, and materials from one place in the shelter to another in the time and manner required to permit the survival of the shelterees.

The basic assumption behind the shelter management approach developed in this study is: it is likely in the nature of population

growth and shelter construction that shelters will never be so many or perceived as so equal in security and comfort that all people can get into all shelters without overcrowding many of them. Therefore, a shelter must be designed to hold the maximum manageable number of people. This is not to say that more people cannot be stuffed into it, but that if more people are stuffed into it, the shelter is not predictably manageable as an organized, survival-maintaining entity over a two-week period or any length of time approximating that. More people might be stuffed into the shelter and still somehow be partially managed, but the management procedures could not then be predicted with any reasonable assurance. Survival over a long period of time would depend on fortuitous combinations of luck, leadership, and altruism.

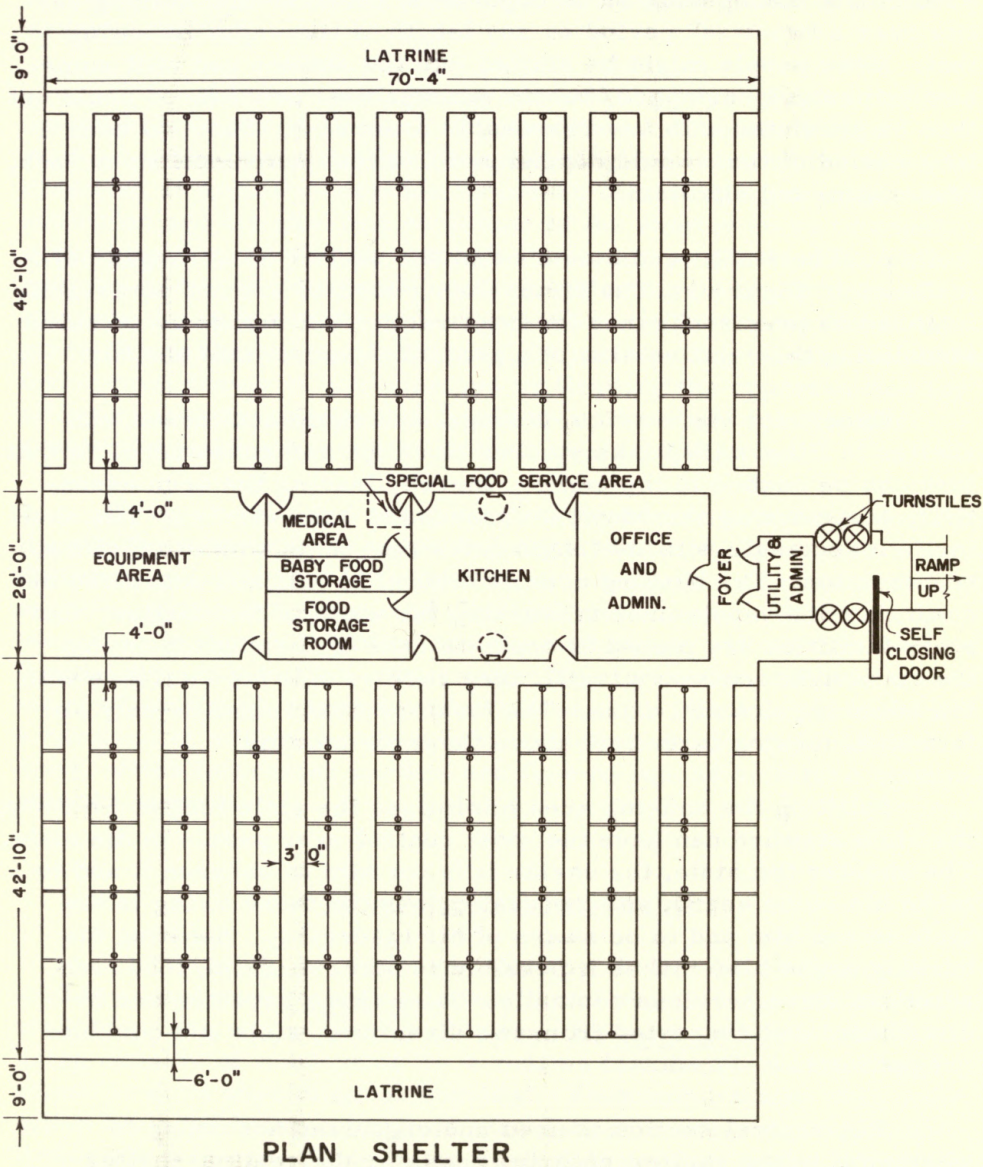
2. The study recommends that the shelter be arranged physically as in Figure 1. The dimensions provided are not necessarily intended as precise figures for construction but rather as an aid in visualizing the relative size of a possible (theoretical) shelter.

Except for the service, storage, and equipment areas, the shelter is filled with bunks stacked five high and constructed so that they can be pushed to the ceiling, thereby leaving the area essentially clear during the "day" for movement and exercise. The shelter is a rectangle with its length twice that of its width to facilitate construction. The bunking area is divided in half and separated by a service and supply area traversing the width of the shelter. Lavatory facilities are placed at opposite ends of the shelter so that the consistent and heavy traffic they receive will not interfere with the other service activities. The lavatory areas need be only six feet high, leaving three feet above them for storage.

Splitting the bunking area minimizes the aisle length. Thereby, the aisle steward can have the most control over people in his aisle. The shorter the aisle, the easier it is for him to observe it and to make his voice heard; and the easier it is for those living in the aisle to see him and to be aware of his leadership. Splitting the bunking areas also makes it possible to place medical, food, and administrative services centrally. Since these services can be distributed and requested from two directions, aisle and corridor congestion is reduced.

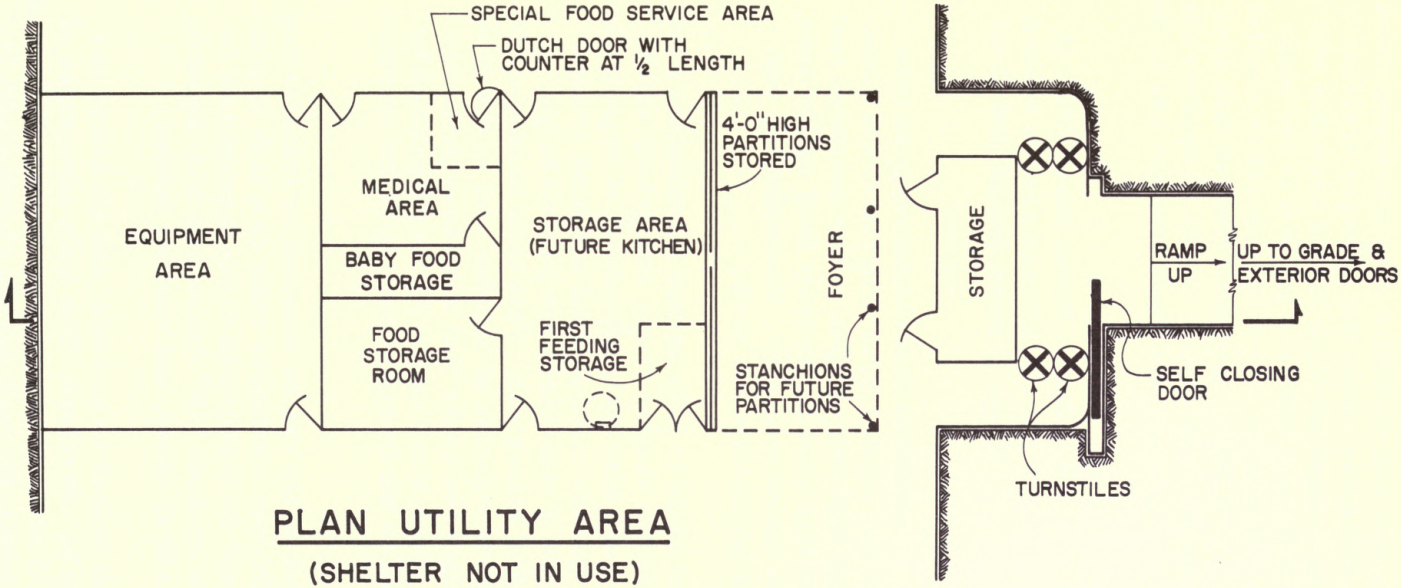
The central section is used and organized according to whether it is the shelter-entering phase or the routine-shelter-living phase.

During the shelter-entering phase (Fig. 2), all administrative and service impedimenta not permanently attached to the shelter



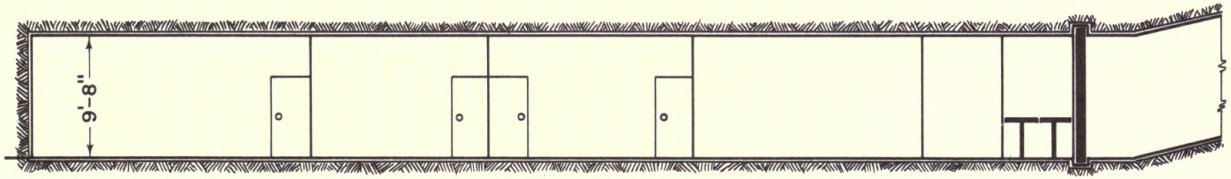
PLAN SHELTER
(1,000 PERSONS)

Figure 1.



PLAN UTILITY AREA

(SHELTER NOT IN USE)



SECTION

Figure 2.

shell are stored in the storage area or hung from the ceiling of the central area. This leaves a clear space between the shelter entrance and the storage area that will facilitate easy movement from the entrance to the bunks. Moreover, when the manager arrives, he will be able to take a prearranged position in this area that will permit him to observe the arriving crowd and guide it to the bunking area. After the door, controlled by a pre-set population counter in the turnstiles, has been closed and people have cleared this area by getting into bunks or standing in the aisles, it will be appropriate for management to begin to reorganize this clear area for use in the routine-shelter-living phase.

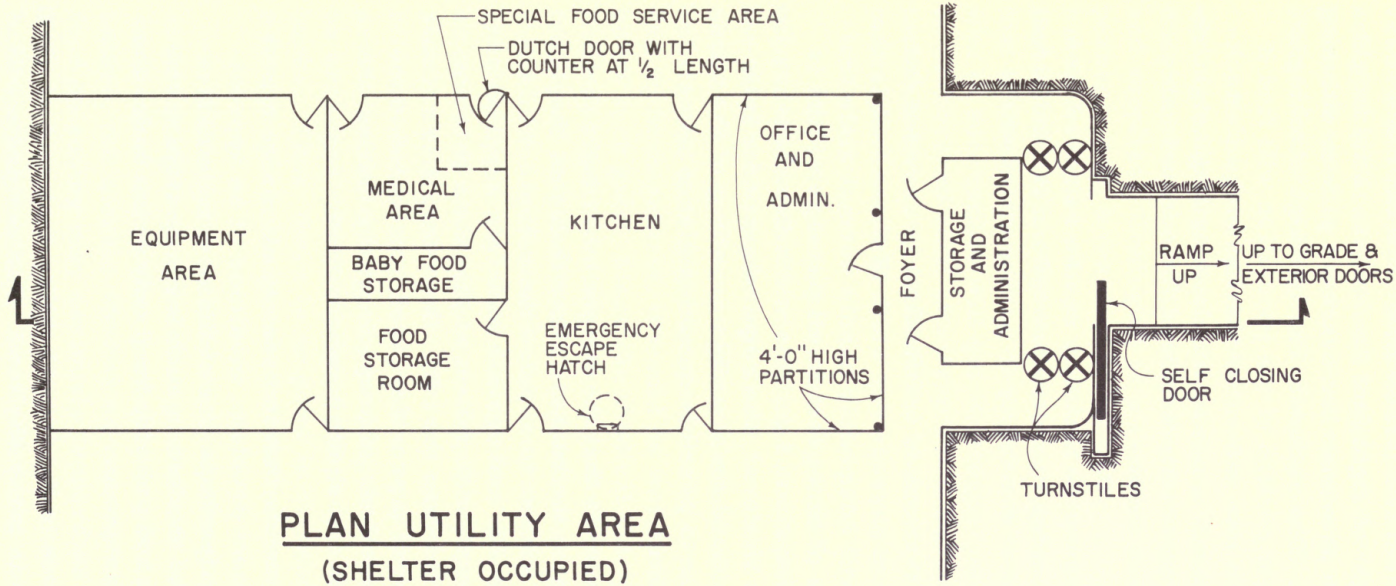
At the beginning of the routine-shelter-living phase (Fig. 3), equipment is removed from the ceiling, the storage area is opened, equipment and service facilities and supplies are distributed about the clear space.

In the storage area are partitions that can be snapped onto pre-placed studs to provide the service area with functional boundaries. The storage area that held the equipment now becomes part of the service area. Behind this area is the main food supply area, which now becomes the true storeroom area. Housekeeping supplies are in the storage and administration area.

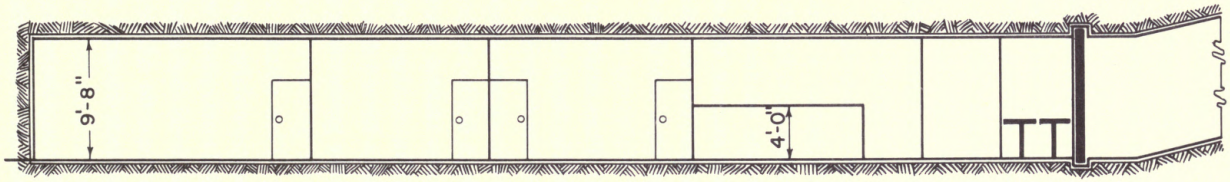
The shelter is painted white to help spread illumination more evenly, to encourage keeping the shelter clean, and to help establish an institutional atmosphere with its implications of organization and competence. Stimulus variety can be added and bunk areas made more easily identifiable if stanchions are painted bright colors—one color per block of stanchions. This bunk area identifiability should help people to reorganize at midday and in the evening when it is time to replace the bunks that have been pushed to the ceiling during the day. Bunk rows can be further identified by letters and numbers painted on the floor and ceiling at the entrance to the aisles.

A limited supply of hot water can be obtained by transferring the heat from the air-conditioner condenser coils to a tank of potable water, which, in turn, will be distributed to the appropriate facilities. This water will be at about 110° Fahrenheit and, as such, adequate for beverages, medical cases, and washing babies.

Every bunk has direct access to an aisle, and all aisles are linked together at both ends by corridors. The main advantages of such an arrangement are (a) access and egress to each bunk without disturbing people in other bunks, (b) each person sleeping with his head to an aisle (an important health and general comfort consideration), and (c) ability to eat at the bunk.



PLAN UTILITY AREA
(SHELTER OCCUPIED)



SECTION

Figure 3.

Bunks, stacked five high, have a minimum spacing of twenty inches between them, with six inches below the bottom bunk. This places the top bunk seven feet two inches above the floor and requires a clear ceiling height of eight feet ten inches. This height does not include a ten-inch provision for overhead air-conditioning ducts and electric cabling. The rationale for five-high stacking is twofold. First, a significant portion of the population will find it extremely difficult to climb into and out of the top bunks if stacking exceeds this level. Second, a minimum clear ceiling height requirement of eight feet is apparently required for adequate air circulation at this population density.

Bunks should be designed so that they can be removed from their stanchions. This provides the management and the individual shelterees with a good deal of flexibility in arrangement of the sleeping area.

On the basis of observations of traffic flow in crowded corridors, we believe a uniform passageway width of three feet is the minimum dimension that will adequately handle normal aisle traffic flow. Also, a minimum of three feet in all passage widths is required by the feeding subsystem; i.e., this width is necessary for the passage of food carts. However, the requirements for inter-aisle pedestrian traffic flow and the possible crowding of the corridors near the latrines due to possible queueing places some added burden on the corridors.

3. The study recommends that the people be brought their food, which they eat sitting on the bunks, rather than that they go to some other point in the shelter to receive their food. While there are cogent arguments for and against bulk food supplies as contrasted with individual-ration supplies, at this time it is not possible to make a choice between the two. However, it is recommended that baby bottles be of a pre-sterilized, pre-filled, one-shot type. More familiar methods of preparing baby bottles are essentially unmanageable in the shelter environment.

4. The study recommends that in order to eliminate a possibly insuperable management problem, medicine of an approximately all-purpose variety (perhaps one of the new sulfa derivatives, as well as aspirin) be stocked in such large quantities that decisions as to allocations and priority need only arise under the most extraordinary circumstances.

Of singular importance is the improbability that real medical expertise will be available in many shelters. The residents will have to make do with medical self-help directives and paramedical

assistance. Of almost equal significance is that it appears impracticable to stock the shelter during peacetime with a variety of preventive and curative medicinals because of cost, limited shelf life, and special arrangements required for viability, e.g., refrigeration. Persons needing special medicines will have to bring them to the shelter where refrigeration and protection can be provided.

As to general shelter health, the situation seems to be one where medical personnel can do relatively little and what can be done can be accomplished with relatively few personnel, medicines, and supplies. Contagion is a real problem and could be best met, perhaps, with a massive innoculation program once in the shelter, but this requires large amounts of perishable substances with limited shelf lives. Without such a program, it seems safe to assume that if there is anything contagious in the shelter, nearly everyone who is susceptible will get it, simply because the disease will not be discovered until after experiencing the very close physical contact that is unavoidable in the shelter. Thus, an isolation area appears unwarranted.

Any sick bay, however organized, would have to be able to expand and contract according to occupancy, but this means that the displaced people with their families will be shifted all over the shelter in a continuous game of musical chairs. If there were a substantial gain from this source of irritation and increased burden on management, it would be worthwhile, but there appears to be no such gain. Since the medical subsystem can provide very little specialized attention, care for the sick can be carried on by family or neighbors, assisted and prompted by personnel from the medical subsystem and supplemented by an occasional bunkside checkup from any available doctor. If only a few people need close attention by medical personnel, this personnel can easily attend the sick in their own bunks. If very many are ill, the whole shelter in effect becomes a sick bay. If a very few cases require strict supervision, an emergency bunking area near the medical area can be arranged with the help of the people already sleeping in those bunks. Thus, there is no point in or need for requesting more than a few people to cooperate in this manner.

Of the preventable medical disasters in the shelter, the most devastating is food poisoning in either babies or adults. While the survival of the shelter probably is not dependent on the survival of babies, the morale-shattering consequences of babies dying from food poisoning may seriously jeopardize the role of management. This is a major reason why management must operate a separate baby feeding facility. Food poisoning among adults, if epidemic, which would be its most likely form with the use of bulk food, would

very likely be disastrous to the shelter. Maintenance of management services and procedures would suffer seriously; sanitation would suffer the most, since even the most generous latrine capability would be insufficient. The danger of dehydration and death would be serious if water were in short supply. Food preparation and management techniques, therefore, have been developed in considerable detail.

5. The study recommends a fool-proof latrine system that can also act as an all-purpose garbage repository. Essentially this would consist of toilet seats placed over a holding tank.

6. This study recommends that it be understood that any formal law and order processes in the shelter will necessarily be very limited in authority and in their capacity to cope with disorderly occurrences. Because of population density, guns are particularly useless in maintaining law and order. Punishments based on legal proof of guilt and due process of law are essentially impossible. Even isolation of offenders is difficult and awkward. Hence, it is especially necessary to encourage social pressures and not to depend on overt show of power to maintain tranquility in the shelter.

7. The study recommends an intensive training program for pre-selected shelter managers, since the success of the shelter subsystem will necessarily depend in great part on their knowledge and appreciation of the shelter environment and its processes.

Some indication of the imperative requirements for trained shelter managers is evidenced by the following list of tasks that need to be accomplished during the shelter-taking period and relatively early thereafter. It is doubtful that these can be done effectively or completely without having a pre-trained manager for the shelter.

(a) In-shelter machinery should be started and tested, and critical instruments should be tested.

(b) Personnel should be assigned to encourage orderly filling of the bunks and to exert traffic control during the interim period.

(c) Some form of access to medical treatment should be organized.

(d) The shelter door should be closed if it fails to operate automatically.

(e) Unsanitary conditions in the shelter arising from nausea and lack of excretory control during the shelter-taking period should be eliminated.

(f) The first-feeding supplies (a special food supply) should be removed from the storage area and distributed, and babies should be fed.

(g) The service areas should be established and appropriate stored supplies moved to them.

(h) An inventory and check of supplies should be made.

(i) A census of pertinent data on the shelter population should be undertaken and processed.

(j) Aisle stewards should be elected.

8. The study recommends that several managers be trained for each shelter and that formal arrangements be made so that at all times one manager is available. In this way, each shelter is very likely to contain at least one of these most crucial people.

9. The study recommends, parallel with the manager training program, an intensive training, indoctrination, and familiarization program for the general public to inform it of the realities and obligations of shelter life. Among the things to be stressed in the program are the prohibition against bringing to the shelters large packages, for which there is no room, and the requirement that people dependent on special medicines bring these with them.

10. The study recommends that very careful attention be directed to the design and contents of manuals that will serve to make the necessary shelter operations possible in the absence of any specific competence other than the capability of reading and interpreting the printed word.

Over-all Manpower Requirements

When the shelter is fully organized and operating, the following personnel requirements emerge:

Operational Crews	Number of Persons Per Day	Night (Minimum)
Administration	11	0
Communications	8	1
Feeding	41	0
Medical	16	1
Sanitation	51	0
Security	84	5
Technical	11	0
Total	222	7

In a 1000-man shelter, it is assumed about 25 per cent will be early adolescent or younger, about 8 per cent very old, and about 7 per cent ill upon arrival, leaving around 600 shelterees who will be late adolescents or adults well enough to perform various tasks.

It follows, then, that from among these shelterees about one in three will be actively involved in activities needed to accomplish the basic management goals of the shelter. Further flexibility exists since some crews may operate on a rotating basis--specifically Feeding and Sanitation Crews, all of whom, except for supervisors, can be replaced by others, possibly even on a daily basis.

It may seem that this system of management is quite rigid and authoritarian. Two things need to be said regarding this matter: (a) The system as spelled out in detail in the Dunlap and Associates, Inc., report does not partake of all the authoritarianism conveyed by the style requirements for a brief statement. The management system permits a great deal of "give" in many operations. (b) However, it should also be realized that operating a shelter for two weeks requires a great deal of control over the dissemination of supplies and the use of the shelter and its contents if the health of all concerned is to be insured to the maximum degree, the food to be equitably allocated with none wasted, and all the activities that go with survival to be conducted successfully in a small space with very limited resources. A substantial amount of authoritarianism cannot be avoided unless a very luxurious and, thereby, very expensive shelter is designed.

SOME COMMENTS ON PUBLIC OPINION AND NATIONAL SHELTER POLICY

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Opinion Research Corporation

At this point in time, and after a relatively brief association with some limited aspects of National Shelter Policy, I have had little difficulty in coming to two broad conclusions:

(a) The public has little knowledge of the National Shelter Program--very little shelter thinking or shelter discussion is taking place, and there has been very little shelter building.

(b) Those concerned with National Shelter Policy have little explicit information about the climate of public opinion on this vital public matter.

I should add that I have had little opportunity to be confused by facts. As I understand it, the last extensive national study of public knowledge and attitudes concerning civil defense was conducted in 1954 (Withey, 1954). A few questions on civil defense were included in more recent national studies in 1956 and 1957 (Survey Research Center, 1958). Additional fragments of information are available from a few community studies.

The last national study (Survey Research Center, 1958), carried out shortly after the launching of Sputnik I, provided some clues on the extent of "shelter-thinking" at that time. Fully half the adult public said they knew of nothing they could do to provide for their own or their families' safety before a nuclear attack. Only 15 per cent mentioned building a shelter or preparing shelter space in their home as something they could do.

An interview study in August, 1958, indicated that 2 per cent of residents in the Washington, D. C., metropolitan area had actually done something about fixing or building a shelter area as a personal or family survival action (Edelsberg, Ellickson, Kripke, McHugh, Price, Singleterry, & Taylor, 1959).

The Reubhausen Task Force on Protection from Radioactive Fallout for the State of New York (Protection..., 1959, p. 12), appointed by Governor Rockefeller, interpreted the state of public awareness this way in its July 1959 report:

> Unfortunately the public is not yet aware of the knowledge which is basic to its survival. The average individual does not now understand the threat of radiation or how to protect against it. Nor does he know how to tell when it is present, or have any conception of how much he can receive without becoming ill. It is vital that there be a prompt and general understanding of such matters.

The little information now available on public opinion concerning civil defense does provide some insight into the conditions necessary for acceptance of the shelter program.

As it has now been formulated, national shelter policy is relatively new and you may speculate, as I do, that opinions on it are largely unstructured, even that a large amount of indifference exists. This condition, if it in fact prevails, might ordinarily be taken to be an ideal one in which to undertake a vigorous program to communicate information about shelter needs.

Past research indicates, and I think we would find it true today, that a person's response to communications on national shelter policy will be strongly conditioned by a number of existing clusters of attitudes and knowledges. For example:

(a) his opinion on likelihood and imminence of war,

(b) his expectations regarding use of nuclear weapons in a future war,

(c) his beliefs about the danger of an enemy attack on the United States and on his own community,

(d) his own evaluation of the debate on adequacy of our military defense to deter or protect against enemy aggression,

(e) his beliefs about the effects of nuclear and thermonuclear weapons; e.g., what is the destructive capacity and what are the specific hazards of nuclear attack?

(f) his attitudes toward civil defense in the past; his confidence in, and knowledge of, the local civil defense organization.

The present OCDM program for construction of prototype shelters throughout the country offers powerful opportunities to inform, educate, and motivate the public through both mass media and personal means. Public attention to shelter construction will provide opportunities for credible and knowledgeable community spokesmen to reach the public through local mass media. Presumably, the availability of prototype shelters for drills and demonstrations will permit personal contacts with key community influence groups and also with a broad representation of the entire community populace.

What can we say in advance about the effects of this type of communications program? Can communications influence public opinion on shelter policy? By and large, of course, the answer is "yes." But I would like to suggest that "by and large" answers are not necessarily sufficient.

Success of the national shelter program, with its emphasis on individual responsibility, depends on its acceptance by virtually everyone. Can we assume that everyone will be equally receptive to information about shelter policy? Most research indicates that the answer is "no." In all the fields that have been touched by communications research the self-selection of audiences plays a considerable role (Lazarsfeld, 1953). Individuals who selectively expose themselves to shelter information will probably be those who are already most advanced in their shelter-thinking, while those who are most in need of information are very likely to be missing from the audience.

Further, what about those who expose themselves, selectively or accidentally, to shelter information? Will they adopt a favorable disposition toward shelter policy, and more important, will they actively participate by doing something to fix or build a shelter area? Not necessarily. Generally speaking, amount of education has been positively correlated with knowledge of civil defense matters. But in the 1957 national study (Survey Research Center, 1958), the more formal education a person had, the less likely he was to indicate support for shelter policy.

One additional study (Scott, 1953) suggests the complex interaction between information and behavior on civil defense. Information about the civil defense program had only limited and mixed influence on willingness to volunteer for civil defense work.

Available resources for a communications effort are limited, just as they are for any other type of human activity. Success of the program may well depend on the most effective utilization of

those available resources. Fortunately, the construction of prototype fallout shelters provides more than just a focal point of public attention to the program. A substantial amount of research activity, organized around community effort, is also being planned in connection with the prototype program.

This research effort will encompass many broad objectives and will include studies of shelter engineering and habitability as well as of public knowledge and attitudes. It is with this latter area, of course, that I am particularly concerned and that I think can provide substantial guidance to civil defense officials seeking to obtain public acceptance of the program.

The types of research that I plan to outline in the following pages should cover every aspect of the communications process. It should thoroughly explore the nature of the audiences for projected information and education activities, the content of communications, the conditions under which they take place, and the effects of communications.

Hopefully, it is the type of research program that will focus the attention of social scientists on the potential of valuable theoretical explorations and, at the same time, encourage them to make positive contributions to acceptance of the shelter program.

First, there is a need for a broad-scale study of public knowledge and attitudes in those communities in which prototype shelters are being constructed. If completed at the appropriate time, such studies would provide baseline measurements of the climate of public opinion. Subsequent studies could then measure changes that take place during the course of the shelter program, as additional information and education efforts are undertaken by the community civil defense organization.

For the moment, however, let us start with a study completed at an early point in time. Properly designed, it should provide considerable background information on clusters of knowledge and attitude, probably related to willingness to accept the shelter program and to take action on it, such matters as probability of war, military preparedness, existing attitudes toward civil defense. Public understanding of fallout and radiation should be studied intensively. How do people perceive the threat and what do they know about protection against it? Does the program seem reasonable? What are the psychological resistances to it? By studying the audience for the communications effort, we hope to gain guidance both on what type of information to present and on how to present it. What we are looking for are ways of presenting new information

that the audience will accept and that will influence shelter-thinking and behavior in the desired direction. We want to reject those ways of presenting information that will lead to distortion or rejection by the audience.

At any given point in the program it will be desirable to devote special attention to the study of those who are most advanced in their shelter-thinking or their actual shelter construction. (To find enough of this latter group for separate study may require special sampling procedures or special effort, such as a search through building permit records.) We should be concerned here with the sources of influence on these persons, their motivations and rewards for shelter construction, and the role they play in diffusion of the idea. It may be especially important to find out whom these people have talked to and the extent to which they act as influence agents in the community.

As a supplement to these broad-scale community studies I would like to note the importance of special studies among key community groups. Some of these groups may be designated because of their role in the community. Specialized communication to community government officials and organization leaders may be desirable because of the breadth and frequency of their personal contacts. Home builders, architects, and real estate brokers may be especially important because of their potential influence on the attitudes and actions of prospective home buyers.

Up to now we have looked at the audience for community information and educational activities, or perhaps, the audiences for a number of specialized communications efforts. By studying current levels of awareness and shelter-thinking, as they are related to informational and attitudinal clusters, we hope to find clues that will help us choose those ways of communicating for which we would predict the most success. If we wish, repeat studies of the same type will help evaluate these efforts to persuade people to take action.

While these studies tend to view the communications audience as a set of individuals, we should not overlook the fact that knowledge of an individual's interpersonal environment is basic to an understanding of his reactions to communications (Katz & Lazarsfeld, 1955). In fact, an important objective of the research effort should be to determine the extent to which shelter-thinking is dependent on the social support of others--what types of group affiliations are relevant for what kinds of people.

At this point I would like to explore briefly the possibilities for carrying out experimental studies among visitors to prototype shelters. For example, alternative plans for shelter demonstrations would encourage visits by individuals, by family units, or by larger groups, such as neighborhood associations, PTA, church groups. By careful control of experimental variables and follow-up study of visitors, the effects of demonstrations under a variety of conditions can be evaluated. Experiments constructed around group discussions would help isolate peer-group influences on reactions to shelter demonstrations.

Similar studies would make it possible to evaluate the effects of varying the content of verbal communications with visitors. It would also make possible an evaluation of different types of equipment displays within the shelter and of brief versus longer periods of time spent in shelter demonstrations.

In these studies among shelter visitors, considerable emphasis is placed on determining the ideal or optimum conditions under which shelter demonstrations should be conducted. The demonstration opportunity injects "personalism" in the communications act, which can be used to great advantage in stimulating active participation in the shelter program. It is an opportunity that you are not likely to have more than once with any individual. Of great importance is that any aspects of the demonstration that produce negative effects should be isolated and ruled out.

Follow-up studies among shelter visitors can test the long-term effects of shelter demonstrations in terms of knowledge, attitudes, and behavior; and can test the need for supplementary communications efforts to stimulate shelter building.

The scope of civil defense has been described as staggering. Even the research needed to support efforts to obtain public acceptance of the shelter program might be described as enormous. No one community can be expected to support every type of study. Spread over many communities, however, systematic collection of information should yield results important to the success of the national plan.

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PUBLIC REACTION TO THE UNSCHEDULED SOUNDING OF AIR-RAID SIRENS IN A METROPOLIS

A FIRST GLANCE AT THE DATA

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After many years of trying, the Chicago White Sox finally won an American League pennant on September 22, 1959. In anticipation of this event the Chicago City Council, several days earlier, had "further resolved that bells ring, whistles blow, bands play, and general joy be unconfined when the coveted pennant has been won by the heroes of 35th Street." Reasoning deductively from the spirit of this municipal proclamation and adding a touch of personal inspiration, Fire Commissioner Robert J. Quinn (also Acting Director of Civilian Defense in Chicago) ordered the city's air-raid sirens to be sounded at 10:30 P.M., some forty-five minutes after the game was over in Cleveland. The sirens sounded a long, steady blast for about five minutes.

Newspapers reported that a large proportion of the city's population was genuinely upset by the sirens, and irate letters-to-the-editor denounced the decision to use such an awesome communication symbol so frivolously. The telephone company told us, and told the newspapers, that their switchboards were far overtaxed, with many people unable to get a dial-tone. Commissioner Quinn is certain that the telephone company, as well as radio and television stations, were warned in advance, and while there is some difference of opinion concerning the facts of the case, at best the warnings arrived only minutes before the actual sounding of the sirens and rarely reached their proper destinations in time to do much good. During the sounding of the sirens, however, radio stations began to make spot announcements, and telephone operators were told how to reply to queries.

The Study Design

Reacting to the research opportunity presented by this situation, a group of graduate students at the University of Chicago

organized to design and execute a study of public reactions to the unexpected sounding of the sirens. The National Opinion Research Center and I agreed to lend active support, and, with some assistance from the Disaster Research Group, we went to work. In the tradition of Cantril's study of The Invasion from Mars, the focus of the research was to be (a) on factors influencing differential perception of the meaning of the siren, and (b) on the kinds of actions taken in response to the siren, particularly the kinds of verification behavior that different sorts of people undertook in order to confirm or disconfirm their initial interpretations. In addition to a detailed set of questions aimed at reconstructing exactly what was thought and done by each respondent, and in addition to the usual census variables (such as age, sex, and education), the study incorporated a large number of items having to do with perception of the state of international affairs, an entire battery of items aimed at uncovering various attitudes and dimensions of personality (e.g., attitudes toward authority, attitudes toward planning ahead, attitudes toward the efficacy of Civilian Defense), and a variety of items concerned with what respondents learned from the experience with respect to such things as Civilian Defense and their own behavior in a real raid. In all of this we soon learned that we had a worthy predecessor in William A. Scott's Survey Research Center study of an episode in Oakland, California, in May 1955, when air-raid sirens took that city by surprise.

The Sample

A sample of 250 dwelling units was decided upon, of which 241 were actually obtained. These were distributed among 25 census tracts, which were systematically selected from the total number of tracts in Chicago when ordered according to median income level as reported in the 1950 census. Within each of the 25 selected tracts, two blocks were randomly selected, and in turn, five dwelling units were specified for each block. Interviewers were instructed to alternate male and female household heads as they proceeded from house to house. Thus, the sample design is rather carefully controlled, with the exception that interviewers were permitted to proceed to the next adjacent dwelling unit after only one call-back in the case of "not-at-homes" and without any call-back in the case of refusals.

This decision, plus a very high refusal rate, gives some cause for concern, but altogether a comparison of the sample results with currently available demographic data suggests that the sample is quite adequate. For example, 23 per cent of our interviews are with Negroes, and the 1957 estimate of the Chicago Community

Inventory is 28 per cent Negro. Our sample is 31 per cent Catholic, and the estimate of the research department of the Church Federation of Greater Chicago is 36 per cent Catholic. Compared with the 1950 census, we have a somewhat more wealthy and better educated sample but more recent data from the "Survey of Buying Power" (Sales Management, May 10, 1959) suggest that we are very close to the mark.

Given that the interviewing continued through December 1959, (i.e., as long as three months after the event), it is important to raise a question concerning the validity of the responses. While this is a difficult question, at best, our interviews give good reason to believe that the event remained highly salient. Our interviewers estimate that 55 per cent of the respondents recalled the event very vividly, and only 7 per cent of the respondents were judged to have poor recollections of it. More interesting is the fact that a comparison of the interviews completed in November with those completed in December indicates no substantial difference in the distribution of answers to the key question of what the sirens meant. That is, in both November and December essentially the same proportions of people reported that at the time they thought the sirens meant an air-raid alert, or that they signalled only the White Sox victory, a fire engine, or something else.

What Did the Sirens Mean?

In a variety of ways it was possible to probe what people thought the sirens meant. If they had more than one thought, an attempt was made to assist the respondent in reconstructing the sequence of his several thoughts, as well as the rationalizations invoked for each and the attendant actions that were taken.

Of those who reported hearing the sirens at all (approximately 83 per cent of the population; the remainder having been out of town or out of reach of a siren, for example, by virtue of being asleep), 28 per cent said they knew immediately and never entertained any doubt that the sirens were celebrating the baseball victory. On the other hand--and somewhat to our own surprise—fully half of those who heard the sirens considered, even if only for a moment, the possibility that the sirens might be a real air-raid alert. Another 17 per cent did not think of an air-raid alert, but instead thought the sirens might be those of fire trucks or might be signalling a disaster or emergency of some sort.

This classification constitutes the basis of our analysis. Specifically, the first group (28 per cent) knew immediately that the sirens were sounded in celebration of the baseball victory and did not waiver in this conviction. The second group (50 per cent) entertained the possibility of a genuine alert, if only for a moment. Regardless of what other thoughts they may have had concerning the meaning of the siren, those who reported having considered the possibility of an alert were classified with the second group. The third group (21 per cent) consisted of those who did not consider a raid but did consider something other than, or in addition to, the baseball game results. Interestingly, very few thought that the sirens were being tested or had gone off by mistake, even though it occurred to a few that the sirens customarily are sounded on Tuesday morning at 10:30 a.m., i.e., twelve hours earlier.

The question is how seriously to take these findings. Speaking for our research group, I want to say that we began to take them more and more seriously as we examined not only this summary question but other parts of the interview as well. For example, when asked, 37 per cent of all those who heard the sirens admitted that they were frightened. When asked whether they felt uneasy, 42 per cent said, "Yes." Furthermore, in describing the reactions of the others whom they were with, more than one-third of the respondents reported their associates either as "excited and nervous" or "confused and uncertain."

Focusing on those who entertained the possibility that the sirens might mean a genuine alert, one-fourth said they were "certain" this was the case; half had various degrees of doubt; and another fourth was very doubtful. Among this same group who considered an alert, almost half said they thought a real attack was a possibility. Indeed, more than half gave at least some thought to taking protective action, and almost three-fourths sought some form of information. While less than 5 per cent of this population believed in the alert for as long as thirty minutes, fully 37 per cent believed in it for five to ten minutes—by their own estimates; the remaining 58 per cent estimated that they held to the belief for no more than a few seconds (25 per cent) or for a minute or so (33 per cent).

Altogether, these data suggest that Chicago was considerably upset by the sirens. Compare the Oakland findings: in Oakland a much smaller proportion seems to have taken the sirens seriously. Only about 60 per cent heard the siren at all (compared with more than 80 per cent in Chicago), and only 20 per cent of those who heard it reported belief in its genuineness. The largest single group of hearers thought it was just another test. If we are right

in interpreting Oakland as relatively less affected by the sirens than Chicago, perhaps the reason has to do with the greater frequency of tests in Oakland (Chicago merely sounds the sirens routinely once a week at 10:30 a.m.) or with the fact that Oakland was a daytime incident and Chicago was at night. In any event, it seems rather paradoxical that the sirens were treated more seriously precisely in a situation where an alternative hypothesis—that of the ball game—was so readily available. The fact that so many people did not immediately associate the sirens with the game suggests that, for many, the siren is a relatively unambiguous symbol. The fact that so few thought it a test also implies that the signal has not yet come to mean "Tuesday-morning-at-10:30," or a loud noise to be ignored. On the other hand, as we shall see, it is not so unambiguous that people were willing to take protective action without first obtaining additional information.

Most people, of course, were at home when the sirens sounded in Chicago. They were at home because it was 10:30 at night; they were also at home because many had been watching or listening to the ball game being broadcast from Cleveland. Being at home, relatively few people were alone. Indeed, relatively few were with friends or neighbors or co-workers; most were with their families. In one sense, being with one's family alleviates the concern with the welfare of kin that preoccupies people who are separated from their families when disaster strikes. In the present instance, however, being with one's family seems to have led to a certain atomization from the kinds of other people one learns to rely on in daytime decision-making. A comparison of the interpretation of the meaning of the sirens offered by those who were with relatives as compared with those who were with friends, neighbors, or co-workers reveals that 29 per cent of the former were certain that the sirens referred only to the ball game as compared with 48 per cent of the latter. And more of those who were with family members thought it might be a real air-raid. Although further investigation is obviously required, this suggests that the structuring of an ambiguous situation can be accomplished more accurately when one is with others who are not family members. In other words, two heads are better than one, provided that the other head does not belong to your spouse.

Factors Affecting Differential Responses to the Sirens

A number of other factors seem to be related to differential perception of the sirens. One of the most interesting of those we have looked at so far is the correlation between a respondent's view of the international situation and his interpretation of the

meaning of the sirens. Respondents who felt that the international situation is "better" than it was five years ago were more likely to have thought the sirens signalled a baseball victory than were respondents who felt that the international situation has worsened. This confirms a similar finding in the Oakland study. Baseball fans, of course, were another group who were more likely to think the sirens celebrated the White Sox victory. And men more than women—even holding fanship constant—were more likely to think of the ball game as the explanation.

Interestingly, the effect of education on interpretation of the sirens' meaning varies with the degree of involvement with baseball. Among non-fans, the better educated are more likely to have associated the sirens with the game; the less educated are very unlikely to have done so. Among baseball fans, however, education makes little difference, and indeed there is even the suggestion of an inverse relationship. At the very least, it seems to suggest that the well-educated person makes up for his lack of personal involvement with rather general knowledge or insights that are not available to the lesser educated. Another interesting aspect of the response of low-educated non-fans is that they were the only group to have thought of fire as a serious possibility. This suggests either that they may be less well acquainted with air-raid sirens or that they may be more preoccupied with fires and fire alarms in their neighborhoods.

What Did People Do?

Now let us turn to consider the sorts of action that were taken by those who entertained the possibility that it might be a real alert. We divided actions into two kinds: (a) communications behavior, i.e., attempts to verify the true meaning of the sirens, and (b) protective behavior, if any.

As far as communication behavior is concerned, two-thirds of those who thought it might be an air-raid turned on their radios and listened attentively to hear if there might be word of a raid. Just as many looked outside into the street to see what they could see. A third group discussed the situation and asked advice of people they were with. Small numbers actually went outside to look (19 per cent) or to ask somebody (11 per cent) what was going on, and about 6 per cent made a telephone call specifically to obtain information from an individual or a public agency. Extrapolating to the one-and-a-half-million households in the city suggests that there may have been 50,000 or more extra phone calls attempted during those brief moments.

An analysis of the typical sequence of information-seeking actions indicates that the most frequent first actions consisted primarily in discussing the situation with an associate or looking outside. Turning on radio or TV was also frequently mentioned as a first action, though considerably less often than the former two. For those who went on to a second action, going to the mass media was the most frequently cited, with looking outside mentioned almost as frequently. The 32 people who reported three information-seeking actions, and the 16 who went on to four things, tended to emphasize actually going outside to see or to ask. A typical sequence of communication-oriented activity would thus be (a) talking to a companion and/or looking outside, (b) tuning in the radio, and (c) actually going outside. It may be appropriate to observe that here, as in other decision-making situations that have been studied by social science—ranging from farmers' decisions to adopt a new practice to decisions as to what movie to see—almost nobody acts on the basis of one source of information alone.

As for protective behavior, one must distinguish between intention and action. While a sizable proportion of those who thought it might be a real alert considered taking some form of protective action, in fact almost nobody did so. Interestingly, the few cases where actual protective action was taken involved people who had suffered traumatic experiences in war, in bombings, or in recent personal tragedy. The most thoroughgoing action story in these few cases is that of the family that "got the children up and got them dressed and were going to find a place under the stairs where they would be safe...Started to get blankets and water and some canned food, radio, flashlights and to take down everything C. D. told us to do if we hear the siren..." But, to put it mildly, this was an unusual case.

Knowledge of Civilian Defense and Allied Matters

In addition to studying what people did and thought in response to this particular episode, the survey provided an opportunity to inquire into what people know about protective procedures, and what their attitudes are towards such matters. We also tried to discover whether people's attitudes or knowledge had been changed in any way by virtue of the experience of September 22.

Toward the end of our interview, then, we asked all respondents, "What do you think you would do if you got the signal that there was going to be an enemy attack?" Answers to this question focused on seeking shelter: half of the respondents indicated they would find shelter in their basements, and another 10 per cent talked in terms

of seeking an air-raid shelter. Other answers referred to such things as turning off the lights, lying down on the floor, and putting in a supply of food and water. Four per cent indicated that they would leave town, again a sizable number if extrapolated to the population of Chicago, but about as small a proportion as in Oakland. Ten per cent said they would keep calm and await instructions from Civilian Defense. About 11 per cent indicated that they would do nothing, and some 9 per cent volunteered that even if they did do something it would be essentially meaningless and without hope. Surprisingly, very few people said, "Don't know" in response to this question. Following this question we asked, "Did you ever think about this before just now?" Seventy per cent of our sample said that they had. Thirty per cent said that they had not.

The above question intentionally excluded those categories of "doing" that involve verification by our specification that there was going to be an attack. We then asked, "If you heard the warning and wanted to get some more information about what was going on and what to do, where would you try to get it?" The answers to this question were heavily concentrated on radio (35 per cent), Conelrad (25 per cent), and a variety of phone calls to the telephone company, to the police, to the fire department, to Civilian Defense (some 30 per cent of the sample population). The Oakland study asked essentially the same question and found that about 30 per cent would tune to Conelrad. We then inquired specifically concerning acquaintance with Conelrad and found that while almost 60 per cent knew there was a Conelrad radio station, only some 17 per cent of our sample could correctly identify the Conelrad location on the radio dial. This compares favorably, however, with the small number (7 per cent) in Oakland.

Learning from the Experience

Finally, let us review some of the questions by which we tried to evaluate what people had learned from the experience. The first method we employed in trying to do this was to ask, following the sorts of question that have just been reviewed, "When did you learn this?" For example, following the Conelrad question, we asked, "When did you learn this?" and found that, despite a large amount of newspaper publicity in the aftermath of the sirens, virtually none of those who knew the numbers of the dial said that they had learned them following the false alert. On the other hand, we asked, "Whose job is it to ring the sirens in case of a real attack?" A third answered that they did not know; 2 per cent said Civilian Defense; 16 per cent said the mayor; and 11 per cent said Fire Commissioner. In this case, one-third claimed to have learned their answers as a

result of the episode. Paradoxically, however, most of these answers are essentially incorrect.

The other method that we employed to get at the possible implications of the experience for knowledge and attitudes was to ask directly. In reply, 9 per cent of the volunteered answers had to do with the importance of preparing now for an emergency, becoming interested in Civilian Defense, and the like. Another 7 per cent or so said that they had learned something useful about alert signals. More than 10 per cent learned something about people: that they become frightened easily, that they cannot be counted on to act rationally, and so on. A large group had something to say about the use of the sirens, insisting that they had learned either that it should not be used except in a real emergency (22 per cent of the replies) or that people should be warned in advance (8 per cent). Indeed, a very large majority (74 per cent) of the sample thought that it was a bad idea to ring the sirens to celebrate the White Sox victory, but when asked whether, with proper warning, the sirens might be used for such occasions in the future, a sizable proportion of those who objected thought they might be used for that purpose.

This particular finding is rather intriguing in that it suggests that we might distinguish between people whose attitude toward the sirens is frivolous, or disinterested, or purely instrumental (in the sense that they are against using it indiscriminately but feel that with proper warning it is permissible), or "sacred" in the specific sense of being dedicated exclusively to one and only one function. There may be a small-town/large-town difference here, inasmuch as a number of respondents originally from small towns told us that the fire-house siren was always sounded when the high-school football team won a game, and that it would be appropriate to use the air-raid sirens in the same way, with proper warning.

I must warn you that all this is based on the most superficial first-glance at our data. This preliminary look seems to suggest that the air-raid alert was taken seriously in that a sizable proportion of Chicagoans thought it might be genuine. Whether the thoughts they had or the actions they took (or, more often, did not take) were appropriate must be evaluated in terms of some notion of what people should have done or should be trained to do, if anything. Personally, I am rather hesitant about preoccupying people with preparedness; but I am not sure. In any case, when we have finished with our analysis, I think we shall have a fairly accurate picture, with a fairly good sample, of exactly what happened that night. We shall also have a good idea of people's attitudes about sirens,

Civilian Defense, and allied matters. Of course, at least as interesting for us will be the discovery of social and psychological factors that make for differentials in the perceived meaning of the siren, and differentials in attitudes toward the siren as a modern sacred symbol.

DISCUSSION OF PAPERS

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I have been puzzled ever since I have been here as to exactly why I was included in this august body of symposium participants. I expect it is because I represent the family-life educators, and I assure you it is not because of any prior knowledge that I have of fallout shelters. As a matter of fact, up until yesterday I hardly knew what they were.

This has been a very insightful meeting as far as I am concerned. I do not think I will ever be the same again. As a matter of fact, I could say that the reason my voice is so bad is that the symposium up to this point has left me speechless. At least I awoke this morning with no voice at all, so I hope that this strain that I am speaking under will not interfere too much with my communication with people in the room.

I have listened to these many interesting and varied papers with quite mixed emotions. On the one hand, I think I have generated a lot of personal anxiety, because I realize that I know so little about civilian defense. I know so little about how to prepare myself and my family for a crisis if it should occur. I suppose that if this is typical of me it is typical of the majority of parents, at least parents in the Midwest. From the reports that have been given I suspect that this is true not only of the Midwest but of the nation. On the other hand, I have had certain feelings of relief that there has been work done that does give us some guideposts for action.

It seems to me that it is very valuable for us to know the findings of related research, certainly to know something about the reactions to deprivation, to know the psychological effects of the various adverse environmental conditions on human behavior, and to be able to anticipate somewhat the possible sequence of reactions that might occur in a shelter-living situation. It certainly is reassuring to know that active research is being done along these lines, as well as the more practical matters of construction, managing, and stocking of shelters.

Because of my primary concern with families, I keep wondering what the implications of all these findings are for family life. I keep asking myself how we as parents can prepare ourselves and our

children for such an experience. Perhaps the building of inner resources, as suggested by Mr. Miller yesterday, is one of the things that parents can do with themselves and with their children.

We, of course, fear most what we know least about. So it seems to me that we who are parents logically ought to inform ourselves of possible courses of action which we might pursue. In other words, the pre-occupancy period is one to which we might very well address ourselves.

It seems to me that we as parents ought to acquaint ourselves with the possibilities of what we are to face and that these ought to be realistic anticipations. Certainly an unrealistic viewpoint at this time could be very disastrous for us. Once we can make some sort of a realistic appraisal of what perhaps lies in store for us, then I think we can outline courses of action that might be pursued in the event of various types of situations.

Now, I have to admit that at first this idea of the family shelter was particularly appealing to me, because we think of the family as getting most of its security from within the home, or when the family members are together. Certainly it was the experience in England after the bombs and the air raids in the Second World War that children, particularly those who were evacuated in order to remove them from the danger of the bombs, suffered certain emotional and psychological problems that were far greater and far harder to overcome than those suffered by children who lived through the raids but who had the reinforcement of being with their family group.

In order to be realistic, I think we have to ask the question: What is the chance of the family being together in a family shelter? It depends entirely on when the warning is received. If this is going to occur at night, the chances are pretty good, as Mr. Katz pointed out, of people being home together. But we have no guarantee that this is when it will take place. I think if I were the enemy I would be trying to have an attack at the time when people were concentrated in areas of production, and then I would strike hard against those areas of production. So I think that realistically the chances of the family being together at this period are pretty small.

I am inclined to go along with Mr. Fritz on the idea of concentrating less on family shelters and more on a communal type, because if this event occurs during the day the father will be at work, the mother may be at work. The mother with young children possibly would be at home with the babies, but the school-age children will be at school. As the children get older, any of you who have teen-age children know that the children are home less and less. So it is quite

conceivable that in a situation like that every member of the family would be in a location different from any other members.

What can we do about this? How can we prepare our children so that there will be a minimum of anxiety under these conditions of separation? If we are overly anxious, unreassured, the chances for premature withdrawal from the shelter are certainly greatly increased.

The question is how much you can prepare children for an event of this kind. I suspect that with little children there should be no preparation, because just the fact that they can be near their parents is probably the greatest security that you can give them. But the school-age children certainly ought to be prepared for at least a limited period of separation from their parents, and perhaps this is something that you can do without frightening the children to death. It seems to me that this is something that can be taught, that children can be prepared for. They can be taught to understand that in such an emergency they will be taken care of in the proper places and that, as good chtizens, it is their duty to fit in with the existing structure, to fit in with the management pattern. Undoubtedly the schools will be pretty well organized through the administration and the teachers to take care of the children that are in their charge in this period.

I think that one asset we have with little children is the fact that they love adventure. They love tales of adventure, and they do not have a recognition of danger to themselves as such. This is something that just does not happen to them or people that they know. So perhaps this can be approached from the standpoint of the pioneer, appealing to the adventuresomeness of children, to their imagination, and this may help them to get over a difficult adjustment.

I think parents and teen-age children will just have to school themselves to the fact that they will be separated from the other members of the family and that they must trust that every member of the family is taken care of; that as long as they do what is planned for them the other people will be taken care of, too. It seems to me that if courses of action have been planned in advance, some of the anxiety that will arise in this emergency situation may be minimized.

The frightening thing to me is that this is an utterly useless plan unless there is an adequate program of shelter building, which I feel must be instituted on a national scale. Certainly, if there are no places to go, then we cannot have courses of action or adequate advance plans that we can carry out. I am really tremendously concerned at this point because there seems to be such a wide gap between planning and execution of an adequate shelter program.

It seems to me that at the present time there are very few families who will even admit the danger of thermonuclear warfare or who will see or admit the necessity of getting ready for it. It is a case of "it can't happen to me; it may happen to someone else, but it isn't going to happen here."

I think the stimulation for this preparation is going to have to come from the Government. I cannot see it as arising from individual families.

I think the real question is how we can motivate people to prepare for this type of experience. It is pretty difficult with the value systems with which we, as families, are living today. Somebody mentioned yesterday the fact that probably after such a crisis the cultural values that we now hold would change. But we are dealing with the pre-emergency period, and the cultural values that we currently hold measure the obtaining of material goods as the badge of success for most families; these things are very important to us. If there were not the mass media constantly bombarding us to buy more cars, more refrigerators, more of this, and more of that, we would be relieved of a tremendous influence on this conspicuous type of consumption in which most of us indulge. Actually if we are unrealistic about this danger, even two, three, or four hundred dollars, as was suggested yesterday for a minimum shelter, might seem rather nonessential and nonsensical in our present-day situation.

So it seems to me that the real problem that we are faced with is getting these plans into action on a national level if we are going to be successful at giving some sort of protection to the nation's families.

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The points I would make are simple ones, maybe even simple minded. While I have little doubt that the work we have heard described is most worthwhile--in that it has had such an impact upon a skeptic like myself--yet still I feel that the explicit contexts of the studies should be broadened.

I realize that many of you are quite action minded and have been concentrating on the policy and action consequences of shelter research. The possibilities of doing research interests me, and I should like to touch upon both the problem of luring first-rate men into researching your interests and the problem of reconceptualizing the problems you mention so as to expand the spectrum of outputs.

There has been a dichotomy of basic versus applied which could handicap us here. Certainly you seek answers to specific and important problems, but such answers are likely to be most useful if the problems have been stated in very general fashion, in which case they apply to many more specific subclasses of events. Your specific problem ought to intrigue those scientists able to make outstanding contributions on the basis that it is an example, or that some aspect of it is an example, of that broader class of events in which they are interested already. Behavioral scientists explore such problems with a minimum of subsidization. Broadly stated problems tend to be of general scientific interest. They compel the interests of first-class men not as consultants but as researchers. Such problems become major items of research, high upon one's agenda of key investigatory activities. The few really salient variables involved stand out clearly. These problems lure not only first-rate men but more of the time and energies of such men than one could otherwise obtain.

Now clearly the energies of some very able men have been recruited, and typically I presume they restate the problems facing them in the more general conceptual language of science. I would like to mention a few conceptualizations that hopefully might increase the range of eventually practical outputs to be derived from the work and lure top investigators into this field. I shall presume that many researchers cannot immediately see the relevance of research needed by OCDM to their interests. But there are some most important, general problems involved in what has been described today and yesterday.

Experiments on shelter habitability are inevitably small group research tests of the compatibility of members of small groups under sensorially deprived conditions when there is quick sensory habituation to all but the most novel aspects of the environment. For many shelter inhabitants novel elements may be "closeness" and "dirt." Although preparatory set becomes an interesting variable for explorations, do subjects expecting, say, dirt habituate to it? For most persons the most changing and the most meaningful aspects of the environment may be the other persons toward whom it could be hypothesized that rather stronger than usual positive and negative emotional attachments or cathexes will develop. Social life in the fairly

small shelter over all but very short periods could even resemble social life in outer space. Research on living together in confinement can benefit OCDM and the space program. At any rate we know little about behavior or fundamental psychological processes in situations where the other persons have grown far more important than they were. Will there be, for example, more perceptual differentiation of individuals under such circumstances? Will meaning structures in the semantic differential sense shrink toward the single one of evaluation; that is, will there be a tendency for less objective, denotative thinking under conditions of confinement?

The whole passive defense area looks like an interesting one in which to study attitudes and attitude change. One might, for example, hypothesize that additional change is induced most easily in those areas where change implies no need for a change in the self-concept or perhaps the concept one has of his society. It would be interesting to look at passive defense measures generally in terms of what employing them implies for most Americans in terms of changes in self-concept or our societal self-concept. Maybe passive defense is dissonant with the generally held self-image of the United States.

Nathan Maccoby and his colleagues at Stanford have been working on the problem of attitude change toward child rearing in parents. He has been concerned with the relatively short persistence of many attitude changes; people backslide. So he has been experimenting with the use of two kinds of communications, first a general one intended to unsettle one's general and more basic assumptions, which underlie and support behavior, and then a specific one concerned directly with certain concrete practices. He feels that this sequence of communications means that there is less defensiveness toward the second (specific attitude-oriented) one and more behavioral (as contrasted with verbal) change resulting. Certainly you also face a problem in inducing attitudinal change where many assumptions need to be questioned first or the problems redefined so that fewer defenses are aroused to protect one's self image or our image of the United States.

Many people interested in mental health or in decision making under stress could experiment with the situations that are of most interest to you. Many of the crises or disasters described here look as if they reduce ego strength or effective cognitive functioning as these are embodied in a group and in individual members. These people look less creative, less involved in or capable of original thought. Their interests and their goals narrow. They exhibit regressive behavior and less independence. They grow more passive. In other words, they appear to decline in mental health as the term is most frequently used these days.

I suspect and feel that Charlie Fritz's hypotheses are relevant here: that persons in crises should be actively seeking to master the environment that they will face. They should formulate values, goals and purposes, and expectations that lead to action. The existence of values and their internalization should serve to insulate them from the traumata of the real world. I am, moreover, suggesting that there are a number of hypotheses relevant both to work of broad scientific interest and to the practical problems you face. Some more examples of hypotheses of interest to persons who work in the fields of mental health might be appropriate. There can be concern with making life in a trying situation--the shelter, when one's world and one's friends are at least changing radically--not merely bearable but also interesting. Maybe a supply of psychic energizers would be appropriate! Work in group therapy and with small, group-dynamic oriented training laboratories suggests that people who even merely observe one another and introspect with capable professionals present, develop powerful and often positive affective bonds towards one another and have experiences that are satisfying and reasonably rewarding. Often they cannot say why their experiences are satisfying but still find them so. These can be persons with a profound sense of personal crisis, or personal disaster or tragedy who can find, can build, new meaning through an experience with a group.

Now it is true that shelter life during a nuclear war may never become enjoyable or even close to it, but perhaps experiments on social life in shelters might draw on talent and hypotheses from these other fields and contribute both toward general scientific knowledge and toward the possibility that shelter life during a nuclear war might become more endurable.

A psychologist named Albert Eglash at Washington College is studying the helpful impact of redefining miserable experiences so that one is least rigidly defensive and has more energy available to absorb and deal with such experiences. Some of his redefinitions involve the use of humor. Maybe the possibilities of humor as a pro-mental health measure have been ignored too much. It might be most helpful to people in shelters to be able to use humor. One could hypothesize that those persons with the most developed sense of humor could tolerate shelter life best or that groups with such persons present would adapt better than ones without them. During World War II, the use of humor on submarines being depth charged could sometimes serve to make even that horrendous experience more endurable.

Most of the hypotheses I have mentioned can be related to theory at a general level but so, of course, are many other observations that have been reported here yesterday and today. The University of Chicago study of a fake air-raid alert, for example, reminds me of some

work of the experimental psychologist, Egon Brunswik, on the probabilistic use of cues (maybe several very different cues must all suggest that some kind of emergency is present before one will believe that it is an actual emergency). Donald T. Campbell reports on his revision of such thinking in an article in Information and Control, (December 1958, 1), on systematic error on the part of human links in communication systems. Once such a study as that of the unscheduled alert is put into a broad theoretical context, it is clearly meaningful to many scientists who will look at it carefully and comment on it or take off from it quite constructively.

MARY E. ROBINSON
Brookings Institute

I would like to comment on the discussion by extending some of the observations made yesterday and earlier today by several other participants. In doing so, I will try to make explicit some of the ways deployment of our resources, post-attack, will bear on shelter behavior patterns--behavior patterns of people before they go into shelters, while they are in the shelters, and certainly after they emerge from shelters into the struggle for survival among the ruins and the remainders.

We must start with the point that the situation that concerns us today--shelter habitation in the event of a nuclear attack--will indeed be a national disaster situation, not a limited disaster situation. Recognizing this, we must be prepared for the fact that the shelterees will be absolutely correct in assuming that the whole fabric of their society will have been very severely damaged. If, moreover, they conclude that the whole social fabric has disintegrated and society can no longer protect, reward, or punish, then their desire to act negatively and in socially destructive ways will be almost overwhelming. If they think the law of the jungle is all that waits outside, that post-shelter survival will depend on every man fending for himself, then I think you can count on jungle behavior reaching into the shelter, too.

In-shelter time will vary according to distance from targets, and may range from a few days to fourteen or more. In order to keep shelter behavior manageable, it will be crucial to prove during these few days that the community outside has not, in fact, disintegrated.

Perhaps the most crucial way to demonstrate this is to activate the organization for estimating, allocating, and distributing the scarce survival resources outside the shelter. During this time, the people in the shelter must know that the supply of resources upon which their survival depends is being garnered, cared for, protected, and readied for conservative distribution, so they will not emerge just to root, hog, and die.

Required particulars of this demonstration of the continuity of the outside social order would include the following:

(a) Plans and capability for establishing the number and identity and for utilizing skills of the surviving population.

(b) Plans and capability for locating, sequestering, and protecting vital survival supplies. This would include both the emergency stockpile supplies and the much larger quantities of survival items that will be in various commercial channels of production and distribution.

(c) Plans and capability--especially organizational capability--for assuring emergency distribution of the minimum survival supplies (food, medicine, clothing, and fuel) in an immediate post-shelter emergency period.

(d) Beyond this emergency distribution system, furthermore, local authorities will have to demonstrate plans and capability for linking isolated areas and re-establishing flows and exchanges of emergency goods and services. Only if "islands of survival" can be quickly joined into a re-established national system of interchanges can we insure that even minimum standards of distribution will be maintained and replacement production got underway.

(e) Most important, it will be necessary to demonstrate plans and capability for calculating, reserving, and allocating required sorts and proportions of resources required to re-establish production. Take fuel, as an example: the allocation of supplies of fuel between the consumer and producer uses of fuel must be planned for and quickly effected, or vital subsequent transport and production needs can never be met.

(f) Plans and capability for reconstituting those economic practices and financial institutions, such as money and credit, upon which our whole tradition and experience for creating and maintaining a rising level of existence has

depended. Herman Kahn of the RAND Corporation very clearly and forcibly makes the point that people will not prepare for or persevere in a life that holds only dwindling prospects. Unless we can demonstrate pretty well from the first that we intend to conserve and use remaining resources to expand minimum survival levels, indeed ultimately to recreate a life of amenities, I do not think you are going to get people to build the shelters in which to save themselves.

These are some of the most important things we must be prepared to do if we are to demonstrate to people in shelters that society outside retains the capacity to protect and reward those who contribute to its survival and reconstruction. Unless this demonstration is undertaken long before the actuality of attack, however, there may be as little hope for the existence of the shelters themselves as there will be little hope of socially constructive behavior in shelters.

DWIGHT W. CHAPMAN
Vassar College

Sitting here and thinking about "modal man" crouching in his "conceptual shelter" under the impact of a "nominal weapon" has led me to think that in psychology there happens to be a field of research that we have used peculiarly little in disaster studies. That is the field of role-behavior and role-conceptions. This in turn stirs up a little nostalgic shiver by recalling that too many years ago, when I was an undergraduate, there was a professor of moral philosophy on the faculty who, together with his wife, would issue annually invitations for a tea at his house to a selection of students -- selected on heaven knows what criterion, though I fell in the sample one time. He was a large, self-confident, pink-cheeked person who exuded an overwhelming aura of wholesomeness; and so was his wife. While no undergraduate looked forward to this engagement, it was nevertheless an invitation that was not lightly declined. Therefore, I showed up. And in keeping with the general wholesomeness of the household, it was a tea, not a cocktail party. Actually it wasn't even tea; it was cocoa, which is even more wholesome. He and his wife had a way of inventing and sustaining a conversation in the face of the solid wall of eyeballs presented by the undergraduate guests, and you could see them early in this event searching their minds for something to start out with.

Suddenly he said, "I have always been so interested in William James's observation that every day we give up an old ambition. It is so true."

And she in her twittering manner, and evidently to stir the conversation and keep it from dying in the laps of this uncooperative company, said, "I don't think James was right. For instance, William, can you think of anything that you couldn't do if you really set your mind to it?"

We were then treated to the spectacle of the great man faced with this unforeseen dilemma. He thought and thought and thought, and seemed very near to giving up, when suddenly his face brightened and he said, "Well, my dear, I don't think I could high-jump six feet four inches."

To which she replied, "But, William, it doesn't matter. You wouldn't want to."

Now, the behavioral importance of the notion of role is that it does imply the taking on and discharging of desires. There are few other avenues, I think, that offer such economy in the effort to change attitudes and motivations. The research on role seems to show that one and the same individual is capable of very dramatic kinds of transformations in his motives, his aspirational levels, what he is going to pay attention to, and what he is going to do in a given situation, depending on his identification with some concept of role that is relevant to the situation.

When we are thinking of the job of engineering human behavior to be effective in the shelter situation, possibly we ought to pay a little more attention to the establishment of role concepts and the effort to get individuals ready to identify with these roles. Thereby we might predetermine whole chunks of behavior or whole bundles of motivations more economically than we can by bits of persuasive information or by the tedious inculcation of new habits.

At about that point my practical notions run thin, because I can foresee all kinds of difficulties. I can only pass on to a few kinds of queries about this. For example, in the establishment of cultural roles that the individual can conceptualize and identify with, I think we have the feeling that society accomplishes this by presenting and maintaining some role models--some people who actually and visibly function in this way and whose identities are well tied in with certain expectations about their behavior. I am not so sure that we have reached that point in civil defense roles. I can see difficulties in an agency's accomplishing this as long as it is not accorded, for various

reasons, very high prestige in the system of government. Prestigeful role models are essential. Moreover, I think that the general culture has to support a good definition of the necessary roles. Here informational programs perhaps do some good; but, on the other hand, I cannot see that we have anything yet in our society that represents, for example, a literature providing a Horatio Alger who against great odds and by his own ingenuity worked himself up to be a civil defense warden or a manager of a shelter. Certainly we do not have any book entitled The Rover Boys in Macy's Sub-Basement.

However, I think that the resources latent in role theory are sometimes underestimated. In order to realize how they are underestimated, it is suggestive to look at children. A good deal of growing up consists in experimenting with various roles and in the abrupt changes of behavior that take place in consequence of this play.

There is a little sandlot baseball team that makes life in our house almost unbearable because it plays on a vacant lot next to us. Outside this game, most of the protagonists are small, shy, soft-spoken boys. Once they are on the diamond in uniform, however, they are loud and aggressive, and they spend their time "bawling out" the umpire with the best accepted phrases. These transformations in behavior are terrific. One can easily conclude that a rather sorry part of growing up in any culture is the abandonment of this experimenting with different roles. Some of our disaster research is illuminating about this, because it does show that under stresses that take away the necessity of our preserving, in a dignified way, the limited number of roles that we accept as adults, all kinds of other useful role behavior opens up to people -- roles that they perhaps have only conceptually, or with a minimal kind of verbal bantering-around, ever experimented with before. Would there be ways, practically speaking, in civil defense exercises and training for amplifying the opportunities to experiment with survival roles?

Finally, I recognize this: while "role" is an easy concept to apply to highly specific jobs in civil defense (the manager of a shelter or workers under him having exceedingly well defined duties) and while it has its value in yielding public concepts of these duties so that other people who really have not performed those duties can take them over with at least a modicum of ideas of what they are about, how does it apply to the large mass of people generally? And here I wonder (I do not like the prospect, but we do not like any of the prospects that bear on this), what of the prospect of cultivating in the American scene the notion of the general role of "survivor"? This is a role which is very real in continental countries that have had plenty of experience with disaster. It is a very heroic role, and it is a role that potentially can belong to anyone. I am not sure it exists in America. Maybe this defines a part of the civil defense job.

JAMES D. THOMPSON
University of Pittsburgh

Like several of the others I found this a very educational experience. I have never believed that a day or two of education makes an expert, and so this morning I sat down and turned on my inspiration switch and perked along without it doing very much most of the day. I think I finally got a little bit of inspiration, and then I discovered 15 minutes ago that Mary Robinson was on the same channel. So I have been tuned to Conelrad for 15 minutes and I cannot get a signal. But I might repeat some of her points in a little different language at least.

It seemed to me that the research that we have heard about has been very exciting. It has considered the situation from quite a sophisticated point of view. This is necessary but not sufficient for the kind of problem that I foresee. Maybe my conceptions are not at all what would be realistic, but suppose we make a few different assumptions. I would like to underscore this by being Machiavellian for a few minutes, and suggesting that we think not about helping people by providing shelters during this extreme situation but rather that we think in terms of sheltering people so that we can use them a little later in the recovery and reestablishment of the social fabric.

It seems to me that this approach that emphasizes the post-shelter situation suggests some additional things that we would need to be thinking about and hopefully doing some research on. Because if we make the assumption that the facilities of the world external to the shelter are going to be in considerably different states than when we went into the shelter, it seems to me that we have to think about establishing new goals for most of the people in these communities, or at least new goals for the foreseeable future for them, and that this is going to need programming. It is going to need the establishment of priorities. It is going to need assessment of the skills necessary, assessment of where those skills lie, and a redirection of people from their old skills into new ones. It is going to mean, apparently, a change in the status relationships of people, because suddenly old, elite, luxury skills no longer are going to be elite, and skills that formerly were rather lowly regarded may suddenly become very important.

From the conception I have, it is going to change organizational patterns and authority relationships, not only during the shelter period, but certainly when people go back outside.

Now, we have also had a number of indications that one of the problems in the shelter is that of providing meaning, of establishing norms if the old norms are obviously of no use, of putting some direc-

tion, some orientation on to the future and away from worry about the past, and of keeping people busy.

It seems to me that the preparation for rebuilding society once we leave the shelter is perhaps the vital thing that will satisfy those needs of keeping people busy and giving them a new direction and new sense of purpose. On the other hand, in addition to all of the terrible problems of managing the shelter, this would put extremely large, additional burdens on somebody to manage this reassessment and training period during the shelter experience.

JOHN L. KENNEDY
Princeton University

I think I know why I am on this panel. I have been attending shelter habitability meetings for several years. So I cannot claim ignorance, or that this is all new, or that every transmission today has been free of noise. But there is a ray of hope. The quality of the discussions on this problem, it seems to me, has substantially improved in the last two years. Two years ago those of us who would listen to people like Mr. Garrett were mainly wringing our hands. But we are now talking more fact and less fancy. We are looking to the future with some hope as opposed to despair.

Most of the "goodies" that I was going to talk about have already been said. The symposium speakers had some ideas that are worth attending to. I did take some notes on the papers today, and for what it is worth, I propose to go through these notes and comment on the problem of shelters and shelter habitability.

Starting with Mr. Fritz's paper, I have no objection to the notion of large communal shelters, but before going entirely in that direction it does seem to me that the problem of epidemics and sickness is a possible argument for maintaining at least the idea of family shelters.

My friend and colleague Jack Vernon gave a ganz amerikanische paper this morning about where we are on a continuum from the notion that a shelter should consist of a pine box six feet by three feet in which you lay yourself out like a corpse for as long as your accumulated fat lasts -- that is one end of the continuum, to the other end of the continuum which is the "joy through work" or "whistle while you work" notion that we have heard.

We are going to have to take a stand as a nation on where we want to be on this continuum, because I think it is one of the reasons why we do not communicate very well with people in general on this topic. If they see sheltering as a period during which they are stretched out corpse-like, obviously they are not going to like it, nor are they going to take much stock in the possibility that they will have to do this. Conversely, if you tell them that sheltering is going to be an esthetic experience, they are not going to believe you.

So I think it is time that we paid some more attention to what level of deprivation we are planning on here. I have no answer to this problem.

Mr. Altman's paper was a most interesting one. I appreciated the light tone, but he should be told that this attitude is only possible because he has not faced up to a lot of the problems of studying a group of people in a shelter over a period of time. I highly approve of his plans. He is going to obtain some very interesting results. I like his forthright calling of a spade a political football.

We are in a period, it seems to me, when research support for the behavioral sciences and the use of information derived from the behavioral sciences is down at the bottom of the cycle. All of us can remember a few years ago, right after World War II, when there was great enthusiasm, considerable support, and an optimistic conviction that here was an area of research investigation that would yield to the centralizing of large resources and the enthusiastic getting on board of a lot of scientific talent. We detect in the last few years a sober reappraisal of this point of view, in fact so sober that it is getting harder and harder to find support for behavioral science research.

In talking about research in relation to shelter occupancy and the problem of predicting what large groups of our people are going to do when faced with the miserable decisions that they will be faced with, our behavioral sciences do not really tell us many of the answers. I would like to see a lot more basic research in the behavioral sciences go on, but I am somewhat disabused of the notion that by supporting a research contract the answers to some of these knotty questions will be obtained.

I thought Mr. Olson's paper was extremely interesting, but he can cease development work on the multiple-purpose compressed cereal bar -- it has already been developed! I remember the taste of this multi-purpose compressed cereal bar very well in my days as an employee of the Yerkes Laboratories of Primate Biology. It was known in those days as the "chimp cracker," and it was delicious,

as my friend Glen Finch here will attest. I will be happy to give Mr. Olson the reference to the makeup of the chimp cracker.

Mr. Michael's paper was generally delightful. Management is certainly a central problem in the design and operation of large shelters. I just wonder whether it is possible to over-plan or over-manage. One of the consequences of over-planning or over-management is to take some of this "joy" out of shelter occupancy.

The only particular point that I would like to comment on in Mr. Katz's paper is the proposal that people require corroboration in order to take action. This idea has appeared in several other connections, and I just wonder whether it is a general principle. If so, it is an important one, and our whole program of warning needs to take this principle into account.

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The National Research Council was established by the Academy in 1916, at the request of President Wilson, to enable scientists generally to associate their efforts with those of the limited membership of the Academy in service to the nation, to society, and to science at home and abroad. Members of the National Research Council receive their appointments from the President of the Academy. They include representatives nominated by the major scientific and technical societies, representatives of the Federal Government, and a number of members-at-large. In addition, several thousand scientists and engineers take part in the activities of the Research Council through membership on its various boards and committees.

Receiving funds from both public and private sources, by contributions, grant, or contract, the Academy and its Research Council thus work to stimulate research and its applications, to survey the broad possibilities of science, to promote effective utilization of the scientific and technical resources of the country, to serve the Government, and to further the general interests of science.