TWO SIMULATION TECHNIQUES FOR FALLOUT SHELTER RESEARCH: THEIR PROPERTIES AND AN APPLICATION TO EVALUATING SHELTER MANAGEMENT GUIDANCE

(Final Report)

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September 1967

Institute for Performance Technology
AMERICAN INSTITUTES FOR RESEARCH
Pittsburgh, Pennsylvania

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(Summary of Final Report)

Prepared for:

Office of Civil Defense
Office of the Secretary of the Army
Under
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Work Unit 1519A

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PURPOSE

The study reported here had two major purposes. The first was to develop test environments capable of producing shelter-appropriate behavior in subjects. The second was to test the effectiveness of two types of shelter management guidance.

APPROACH

Development of Test Environments

The chief purpose of behavioral fallout shelter research is to produce valid predictions of human performance in shelters during a nuclear attack. In order to maintain strong subject involvement throughout a shelter stay and to insure that participants adopt the set of survival-oriented shelterees, it is necessary to provide a situation which affords appropriate motivation. Two techniques were developed and employed to achieve this set-simulation during these studies: (1) Extra-Shelter Environmental Threat Substitution (environmental threat), in which the shelterees perceived an actual danger in the environment surrounding their shelter system, substituting for the radiation dangers of fallout; and (2) Intra-Shelter Simulation (internal stress), a habitability technique in which another motivation is substituted for survival drive.

External Threat Test Environment

The basic requirement for effective threat substitution in shelter research is to enclose the subjects in a facility which they perceive as protecting them from an actual threatening environment. This must be accomplished, of course, without actually endangering the subjects. Development of a specific research technique proceeded in four major steps: (1) specifying the stimulus characteristics associated with fallout conditions that define the physical threat to shelter inhabitants; (2) identifying possible substitute threat elements; (3) evaluating these threat

producing elements in terms of the number of relevant stimulus characteristics which they present, and the feasibility of employing them; and (4) selecting the most suitable threat element and pilot testing an external threat technique based upon that element.

As a result of this developmental process, the environmental threat technique which was selected was to confine subjects in an air-filled tank submerged 20 feet beneath the surface of a body of water. The perceived threat of the surrounding water substituted for the threat of radiation.

Internal Stress Environment

Under this research technique no attempt was made to pose a perceived threat to the lives or health of the subjects. Instead, a sociocultural threat, that of losing all or part of their honorarium, was imposed upon the subjects. These studies were conducted in a normal room configuration. Subjects were informed that their honorarium would be prorated on the basis of their performance. Those who exposed themselves to simulations of danger which would have resulted in their death would receive only $10.00. Those whose exposure would have resulted in serious injuries would have received $25.00 and those who remained unexposed would have received $50.00 for their participation in the study.

Guidance Materials

Two kinds of guidance materials were evaluated and compared during this research: (1) A comprehensive, detailed manual containing full discussions of all reasonable shelter-relevant subjects ("full" guidance). (2) A terse, quickly applicable deliniation of common shelter tasks and problems from which shelterees are expected to extrapolate specific procedures ("abbreviated" guidance).

The "full" guidance selected for employment was the Shelter Manager's Guide (Brandagee & Bend, 1965) which was developed as part of a previous AIR project. This 200-page document details the step-by-step decisions and actions that the shelter manager must make in order to organize and operate a fallout shelter.

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The "abbreviated" guidance employed was the Small Shelter Management Guide (Bend, Unterwagner & McIntyre, 1966) which was essentially a distillation of the Shelter Manager's Guide. The objective of the Small Shelter Management Guide was to distill from the more comprehensive document the essential information and action guidelines that would apply primarily to small shelters in which no trained shelter manager is available. In preparing this document the advantages of brevity, multiple users and flexible scenario were recognized, as were the dangers of excessive abbreviation.

Research Design

The general research design for this investigation is illustrated in Table I. Use of the two types of guidance materials was investigated using both of the research techniques developed by the Institute. Both research techniques were applied to a small shelter situation, and use of the guidance was examined in an emergent leadership condition.

Due to the differences which exist between the two test environments in terms of group size, observation techniques and other factors, only case study comparisons of these techniques were possible. However, the research design did provide an opportunity to experimentally compare the value of "full" versus "abbreviated" guidance under both research techniques.

Table I

Research Paradigm

	Full Guidance	Abbreviated Guidance
Environmental Threat N=8	Study #1	Study #2
Internal Stress N=19	Study #4	Study #3

Development of Behavioral Measures

A number of behavioral measures, both quantitative and qualitative, were developed for these studies. Two measures, survival set and tension score, were designed primarily to assess the impact of the two set-simulation techniques. Four more measures were developed for comparing the effectiveness of full and abbreviated guidance. These six measures included:

1. Survival Set; critical incidents of behavior which reflected the subjects' assumption of their proper role as actual shelterees.
2. Tension Scores; a Bales-type method for noting the frequency with which subjects showed or released tension during their shelter stay.
3. Manner of Guidance Use; which included nine specific observations regarding the way in which use was made of the management guidance during the shelter stay.
4. Amount of Participation in Shelter Functions; which reflected both the number of different functions each subject participated in (versatility), and the total number of times he participated in some function (Function Participation Score).
5. Effectiveness of Participation in Shelter Functions; extent to which the shelterees approached tasks properly, using effective techniques.
6. "Casualty Score", which used the payment schedule of the subject honoraria to establish a score based on simulated injuries resulting from improper performance during the shelter stay.

RESULTS

Research Techniques

Both of the research techniques developed for this study proved to be useful for the study of shelter management guidance. Shelteree performance was quite consistent within each research technique, while clear differences existed between them. Subjects in the internal stress study performed shelter functions with much greater vigor and initiative than those under environmental threat. The subjects appeared highly motivated to "survive"; more motivated than has been the case in any previous studies.

While those exposed to environmental threat appeared relatively casual in their performance of shelter functions, they exhibited a higher level of tension, and referred more extensively to the guidance materials, particularly in those few situations where shelter functions were performed.

In interpreting these results one must recognize that the subjects in the environmental threat knew that their potential loss was very great, but that the probability of this loss was extremely low. The internal stress subjects, on the other hand, knew that the maximum possible loss was comparatively small, but understood that the probability of loss was great unless they took positive controlling actions.

It seems reasonable to conclude that the internal stress research technique provides a valuable tool for behavioral studies relating to fallout shelter systems. At the same time one cannot conclude on the basis of these studies that the internal stress technique provides a more "valid" test situation for investigating shelteree behavior than does the use of perceived environmental threat. Shelterees involved in actual nuclear attack might trust in the integrity of their shelter system and the capability of local government authority with the same faith as that exhibited by the test subjects with regard to their submerged shelter and the research personnel responsible for their safety. It would seem advisable to examine past and future shelter stays associated with real disasters

for behavior patterns similar to those observed under perceived environmental threat, before rejecting this methodology as a valid research technique.

Guidance Materials

The results of this study showed a generally unanimous trend toward superiority of abbreviated guidance as an aid to emergent, untrained managers of small shelters during the first 24 hours of a shelter stay. This finding is supported by consistent results from the two different research techniques.

There is an obvious need to examine both full and abbreviated guidance materials within the context of large shelters, longer shelter stays and the presence of trained shelter managers. A reasonable configuration for study would be the use of both kinds of guidance materials as an integrated package.

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ABSTRACT

The research program reported had two major goals:

1. Developing and testing the effectiveness of methods for simulating in subjects the "survival set" to be expected in shelterees.
2. Evaluating the effectiveness of two types of shelter management guidance in small shelters with emergent management.

Two "survival set" simulation techniques were developed:

1. Environmental threat, where subjects were confined in an air-filled tank, submerged 20 feet in water. Here the threat of the surrounding water substituted for the threat of radiation.
2. Internal stress, conducted in normal room configuration. Here, threat of pay reduction for inadequate performance of shelter functions served as a substitute motivation for threat of death or injury.

The two techniques produced differing kinds of realism. While internal stress subjects demonstrated great vigor and initiative in performing survival functions, environmental threat subjects exhibited comparatively high tension levels and attentiveness to guidance. The advantages of each technique are discussed, and suggestions for other applications are made.

The two types of guidance compared were an extensive, 200-page handbook (full guidance) and a large, folded single sheet which tersely outlined essential management procedures (abbreviated guidance). The latter was based on the larger document. In the results, there was a generally unanimous tendency to show that the abbreviated guidance was superior across all variables. It was pointed out that these results apply only to small shelters under emergent management.

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INTRODUCTION

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GENERAL

This report describes two major efforts performed in laboratory studies: First, the development of test environments which were capable of producing shelter-appropriate behavior in subjects; second, testing the effects and efficiency of two types of management guidance.

TEST ENVIRONMENT

The chief purpose of behavioral fallout shelter research is to produce valid predictions of behavior and performance in shelters during a nuclear attack period. Validity of results can be assured only if all significant aspects of such an attack and the associated shelter stay are accurately simulated to subjects of the research.

Historically, shelter studies have attempted to simulate the physical conditions and events to be expected in actual fallout shelters: crowding, austere facilities, standard shelter stocks, typical management, sound effects, and similar shelter characteristics have all been imposed.

Still, subjects of previous research had no reason to feel their well-being threatened by the attack simulations. As a result, participants may have adopted mental sets inappropriate to an actual emergency. Where no personal motive to prevent or correct simulated dangers occurred, (other than a willingness to cooperate with the experimenters), cooperative role-playing appeared. At worst, subjects performed minimally, waiting for the end of the study and the disbursement of honoraria.

Such attitudes were evidenced by several behavior patterns:

1. At entry, looking for monitoring equipment--microphones, one-way glass, cameras, etc.
2. Performance of comfort-related tasks with little attention to those whose completion would be important to survival under attack conditions.

3. Relaxing and trying to keep themselves amused throughout the study, to the exclusion of the performance of necessary survival tasks.

4. Many verbal references to the real world outside throughout the study.

5. Verbally anticipating exit during the second half of the study.

The American Institutes for Research (AIR) therefore feel that predictions about what people will do in a real shelter, and recommendations for controlling these behaviors, have often been inadequately based: that observations and descriptions of behavior were elicited by shelter exercises in which the participants' mental sets may have been inappropriate and that, to this extent, the validity of the results is uncertain.

The Institutes' previous efforts to control these behaviors through the introduction of appropriate stress have had considerable success, (Hale, et al, 1966). Three significant shortcomings remained, however. First, an actor (who was of necessity familiar with the study scenario) managed the "shelter," which interfered with meaningful observations of management responses to problems. Second, the activities of a "planted" actor-agitator may have modified subject behavior to some undeterminable extent. Third, despite control of subject's information, simulation of many predictable characteristics of shelter stay, and realistic presentation of several shelter problems, the shelter experience still had no real effect on the shelteree's well-being. It therefore afforded limited control over the subject's internal motivation and mental set, which may have been unlike that of a group undergoing nuclear attack.

In summary, no previous methodology has consistently produced subject behavior patterns which reflect concern for their safety, or has provided an opportunity for "survival" motivation. For this reason, the degree of similarity between subject performance in tests and shelteree performance in an attack period has not been determined.

In order to maintain strong involvement throughout the shelter stay, and to insure that participants accept the set of survival-oriented shelterees, it is necessary to provide a situation which affords appropriate motivation. This is the fundamental concept of Survival Set Simulation, which was employed in the research here reported. Three such motivating situations suggest themselves.

First, subjects could be made to believe an actual attack is in progress. In this case no substitutions for reality would be apparent to subjects. This would insure realistic performance on the part of subjects since their mentalsets toward the situation would be that of "atomic attack." This approach would require very large amounts of technical simulation, very heavy staffing, and rigid information control. A single failure of simulation would destroy the illusion, and thus, the validity of the results. The conduct of such a study would therefore be very expensive. This technique would also be difficult to employ within the bounds of ethics. For these reasons this approach was not attempted in the current effort.

Second, in place of a fallout shelter facility, a situation offering protection from some other threat to safety which has motivational characteristics similar to those expected of attack conditions could be substituted. Such a situation would be one in which subjects perceive a physical danger in the environment surrounding their shelter system. Under such a condition, subjects would be motivated by survival drives to solve problems related to the threatening element.

Third, in place of physical threat, a socio-cultural threat with similar motivating properties could be substituted. This condition could be conducted in a typical fallout shelter habitability test facility. Here, subjects would have to solve problems relating to individual and shelter survival to avoid socio-cultural sanctions.

The latter two approaches to survival set simulation were selected for implementation under this contract, both to expand the technological capability of shelter research in general and to maximize the validity of

findings in the current effort. The two techniques were named and defined as follows:

1. Extra-Shelter Environmental Threat Substitution (environmental threat), in which the shelterees perceive an actual danger in the environment surrounding their shelter system, substituting for the radiation dangers of fallout.

2. Intra-Shelter Stress Simulation (internal stress), a habitability technique in which another motivation is substituted for survival drive. Stress is created by imposing technical and interpersonal problems which threaten the goals of the thus simulated drives. Problems are created with simulation devices and information control.

GUIDANCE

The development of research techniques is valuable only when those techniques find application in actual research problems. Such applications were included in this research program. The primary problem studied was the comparative effectiveness of two kinds of emergency guidance as employed by emergent management.

Evidence from prior studies suggests that shelter management guidance may be ignored or lost, or even confiscated by an individual in his efforts to aggrandize power. Furthermore, there is concern regarding the effectiveness of comprehensive guidance, such as AIR's Shelter Manager's Guide when used by untrained persons under emergency conditions, since such guidance is prepared primarily as a reference manual for trained shelter managers.

Based largely upon this Shelter Manager's Guide, AIR has developed an abbreviated form of guidance. It was designed specifically for use in small shelters with emergent leadership, but had not been use-tested in the occupancy context. Study of the use of such materials under stressful conditions was clearly required if the materials were to be optimally employed. Each guidance type was use-tested in this research, each under both set-simulation techniques.

RESEARCH PARADIGM

The research paradigm for this investigation is illustrated in Table I. Use of the two types of guidance materials was investigated using two of the research techniques developed by AIR: Internal Shelter Stress, and External Threat. In the situation involving external threat only, the guidance materials were modified slightly to reflect defense against the actual threat element as opposed to the radiation threat surrounding a fallout shelter in operation. Information regarding food, water, sanitation, and other shelter functions remained unchanged.

Table I

Research Paradigm

	Full Guidance	Abbreviated Guidance
Environmental Threat N=8	Study #1	Study #2
Internal Stress N=19	Study #4	Study #3

Use of the guidance was examined in an emergent leadership condition; that is, no shelter manager was appointed by the experimenters. Each study group was permitted to work out its own system of operation. The types of behavioral data collected were:

1. the manner in which the guidance materials were used;
2. general shelteree performance;
3. the extent to which "survival set" was exhibited.

Due to large differences which exist between the two test environments in terms of group size, observation techniques, and other factors, only case study comparisons were possible. Nevertheless, useful data has been obtained concerning the way in which emergency guidance materials are used under both perceived threat and under internal shelter stresses. This study also provided an opportunity to experimentally compare the value of full vs. abbreviated guidance under stress.

APPROACH

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DEVELOPMENT OF SET SIMULATION TECHNIQUES

The techniques for applying apt motivational pressures to create appropriate mental sets and to supplement physical simulations can vary considerably, depending on the specific application. Therefore, the two methodologies which were employed to this end required considerable development. The first of these was the presentation of an actual danger, perceived as such, to the shelterees.

External Threat Test Environment

The threat of bodily harm quite reasonably may have a substantial impact upon the behavior of fallout shelter occupants during an actual nuclear attack. Because this impact may be different from that of other stress factors, this variable warrants specific attention. Research could help to determine what special effects physical threat might have on shelter inhabitants, and what steps might be necessary to counteract those effects.

The most obvious predictable attributes of threat in a shelter situation are:

1. knowledge on the part of the shelterees that the integrity of the shelter is all that stands between them and a hostile environment, and
2. the perception of premature shelter exit as a threat rather than an escape.

The basic requirement for effective threat substitution in shelter research, then, is to enclose the subjects in a facility which they realize is protecting them from an actual threatening environment. This must be accomplished, of course, without actually endangering the research subjects.

The presentation of physical threat has always been difficult to achieve under safe laboratory conditions. The Institutes have been concerned with this issue since the inception of its shelter research. Exploratory

study has demonstrated the feasibility of satisfying both of these seemingly contradictory conditions in a test facility (Hale et al., 1966).

Development of a specific technique for Extra-Shelter Environmental Threat substitution proceeded in four major steps:

1. Specifying the stimulus characteristics associated with fallout conditions which define the physical threat to shelter inhabitants.
2. Identifying possible substitute threat elements.
3. Evaluating potential substitute threat-producing elements in terms of the number of relevant stimulus characteristics which they present, and the feasibility of employing them.
4. Selecting the most suitable threat element and pilot testing an external threat technique based upon that element.

The success of any simulation technique depends to a great extent upon the number of stimulus characteristics of the environment under study which can be duplicated in the laboratory setting. An initial step in this research therefore was to identify all the stimulus characteristics of fallout conditions which might significantly affect shelter inhabitants under actual nuclear attack conditions.

Seven stimulus characteristics were selected as primarily important. The element chosen as a substitute for radiation threat should:

1. be perceived as a physical threat by the shelterees. The shelter inhabitants must be aware of the potential hazard of the element even though they may perceive it as being under control. Thus the threat element must be producible in obviously hazardous amounts or intensity in the lab setting.
2. surround the shelter, making the structural integrity of the shelter important. The threat element itself, however, should not actually threaten the physical integrity of the shelter.
3. be capable of entering the shelter if proper precautions are not taken by the shelterees.

4. not present a pronounced physical barrier to premature shelter exit. That is, shelterees should not be physically impeded from leaving the shelter at any time.

5. be almost certainly injurious with prolonged exposure.

6. be less and less harmful as time elapses (or the intensity or amount of the element should be variable).

7. not be painful initially on exposure.

The second step in environmental threat technique development was to identify potential threat elements through review of the environmental stress literature and "brainstorming" sessions with technical personnel who were familiar with the stimulus requirements. Ten threat elements were identified for consideration: air pressure, darkness, electric shock, extreme temperature, actinic light, noxious gas, unnerving sound, water (spray), water (submersion), and wind blast. A number of other potential threat elements were eliminated from consideration when it appeared that the safety of the subjects could not be assured.

The third step was evaluation of each threat element in terms of its relevance and practicality. Darkness was eliminated immediately because it was not sufficiently threatening to normal adult subjects. Noxious gas and unnerving sound were rejected because of the difficulty of controlling and containing these elements. The remaining seven elements were subjected to more formal evaluation.

The relevant stimulus characteristics outlined above were weighted according to their relative importance. Then each proposed threat element was examined for its ability to present those stimulus characteristics. The threat elements were individually scored by totaling the weights of all stimulus characteristics which a given element could present. Submergence of the test shelter in water received the highest "simulation score" in this analysis.

The technical problems associated with safe application of each threat element in laboratory research were considered next. The three

test elements with the highest scores (water submergence, compressed air submergence, and water at exit) were examined in terms of the cost and feasibility of: (1) locating or fabricating the shelter facility, the threat, and the means of threat containment, (2) development and testing of support equipment and facilities, and (3) the development and testing of operating procedures. Again, total submergence in water had a distinct advantage. An acceptable basic underwater facility was available to the Institute. Thus, smaller developmental costs were associated with this threat element than with others. Additionally, some basic equipment and procedures necessary for conducting research at this facility had previously been developed and pilot tested by the Institutes.

Subject recruitment and processing was the third consideration in evaluating threats. The nature of the threat could be expected to influence the interest and willingness of subjects, and the selection of threat elements had to include consideration of recruitment difficulties. Subject orientation can be critical to any threat or stress study, since pretest instructions are needed to provide subjects with the information required to assure their safe participation. Such instructions could, however, either eliminate the perception of the threat element as a danger or make it seem too awesome. The effect of each threat element on the nature and extent of subject recruitment and orientation requirements was carefully defined for each element.

Comparison of the three best rated threat substitutes (water submergence, compressed air submergence, and water at exit), revealed no real differences in problems of subject recruitment and orientation. In addition, it was felt that of the three, water submergence represented the least "artificial" threat situation; and especially that it was the one over which the experimenters' control would be perceived as least. Finally, pilot testing indicated that the submersion experience was appropriately stressful.

The only major disadvantage in the use of the existing test facility is its size. The existing facility is only large enough to hold 8 to 10 subjects, and does not contain sufficient head room for most subjects to stand erect. It was felt that a team of 8 to 10 shelterees would be large

enough to permit the performance of standard shelter functions without excessive job loading. A group of this size also approximates the size of the basic shelter organizational unit (Bend et al., 1963), and will permit the development of normal group processes. Although a larger subject capacity would have been desirable, the special construction of a large facility of any of the three high-rated types would have been equally and prohibitively expensive. Since a small facility was inevitable, the advantages of water submergence favored use of the existing facility.

The legal and ethical implications of water submergence were acceptable. Most important, however, water submersion retained a basic concept of the research techniques: Subjects could be protected from a threat by a real shelter (as opposed to being exposed to danger).

Internal Stress Environment

The second new methodology for applying motivational pressure to create simulated mental set was also developed and employed under this contract. In this technique, the typical "real world" fallout shelter was retained as the subject environment. No attempt was made to pose perceived threats to the lives or health of the subjects. Instead, a substitute motivation was employed.

In day-to-day life, most people of this culture are not directly motivated by a concern for their physical welfare. People work to earn money, obey laws to avoid fines, obey supervisors to gain raises in pay, etc. Money so gained and conserved is then used to maintain and insure physical welfare through purchase of food, shelter, medical care, etc. Money, then, is an intermediary between life support drives and satisfaction of these drives, and becomes itself a goal of these drives.

This drive-goal relationship was vigorously underlined for those subjects which were run under this methodology. They were informed that their honorarium would be prorated on the basis of their performance in the experimental situation as follows: Those who exposed themselves to simulations of danger which would have resulted in their death would receive only $10.00; those whose exposure would have resulted in serious injury would receive $25.00; those who remained unexposed would have received $50.00 (See subject letter II, Appendix A).

The maximum pay was set somewhat above the usual rate to increase subjects' perception of "something to lose." Rules for determining the severity of such "injuries" (reductions in payment) were prepared beforehand, but were not revealed to the subjects before completion of the study (see Appendix B, page 100). Rules for avoiding "injury" were implicit in the guidance materials supplied. That is, proper shelter management as explained in the provided guidance would result in courses of action which avoid or solve the "dangers" posed before "injury" occurred. Mention of this relationship between rules and guidance, even the existance of "guidance," specifically was carefully avoided in subject briefings since use of guidance was under study. However, if all subjects had correctly implemented their guidance materials, all subjects could have received their full honorarium.

It is not maintained that such threat of loss of pay is in any way equal to threat of injury or death, but important similarities do exist. Strong motivations were created for avoiding situations which were perceived as dangerous or lethal in the simulation context. Further, subjects were motivated to take action aimed at reducing the "dangers" to all shelterees. Finally, a motivation had been induced for avoiding activities which were "hazardous" to them as individuals, even though the activities might have been beneficial to the shelter as a whole.

Technical Problems

Having thus provided motivation for careful and thoughtful performance of shelter tasks, special technical problems in shelter operation were prepared. These problems were to be the actual source of stress in subjects because they would be seen as dangers to subjects' honoraria.

The selection of technical problems for inclusion in the internal stress scenario was directed by four criteria. First, it must be reasonable that they arise in the shelter context. Second, they should be perceivable as "dangers" or threats to subject honoraria. Third, they must be susceptable to accurate simulation without creating real danger. Fourth, they should afford subjects an opportunity to make costly mistakes by mishandling the problem.

On these bases,the following technical problems and presentation techniques were developed and employed in the internal stress studies.

1. A "near miss" with a thermonuclear weapon whose detonation causes the entire shelter to vibrate. In addition to requiring a check for structural integrity this "blast" caused --

2. "Rupture" of an apparent gas line within the shelter. In reality, the "rupture" emitted air, tainted with n-butyl mercaptain. This produced a harmless, full-sensory simulation of natural gas. The flow rate was set to require a correction within a short time to avoid "fire", or"explosion."

3. Electrical failures which caused shelter lighting to flicker or go out for varying periods was simulated.

4. Emergency lighting was provided by an extension from a portable lighting kit (PLK), strung in by a purported shelteree. PLK operation in non-contiguous shelter space within the same shelter facility was performed by the research staff.

5. A radiological danger, simulated by a harmless electromagnetic field, was created outside the shelter entrance. This field extended to include a small portion of the shelter itself. The subjects were able to detect this with standard OCD radiological monitoring equipment, internally modified to detect the field.

6. Long stored, poorly prepared, bacteria laden water was simulated with harmless flavoring and texturing agents. Subjects could either solve this problem by use of purification tablets or bypass it by replacing their water from a nearby restroom before the radiation threat appeared.

7. A supplementary water supply was simulated by providing a drain valve in a water pipe which was installed through the shelter space. The pipe was gravity fed from a five gallon tank, thus affording a one-day supply at standard rationing.

8. The two in-shelter water sources totaled ten gallons, enough only for the purported duration of the stay--48 hours. The rationing problem thus imposed is significant since disproportionate consumption was

extrapolated to determine when full supplies would have been exhausted in a 14-day stay. This in turn reflected the number of days of water deprivation at the stay's conclusion, the resulting impairment of health, and the degree to which subjects' pay should be reduced.

To enhance a sense of isolation in the subjects, observation was entirely covert, and phone calls from an emergency operations control center were not used. In fact, no phone was provided. Problems and information which might have been presented by phone were absorbed in other inputs.

Psycho-social problems

Psycho-social problems were developed through interpersonal stress, occurring as a result of two types of experimentally induced factors. The first of these was each subject's threatened loss of honorarium. Since faulty shelter management could result in the reduction of any or all subjects' pay, individuals were expected to have a strong personal interest in having all aspects of shelter life well handled, perhaps to the extent of "nagging" those in charge. Subjects were expected to be more willing than in earlier studies to take an active part themselves, to protect their own interests. Such willingness and interest, if general, could create its own conflicts as individuals or factions clash over their own ideas of the right solutions to problems. While the common experience of the virtues of cooperation might be a powerful force, individuals could still be very reluctant to undertake tasks which expose them to simulated dangers however important the tasks might be to the survival of the shelter as a whole. Each was expected to want someone else to do "dangerous" jobs, resulting in strife as each attempted to conserve his own honorarium.

The second interpersonal stress factor introduced was the separation of families. There has been concern in civil defense planning about the effects of family separation and the ensuing worry of shelterees about absent family members. In the Internal Stress studies some families, who did not plan on being separated, were broken up just prior to shelter entry as follows: About 25 subjects were selected for each study, with the understanding that some might not be used. Their briefing explained that a shelter was to be simulated. Prior to their shelter entry about

five pre-selected family members were abruptly separated from the group with the implication that they were going to a different area. (Actually, they were debriefed and sent home.) Those remaining were taken to the shelter facility, believing that the others had gone to another. This yielded some "shelterees" under study whose absent family members' welfare was in doubt. Through further information control, situations were presented which caused them to perceive dangers to the absent family members, inducing conflicts among their roles as shelterees, as money-earning subjects, and as family members.

Shortly after entry, a staff member came to the test shelter in the guise of a member of the separated group (see technical problem #4 above). In conversation with the subjects he presented certain pre-selected items of information about the "other shelter," including indications that conditions were worse there. The shelter area also contained a speaker of a simulated one-way paging system controlled from the "other shelter space." By this means, the subjects received problems based on conditions in "the other shelter area."

If the difficulties described were of such a nature that the remaining family members could do nothing to alleviate them, anxiety alone could have resulted. However, two situations were presented which could be improved by the real subjects, but only at some cost (literally) to themselves.

The first was a request for food supplies, stating that none were present in that (other)"shelter area." The second was a request for medical assistance, stating that a child had injured himself.

A trip through a "contaminated" area was required in either case to get supplies to the "other group" which supposedly contained the absent members of separated families. Remaining family members were thus caught in a double approach avoidance conflict, toward money and performing their shelter functions while their family "suffered" on one hand, and toward assisting their family while losing money on the other.

It is likely that perceived threat was reduced in prior studies by assuring subjects that they would be observed at all times and by making monitoring facilities obvious through the use of one-way glass, etc., thereby implicitly assuring them that whatever occurred was intentional and harmless, and controlled by ethical professionals. In the Internal Stress series, although subjects agreed to permit observation, observation equipment was entirely invisible. Microphones were concealed above the ceiling. Visual observation was conducted via one-way see-through walls, transparent from the observer's side. Every effort was made to allow subjects to believe that no staff members were in the vicinity at any particular time. This permitted subjects to assume that some apparent threats were unintentional, (and due to experimenter error).

Concealed observation and separated families both tended to heighten subject involvement in the initial portion of the stay, by removing a source of distraction on one hand, and supplying a real concern on the other. Involvement was to be maintained through the conclusion of the study by recruiting subjects, ostensibly for a two-day period and employing them in a one-day study. In this way there should have been no appreciable concern with a hotly-anticipated time of departure. Subjects had reasons to believe they still had 24 hours of occupancy ahead of them when they were released.

The only direct stressor employed was the separation of families. Performance-based pay and perceived freedom from observation could become stressful only when technical problems were presented which caused subjects to doubt the safety of either their pay or their persons.

DEVELOPMENT OF GUIDANCE MATERIALS

Two kinds of guidance materials were to be evaluated and compared in small shelters under emergent management in this research:

1. A comprehensive, detailed manual, containing full discussions of all reasonable shelter-relevant subjects (full guidance).

2. A terse, quickly-applicable delineation of common shelter tasks and problems, from which shelterees are expected to extrapolate specific procedures (abbreviated guidance).

Full Guidance

The "full" guidance selected for employment was Shelter Manager's Guide (Brandagee & Bend, 1965), which was developed as part of a previous AIR project. This manual had proved satisfactory in prior tests with trained management and was judged representative of good "full" guidance. This 200-page document detailed the step-by-step decisions and actions that the manager must make to organize and operate a fallout shelter. Included were: immediate answers to critical shelter problems or contingencies which may arise, supporting details including actual procedures and requirements, and background information needed to implement the decisions and actions. The guidance information in this document is divided into five phases: Entry, Initial Organization and Operations, Routine, Temporary Emergence, and Contingencies. In all sections but two, the actions and decisions which a manager must make in order to organize and operate a fallout shelter have been placed in a sequential order based on both importance and probable need. The Routine and Temporary Emergence sections have topics arranged in alphabetical order.

The Shelter Manager's Guide was designed to cover a very broad spectrum of shelter situations. This necessitated certain assumptions regarding the amount of information to be presented, the capabilities of those who use the guidance, and the priority and other format factors associated with presentation of the information. The Shelter Manager's Guide was very comprehensive in terms of the information presented. It was designed for

use in shelters with or without a trained shelter manager, but appeared to be more useful to a trained manager, or to one that has at least had time to familiarize himself with the content and organization of the guide. The guide is also theoretically applicable to a wide range of shelter sizes. The shortcomings of this kind of guidance are several:

The more information that is compiled in a management guide, the more unwieldy it becomes, engendering data retrieval problems.

When information is contained in a single bound volume, it is difficult for more than one person at a time to have access to that information. The common solution, using tear sheets or separate cards or envelopes that are to be distributed to users, apparently creates a problem in that materials disappear or turn up in the wrong hands or pose coordination problems. Also, a bound guidance volume is predicated upon an implied scenario of shelter events. The author makes a decision as to the order in which events are likely to unfold or ought to unfold in the shelter. If actual shelter situations do not occur in the predicted sequences the guidance user can be hard put to make his way through the document and locate relevant information.

Abbreviated Guidance

The "abbreviated" guidance employed in the current research was the only one of its kind available: Small Shelter Management Guide (Bend, Unterwagner & McIntyre, 1966), which was based on the previously discussed Shelte Manager's Guide.

The objective of this developmental effort was to distill from the comprehensive Shelter Manager's Guide the essential information and action guidelines that would apply primarily to small (less than 50 persons) shelters, as well as many of the small public shelter facilities (300-persons or less).

In preparing this document, the advantages of brevity, multiple users, and flexible scenario were recognized, as were the dangers in excessive abbreviation.

If one searches through a document that purports to carry management guidance and finds only brief generalizations and exhortations, valuable time will be lost that could have been applied to thinking through a solution. The Small Shelter Management Guide attempts to provide in an equivalent of eight pages, the essential information required for small shelter management guidance.

The Small Shelter Management Guide attacks the problem of multiple users through format. It is a large fold-out sheet, equivalent to eight pages, 8 1/2 x 11. Different areas of it can be read simultaneously by several people, while control of the materials is retained by the manager. While the Small Shelter Management Guide retains an implicit scenario of events, its large "page" size does make available information about a number of shelter activities at one time. The user can therefore more readily pick and choose guidelines appropriate to actual shelter happenings regardless of their sequence. (This capability comes at a cost of making some of the early entry phase guidance items difficult to retrieve after a period of time has elapsed.)

Prior to this study this abbreviated guidance document had not been tested or even observed in use during shelter occupancy. It was felt that even though this document might overcome some of the disadvantages of other types of in-shelter guidance it might create its own set of use problems. It seemed useful therefore to observe the effects of the "full" guidance provided in the Shelter Manager's Guide and those of the "abbreviated" Small Shelter Management Guide in parallel situations within a small shelter setting. Use of these two forms of guidance was therefore compared within the context of each of the two set simulation techniques developed. Care was taken to place each form identically within any one research facility.

DEVELOPMENT OF BEHAVIORAL MEASURES

A number of behavioral measures, both quantitative and qualitative, were developed to evaluate data relevant to the two major goals which were pursued in the studies. Two measures--Survival Set and Tension Scores--were designed primarily to assess the impact of the two set-simulation techniques. Four more--Manner of Guidance Use, Amount of Participation, Effectiveness of Participation and "Casualty" Score--were developed for comparing the effectiveness of full and abbreviated guidance. Because some measures can be applied in more than one goal area, the discussion of each measure will cite the analytic function of that measure.

Survival Set

Shelter researchers have always been faced with the problem of providing realism in shelter stays and encouraging shelterees to treat their shelter situation as if it were an actual emergency. Indeed, owing to the fact that contemporary shelter stress simulation techniques do not, by definition, produce threat, the degree to which subjects assume the role of persons caught up in an actual emergency is of crucial importance. Should they fail to achieve such a set, their behaviors in the shelter take on much less meaning in terms of possible parallels to their actual emergency behaviors. For these reasons, it was thought advisable to develop some index of the degree to which shelterees in both set-simulation conditions adopted a survival set during their shelter confinement. The chief sources of data for survival set were critical incidents of behavior which reflected subjects' assumption of their proper role as actual shelterees. The critical incidents were noted within two categories of behavior:

1. Responses to specific threat-related problems deliberately imposed upon the experimental situation. These problems included changes in water level, in atmospheric content in the environmental threat studies, and simulated radiation levels, blast effects etc. which occurred as part of the internal stress scenario.

2. Responses which were generalized to other aspects of the shelter situation. Specific areas of interest here included the extent to which the shelterees responded to potential threat elements which were not directly imposed upon the experimental situation (the potential fire hazard, for example); the response of the subjects to non-threat related aspects of their shelter stay such as feeding, sanitation, etc.; and the extent to which reference was made to "real world" factors such as the observation techniques and current events outside the shelter during the test period.

These critical incidents included not only verbal responses, but also any activities involving the monitoring of threat elements, amelioration of potential threats, or a deliberate exposure to these threats. All such incidents were felt to give an accurate reflection of the extent to which the shelterees recognized "survival" as a primary goal during their shelter stay.

Tension Scores

The amount of "anxiety" or "tension" exhibited by the subjects would also seem to be of interest in assessing the impact of any simulation technique. While terms like stress, anxiety, tension and fear are used and understood in everyday language, they always have been troublesome to define operationally. Many of the more universally accepted measures also would be intrusive to a fallout shelter scenario. A Bales-type method for noting the frequency with which subjects showed tension or released tension during their shelter stay was utilized for this study. The standard Bales definitions of showing and releasing tension were used (Bales, 1951). They can be defined briefly as follows:

1. Shows tension--includes any indication of diffuse tension or anxiety or frustration, shame or guilt and withdrawal.

2. Shows tension release--includes such things as the spontaneous indication of relief, joking and laughing.

Emission of these behaviors was recorded on a time sampling basis, and summed by subject.

The data were collected by review of the video tapes made during the environmental threat studies and on a real-time direct observation basis during the internal stress studies. It was felt that responses which showed tension would ordinarily have a much more negative effect upon the shelter system than responses involving tension release, and that it would therefore be desirable to conduct a separate analysis of these two response categories.

Manner of Guidance Use

The way in which guidance materials were used during the shelter stays has an obvious application to the study of "abbreviated" vs. "full" guidance. This information is of interest in comparing threat conditions also, since the interest with which guidance is pursued would seem to reflect the shelterees' attitude toward their "survival" within a particular test environment.

One of the primary responsibilities of the senior observer during all four shelter studies was to observe the manner in which the guidance materials were used during the shelter stay. While keeping a running account of guidance usage, the observer was alert for a number of specific data points, including:

1. The speed with which the presence of guidance materials in the shelter was recognized by any shelteree.
2. The extent and manner of exposure of specific individuals to the guidance materials: whether the materials were passed along from one individual to another, retained by a single individual, broken up and distributed to several people within a small group, etc.

3. Manner in which guidance materials were called to the attention of the general shelter population.

4. The attentiveness of the shelter population to any general dissemination of guidance information.

5. The extent to which guidance material was consulted during the performance of specific shelter functions. This includes formal application (such as one person reading directions while another performed a task), or informal application (as in the case where someone spontaneously offers information from the guidance to another individual engaged in some shelter function).

6. The number of people who, for one reason or another, referred to the guidance materials during their shelter stay, and the amount of time which was spent in this activity.

7. The extent to which the guidance materials were mentioned at times other than when specific shelter functions were being performed.

8. Comments made by the shelterees, both during and following their shelter stay, regarding such things as the accuracy and applicability of the guidance materials.

9. The specific manner in which guidance materials were applied: e.g.,an emergent shelter manager quoting directly from the guidance; one person reading the guidance and passing the information along to another individual who then "managed" the group; dividing the guidance up and distributing it among a number of "team heads" who then managed the shelter; etc.

Careful observations were made with regard to each of the above points and recorded in the senior observer log. Afterward, the logs were examined, and for each of the four studies, subject performance was summarized for each of the nine data points enumerated above.

Amount of Participation in Shelter Functions

In an actual emergency, the amount and extent of shelteree participation in vital shelter activities could perhaps be the difference between a successful and an unsuccessful shelter. Should shelteree involvement be insufficient to initiate and maintain the various shelter acitivites, physical and psychological decrement could easily result. Therefore, it was thought desirable to devise a measure reflecting the specific identity of participants in shelter functions as well as the number participating. Such a measure would prove useful in the discussion of both use of guidance and individual characteristics.

In order to define amount and extent of participation, it was first necessary to identify the major task areas contributing to the proper operation of the shelter. Twelve function areas were isolated:

1. Shelter organization and orientation
2. Safety and security
3. Medical care
4. Communications
5. Water distribution
6. Food
7. Training
8. Sanitation
9. Sleeping
10. Recreation
11. Support
12. Social control

Data bearing on participation in shelter functions was recorded in log form by a senior observer. Among his duties was entering a note each time a subject participated in a shelter function. From this could be derived both the number of different functions each subject participated in (versatility) and the total number of times he participated in some function (Function Participation Score).

The Effectiveness of Shelter Functions

In addition to amount of participation, which may be affected chiefly by subject motivation, effectiveness of that participation should also be judged. Participation alone, while necessary to the successful conduct of a function, does not by itself guarantee success. For success, shelterees must approach tasks properly, using effective techniques. Since presenting effective procedures is the function of shelter guidance, a measure at this point in the survival process is important to the evaluation of guidance. This reasoning led to the development of the Effectiveness of Participation Score. Effectiveness data were recorded in a checklist used by senior observers to rate the effectiveness of the shelterees in the performance of the various shelter functions as performance occurred.

The checklist itself was devised to determine which of several events, both desirable and undesirable, occurred during each shelter function. It contained a section for each of the 12 shelter functions outlined above and each section contained between 5 and 12 event items to be checked "yes" or "no." Each senior observer was asked to complete a checklist for those shifts he observed. (A copy of the checklist is included in Appendix B.)

Scoring was developed by examining each item in a blank checklist and determining how many repetitions of the event described would logically constitute complete occurrence of the item, e.g., food must be distributed more than once. (The criteria for occurrence are given with the checklist items in Appendix B.) Each checklist event occurrence was then rated as either desirable or undesirable for the operation of a shelter. (Non-occurrence of an undesirable checklist event was treated as a desirable occurrence.) Applying the criteria for occurrence to the completed checklist, each study was scored separately. The total of undesirable events was subtracted from the total of desirable events, yielding a group score of effectiveness.

"Casualty" Score

Since the required final product of the overall shelter program is healthy post-attack shelterees, a measure of subject "survival" under the simulated conditions of the experimental studies is important. Such a measure is available for the internal stress studies. Here a pro-rata shelteree pay schedule was applied and subject honoraria were reduced, based on simulated injuries resulting from improper performance in-shelter. (See Appendix B for pay-off schedule). This payment schedule formed the basis of the "Casualty" Score.

Several simulated dangers were included in the payment schedule, selected on the basis of ease of observation of critical occurrences and definitiveness of the results of such occurrences. The following simulations were selected for inclusion: radiation, bad water, inadequate water and leaking gas. The effects of exposure to the dangers of bad water, water deprivation and radiation were specified in accord with current guidance. The effects of a gas leak (explosion and suffocation) were specified after consultation with a representative of a natural gas supplier.

To reduce complexity, the rules were designed to yield just three conditions of health: "fatal injury," "serious injury," and "no injury." Senior observers kept watch for "injury" producing behaviors, recording their occurrences in their log.

By comparing numbers of "injuries" and "deaths" between studies it becomes possible to evaluate in one sense, at least, the effect of guidance on shelter "survival."

THE STUDIES

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SUBJECT RECRUITMENT

Due to the extreme differences in physical environments between set-simulation conditions, it was especially important to insure similar subject populations across all conditions to avoid biasing the results in favor of one or another condition. For this reason subjects for all studies were recruited under the same effort. An advertisement was placed in the classified section of a Pittsburgh newspaper. Those interested were invited to telephone the Institutes. An application was then sent to each person who indicated interest in participating, together with a letter which presented the following information:

1. Thank you for your interest.
2. A number of studies will be conducted.
3. If selected, you may participate in only one study.
4. The purpose of the studies is to gather data on how groups react to various situations.
5. If selected, you would join a group of people in a room with two-days' provisions.
6. A fallout shelter during attack will be simulated.
7. The group's goal will be to "survive."
8. Participants can earn a maximum of $50.00.
9. One situation available is a "conventional facility" (a room in an office building).
10. The other situation is a "submerged facility" (an air-filled room anchored 20 feet under water).
11. You may apply for either condition or both.
12. Applications will be accepted from individuals over 18, and from 8-12 year olds if they come with their families.[1/]

[1/] Although 8-12 year olds were permitted to volunteer for environmental threat studies, they were selected only for internal stress studies.

The full text of this letter may be found in Appendix A. Completed and returned applications were classified in terms of availability, sex, age, race, and whether the applicant wished to participate alone or as a member of a group of applicants. While applicants could opt for either condition (see item 11 above), only those who applied for both were considered. In this way, equivalency of subject population across conditions was further enhanced. Upon being classified, potential subjects were tentatively selected for participation. These people were sent a second letter of more explicit information, relevant to a specific environmental condition. The content of the second letter therefore varied between study situations. The text of both forms is reported in Appendix A.

In order to qualify for any study a potential subject was required to attend an examination which was held shortly before each shelter stay at the University of Pittsburgh's Falk Clinic. It was carried out by project personnel in cooperation with the Clinic's medical staff. The medical consisted of a comprehensive physical check, a urinalysis, hemotology, and chest X-ray, plus electrocardiogram when appropriate. Enough information was gathered to assure that no medical condition existed which would constitute a health hazard in the shelter. As subject candidates were processed, an attempt was made to spot any blatant character abnormality or psychoneurotic condition which might prove to be a danger to the other shelterees or the individual himself under the stress of shelter life. There was, however, no attempt to probe in depth.

A subject found unsatisfactory from a medical or psychological standpoint was excluded from further consideration, and, if the difficulty was of a medical nature, he was notified and a letter was sent to his personal physician. The number of potential subjects rejected, however, was small.

When the results of the tests were known, the final subject list for the last stages of processing was prepared and subjects were notified. The final stages of subject processing were necessarily different for the two set-simulation techniques. Those scheduled for the submerged facility required special training for their safety, while those scheduled for

the internal threat facility required special processing to control their information, motivation and mental set. These special treatments will be described in the following sections which discuss the conduct of studies in each facility, separately.

CONDUCT OF ENVIRONMENTAL THREAT STUDIES

Subject Facility

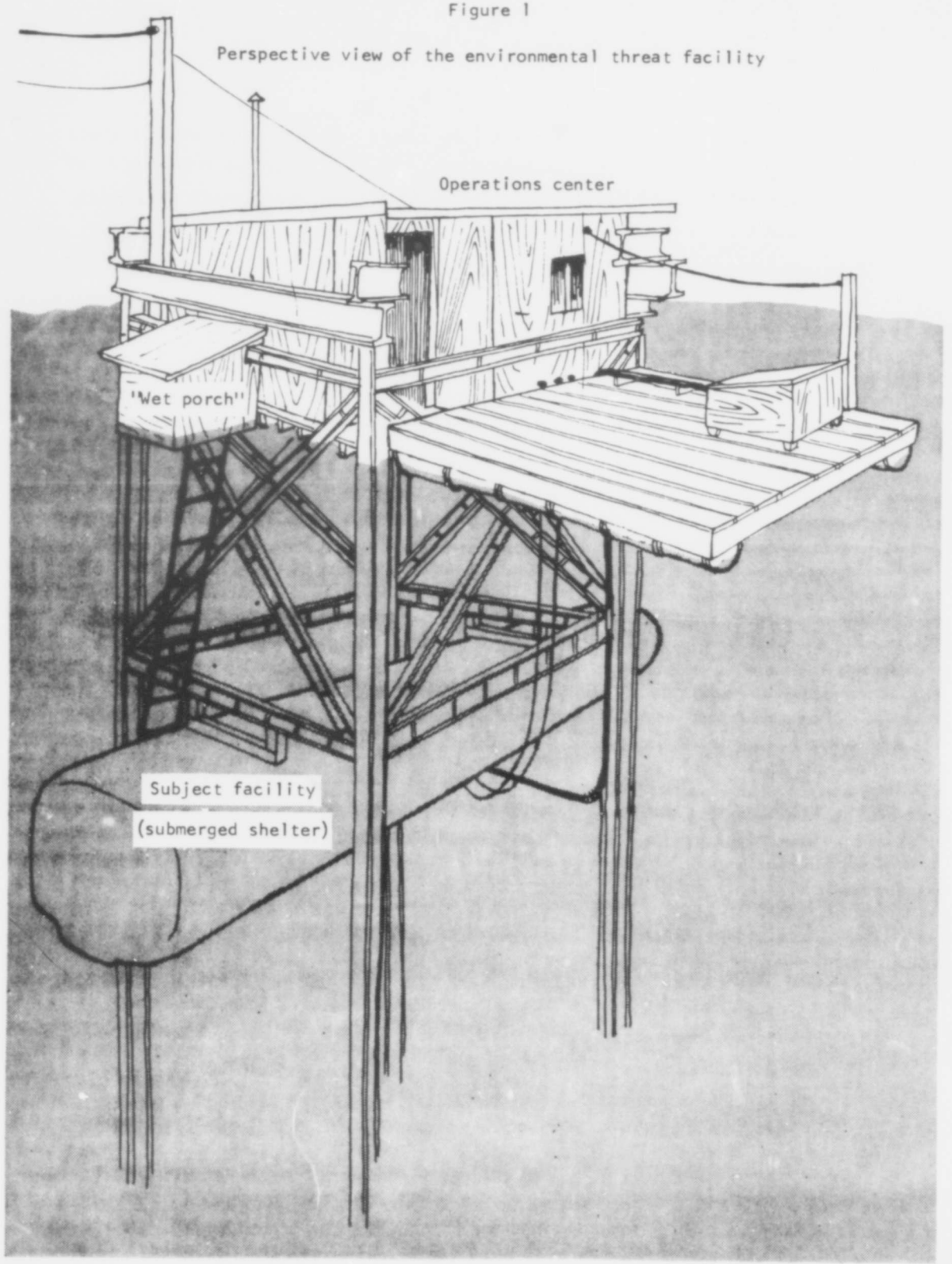
The shelter structure itself is an insulated stainless steel tank, roughly 30 feet long by 5 feet wide by 4 feet high. This tank is held at a depth of 20 feet beneath the surface of the water by a steel tower which is anchored in the lake bottom and which extends a few feet above the surface of the water. A platform and shed, constructed on the tower just above the water line, served as an operations center for the research staff. A sketch of the research facility is presented in Figure 1.

The bouyancy of the air-filled tank is adequately countered by the combined weight of the tower and four concrete anchor blocks suspended by cables from the tank itself. Three hatches are present in the bottom of the tank; one near each end, and one in the middle. The two near the ends are the larger, about two feet across. The hatch at the larger, arbitrarily designated "forward" end, was reserved for routine access, and that at the rear for emergency exit. The center hatch, 18 inches in diameter, was used for all utility lines entering the shelter. These floor hatches could be kept open at all times, with the water held out by pressure, on the principle of a diving bell. A wooden false floor provided a relatively dry, uniform resting surface.

Modifications to this basic facility were made to adapt it to the study of environmental threat. Divers erected partitions, provided utilities (compressed air and venting pipes, communications cables, and 110-volt power lines), installed monitoring equipment and appropriate appliances, and stocked supplies for subject consumption.

Figure 1

Perspective view of the environmental threat facility



The completed facility contained three chambers created by two partitions across the width of the tank. The sanitation and storage chamber occupied the rearmost portion. The connecting doorway with the main occupancy chamber was located just forward of the rear hatch. The main chamber encompassed all but three feet of the remaining length, extending past the forward hatch and terminating in a solid partition. This last three feet of space was occupied by a covert observer. The partition contained a latched-in panel which the covert observer could drop away from him to cover the exit hatch. This provided a swift method of preventing unassisted exit. In addition, this observer was a highly skilled SCUBA diver. He had sufficient diving equipment in his chamber to assist a subject in the water until safety divers from the surface could arrive.

Ventilation of the shelter was a major technical problem encountered in conducting this study. There were two reasons for this. First, the pressure differential between the shelter and the surface made provision of an adequate air supply a considerably more complex task than would have been the case for an equivalent land-based shelter. Second, shelter ventilation was a paramount factor in assuring the safety of the shelterees, and the requirements for this system were therefore quite stringent. Air trapped in the shelter was pressurized to approximately 1.7 atmospheres (10 p.s.i. guage pressure). This compression meant that 5 c.f.m. of air per person had to be provided from the surface for every 3 c.f.m. of air at the shelter. An additional problem was that the toxic effects of any air contaminants increased with pressure.

Air was supplied to the shelter by means of an electrically operated Condé blower rated to produce a continuous flow of 34 c.f.m., 12 p.s.i.g. This provided an air flow of 4 c.f.m./person, an amount which was adequate for both breathing and ventilation, and produced negligible contaminants.

The shelter was warmed by a two-speed electric heater/fan capable of 1600 watts output. The addition of heat had the added benefit of reducing the shelter humidity below the dew point, thus increasing the comfort level.

Light was supplied by means of fixtures installed on the front and rear bulkheads. One 150-watt flood light forward and one 75-watt bulb at the rear provided sufficient illumination for both remotely observed television monitoring and subjects' general lighting requirements.

The submerged shelter was stocked with the standard OCD food, water, and medical supplies. A standard OCD sanitation kit was installed in the submerged shelter, using a water drum (as opposed to the cardboard SK drum) as the basic sanitary container. The water drum was suspended through the rear hatch, supported in a framework of 3/4 inch marine plywood two feet square and 4 1/2 inches high. This framework and the drum could be quickly lifted from the hatch as a single unit to permit use of the hatch as an emergency exit.

Guidance was displayed on a clipboard mounted on the rear bulkhead, facing the main occupancy chamber.

Operations Center

Facilities for observation and control of the submerged shelter were centralized in a specially constructed shed located atop the submerged tower which supported the shelter. Electrical power for lighting, electronic equipment, and the air compressor was supplied via lines strung across the lake to the nearest electric power distribution point.

A 16-foot square shed was specially constructed atop the submerged tower which supported the shelter, to serve as an operations center. A large float moored alongside functioned as a landing stage, storage depot, compressor platform, and subject processing area. The shed was partitioned into two rooms. One was reserved for monitoring functions, and the other for diving operations.

The diving room contained an outside door to the moored float, and in addition another opening which gave direct, sheltered access to the lake via a lean-to built into the water. Dubbed the "wet porch" this device lessened the effects of November weather on operations. A ladder descended from the "wet porch" to a point near the main access hatch in the submerged tank. This room contained windows affording a controlling view of the adjacent lake. Diving gear storage lockers, gear drying facilities, a

propane heater, and seats for the "ready" divers completed the diving room facilities. During the conduct of studies, this room was continuously manned by a team of two safety divers who could descend to the shelter in a matter of seconds. Their proximity to the monitoring equipment insured that they could readily be informed of the state of the shelter if an emergency arose.

A doorway connected the diving room to the monitoring room. Here all control equipment for life support utilities and observation was centralized in an equipment rack and monitor's table.

Two major shelter observation systems were used in the studies of environmental threat: (1) a closed circuit audio and television system, and (2) a covert observer.

A television camera and two microphones in the shelter relayed sight and sound to a video monitor and loudspeaker by which the activities of the shelterees were constantly observed and written logs were made. In addition, portions of the shelter stay were recorded on video tape for later analysis of shelteree behavior.

The second observation system used an observer installed in the chamber within the shelter itself. Besides keeping a written log to supplement the one maintained topside, this observer was in constant two-way communication with the operations center, which had capability for tape recording his comments. This observer was installed in his station prior to shelter entry, and exited after all shelterees had ascended; the shelterees were not aware of his presence. His presence in the shelter provided an additional safety measure, since he was qualified to assume direction of the subjects should any emergency situation arise.

In order to simulate a change in the threat element, a vent system was installed in the shelter which permitted the experimenters to raise the shelter water level to the level of the wooden flooring. The venting process was controlled from the operations center and the water level was varied during the course of the shelter stay.

The final function of the operations center was to provide facilities for subject handling, entry to and exit from the shelter. These procedures and techniques will be discussed in a later section.

Observation Techniques

Because of the radical differences between the two test environments, separate observation techniques were required for the collection of environmental threat and internal stress data. A discussion of the technique used for the environmental threat experiments is presented below; the discussion of the technique used for internal stress will be reserved until later.

Three types of observation and data collection were used in the studies of external threat: remote real-time audio-video monitoring at the operations center, observation by covert observer in the shelter, and later study of video tapes.

Operations center observation was carried out by teams of two observers whose major responsibilities were:

1. Maintaining an ongoing log of shelter events, describing activities, and noting their time of occurrence, and the participants.
2. Operating all observation and communication equipment.
3. Video recording (a) a time sample on a one-minute-out-of-five basis of ongoing shelter activities, and (b) all critical events including subject entry and exit.
4. Operating the air blower and monitoring the shelter exhaust air for excess carbon dioxide.
5. Operating the shelter venting system which controlled water level in the shelter.
6. Maintaining a safety watch and coordinating activities of the safety divers.

The covert observation system used a hidden observer behind the forward partition. The partition between this observer and the shelterees

contained a covert viewport disguised as a speaker grill. This observation technique, newly developed by AIR, is described fully under the facility description for the internal stress studies. The observer remained in-shelter for the duration of the stay and kept the same hours as the shelterees so that he would be on the alert during times of shelter activity. He was expected to:

1. Maintain a log of shelter activities to supplement that kept by the topside observers.
2. Maintain intercommunication with surface observers.
3. Maintain a strict safety watch, especially to prevent any sudden attempts to exit until safety divers could arrive.

The video recordings of time-sampled shelter events were reviewed at the home office within several days after the completion of each stay.

Subject Orientation and Training

Subject orientation and training can be critical to any threat stress study since pre-test instructions can strongly affect the anxiety level of those participating in an experiment. The basic problem in an environmental threat study is to provide subjects with the information required to assure their safe participation without at the same time eliminating the perceived threat related to the situation.

The specific problem in this study was to provide the subjects with sufficient training in the use of self-contained underwater breathing apparatus (SCUBA) to permit their safe descent to and ascent from the test chamber without thereby eliminating the subjects' perception of 20 feet of water above them as a threat. The orientation and training program had two basic goals. The first was to provide the subjects with sufficient skills to assure their safety during participation in the study. The second goal was to create the proper attitude on the part of the subjects with regard to the environmental threat associated with this study.

Ideally, the participants in this study would regard their descent to and ascent from the submerged shelter with the use of SCUBA as a

procedure which would be essentially as safe as travel to and from a shelter facility when no radiological hazard existed. Secondly, the subjects were to feel perfectly safe while in the shelter facility as long as the shelter system did not fail (i.e., loss of pressurization, structural failure, etc.). Finally, it was essential for the subjects to regard premature exit from the shelter facility without the use of SCUBA as a major threat to their personal safety.

In order to meet these requirements it was not possible to provide participants in the study with standard SCUBA diving training. A basic aspect of such standard training is to teach the student how to survive without SCUBA gear so that he may successfully deal with any emergency situations that might arise. Since the submerged shelter was at a relatively shallow depth, an emergency ascent from the shelter without the use of SCUBA would present no problem to a well-trained diver. For this reason the training program was directed at making the subject completely confident with, but dependent upon his SCUBA and his two escort divers.

This training was conducted by professional SCUBA instructors who are members of the AIR Human Factors Research Diving Team. The training took place in an indoor pool which was 16 feet in depth. This exceptional pool depth permitted the subjects to experience pressure changes of the order of magnitude they would encounter at the test site. The subjects were instructed in the procedures for equalizing pressure during their descent to the shelter and were shown how to wear and use SCUBA and a face mask.

The primary task of the subjects was to descend a ladder identical to the one at the test facility, move laterally along a guide line and then ascend another ladder. The subjects were constantly accompanied by escort divers during their training.

At a number of points during the training program, the subjects were told about the danger of air embolism should they ascend to the surface from any depth without exhaling. The purpose of this orientation was to serve not only as a safety precaution but also to emphasize the danger

of their external environment should the subjects choose to leave the shelter without SCUBA and escort divers.

In order to instill confidence in the use of SCUBA and to maintain the naivete of the subject with regard to the environmental threat, the participants in this study were not given instructions on the variety of problems which could occur with the use of SCUBA and the various techniques for dealing with these problems. Rather, they were to be completely dependent upon the escort divers. The fact that they were not receiving standard or even adequate instruction as free swimming SCUBA divers was constantly emphasized to the subjects throughout their training and again at the end of the study, at which point the hazards involved in the use of SCUBA could be more fully explained to them.

The attrition rate of the subjects during SCUBA training was approximately 10%. Interestingly enough, a lack of swimming ability did not appear to be related to the difficulties experienced during training. The primary problem encountered was ability to adjust for pressure changes during descent in the training pool, much as one would have to do in an elevator or airplane.

Those that completed this training were apparently confident of their ability to safely travel to and from the submerged shelter. This was reflected not only by verbal behavior on the part of the subjects, but also by the fact that once assigned to a specific sumberged shelter study there was absolutely no attrition within the subject pool.

Shelter Entry and Exit

Because of the purposely limited diving skills possessed by test subjects, special procedures were necessary to assure their safe descent to and ascent from the submerged shelter. These entry and exit procedures are detailed below.

When the subjects arrived at the test facility they were ferried by boat to the operations center above the shelter where they donned their swimsuits and stored their street clothing. They were reminded of proper descent procedures by a dive master. The first four then put on rubber

"wet suit," airtanks, and face masks. During this time a diver in the shelter made last minute checks in preparation for the arrival of the first subject.

At the conclusion of the topside briefing the first subject entered the water from inside the operations shed through the "wet porch." He was assisted by two safety divers who accompanied him as he descended the ladder to a point immediately below the shelter, followed a hand line a short distance to the access hatchway on the underside of the shelter, and pulled himself up into the shelter. The inside diver then checked him to assure that he had equalized pressure properly, released the safety divers, and helped the subject remove the diving gear.

The safety divers then surfaced to assist the descent of the next subject. Upon their return, they took the equipment removed from the first subject back to the surface to equip another subject for descent. This procedure was repeated until all eight subjects had been escorted to the shelter.

After entry was complete, a staff member descended to the shelter and presented the shelterees with a final short safety briefing. At the conclusion of the briefing the staff members and diver exited, marking the beginning of the shelter stay. This occurred between 5:00 pm and 5:30 pm Saturday.

The shelter stay was officially terminated Sunday at 3:00 pm with an announcement over the shelter loudspeaker telling the shelterees to prepare for exit. Divers then entered with the necessary diving equipment and subjects were removed as they had entered, one at a time and assisted by the two safety divers. Rate of ascent was strictly controlled by the divers, thus permitting sufficient time for the subject to equalize pressure while returning to the surface.

Study Scenario

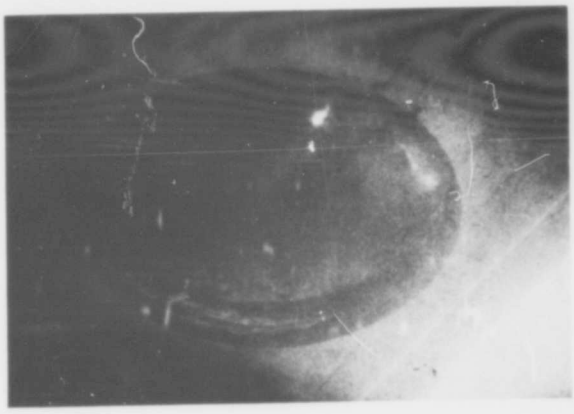
In keeping with the experimental design which required the isolation of the submerged shelter from any outside problem inputs, little in the way of an official scenario was developed. The few events that were programmed are described below, together with those which although under shelteree control, were consistent between studies.

Shelter Time	Event
One-half hour prior to subject arrival	Covert observer entry and check. Observer descends, checks out shelter life support and communications equipment, and enters concealed observatior chamber.
First Hour (4-5 pm)	Shelter entry. Subjects were dressed in wet suits, face masks, and SCUBA and descended to the shelter one-by-one, where a diver assisted them in removing their gear and suits and permitted them to don dry sweat suits.
Second Hour (5-6 pm)	Complete shelter entry and shelteree briefing. Project staff member enters shelter and briefs shelterees on safety rules. His exit marks the beginning of the shelter stay.
Evening (8-9 pm)	First water level excursion. Water level permitted to rise in the shelter to the level of the flooring (approximately 8 inches), remain stationary for a time, then recede to its original level.
Evening (10-11 pm)	Preparation for sleep and bedding down. (Under shelteree control).
Morning (7-8 pm)	Shelterees begin day's activities (Under shelteree control).

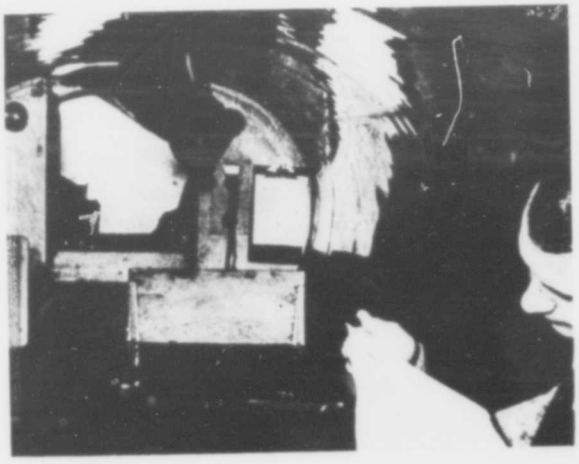
Morning (10-11 pm)	Second water level excursion similar to the first excursion.
Afternoon (3 pm)	Exit announcement. Divers enter with wet suits, face masks and SCUBA. Shelterees suit up and ascend one-by-one with divers assisting.
Afternoon (4-5 pm)	Observer exits. After subjects have dressed and left the topside facility, covert observer exits observation chamber and ascends. Air and power to the shelter are then shut off.

THE SHELTER

View Of Submerged Shelter As Seen From Above

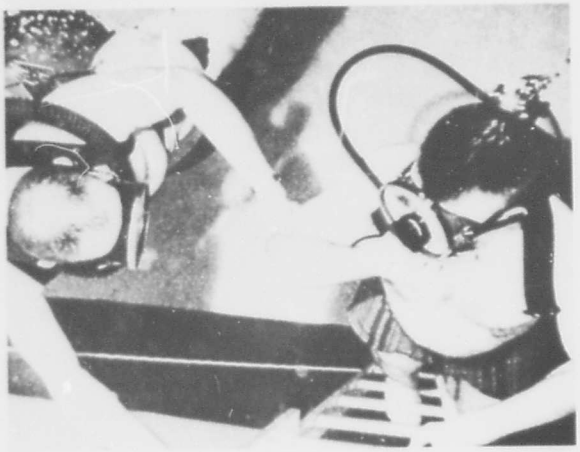


Entry Hatch As Seen From Just Beneath The Shelter. Note Light Inside Shelter.



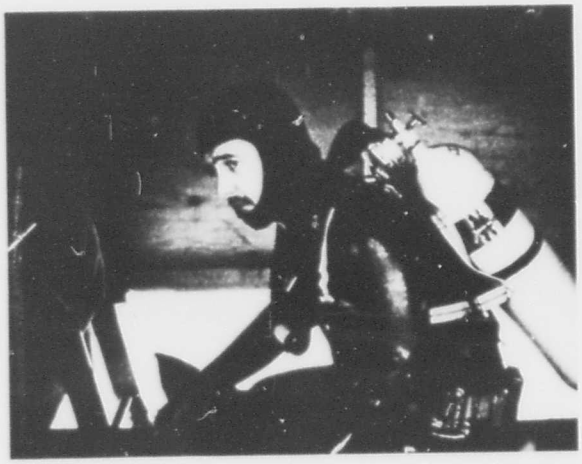
View From Entry Hatch Toward Rear Of Shelter. Panel With Writing Board Was Later Inserted In Forward Bulkhead.

Forward Bulkhead. Diver Sits At Observer Station Which Later Was Concealed By Break-away Panel.



Subject Undergoing SCUBA Training.

Orientation Of Subjects Prior To Descent To Shelter. Note Female Escort Diver In Background.



Escort Diver Awaits Next Subject For Descent From "Wet Porch."

Escort Diver Surfaces Following Shelter Entry

Standby Divers

Communications Console

TV Monitor And Video Tape Equipment. Observer Is In Contact With In-Shelter Observer.

View Of Shelter Via TV Monitor

CONDUCT OF THE INTERNAL STRESS STUDIES

Subject Facility

A new laboratory for the study of internal stress was constructed in the recently completed AIR Pittsburgh office building. (See Figure 2) The subject environment was a room ten feet by twenty feet, with a suspended acoustical ceiling seven feet from the floor. An electrical closet about five feet square opened from the main subject space. OCD stocks for each study were stored here and guidance materials were clipboard mounted on the outside of the closet door. Although the subject space contained two doors at opposite ends, only one (in a short wall) was used for primary access. The other remained locked, to be opened by the experimenters in case of emergency. A housing for public address speakers was mounted beside the primary door.

Illumination was provided by six flourescent fixtures mounted above the suspended ceiling and consuming a total of 480 watts. The subjects had no switch to control this light. An emergency 100-watt incandescent lamp, served by a separate circuit was similarly mounted and controlled by the observers. All wall plugs in the room were rendered inoperative.

The subject environment was finished and furnished as a dual-purpose shelter in its "primary" configuration; a representative lower-management office. The primary access door bore the legend "laboratory director." The space contained one desk, one leather swivel chair, one desk lamp, one in-out box, one desk organizer, a mirror, several visitors chairs, one bookcase, five coat hangers on a pipe, a waste basket and a half-full ashtray. Papers, pencils and reports occupied the desk. The bookcase contained two used ten-watt public address amplifiers, an inoperative circuit board assembly of electronic parts, a partial roll of electrical tape, a full caulking gun, an empty electronics box, a roll of chart paper, switch panels, a box of small parts and fittings, a wiping rag (used), a pencil sharpener, two old in-out boxes, and numerous small fittings and parts.

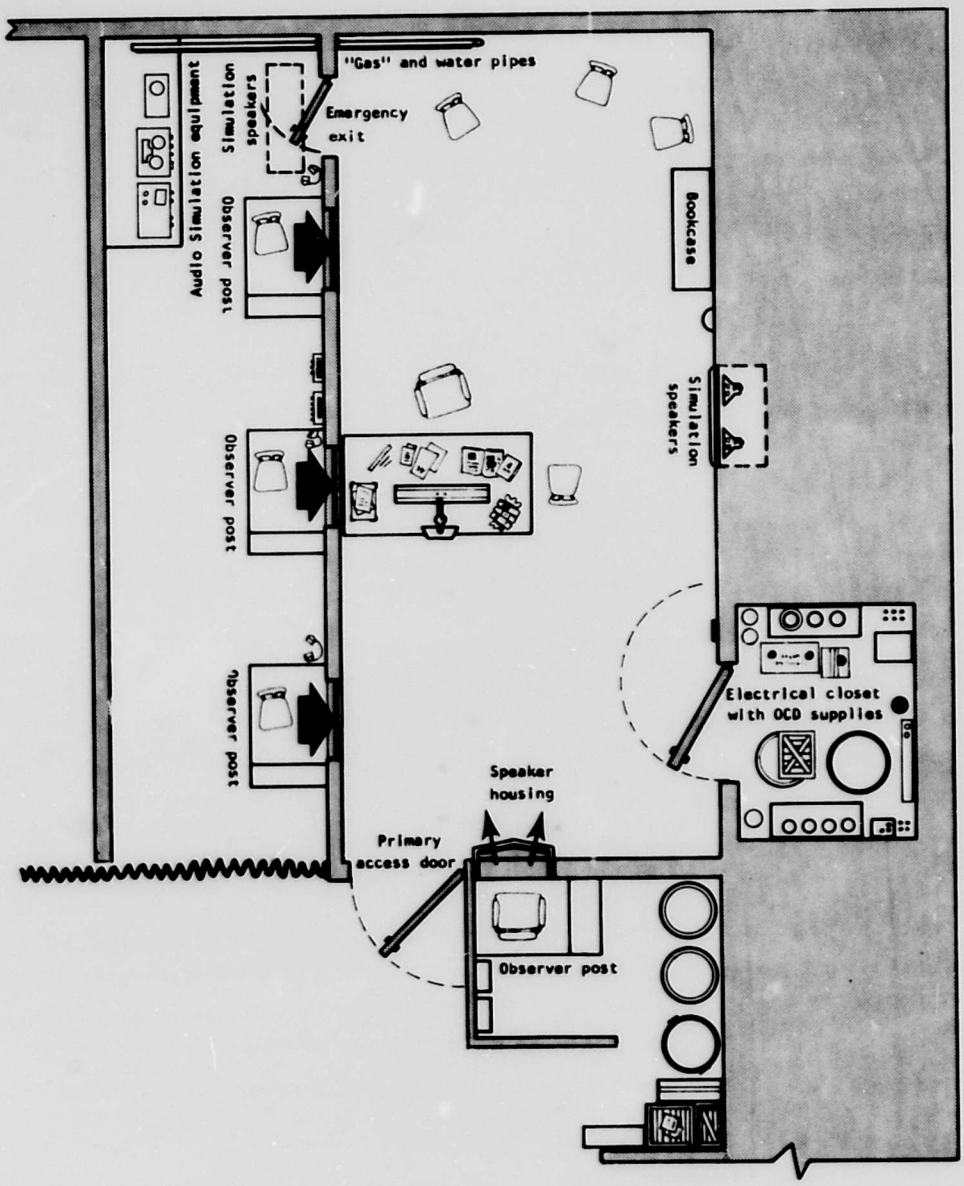


Figure 2. Internal stress facility floor plan

Two pipes entered one end of the room near the ceiling, ran six feet, turned upward and passed through the ceiling. The lower of the two was 3/4 inch steel pipe, labeled "cold water." Just before it turned to enter the ceiling, a tee fitting and valve labeled "drain" was installed. The upper pipe was 1 1/4-inch steel pipe, labled "gas." Where it reached the elbow, the last 1/2 inch of thread was broken off and the remainder merely butted against the elbow fitting which was held in place by the pipe which penetrated the ceiling and was anchored out of sight.

Subjects were observed from two adjoining walls of their space. These walls were two-by-four studding, faced on both sides with 1/4-inch plywood, and soundproofed with plasterboard and rock wool batts between the studding. This effectively prevented observer sounds from reaching subjects. The subject side of the long wall was covered with blue burlap and the short wall was painted to match prior construction.

Observation and Operations

The main observation chamber occupied a six-foot-wide space running the length of the long wall. It contained three observation stations. Each station was located on a carpeted platform with a 30-inch stool mounted on it. This placed a seated observer's eye level near the seven-foot ceiling within the shelter.

Ports were cut through the partition at these points, and glazed with blue plexiglass, flush with the plywood facing of the subject side, but behind the undisturbed burlap covering. This allowed satisfactory vision into the illuminated subject space, while the ports remained invisible from the subject side, although observers had some supplementary red illumination. Each port was provided with a "blackout screen" which was used when the subject space was darkened for power failure simulations.

Four cardioid pattern microphones were mounted above the ceiling in the center of the subject space. Each was angled downward, one toward each corner. The acoustical panel directly below was shaved thin from the microphone side, allowing the pattern holes to penetrate. The microphone signals were fed to a mixing and amplification system mounted at the

center observation station. The senior staff member, who generally occupied this post, could use this system to select the area of the subject space to be monitored at any time. Each observation station had a pair of earphones, equipped with volume controls, which received the resulting signal. Filters associated with the signal mixing system alleviated problems of equipment noise and background hum.

Audio simulation equipment was assembled on a single table in the main observation chamber. Weapon blast was simulated with about 20 seconds of pre-recorded sound effects, played from 1/4-inch magnetic tape through a 40-watt stereo amplification system. Two speaker complexes were used, one faced against the locked emergency exit door, and the other across the room, concealed behind a grill in a sealed-off cold air return duct. Each was driven by one amplifier channel at maximum output.

"Emergency Broadcast System (EBS) messages" and "paging system" simulations were pre-recorded on a single 1/4-inch tape. From a tape player on the audio simulation table, this programming was played back through a remote speaker mounted in the speaker housing beside the main door.

This speaker housing formed the nucleus of the second observation chamber. Its chief function was as another viewing port which also employed the technique of fabric-covered plexiglass. In this case, however, the fabric was thin grille-cloth, mounted in a twelve-inch circular opening in a square of plywood. Two such squares were set at about a 150° angle to each other, and the four sides of this assembly were enclosed as a backless box, forming a "speaker enclosure" from the subject's side when mounted on the wall. From the observer's side, it formed a wide-angle view port, through to the two angled faces. For further camouflage, a five-inch speaker was actually mounted in a corner of the housing, serving as the previously mentioned remote speaker for EBS and paging system simulations.

Since this observation point had a superior view of the primary access door, a light-signal system between this post and that of the senior observer was used to alert the senior observer to significant occurrences.

A radio-frequency field, generated by a primitive spark-gap transmitter, was employed to simulate radiation. The signal was detected and amplified by devices built into a normally stocked OCD radiation meter (CD V 700) using the probe lead as an antenna. A meter movement which read "roentgens" was substituted for the existing one which read "milliroentgens," to simulate dangerous short-term-exposure radiation levels. Signal strength and receiver gain were pre-set to read 500 R near the transmitting antenna, which was deployed about ten feet outside the "shelter", in front of the primary access door. The field diminished in intensity as a monitor retreated into the "shelter area" but an appreciable reading could be obtained in about half of that room. To avoid confusion of the part of subjects regarding the desirability of evacuating the "shelter" it was decided that the transmitter would only be operated when subjects were monitoring within three feet of the primary access door.

A gas leak simulator was constructed. A blower was connected by a flexible duct to the 1 1/4-inch pipe which passed through the subject space. A threaded fitting, mounted on the underside of the blower housing, accommodated a jar containing n-butyl mercaptan in an alcohol solution. The passage of air over the mouth of the jar tainted the air sufficiently for the purpose. In practice, the blower was on at the beginning of a study, and the jar of butyl mercaptan solution was installed silently at the appropriate point in the special effects scenario. This prevented the sound of the blower from being associated with the "gas leak." At the same point in the scenario, a retracting mechanism was activated, w which caused the "gas" pipe to be separated 3/4 inch under spring tension from the elbow fitting in the subject space at the prepared "break."

A means of augmenting water supplies was provided from a five-gallon tank full of water mounted in the main observation chamber eight feet from the floor. This tank was connected to the 3/4-inch pipe, labeled "cold water" which passed through the subject space. When subjects opened a drain valve in that pipe, water flowed out under force of gravity until

the negative pressure in the tank became great enough to halt the flow. This simulated the "lock" effect to be expected in tapping unpressured pipes without an opening above the drain point. A valve in the tank permitted the experimenters to restore atmospheric pressure to the tank, simulating self-correction of the "lock" over time.

Subject Orientation

The practice of information control in processing subjects is crucial to the success of the present internal stress technique. There are several reasons for this:

1. Prior knowledge of problem simulations would modify subject responses to the problems.
2. The desired perception of isolation on the part of subjects could be maintained only if they remained ignorant of observation techniques.
3. Concerns over separating from other family members could only appear if subjects had no reason to believe that absent family members were safe at home.
4. Anticipating reactions to emergence would appear if subjects suspected the studies would terminate in 24 hours.

Therefore, each contact with subjects, whether written or verbal, was carefully planned and controlled. The possibility of family separation, for example, was mentioned just once to subjects, in the first letter or phone call responding to an application: "In the course of the study, members of the same family may be assigned to different rooms. In no case will children be separated from both parents." (See Appendix A for full text.) Thus they were made aware of the possibility, but not reminded of such separation as a likelihood. Additionally, this permitted the misconception that more than one shelter area existed. All such false impressions were corrected clearly before subjects were released at the conclusion of a study.

Subjects and alternates for the internal stress studies were notified to report for a specific study by letter and/or telephone and given the following instructions.

1. Date, time and place (6:00 pm, Friday, AIR).
2. Be prompt.
3. Park in the AIR garage.
4. Casual clothes should be worn.
5. Bring only items you might ordinarily have on your person.
6. Be prepared to remain until 5:00 pm Sunday.
7. Make necessary arrangements in case you should wish to leave early.

The full letter is given in Appendix A.

When subjects arrived in the building lobby, they were guided immediately to a processing area. This separated subjects driven to the study by others from their drivers. The drivers were then intercepted by staff members and informed of their rider's true exit time (as opposed to Sunday night as subjects had been allowed to believe).

Meanwhile, as subjects arrived at the processing area, they had their pulse and temperature taken and received an upper-respiratory check. When any abnormal symptoms were found, a physician's judgment was obtained.

Subjects then moved to a second processing station where first, their file of forms was checked for completeness. Any missing forms were obtained. Second, they were allowed to check any items they wished, plus all items specified by the experimenters. The specified items included food, radios, weapons, and keys.*

*All keys were taken from all subjects so that those who were to be separated from their families and sent home could be given the necessary car and door keys, which might otherwise be in the hands of remaining family members.

When pre-processing was completed and all subjects were present, (approximately 6:45 pm) the pre-selected alternates were removed from the processing area, informed that their services would not be required, and sent home.

Those remaining were issued identification numbers (pinnies) to be worn on chest and back. When they were all in place, the subjects were given a verbal briefing which included the following points.

1. The study theme centers around nuclear attack.
2. You should act in accord with this theme.
3. Sealed rules for determining pay are posted in your space.
4. They may not be opened until after the study.
5. You can assure your "survival" by behaving correctly in response to the attack scenario.
6. Do not damage the facility or interfere with electrical equipment.
7. Obey any "do not touch" signs.
8. Assume you've been walking in the area when you heard the attack warning. You will be directed to shelter.
9. Treat any problems which may confront you as real.
10. Forfeiture of honorarium may result from either premature opening of rules or premature exit.

A transcript of the briefing may be found in Appendix A.

A group of subjects, including all separatees and their participating family members, was then called out and taken by elevator to the laboratory floor. When the elevator doors opened, waiting staff members halted the group. One said,"The following people will go that way--to your left." A list of names was then called: A "planted" staff member, two wives and several children of one of the wives. They were sent down the hall in one direction with a staff member while the remainder were led away

in the opposite direction and the subjects remaining in the processing area, all participants, were then escorted in two groups into the test facility and left to their own devices. Meanwhile, the separatees were debriefed and de-hoaxed by the project director, who made whatever transportation arrangements were necessary.

Subjects, at the time they entered the shelter,had the following possible erroneous misconceptions regarding their participation as a result of careful misdirection in the information control process:

1. Another shelter test was being conducted simultaneously.
2. Those who had been separated from the group were in the "other shelter" test.
3. Their occupancy of the test facility would continue for 48 hours.
4. Everyone who was processed with them was a bonafide subject.
5. They would not necessarily receive continuous "live" observation.

Study Scenario

The special problems and simulations programmed into the studies were presented on a fairly rigorous schedule. The scenario of special events is as follows. The first evening's events were assigned in terms of hours and minutes after entry, due to small unavoidable variations between the two internal stress studies.

Time	Event[1/]
Entry	EBS #1: Warning of imminent attack, repeated three times.
E + 0009	EBS #2: "Attacks west of the Mississippi. None reported in this area."
E + 0010	Blast simulation: Audio effects, vibration, flickering shelter lights.

1/Texts of messages are abstracted.

Immediately following	Gas leak simulation via "broken" pipe resulting from blast. This simulation was continued until subjects had effected repair.
E + 0020	Staff member enters, simulating separated shelteree from the "other shelter." He carries extension lamp from lighting kit.
E + 0035	EBS #3: Emergency operations center request for number of additional shelterees each shelter can take.
E + 0040	Radiation simulation on.
E + 0125	PA #1: People experimenting with public address gear: "Can you hear us out there?" etc. -- pause for reply -- "Aw, forget it."
E + 0307	EBS #4: "Fallout began several hours ago. Radiation is high. No one should leave shelter. No nuclear detonation near here. Power failure in the area."
Immediately following	PA #2: "We heard you," other voices -- "Nah, it's supposed to be a radio." "Maybe it only works one way."
E + 0345	PA #3: "We have no food, but ample water. Our location is . . . Please bring us food."
9 am Saturday	Light failure: Emergency lighting kit operated immediately.
10 am Saturday	PA #4: Irritated, somewhat heated exchange over seating space in the "other shelter" (microphone is "accidentally" on)

2 pm Saturday	PA #5: "A youngster has injured his finger, wants a bandaid, and probably needs some first aid supplies if he and his mother are to remain in shelter."
3 pm Saturday	EBS #5: "Fallout has stopped. Radiation is still high. No one should leave shelter."
4 pm Saturday	Light failure: Emergency lighting kit operation delayed five minutes.
5 pm Saturday	PA #6: System turned on -- only background noise. (Simulating children playing with "paging system" in the "other shelter.")
	CONCLUSION OF STUDY. Experimenter entered, notified group of termination, stressed that this was according to plan had subjects gather their personal property, and led them to a debriefing room.

Subject Debriefing

Immediately upon termination of their shelter stay the shelterees were taken to another room and debriefed. The first matter covered in this debriefing was the scoring of the shelterees' "survival" during their shelter stay. The rules that had been established for this scoring were reviewed with the subjects and their performance in relation to these rules was discussed. They were informed of their survival score and thus the amount of money they would receive for their participation, and the basis for this scoring was explained.

The second and major purpose of this debriefing was to "de-hoax" the subjects. This "de-hoaxing" involved clarification of all misconceptions the shelterees might have had concerning their shelter stay which could have resulted from information inputs and other manipulations by the experimenters. Such a clarification is necessary for ethical reasons in any study and assumes particular importance in a high stress study where subjects who have been mislead at some point during a

study will tend to resist any additional information inputs by the research staff.

This de-hoaxing was conducted by the project director, who had not previously addressed the subjects and thus was not subject to as much suspicion as the other members of the research staff. The project director systematically covered each possible misconception by the subjects. Reference was made to each misleading input which the shelterees had received and the actual situation was carefully explained to the subjects.

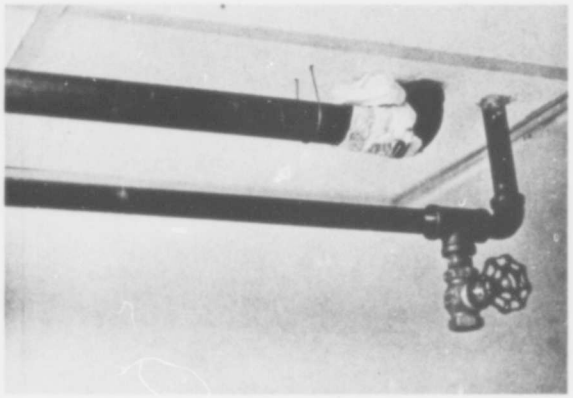
Specifically, subjects were told that the study had officially terminated; that it was planned as a 24-hour rather than a 48 hour study. They were informed that there was only one simulated shelter area involved in the testing, and that was the shelter in which they were located. They were told that the people who had been separated from them earlier had been sent home immediately following separation, and that the visitor who had entered their shelter later was a member of the research staff. They also were told that the lighting kit was operated by the research staff and that the transmissions that they had heard over the public address system were pre-recorded by the staff. In each case, the reasons for misleading the subjects were carefully explained to them.

Subjects also were reassured that the "dangers" which they had confronted during the shelter stay were simulated. Particular emphasis was placed on the fact that radiation readings which they received were not generated from an actual radioactive source.

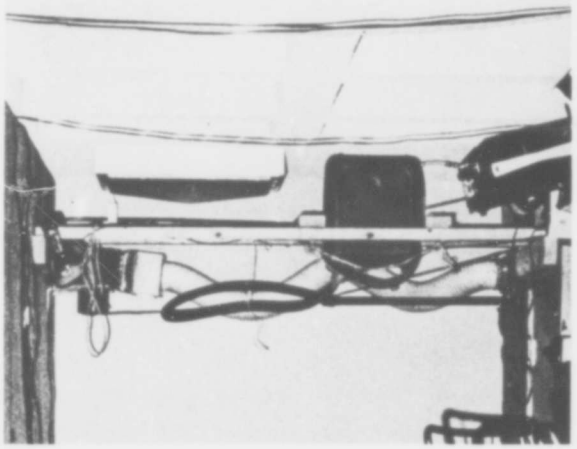
Finally, the subjects were admonished not to discuss the study in which they had participated and were reminded of the agreement and release form that they had signed. This was felt to be especially important in this study because the information which had been provided to the subjects during their de-hoaxing was exceptionally detailed. While the subjects were permitted to ask questions following the debriefing, the research staff would not discuss any information not related to the clarification of any misconceptions on the part of the subjects. For example, the shelterees were not told the methods by which they were observed

during their shelter stay, even though they showed great interest in this subject.

SIMULATION



Water And Gas Lines Following Repair of "Gas Leak" By Shelterees



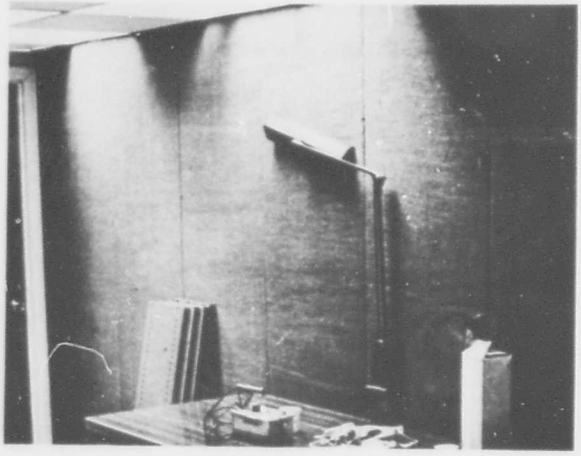
Equipment For Water And Gas Simulation

SUBJECT PROCESSING

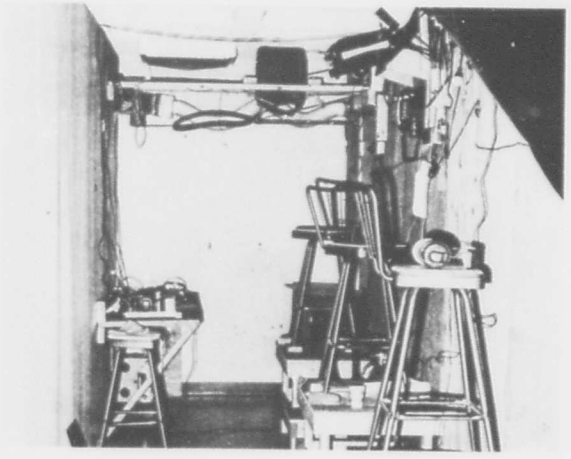
Subject Check-in

Final Medical Check

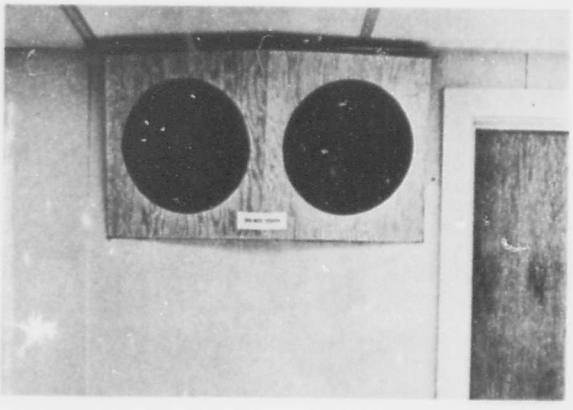
OBSERVATION FACILITIES



View Of Shelter Wall Containing Hidden Observer Ports.



Observer Area On Opposite Side Of Shelter Wall



Shelter P. A. Speaker Housing

View Of Shelter Through P.A. Housing

IMPACT OF FAMILY SEPARATION

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RESULTS

GENERAL

The results obtained for each behavioral measure are presented below. Survival Set and Tension are described first. These two measures are of primary interest in evaluation of the two set-simulation research techniques. The results obtained under the other four behavioral measures, which relate primarily to the evaluation of full versus abbreviated guidance, are then presented. The implications which all of these measures hold for the evaluation and comparison of research techniques and guidance materials will be presented under Discussion and Conclusions in the next section of this report.

SURVIVAL SET

The survival set of the subjects appeared to be quite similar within the context of each set-simulation technique; that is, both groups of subjects exposed to environmental threat responded similarly in terms of their survival set. The same was true of both groups who were exposed to internal shelter stress. Some notable differences were observed between the two set-simulation techniques, however.

Environmental Threat

The subjects who were exposed to environmental threat were alerted to only two basic threat elements; potential flooding of the shelter area and potential contamination of the shelter atmosphere. The subjects in both environmental threat studies duly monitored these two threat elements. Gross changes in the water level at the shelter entrance hatch could be detected by casual visual inspection. Visual monitoring of the water level was formalized only to the extent of posting a night watch in the vicinity of the entrance hatch. In most cases the water level in the shelter had risen several inches before it was detected by the shelterees. Once a change in water level was detected, both groups of shelterees quantitatively measured water penetration.

CO_2 monitoring, involving use of the detection equipment stocked in the shelter, was conducted at irregular intervals during both underwater shelter stays, but with sufficient frequency to insure the safety of the shelterees.

In spite of adequate monitoring, the shelterees in both environmental threat groups demonstrated very little concern about either of the threat elements exceeding tolerable limits. Individuals not directly assigned to a monitoring task paid little or no attention to monitoring activities. This was true even when the water level was actively rising within the shelter area. When the water level reached a maximum level (approximately level with the floor boards of the shelter) the subjects expressed concern only over the possible discomfort if blankets were wetted. Comments concerning the possibility of major flooding in the shelter were made only in a joking manner, i.e. "It won't get higher than 3-1/2 feet" (the height of the ceiling as measured at the small end of the shelter).

It is probably important to note that the subjects' apparent lack of concern while in shelter did not extend to a casual attitude regarding the threat element itself. Several concerns for safety while passing through the threat element were noted at entry: "Number__ indicates fear to diver, then laughs nervously;" "Number__ stares anxiously at hatch (while his mother descends)." The participants in one study seriously discussed the "free ascent" technique just prior to their exit from the shelter, and one shelteree who had appeared unconcerned during the shelter stay panicked during her ascent from the shelter.

A striking negative finding of the environmental threat studies was that not a single reference by the subjects was detected, to any threat element other than a gradual increase in water level or atmosphere contamination. No mention was heard of the threat of fire in the shelter even though it appeared that cigarettes burned faster in the shelter due to the relatively high partial pressure of oxygen in the atmosphere. More interestingly, the subjects never expressed concern over a major structural failure of the shelter facility (a factor which was of some concern to members of the Institute's staff who served as subjects in pilot testing of the environmental threat technique).

Finally, perhaps due to the smallness of the subject population, the subjects in both environmental threat groups paid considerably less attention to non-threat related activities such as food, water, sanitation, etc., than is ordinarily found to be the case during experimental shelter exercises. Functional teams were designated in both studies, but their activities were on a response-to-expressed-needs basis, with very little attention being paid to rationing, periodic inventory, and other planning or administrative tasks.

Internal Stress

In both of the internal stress studies, the subjects were almost fanatic in the attention they paid to the technical problems imposed by the experimental situation. Monitoring of the threat element (simulated radiation) was vigorous and close attention was paid to all other problem areas. In addition, the subjects continuously expressed real concern over the possibility that the threat elements would exceed "tolerable" limits. Interestingly enough, there was little reference to money as part of these expressions of concern. The response of both internal stress groups to the various technical problems is summarized below.

In both internal stress studies, subjects made responses appropriate to a nearby explosion during blast simulation. They dropped to the floor with only slight hesitation and remained prone through the conclusion of the simulation. An observer noted that "the blast really got a reaction out of them." The subjects detected the "gas leak" and located its source within one minute after the blast. They proceeded to seal it with caulking compound and tape after trial and error in both situations. No one in either study smoked or struck a spark during the period of simulated explosion danger. In one group smoking was suspended for the duration of the study.

Subjects in one of the internal studies located the radiation monitoring equipment immediately upon shelter entry and utilized it in an exploratory mission outside the confines of the shelter prior to a simulated descent of fallout. During this exploratory mission they managed to acquire

some provisions for use during their shelter stay. In both studies, radiological monitoring was performed at intervals approximating one-half hour throughout the shelter stay. Shelterees expressed considerable concern when the meter was dropped accidently in one study. During one study one individual emerged from the shelter while radiation was being simulated, but only briefly. The purpose was to take a radiation reading outside the shelter and the individual did not remain outside the shelter long enough to receive simulated injury. In addition to monitoring, the subjects took several steps to protect themselves from radiation by placing furniture and steel shelving against the door (from which a high radiation reading was obtained). One group also designated an area around the door which they regarded as "dangerously hot." Some observer log references were· "subjects carefully avoid going into 'hot areas'" and "number__ says 'don't touch the door, it's red hot.'" Both groups were concerned with the possibility of inflowing air carrying fallout with it. To prevent this, the cracks under both doors were stuffed with toilet paper, and one group covered a ventilation grill with plastic. A child was overheard asking her father whether "the radiation business is make-believe."

While no subject even tasted the "bad" water placed in the shelter, one group treated it with halazone and then filtered it, using the douche bags stuffed with sanitary napkins, and maintained it as a reserve supply. The other group apparently never considered drinking "spoiled" water and employed the can and its contents as a sanitation kit.

Both groups found the supply valve for the simulated auxilliary water supply and began tapping it within 14 and 32 minutes of shelter entry, respectively. The group that had used the water drum as a sanitation kit then used their sanitation kit as a recepticle for auxilliary water. The other group used an empty waste basket. (Since this waste basket was old and dirty with unknown substances, the experimenters found it necessary to remove this container and substitute 5 gallons of fresh water in a drum. In actual practice the subjects procedure probably would have been safe because they halazonated the water in the waste basket).

EBS messages were generally received with careful attention by both groups and the shelterees discussed the impact of any new information. Where action was called for by an EBS message, it was taken. For example, the message indicating that additional shelterees might arrive resulted in both groups discussing the number of additional shelterees that they could accept.

Observations made during the family separation stage of subject processing reflect the inception of strain on the subjects in both internal stress groups. This stress seemed due in part to the subject perception of stress in those being separated from them. One child was noted as "whimpering when separated from father." In the case of a large family which included an infant, much of the stress of separation arose from the hurried division of child care supplies between the separating parents.

During the shelter stay "paging system" messages were carefully attended to, and these simulations of another shelter had considerable impact upon the shelterees. Efforts were made to identify the voices from the paging speaker as those who had been separated. Strong attempts were made to communicate with the other shelter by calling aloud to the speaker, knocking on pipes, tapping into the building's telephone system using a speaker as a microphone, and even by attempting to crawl through the ventilation duct work. Subjects whose families were separated expressed concern for the welfare of those "in the other shelter." Observer logs report: "Number__ wonders how his baby is doing with no food"; "Number__ says 'My wife has a bad enough time just being at home with those kids!'" Other shelterees made references to the "other shelter" as a better place to be.

The subjects in both of the internal stress studies paid considerable attention to the possible occurrence of further problems of sorts which had not arisen yet. As was already mentioned, both groups expressed concern (in the form of corrective action) about fallout entering the shelter--a contingency which was not simulated. Additionally, one group prepared emergency plans to cope with evacuation, fire, bad air, and light failure.

The subjects also showed concern over other threat contingencies less directly related to the specific problems to which they were exposed. For example, one subject was overheard to say "we had better fill our water supply before a missile attack comes." Heated debates arose over rationing; whether calculations should be based on a two-day or two-week stay. Both groups recognized the need for careful rationing of supplies and went so far as to limit themselves to one cup of water a day.

Finally, there were surprisingly few references by the subjects to the "real world" outside their simulated shelter. During both of the internal stress studies, a total of only 8 references to the shelter or its equipment as part of a research facility were noted. Such a small number of extra-shelter references is without precedent in previous shelter research.

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TENSION SCORES

Due to a malfunction in the video tape recorder during the study of abbreviated guidance under environmental threat, it was not possible to obtain tension scores for that cell of the experimental design. The data obtained for the other three studies are presented in Table II. T-tests were performed to assess the differences between the mean tension scores.

Table II

Mean Number of Tension-Related Responses

RESEARCH TECHNIQUE	Type of Guidance: FULL	Type of Guidance: ABBREVIATED
Environmental Threat	Showing Tension = 87 Releasing Tension = 63 Total = 150	
Internal Stress	Showing Tension = 11 Releasing Tension = 11 Total = 22	Showing Tension = 26 Releasing Tension = 11 Total = 37

All three (showing, releasing, and total) tension scores for the full guidance environmental threat condition are significantly higher (.01) than the scores obtained under internal stress. The average frequency with which tension-showing responses appeared with the use of abbreviated guidance under internal stress is significantly greater (.01) than the frequency found with the use of full guidance under internal stress. This, in turn, leads to a significantly nigher (.05) total tension score for abbreviated guidance under internal stress.

While dramatic differences appear to exist, particularly between the two research techniques, interpretation of these results must be moderated by an awareness of extraneous differences between the experimental conditions which could affect the tension scores. The two obvious extraneous discrepancies between the two experimental groups are the absence of children in

the environmental threat tests, and the difference in group size between the environmental threat and internal stress studies. As was expected, the children who participated in either of the internal stress studies exhibited far fewer tension-related behaviors than did the adults. In order to correct for this bias, the data presented in Table II include only adult tension scores. This provided an N of 12 for the full guidance study and an N of 13 for the experimental group which used abbreviated guidance.

Another difficulty which arises with the use of children in only the internal stress studies is that adults may tend to suppress tension-showing responses in the presence of children, while at the same time children may tend to elicit the tension-showing responses from other adults. The data could not be corrected for this factor. It could only be hoped that the two tendencies would cancel each other.

It might be hypothesized that the difference in group size between the environmental threat and the internal stress studies would produce a difference in general response frequency which would be paralleled in counts of tension-related responses, and thus in the tension scores. It was possible to test this hypothesis in at least a limited fashion, since six additional Bales-type response categories were recorded during the course of the studies. These responses were recorded in connection with an ancillary study to examine the relationship of individual characteristics and shelter leadership (AIR, 1967). They included "giving information," "asking information," "talking to self," "physically directing others," "physically responding to others," and "acting alone." Although the total of these responses and tension-related responses cannot be considered as an inclusive index of the general response level of the subjects, it was thought to be an adequate baseline against which to compare the frequency of tension-related responses. Within each test, the percentage of each individual's "general response" which were tension-related was computed. The mean of these percentages for each of the three tests is reported in Table III.

Table III

Means of Individual Ratios:
Tension-Related Responses to "General Response Levels"

		Type of Guidance	
		Full	Abbreviated
RESEARCH TECHNIQUE	Environmental Threat	0.47	(no data)
	Internal Stress	0.29	0.47

An F-test performed on these means indicated significant differences (.01) among them. T-tests confirmed inspection, showing that the internal stress, full guidance condition was significantly lower (.01) than either of the other two means. Thus, when the activity level correction is applied, the difference between the two research techniques is still confirmed. Suprisingly, the difference between the guidance types is enhanced and increased in significance. The latter difference may reflect a tendency of full guidance to reduce tension in shelterees. This possibility is discussed later in this report. (See pages 84-85).

Finally, one must consider the possibility that tension-related responses might be suppressed to a different extent in different sized groups. Unfortunately, there was no way available to predict either the direction or extent of such a relationship.

MANNER OF GUIDANCE USE

Examination of observer notes in terms of the nine data areas outlined for manner of guidance use revealed no important differences across guidance types in four areas. Moreover, most differences across set-simulation conditions are attributable to sheer difference in group size and have no implications for the present research goals.

The manner in which full and abbreviated guidance were used will be compared in terms of the five differentiating data areas:

Speed of Guidance Recognition

"Recognition" is defined as the moment when someone first removes the guidance material from its initial place. Since, in the environmental threat condition, entry required about an hour, there was a considerable period prior to the official beginning of the "shelter stay" during which early arrivals could familiarize themselves with some aspects of the shelter. The times noted in Table IV are the number of minutes after the official start of the studies at which guidance was first recognized. While a statistical comparison between research techniques is not possible, it is clear that in both environmental conditions, abbreviated guidance was recognized faster.

Table IV

Time of Guidance Recognition

	FULL	ABBREVIATED
Environmental Threat	15 Min.	0 Min.*
Internal Stress	5 Min.	3 Min.

*(In the abbreviated guidance, environmental threat conditions, the guidance was picked up prior to the official start of the study).

Dissemination of Guidance

Two different approaches to task management were observed in the full guidance studies. In the environmental threat condition, a strong manager emerged who took personal charge of the handbook and read lengthy sections aloud to the shelterees. (Since the shelter group contained only eight persons, all [illegible] task functions.) In the internal stress condition, on the other hand, several individuals in succession read a part of the book, attempted to apply the guidance, and were rebuffed by the group, after which someone else would try to master the recommendations and start shelter operations going.

In the abbreviated guidance studies, less autocratic methods prevailed. Under the threat condition, one man began reading the guidelines to the group, but he was soon joined by another who supplied interpretations and encouraged comment. In the stress condition, although one man promptly and smoothly assumed leadership by following the first instructions in the abbreviated guidance, he subsequently decentralized control of the guidance. It was divided in half, and both halves circulated throughout the shelter. Some portion of the guidance materials was read by all who had reason to do so by virtue of their assignment.

Thus, in the groups possessing full guidance, either one person or several in succession tried single-handedly to master and implement instructions. Where abbreviated guidance was supplied, more cooperative effort appeared: a two-man joint effort in the threat condition, and division and circulation of the guidance itself in the stress condition.

Attentiveness of Shelterees to Guidance Dissemination

The manager of the full guidance study under environmental threat conditions read at length from the guidance. Eventually group pressure rose to the point of halting the readings. However, until this point the shelterees listened quietly, giving the guidance their full attention during several hours of reading. Under internal stress conditions, when

several subjects consecutively tried to instruct the group on the basis of the full guidance, they tended to become enmeshed in detail and soon lost the group's attention.

In the two studies conducted with abbreviated guidance, in which the material was discussed in the threat group and circulated in the stress group, guidance was consistently received attentively.

Application of Guidance to Tasks

When the two set-simulation conditions were compared in terms of guidance application, only one clear trend was identified which could not be readily attributed to differences in group size. This was the amount of reference to guidance during specific task performance. Those carrying out shelter set-up operations in the environmental threat condition referred extensively to guidance, whether full or abbreviated. On the other hand, in both internal stress groups only brief reference was made to guidance during the performance of shelter functions, regardless of guidance type.

Subject Comments on Guidance

The subjects in all studies, not knowing the purposes of the research, unfortunately did not volunteer their evaluation of the guidance materials to any extent. Only one pertinent comment was recorded but its insightful nature warrents its inclusion here. During the post-occupancy debriefing session, an informal leader of a full guidance group expressed the feeling that the guidance should be made easier to use, by providing an outline, an immediate actions list: "maybe just highlight...the important things... You could take care of these first, and then go on to some of the minor things."

AMOUNT OF PARTICIPATION IN SHELTER FUNCTIONS

Table V presents the mean number of different functions participated in per person (versatility) for both types of guidance. The data are compared separately for the two set-simulation conditions. Table VI gives the mean number of participations in any function per person (function-participation score) for each study. Although Table IV shows consistent differences between guidance types, when t-tests were performed comparing the means within set-simulation conditions for both measures, none were found to differ significantly.

Table V

Mean Number of Different Functions Participated in Per Individual

	Guidance	
	Full	Abbreviated
External Threat Condition	3.38	3.75
Internal Stress Condition	2.83	3.46

Table VI

Mean Number of Function-Participations Per Individual

	Guidance	
	Full	Abbreviated
External Threat Condition	9.00	6.75
Internal Stress Conditon	7.50	7.85

EFFECTIVENESS OF PARTICIPATION IN SHELTER FUNCTIONS

Table VII shows the results of the effectiveness of participation analysis for both threat conditions. The data presented in the table give the percentage of the 92 items in the Shelteree Effectiveness Checklist which indicates:

1. The occurrence of events augmenting shelter effectiveness,
2. The occurrence of events detrimental to shelter effectiveness, and
3. Inconclusive (undifferentiated) events.

The effectiveness score is simply the arithmetic difference between the percentages of augmental and detrimental events. As was discussed in more detail earlier, differences in group size make it inadvisable to compare these data across simulation conditions. In both conditions, however, substantially greater effectiveness is related to the use of abbreviated guidance.

Table VII

Effectiveness of Participation in Shelter Functions

External Threat Condition

Type of Guidance	Augmental Events (%)	Detrimental Events (%)	Inconclusive Events (%)	Effectiveness Score
Full	53	45	2	8
Abbreviated	77	17	5	50

Internal Stress Condition

Type of Guidance	Augmental Events (%)	Detrimental Events (%)	Inconclusive Events (%)	Effectiveness Score
Full	49	39	12	10
Abbreviated	64	28	8	36

CASUALTY SCORE

As indicated previously the measure of the degree of simulated injury is appropriate to the internal stress condition only. All shelterees in the extended guidance condition fell to "serious injury" status. This resulted from their making use of only one of the three possible water supplies provided, thus causing a simulated water shortage which would have caused serious dehydration during a 14-day stay. No "injuries" or "deaths" were sustained by the group in the abbreviated guidance condition.

DISCUSSION AND CONCLUSIONS

GENERAL

The purpose of this study was to develop and utilize two research techniques for the experimental evaluation of abbreviated versus full shelter management guidance. Rigid experimental comparison of the effectiveness of the two research techniques was not possible because of the variety of extraneous factors associated with the two respective test situations. In spite of the restrictions involved, considerable insight was obtained into the value of the two set-simulation research techniques. At the same time, rather definitive results were obtained from the experimental comparison of the two types of shelter management guidance. A discussion of these insights and results appears below.

RESEARCH TECHNIQUES

Discussion

Both of the research techniques developed for this study proved to be useful for the study of shelter management guidance. Although the experimental design was not directed at a definitive comparison of the two research techniques, there seems to be sufficient data to support speculation about which technique provided a more "realistic" test environment for the study of behavior in fallout shelters. The data sources for such comparisons include the survival set of the shelterees, their tension scores, and their attentiveness to guidance materials. In all three of these categories shelteree performance was quite consistent within each research technique, while clear differences existed between them.

In summary, the subjects quite obviously exhibited survival attitudes in the performance of shelter functions with much greater vigor and initiative under conditions of internal stress. While those exposed to environmental threat appeared quite casual in their performance of shelter functions, they exhibited a higher level of tension than the comparable internal stress group, and were more attentive to the guidance materials, particularly in those few situations where shelter functions were performed.

In interpreting these results one must recognize that the subjects under environmental threat knew that their potential loss (actual injury or even death) was very great, but they were given every reason to believe that the probability of loss was extremely low as long as they did not take deliberate, unilateral action to prematurely leave the shelter. The internal stress subjects, on the other hand, knew that their maximum possible loss ($50.00) was comparatively small, but understood that the probability of loss was great unless they took positive controlling actions. Further, the subjects in the underwater shelter believed that, should their protective system fail, there was little that they could do other than rely upon the experimenters for their safety.

Such a psychological environment could lead the submerged subjects to actively monitor their threat elements (to keep the experimenters informed), but would not necessarily motivate activity directed at eliminating or controlling the threats if they felt themselves to be impotent. This lack of goal-directed activity could in turn result in a relatively high level of general tension-related responses among the shelterees.

Conclusions

It seems reasonable to conclude that the internal stress research technique used in this study provides a valuable tool for behavioral studies relating to fallout shelter systems. The subjects appeared highly motivated to "survive"; more motivated than has been the case in any previous studies with which the Institutes are familiar. Such active participation on the part of the subjects also provides an excellent data base for the study of almost any shelter function and its related variables. In addition, the simulation techniques utilized in this type of study can be safely and effectively implemented at a reasonable cost.

One cannot as easily conclude that the internal stress technique provides a more "valid" test situation for investigating shelteree behavior than does the use of perceived environmental threat. It can readily be

hypothesized that shelterees involved in an actual nuclear attack might trust in the integrity of their shelter system and the capability of local government authorities with the same "blind faith" as that exhibited by the test subjects with regard to their submerged shelter and the research personnel responsible for their safety. Current public information programs are designed to instill confidence in the shelter program. It would seem advisable to examine past and future shelter stays associated with real disasters for behavior patterns similar to those observed under perceived environmental threat before rejecting this methodology as a valid research technique.

In the final analysis it is important to note that the difference in general impact between full and abbreviated shelter management guidance was consistent under both research techniques. This encouraging finding adds considerable confidence to the conclusions presented in the following section.

GUIDANCE MATERIALS

Discussion

The consistent differences observed with regard to the use of full versus abbreviated shelter management guidance may be summarized as follows:

1. The presence of abbreviated guidance in the shelter was recognized faster under both research techniques than was the presence of full guidance.

2. Use of the abbreviated guidance involved a two-man joint effort under environmental threat, and division and circulation to all task leaders in the internal stress test. Application of the full guidance materials was autocratic under both research techniques.

3. There was a consistent, albeit statistically insignificant, trend for shelterees using abbreviated guidance to participate in a greater variety of shelter functions than those using full guidance.

4. The two groups using abbreviated guidance were significantly more effective in their performance of shelter functions than were the full guidance groups.

5. Survival score varied in favor of abbreviated guidance, since there were no "casualties" under abbreviated guidance, while the full guidance group sustained "serious injuries" (dehydration). While these data are available only from the two cases of internal stress, it is comforting to note that "survival" was positively related to effective use of guidance.

In short, there is a generally unanimous trend toward superiority of abbreviated guidance. This superiority appears to result from the ease and speed with which the abbreviated materials could be read. Basic shelter needs and supporting data were presented concisely to shelterees who were, especially during the early hours, action-oriented, and who

therefore tended to quickly lose patience when required to read a detailed presentation. The speed with which a particular fact could be located also tended to favor the use of a brief guide, again due to the apparent pressure under which the shelterees operated.

The notable lack of detailed information in the abbreviated guidance did not seem to affect in any way, the operation of the shelter. This probably resulted from both the generally high motivation of the shelterees and the specialized instructions included with the sanitation kit and other shelter equipment which required special manipulation. Thus the major limitation of the abbreviated guidance, its lack of detail, did not noticeably influence performance.

These apparently definitive findings should be qualified in several ways. First, these studies involved only the first twenty-four hours of a shelter stay. The more detailed information available in the full guidance might substantially enhance shelteree performance as additional problems arise and more time becomes available for assimilation of the guidance.

Second, these studies were conducted without the use of trained shelter managers. Such individuals, who could quickly identify basic shelter needs on the basis of their training, might more effectively utilize the broader information pool available in the full guidance.

A third factor was the relatively small size of the test shelter populations. It is difficult to predict whether the complexity of large shelter operations would, in itself, require more detailed and comprehensive shelter management guidance than that provided in the abbreviated materials.

Finally, it should be noted that when tension scores are corrected for general activity level, the shelterees who used abbreviated guidance showed significantly (.01) greater tension than those who used full guidance under the same research technique. It might be hypothesized that abbreviated guidance, which simply identifies shelter needs and provides minimal data for meeting them, generates higher general tension in the shelterees

than the full guidance, which provides more information for use in solving shelter problems. While general tension levels demonstrated in these 24-hour studies did not pose any special problems for shelter management, both tension level and the impact of cumulative tension may affect operations as the length of the shelter stay increases.

Conclusions

It seems clear that abbreviated shelter management guidance is superior to full guidance as an aid to emergent, untrained managers of small shelters during the first twenty-four hours of a shelter stay. This finding is supported by consistent results from two different research techniques designed to simulate accurately certain shelter conditions which are projected to occur during an actual attack. There is an obvious need to examine both full and abbreviated guidance materials within the context of larger shelters, longer shelter stays, and the presence of trained shelter managers. A reasonable configuration for study would be the use of both kinds of guidance materials as an integrated package.

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APPENDIX A

SUBJECT PROCESSING AND INFORMATION CONTROL MATERIALS

INITIAL CONTACT LETTER

AIR AMERICAN INSTITUTES FOR RESEARCH

135 NORTH BELLEFIELD AVENUE
PITTSBURGH, PENNSYLVANIA 15213

Institute for Performance Technology

Dear

In response to your recent inquiry regarding our upcoming studies, we would like to take this opportunity to thank you for your interest, and to explain this research study in more detail than was possible in our newspaper announcement.

There will be a number of separate studies conducted throughout the fall and winter. Once accepted as a subject, you can participate in only one of the studies.

The purpose of these studies is to gather data on how groups of people, brought together and left alone, will react to various situations. Should you be chosen as a participant, you will join a group of people in a room containing sufficient provisions for 2 days. You will be told that the room is a fallout shelter and that you are under atomic attack. The group's goal will be to "survive" under these mock attack conditions for the 2 days. Everything necessary for "survival" will be stocked in the shelter.

Those who participate can earn a maximum of $50 by completing their stay successfully. The precise amount may be determined by the success with which the problems relating to "survival" of the group are solved.

Two different facilities will be used for the studies:

Conventional Facility. If you are assigned to a group in this facility, you will occupy a room in an office building. A large number of problems appropriate to the situation will be introduced.

Submerged Facility. An air-filled room has been anchored twenty feet underwater. If you are assigned to a group occupying it, you will be presented with some problems from the conventional facility, plus others relating to this unique environment.

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If you wish to apply for one or the other of these facilities, you may. However, your chances of being selected at all are much better if you are willing to be in either (See item 20 on the enclosed application form).

We feel that you will find these studies to be inherently interesting as well as financially rewarding. For example, to the best of our knowledge, this is the first time anywhere that a family unit may live together underwater.

We would be pleased to consider you as a subject. Please complete the attached application form and return it as promptly as possible.

We will consider applications from:

1. Individuals 18 and over, and

2. Persons between 8 and 12 only if they come with other family members.

Those whose applications are selected will receive more detailed information later.

Once again we want to thank you for the interest you have shown in our project. We shall look forward to receiving your application in the mail.

Sincerely,

Sheila B. Mann
Coordinator

SM:cm

SOCIAL SYSTEMS PROGRAM, AMERICAN INSTITUTES FOR RESEARCH
135 N. Bellefield Avenue, Pittsburgh 13, Pennsylvania 683-7600

APPLICATION FORM

(Please print or type. All information will be held strictly confidential).

1. Full Name:_____ 2. U.S.Citizen: Yes___ No___

3. Home Address (including zone or town):_____

_____ 4. Home Phone:_____

5. Occupation (describe fully):_____

_____ 6. Business Phone:_____

The information contained in items 7 through 14 will be used by our research staff to assemble subjects into groups which are representative of the population of America. The wide range of races and creeds found in America will, therefore, be reflected in these groups whenever possible.

7. Sex:_____ 8. Age:_____ 9. Race:_____ 10. Religion:_____

11. Marital Status:_____ 12. Age(s) of Children:__/__/__/__/

13. Describe any leadership experience you have had (military, civilian or civil defense):

_____

14. Education: Circle highest grade attended. 6 or less 7 8 9 10 11 12
College: 1 2 3 4 5 or more.

15. Do you have heart trouble?_____ Diabetes?_____

16. Do you have or have you ever had any respiratory disease (TB, asthma, etc.)?_____

17. Have you been hospitalized or had any serious illness in the last 6 months?_____

18. Are you presently under the care of a doctor, psychiatrist, or counselor? If so, for what?_____

19. Have you received professional help for an emotional or nervous disorder within the past 3 years?_____

20. Which of the studies listed below could you participate in?

_____ Underwater (conducted in October)

_____ Conventional (conducted in January).

21. Would any friends, associates, or members of your family be interested in participating in these studies? (Print their names, addresses, and telephone numbers on a separate sheet and send with your application).

22. Have you had any experience as a subject (for this organization, or others) that might help you in these studies?_____ Please describe briefly (include approximate dates).

_____

_____

ENVIRONMENTAL THREAT INFORMATION AND SCHEDULING LETTER

AIR AMERICAN INSTITUTES FOR RESEARCH
135 NORTH BELLEFIELD AVENUE
PITTSBURGH PENNSYLVANIA 15213

Institute for Performance Technology

Dear

We are pleased to inform you that you have been tentatively selected to participate in one of our underwater studies to be conducted the week end of October and 1966. Preliminary to actual participation in the study, however, all subjects will be given a comprehensive medical examination and attend a training session where they will be briefed on and will practice the things they will need to know for their participation.

The timetable for these events is as follows: The medical examination will take place on Monday evening October at Falk Clinic, 3601 Fifth Avenue in Oakland, Pittsburgh. You may arrive anytime between 7 and 7:30 PM. There is, of course, no charge for the examination. The training session will be conducted the following Wednesday evening, October at our office, 135 N. Bellefield Avenue. The session will begin promptly at 6:45 PM. Bring your swimsuit and a towel as some of the time will be spent doing simple swimming exercises in a nearby pool.

Based on the outcomes of the medical and the training session and the information in the applications, the research staff will select the persons who will actually participate in the study and contact them at least one week prior to the study.

Those selected to participate will meet at A.I.R. Saturday morning, October promptly at 10:30 AM. From there they will be taken to the airport and flown via a commercial airline to our research facility near Reading, Pennsylvania where they will enter our underwater test facility and remain for 32 hours. After their underwater stay the group will be transported back to Pittsburgh, arriving at A.I.R. about 10:00 PM Sunday.

Again, let me welcome you as a tentative participant. I hope this letter has answered any questions you might have about what you will be doing in preparation for the underwater study. However, should you have a question, please don't hesitate to give us a call. Ask for Mrs. Mann in the Social Systems Laboratory.

We are looking forward to seeing you at the Medical Exam.

Sincerely,

Richard L. Dueker

Richard L. Dueker
Assistant to the Project Director

RLD:cm

TELEPHONE (412) 683-2000 • CABLE AIRESEARCH

ENVIRONMENTAL THREAT SCHEDULING AND CONFIRMATION LETTER

AMERICAN INSTITUTES FOR RESEARCH
135 NORTH BELLEFIELD AVENUE
PITTSBURGH, PENNSYLVANIA 15213

26 October 1966

This letter is to confirm certain aspects of your participation in our study for this coming weekend.

On Saturday, October 29th you will arrive at our building, 135 N. Bellefield Avenue, no later than 10:30 am. You will depart from here at 11:00 am by limousine which will take you to Greater Pittsburgh airport.

As to your personal effects, we suggest that you bring only casual clothes for Saturday and Sunday, plus any personal toilet articles that you wish.

Remember however, that the majority of your time will be spent in the underwater shelter. Clothing will be supplied for wearing in the shelter. The only personal clothing needed in the shelter will be your bathing suits.

After your shelter study is completed you will be driven to a nearby motel where you can freshen up before starting back. Dinner will be provided and your final destination will be back at the AIR building where you can pick up your car or arrange to be picked up between 10 and 11 pm.

If you have any questions, please feel free to call me.

Sincerely,

Sheila B. Mann
Coordinator

TELEPHONE (412) 683-2600 • CABLE AIRESEARCH

INTERNAL STRESS INFORMATION LETTER

AIR

AMERICAN INSTITUTES FOR RESEARCH

135 NORTH BELLEFIELD AVENUE
PITTSBURGH PENNSYLVANIA 15213

Institute for Performance Technology

Some time ago you submitted an application to our organization to be considered as a possible subject in our studies. We are pleased to inform you that the following members of your family have been tentatively selected to participate in one of our weekend studies to be conducted during January 1967.

*

Those selected for a study will stay in an office in the Pittsburgh area over a weekend beginning on a Friday evening. Two studies will be carried out. The first will be January 13-15, and the second will be conducted January 20-22.

Preliminary to actual participation in the study, all subjects will be given a medical examination at Falk Clinic. After your medical examinations you may all be used as a family group, or you may be notified
* that only certain members of your family may participate. In the course of the study, members of the same family may be assigned to different rooms. In no case will children be separated from both parents.

To increase the effectiveness of this study we shall imitate dangerous conditions, which your group should control. If they are not controlled, those who become exposed to these "dangers" will be scored as "injured" or "killed", according to a set of written rules. At the outset of your weekend, you will be given a sealed set of rules which you may examine after the study.

The amount of money paid to each subject will be based on the extent of the "injuries" to which he has allowed himself to become exposed. Upon completion of the study you will be informed of any "injuries" you have sustained.

TELEPHONE [illegible] • CABLE AIRESEARCH

If you have not been severely "injured," you will receive full pay - $50.00.

If your "injuries" are not "fatal," you will still receive - $25.00.

If you were supposedly "killed," you will receive only - $10.00.

All "injuries" (loss of pay) may be avoided if everyone realizes that what he does or does not do will affect pay, just as in real life it would affect health.

I hope this letter has answered any questions you might have about the studies for which you applied. We will be contacting you again soon with definite dates for the medical as well as other information pertinent to the study. If you are no longer able to participate, please call 683-7600, The Social Systems Laboratory, to notify us.

Sincerely,

Donald E. Meagley
Task Leader

DEM:sm

* These sections were included only in letters to families. In letters to single participants, they were deleted, as was the first paragraph reference to "members of your family."

INTERNAL STRESS SCHEDULING AND CONFIRMATION LETTER

AIR

AMERICAN INSTITUTES FOR RESEARCH

135 NORTH BELLEFIELD AVENUE
PITTSBURGH, PENNSYLVANIA 15213

Institute for Performance Technology

This letter is to confirm your family's participation in the study to be conducted at the AMERICAN INSTITUTES FOR RESEARCH during the weekend of 20-22 January 1967. You are to report to the Institutes at the above address at 6:00pm, Friday evening, January 20th. Please be prompt, as these studies are conducted on a tight time schedule.

Parking facilities will be available in the garage beneath the AIR building as of 5:30 pm. Access to the garage is via the ramp to the right of the front door as you enter the building.

Casual clothes should be worn during your shelter stay. Please bring to the study only those items which you ordinarily might have on your person.

You should be prepared to remain at the Institutes until Sunday evening, January ~~22nd~~ at approximately 5:00 pm. However, you also should recognize the possibility that you may wish to leave prior to that time, and make the necessary arrangements with your family.

We are pleased to welcome you as a participant in this study, and will look forward to seeing you on Friday evening.

Sincerely,

Donald E. Meagley

Donald E. Meagley
Task Leader

DEM:sm

NOTE: THE FIRST SENTENCE WAS MODIFIED TO READ "YOUR PARTICIPATION" IN THE CASE OF SINGLE SUBJECTS.

TELEPHONE [illegible] ● CABLE AIRESEARCH

AGREEMENT AND RELEASE

1. I, _____,

of _____,

volunteer to act as a subject in a research study to be conducted by the AMERICAN INSTITUTES FOR RESEARCH.

2. I believe that I am physically and mentally fit to withstand any stresses which such participation might impose on me. I assume all risks of illness and injury which may occur because of my participation in said experiments. I hereby release the American Institutes for Research from all liability for any injury sustained, or illness developed by me during my participation in said experiments, not occasioned by any negligence on my part, of the American Institutes for Research.

3. I understand that I might be observed during my participation and that my conduct and/or voice may be recorded by photographic and/or recording devices. I also realize that public reports and articles will be made of the experiments and all of the observations, and consent to publication of such, including the use of photographs.

4. As compensation for my voluntary services as a participant in the aforesaid studies, the American Institutes for Research will pay me a sum dependent upon my performance as outlined to me in a previous letter, for the testing session if I am selected to participate in it.

5. I hereby agree, under penalty of forfeiture of all compensation due me, not to give information regarding these studies to any public news media nor to publicize any articles or other accounts thereof without prior written approval by the American Institutes for Research.

Intending to be legally bound, I have signed and sealed the herein Agreement and Release, this _____ day of _____ 1967

_____ (Signature)

SHELTER BRIEFING

May I have your attention, please!

The general theme of this study centers around a nuclear attack upon this country. It is important that you (play along with) this theme to assure your simulated survival,and thus, maximum payment for your participation.

In a conspicuous place in the shelters are rules by which we will evaluate your performance, both as individuals and as a group, while in our test shelters. These rules are sealed in a brown envelope, and this seal must not be broken until after you all have completed the shelter stay.

Even though these rules are sealed, you can assure your simulated survival by conducting yourselves in what ordinarily would be the correct way to behave in a real shelter during an actual nuclear attack. You may use whatever facilities are available in your particular shelter area, but please do not destroy anything which is obviously designed for peacetime use. In particular, please do not interfere with lighting, communications, or any other electrical facilities in or around your particular shelter area. There will also be a number of DO NOT TOUCH signs placed about the shelter areas. You should obey these signs.

You will enter the shelter in just a few minutes.

Assume that you have been walking in the Oakland area when you hear an attack warning indicating that you must take shelter immediately. Floor wardens will direct you to your designated shelter area.

During your shelter stay you will be confronted with a number of problems which might occur in an actual shelter. You should treat these problems as real, and handle them as best you can. Your simulated survival will depend upon it.

At the end of this study the seal will be broken and your performance will be scored on the basis of the enclosed rules. Naturally, if these rules are opened during the study everyone will forfeit their honorarium. Also, as you know, if you leave the study before it is terminated by the experimenters, you, as an indi idual may forfeit your entire honorarium.

Remember to conduct yourselves the way you would in an actual shelter. You may or may not have a trained manager assigned to your shelter. In any case, you will have many aids available to you.

You are now about to go to your shelters. GOOD LUCK!

APPENDIX B

PERFORMANCE SCORING MATERIALS

RULES GOVERNING PAYMENT OF SUBJECTS

SIMULATED DANGER	RULES
Radiation	Radiation began 5 minutes after the message from your loudspeaker that fallout was descending in the Pittsburgh area. 1. Anyone who was several feet beyond the shelter door for more than a minute after this time was "seriously injured" and will receive $25.00. 2. Anyone who was beyond the door for more than two minutes after this time was "killed" and will receive $10.00.
Bad water (the water in the drum)	If the water was treated with Halazone tablets from the medical kit, it was made "safe." 1. Anyone who swallowed any of this water without prior treatment was "infected by bacteria" and "seriously injured." They will receive $25.00. (One"taste" is OK). 2. Anyone who drank more than one full glass of this water without prior treatment was "killed" and will receive $10.00.
Inadequate water	Your water drum held only one day's supply of water. To have enough for the two days you expected to stay, you had to get more, either from the pipe in your shelter or from nearby restroom. If you used only the pipe water or only the drum water, you had half-enough to live on. You would have been dangerously dehydrated after two weeks of this. 1. If you used only one water source, you were all "seriously injured" and will receive $25.00 each.
"Gas" leak	Air with gas in it can, as you know, explode if a flame is made, or even if a spark is struck. In our simulation, an explosive mixture existed from two minutes after the loud noises which began soon after you entered the shelter. There continued to be an explosive mixture until 10 minutes after you found and fixed the leak. 1. If a spark was struck or a flame was lit or a cigarette was burning during this period, all of you would have been "severely injured" and some of you might have been "killed."

If there was such a spark, flame, or burning cigarette during this period, each of you will be given a chance to draw a slip of paper from a box. The box will contain 30 slips. Three will say "killed, $10.00" and 27 will say "injured, $25.00." This will be the explosion's effect on you, and your payment.

If anyone was "severely injured" more than once under these rules, his multiple injuries "killed" him. He will receive $10.00.

SIMULATED ONE WAY PAGING SYSTEM SCRIPT

Script #1

S Helo, Hello.

R Hey, that's coming over our speaker.

S Huh, hello, testing 1 - 2.

R Yeah, it's coming over our speaker.

H Are we supposed to mess around with that?

S They put it in here.

R I don't see any Don't Touch sign on it.

S I wonder how come we can hear ourselves on the speaker.

R Hey, maybe we can talk to those other guys.

H Say something and see if they answer back.

S Hello, Hello. Can you hear us out there?

S If you can hear us in the other shelter or someplace uh, say something back.

R Maybe it's just so the experimenters can hear us or talk to us.

S Be quiet a minute and see if we can hear anything from the other people.

H Ah, forget it, they're just trying to bug us.

Script #2

S Hello, we hear you out there.

D Naw, that's suppose to be a radio.

S Hello, can you hear us?

S We can hear stuff from a radio but we can't hear you guys.

D Maybe it only works one way.

H I didn't see any mike when I was in there.

Script #3

S Hello, hey listen, if you can hear us we think we're getting through to the other group, but we can't hear anything from you guys that we can understand. We don't have any food supplies. We're suppose to have crackers or something, uh, if you have anybody down there that would like to bring us some, we'd appreciate it. We got this big can of water but no food. We're on the other side of the building. If you have any crackers or stuff for the kids, uh, how about bringing it up and maybe we can swap some water for it. Huh, oh yeah, we're already picking up so much radiation even inside our shelter here, that we can't send anybody out without loosing a lot of money. So, if you got anybody that can make a quick dash without loosing too much money we'd appreciate it. Answer us if you can.

J Have them flash the lights or tap on the wall or something and see if we can hear it.

Script #4

S Hello, hello, uh, would you believe a bandaid?

H Aw come on now be serious.

S Uh, we have a little kid that says he needs a bandaid for his finger, really bad and he wants to leave if he doesn't get one. If you've got any bandaids down there uh, if you can hear us we'd appreciate it if you could send us a couple. Maybe an antiseptic, if you haven't picked up too much radiation already. Hello, can you hear us? Look this kid'll probably have to leave, uh, along with the rest of his family if we can't help him out.

H Tell him, 10 minutes.

S Hello, uh, if you can hear us, we'll wait about 10 minutes before we let these people leave and if you can help us out, how about

sending somebody up to the sixth floor to the men's room in the front. Thank you.

Script #5

H Hey get away from there.

CRITERIA APPLIED TO SHELTEREE EFFECTIVENESS CHECKLIST

Each item in the following "Shelteree Effectiveness Checklist" is coded in two terms: the desirability of its effect (positive or negative value) and the criterion for its occurrence. The two code symbols are entered for each item in the specimen checklist, immediately preceding the "yes" column--desirability first.

Those items whose occurrence was judged to be desirable are coded with a "+" and those whose occurrence is undesirable, with a "-."

For some items, e.g., p. 106, Item 4 "Are shelterees counted?" the criterion for occurrence is one observer note of an event. Such items are coded ($\pm$) A.

Others, e.g., p. 107, Item 3 "Is there waste in distribution..." must occur more than once to be significantly beneficial or harmful. Such items are coded ($\pm$) B. In these cases a <u>majority</u> of "yes" entries for the item constituted occurrence and a majority of "no" entries constituted non-occurrence.

In scoring, non-occurrence of a "-" item was counted as a desirable event and non-occurrence of a "+" item was counted as undesirable.

A few special cases require further explanation. These are <u>groups of items</u> in which latter responses are logically dependent on the first of the group (the "primary"). When the primary event occurred, the desirability of the event was determined by the sign of the majority of secondary events. In the specimen checklist, the item numbers of these groups are shown linked together and the primary event is indicated with a "P" (for example, see p. 107, Items 11 and 12.

SHELTEREE EFFECTIVENESS CHECKLIST

Shelter Orientation (Entry Phase)		Yes	NO	Shelter Hour
1. Is assistance given in filling the shelter?	+ A			
2. Is the shelter prepared for occupancy - inventory?	+ A			
3. Are shelterees reassured?	+ A			
4. Are shelterees counted?	+ A			
5. Is command assumed as soon as possible?	+ A			
6. Are briefing sessions established?	+ A			
7. Are augmented supplies considered?	+ A			
8. Is temporary shelter organization established?	+ A			
9. Are living spaces assigned?	+ A			
10. Is guidance material read or used?	+ A			
11. After shelter is filled, are entrances checked?	+ A			
12. Is the emotional atmosphere assessed?	+ A			
13. Is H_2O level immediately monitored (Radiation Level for Internal)	+ A			
14. Is CO_2 level immediately monitored. (Temperature Level for Internal)	+ A			

Do (Does) team(s) (leadership) emerge?

NOTE: In forms where H_2O level appears, substitute radiation level and where CO_2 level appears substitute temperature readings.

SHELTEREE EFFECTIVENESS CHECKLIST

Water Distribution and Consumption		Yes	No	Shelter Hour
1. Are teams set up?	+ A			
2. Does it take too long for shelterees to be served?	- B			
3. Is there waste in distribution-- spillage, broken cups, etc.?	- B			
4. Is water rationed?	+ B			
5. Are cups mutilated?	- B			
6. Are cups stored adequately?	+ B			
7. Are cups filled by using clamps rather than by dipping?	+ B			
8. Are checks made on how much water is left?	+ A			
9. Are logs used?	+ A			
10. Are cups rationed?	+ A			
P 11. Is a water distribution schecule set Up?	+ A			
12. Is water distribution schedule abided by?	+ B			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

Safety or Security		Yes	No	Shelter Hour
1. Are night watches posted?	+ A			
2. Are safety and/or security teams set up?	+ A			
3. Are provisions made for emergency exit?	+ A			
4. Are provisions made for countering would-be looters?	+ A			
5. Is H_2O level monitored?	+ B			
6. Is shelter space measured?	+ A			
7. Are shelterees briefed on use of monitoring equipment?	+ A			
8. Are logs used?	+ A			
9. Are general hazards avoided, i.e., sharp instruments jagged tin cans, etc.	+ A			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

	Medical Care		Yes	No	Shelter Hour
P	1. Is a team designated?	+ A			
	2. Is the team set up early enough in the shelter stay?	* + A			
	3. Do training sessions occur?	+ A			
P	4. Are medical supplies identified?	+ A			
	5. Are medical supplied inventoried?	+ A			
	6. Are medical supplies made secure?	+ A			
	7. Is coughing or sniffling attended to?	+ A			
	8. Are logs used?	+ A			

Do (Does) team(s) (leadership) emerge?

* In order to be scored as occurring, this event must have occurred during the first three hours of a shelter stay.

SHELTEREE EFFECTIVENESS CHECKLIST

		Training and Education		Yes	No	Shelter Hour
P	1.	Are training and education sessions held?	+ A			
	2.	Are shelterees attentive?	+ B			
	3.	Is information presented correctly?	+ B			
	4.	Are training sessions diversified?	+ B			
	5.	Are shelterees inquisitive?	+ B			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

	Communications		Yes	No	Shelter Hour
	1. Are teams established?	+ A			
P	2. Are communication rules established?	+ A			
	3. Are rules abided by?	+ A			
	4. Is communication equipment inspected?	+ A			
	5. Is communication equipment explained?	+ A			
	6. Are logs used?	+ A			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

Food Distribution and Consumption		Yes	No	Shelter Hour
1. Are teams set up?	+ A			
2. Does it take too long for shelterees to be served?	- B			
3. Is there waste in distribution?	- B			
4. Is food rationed?	+ B			
5. Are containers mutilated?	- A			
6. Are containers stored adequately?	+ B			
7. Is there waste in consumption?	- B			
8. Are checks made on how much food is left?	+ A			
P 9. Is a food distribution schedule set up?	+ A			
10. Is the food distribution schedule abided by?	+ B			
11. Is food hoarded?	- B			
12. Are logs used?	+ A			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

	Provisions for Shelter Sanitation		Yes	No	Shelter Hour
	1. Is a sanitation team set up?	+ A			
	2. Are attempts made to police the area for rubbish?	+ A			
	3. Are recepticles or areas assigned for rubbish disposal?	+ A			
	4. Are sanitation supplies rationed?	+ B			
P	5. Are smoking rules established?	+ A			
	6. Are smoking rules abided by?	+ B			
	7. Is the use of the toilet explained or discussed?	+ A			
	8. Is there uneasiness about using the toilet?	- B			
	9. Are hands cleaned before food or water distribution?	+ B			
	10. Is sanitation kit inspected or explained?	+ A			
	11. Is the sanitation kit used?	+ B			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

Provisions for Sleeping		Yes	No	Shelter Hour
1. Are sleeping positions and spaces assigned?	+ A			
2. Is there separation of the sexes?	+ A			
3. Are married people kept together?	+ A			
4. Is there a special time set up for sleeping?	+ A			
5. While sleeping is there free access to the toilet?	+ B			
6. While sleeping is there free access to emergency exits?	+ B			
P 7. Is a night watch maintained?	+ A			
8. Are night watchmen periodically changed?	+ A			
9. Is frequent bodily contact a disturbance during sleep?	- A			
10. Is there a significant amount of insomnia?	- A			
11. Is there any loud talking while others are sleeping?	- A			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

Recreational Activities		Yes	No	Shelter Hour
1. Is there a team set up?	+ A			
2. Are recreational activities appropriate to head space?	+ B			
3. Are recreational activities appropriate to ages?	+ B			
4. Do shelterees appear to enjoy recreational activities?	+ B			
5. Is there diversity in recreational activities?	+ B			
6. Is everybody participating in recreational activities?	+ B			
7. Do non-participants object to individual activities?	- B			
8. Is participation forced?	- B			
9. Are recreational activities improvised? (as opposed to planned)	- B			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

	Support Activities		Yes	No	Shelter Hour
	1. Are teams established?	+ A			
P	2. Are religious services held or allowed for?	+ A			
	3. Are services appropriate for the situation?	+ A			
	4. Are religious preferences assessed?	+ A			
	5. Are shelterees encouraged not to engage in individual activities?	+ A			
	6. Are shelterees reassured?	+ A			

Do (Does) team(s) (leadership) emerge?

SHELTEREE EFFECTIVENESS CHECKLIST

		Social Control		Yes	No	Shelter Hour
P	1.	Are rules of social behavior set forth?	+ 1			
	2.	Are rules of social behavior abided by?	+ 2			

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13. ABSTRACT

The research program reported had two major goals: Two methods for simulating in subjects the "survival set" to be expected in shelterees were developed, and their effectiveness was tested. Second, the effectiveness of two types of shelter management guidance in small shelters with emergent management were evaluated.

The two "survival set" simulation techniques developed were environmental threat and internal stress. Under environmental threat, subjects were confined in an air-filled tank, submerged 20 feet in water. Here the threat of the surrounding water substituted for the threat of radiation. Internal stress was conducted in normal room configuration. Here, threat of pay reduction for inadequate performance of shelter functions served as a substitute motivation for threat of death or injury.

The two techniques produced differing kinds of realism. While internal stress subjects demonstrated great vigor and initiative in performing survival functions, environmental threat subjects exhibited comparatively high tension levels and attentiveness to guidance. The advantages of each technique are discussed, and suggestions for other applications are made.

The two types of guidance compared were an extensive, 200-page handbook (full guidance) and a large, folded single sheet which tersely outlined essential management procedures (abbreviated guidance). The latter was based on the larger document. In the results, there was a generally unanimous tendency to show that the abbreviated guidance was superior across all variables. It was pointed out that these results apply only to small shelters under emergent management.

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Shelter Management Guidance						
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Shelter Manager's Guide						
Survival Set						
Environmental Threat						
Internal Stress						